

Serious Games for Sexual Health

Moderator: Ross Shegog, PhD¹

Participants: Katherine Brown, PhD,² Sheana Bull, PhD,³ John L. Christensen, PhD,⁴ Kimberly Hieftje, PhD,⁵ Kristen N. Jozkowski, PhD,⁶ and Michele L. Ybarra, MPH, PhD⁷

Program developers and researchers in the sexual health domain have increasingly embraced technological trends as they emerge. With the emergence of serious game applications to impact health behaviors, a natural step for research enquiry will be the investigation of serious games for sexual health education. We invited a panel of sexual health researchers who are working at the intersection of sexual health behavior change and technology applications to comment on the place of serious games in furthering the field of sexual health. The panel grappled with six questions.

Ross Shegog: *Why games for sexual health education? What are the advantages and disadvantages of using serious games to teach sexual health and impact behavior change?*

Katherine Brown: As a health psychologist specializing in the development and evaluation of behavior change interventions, I have been involved in developing interventions that target sexual health behaviors through varied delivery modes, including Web sites and apps [applications], self-contained computer programs, e-learning modules, serious games, and even good old-fashioned pen-and-paper-based tasks. Much of this work has been focused on sex education and young people. In a classroom or other similar education-based context, serious games, with their interactive nature and use of technology, have an obvious appeal for most young people compared with the traditional sex education format. Those fortunate enough to have received sex education at school may recall a slightly embarrassed and under-confident teacher showing videos and delivering content from the front of the classroom. My experience is young people find serious games much more engaging!

Dependent on the exact design and delivery format, serious games can provide tailored intervention content relevant to a given group or individual, rather than being one-size-fits-all. Games also allow interactivity and responsiveness to the gamers' input without having to ask an adult (something that

can be a barrier to addressing sexual health needs for young people),¹ and serious games deliver the intervention consistently. Consistency is useful for testing whether particular behavior change content and techniques are effective at achieving a targeted behavior change and, in turn, consistently delivering the interventions when rolled out to a broader population. Serious games, however, will never be a panacea. Particularly when it comes to vulnerable young people, there can never be a substitute for human communication and care by both professionals and parents with the best interests of the young person at heart.

Sheana Bull: I believe games for health in sexual health education can be an important tool in a toolkit of multiple approaches to using digital technologies to facilitate healthy sexual behavior. The medium simply makes sense for youth and young adults who have spent their lives engaged in online and app-based gaming. Delivery of sexual health education in a game format is a logical way to create content that resonates for this group at highest risk for negative sexual health outcomes such as sexually transmitted infections (STIs).

There are multiple advantages in using games for sexual health education: It is an intuitive medium for youth; one could easily build game modules for sexual health that can be integrated into popular sites and increase exposure to content; gaming may be more appealing to particular segments and

¹University of Texas School of Public Health, Houston, Texas.

²Coventry University, Coventry, United Kingdom.

³University of Colorado School of Public Health, Denver, Colorado.

⁴University of Connecticut, Storrs, Connecticut.

⁵Yale School of Medicine, New Haven, Connecticut.

⁶University of Arkansas, Fayetteville, Arkansas.

⁷Center for Innovative Public Health Research, San Clemente, California.

therefore be more effective for specific audiences (e.g., teen boys); and the practice and mastery of skills through gaming will allow greater sustainability in skills over time.

Some likely disadvantages with gaming in sexual health education include: Development of games may be more costly and time-consuming than delivery of sexual health education using other social media platforms and tools; it may appeal to too narrow of an audience to be impactful; and consumers may expect regular updates to games, making ongoing programming and additional costs necessary.

John Christensen: Across the world, sexual health education is an uncomfortable experience that involves an awkward teacher addressing a classroom of giggling students as they thumb through a dry, overly clinical textbook. An inherently private topic, “sex ed” is taught right alongside reading, writing, and arithmetic, as if it’s no big deal. But it’s a huge deal. For many young people, sexual health education is associated with negative emotions such as fear, anxiety, and shame. Negative experiences such as these may interfere with a student’s ability or motivation to learn sexual health information and relevant risk-reduction skills. Videogames may overcome this challenge. Games can transform a boring, embarrassing topic into something fun that can be delivered in a private setting; content can be tailored to prior experience or modified for use based on age, gender, or sexual identification.

On the other hand, sexual health games have their disadvantages. Computing power and bandwidth limitations may stifle the sophistication and reach of these digital media interventions. While members of vulnerable populations are increasingly able to access serious games through mobile devices such as smartphones and tablets, smaller display size is associated with lower levels of immersion and persuasion. Making a realistic, truly entertaining game can be quite expensive and time-consuming, games containing sexually explicit content are challenging to disseminate since additional precautions are needed to ensure exposure to age-appropriate eyes only, and videogames don’t appeal to everyone; some people are simply not interested.

Kimberly Hieftje: Sexual risk behaviors among teens continue to be a serious concern, indicating that current interventions and prevention efforts are clearly not working. Our systematic review of electronic media-based interventions (including videogames) for promoting health and safety behavior change in youth suggested they can improve behavior in youth, including sex-related behavior.² Given the need for more effective interventions, games for sexual health education and risk reduction may be an ideal approach to reaching teens.

