

Viewpoint

What Serious Video Games Can Offer Child Obesity Prevention

Debbe Thompson, PhD

USDA/ARS Children's Nutrition Research Center, Pediatrics, Baylor College of Medicine, Houston, TX, United States

Corresponding Author:

Debbe Thompson, PhD

USDA/ARS Children's Nutrition Research Center

Pediatrics

Baylor College of Medicine

1100 Bates Street

Houston, TX, 77030

United States

Phone: 1 713 798 7076

Fax: 1 713 798 7098

Email: dit@bcm.edu

Abstract

Childhood obesity is a worldwide issue, and effective methods encouraging children to adopt healthy diet and physical activity behaviors are needed. This viewpoint addresses the promise of serious video games, and why they may offer one method for helping children eat healthier and become more physically active. Lessons learned are provided, as well as examples gleaned from personal experiences.

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KEYWORDS

serious video games; children; teenagers; obesity prevention; formative research, qualitative research

Childhood Obesity

Childhood obesity is a worldwide public health issue [1,2], and is associated with adverse health effects in both children and adults [3,4]. Obese children and adolescents are more likely to become obese adults, further exacerbating the public health urgency of this issue [3,5]. Diet and physical activity behaviors, the cornerstones of obesity prevention [6,7], track into adulthood [8,9]. Establishing healthy diet and physical activity behaviors during childhood is an important aspect of obesity prevention. Effective ways to achieve and maintain this goal are needed.

Technology may offer an effective method for encouraging children to adopt healthy behaviors. Technology is pervasive in today's world and influences many aspects of our lives, including how we communicate, educate, and entertain ourselves. Video games are an example; 97% of 12-17 year olds play video games, play multiple genres, and have access to computers and other devices on which to play the games [10,11]. Internet access, including high-speed access [11], has increased, making Internet games more accessible. Evidence indicates the digital divide is diminishing [12], particularly when mobile platforms are taken into account [13,14]. Thus, Internet video games offer a familiar, convenient, and readily accessible

channel within which to evaluate obesity prevention programs developed for children and teenagers.

While traditional video games are primarily designed to entertain, a new genre has emerged that seeks to do more. Serious video games, often referred to as games for health when they target health behaviors [15], are showing promise as a method for promoting healthy behaviors to youth [15,16]. Serious video games have the dual goal of entertaining, while promoting behavior change [17,18]. This game genre has the formidable task of achieving a balance between "fun-ness" (ie, components that entertain, such as animation, storyline, sound effects) and "serious-ness" (ie, the components that promote behavior change, such as goal setting, problem solving) [18]. This balance, although sometimes difficult to attain, is essential; too much "fun-ness", the game will entertain, but it will not likely change behavior; on the other hand, too much "serious-ness", and the players will not likely play all levels or episodes of the game (ie, inadequate dose), making behavior change less likely.

Serious Game Components Targeting Behavior Change

There are several components that should be considered when developing serious games for health behavior change. These include interactivity, feedback, characters, story, and sound effects [18,19]. For examples of how features such as these were incorporated into a serious video game, please see Thompson et al [18].

Interactivity

Rather than a didactic presentation of facts or figures, the player is able to interact with and “discover” knowledge and skills, and then immediately apply these to overcoming behavioral obstacles in the game.

Feedback

A serious video game offers a unique opportunity to receive immediate feedback, thus refining, reinforcing, and enhancing newly found knowledge and skills.

Characters

The protagonists model desired behaviors, while the antagonists attempt to “foil” the player’s efforts to attain a goal, thus adding challenge and interest.

Story

The story adds intrigue and excitement, and can be designed to “wrap” the behavioral components into the game for a more seamless experience.

Sound Effects

The sound effects convey meaning and direction without words. For example, a ticking clock or fast-paced music can indicate that time is running out or that the player must act quickly.

My colleagues and I have been involved in the development and evaluation of a variety of serious video games and other technology-based interventions for a number of years [20-33]. We have learned many lessons along the way, including the following.

Just Because You Can, Does Not Mean You Should

Think about the behavior you’re targeting and the project goal. It may be that another method or approach would be a better fit.

For example, research suggests that video games may not be the best method for enhancing moderate to vigorous physical activity [34,35]. We have seen this in our own work [20,21]. It is highly likely that we have not found the “ideal” method for using technology to promote physical activity. This is an area that needs additional investigation. For example, we are investigating the effect of text messages [33] and avatars created from photographs of the player (ie, self-representational avatars) as ways to promote physical activity to teenagers. It may be that traditional approaches are more effective than serious video games at enhancing physical activity; however, before we give

up on technology as a way to promote physical activity, it is imperative that additional methods, such as these and others, be investigated.

