How to Design Tobacco Prevention and Control Games for Youth and Adolescents: A Qualitative Analysis of Expert Interviews

Amanda K. Hall, PhD,¹ Rebecca Mercado, MS,² Charkarra Anderson-Lewis, PhD, MPH,²
Gabrielle Darville, MPH,² and Jay M. Bernhardt, PhD, MPH³

Abstract

Objective: Games for health, including digital videogames and gaming-based approaches, are increasingly being used in health promotion research and practice. Recently published research has shown that videogames have significant potential to promote healthy behaviors among youth and adolescents. Yet, there is a lack of available evidence-based resources to guide practitioners on the integration of games into tobacco prevention and smoking cessation interventions. To address this gap, expert researchers and game developers were interviewed to further define games for health, explore the current research, and provide recommendations for developing, evaluating, and promoting effective anti-tobacco games.

Materials and Methods: Nationally recognized experts on game development, games for health, tobacco, and health behavior were asked to participate. A qualitative analysis of 25 in-depth individual interviews using a constant comparative approach for emerging themes was conducted.

Results: Main themes that emerged from the data analysis included the following: (1) the current state of games for health research to facilitate health behavior change, (2) strategies for how to develop and evaluate games for quality and impact, and (3) recommendations for how to effectively design tobacco prevention and smoking cessation educational videogames that engage youth and adolescents.

Conclusions: The synthesized findings identified through these expert interviews offer stakeholders strategies for how to incorporate games for health within their current and future work. Specific recommendations are presented for developers and researchers to consider when developing and evaluating videogames for tobacco prevention and smoking cessation targeted at youth and adolescents.

Introduction

PLAYING VIDEOGAMES IS POPULAR among youth and adolescents in the United States. Nearly 91% of youth and adolescents between the ages of 2 and 17 years play videogames.¹ Games immerse players in fun and interactive ways where players are motivated to engage in digital adventures to solve problems or overcome challenges.² All games contain four main characteristics: goals, conflict, rules, and the ability to win or lose.³ The characteristics of games and the popularity of playing games among youth and adolescents provide an ideal medium suitable for health communication and education.

Many new videogames are being developed around health topics, referred to as “games for health,” to promote changes in players’ motivations and behaviors. Games for health (aka “serious games”) are digital games designed specifically for health behavior education and health promotion applications. For example, results from a randomized clinical trial of children playing videogames designed to change diet and physical activity behavior, “Escape from Diab” and “Nanoswarm,” found significant improvements in healthy eating habits.⁴ However, although more research has been conducted on the development and evaluation of videogame interventions designed to change diet and exercise behaviors, less has been studied on the effectiveness of videogame

¹University of Washington, Seattle, Washington.

²University of Florida, Gainesville, Florida.

³University of Texas at Austin, Austin, Texas.

The content of this article is solely the responsibility of the authors and does not necessarily represent the official views of the Food and Drug Administration, the National Cancer Institute, or the National Institutes of Health.

interventions on other health behaviors, such as for tobacco prevention and smoking cessation. Therefore, videogames and game-based approaches may prove to be effective intervention tools to prevent tobacco product initiation and for smoking cessation among youth and adolescents.

A meta-analysis by Sussman et al.⁵ found that successful teen smoking cessation programs contained components such as motivation enhancement, cognitive and behavioral strategies, and social influences, which are all design features of games. Stein-Seroussi et al.⁶ tested a teen smoking cessation curriculum that incorporated interactive game features and achieved higher post-90-day follow-up abstinence in the treatment group compared with the control group. Videogames mentioned in the literature devoted to smoking prevention and cessation included “Rex Ronan: Experimental Surgeon,” “Nicot,” “Blast ‘n Quit,” “Smoke Rings,” and “Lit2Quit” (<https://lit2quit.wordpress.com/about/>); however, most of these videogames were not designed for youth and provide little guidance for researchers and game developers on how to design, implement, and evaluate videogames for tobacco prevention and smoking cessation, specifically among younger populations.