A videogame intervention has several advantages over conventional interventions: Since videogames are mobile and easy to disseminate, any school, afterschool program, parent, or teen with access to the Internet can download and play the game; because games are self-contained, there is limited need for specialized training of staff or teachers to conduct the intervention; videogames allow players to role-play situations involving risk behaviors (such a boyfriend asking the player to go upstairs at a party) and can experience the consequences of their choices in a safe environment; videogames can also be tailored and specific to a player’s aspirations or goals, making the results of his or her behaviors and actions

within the game even more compelling; and a player can engage with the material at his or her own speed, re-play favorite scenes or storylines, and repeat levels for higher scores and better understanding. Alternatively, videogame interventions built for only one platform may have limited reach to individuals unfamiliar with, or who use, a different platform.

Kristen Jozkowski: Theories suggest that behavior change depends on changing an individual’s behavioral determinants (i.e., factors that influence one’s willingness to engage in the behavior). Serious games could be designed to influence a target population’s behavioral determinants to make large-scale changes in behavior. Increasing someone’s knowledge or awareness about a particular problematic behavior that leads to negative health outcomes may influence his or her willingness to engage in the behavior. For example, informing adolescents that engaging in vaginal-penile intercourse without using a hormonal or barrier birth control method could result in an unintended pregnancy may increase their likelihood of using a birth control method. However, knowledge and awareness are not the only factors that influence behavior change.

Several other behavioral determinants influence people’s engagement in health behaviors, such as having the proper skill-set to be able to engage in a particular behavior like using a condom correctly and consistently. In this example, serious health games could influence behavior change (i.e., increase correct and consistent condom use) by providing an opportunity for individuals to practice this skill via gameplay. Specifically, avatar characters could practice putting on a condom or role-play condom negotiation with a non-player character. Serious games represent an intervention likely appealing to young adults given that they recreationally play videogames. When the format of the intervention is appealing, a target population will be more likely to participate.

For sexual assault prevention, one of my areas of expertise, multipronged interventions, addressing the multifaceted ways in which college culture institutionally supports sexual assault, could be more effective in reducing incidents of sexual assault compared to programs that focus on one aspect like consent promotion or risk reducers. However, it can be challenging to design interventions that address a myriad of issues. My work provides some evidence to suggest that videogames could be suitable for addressing a variety of factors that contribute to sexual assault on college campuses, but more research is certainly needed to substantiate my preliminary findings.

Michele Ybarra: Three in four youth 14–17 years old play games daily, according to data from our 2012 national Growing Up with Media study.³ As such, serious games have the potential to go where many youth “are.” Not only are games a medium that many adolescents have adopted, but they have features that can promote interactivity with the game content, thereby increasing engagement and the likelihood that the content will be read and subsequently remembered. Also too, like other technology-based healthcare interventions, serious games have the potential for wide reach: Once an intervention is made available online, anyone with Internet access anywhere around the world can use it. This can be an advancement over face-to-face programs, which

can have significant structural barriers (e.g., the need to train facilitators; secure a dedicated room to hold weekly meetings; carve out time in the school day to deliver the program if it is school-based). Furthermore, if the program is Web-based, content just needs to be changed and uploaded once, as opposed to reprinted or otherwise pushed to each individual intervention site.

Counterbalancing these potential benefits, there are important drawbacks to keep in mind. Beyond the big one—which is lack of access—there is often the assumption that “if we build it, they will come.” As with other self-directed interventions however, there needs to be a reason for people to both seek out the game and to play it long enough to affect behavior change. For example, a person recently diagnosed with an STI may be motivated to look for programs that can teach her ways to reduce her risk; whereas someone who perceives herself to be of low risk may not seek out the game. Or, perhaps she only completes the first level (or module, etc.) when completion of at least three levels (for example) is necessary to change behavior. Another potential risk is assuming that games are salient to all youth. We integrated game-like features (i.e., leveling up; badge accrual) in a beta version of Guy2Guy, a text messaging-based HIV prevention program for men 14–18 years of age. When we focus group-tested the ideas, about one in five teens didn’t know what we meant by ‘leveling up’ and didn’t really find the feature compelling. When asked if they would stop using the program as a result, they said no. From their perspective, the game-like feature didn’t help the experience, but it didn’t fatally hurt it either. We need to be aware that not all teens play games—even men—and to develop games with features that are approachable and at least neutral to those who don’t.

Ross Shegog: *What unique factors need to be taken into account when developing, implementing, and evaluating a serious game to impact sexual behaviors compared to other domains?*

Katherine Brown: Sexual behavior generally, and safer sex behaviors specifically, are many and varied. Even condom use is made up of five separate behaviors: Accessing (or buying) condoms, carrying or storing condoms where they can be accessed when needed, negotiating condom use with a sexual partner, actual use of the condom, and correct removal and disposal of the condom after use.⁴ Clearly understanding the target behavior and the factors that influence and predict that behavior are critical to developing the right intervention or serious game content.^{5,6} One game cannot possibly address all issues relating to unsafe sexual behavior, so we need to specify what we want to achieve. For example, do we want to enhance some aspect of condom use, or target the likelihood sex will be avoided if no condoms are available? Further sexual behavior is often unplanned, particularly amongst young people, and may also be engaged in under a degree of coercion. Creating rational decision-making content and the provision of facts alone are unlikely to adequately address the reasons why unsafe sex occurs.

