Published in final edited form as:

AIDS Care. 2014 April ; 26(4): 441–447. doi:10.1080/09540121.2013.841837.

Acceptability and feasibility of CyberSenga, an Internet-based HIV prevention program for adolescents in Mbarara, Uganda

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Abstract

Capitalizing on emerging data suggesting that HIV preventive behaviors can be positively affected by Internet-based programs, we developed and tested CyberSenga, an Internet-based, comprehensive sexuality education program for adolescents in Mbarara, Uganda. Three hundred and sixty-six secondary school students were randomly assigned to either the 5-lesson program (+ booster) or a treatment-as-usual control. At three-month follow-up, intervention participants provided feedback on program acceptability. Six focus groups with intervention participants were additionally conducted after the final follow-up at 6 months. Data support a hypothesis of feasibility: Despite schedule interruptions, 95% of intervention participants completed all 5 modules; only 17% deviated from the once-a-week intended delivery schedule. Internet service was uninterrupted during the field period and, in general, the technology performed to specifications. The intervention also appears to be acceptable: 94% of intervention youth somewhat or strongly agreed that they learned a lot and 93% said they were somewhat or very likely to recommend the program. Although more than two in three youth somewhat or strongly agreed that the program talked too much about sex (70%) and condoms (75%), 89% somewhat or strongly disagreed that “I do not think kids like me should do the CyberSenga program”. Feedback from focus group participants further suggested that the content was generally acceptable and did not contradict local norms in most cases. In fact, despite concerns from some local stakeholders to the contrary, information about condoms did not appear to be confusing or contradictory for youth who were abstinent. Nonetheless, some of the sexual topics seemed to be unfamiliar or uncomfortable for some participants – particularly brief references to oral and anal sex. Together, both qualitative and quantitative data suggest that the program is a feasible and acceptable way of delivering HIV preventive information to both sexually experienced and inexperienced adolescents in Mbarara, Uganda.

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Conflicts of interest

The authors have no conflicts of interest to declare.

Keywords

sub-Saharan Africa; Internet; HIV prevention; adolescents; school

An estimated 3% of adolescent females and just over 2% of adolescent males are HIV positive in Uganda (Uganda Ministry of Health, 2012). Although most new infections are caused by heterosexual transmission, life skills-based HIV education is only available in 15% of schools (Government of Uganda, 2010). Increasing youth's access to comprehensive healthy sexuality programming needs to be a priority if incidence rates are to be reduced (Hendriksen, Pettifor, Lee, Coates, & Rees, 2007).

In the past decade, Internet-based HIV prevention programs have emerged in developed countries (Ybarra & Bull, 2007). These programs realize reductions in sexual risk behaviors comparable to face-to-face programs, but are less costly to scale up (Noar, 2012; Noar, Cole, & Carlyle, 2006). Because many Ugandan adolescents have Internet access (Ybarra, Kiwanuka, Emenyonu, & Bangsberg, 2006), such programs also may be feasible in developing country settings. Capitalizing on what appeared to be a trend towards increased Internet access for young people, we developed and tested CyberSenga, an Internet-based, comprehensive sexuality education program for adolescents in Mbarara, Uganda.

In Uganda, the Senga is the father's sister and is typically responsible for offering female children guidance on sexual health (Muyinda, Nakuya, Pool, & Whitworth, 2003). The Kojja is the male equivalent. We adopted the Senga and Kojja symbols to represent culturally salient, trustworthy role models for youth to follow throughout the intervention. Two adolescent characters, 'Moses' and 'Eunice', were created for users to relate to as peers.

The program was designed to affect condom use if youth had sex, and otherwise, abstinence. Intervention content was informed by the Information-Motivation-Behavior model of HIV preventive behavior (J. D. Fisher & Fisher, 1992; J. D. Fisher & Fisher, 2000) and extensive formative work that included focus groups and beta testing (Bull, Nabembezi, Birungi, Kiwanuka, & Ybarra, 2010; Ybarra, Birungi, Prescott, & Bull, 2012; Ybarra et al., 2006). Five one-hour modules were created: 1) HIV Information (e.g., how you acquire HIV); 2) Decision Making and Communication (e.g., the steps to making a decision); 3) Motivations to be healthy (e.g., benefits versus drawbacks of being sexually active versus abstinent as an adolescent); 4) How to use a condom to be healthy; and 5) Healthy relationships (e.g., dating violence).