The purpose of this study was to identify nationally recognized experts on games for health, health behavior, and tobacco-related games and to conduct systematic, semistructured interviews to identify lessons learned and guidance on how to design, develop, implement, and evaluate videogames for tobacco-related education and communication for youth and adolescents. This research involved diverse gaming experts from multiple sectors including academia, government, nonprofit advocacy and educational organizations, game developers, and gameplayers (aka “gamers”).

Subjects and Methods

Participants and design

Interviews were conducted with experts in the fields of gaming, health behavior, and tobacco with a particular focus on experts with experience working with youth and adolescents. The purpose of the interviews was to elicit in-depth input and recommendations from expert researchers, practitioners, and game industry specialists to explore the current state of games for health research and practice and strategies for using games as a means to promote health, as well as their recommendations for using games as a means to effectively reach youth and adolescents with tobacco prevention and smoking cessation messages.

A purposive sample of research and game development experts was initially identified based on their publication record, word-of-mouth recommendations, and body of work or experience in the fields of gaming, games for health, health behavior or behavior change, and tobacco. It was important to identify experts with strong research backgrounds and game development experience to ensure the strength of their recommendations. Identified experts were contacted via e-mail and invited to participate in the study. If the response was positive, a member of the research team contacted them by phone to confirm their desire to participate and their ability to be at one of the three conference locations where the interviews would be conducted. A snowball method of interviewee identification and selection was

additionally used, whereas participants referred other experts to participate based on their relevant areas of expertise. In total, 25 experts were interviewed.

Interviews were conducted using open-ended questions to elicit responses and allow each expert the opportunity to share his or her thoughts and opinions related to games for health, in general, and, more specifically, videogames for tobacco prevention and smoking cessation. Participants were provided a copy of the interview guide prior to their arrival, and additional copies were made available on-site. Participation was voluntary and experts were compensated for participating. Approval for this study was granted through the University of Florida’s Institutional Review Board (IRB) as well as the National Cancer Institute’s IRB. Respondents gave verbal and written consent to participate and permission to use and share their answers and identity and to make their answers public. Table 1 provides a listing of the areas of expertise represented by those interviewed.

Interviews

Twenty-five individual semistructured interviews lasting from 13 to 44 minutes were conducted by the same member of the research team in a location conducive to private conversation. All interviews were video and audio recorded. Three rounds of largely similar but slightly focused interviews were conducted to explore health game topics related to research and practice and videogames for tobacco prevention and cessation. Interview Round 1 ($n=8$) included research experts with a focus on games for health and health behavior, Interview Round 2 ($n=9$) included research and game developer experts with a focus on game development and evaluation, and Interview Round 3 ($n=8$) included

TABLE 1. CHARACTERISTICS OF EXPERT INTERVIEWEE PARTICIPANTS

<i>Characteristic</i>	<i>Specifics</i>
Fields represented by the experts	Consultant Game industry (public and private) Government Researcher Professor
Areas of expertise	Health behavior research <ul style="list-style-type: none"> Obesity prevention, nutrition, physical activity, medication adherence, chronic disease self-management, substance abuse, rehabilitation, therapy, child development, health education, and family health Games for health development and evaluation Anti-tobacco mass media campaigns/messages Prevention of risky behaviors (e.g., human immunodeficiency virus, drinking) Smoking cessation Tobacco policy User-centered design Youth tobacco prevention

research experts with a focus on tobacco prevention and smoking cessation. The interview guide was modified and resubmitted to the IRB for approval after each round of interviews to further target questions specific to interviewees' areas of expertise. Table 2 includes an amalgamation of the main topics and questions explored across all three rounds of interviews.