Several ethical issues also require consideration (e.g., how to deal appropriately with consent, and parental inclusion in the consent process where young people are under the age of 18 years). Young people themselves are always asked to consent; schools or other *in loco parentis* bodies also provide

consent, but engaging parents without jeopardizing a research or evaluation process can be challenging. If you ask all parents to positively consent to their child’s participation, a lack of response can completely destroy the implementation and evaluation procedure; yet if you ask parents to withdraw consent only, assuming no response means they are happy for their child to participate, messages may not get through, and parents not happy with their child’s participation complain when they become aware. Decisions about appropriate processes and ethical approval may have to be made on a school-by-school (or other organization) basis dependent on the communication strategies they employ and the particular community’s expectations. A final challenge is the difficulty gathering objective data about a game’s impact on actual behavior. Evaluation work must often rely on participant self-reports.^{7,8} In some cases, it is possible to get objective behavioral indicators (e.g., sexual health services use), but for much evaluation self-report is the best proxy for actual behavior.

Sheana Bull: Any sexual health education program faces challenges: Legal and political considerations related to content appropriateness; confidentiality and privacy for participating individuals; the need to be comprehensive and focus on issues such as sexual orientation, coercion and communication, and sexual decision-making; and ongoing community concerns that youth exposed to sexual health education may engage in more risk behavior. A gaming approach can address these concerns by some creative approaches focusing only on tailored content that is relevant to a gamer’s cognitive and social development. Content can be tailored having users complete an initial assessment of cognitive development and current risk behavior. If games are available in a DVD or other format that doesn’t require online access, users may avoid breaches in confidentiality from playing online. For online use, gamers should be educated about using profiles and passwords that do not identify them, and games should be constructed such that all interactions are hypothetical, not requiring disclosure of personal or identifying information. As with any program in sexual health, game developers should obtain input from parents, institutional representatives (e.g., school administrators), and the target audience.

John Christensen: Arousal has been linked to immersion and persuasion. If eliciting the player’s sexual arousal is a game goal, avatar realism becomes extremely important during the design process. If the avatar lacks polygons or is too cartoon-like, the player may not perceive this avatar to be sexually attractive, and arousal is unlikely. Similarly, an avatar that approaches hyperrealism (but falls short) may also result in a state of low sexual arousal. The design team must extensively pretest avatars (as well as dialogue, music, artwork, and decor) with members of the target population. Since beauty is in the eye of the beholder, it is difficult to create a one-size-fits-all avatar that appeals to all members of the target population. Luckily, videogames allow character customization, which is particularly useful for games to elicit sexual arousal.

Kimberly Hieftje: “PlayForward: Elm City Stories” was developed for at-risk minority adolescents aged 11–14 years.

We conducted 2 years of formative research including focus groups with our target demographic to understand more about the risks in their environment, their future aspirations and goals, their peer and family relationships, and even their preferences for clothing, hair, and shoe styles. We also talked with afterschool program directors, in-school nurses, parents, and older adolescents to help us understand what teens were experiencing. This was essential to creating a videogame that was true to our players' lives. To develop content, we researched evidence-based sexual risk reduction interventions and knowledge expectations and used them as guides. In production, we went through countless iterations of each game section, often line by line, to ensure that each sentence and concept was comprehensible for our age group. Formative research and ongoing iteration review are a lengthy but essential process.

Kristen Jozkowski: The factors mentioned above are important considerations when developing, implementing, and evaluating any public health intervention. One important factor unique to game-based interventions includes utilizing avatars for some intervention components such as role-playing condom negotiation prior to engagement in sexual behavior. At what point does one halt the intervention during a role-play for practicing condom negotiation skills? If the game allowed students' avatar to engage in sexual behavior with other characters, this would likely be viewed negatively by schools and parents. Students might find it titillating to force their avatars to engage in sexual behavior, and the benefit of role-playing could get lost. Similarly, in regard to a sexual assault prevention intervention, it could also be helpful to provide students with the opportunity to practice consent negotiation. "Best-practice" recommendations suggest that sexual consent communication should be an ongoing process (i.e., individuals should not assume consent to engage in intercourse just because they are kissing and touching). However, it may feel awkward to practice consent negotiation in a role-play format with avatars as this would result in the avatars engaging in sexual activity, raising the same concerns mentioned above.

Michele Ybarra: I think the above responders have well-articulated many of the challenges. I would only add that most of these issues are not specific to serious games. They need to be explicitly addressed in all technology-based interventions. I would also point out that as researchers, I think we need to acknowledge and wrestle with the fact that we often tout the public health benefit associated with swift and wide upscale of technology-based sexual health interventions, and then rarely make them publicly available. We need to do a much better job of rigorously evaluating programs while also ensuring that they are subsequently publicly available—even if we plan to continue research on the next (e.g., version 2.0) iteration.