Intervention content was tailored to four groups: abstinent boys and girls, and sexually active boys and girls, respectively. All versions included the same concepts (e.g., effective communication), but content was tailored for saliency based upon one's biological sex and sexual experience as indicated by themes noted in the formative research (Ybarra et al., 2012) as well as on feedback from the Community Advisory Board. For example, text for abstinent youth acknowledged they were choosing not to have sex now; but in the future, when they were older and in a healthy relationship, they would hopefully be ready to have sex. Content discussed relevant topics to provide youth with the information and skills they needed to make healthy decisions in the future. Text for males addressed assumptions of what 'real men' do. Thus, to counter the cultural norm that one is not a real man until he has sex, CyberSenga suggested that a real man is one who waits until he is in a healthy relationship to have sex; and that real men always use condoms.

In this paper, we examine program feasibility and acceptability. Findings from the randomized controlled trial are reported elsewhere (Ybarra et al., in press).

Methods

Chesapeake IRB in the United States and Mbarara University Science and Technology Ethical Committee in Uganda reviewed and approved the research protocol. Youth informed assent and guardian permission were obtained from all study participants.

Location and participants

Mbarara, Uganda is the seventh largest urban center located in Southwestern Uganda (Uganda Bureau of Statistics, 2010) surrounded by a largely rural population. HIV prevalence rates in Uganda range between 4–11% (Uganda Ministry of Health, 2012). The Southwestern region, where Mbarara is located, has the fifth highest HIV prevalence rate (8%) among 15–49 year olds (Uganda Ministry of Health, 2012).

Participants in the randomized controlled trial (RCT) were enrolled in grades Senior 2 (S2) to Senior 4 (S4) (similar to US grades 9–11) at one of four partner schools, and reported Internet or computer use (ever). Partner schools were purposefully recruited to reflect a diversity of family socioeconomic status and religion: two were all-boys private schools; one was a mixed-sex private Muslim school; and one was a mixed-sex public school.

Because of time constraints presented by the school schedule, a subset of youth ($n=740$) were screened for eligibility (Ybarra et al., in press). All 416 youth identified as eligible were invited to participate in the RCT [the sole reason for being ineligible was lack of computer / Internet use], 366 of whom enrolled. Participants were, on average, 16.1 years of age (SD: 1.4 years; Range: 13–19+). Eighty-four percent ($n=307$) were male. Thirty-one percent ($n=114$) reported ever having vaginal or anal sex; 22% ($n=83$) had had sex in the past two years at baseline. Characteristics of youth allocated to the intervention arm are shown in Table 1.

Intervention and control group design

All intervention youth were assigned the first five CyberSenga sessions. A random subsample of intervention participants received one additional module (booster) reviewing intervention content at four months post-intervention. The control arm was treatment as usual: Participants received no interaction beyond the HIV programming offered at the schools. All participants, intervention and control, were exposed to the school's programming.

Procedures

Data collection—Participants completed surveys at baseline, three-months and six-months post-intervention. Ninety-two percent of intervention and 93% of control participants provided six-month follow-up data ($X^2(1) = 0.4$, $p=0.55$; (Ybarra et al., in press)).

Six focus groups (two female and four male) were conducted at CyberSenga offices among intervention participants to query program experiences. Groups lasted approximately one hour, and were held one month after the six-month follow-up period ended to avoid affecting outcome data.

Incentives were not provided to participants.

Randomization—After completing the baseline survey, youth were randomly assigned to either the intervention ($n=183$) or control ($n=183$) groups by the CyberSenga software.

Getting online—Study components, including data collection and intervention delivery took place at the schools in afternoons after classes in ‘mobile cafés.’ Netbooks (i.e., a 10-inch laptop) and an Internet router were set up by study staff. When participants logged into the program at the baseline survey, they were prompted to register by entering their first and last name, and answering five ‘secret questions’ that were intended to be easy to remember (e.g., one’s favorite color). To log in to the program subsequently, participants typed in their names, and answered two of the secret questions randomly chosen by the software.

Youth randomized to the control group did not log in again until the follow-up surveys. Intervention youth were assigned a day a week to come to the study mobile café for five weeks to complete the CyberSenga modules. If they were unavailable, alternate dates were provided.

Measures

Study materials were written and components conducted in English, the official national language of Uganda and the language of school instruction.

