

PROJECTHEARTFORGIRLS.COM: DEVELOPMENT OF A WEB-BASED HIV/ STD PREVENTION PROGRAM FOR ADOLESCENT GIRLS EMPHASIZING SEXUAL COMMUNICATION SKILLS

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This article describes the development of ProjectHeartforGirls.com, an interactive web-based program designed to improve sexual communication skills and reduce the risk of HIV/STDs among adolescent girls, a population at heightened risk for negative sexual health outcomes (Centers for Disease Control and Prevention, 2013). Although sexual communication is a critical predictor of safer sex among teens, there are few online interventions that target these skills as a central program component. We developed ProjectHeartforGirls.com to fill this gap. Program development involved (1) identifying the target population (ethnically diverse high school girls), (2) clarifying the theoretical foundation (Reasoned Action Model), (3) conducting formative qualitative research ($n = 25$ girls), (4) drafting initial program content, (5) receiving ongoing feedback from a teen advisory board ($n = 5$ girls), (6) programming online content, and (7) conducting usability testing ($n = 6$ girls). These steps are described along with the final intervention product, which is currently being evaluated in a randomized controlled trial.

The persistent epidemic of HIV and other sexually transmitted diseases (STDs) among adolescents in the United States require innovative intervention approaches. In the U.S., youth ages 15–24 represent a quarter of the sexually experienced popu-

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lation, but acquire half of all STDs (Kirby & Laris, 2009; Weinstock, Berman, & Cates, 2004). Accordingly, over 9 million STDs and nearly 8,500 new cases of HIV are diagnosed among youth each year, with girls at greater risk of infection than boys (Centers for Disease Control and Prevention [CDC], 2010, 2015). If left untreated, STDs can lead to serious complications, including pelvic inflammatory disease, cervical cancer, and infertility (CDC, 2009). Additionally, untreated STDs substantially increase one's risk of future HIV transmission (Fleming & Wasserheit, 1999). While progress has been made to improve behavioral interventions in schools and communities across the country (Goesling, Colman, Trenholm, Terzian, & Moore, 2014), novel intervention efforts are still needed to improve adolescent sexual health and curb new STD and HIV infections.

One ideal target for efforts to improve adolescent sexual health is to improve sexual communication and negotiation skills. Sexual communication is a critical component of safer sex behavior in adolescent and young adult sexual relationships. Youth who discuss sexual health topics with their partners are significantly more likely to use condoms consistently than are youth who have not had these important conversations (Noar, Carlyle, & Cole, 2006; Sheeran, Abraham, & Orbell, 1999; Widman, Noar, Choukas-Bradley, & Francis, 2014). Additionally, a meta-analysis of over 40 psychosocial variables demonstrated that sexual communication was more strongly associated with condom use than any other factor, including condom use intentions, knowledge, attitudes, and sexual self-efficacy (Sheeran et al., 1999).

However, sexual communication does not occur in all adolescent sexual relationships. As many as half of teens report they have not discussed condoms or other important safer-sex topics with their partners (DiClemente, 1991; Ryan, Franzetta, Manlove, & Holcombe, 2007; Widman, Choukas-Bradley, Helms, Golin, & Prinstein, 2014). These low numbers are perhaps not surprising considering that open discussions about sex require skills in sexual assertiveness and negotiation that are not frequently modeled for youth (Brown & Witherspoon, 2002; Metts & Spitzberg, 1996). Given the health-protective role of sexual health discussions and the fact that these are skills that can be learned (Hargie, 2010), sexual communication skill development is an ideal target for adolescent safer sex intervention efforts.

In addition to targeting communication skills, interventions for youth may be most useful when they are engaging, interactive, and can be broadly disseminated (Noar & Willoughby, 2012). Technology-based interventions, including electronic-health (eHealth) approaches, are extremely well-suited for these purposes. Such approaches use technology-based platforms (e.g., computers, tablets, smart phones) as the primary mechanism to deliver intervention messages. Technology-based approaches offer a host of benefits, including the ease and low cost of administration, the potential to reach large numbers of people cost effectively, increased fidelity of intervention delivery, the ability to individually tailor intervention content, and opportunities for amplified interactivity, customization, and engagement by the user compared with traditional face-to-face intervention approaches (Lightfoot, 2012; Rapoff, 2013). There is also clear evidence for the efficacy of delivering HIV and STD prevention interventions through interactive technologies (Noar, Black, & Pierce, 2009; Noar, Pierce, & Black, 2010). Among adolescents in particular, the ubiquitous use of technology to communicate with peers and to access health information suggests that technology-delivered interventions also may be a way to meet