Ross Shogog: *What theories or models are important in informing the development of sexual health games, and what published references have been most informative for you?*

Katherine Brown: I have found *Planning Health Promotion Programs: An Intervention Mapping Approach* by Bartho-

lomew et al.⁵ (2011) and *The Behavior Change Wheel: A Guide to Designing Interventions* by Michie et al.⁶ (2014) (which includes the behavior change taxonomy V1), to be extremely useful. Others include the open access article in *Implementation Science* by Cane et al.⁹ (2012) on the work that informed the development of the Behavior Change Wheel, an enduring publication by Craig et al.¹⁰ (2008) in *BMJ* providing Medical Research Council guidance in the United Kingdom on complex intervention development, and the text by Noar and Harrington¹¹ on electronic health applications, also recommended by Christensen (below). These frameworks and tools do not advocate any one theoretical approach but specify how to draw on theory and evidence to support the development of games for the targeted population. I also agree with Bull (below), who recommends incorporating theories from beyond behavior change.

Sheana Bull: The mhealth [mobile health] field has missed opportunities to go beyond behavior change to incorporate theories of instructional design, health communication, and game theory. The advent of multiplayer online games suggests social network theory may be important in developing a sexual health game. For example, persuasive messages within a game could encourage gamers to model a behavior within their networks and receive rewards for doing so. Incorporating diverse theoretical perspectives outside traditional behavioral change theory will allow us to keep pace with the dynamic and engaging world of gaming so familiar to young audiences. I can recommend the following references, including Jonah Berger's work on the qualities of viral media,¹² Kriss Barker's Sabido Methodology,¹³ Atkinson et al.¹⁴ (2009) on iterative user-centered design, and an informative case study from Hill-Kayser et al.¹⁵ (2009) on the design, implementation, and user satisfaction testing of an Internet tool on cancer survivorship planning.

John Christensen: My work is largely guided by Lynn Miller's theoretical model, Socially Optimized Learning in Virtual Environments (SOLVE).¹⁶ Her approach combines cognitive with emotion-based components that have recently become popular among interventionists. Building upon the neuroscience-based model of risky decision-making of Bechara and Damasio,¹⁷ SOLVE argues that the emotions experienced while making risky decisions in a virtual gaming environment have a profound impact on subsequent real life behavior. The Social Cognitive Theory of Bandura¹⁸ can also be useful because social learning and role-playing are so easily incorporated into games. Anyone interested in designing games that change health behavior for the better should own the following two books: (1) *Serious Games: Mechanisms and Effects* by Ritterfeld et al.¹⁹ and (2) *eHealth Applications: Promising Strategies for Health Behavior Change* by Noar and Harrington.¹¹ These both have been extremely valuable resources during the design process. I would also highly recommend a book by Blascovich and Bailenson²⁰ titled *Infinite Reality*. This is a fun-to-read book that explores the intersection of gaming, virtual reality, and social science research.

Kimberly Hieftje: "PlayForward: Elm City Stories" was developed using constructs from social learning and self-efficacy theories as well as principles from message framing,

grounded in prospect theory. We created a logic model to guide the development of game design manuals, or game playbooks, as well as the game.²¹ As part of our formative research to develop a theory-driven, evidence-based videogame with the focus on risk reduction in youth, we explored related findings from the literature and translated established methods of both qualitative and quantitative research to develop this intervention and evaluate it. In this way, we can demonstrate that videogame technologies, while possessing the benefits of engagement, transportability, increased reach, and impact, can be seen as credible and reproducible, similar to other successful behavioral interventions.

Kristen Jozhowski: The theory that I use most often is the Reasoned Action Approach (RAA) of Fishbein and Ajzen,²² which is the most recent formulation of the Theory of Planned Behavior and the Integrated Model. The RAA posits that intention to engage in the behavior, attitudes toward the behavior, perceived norms regarding the behavior, and perceived behavioral control are the global constructs most immediately associated with engagement in a health behavior. Recently, researchers have recommended drawing theoretical constructs from a variety of theories when developing interventions. Given that adolescents and young adults are often driven by what their peers and salient others think about them, I would suggest drawing on constructs related to social norms (e.g., perceived norms construct from RAA, subjective norms construct from the Theory of Planned Behavior) in designing sexual health interventions for this target population. Diffusion of Innovation Theory may be relevant in helping diffuse gaming interventions within target populations.²³

I served as a content expert as part of a game development team for a game composed of mini-games that addressed different aspects of health: Sexual health, responsible alcohol consumption, and stress management. I provided content expertise on sexual health, specifically sexual consent and sexual assault prevention. Much of the game design focused on deconstructing rape culture and improving sexual consent communication. I drew from literature on interdisciplinary sexual health and sexual assault prevention, specifically the feminist literature addressing rape culture and sexual consent. I think there's a dearth of "how to" articles in this literature. There is certainly a great deal of theoretical literature, but not much in terms of the nuts and bolts.

Michele Ybarra: Here is a great example of an important question, but one that likely needs to be expanded beyond the scope of serious games. There are quite a few evidence-based theories of health behavior change that can be applied to technology-based programming, including serious games. For example, I have used the Information-Motivation-Behavioral Skills Theory of HIV [human immunodeficiency virus] preventive behavior²⁴ as a guiding theoretical model in several of my sexual health promotion/HIV prevention programs.^{25,26} I'm not saying that it is perfect or that it's applicable to all populations and aims, but it is a concrete example of a model that was developed for in-person programming that can easily be adapted for technology-based programming as well. Designing a serious sexual health game requires additional attention to the development of the game's story and the inclusion of rewards/reinforcers.

