GAMES FOR HEALTH JOURNAL: Research, Development, and Clinical Applications
Volume 4, Number 1, 2015

DOI: 10.1089/g4h.2014.0081

Fun, Flow, and Fitness: Opinions for Making More Effective Active Videogames

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Abstract

Despite active videogames' popularity and ability to increase a player's energy expenditure, research indicates their use sharply declines over time, which limits their utility in promoting physical activity. A frequent criticism is that a player's interest is quickly exhausted. At the preconference of the International Society of Behavioral Nutrition and Physical Activity 2014, a group of investigators and videogame developers gathered to share lessons learned from using serious videogames in health behavior change and offer insight to guide future efforts.

Introduction

Active videogames (AVGs) emerged in the late 1990s in the form of arcade entertainment played by jumping, hopping, and stretching over footpad dance sensors to the beat of music and flashing lights. Eventually released on home game consoles and personal computers, titles such as ''Dance Dance Revolution'' (Konami, Osaka, Japan) laid the groundwork for a multitude of fitness and ''exergames'' now played by millions. According to a report by the Entertainment Software Association and the President's Council on Fitness, Sports & Nutrition[1] between 2002 and 2007, 5 percent of all videogames were released as AVGs, rising to 20 percent of releases by 2011. The report estimated that 2012 AVG sales were $750 million and predicted continued growth for the genre through 2015.

Commercial AVGs have been sold as consumer entertainment products, not medical devices. As such, they were never intended as research instruments. Research has demonstrated some commercial off-the-shelf active games' preliminary efficacy (for example, dance games to boost physical activity [PA]); however, AVGs may lack real-world effectiveness in natural settings over the long run. The promise of active games as evidenced by high sales figures coupled with their appeal to wide audiences was the basis for a recent scholarly meeting, ''Games for Increasing Physical Activity Conference,'' in Houston, TX, a satellite meeting of the International Society of Behavioral Nutrition and Physical Activity 2014 conference. In a breakout session, a group of investigators and videogame developers shared lessons learned from using AVGs in health behavior change. The question posed to the experts was how to increase use of AVGs over longer intervals. We report herein opinions and ideas for future AVG research.

Studies show that players can achieve incremental bouts of PA in virtual activities experienced through AVGs, although the effect is short term.[2,3] Because almost two-thirds of Americans are overweight or obese[4] and because more than half of American children and adults regularly play videogames,[1] the potential for AVGs to improve PA levels remains compelling. Despite their popularity, a common criticism of both researcher-produced AVGs modestly funded by grants and commercial off-the-shelf AVGs developed with substantial budgets is that many players consider AVGs boring,[5,6] which may account for their short-term effect.

We focused our discussion on increasing engagement with the AVG, rather than a particular theoretical framework. To the group's AVG researchers, it was disappointing that the promise of AVGs seemed mitigated by boredom. Players' use of AVGs often peak after a single week of gameplay.[6] We considered ways of keeping AVGs fresh, with new songs, new steps, new stimuli. The developers, epidemiologists, kinesiologists, clinicians, and behavioral and communication scientists in our group analyzed AVGs to determine problems associated with game design that limit player interest. Their analysis raised

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the following questions for further research and spawned ideas to boost AVG playability and engender long-term player engagement.

How Can AVGs Promote Engagement and Avoid Boredom?

Boredom when playing videogames of any kind—active or sedentary, researcher-developed or commercial—seems likely if gameplay consists mainly of repetitive player tasks. For example, the AVG ''Wii Sports Resort'' (Nintendo, Kyoto, Japan) includes a mini-game called ''Swordplay'' where players duel with game characters called ''Miis.'' The game offers variations of sword fight activity, but players are generally limited to stadium matches or showdowns with packs of Miis who (inexplicably) only want to fight and never seem to die, no matter how many times the player beats them. A developer felt experienced players dismiss never-ending repetitive gameplay mechanics as ''grinding'' or ''treadmilling.'' Some repetition is unavoidable in most videogames and may even be beneficial: Once players understand the mechanics of the game, they can continue gameplay with ease and without having to repeatedly learn basic tenets. Too much grinding through unrewarding and predictable loops that players find, however, could be frustrating and tedious, lessening players' desire to stay engaged.[7]

Player autonomy and choice are also factors that affect engagement and motivation,[8] but boredom may ensue if choice is not goal directed. Continuous open-loop gameplay that produces the same result regardless of player input may be perceived as gratuitous. Allowing a player to personalize the game, create strategies, and choose challenges and content and/or the game environment may prove incentivizing for prolonged engagement.

Assuming a ''better mousetrap'' can be built,[8] the group noted that, from the perspective of child development, it is important for those designing videogames to keep in mind children exercise and play in short ''bouts'' of movement. Whereas adult guidelines for PA specify maintaining cardiovascular fitness with sessions of at least 10 minutes, children are often observed playing in much shorter-duration PA bursts. When children are observed on playgrounds, recess, gym classes, and classrooms, it is clear they frequently alternate between periods of play and rest.[9] There may be pressure on AVG developers to have players be physically active all of the time, similar to the way some first-person shooter games (which are considered a sedentary pursuit) engage players with non-stop button mashing. Given children's actual play patterns, the group asked why not design games that mirror these patterns, perhaps expanding active periods gradually as the game progresses? For example, first-person shooter games could be interspersed with short, simulated physically active ''chases'' of the enemy (even if it is just running or jumping in place), culminating in the enemy's capture, rewarding PA. Rewards could be set higher than in ''in-app purchase'' so that rewarding the PA would be at a higher rate than a cash transaction.