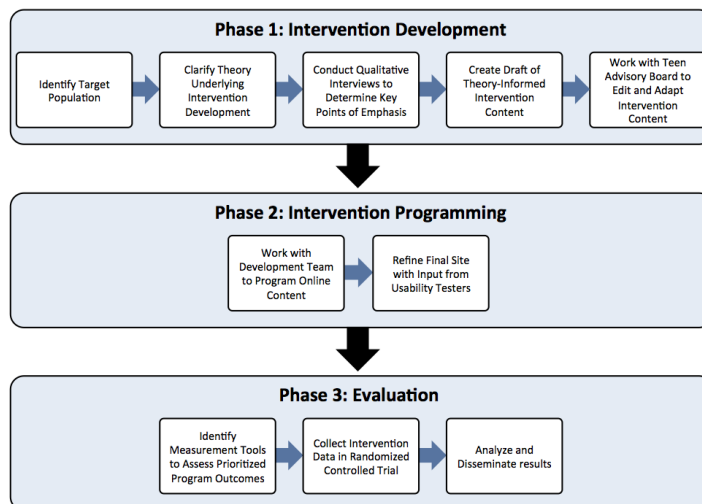


FIGURE 1. Flowchart of intervention development and evaluation.

youth “where they are” and to connect in a way that is familiar, nonthreatening, and intuitive (Lightfoot, 2012).

PURPOSE OF THE CURRENT STUDY

Our research team recently developed ProjectHeartForGirls.com, a web-based, interactive sexual health program for ethnically diverse adolescent girls that primarily targets sexual communication skill building alongside other key theoretical factors known to enhance safer sex practices (Fishbein & Ajzen, 2010). The ultimate goal of this program is to improve sexual health outcomes by increasing sexual communication skills and reducing the risk of HIV and STDs among girls. This article describes the process of developing the web program, based on best practices for intervention development and process evaluation (Linnan & Steckler, 2002). As shown in Figure 1, this process included: (1) identifying the target population, (2) clarifying the theoretical basis for the intervention, (3) conducting formative qualitative interviews, (4) drafting initial program content, (5) receiving ongoing feedback from a teen community advisory board, (6) programming online content, and (7) conducting usability testing to refine and finalize the web program. The stages are described below along with the final intervention product.

METHOD AND RESULTS

IDENTIFYING THE TARGET POPULATION

The target population for this sexual health program was adolescent girls who were ethnically diverse high school students. We selected adolescent girls for initial intervention development because, compared to boys, girls are at increased risk for

STDs and experience more serious sequelae from infections (CDC, 2009; Haggerty et al., 2010; Monk & Tewari, 2007). Sexual communication skills training also may be particularly important for girls because girls are more reliant on verbal negotiation for condom use since they have less direct behavioral control over traditional male condoms than boys (Amaro, 1995; Amaro & Raj, 2000).¹ Additionally, given that the HIV and STD epidemics disproportionately affect minority girls and women (CDC, 2013), we designed the program to appeal to ethnically diverse girls. We felt this was important for future uptake of the program among the populations most in need of effective health interventions. Finally, we determined that high school girls were an appropriate target for the intervention as they are at the critical developmental juncture when the majority of girls become sexually active for the first time and are most susceptible to establishing patterns of risky sexual practices (CDC, 2013).

CLARIFYING THE THEORETICAL FOUNDATION

The program was guided by the Reasoned Action Model (Fishbein & Ajzen, 2010), a comprehensive health behavior theory shown to predict condom use among adolescents and young adults (Albarracín, Johnson, Fishbein, & Muellerleile, 2001). This theory posits that three factors—sexual attitudes, perceived norms, and self-efficacy—predict an individual's intentions to use condoms. Intentions then serve as the key proximal antecedent of condom use. This theory also emphasizes that an individual's skills and abilities (e.g., factors that impact behavioral control over condom use) can moderate the link between intentions to use condoms and condom use behavior. Multiple investigations have now demonstrated that sexual communication is a key skill that is both directly related to condom use and also impacts the intention-behavior link (Bryan, Fisher, & Fisher, 2002; Noar et al., 2006; Sheeran et al., 1999; Widman, Golin, & Noar, 2013; Widman, Noar et al., 2014). Thus, we used this extended model that accounts for the role of sexual communication as the theoretical underpinning for intervention development. Specifically, our program included five modules targeting five domains of sexual decision-making: (1) safer sex motivation/intention, (2) HIV/STD knowledge, (3) sexual attitudes and norms, (4) safer sex self-efficacy, and (5) sexual communication skills. Because sexual communication skills training was so central, in addition to focusing exclusively on this in one module, we incorporated multiple aspects of sexual communication throughout the program (e.g., building motivation toward communicating, targeting positive attitudes about sexual communication).