Know What You Want Before You Start

Once programming has been completed, it is expensive to make a change. An approach that has worked for us is to know what you want and how the pieces fit together before starting development. For example, first identify the “serious” components that need to be included based on the theoretical framework (ie, content, behavioral procedures) and the targeted behavior (ie, diet, physical activity) [19]. Then negotiate with the design studio about how to structure the game to create a seamless, entertaining experience for the player. We have discovered that following a process similar to this minimizes miscommunication and increases the likelihood that you will be satisfied with the end result [19].

Carefully Assess Your Budget

Serious video games can be expensive to develop [19]. In addition to having an ample budget to cover the costs of development, it is wise to have a contingency budget to cover unexpected issues (eg, technical problems, etc) that may develop. Often, it is not “if” unexpected delays or set backs will occur, but “What do I do now?” when they do. Anticipate and plan for them.

We have seen this in our own technology-based work. Negotiation and open communication with the game design team are essential. Using the approach described above has been extremely beneficial to achieving our research goals within a reasonable budget. For example, in a serious video game promoting fruit and vegetables to youth [31], during discussions with the game design studio, we were informed that flickering torches were possible, but it would be expensive to animate them, which was not feasible given our budget. Through negotiation and communication, we compromised on a lower cost way to animate the torches (ie, overlays versus actual animation), leaving us both satisfied with the outcome. Other issues that need to be discussed with the game design studio are commercialization and intellectual property rights (ie, who owns what) [19].

Partner With Your Target Audience

The importance of research with the target audience to serious video game design cannot be emphasized enough [36]. It is important to understand their perspective before initiating game development. For example: (1) What are their beliefs and attitudes regarding this behavior?; (2) What problems do they face when trying to engage in the behavior?; (3) What type of information do they want, and in what format?; (4) What would a serious video game addressing this behavior need to include?; and (5) equally as important, What should it not include? [32,36]. Alpha testing with them throughout development is also important, for example: (1) Did we get it right?; (2) What changes, if any, are needed?; (3) Do you understand what this is asking you to do?; and (4) Can you do it using the approach

presented in the serious video game?. Beta testing to identify technical issues (ie, “bugs” or “glitches”) before finalizing the game is also essential. During this phase, be sure to test the serious video game with different operating systems, hardware, browsers, and connection speeds. After the outcome evaluation has been completed, asking the target audience, (“Did we meet your expectations?” and “What, if anything, should we do differently next time?”), would inform the next game you develop. Partnering with the target audience is essential. Partnering with them will help avoid costly mistakes and help ensure the game addresses their needs and interests in an appealing and acceptable manner.

We used this approach when developing a serious video game for elementary aged school children [31]. We first convened an expert panel of 4th and 5th graders, and, over a period of several months, they vetted critical aspects of the serious video game, such as characters, storyline, and behavior change components. Several of the behavioral components involved complicated concepts, such as implementation intentions (ie, plans connected to goal attainment) [37]. Therefore, it was essential to obtain the children’s feedback on whether they understood what they were being asked to do and whether they could do what they were being asked to do. Their comments were used to refine the game components as identified above and enhance its developmental appropriateness and appeal. They also participated in a pilot test, which served as a final beta test of the serious video game and its procedures.

Do Not Forget About the Data

A myriad of data can be collected as players navigate through the game, but not all of it may be useful (eg, time spent in the serious video game, which may not be useful if gameplay is discontinued for another activity, such as eating dinner, but the game or Web browser is not closed). Identify in advance what data you want to capture (eg, goals set, goals attained, problems encountered, time needed to attain each level) early in the development process. Talk with the game design studio about the data you need and how you would like these data stored in the back-end database to avoid potentially expensive (or unfortunate) surprises at the end (ie, miscommunications regarding which data were to be collected and/or how they were

to be stored). Data security is also an important issue that should be addressed, (ie, How will the data, as well as confidentiality, be protected?).

When we develop technology-based programs, we typically have a discussion with the game design studio well before the end of the programming phase, where we discuss options for data collection, and how the data are stored in the database. We have learned that this process helps to avoid missteps and opens up an important discussion between key players. For example, when developing the serious video game promoting fruit and vegetable consumption [31], we provided the game design studio with a document that identified the data we needed and how the data tables should be formatted, including whether the tables needed to include numbers or words (eg, “choice 2” or “carrots”). We then had a discussion about possible options and came to an agreement about what data would be collected, and what the tables would look like. During this discussion, it was discovered that the game design studio and the research team had very different opinions about how the game play information would be saved. This realization proved to be critical and opened up an extremely important dialogue between the game design studio and the research team. This process made several key points very clear-do not make assumptions; keep the lines of communication open; and be open to alternative ways of accomplishing the same goal-you may be pleasantly surprised by the result.

