**Original Study**

**Girl Talk: A Smartphone Application to Teach Sexual Health Education to Adolescent Girls**

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**A B S T R A C T**

**Study Objective:** Produce Girl Talk, a free smartphone application containing comprehensive sexual health information, and determine the application’s desirability and appeal among teenage girls.

**Design, Setting, Participants, and Interventions:** Thirty-nine girls ages 12 to 17 years from Rhode Island participated in a 2-phase prospective study. In phase I, 22 girls assessed a sexual health questionnaire in focus groups. In phase II, 17 girls with iPhones used Girl Talk for 2 weeks and answered the revised sexual health questionnaire and interview questions before and after use.

**Main Outcome Measures:** Participants’ responses to the sexual health questionnaire, interviews, and time viewing the application were used to determine feasibility and desirability of Girl Talk.

**Results:** Girl Talk was used on average for 48 minutes during participants’ free time on weekends for 10- to 15-minute intervals. Reported usefulness of Girl Talk as a sexual health application from baseline (6 participants) to follow-up (16 participants) increased significantly (35.3% vs 94.1%; P < .001). Knowledge improved most in topics related to anatomy and physiology (70.5% to 74.7% out of 7 questions), sexuality and relationships (76.5% to 80.0% out of 10 questions), and STI prevention (75.6% to 79.0% out of 7 questions). Most phase II participants (13 out of 17, or 76.5%) were exposed to sexual health education before using Girl Talk, but 16 out of 17 participants (94.1%) stated that the application provided new and/or more detailed information than health classes.

**Conclusion:** Girl Talk can potentially connect teenage girls to more information about sexual health vs traditional methods, and participants recommended the application as a valuable resource to learn about comprehensive sexual health.

**Key Words:** Adolescent, Health education, Prospective studies, Reproductive health, Sexual behavior, Sexually transmitted diseases, Surveys and questionnaires, Health care smartphone applications

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**Introduction**

The World Health Organization declared in 2010 that research should focus on the development of interventions related to comprehensive sexual health education for teenagers to combat unintended pregnancy and sexually transmitted infections (STIs). Legislation in the United States does not mandate comprehensive sexual health education for teens despite previous research attesting to the success of such education in the classroom. National organizations have also recommended that doctors provide anticipatory sexual health education and guidance to teenagers. The American College of Obstetricians and Gynecologists recommends that young women have an anticipatory sexual health information visit with a gynecologist between ages 13 and 15 years, but the American Academy of Pediatrics recommends that physicians respond to sexual health questions when patients are between ages 15 and 17 years. Current efforts at early intervention do not reach teenagers who have already reached sexual debut by ages 14 and 15 years. New and innovative ways to deliver sexual health information are therefore needed to better support teenagers.

Smartphone usage has increased to 73% among American adolescents since 2013 alongside the widespread success of the Apple App Store. Smartphone applications have been shown to be highly effective in providing health information to teenagers. Krishna et al showed in a 2009 systematic review that mobile phone usage incorporating abbreviated reminder services and general adolescent health education materials can improve health outcomes among teenagers. Many health-based smartphone applications already provide information to users, but few smartphone applications incorporate evidence-based theories for behavior change. Furthermore, there are few smartphone applications related to sexual and reproductive health that are available to users. Using a smartphone application to provide sexual health information to younger populations might aid in increasing awareness of sexual risk
behaviors before sexual debut. More than 46% of surveyed Web sites in 2010 that provided sexual health information contained errors or inaccurate content. Providing accurate, comprehensive, and up-to-date sexual health education materials to teenagers through smartphones vs Web sites might improve their sexual health outcomes.

Teens in the United States, especially in Rhode Island, seek out information related to sexual health through electronic resources over other information outlets. In a previous survey, Rhode Island middle and high school students stated that they most often use social media and peers to obtain sexual health education, respectively. Neither age group stated that they sought out medical advice from medical practitioners. Rhode Island’s state legislature required public and private schools to implement “medically accurate, age-appropriate, and culturally appropriate and unbiased” sexual health education for students upon approval through the state’s Department of Health. As of 2015, Rhode Island’s sexual health curriculum does not encourage teenagers to discuss sexual health with parents or providers, and legislation does not contain information on how sexual health content in schools is regulated or evaluated.

New methods are needed to encourage discussions on sexual health between teenagers and trusted adults. Smartphone usage has the potential to provide accurate and comprehensive sexual health information to teens that is supported by providers, parents, and other trusted adults.

On the basis of the growing use of social media and smartphones by teenagers to learn about sexual health, the evidence-based objectives of our research study were twofold. Our first objective was to design Girl Talk, an Apple-compatible smartphone application providing comprehensive sexual health education materials to girls ages 12 to 17 years. We proposed that introducing age-appropriate, comprehensive, and culturally representative sexual health materials through a free and readily accessible media format like Girl Talk would allow teenage girls to access information needed to improve knowledge of risky sexual behaviors. Our second objective was to test the feasibility and desirability of Girl Talk among female adolescents. We proposed that Girl Talk could provide appealing and comprehensive sexual health information to a wide audience of teenage girls.