Data analysis

Interviews were transcribed verbatim by a trained transcriptionist. Transcripts were organized and coded to identify initial themes across all 25 interviews. Themes were further compared and contrasted across interview rounds to look for differences and similarities among experts. To establish reliability, two independent researchers individually coded each transcript and then met to discuss the identified codes. Differences were discussed, and a final coding scheme was established. All qualitative data were analyzed using NVivo10 software (QRS International, Inc., Doncaster, VIC, Australia).

Results

The current state of games for health

The majority of experts had experience working on health-related game projects as researchers, consultants, or developers. When asked to describe why youth and adolescents engaged in gameplay, the experts most frequently mentioned the following: games are fun, challenging, interactive, immersive, and an effective tool for learning, providing (immediate) feedback to the player (via rewards or incentives), and providing players the ability to share gameplay with others (e.g., friends and family). Participants further mentioned that games were particularly attractive to youth and adolescents because games met their need for creative and entertaining outlets where they could express themselves and accomplish tasks or solve problems.

When asked what defines a game for health or health game, a few of the experts did not have a clear definition. They stated the current lack of literature, rigorous evalua-

tions, and compelling examples needed to establish a clear definition and best practices as some of the challenges a game for health currently faces. However, many of the experts stated that the main purpose of games for health should be to improve health outcomes, while also including basic characteristics that all games contain:

Any game is a rule-based activity that involves challenge to reach a goal and gives feedback about your progress toward the goal. I mentioned earlier that a health game should align health goals with game goals. You don't put the health stuff as secondary and then there's this game you play; you have to somehow deal with the health issues as a way to win.

As far as the characteristic for a game for health it should be a game that's [that its] main purpose is to improve someone's health or improve the provision of healthcare.

When asked what features or characteristics should be included in a game for health to engage youth and adolescents, the majority of experts mentioned the following: an intriguing storyline/narrative, a clearly stated health purpose/goal, the ability to develop/master skills and solve problems within the gameplay environment (e.g., ability to win or lose), ability to role-play (i.e., simulation of real-world activities or events), health messages and information, and relevant or authentic gameplay.

When interviewees were asked what are some of the benefits for using games for health promotion purposes, the following themes emerged: multiple platforms and applications available to play games (e.g., computers, tablets, smartphones, Xbox[®]'s Kinect[®] [Microsoft, Redmond, WA], PlayStation[®] 2 [Sony, Tokyo, Japan], Nintendo[®]'s [Kyoto, Japan] Wii[™], Web-based and mobile applications, sensors); convenience/mobility of various game platforms and accessibility of games; adaptability of games; multiple health message exposure opportunities during gameplay; games are more interesting than textbooks; and games can be leveraged as effective learning tools for health education:

Games are by their very nature learning devices and teaching devices...The fact that they're entertaining and fun leads to an ongoing engagement with the topics that often we don't get through our traditional health communication and education materials.

Everybody loves video games. Everybody plays video games. More and more people have access to video games...it's readily available...Kids are always playing video games so why not get in there and try to reach them where they are?

Strategies for design, development, and evaluation

Many of the experts had personal experience designing and developing games for health as well as evaluating them for quality and impact. When the interviewees were asked what strategies they would recommend to design and develop games, the following themes were most frequently described: evaluate existing popular games, play lots of games in many formats and genres, build a multidisciplinary team of experts, conduct formative research on the desired health behavior topic and target population, involve the target audience in the design of the game, incorporate theory, pilot-test with the target audience (throughout multiple iterations, which takes time and money), clearly define the health goals and purpose of the game (i.e., create an instructional design plan), clearly define the desired health

TABLE 2. INTERVIEW GUIDE TOPICS

-
- Experience creating or designing health or social behavioral change games
 - Role in game development and/or game design
 - Types of health behaviors that are most amenable for games for health
 - Benefits/challenges of using games for health promotion
 - Process for game development/design and testing with your target population
 - Relevant theories, models, and/or evaluation strategies
 - Strategies for promoting or evaluating games
 - Advice you would give to someone new to this area of research
 - Lessons learned since you started doing this work
 - Recommendations for using games as a means to improve health outcomes
 - How to best evaluate health-based games for quality and impact
 - Examples of games for tobacco interventions for youth/adolescents
 - Defining a game as successful for health behavior change
-

outcomes and how they will be evaluated, build a creative, innovative, fun and interesting game, consider the location of where your videogame will be played (e.g., classroom, hospital, home, or lab), consider the developmental stage (cognitive and physical ability) of players, and games can be used as a tool to complement other health interventions:

We'll have a team that will create proposals and perhaps do prototyping. Perhaps do focus testing. Then there's a development phase where we're actually building. Throughout that we're play testing with the target demographic because play testing is really a critical part of iterative game design which is really how you get a great game.

When asked what methods should be considered when evaluating games for quality and impact, the majority of experts mentioned randomized controlled trials, surveys, and quizzes. Additionally, the following themes were most frequently recommended: compare in-game data with outside game evaluation data, compare short-term and long-term outcomes, look at digital records (e.g., log files, real-time or gameplay data), back-end data (Web analytics), and sensor data, alpha and beta testing, obtain verbal feedback from players, use qualitative and quantitative measures, use standardized instruments, compare players with nonplayers of the game, measure changes in self-efficacy, knowledge, attitudes, beliefs, and compare gameplay data over time:

Right, and the fact that you could use games for interventions, but if you could come out at the end of the day and say what somebody does in a game has a high correlation with what they report they would do in real life. Even better, two years down the road, what they actually did in real life. Then you might be able to actually use games as a form of measurement, actually have a data collection source.

Incorporating behavioral change theories into games was an overarching theme recommended by many of the experts in all three rounds of interviews. The most commonly mentioned theories, models, frameworks, and constructs included the following: Social Learning/Cognitive Theory, Health Behavior Theory, Theory of Reasoned Action, Theory of Planned Behavior, Health Belief Model, Stages of Change, and Self-Efficacy. Additional theories and models that were mentioned included Self-Determination Theory, Game Theory, Behavioral Inoculation, Bystander Intervention Model, Motivational Interviewing, Cognitive Behavior Therapy, Health Communication Theories, Mass Media Theories, Procedural Rhetoric, Constructivist Learning Theory, Cultural Learning Theory, Situated Learning Theory, Classic Framework; Social Norms; Social Networking Theory, and the Extended Parallel Process Model:

What we find important to include is to build a model. A model of how the game's going to work and that within that model you are tagging out or tagging in...pieces of evidence based theories that you believe you have translated into the game and then translated that into the procedural rhetoric of the game as well as its media layers.

Targeting youth and adolescents for tobacco prevention and cessation

Many of the experts had experience working in the fields of tobacco prevention and smoking cessation, and several had experience developing and designing games for tobacco prevention and smoking cessation interventions. The experts

mentioned that games can be an excellent delivery tool for health and behavior change messages and can provide repeated exposure to health messages due to the engaging nature of games and a child's natural desire to play. Additionally, videogames can provide a simulated environment ideal for problem solving, role-playing, and practicing tobacco product resistance and refusal skills.

The experts identified several reasons why videogames are ideal tools for smoking cessation, such as using videogames as a means of distraction when experiencing a craving, the convenience of mobile devices to access information or a videogame when faced with a temptation to smoke, and receiving immediate feedback to assist with cigarette urge management and emotional triggers. An example of a smoking cessation game mentioned by many experts was "Lit2Quit." "Lit2Quit" was described as a mobile and Web-based game designed using a cigarette urge management approach to help people quit or reduce smoking by having the player blow into the phone to play the game and induce a biofeedback effect, thus reducing the urge to smoke:

Our theory is that a game intervention can actually help people through those periods when they are most likely to relapse, to go back to smoking or to increase their smoking.

I mentioned craving, engagement and resistance skills. I would also add to that list that it's a relapse prevention tool...I think a lesson learned might even be to really focus on the relapse prevention piece because I think the games, especially the mobile games, can be very useful there.