Intervention *feasibility* was measured by process measures: field interruptions (e.g., events that delayed the intervention delivery) and technology problems (e.g., non-working netbooks). Field interruptions were tracked with a log that staff completed each day in field.

Intervention *acceptability* was measured by twelve quantitative questions about the intervention experience asked at three-month follow-up. Items were written for this study, and included one’s likelihood of recommending the program to their friends, etc.

More nuanced acceptability data were captured in focus groups that queried intervention participants’ overall experiences with the program, including likes and dislikes and challenges they experienced using the intervention. Participants also were asked how useful the strategies for being abstinent and using condoms were; and whether their perceptions of these preventive behaviors had changed as a result of the program. Finally, program design aspects, including length of each module and the overall program, were queried. To refresh their memory, youth were shown screen shots of the intervention.

Methods

Descriptive statistics were used to detail the demographic characteristics of the sample. Comparisons of quantitative data were tested for statistical significance using chi-square tests.

Focus group discussions were audio recorded and digital audio-files were saved on a password-protected computer. The discussions were transcribed and analyzed by two researchers using content analysis, with three stages of coding: After developing an a priori codebook with codes to identify themes anticipated to emerge, an iterative open coding process was conducted. During the second phase of coding, axial coding, themes and relationships between themes were identified. In the third phase of coding, summary coding, primary themes were identified and the main findings from analysis summarized, while also identifying outliers and rare findings. After each of these stages, the two researchers randomly selected 30% of the transcript passages to code to establish inter-rater reliability. At each stage, reliability estimates were at least 75% or greater. When there were disagreements on codes, the researchers met and discussed discrepancies. Ultimately, full agreement on coding was achieved at each stage.

Results

First, we describe the experiences related to intervention delivery. Next, a description of program implementation experiences is provided. Finally, we examine descriptions of program acceptability among youth.

Intervention feasibility

Field experiences—Intervention delivery was affected several times because of conflicting school and participant schedules (e.g., one's CyberSenga appointment was at the same time as an inter-collegiate sports game). Nonetheless, most participants completed the intervention according to the intended once-a-week delivery schedule: 95% (n=173) of intervention participants completed all five modules, and only 17% deviated from the intended schedule. In addition, 16% (n=29) chose to review at least one of the five modules that they had previously completed.

Most participants did not have an email address and therefore lacked experience with creating and remembering a password. That is why 'secret questions' were used instead. Participants had difficulty remembering answers to their secret questions - even those who logged in weekly as intervention participants - however. In response, we created a password-protected page allowing staff to search for the participant's secret questions and help them log in. Despite youth challenges logging into the program, efforts to ensure participants' privacy were noted: *"I liked Cybersenga because it kept my privacy and I was sure that what I was reading no one was accessing it"* (S3 Male).

Technology—In general, the software performed according to specification: the randomization feature worked as intended; the login feature allowed youth to access their personal program and to resume a lesson where they stopped previously; and the modules did not have glitches or bugs. We discovered at the booster session, delivered after the three-month follow-up survey, that there was an error in the software program such that youth had been re-randomized and their path (sexually active versus abstinent) re-assigned based upon their answers at the three-month follow-up survey. This resulted in some youth being reassigned in the database from e.g., the intervention group to the control group; and from the e.g., abstinent path to the sexually active path. While we were in field and the problem was being addressed, as a workaround, all youth who had been incorrectly re-randomized to the control group were given the abstinent booster path to work through, irrespective of their sexual activity status (to protect their privacy). This affected 30% (n=27) of booster participants. As shown in Table 2, compared to 9% of abstinent males, 68% of sexually active males ($p<0.001$) and 62% of abstinent females were pathed incorrectly ($p<0.001$ based upon a logistic regression model predicting the odds of misassignment based upon intervention path). Only three of these twenty-seven youth reported sexual activity at six-month follow-up, making subsequent analyses to understand how this misassignment may have affected sexual behavior untenable.

There were no Internet service interruptions during the intervention, and the mobile café which relied upon a car battery to power the router, worked without issue. Access to websites other than CyberSenga was restricted using freeware parental control software. Some of the netbooks had not been correctly configured, however. In all cases of youth visiting other sites, the intervention module was first completed before they viewed other websites. Other sites visited were typically gaming sites, information sites (e.g., celebrity news) or social networking sites (e.g., Facebook). Pornography was never detected.

Future program accessibility—Eighty-nine percent of the focus group participants mentioned the possibility of accessing the program if it were available online in the future, although none identified school as a future access point.