Developing serious video games is a difficult, time consuming, humbling, and exhausting experience, but it is also exhilarating. When a parent tells you what a difference the game has made in his or her child’s life, or the outcome evaluation shows the child not only played all episodes of the game, but modified their behavior, such as eating more fruit and vegetables [21], you realize the potential of this work for child obesity prevention. Will you make mistakes? Yes; like most things in life, there is no iron clad formula for success. But when you get it right, it is invigorating, and you can’t wait to start working on the next serious video game. There is nothing like knowing that you made a difference in someone’s life, particularly a child’s life.

Relax, and enjoy the journey! In my opinion, it’s well worth it.

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Conflicts of Interest

None declared.

References

1. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA* 2014 Feb 26;311(8):806-814. [doi: [10.1001/jama.2014.732](https://doi.org/10.1001/jama.2014.732)] [Medline: [24570244](https://pubmed.ncbi.nlm.nih.gov/24570244/)]
2. Wang Y, Lobstein T. Worldwide trends in childhood overweight and obesity. *Int J Pediatr Obes* 2006;1(1):11-25. [Medline: [17902211](https://pubmed.ncbi.nlm.nih.gov/17902211/)]
3. Reilly JJ, Methven E, McDowell ZC, Hacking B, Alexander D, Stewart L, et al. Health consequences of obesity. *Arch Dis Child* 2003 Sep;88(9):748-752 [FREE Full text] [Medline: [12937090](https://pubmed.ncbi.nlm.nih.gov/12937090/)]
4. Reilly JJ, Kelly J. Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: Systematic review. *Int J Obes (Lond)* 2011 Jul;35(7):891-898. [doi: [10.1038/ijo.2010.222](https://doi.org/10.1038/ijo.2010.222)] [Medline: [20975725](https://pubmed.ncbi.nlm.nih.gov/20975725/)]
5. Engeland A, Bjørge T, Tverdal A, Sjøgaard AJ. Obesity in adolescence and adulthood and the risk of adult mortality. *Epidemiology* 2004 Jan;15(1):79-85. [doi: [10.1097/01.ede.0000100148.40711.59](https://doi.org/10.1097/01.ede.0000100148.40711.59)] [Medline: [14712150](https://pubmed.ncbi.nlm.nih.gov/14712150/)]
6. Koplan JP, Liverman CT, Kraak VA. Preventing childhood obesity: Health in the balance. Washington, D.C: National Academies Press; 2005.
7. COPIO, Medicine IO. Accelerating progress in obesity prevention: Solving the weight of the nation. USA: National Academies Press; 2012.
8. Lien N, Lytle LA, Klepp KI. Stability in consumption of fruit, vegetables, and sugary foods in a cohort from age 14 to age 21. *Prev Med* 2001 Sep;33(3):217-226. [doi: [10.1006/pmed.2001.0874](https://doi.org/10.1006/pmed.2001.0874)] [Medline: [11522162](https://pubmed.ncbi.nlm.nih.gov/11522162/)]
9. Telama R, Yang X, Viikari J, Välimäki I, Wanne O, Raitakari O. Physical activity from childhood to adulthood: A 21-year tracking study. *Am J Prev Med* 2005 Apr;28(3):267-273. [doi: [10.1016/j.amepre.2004.12.003](https://doi.org/10.1016/j.amepre.2004.12.003)] [Medline: [15766614](https://pubmed.ncbi.nlm.nih.gov/15766614/)]
10. Lenhart A, Kahne J, Middaugh E, Macgill A, Evans C, Vitak J. Teens, video games and civics. Washington, DC: Pew Research Center; 2008. URL: <http://www.pewinternet.org/2008/09/16/teens-video-games-and-civics/> [accessed 2014-06-24] [WebCite Cache ID [6QZdH4fdN](https://www.webcitation.org/6QZdH4fdN)]