The game can be with them in the same social context as the temptation. We think that there's a huge opportunity in this area for adolescents.

The experts further identified various recommendations on the use of videogames as tobacco prevention tools, such as using the game as a reinforcement of didactic lessons by making it part of a health education curriculum. Another identified recommendation included using games as a means to target emotional appeal by showing the negative consequences of smoking, specifically focusing on the cosmetic effects of smoking such as bad breath, yellow skin and teeth, etc. The experts further identified that videogames can provide an excellent medium for counteracting mass marketing tobacco industry messages and media portrayals of smoking as desirable. An example of a tobacco prevention game mentioned by many experts was "Flavor Monsters," a mobile fact-based, anti-tobacco industry game targeting youth and adolescents 12–17 years old available for the smartphone. Other types of tobacco prevention and smoking cessation-related games that were mentioned by experts in this study included the following: "Tobacco Free Teens," "Tunnel Tail," "Elm City Stories," "Smoking Rabbit," "Rex Ronan: Experimental Surgeon," "Recovery Warrior," "Cigarette Crush," "Cigarette Fighter," "Don't Blow It," "Crazy Blowers," "David Carr: Stop Smoking," "Escape from Nicotinia," and "B.A.R.N." (Body Awareness Resource Network).

Discussion

The popularity of videogames and the potential use of videogames as tools designed specifically around health topics to promote healthy behaviors or behavior change have spurred the growth of games for health. Leaders in the games

for health movement include Health Games Research (funded through the Robert Wood Johnson Foundation's Pioneer Portfolio) and the Games for Health Project. These initiatives were built to facilitate networks of professionals and researchers in the games for health industry and to provide resources and support for the design and development of digital games that promote health.

The Games for Health Project further developed a taxonomy for health games, which includes the following main categories: Preventative, Therapeutic, Assessment, Education and Training, Informatics, and Production (Ben Sawyer, Digital, Inc. & Games for Health Project).⁸ Although the games for health taxonomy aims to address questions related to the expectations of the player and how he or she acts during gameplay (i.e., players' motivations and health behaviors), there is a lack of available research and guidelines on how to develop health games targeted at specific populations and health behaviors. Therefore, the purpose of this study was to establish the current state of research and practice on games for health and further explore recommendations for developing and evaluating health games designed for youth and adolescents on the topics of tobacco prevention and smoking cessation.

To the authors' knowledge, this is the first study to interview experts working on games for health research and videogame development designed for youth and adolescents focusing on tobacco prevention and smoking cessation. Additionally, this study explored games for health challenges and lessons learned. This study aimed to aggregate advice from experts to provide a resource for professionals interested in designing, implementing, or evaluating games for health and to help guide future research on videogame development.

The majority of experts had developed or conducted research related to health games. The current state of research and evidence in games for health among youth and adolescents has been primarily focused on such behaviors as diet, exercise, and chronic disease management (e.g., asthma, diabetes, cancer).^{9–13} However, the current state of games for health is burgeoning. Many health games, on a variety of different topics, are being developed and tested, but published results are not yet available.

For example, experts mentioned games such as "Lit2-Quit," "Flavor Monsters," and "Elm City Stories," and findings from the development and evaluation of these games will add to the body of evidence to establish games for health guidelines and best practices. The current and potential available evidence related to games for health targeted at youth and adolescents and the use of videogames as effective tools for tobacco prevention and smoking cessation is promising. However, more research is needed to further test effective non-game-based tobacco prevention and smoking cessation strategies to develop guidelines and best practices for games for health research and design.

Limitations

Study findings contribute to the current state of research and practice in games for health in general and particularly in reference to videogames designed for youth and adolescents for tobacco prevention and smoking cessation. Findings from this expert sample augment the literature in

the area of health games. Despite the rich body of data from the qualitative study, limitations exist. This analysis is limited because of the availability of experts sampled and their willingness to be interviewed. It provides a starting point for future analysis and to establish best practices in games for health across diverse health topics. The accuracy of these self-reported data is unknown, and use of individual interviews to collect data may have caused some participants to offer responses perceived as socially desirable to the interviewer.