In addition to the Reasoned Action Model, our intervention was informed by fuzzy-trace theory (Reyna, 2008; Reyna & Brainerd, 2011). This theory has capitalized on advances in cognitive neuroscience to explain adolescent memory formation, judgment, and decision-making. It emphasizes the importance of gist-based processing for youth and asserts that gist representations (i.e., messages distilled to their basic meaning and patterns) are key memory aids used in decision-making. Importantly, gist-based processing has been shown to produce larger and more sustained effects on behavioral outcomes related to adolescent sexual risk taking (Reyna & Mills, 2014). In line with fuzzy-trace theory, we focused on distilling the information in our intervention to the essential bottom line. We created a tagline to run throughout the intervention to capture the critical take-home message: "Make a Choice, Use

1. We believe that boys also play a critical role in making sexual health decisions and we have plans to adapt and extend this program for boys if it shows preliminary efficacy for girls.

your Voice.” This tagline was present on every screen and each module emphasized this main point.

FORMATIVE QUALITATIVE INTERVIEWS

Semistructured qualitative interviews were used to inform an initial draft of intervention content. Interviews were conducted with 25 adolescent girls (ages 16–19). The interviews focused on the key terms teens use to describe sexual health topics, how they learned to communicate about sex (if at all), and the barriers that prevented assertive communication with dating partners. Additionally, we asked the participants to recommend content that would be important in a sexual health program. Participants were recruited from the local community through flyers and a research listserv and compensated with \$25. All interviews were audio recorded, transcribed, and analyzed within Dedoose version 5.1.26. The Institutional Review Board of the University of North Carolina, Chapel Hill, approved all procedures.

We used a summary report template to summarize key findings by interview and conducted additional analysis to interpret salient themes. While a full report of these findings is beyond the scope of this article, we will highlight a few important points that we incorporated into intervention development. First, when participants were asked to define terms such as abstinence and dating, their answers were highly varied. This solidified the importance of clearly defining key terms, which we did on an introductory screen within the intervention. Second, through these interviews, we identified several critical barriers to open communication. For example, participants indicated an inherent trust in partners, even if misplaced, that made it seem unnecessary to talk about topics like STDs. They also expressed concern about negative partner reactions (e.g., confusion, mistrust) if they were to initiate sexual health discussions. In the intervention, we directly acknowledged these barriers and debunked common communication myths (e.g., a partner would always tell you if they have an STD). Third, several participants mentioned texting as a central route of communication in their romantic relationships and stated it was easier to discuss difficult issues, including sexual issues, by bringing them up over text message first. Based on this feedback, we acknowledged that text messaging could be a viable alternative to face-to-face communication when it comes to negotiating sexual health (Widman, Nesi, Choukas-Bradley, & Prinstein, 2014). Finally, participants offered many recommendations for intervention content that we followed, such as providing accurate information that was free from “scare tactics,” ensuring sexual health information could be obtained confidentially, and including a question and answer (Q&A) component to address common questions that are difficult for teens to ask adults.

DRAFTING INTERVENTION CONTENT

After we completed the qualitative interviews, we began drafting intervention content. We found inspiration for web design by reviewing other websites with relationship and health information that targeted teens (e.g., teenvogue.com, kidshealth.org, sexetc.org, iwannaknow.org) and by reviewing the literature on other computer or web-based approaches to sexual health promotion (Bull, Pratte, Whitesell, Rietmeijer, & McFarlane, 2009; Ito, Kalyanaraman, Ford, Brown, & Miller, 2008; Markham, Shegog, Leonard, Bui, & Paul, 2009; Marsch et al., 2011; Roberto, Zimmerman, Carlyle, & Abner, 2007). We also began working with an illustrator and a graphic designer to create a logo, color palate, and initial page layouts and illustrations for each of the five theory-based program modules. For each module, we identified 3–5 key intervention objectives and created sample content to address

each objective, including audio and video clips, colorful infographics, Q&A pages, tailored feedback messages, and interactive knowledge and skill-building exercises.