11. Rideout VJ, Foehr UG, Roberts DF. Generation M2: Media in the lives of 8- to 18-year-olds. Menlo Park, CA: Kaiser Family Foundation; 2010. URL: <http://files.eric.ed.gov/fulltext/ED527859.pdf> [accessed 2014-06-24] [WebCite Cache ID [6QZdPyq8R](https://www.webcitation.org/6QZdPyq8R)]
12. Livingston G, Parker K, Fox S. Latinos online, 2006-2008: Narrowing the gap. Washington, DC: Pew Research Center; 2006. URL: <http://www.pewhispanic.org/2009/12/22/latinos-online-2006-2008-narrowing-the-gap/> [accessed 2014-06-24] [WebCite Cache ID [6QZdT15aE](https://www.webcitation.org/6QZdT15aE)]
13. Smith A. African Americans and technology use: A demographic portrait. Washington, DC: Pew Research Center; 2014. URL: <http://www.pewinternet.org/2014/01/06/african-americans-and-technology-use/> [accessed 2014-06-24] [WebCite Cache ID [6QZda2j5q](https://www.webcitation.org/6QZda2j5q)]
14. The Nielsen Company. The US digital consumer report. New York, NY: The Nielsen Company; 2014. URL: <http://www.nielsen.com/us/en/reports/2014/the-us-digital-consumer-report.html> [accessed 2014-06-24] [WebCite Cache ID [6QZdd3qJB](https://www.webcitation.org/6QZdd3qJB)]
15. 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 Jan;34(1):74-82 [FREE Full text] [doi: [10.1016/j.amepre.2007.09.027](https://doi.org/10.1016/j.amepre.2007.09.027)] [Medline: [18083454](https://pubmed.ncbi.nlm.nih.gov/18083454/)]
16. Lu AS, Kharrazi H, Gharghabi F, Thompson D. A systematic review of health videogames on childhood obesity prevention and intervention. *Games Health J* 2013 Jun;2(3):131-141 [FREE Full text] [doi: [10.1089/g4h.2013.0025](https://doi.org/10.1089/g4h.2013.0025)] [Medline: [24353906](https://pubmed.ncbi.nlm.nih.gov/24353906/)]
17. Thompson D, Baranowski T, Buday R, Baranowski J, Juliano M, Frazier M, et al. In pursuit of change: Youth response to intensive goal setting embedded in a serious video game. *J Diabetes Sci Technol* 2007 Nov;1(6):907-917 [FREE Full text] [Medline: [19885165](https://pubmed.ncbi.nlm.nih.gov/19885165/)]
18. Thompson D, Baranowski T, Buday R, Baranowski J, Thompson V, Jago R, et al. Serious video games for health: How behavioral science guided the development of a serious video game. *Simul Gaming* 2010 Aug 1;41(4):587-606 [FREE Full text] [doi: [10.1177/1046878108328087](https://doi.org/10.1177/1046878108328087)] [Medline: [20711522](https://pubmed.ncbi.nlm.nih.gov/20711522/)]
19. Baranowski T, Buday R, Thompson D, Lyons EJ, Lu AS, Baranowski J. Developing games for health behavior change: Getting started. *Games Health J* 2013 Aug;2(4):183-190 [FREE Full text] [doi: [10.1089/g4h.2013.0048](https://doi.org/10.1089/g4h.2013.0048)] [Medline: [24443708](https://pubmed.ncbi.nlm.nih.gov/24443708/)]
20. Baranowski T, Abdelsamad D, Baranowski J, O'Connor TM, Thompson D, Barnett A, et al. Impact of an active video game on healthy children's physical activity. *Pediatrics* 2012 Mar;129(3):e636-e642 [FREE Full text] [doi: [10.1542/peds.2011-2050](https://doi.org/10.1542/peds.2011-2050)] [Medline: [22371457](https://pubmed.ncbi.nlm.nih.gov/22371457/)]
21. Baranowski T, Baranowski J, Thompson D, Buday R, Jago R, Griffith MJ, et al. Video game play, child diet, and physical activity behavior change: A randomized clinical trial. *Am J Prev Med* 2011 Jan;40(1):33-38 [FREE Full text] [doi: [10.1016/j.amepre.2010.09.029](https://doi.org/10.1016/j.amepre.2010.09.029)] [Medline: [21146765](https://pubmed.ncbi.nlm.nih.gov/21146765/)]