Intervention acceptability

Intervention program design—In the three-month follow-up quantitative survey, 94% of intervention youth somewhat or strongly agreed that they learned a lot, 76% said that the content talked about things they had experienced, and 93% said they were very likely to recommend the program to their friends. At the same time, 77% somewhat or strongly agreed the program had too many lessons. As shown in Table 3, male and female participants largely agreed in their appraisal of the program. Although sexually active youth were somewhat more likely to agree that the information talked about things they had experienced compared to abstinent youth (85% vs. 74%, respectively; $p=0.14$), they were less likely to say that the program had given them skills they can use to stay healthy (85% vs. 98%, $p=0.001$), recommend the program to friends (85% vs. 86%, $p=0.02$), and change their behavior because of what they learned (83% vs. 93%, $p=0.06$).

Most of the focus group participants found the length of the modules acceptable. *“Me, I think that the time was okay. Because it had all the elements like decision making, condom use, everything was okay”* said one of the S3 males. Participants also said that the program was interesting and engaging. They enjoyed peer role models, Eunice and Moses, and felt the language was salient and ‘real’: *“The way Eunice and Moses were communicating helped [me] learn a lot”* said an S2 female. Participants found exercises reinforcing program concepts as helpful: *“The games were engaging because whenever I would answer a question I would score and that made the topics so interesting for me and this encouraged me to move on to the next topic”* said one of the S4 males.

Program content—Although most youth somewhat or strongly agreed that the program talked too much about sex (70%) and condoms (75%), 89% somewhat or strongly disagreed that “I do not think kids like me should do the CyberSenga program”. Most youth agreed the content was easy to understand (95%) and that they had gained skills to help them keep healthy (95%). Again, few differences were noted by biological sex (Table 3).

In the development phase, both adults and youth had expressed concern that talking about condoms with abstinent youth may present contradictory messages. Feedback from intervention participants suggested that instead of creating uncertainty, CyberSenga content was useful for future skills building. While some of the sexual topics seemed to be unfamiliar, others (particularly oral and anal sex) seemed to be disturbing, however. A female from S2 said: *“...some topics were disgusting like a penis being placed in the mouth it was so disgusting to me.”* A S2 male shared a similar sentiment: *“...[I] had problem on the issue of oral sex; for me it was very nasty.”* The strength of their reaction is interesting given that oral sex was only mentioned in the first module when different types of sex and their relative HIV risk were presented. Table 4 offers examples from focus group participants on what they learned about each of the major CyberSenga topic areas.

Data from focus groups revealed topics participants felt were not addressed in the program. Although the ways HIV is transmitted were discussed in detail, male participants thought it would be important to discuss whether one could get HIV if they had unprotected sex with a woman who has no wounds in her vagina. The question suggests an ongoing misunderstanding about how HIV is transmitted, including the role that vaginal fluid plays. Some also expressed ambivalence about whether one can remain abstinent in a romantic relationship. One of the S3 males mentioned: *“I have friends who are both boys and girls*

and they say that if you love the girl, you have to first have sex with her to show that you love her. Is this true?" These themes were directly discussed in the program content.

Discussion

To our knowledge, this is the first Internet-based HIV prevention program for adolescents that has been systematically developed and tested in sub-Saharan Africa. Program acceptability appears high. Nonetheless, some negative feedback was received: More than two in three youth said that the program talked too much about sex and about condoms. Coupled with the focus group data, it seems that this may mean that the program exposed youth to things they have not done themselves or were uncomfortable thinking about. This does not necessarily suggest poor acceptability. Sometimes, people need to be challenged to think about things with which they are uncomfortable to develop capacity to problem solve issues if they unexpectedly arise. This is echoed by the three in four youth who strongly disagreed that youth should not do the CyberSenga program. Although participants may have been uncomfortable at times, they still acknowledged the value in the program.

Data suggest the CyberSenga program could be feasibly delivered. None of the participants considered school as a possible future access point, however, reflecting the still-limited access to Internet in Ugandan schools. To implement CyberSenga feasibly in the future, possible options include: promoting access through other venues (e.g., Internet cafés); having organizations similarly implement mobile cafés on school campuses; and/or having government or private donors gift computers and Internet connectivity to schools.