TEEN ADVISORY BOARD

As we were developing the intervention style and content, we worked closely with an ethnically diverse group of 5 teen girls (ages 15–18) from the community that served on our teen advisory board. These girls provided ongoing feedback and critical guidance on the tone, content, and features of the intervention. We met with the advisors on seven occasions and also had regular contact via email and text messaging. The advisors piloted all intervention materials and provided suggestions for improvement. Additionally, the advisors recorded audio clips modeling effective communication skills that were used in the intervention. In response to the teen advisors' feedback, we made a number of important changes during intervention development, including (1) changes to the color palate and illustration style; (2) clarification to the wording throughout the program, including elucidation of all key terms; (3) addressing additional myths about STDs common among their peers; and (4) placing a greater emphasis on relationship skills, including tips for identifying healthy and unhealthy relationships.

TECHNICAL DEVELOPMENT

We worked collaboratively with the Communication for Health Applications and Interventions (CHAI) Core to complete the technical design and programming for the website. CHAI Core is an NIH-funded facility (P30 DK56350; P30 CA16086) that applies state-of-the-art techniques to the development of behavioral science interventions aimed at health promotion and disease prevention. The CHAI Core team included a graphic designer, computer programmer, project manager, several research assistants, and a contracted illustrator. In collaboration with CHAI Core, our research group spent approximately 12 months in an iterative process developing the illustrations, animation, graphic design, navigation, architecture, and functionality of the site. A CHAI Core web developer programmed the final website once intervention content was finalized.

USABILITY TESTING

Once a complete version of the web-based program was developed, we recruited six 18-year-old girls to participate in a 90-minute usability testing session. During the session, teens completed the entire program using a "think aloud" protocol to express their thoughts and questions about the material they were viewing. Responses were used to assess the design and functionality of the web program as well as opinions about the site, comprehension of the content, and the potential usefulness of the program.

Overall, users provided positive feedback on the illustrations, animations, design, and interface of the site. They thought the style of the site was fun, bright, and visually appealing. They described the site as generally easy to navigate and full of useful information. Components that the users particularly enjoyed included the interactive quizzes, the Q&A sheets, and the animated videos. In addition, users suggested valuable areas for improvement. These included: (1) clarifying the instructions for several games and activities, (2) clarifying which activities had already been completed, (3) shortening the Q&A text to improve readability, (4) adding additional voiceover to increase attention, (5) including more information about the location and cost of sexual health services for teens, and (6) stressing that sexual