Ross Shegog: *What gaming strategies (e.g., feedback, story, levels, avatars, measures of achievement) have you found most useful in designing sexual health games?*

Katherine Brown: We have found game show formats with graded tasks (i.e., tasks getting progressively more challenging) and feedback to be useful ways to deliver content. Role-playing allows players to try scenarios that allow us to demonstrate outcomes, thereby manipulating outcome expectancies, and anticipated affect.

Sheana Bull: Based on formative research, we are incorporating a system of levels and badges as rewards in a text message sexual health program for young gay and bisexual men.²⁷ Participants can "pass" to the next level and earn a badge for doing so when they demonstrate increased awareness or correctly answer questions related to specific skills (e.g., elements of assertive communication). They didn't expect anything beyond these virtual rewards. In a text messaging sexual health program, youth are texted a question; if they respond correctly, we send a congratulatory response; if they respond incorrectly, we thank them and send the correct answer. Later, we attempt to positively reinforce participation and collective efficacy by sending out the percentage of people who answered correctly. These bidirectional text questions may draw the highest proportion of responses from participants.

John Christensen: The inclusion of multiple levels that gradually increase in difficulty can be helpful when attempting to train complex self-regulatory skills. For example, to provide the player with the communication skills to successfully negotiate condom use, the player encounters a sex partner in level 1 who initially resists, but is easily convinced after a few turns of the conversation. At the next level the sex partner is programmed to be more risky and difficult to convince. By the game conclusion, the player has learned numerous safe sex communication strategies and feels confident in his or her ability to negotiate safer sex. A second useful strategy is the inclusion of a recap at the end of the game, which includes key information and reminders relevant to the recommended skills and behaviors. We also take this opportunity to run pre-animated scenes depicting their avatar modeling the recommended behaviors.

Kimberly Hieftje: An Aspirational Avatar is the character the player assumes in the game. The player continuously updates his or her avatar, including personally relevant future goals, hopes, and aspirations. The player becomes invested in his or her avatar, viewing it as a representation of him- or herself. Players are able to go to their epilogue (a visual depiction of their avatar's life) and see how the choices made in the game impact their future. Narrative and recurring characters give the game realism and relatable experiences, making the outcomes and consequences more meaningful. Many storylines and scenarios came directly from experiences of the youth we talked with in our formative work.

Kristen Jozkowski: I used avatars, feedback, story, and task-based achievement activities to orient the game. The player's interactions with the non-player characters have been useful in enabling students to engage in role-playing. Role-playing

the situations that students may confront enables them to practice engagement in healthful behaviors. Feedback and task-based activities provide increased knowledge or awareness about a particular health issue or behavior. Students reported learning useful previously unknown information when engaging in activities with feedback. The story aspect of the game helped sustain interest in the intervention.

Michele Ybarra: As a co-Principal Investigator of the Guy2Guy study that Sheana describes above, I appreciate her examples of game-like strategies that can be integrated not just into serious games but also other technology-based programming. Indeed, we have to be careful not to assume that only games need interactive features, and that interactivity makes it a game. When developing CyberSenga,²⁵ an Internet-based healthy sexuality program, I attended the Game Developer's Conference in Austin, TX. One of the things they talked about was how we often call something a game that is actually an exercise. In doing so, we may ignore the lessons learned from other technology-based interventions that have applications for serious games. Calling something a game that is not (e.g., that is actually an exercise) may also result in us losing our audience because we fail to meet their particular expectations. Just because we call it a game does not make it so. I additionally learned that rewards and levels are key for any game—be it “serious,” mainstream, or even an exercise. For example, in our CyberSenga intervention, the reward for getting the answer correct was to build your own avatar (e.g., pick a purse, a hat). This was one of the most positively appraised features in the entire five-module program.

Ross Shegog: *What are the key issues in establishing serious games as a feasible and effective strategy for sexual health behavior change?*

Katherine Brown: Interdisciplinary teams with the right mix of skills are most important for establishing serious games as a feasible and effective strategy for sexual health behavior change. Expertise is needed in end-user engagement to ensure the interface and acceptability are optimized. Game developers with technical programming skills, and experts in CGI [computer-generated imagery] animation are needed to ensure an optimum gaming experience. People with knowledge and expertise in sexual health behavior change are needed to get the behavior change content and messages right. Once evaluation provides evidence of a successful product, marketing, commercialization, and/or knowledge transfer skills are needed to ensure the product has impact and a life beyond evaluation.²⁸

Sheana Bull: Integration of design, health communication, gaming, and social network theory is the most critical to success of games for sexual health. The issue of scale and dissemination has not been touched on. The upfront costs and effort in game development will only be returned when large numbers of users are exposed to games. Input from stakeholders offers a wonderful opportunity to integrate plans for dissemination and scale when development begins.