Despite content written to address endemic myths and misunderstandings in Uganda, ongoing confusion about some issues emerged in the focus groups. Future iterations of the CyberSenga program could provide opportunities for participants to ask questions that could be posted on a public online bulletin board for other participants to see. Structural change components may also need to be integrated into future iterations of the CyberSenga program. For example, romantic relationships are illicit in secondary schools in Uganda because they are assumed to have a sexual component. Youth who are found to be in a relationship are publicly shamed and suspended. In order to change youth beliefs, we need to also change adults' assumptions, especially in this case, those of school officials. Similarly, that sex makes one a 'real man' is a core cultural expectation in this setting and norms need to be addressed at the community and social level.

It is important to acknowledge that, while technology reflects exciting opportunities to disseminate evidence-based interventions in settings that have scarce healthcare dollars, technology advances can introduce unexpected challenges. We planned to roll out a publicly accessible version of the CyberSenga website in the summer of 2012. An update to Adobe flash has resulted in malfunction of some program components. Certainly, web-based programs are less expensive to disseminate once they have been developed compared to in-person programs; however, such programs still require financial support to pay for maintenance and software upgrades. It also bears noting that although access to cell phones is more ubiquitous than to the Internet in Uganda, students are not allowed to have phones in school. Similar access issues would therefore be experienced if the program were delivered via text messaging. Access to technology is increasing in developing countries, yet it is critical to understand what structural barriers remain.

Conclusion

Intervention impact and behavior change is only possible if the program is feasibly delivered within the local context, and the content acceptable within cultural norms. This mixed methods study suggests that CyberSenga was well liked by participants and easily integrated

into their daily routines. The program may have a role in future adolescent-focused HIV prevention efforts in Uganda.

Acknowledgments

We would like to thank the entire CyberSenga Study team from Internet Solutions for Kids, Internet Solutions for Kids – Uganda, Mbarara University of Science and Technology, the University of Colorado, and Harvard University, who contributed to the planning and implementation of the study. Finally, we thank the schools and the students their time and willingness to participate in this study.

Funding

The project described was supported by Award Number R01MH080662 from the National Institute of Mental Health. The clinic trial registration number is: NCT00906178. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute of Mental Health or the National Institutes of Health.

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Table 1
Characteristics of Intervention Participants by Sexual Experience and Program Path (n=182)

Youth characteristics	Abstinent males (62.3%, n=114)		Sexually active males (21.9%, n=40)		p-value
	% (n)		% (n)	Abstinent females (15.3%, n=28)	
Demographic characteristics					
Age (M: SD; Range: 13–19+ years)	15.8 (1.4)		16.3 (1.5)	15.9 (1.2)	0.14
Day scholar (versus boarding school)	25.4% (29)		22.5% (9)	71.4% (20)	<0.001
Highest maternal education is primary school or lower (versus higher)	32.5% (37)		37.5% (15)	28.6% (8)	0.77
Highest paternal education is primary school or lower (versus higher)	27.2% (31)		22.5% (9)	28.6% (8)	0.86
Use Internet monthly or less often (versus more frequently than monthly)	49.1% (56)		52.5% (21)	82.1% (23)	0.01
Health					
Fair / poor health (versus average / above average)	22.8% (26)		12.5% (5)	14.3% (4)	0.42
HIV-related indicators					
Somewhat / strongly tired of HIV prevention messaging	22.8% (26)		22.5% (9)	35.7% (10)	0.48
No HIV stigma-related beliefs (Range: 0–4)	29.0% (33)		30.0% (12)	25.0% (7)	0.46
Risk of HIV is above average chance	4.4% (5)		2.5% (1)	17.9% (5)	<0.001
High HIV information ^d	49.1% (56)		55.0% (22)	28.6% (8)	0.12
Psychosocial indicators					
Somewhat / extremely unlikely to have a 'bright future'	12.3% (14)		7.5% (3)	10.7% (3)	0.84
Wishes could have more self-respect	85.1% (97)		77.5% (31)	75.0% (21)	0.09
Social support from a special person (M: SD; Range: 5–20)	16.5 (3.7)		17.7 (3.9)	16.3 (4.2)	0.74
Social support from family (M: SD; Range: 5–20)	17.2 (3.1)		17.4 (3.02)	16.6 (3.5)	0.38

Note: One female was allocated to the 'sexually active females' path. To protect her anonymity, her data are not shown.