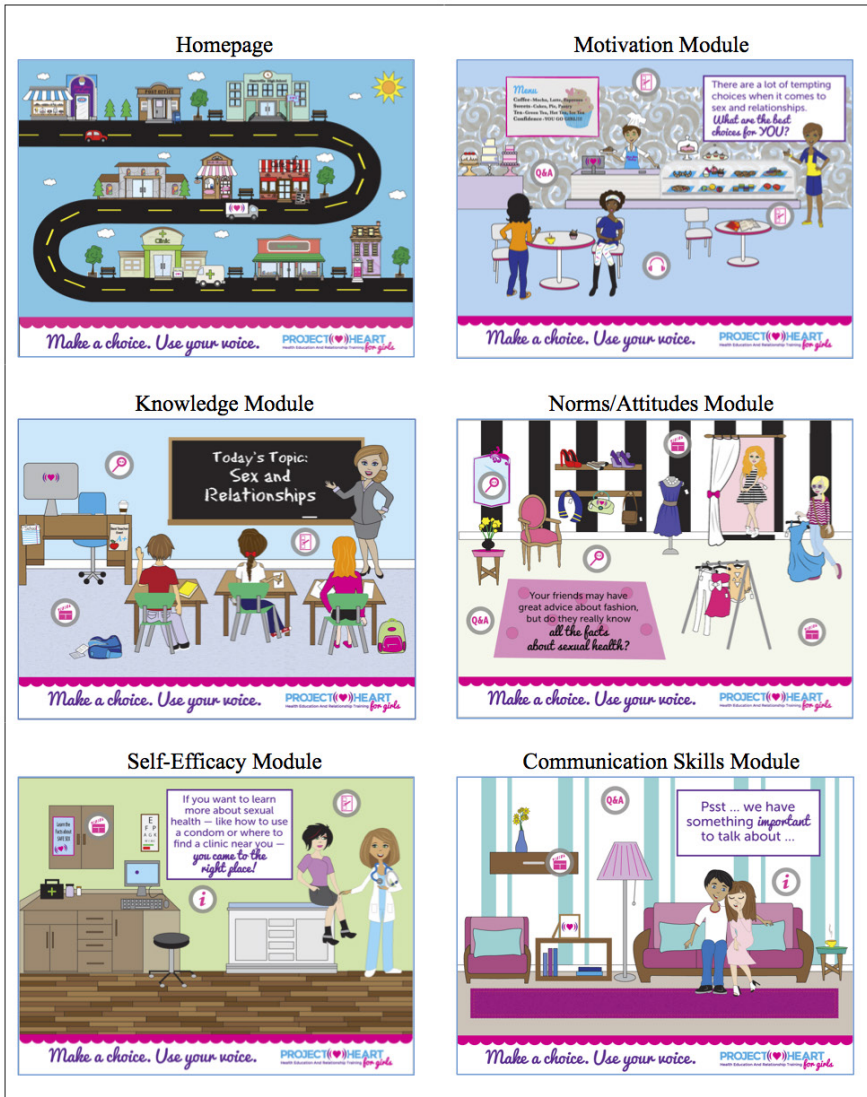


FIGURE 2. ProjectHeartForGirls.com homepage and five program modules.

health services are confidential. Based on this feedback, we made a round of additional changes to arrive at our final product.

FINAL INTERVENTION DESIGN, CONTENT, AND INTERACTIVE COMPONENTS

With valuable input from the aforementioned sources, we arrived at a final web program that can be completed in 30–45 minutes. Visually, the program is configured like a small town, with animated characters, cars, and buildings (see homepage and each room in Figure 2). Participants are guided through five buildings in a sequential order, each of which maps onto one of the five theory-based domains emphasized in the program, including: (1) a bakery targeting safer sex motivation, (2) a school targeting STD/HIV knowledge, (3) a boutique targeting sexual attitudes/norms, (4) a clinic targeting safer sex self-efficacy, and (5) a living room where teens

TABLE 1. Five Modules to Target Five Areas of Sexual Decision-Making

Theoretical Construct	Purpose of Module	Sample Features
Motivation	Importance of making informed decisions about abstinence and condoms	Values clarification exercise
	Heighten personal risk perception	STD risk perception game
	Empower girls to make healthy decisions that fit within their own values	Q&A
	Highlight importance of communication in healthy relationships	Motivational audio clips
Knowledge	Improve awareness about HIV and STD prevalence and transmission	STD quiz with feedback
	Increase understanding of symptoms and treatments for HIV and STDs	Infographic about STDs
	Increase knowledge about pregnancy prevention	Video clips ^a
Attitudes and Social Norms	Challenge negative norms about abstinence and condom use	Infographic about pregnancy
	Improve attitudes about abstinence and condom use	Infographic about condom use
	Highlight importance of communicating about sex with trusted adults	Video clips ^a
Self-Efficacy	Increase confidence in proper condom use	Condom demonstration video ^b
	Increase ability to locate local sexual health services	Condom skills game
	Stress importance of routine STD screening if sexually active	Sexual health services locator
	Improve self-efficacy for communication about sexual health topics	Video clips
Sexual Communication	Sexual communication and refusal skills	Didactic skills training
	Negotiating abstinence with a partner	Video clip modeling skills ^c
	Negotiating condom use with a partner	Audio clips modeling skills
	General sexual assertiveness training	Audio playback with self-feedback

Sources: ^aBedsider.org; ^bPlannedParenthood.org; ^cHowcast.com

learn and practice sexual communication skills. Within each module, there are 5–8 animated buttons that link to program content. All material is age-appropriate and presented using brief written text with matching audio. Program content and sample methods are presented in Table 1.