Materials and Methods

Application Design

Girl Talk’s interface incorporated 4 guiding principles: inclusion of trusted sexual health information, visually appealing graphics, compatibility with iPhones, and age-appropriate, straightforward content. First, the application’s content included preexisting and accurate sexual health information from government agencies (ie, the Centers for Disease Control and Prevention and the Department of Health and Human Services’ Office of Adolescent Health), national organizations (ie, Planned Parenthood, the National Campaign to Prevent Teen Pregnancy, and the Representation Project), community-based organizations (ie, Brown University’s Office of Health Promotion), and publications highlighting diverse identities in education such as Teaching for Diversity and Social Justice by Maurianne Adams.

Second, the graphics, icons, and content within the Girl Talk application were visually appealing. Bold color schemes, on the basis of the coding produced by software developers from Boston Technology Corporation, captured the attention of users.

Third, Girl Talk was an Apple-compatible smartphone application available to many teenage girls. Boston Technology Corporation designed the application to be viewed on iPhone versions 4 and later.

Last, all content within Girl Talk was formatted to be easy to navigate and readily understood on the basis of the age and grade level of users. Groupings of topics within Girl Talk included:

- A “head” section, which included information about mental health, body image, gender and sexuality, and relationships;

Fig. 1. Girl Talk navigation menu.
• A “breast” section, which included information about breast health and self-examination;
• An “abdomen” section, which included information about healthy lifestyles and reproductive health, including the menstrual cycle and contraception; and
• A “more info” section, which clarified common misconceptions about sexual health and provided additional resources such as Web sites and hotlines.

Medical and undergraduate students wrote and updated content for Girl Talk on a collaborative writing platform (ie, a “Wiki” online database). All students possessed knowledge in relevant areas including adolescent sexual health education, obstetrics, adult gynecology, and pediatric and adolescent gynecology. Students also consistently revised the Wiki to maintain the application’s accuracy.

**Study Design**

Phase I of the study was conducted at Women & Infants Hospital of Rhode Island in Providence, Rhode Island after institutional review board review and included 22 enrolled participants. To meet eligibility criteria, participants were required to be female Rhode Island residents between the ages of 12 and 17 years. Recruitment sites for participants included local clinics, youth community centers, private pediatric practices, obstetrician-gynecologist offices, advertisements on local bus routes, school-based nurses and health educators, and a Spanish-language radio talk show. All youth participants signed an assent form in the presence of 2 investigators and a parent/guardian who also signed a consent form. Participants were separated into 2 age-specific, moderator-led focus groups during phase I to validate a sexual health questionnaire for clarity, comprehension, and age-appropriate language. Feedback from phase I focus groups shaped revisions to the questionnaire before use in phase II. The questionnaire was divided into 5 distinct categories: anatomy and physiology, mental and physical health, pregnancy prevention, sexuality and relationships, and prevention of STIs. The Rhode Island Department of Education Comprehensive Health Instructional Outcomes released in 2015 also guided the separation of questions into the listed sections for analysis. Participants in phase I were compensated with $20 in iTunes gift cards.

Phase II of the study was also conducted at Women & Infants Hospital of Rhode Island and included 20 enrolled participants. Phase II participants were required to meet phase I’s eligibility criteria and also own an Apple iPhone version 4S, 5, 5S, 6, or 6 Plus. The same recruitment strategies used for phase I were used for phase II. Participation included attending 2 appointments with the study team as well as use of the Girl Talk application. During the first appointment, participants answered qualitative interview questions regarding smartphone usage and the sexual health questionnaire developed in phase I to test sexual health knowledge. All interview questions were standardized by investigators through the use of an interview script. Participants then downloaded Girl Talk, created a user account within the application, and completed the questionnaire within the application. After completing the questionnaire, participants were able to select the ethnicity of their Girl Talk character and were given a tutorial of the application’s functions. All participants used the application for a 2-week period and were sent notifications on their iPhones every 72 hours to encourage self-selected use of the application. At the close of 2 weeks, participants were scheduled for a second appointment during which they evaluated all content featured in Girl Talk as well as the application’s overall appeal. Participants also provided suggestions to improve the application’s content and format. Before deleting the application at the conclusion of the study, participants were asked to retake the sexual health questionnaire to determine any improvements in sexual health knowledge. Three participants were lost to follow-up during phase II resulting in the analysis of 17 respondents at baseline and follow-up. Participants in phase II were compensated with $30 iTunes gift cards.