22. Baranowski T, O'Connor T, Hughes S, Beltran A, Baranowski J, Nicklas T, et al. Smart phone video game simulation of parent-child interaction: Learning skills for effective vegetable parenting. In: Arnab S, Dunwell I, Debattista K, editors. *Serious games for healthcare: Applications and implications*. Hershey, PA: IGI Global; 2012:248-265.
23. Baranowski T, Baranowski JC, Cullen KW, Thompson DI, Nicklas T, Zakeri IE, et al. The fun, food, and fitness project (FFFP): The Baylor GEMS pilot study. *Ethn Dis* 2003;13(1 Suppl 1):S30-S39. [Medline: [12713209](#)]
24. Cullen KW, Thompson D. Feasibility of an 8-week African American web-based pilot program promoting healthy eating behaviors: Family Eats. *Am J Health Behav* 2008;32(1):40-51. [doi: [10.5993/AJHB.32.1.4](#)] [Medline: [18021032](#)]
25. Cullen KW, Thompson D, Boushey C, Konzelmann K, Chen TA. Evaluation of a web-based program promoting healthy eating and physical activity for adolescents: Teen choice: Food and fitness. *Health Educ Res* 2013 Aug;28(4):704-714. [doi: [10.1093/her/cyt059](#)] [Medline: [23748162](#)]
26. Jago R, Baranowski T, Baranowski JC, Thompson D, Cullen KW, Watson K, et al. Fit for life boy scout badge: Outcome evaluation of a troop and Internet intervention. *Prev Med* 2006 Mar;42(3):181-187. [doi: [10.1016/j.ypmed.2005.12.010](#)] [Medline: [16458955](#)]
27. Thompson D, Baranowski T, Cullen K, Watson K, Liu Y, Canada A, et al. Food, fun, and fitness internet program for girls: Pilot evaluation of an e-Health youth obesity prevention program examining predictors of obesity. *Prev Med* 2008 Nov;47(5):494-497. [doi: [10.1016/j.ypmed.2008.07.014](#)] [Medline: [18718846](#)]
28. Thompson D, Baranowski T, Baranowski J, Cullen K, Jago R, Watson K, et al. Boy scout 5-a-day badge: Outcome results of a troop and Internet intervention. *Prev Med* 2009 Dec;49(6):518-526. [doi: [10.1016/j.ypmed.2009.09.010](#)] [Medline: [19765608](#)]
29. Thompson D, Mahabir R, Bhatt R, Boutte C, Cantu D, Vazquez I, et al. Butterfly girls: Promoting healthy diet and physical activity to young African American girls online: Rationale and design. *BMC Public Health* 2013;13(1):709 [FREE Full text] [doi: [10.1186/1471-2458-13-709](#)] [Medline: [23915235](#)]
30. Thompson D, Baranowski J, Cullen K, Baranowski T. Development of a theory-based internet program promoting maintenance of diet and physical activity change to 8-year-old African American girls. *Computers & Education* 2007 Apr;48(3):446-459. [doi: [10.1016/j.compedu.2005.02.005](#)]
31. Thompson D, Bhatt R, Lazarus M, Cullen K, Baranowski J, Baranowski T. A serious video game to increase fruit and vegetable consumption among elementary aged youth (Squire's Quest! II): Rationale, design, and methods. *JMIR Res Protoc* 2012;1(2):e19 [FREE Full text] [doi: [10.2196/resprot.2348](#)] [Medline: [23612366](#)]
32. Thompson D, Cullen KW, Boushey C, Konzelmann K. Design of a website on nutrition and physical activity for adolescents: Results from formative research. *J Med Internet Res* 2012;14(2):e59 [FREE Full text] [doi: [10.2196/jmir.1889](#)] [Medline: [22538427](#)]
33. Thompson D, Cantu D, Bhatt R, Baranowski T, Rodgers W, Jago R, et al. Texting to increase physical activity among teenagers (TXT Me!): Rationale, design, and methods proposal. *JMIR Res Protoc* 2014;3(1):e14 [FREE Full text] [doi: [10.2196/resprot.3074](#)] [Medline: [24622344](#)]
34. Peng W, Lin JH, Crouse J. Is playing exergames really exercising? A meta-analysis of energy expenditure in active video games. *Cyberpsychol Behav Soc Netw* 2011 Nov;14(11):681-688. [doi: [10.1089/cyber.2010.0578](#)] [Medline: [21668370](#)]
35. Barnett A, Cerin E, Baranowski T. Active video games for youth: A systematic review. *J Phys Act Health* 2011 Jul;8(5):724-737. [Medline: [21734319](#)]
36. Thompson D. Talk to me, please!: The importance of qualitative research to games for health. *Games for Health Journal* 2014 Jun;3(3):117-118. [doi: [10.1089/g4h.2014.0023](#)]
37. Gollwitzer PM. Implementation intentions: Strong effects of simple plans. *American Psychologist* 1999;54(7):493-503. [doi: [10.1037/0003-066X.54.7.493](#)]

Abbreviations

ARS: Agriculture Research Service

USDA: United States Department of Agriculture

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