Here we briefly highlight two notable components of the intervention that increase potential efficacy of this work: the tailored content and the interactive knowledge and skill-building exercises. First, the program contains tailored content, defined as messages intended to reach a specific person based on the unique information provided by that person (Noar, Benac, & Harris, 2007). Tailoring can increase the relevance of material and make intervention content more likely to be comprehended, remembered, and effective at producing behavior change (Noar et al., 2007). We incorporated tailoring by having participants complete a brief screening quiz before entering each of the five modules, with immediate feedback on their answers during the quiz. Based on what their responses indicate they need next, the program provides additional content related to their gaps in that domain. For example, before entering the school that targeted sexual health knowledge, participants complete a five-item knowledge-based quiz (e.g., “True or False: STDs usually have

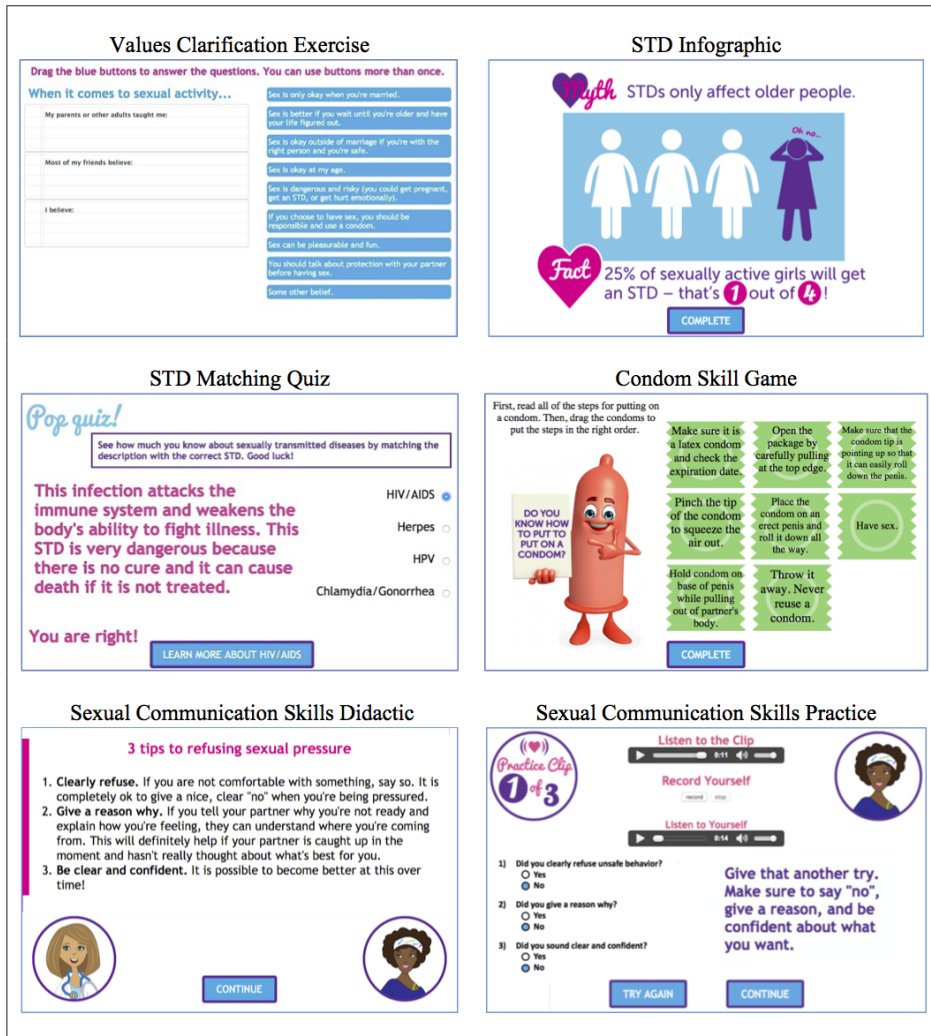


FIGURE 3. Screen shots of STD infographic, condom skill game, and sexual communication skills training activities.

noticeable symptoms, like itching or burning?”). After each response, participants are given supportive feedback on their performance and corrective information. Additionally, participants who answer any item incorrectly are given one additional piece of bonus content within that room that extends beyond the corrective screening quiz information.

Second, the program contains four interactive self-efficacy and skill-building exercises. These include: (1) a values clarification exercise that allows girls a safe space to reflect on their sexual values around abstinence, protection from pregnancy, and protection from STDs; (2) an interactive STD quiz developed by Ito et al. (2008) that allows girls to match common STDs with their appropriate symptoms and provides supplemental information on the prevalence, treatment, and prevention of each STD; and (3) a drag-and-drop game to improve proper condom use where teens put the steps for proper condom application in the correct order (Figure 3).