**Statistical Evaluation**

Phase I focus groups provided feedback for the sexual health questionnaire, but the responses were not statistically analyzed. Only responses provided by participants during phase II were analyzed. Phase II participants’ responses to the 45 questions in the sexual health questionnaire were compiled into an online database maintained by Boston Technology Corporation on a GoDaddy® secure server. All responses were downloaded and assigned quantitative values (ie, 1 = correct, 0 = incorrect) in Microsoft Excel 2013 (Microsoft Corp, Redmond, WA). Survey questions were then divided into the 5 categories determined in phase I: anatomy/physiology (7 items), mental/physical health (6 items), pregnancy prevention (15 items), sexuality and relationships (10 items), and STI prevention (7 items). R Studio, an open-source statistical software package, was used to conduct statistical analyses and create graphical representations of all collected data.

Descriptive statistics were computed from participants’ interview responses and in-application survey responses. Participants’ mean hourly use of their iPhones and the application was on the basis of self-reported data. Correct responses to the sexual health questionnaire items were summed to form a total knowledge score as well as individual domain scores for each of the 5 domains of the scale. The Flesch-Kincaid Grade Level readability scores in Microsoft Word 2013 were used as a literary assessment tool to evaluate age appropriateness of Girl Talk by measuring the grade level and length (ie, word count) of questions and content presented to participants. Flesch-Kincaid scores and changes in participants’ response accuracy were then compared to evaluate each section of Girl Talk.

**Results**

**Participant Information**

The average age of phase I participants was 14.6 years. Among 10 participants in the focus groups of 12- to 14-year-old participants, the average age was 13.4 years. Of 12 participants in the focus groups of 15- to 17-year-old participants, the average age was 15.7 years.
The average age of phase II participants was 15.8 years. Sixteen out of 17 participants (94.1%) reported that they received sexual health information up to 12 months prior to study enrollment. Of the sixteen participants who did receive sexual health information within the past year, 13 participants (81.3%) reported that they received the information from school-based educators or health classes.

**Girl Talk and iPhone Usage**

Participants reported weekly average iPhone usage of 5.7 hours during weekdays, 7.6 hours on weeknights, and 13.1 hours on weekends. Participants reported using social media and instant messaging capabilities on their iPhones more than any other function. On average, social media applications were used for 2.6 to 4.8 hours each week, and instant messaging was used for 0.7 to 4.1 hours during the week. Figure 2 provides a graphical representation of participants’ hourly use of iPhone functions according to time of day. Note that features listed under “other” were reported by participants and include playing music, games, or reading electronic books. During the follow-up session, participants reported using Girl Talk for 48 minutes on average over the 2-week period. Fourteen participants (82.4%) stated that they used the application in increments of 10 to 15 minutes, and 15 out of 17 (88.2%) participants noted increased usage (ie, 20 minutes) of Girl Talk during weekends.

**Categorical Changes in Knowledge on the Basis of Grade Level and Word Count**

Improvements in knowledge among phase II participants were noted for anatomy and physiology (70.5% to 74.7% out of 7 questions), sexuality and relationships (76.5% to 80.0% out of 10 questions), and STI prevention (75.6% to 79.0% out of 7 questions), which all exceed the 2.0% overall change in knowledge (76.7% to 78.7% out of 45 questions). No changes in knowledge were noted for mental and physical health or pregnancy prevention. On the basis of Flesch-Kincaid scores, the average grade level of survey questions was 6.5 vs 8.4 for content. Questions for each category consisted of 14.5 words on average, with a range 12.8 to 16.7. The average number of words for content directly related to 1 or more survey questions was 52; however, content related to questions on mental and physical health was an outlier with an average of 127 words per content area whereas the other question categories averaged between 32 and 45 words per content area. “Mental and physical health” and “pregnancy prevention” were the only categories that did not show improvement in knowledge. Table 1 provides a summary of word counts, grade level, and changes in knowledge for all sections in Girl Talk.

**Seeking Advice**

When asked to select their top 3 sources of information on sexual intercourse, contraception, and pregnancy, participants were most likely to select doctors (14 of 17 participants; 82.4%) followed by nurses (13 of 17 participants; 76.5%) and Planned Parenthood (9 of 17 participants; 52.9%) at baseline. At follow-up, participants had an increased preference in consulting doctors (15 of 17 participants; 88.2%) and a slight decrease in preference for nurses (11 of 17 participants; 64.7%). No changes at follow-up were noted for participants’ preference to consult Planned Parenthood. When asked to select their top 3 sources of information on love and sexual relationships at baseline, participants were most likely to select parents or guardians (10 of 17 participants; 58.8%) followed by doctors (9 of 17 participants; 52.9%) or friends (7 of 17 participants; 41.1%). At follow-up, participants’ preference for doctors (12 of 17 participants; 70.6%) and parents/guardians increased (11 of 17 participants; 64.7%). Compared to 3 participants at baseline, 7 participants reported an increased preference to approach nurses for information on love and sexual relationships (17.6% vs 41.1%; P < .05).

