Might Video Games Help Remedy Childhood Obesity?

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As readers of this journal know all too well, obesity is the most prevalent health problem among children in the United States¹ and globally,² leading to diverse health problems³ and staggering costs.⁴ Most child obesity prevention interventions are not working well, or not at all.⁵ Part of the problem is that the causes of child obesity are not clearly known⁶; nor are the influences on weight control.⁷ Further, our common measures of diet and physical activity (PA) are fraught with error,⁸ thereby minimizing our ability to detect true relationships between lifestyle behavior and adiposity or the outcomes of our interventions.⁹ What a mess!

Within this conundrum, new ideas and approaches are needed. Video games, the most commonly enjoyed medium by this generation of children, generates more money than Hollywood productions. Whereas some believe that games are anathema to childhood obesity prevention or treatment because most games involve sedentariness, the literature on media exposure and childhood obesity indicates that time watching television (TV), and not time playing video games, is the major offending screen medium¹⁰ and the pathway of TV exposure to obesity is primarily through diet, not physical inactivity.¹¹

Games for health (G4H) is a new arena of research and practice that uses entertainment game technology to attain health goals. Diverse G4H have been designed and tested for childhood obesity prevention and treatment.¹² A scoping and systematic review of these articles identified 28 studies involving video games, mostly for childhood obesity prevention. Forty percent of these studies influenced obesity or obesogenic behavior in the desired directions.¹² A roundtable discussion of investigators of G4H and obesity indicated substantial potential for video games to reduce child obesity, but emphasized the need for games to be fun, not just health promoting.¹³ Some of the obesity-related studies used games specially designed to target diet and/or PA change outside the games.^{14–17} “Squire’s Quest!,” targeted at dietary change alone, resulted in an increase of one serving of fruit and vegetables among fourth-grade students after only 5 weeks of game play.¹⁵

“Creature 101,” a comprehensive behavior management software system, including video games, enabled middle school students to decrease sweetened beverage and processed snack intake.¹⁶ “Fitter Critters” enhanced attitudes and self-efficacy toward healthy eating among elementary school students.¹⁷ “Escape from Diab” and “Nanoswarm: Invasion from Inner Space” targeted diet and PA among 10- to 12-year-olds and achieved diet, but not PA, change.¹⁴

Most research on games targeted at PA used commercially available active video games, also called exergames. Exergames were designed by corporations as a new profit-making strategy to incorporate PA into game play (*e.g.*, fancy footwork was needed for the game to progress). Reflecting public health interest in the potential of exergames to encourage PA, many reviews of this literature have appeared.^{18–20} Some reviews have been sympathetic,^{21,22} whereas others have been critical.^{23,24} A reasonably balanced assessment revealed that, in research laboratories, exergames could provide an intense workout that included moderate-to-vigorous PA, but under less-supervised circumstances, children tended not to get much activity¹⁸ and their interest in the activity waned over 1 week or less.¹⁸ Equally disturbing, evidence appeared that players snacked during exergaming, substantially adding to daily caloric intake,^{25,26} thereby possibly vitiating any antiobesogenic potential. A recent important experiment by critics of exergaming revealed that, in their laboratory, exergames led to marked increases in energy expenditure with no differences in caloric intake from playing entertainment games in a similar time interval.²⁷ Whether exergames were concluded to have antiobesogenic potential hinged on the interpretation of whether their data revealed that the children were less active later in the day to compensate for the increased energy expenditure from exergaming.²⁸ In more natural circumstances, exergames led to BMI decreases as part of a larger intervention,²⁹ but PA did not increase.³⁰ Alternatively, exergaming led to increased activity, but BMI did not change.³¹ And in one study, both activity increased and BMI decreased with exergames.³²

Amidst this confusion, a working conference assessed how exergames might influence PA and how we could enhance their antiobesogenic potential.³³ Innovators in game design for promoting exertion proposed that movement and engagement (“fun”) should be rethought: innovatively position sensors to require movement; transform sensor-acquired activity data to create artistic physical representations of the activity (which could be manipulated by players with more-vigorous activity on ensuing attempts); and use a set of exertion game design cards (which provide guidelines to consider in creating new exergames).³⁴ A behavior theorist who is an expert in game design overviewed behavior-theory-specific concepts and change procedures needed in exergames to initially increase PA and maintain it.³⁵ Integrating communications with the more social psychological prescriptions, she introduced “fun” as an acceptable scientific construct (*i.e.*, a form of intrinsic motivation) and highlighted the challenges in maintaining game play or PA.³⁵ Another expert reviewed what is known about the behavior change procedures of feedback, challenge, and reward for enhancing enjoyment (*i.e.*, “fun”) in exergames.³⁶ A diverse array of innovative ways of considering these procedures in exergames was overviewed and an extensive list of research questions to advance PA from exergames was proposed.³⁶ Five ways were identified by which narrative could enhance PA from exergames, and the five challenges faced in doing so.³⁷ A view of the social contexts in which exergames are played indicated that cooperative play produced more lasting PA outcomes than competitive play, but more research was needed.³⁸ A systematic review revealed that patients post-stroke or with cerebral palsy can achieve moderate, and sometimes vigorous, levels of PA in exergames, thereby providing a gateway to wellness promotion in rehabilitation.³⁹ Alternatively, a senior game designer suggested that the time-limited appeal of G4H perhaps reflected the games being too serious, safe, prescriptive, and easy and assumed that players were ready for change, when most were not.⁴⁰

Four working groups at this conference synthesized attendees’ thoughts on how to improve exergames’ ability to increase PA. One group considered principles from behavioral science (health behavior change), business production (*e.g.*, marketing), and technology engineering (human-computer interface) to identify best practices in exergame design.⁴¹ Another addressed how to increase PA by increasing exergames’ engagement or fun, enhancing feedback, and otherwise enhancing game play.⁴² Another group was interested in optimal exergame design for people with disabilities by matching game and game-play environment characteristics to the type of disability, providing disability-appropriate forms of feedback, and involving end users in game design.⁴³ A fourth group addressed the need for formative research, especially qualitative methods in game design, going so far as to advocate for participatory design.⁴⁴

Experiments are beginning to elucidate how exergames may be designed to influence physical activity. Aversive

contingencies in exergames decreased PA, whereas positive contingencies increased it.⁴⁵ Setting action implementation intentions in a game, but not coping implementation intentions, increased activity.⁴⁶ Head-to-head tests of competitive versus cooperative game play revealed that competitive play increased activity⁴⁷ as well as weight loss.⁴⁸ Self-efficacy was enhanced by showing an image of the player on the screen among those who had a positive self-image, but not among those who were dissatisfied with their self-image.⁴⁹

The technology of exergaming is rapidly advancing (*e.g.*, Kinect)⁵⁰ augmented reality games,⁵¹ Zombies Run (www.zombiesrungame.com), and smart watches with virtual sensor networks,⁵² which can be linked to enhance exergaming. These technological advances offer exciting new opportunities for engaging children in exergaming. However, the basic principles of game design still need to be elucidated and thoroughly tested for diet and PA change among children, and then systematically integrated into new G4H.

In summary, G4H have demonstrated some ability to contribute to pediatric obesity prevention and treatment. Many of us believe that the contribution can be substantial because of the broad reach of, and the great attraction to, video games among children. Funding to conduct the necessary research to enhance this effectiveness must become a national priority to find ways to engage children in a fun, but effective, way in what might otherwise be unpleasant activities.

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