The final interactive component was at the heart of our intervention: a sexual communication skills training exercise designed to build skills in sexual assertiveness and refusal. For this exercise, we followed several phases identified as necessary for communication skills training (Segrin & Givertz, 2003) including: (1) Assessment (i.e., determining initial levels of communication and motivation with the screening quiz and tailored feedback); (2) Direct instruction (i.e., explaining the importance of communication and teaching assertiveness and negotiation skills; this was presented in audio format with matching bulleted text through a scripted interaction between the investigator and one of the teen advisors); (3) Modeling (i.e., participants listened to similar age peers successfully enact each communication skill); and (4) Role-playing and feedback (i.e., participants practiced the desired communication skills by listening to a scenario, providing a response as if they were in the situation, playing back their response, and completing a self-feedback assessment). Based on previous sexual communication trainings and assessment techniques (Jaworski & Carey, 2001; St. Lawrence et al., 1995; Weinhardt, Carey, & Carey, 1997), we emphasized three specific behaviors when teaching refusal skills: (1) providing a clear refusal, (2) giving a reason for the refusal, and (3) sounding clear and confident. Images from the communication training can be found in Figure 3.

DISCUSSION

This article describes the development of ProjectHeartforGirls.com, an interactive web-based program designed to improve sexual communication skills and reduce the risk of HIV/STDs among adolescent girls, a population at heightened risk for negative sexual health outcomes (CDC, 2013). Although sexual communication skills are a critical predictor of safer sex among teens (Widman, Noar, et al., 2014), we are not aware of any online programs that target these skills as a central program component and utilize interactive, web-based platforms that can be broadly disseminated. We developed ProjectHeartforGirls.com to fill this gap in the intervention literature.

The program is grounded in psychological and health behavior change theories (Fishbein & Ajzen, 2010; Reyna, 2008) and informed by qualitative interviews and feedback from a community teen advisory board. After nearly 18 months of preparation and a series of iterations, the final animated web program resembles a small town where girls go through a series of shops and buildings, each of which targets one of five areas of sexual decision-making. Program material is presented using features known to enhance intervention effectiveness, such as tailored content based on participant responses, audio/video clips, tips from other teens, interactive games and quizzes, and skill-building exercises that include real-time self-feedback.

The current article provides a useful model for how researchers can develop and test web-based interventions. The eHealth field is still relatively new but rapidly growing (Noar & Harrington, 2012), and while several models for program development have been proposed (Pagliari, 2007), the field currently lacks consensus on a model for developing programs. Our development approach had several strengths, including the use of multiple theories and a focus on communication as the central organizing construct; significant target audience input including a teen advisory board; an iterative approach to development and usability testing where the program was revised at several points in the process; and the application of state-of-the-art graphic design and programming expertise.

We are currently evaluating the feasibility, acceptability, and preliminary efficacy of the ProjectHeartForGirls.com program in a randomized controlled trial (RCT; Clinical Trials registration number NCT02579135). Participants are 222 10th-grade girls who have been randomized into the Project HEART intervention or an attention-matched control intervention that focuses on cultivating growth mindsets (Burnette & Finkel, 2012; Dweck, 2000). We collected data at baseline, intervention, and immediate post-test in the fall of 2015. We are collecting follow-up data at 4 months post-test in the spring of 2016. The key outcomes to be examined include program feasibility/acceptability (i.e., practicality, likeability, perceived usefulness of program content, and enrollment/completion rates), as well as sexual communication self-efficacy, sexual communication intentions, condom intentions, and sexual communication skills assessed with a behavioral task (Jaworski & Carey, 2001; St. Lawrence et al., 1995; Weinhardt et al., 1997). The preliminary trial is not powered to detect effects in condom use, though this will be a goal of subsequent work.

CONCLUSION

The persistent HIV/STD epidemics among adolescents in the United States demand innovative intervention efforts, especially in the digital age. ProjectHeartForGirls.com is a new web-based intervention that aims to enhance sexual health outcomes among adolescent girls by improving sexual communication skills. Program development was informed by theory and target audience input to result in a final product that is both targeted and tailored to a diverse audience of adolescent girls. The RCT underway promises to provide data to assess the acceptability and efficacy of the intervention and promote sexual health among youth.

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