Conclusions

This study explored the current state of research and practice on games for health. The particular topic related to the use of videogames as tools for tobacco prevention and smoking cessation interventions for youth and adolescents was chosen as a case study to add to the body of literature and provide additional formative research on applications of games for health. Findings and recommendations identified through the expert interviews provide stakeholders with strategies on how to effectively design, implement, and evaluate games for health within their current and future work. More research is needed to expand the games for health taxonomy and provide guidelines targeted at specific health behaviors and populations to more effectively design health games that promote healthy behaviors and facilitate health behavior change.

Acknowledgments

The work was supported by the Food and Drug Administration's Center for Tobacco Products and the National Cancer Institute's Office of Communication and Education. This work was also supported in part by the National Institutes of Health's National Library of Medicine Biomedical and Health Informatics Training Program at the University of Washington (grant T15LM007442).

Author Disclosure Statement

No competing financial interests exist.

References

1. NPD Group. Kids and Gaming, 2011, The Video Game Industry Is Adding 2–17 Year Old Games at a Rate Higher Than That Age Group's Population Growth. Available at www.afjv.com/news/233_kids-and-gaming-2011.htm (accessed September 1, 2013).
2. McGonigal J. *Reality Is Broken: Why Games Make Us Better and How They Can Change the World*. New York: Penguin Press; 2011.
3. Schell J. *The Art of Game Design: A Book of Lenses*. New York: Taylor & Francis; 2008.
4. Baranowski T, Baranowski J, Thompson D, et al. Video game play, child diet, and physical activity behavior change: A randomized clinical trial. *Am J Prev Med* 2011; 40:33–38.
5. Sussman S, Sun P, Dent CW. A meta-analysis of teen cigarette smoking cessation. *Health Psychol* 2006; 25:549–557.
6. Stein-Seroussi A, Stockton L, Brodish P, Meyer M. Randomized controlled trial of the ACTION smoking cessation

- curriculum in tobacco-growing communities. *Addict Behav* 2009; 34:737–743.
7. Raiff BR, Jarvis BP, Rapoza D. Prevalence of video game use, cigarette smoking, and acceptability of a video game–based smoking cessation intervention among online adults. *Nicotine Tob Res* 2012; 14:1453–1457.
 8. Hall AK, Marston H. Games for health in the home: Gaming and older adults in the digital age of healthcare. In: van Hoof J, Demiris G, Wouters E, eds. *Handbook of Smart Homes, Health Care, and Well-being*. Charn, Switzerland: Springer International Publishing; (in press). doi: 10.1007/978-3-319-01904-8_55-1.
 9. Baranowski T, Buday R, Thompson DI, Baranowski J. Playing for real: Video games and stories for health-related behavior change. *Am J Prev Med* 2008; 34:74–82.
 10. Lieberman DA. Management of chronic pediatric diseases with interactive health games: Theory and research findings. *J Ambul Care Manage* 2001; 24:26–38.
 11. Papastergiou M. Exploring the potential of computer and video games for health and physical education: A literature review. *Comput Educ* 2009; 53:603–622.
 12. Primack BA, Carroll MV, McNamara M, et al. Role of video games in improving health-related outcomes: A systematic review. *Am J Prev Med* 2012; 42:630–638.
 13. Staiano AE, Calvert SL. Exergames for physical education courses: Physical, social, and cognitive benefits. *Child Dev Perspect* 2011; 5:93–98.

Address correspondence to:
Jay M. Bernhardt, PhD, MPH
University of Texas at Austin
2504B Whitis Avenue (A1105)
Austin, TX 78712

E-mail: jay.bernhardt@austin.utexas.edu