When participants were asked if they shared information from Girl Talk with their family during phase II, participants were more likely to report that they shared information on mental health with family members than other content areas. When participants were asked what topics in Girl Talk they discussed with friends, participants were more likely to report sharing information on contraception than other content areas.

**Participants’ Impressions of Girl Talk**

Nearly all participants in phase II (16 of 17 participants; 94.1%) stated that most or all of their friends owned smartphones that could support Girl Talk. Compared to 6 participants at baseline, 16 participants reported at follow-up that they or other teenage girls would use Girl Talk to learn about sexual health (35.3% vs 94.1%; Fisher exact P = .0008). Changes in participants’ responses were significant and are outlined in Figure 3.
Content strongly favored by participants included topics such as healthy lifestyles (13 of 17 participants; 76.5%), body image (10 of 17 participants; 58.8%), and pregnancy prevention (9 of 17 participants; 52.9%). Whereas 13 of 17 participants (76.5%) were exposed to sexual health education before study enrollment, 16 of 17 participants (94.1%) stated during interviews that Girl Talk provided new and/or more detailed information compared with health classes, especially in relation to breast health, contraception, and STI prevention.

**Suggested Additions to Girl Talk**

When asked if any additional features should be included in Girl Talk, participants were interested in adding features to the application that offered resources through additional interactive formats. Features such as calendars or tracking systems for menstrual cycles were suggested by participants to further apply knowledge received related to anatomy and physiology. Inclusion of live chat rooms, forums, or messaging within Girl Talk was also proposed to quickly answer remaining questions about sexual health. Providing region-specific information such as maps with locations of offices providing gynecological services was also strongly encouraged by participants after using the application.

**Discussion**

Our study results show that Girl Talk is a feasible sexual health educational tool that is appealing to teenage girls.

Increased usage of the application in small increments during participants’ free time mirrors their self-reported use of other features on their iPhones. This finding suggests that Girl Talk can be integrated into the daily use of smartphones among teenagers for quick access to reliable sexual health information. Because our study sample was recruited from a wide variety of locations, our findings mirror the prevalent use of smartphone applications among adolescents as noted in past research. Participants’ enthusiasm and interest in recommending the application to their friends also mirrors trends in previous research and highlights the opportunity to expand the use of Girl Talk to a larger adolescent population. We showed Girl Talk’s ability to convey more sexual health information than traditional sexual health education in a private, timely, and accurate manner. Providing content directly related to community-based resources also gave participants new information that was related to their daily experiences. The application also has the potential to bridge the gap between teenagers, medical providers, and parents by encouraging girls to initiate conversations about contraception use, body image, healthy lifestyles, and holistic well-being with trusted adults.

The limitations to the study were the short-term exposure to Girl Talk, English-only content within the smartphone application, iPhone-only access, and the exclusion of interactive features because of medical-legal confidentiality challenges with integrating features such as real-time question and answer texting services. Inclusion of application features desired by our participants such as resource maps, period trackers, and live messaging/chat forums would have provided additional health communication opportunities for participants. Long-term vs short-term exposure to Girl Talk is needed to further evaluate potential improvements in knowledge. Small improvements in knowledge during phase II might be attributed to the presentation of content at higher grade levels than the questions posed to participants in the sexual health questionnaire. Variance in the length of content of each section of Girl Talk might also affect short-term knowledge improvements among participants. Such limitations can be easily overcome in the future by revising sections in Girl Talk with outliers in content length and readability score before expanding long-term usage of the application to a larger population through a multisite trial. Continuing to expand our collaborations with community-based organizations throughout the country can also provide the support necessary to include more features in the application that were noted by participants.
Our future directions are to focus on (1) revising sections of the application, (2) expanding availability to Android platforms and in multiple language formats, (3) extending the amount of time that participants spend using the application, and (4) including features recommended by participants. Making the grade level and length of each Girl Talk section more consistent will provide an opportunity for girls to continue receiving age-appropriate and straightforward information about sexual health. Expanding the availability of Girl Talk’s content to include iPhone and Android platforms will allow for more girls to access clear sexual health education materials on their phones. Providing this information in multiple languages will also aid in promoting widespread use of the application across a diverse group of adolescents. Providing longer-term access to Girl Talk might provide the information needed to determine long-term changes in sexual health knowledge. Expanding use of the application to a larger group of teenage girls throughout the country will allow for study findings to be generalized to larger populations of girls in the United States. Adding additional interactive features that were recommended by participants might also encourage girls to continue engaging in learning about sexual health after using Girl Talk.

Summary

Developing a smartphone application for comprehensive sexual health education is feasible and practical. The application is well-liked, accessible, and can provide opportunities for clear, factual transmission of information to teenage girls.

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