^a Answered at least 5 of the 6 information questions correctly

Table 2

Distribution of Software Problems Affecting Booster Administration among Youth Randomized to Receive the Booster (n=89)

Biological sex and baseline sexual activity	Pathed correctly (n=62)	Pathed incorrectly (n=27)
Boys - abstinent	91.1% (51)	8.9% (5)
Boys - sexually active	31.6% (6)	68.4% (13)
Girls - abstinent	38.5% (5)	61.5% (8)
Girls - sexually active	0.0% (0)	100% (1)

Note: Data can be summed across the row; Pearson $\chi^2(3) = 33.5$ $p < 0.001$

Table 3
Program Acceptability Indicators by Biological Sex among Intervention Participant Respondents at Three-month Follow-Up (n=176)

Somewhat / strong agree with the statement....	Biological sex		Sexual activity			
	Males (n=146)	Females (n=30)	p-value	Abstinent (n=136)	Sexually active (n=40)	p-value
I liked CyberSenga	93.8% (137)	96.7% (29)	0.54	95.6% (130)	90.0% (36)	0.18
I learned a lot from CyberSenga	93.8% (137)	93.3% (28)	0.92	95.6% (130)	87.5% (35)	0.06
I do not think kids like me should do CyberSenga	10.3% (15)	16.7% (5)	0.32	10.3% (14)	15.0% (6)	0.41
CyberSenga talked too much about sex	69.2% (101)	76.7% (23)	0.41	68.4% (93)	77.5% (31)	0.27
CyberSenga talked too much about condoms	73.3% (107)	83.3% (25)	0.25	74.3% (101)	77.5% (31)	0.68
The information was easy to understand	94.5% (138)	96.7% (29)	0.63	95.6% (130)	92.5% (37)	0.44
The program was easy to use	95.2% (139)	96.7% (29)	0.73	95.6% (130)	95.0% (38)	0.88
There were too many lessons	73.3% (107)	93.3% (28)	0.02	75.7% (103)	80.0% (32)	0.58
The information talked about things I had experienced	76.0% (111)	76.7% (23)	0.94	73.5% (100)	85.0% (34)	0.14
CyberSenga gave me skills that I can use to keep myself healthy	93.8% (137)	100.0% (30)	0.16	97.8% (133)	85.0% (34)	0.001
I would recommend CyberSenga to my friends	91.8% (134)	100.0% (30)	0.10	95.6% (130)	85.0% (34)	0.02

Table 4

Focus Group Responses From Participants About Information They Learned During the CyberSenga Intervention

Topic	Demonstrative quotes
Abstinence	<p>"Abstinence helped me a lot... we were about to go in our holidays. I am having a girlfriend she wanted me to play sex but because of what I have learnt, I said no I said that I have a life to look after and if you do not want to abstain then fine" (S4 male)</p> <p>"I learnt that even when you are not having sex, you should learn to use a condom even when you are abstaining" (S4 male)</p>
Condom use	<p>"We were able to know where to get condoms for free in Mbarara" (S2 male)</p> <p>"I learnt where to get condoms if you are to play sex and how you can put them on" (S2 male)</p> <p>"I have learnt that in order to be safe, you should always move with your condom such that in case you are tempted you should be ready to use it" (S3 female)</p> <p>"I learnt that we should not keep them in our wallet since they can get torn and you know as youth, we are fond of keeping them in our wallets" (S3 male)</p> <p>"I learnt that you should not use a polythene paper for condom when you are playing sex because I learnt that the polythene paper is not effective and that its texture may be rough and hence it may even have some holes in it which may make you to get STDs" (S4 male)</p>
Problem solving	<p>"The program was so interesting it helped me to learn a lot especially on the topic of problem solving: it helped to learn a lot from it especially on how to refuse and avoid sex... the way Eunice and Moses were communicating helped me learn a lot" (S4 female)</p>
Communication	<p>"I learnt to be firm and tell your girlfriend like if she is in need of something and you do not have it. You should learn how to communicate about this" (S3 male)</p> <p>"I learnt how to communicate with the girls in a clear way if you do not want to play sex with them" (S4 male)</p> <p>"Cybersenga program really helped me a lot I am having a girlfriend she wanted me to play sex but because of what I have learnt, I said no and she started complaining that; I know that you are having other girls outside and that it is why you do not want to have sex with me. I said it is okay if you want to go it is okay because you do not respect my decision. This is because I got a chance to learn how to express my feelings to someone and then I stand my ground" (S4 male)</p>