John Christensen: Randomized controlled trials must demonstrate that game-oriented interventions are at least on

par with traditional interventions in terms of effect size and sustainability of change over time. A process of iterative optimization must identify and improve the key intervention components likely responsible for success. We must simultaneously work towards garnering interest in and appreciation of gaming among (1) the target population, (2) funding agencies, (2) and representatives of clinics, educational institutions, and community-based organizations responsible for front-line dissemination.

Kimberly Hieftje: Similar to other evidence-based interventions, serious games must demonstrate efficacy, which must include developing theory-driven games using well-established models, conducting randomized controlled trials, and using reliable and valid assessment tools.

Kristen Jozkowski: Similar to other sexuality interventions, politics pervades the feasibility of an intervention. For example, comprehensive sexuality education more effectively reduces teen unintended pregnancy and STI transmission compared to abstinence-based education, but teaching comprehensive sexuality education in public schools remains politically contentious, though most parents and teachers nation-wide support comprehensive sexuality education. Opponents maintain that informing youth about sexual health practices will encourage engagement even though the peer-reviewed literature demonstrates that this is not the case. Implementing evidence-based sexual health interventions in a game format will likely receive the same types of politic scrutiny. Because sexuality remains such a taboo topic, implementing a sexual health promotion intervention serves as the largest barrier regardless of the format.

Michele Ybarra: I agree with my colleagues above: Randomized controlled trials are the way to establish efficacy and feasibility of serious games. Feasibility questions of particular importance that need to be directly articulated in the design phase and assessed in the evaluation include: Why will users seek out your program, and why will they come back enough times to affect change? How are you, as the researcher, going to make the program publicly accessible, even if you aim to iterate and research the program further?

Ross Shegog: *The panel listed numerous advantages of serious games for sexual health education, advising on important theories, models, resources, and strategies to assist developers and researchers, while also outlining a number of challenges. Emergent recommendations from the panel on serious games in the sexual health domain include the need to (1) collaborate in interdisciplinary teams for game development from concept to market, (2) integrate and apply theories and models from design and development, health communication, gaming, social networking, and behavioral science to guide development, evaluation, and dissemination, (3) attend to formative evaluation with end-users to ensure game desirability and feasibility, (4) apply rigorous evaluation to raise the credibility of games by establishing efficacy, (5) attend to scale and dissemination, and (6) continue to negotiate the unique ethical and political challenges to sexual health interventions through each phase of the concept to market process.*

References

1. Newby K, Bayley J, Wallace LM. "What Should We Tell the Children About Relationships and Sex?": Development of a program for parents using intervention mapping. *Health Promot Pract* 2011; 12:209–228.
2. Hieftje K, Edelman EJ, Camenga DR, Fiellin LE. Electronic media-based health interventions for behavior change in youth: A systematic review. *JAMA Pediatr* 2013; 167:574–580.
3. Center for Innovative Public Health Research. Growing Up With Media. <https://innovativepublichealth.org/projects/growing-up-with-media/> (accessed December 24, 2014).
4. Hancock J, Brown KE, Hagger M. Promoting condom-related behaviors in a broad population: Evaluation of a life guide-based intervention. *Appl Psychol Res J* 2014; 1:16–33.
5. Bartholomew LK, Parcel GS, Kok G, et al. *Planning Health Promotion Programs: An Intervention Mapping Approach*, 3rd ed. San Francisco: Jossey-Bass; 2011.
6. Michie S, Atkins L, West R. *The Behavior Change Wheel: A Guide to Designing Interventions*. London: Silverback Publishing; 2014.
7. Brown KE, Bayley J, Newby K. Serious game for relationships and sex education: Application of an intervention mapping approach to development. In: Arnab S, Dunwell I, Debattista K, eds. *Serious Games for Healthcare: Applications and Implications*. pp 135–166. Hershey, PA: IGI Global; 2012.
8. Arnab S, Brown KE, Clarke S, et al. The development approach of a pedagogically-driven serious game to support relationship and sex education (RSE) within a classroom setting. *Comput Educ* 2013; 69:15–30.
9. Cane J, O'Conner D, Michie S. Validation of the theoretical domains framework for use in behavior change and implementation research. *Implement Sci* 2012; 7:37.
10. Craig P, Dieppe P, Macintyre S, et al. Developing and evaluating complex interventions: The new Medical Research Council guidance. *BMJ* 2008; 337:a1655.
11. Noar SM, Harrington NG, eds. *eHealth Applications: Promising Strategies for Health Behavior Change*. New York: Routledge; 2012.
12. Berger J. *Contagious: Why Things Catch On*. New York: Simon and Schuster; 2013.
13. Barker K. The Sabido Methodology. Population Media, Inc. Report. 2014. www.populationmedia.org/what/theoretical-framework/ (accessed December 24, 2014).
14. Atkinson NL, Saperstein SL, Desmond SM, et al. Rural eHealth nutrition education for limited-income families: An iterative and user-centered design approach. *J Med Internet Res* 2009; 11:e21.
15. Hill-Kayser CE, Vachani C, Hampshire MK, et al. An internet tool for creation of cancer survivorship care plans for survivors and health care providers: Design, implementation, use and user satisfaction. *J Med Internet Res* 2009; 11:e39.
16. Miller LC, Marsella S, Dey T, et al. Socially optimized learning in virtual environments (SOLVE). *Lecture Notes Comput Sci* 2011; 7069:182–192.
17. Bechara A, Damasio AR. The somatic marker hypothesis: A neural theory of economic decision. *Games Econ Behav* 2005; 52:336–372.
18. Bandura A. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice Hall; 1986.
19. Ritterfeld U, Cody M, Vorderer P. *Serious Games: Mechanisms and Effects*. New York: Routledge; 2009.
20. Blascovich J, Bailenson J. *Infinite Reality*. New York: Harper Collins; 2011.
21. Duncan L, Hieftje K, Fiellin L. Game playbooks: Manuals designed for videogame-based behavior change interventions. *Transl Behav Med* 2014; 4:108–116.
22. Fishbein M, Ajzen I. *Predicting and Changing Behavior: A Reasoned Action Approach*. New York: Psychology Press; 2010.
23. Rogers EM. *Diffusion of Innovations*. New York: Simon and Schuster; 2003.
24. Fisher JD, Fisher WA, Amico KR, Harman JJ. An information-motivation-behavioral skills model of adherence to antiretroviral therapy. *Health Psychol* 2006; 25:462–473.
25. CyberSenga. <http://cybersenga.com/> (accessed December 24, 2014).
26. Guy2Guy. <http://projectg2g.com/> (accessed December 24, 2014).
27. Ybarra M. Harnessing the Power of Text Messaging to Invigorate AMSM HIV Preventive Behavior. NIH Research Portfolio Online Reporting Tools. 2014. http://projectreporter.nih.gov/project_info_description.cfm?projectnumber=5R01MH096660-02 (accessed December 24, 2014).
28. Wallace LM, Brown KE, Hilton S. Planning for, implementing, and assessing the impact of, health promotion and behavior change interventions: A way forward for health psychologists. *Health Psychol Rev* 2013; 8:8–33.

Brief Biosketches



Ross Shegog, PhD, is an Associate Professor of Behavioral Science at the University of Texas School of Public Health and holds an adjunct appointment with the University of Texas School of Biomedical Informatics. He is interested in the application of communication technology in health promotion, disease prevention, and disease management to find creative solutions to the challenges of

optimally impacting health behavior. His recent projects have focused on the application of computer-based education, decision-support systems, and gaming in the health domains of pediatric asthma management, tobacco smoking cessation and prevention, HIV/STI/pregnancy prevention, violence prevention, physical activity, and epilepsy self-management. Dr. Shegog received his doctorate in Behavioral Sciences, Masters in Public Health, and postgraduate diploma in Biomedical Communications from the University of Texas and a postgraduate diploma in nutrition and dietetics from the University of Sydney.



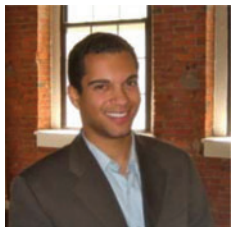
Katherine Brown PhD, is Reader in eHealth and Wellbeing Interventions at the Centre for Technology Enabled Health Research, Coventry University, Coventry, United Kingdom, and works jointly locally with Public Health Warwickshire. Much of her work involves developing and evaluating interventions focused on the sexual health and well-being of

adolescents and young people. Her focus within Public Health has been applying expertise in the design and evaluation of behavior change interventions across a range of preventive areas of health and well-being, including sexual health. Many of the interventions developed by Dr. Brown and her team have used new technologies to engage the end-user. Examples include: the Respect Yourself Web site and Web app (www.respectyourself.info), which embeds targeted behavior change communication aimed at improving access to sexual health services; the “PR:EPARE” sex education serious game, addressing the issue of sexual coercion; and the development of “stop-app,” an electronic health behavior change solution to improving adult attendance at stop smoking services.



Sheana Bull, PhD, is a Professor in the Colorado School of Public Health and the Chair of the Department of Community and Behavioral Health. Dr. Bull directs the mHealth Impact Laboratory, which houses her research focused on building the evidence for mhealth efficacy through more rapid and responsive research methods to test and determine the efficacy of interventions for health promotion that rely on mobile and social media technologies. She has developed and tested programs in sexual health promotion using computers, text messages, and Facebook and is currently developing apps related to promotion of child development, breast feeding, human papillomavirus vaccine compliance, and postpartum weight loss.

interventions for health promotion that rely on mobile and social media technologies. She has developed and tested programs in sexual health promotion using computers, text messages, and Facebook and is currently developing apps related to promotion of child development, breast feeding, human papillomavirus vaccine compliance, and postpartum weight loss.



John L. Christensen, PhD, is Assistant Professor at the Department of Communication at the University of Connecticut. As a PhD student at the University of Southern California, he gained experience related to technology and sexual health by working extensively on two National Institutes of Health-funded grants. The primary objectives of both grants were to develop and evaluate interactive, technology-based HIV-prevention interventions for diverse groups of young men who have sex with men (MSM). The first grant, funded by the National Institute of Allergy and Infectious Diseases, attempted to reduce sexual risk-taking among this population through the use of interactive video technology. John co-designed and co-produced three versions of this intervention for young MSM; each interactive video was targeted to a different race and was demonstrated to successfully reduce risky behavior over the course of a 3-month randomized controlled trial. The second grant, funded by the National Institute of Mental Health, is ongoing. John has developed and is currently testing the effectiveness of an HIV-prevention intervention for young MSM that utilizes interactive intelligent agents and immersive, videogame technology. He is also a co-Investigator on a separate National Institutes of Health-funded grant, developing smartphone applications to encourage HIV testing among minority MSM. In addition to this experience he has successfully completed a training pro-

gram at the Institute of Creative Technologies, which focused on skills relevant to the design of artificially intelligent agents and virtual worlds. He has also developed interactive media applications for the Air Force Research Lab and is currently designing a health-oriented mobile phone application in collaboration with Exeter Media.

gram at the Institute of Creative Technologies, which focused on skills relevant to the design of artificially intelligent agents and virtual worlds. He has also developed interactive media applications for the Air Force Research Lab and is currently designing a health-oriented mobile phone application in collaboration with Exeter Media.



Kimberly Hieftje, PhD, is an Associate Research Scientist at Yale University School of Medicine. Her research interests primarily focus on health promotion and behavior change through the use of videogames. As the Deputy Director for the play2PREVENT Lab at Yale, a platform for the development of videogames for health promotion in youth and young adults, Dr. Hieftje is currently involved in the development and testing of several health behavior change videogames. She is currently the Project Director for a 5-year NIH-funded grant that focuses on the development and evaluation of an interactive videogame, “PlayForward: Elm City Stories,” with the goal of reducing risk behaviors in minority youth. Recently, with funding from the Women’s Health Research Pilot Program at Yale, she developed and pilot tested a social card game intervention, “One Night Stan,” that focused on increasing condom use and partner HIV testing in young black women. The social card game, which has shown preliminary efficacy, will serve as a prototype to develop and evaluate a multi-player videogame on HIV/STI prevention in a pilot randomized controlled trial. Dr. Hieftje has published several articles on the topic of developing serious videogames.

youth and young adults, Dr. Hieftje is currently involved in the development and testing of several health behavior change videogames. She is currently the Project Director for a 5-year NIH-funded grant that focuses on the development and evaluation of an interactive videogame, “PlayForward: Elm City Stories,” with the goal of reducing risk behaviors in minority youth. Recently, with funding from the Women’s Health Research Pilot Program at Yale, she developed and pilot tested a social card game intervention, “One Night Stan,” that focused on increasing condom use and partner HIV testing in young black women. The social card game, which has shown preliminary efficacy, will serve as a prototype to develop and evaluate a multi-player videogame on HIV/STI prevention in a pilot randomized controlled trial. Dr. Hieftje has published several articles on the topic of developing serious videogames.



Kristen N. Jozkowski, PhD, is an Assistant Professor of Public Health, affiliate faculty in Gender Studies, and Director of the Sexual Health Research Lab at the University of Arkansas. She is also a Research Fellow with the Kinsey Institute for Research in Sex, Gender and Reproduction at Indiana University. Dr. Jozkowski studies sexual consent negotiation and sexual violence prevention among college students. As part of this work, she studies and develops alternative approaches to conducting sexual assault prevention education. Her work also focuses on sexual enhancement and sexual function, particularly in adult women. Dr. Jozkowski earned her PhD in Health Behavior from Indiana University School of Public Health with minors in Mixed Research Methodology and Human Sexuality.

sexual consent negotiation and sexual violence prevention among college students. As part of this work, she studies and develops alternative approaches to conducting sexual assault prevention education. Her work also focuses on sexual enhancement and sexual function, particularly in adult women. Dr. Jozkowski earned her PhD in Health Behavior from Indiana University School of Public Health with minors in Mixed Research Methodology and Human Sexuality.



Michele L. Ybarra, MPH, PhD, works in the field of Internet victimization, including cyberbullying and Internet harassment and unwanted sexual solicitation, and has published on the psychosocial characteristics related to these experiences by youth. She earned her doctorate in child mental health services research and evaluation

from The Johns Hopkins School of Public Health. Additionally, she was a predoctoral fellow of the National Institutes of Mental Health and was a joint fellow of the American Schools of Public Health/Centers for Disease Control and Prevention. Michele is the Principal Investigator for Growing up with Media, a national, longitudinal survey of adolescents in the United States to identify the associations between violence in new media (e.g., Internet and mobile phones) and seriously violent behavior, funded by the Centers for Disease Control and Prevention. This study has recently been extended to examine characteristics associated with the manifestation of sexually violent behavior over time. Michele also led a team of researchers in conducting the first-of-its-kind national survey to better understand the benefits as well

as risks posed by the Internet for lesbian, gay, bisexual, and transgender youth. The project was funded by the National Institutes of Health. In addition to epidemiological surveys, Michele leads technology-based intervention studies. She is the Principal Investigator for the CyberSenga project in Mbarara, Uganda, an Internet-based HIV prevention program for secondary school students. She has also led the development and testing of a text messaging-based smoking cessation program for adults in Ankara, Turkey, and young adults in the United States. Michele is also leading an effort to develop and test a text messaging-based HIV prevention program for gay and bisexual adolescent males in the United States. All intervention projects were funded by the National Institutes of Health.