The group discussed mismatched game mechanics as another common AVG problem. Good game mechanics are synonymous with game intent. Physically jumping to simulate leaping over an in-game object in an sports game is relevant to the intended outcome, whereas jumping to count numbers (for example, in an AVG about math) was not matched with the specific outcome and may appear pointless.

Creating common metrics that could be compared across different games, genres, or gaming consoles may improve a player's level of investment. ''Just Dance 2014'' (Ubisoft, Paris, France), for example, is available for six different platforms, including the Nintendo Wii™ and Xbox® Kinect® (Microsoft, Redmond, WA). Scores achieved represent the same level of mastery regardless of which platform one uses. Game developers may want to design comparable metrics for all of their related games to enable players using different platforms to compete with one another.

Another believed frustration of AVG players are stretches of long dialog trees or cutscenes that lock players out of gameplay. It was noted that ''players want to play, not watch.'' Although sometimes necessary to deliver important information about the game's story or health messages, lots of dialog and long cut scenes can make a game seem boring—points that clinicians and researchers working with game developers should take into consideration.

Regarding story, the group noted that captivating storylines, or even storylines at all, seem to be missing in many AVGs. Many sedentary videogames feature epic storied worlds with definable plot openings and story endings occurring at a victory condition. Enhancing the attractiveness of AVGs could require similarly immersing players within unfolding dramas (although avoiding the long dialog and cutscene dilemma). Games like ''Minecraft'' (developed by Mojang, Stockholm, Sweden) allow players to develop their own storylines and settings. A plot twisted delivered as a surprise in a storied world—an unanticipated attack by zombies or an encounter with an uncooperative villager—might enhance AVG player engagement. To further boost PA, interspersed within an AVG story could be challenges whereby players complete a movement or PA to reach a new level or next story chapter.

Providing incentives to promote PA has proven to be a successful strategy in increasing PA and reducing the health risk associated with an inactive lifestyle.[10,11] Material rewards at the initial stages of a PA intervention may provide motivation for behavior change and promote healthier food and PA choices.[12] When an individual is playing videogames, rewards, such as application store coupons to be used for PA or healthy promotion applications or discounts for healthy foods, could be used to incentivize players to use AVGs instead of sedentary games.

Many popular videogames use social media to connect players across the globe. Multiplayer games rely on the basic human desire to connect with others, a possible driver for AVG engagement. This type of play, however, has both advantages and disadvantages. For example, sharing personal information with friends via Facebook or Twitter is popular among digital natives growing up with advanced technology, but exposure to social media has also led to incidents of online bullying, warranting further consideration for pediatric audiences.[13] However, if an online AVG community is carefully constructed, such a creation may help sustain AVG gameplay. Already, some AVGs (e.g., ''Wii Nike Training'' and ''Wii Fit U'') allow players to create online communities to interact with other gameplayers all over the world. Cooperation, intercultural competence, team building, and group cohesion during AVG play could enhance AVG engagement among children.[14–16]

Does Performance Feedback Interrupt Play? What Improvements in Feedback or Performance Monitoring Might Enhance AVGs' Effectiveness?

A videogame experience relies on a measure of instructional content,[17] although AVGs that require detailed tutorials may contribute to frustration and boredom. To avoid disrupted gameplay, the group believed prompts and extraneous feedback should be kept to a minimum or embedded within the game. The use of player growth and performance feedback is a phenomenon unexplored in many AVGs, but has been a successful component in other videogame technology. In-game assessments of gameplay providing feedback of player performance and customizable tools or on-demand training for individual players[16] may also help sustain player interest. Videogames using biosensor input, such as accelerometry, GPS location, and compass position, already exist. Apple (Cupertino, CA) and Google (Mountain View, CA) are developing new mobile capabilities that include heart rate monitors and other biosensors. The group thought wearable sensors have the potential to revolutionize athletic performance and could also be incorporated into AVGs for increased player monitoring and engagement. New technologies such as the Oculus Rift® virtual reality headset (Oculus VR, Irvine, CA) also promise to bring new dimensions—quite literally—to gaming, on which AVGs could capitalize. The group noted players seeking to master a videogame operate in a ''Zone of Proximal Development.'' They are consistently challenged by game algorithms, but always on the edge of attaining their next goal, whether shooting an increasingly more evasive enemy or improving the speed at solving a math puzzle.[18] Games that provide players with the performance data needed to gauge how to improve and make achieving the next level attainable with practice and attentiveness may be more likely to maintain player interest. Next-generation AVGs could exploit the ''Zone'' to draw players in and ensure continued play.

Many successful videogames such as ''Call of Duty 4: Modern Warfare'' (Infinity Ward, developer; Activision, Santa Monica, CA) include a design feature referred to as ''leveling up,'' which indicates progression in a game. This differs from different levels in a PA game and should not be confused with ''game levels.'' Leveling up indicates a player's accumulation of points in the game, reflecting his or her (or his or her avatar's) cumulative skills and experience. Leveling up is like a progress meter, an indication of how far the player has progressed toward a goal. This personalizes the game for players and motivates further gameplay.[7]

Is It True That a Game Must Be Fun for Immersion?

To address this question, the group drew from research literature, notably Mellecker et al.[19] By definition, immersion refers to the construct of ''flow'' considered in the adapted ''Game Flow'' model, which suggests players experience a deep and effortless experience when engaging in gameplay.[20] When considering the impetus for AVG participation, it seems fair to consider immersion, which is often cited and associated with enjoyment when participants are engaged in videogame play.[8,21] Intuitively, a videogame with fun and engaging stories should attract players and facilitate immersion into the game. For example, children usually are attracted to role-playing, story-based videogames where players undertake missions, leading to a sense of accomplishment as they progress through the game.[22,23] Mediating factors associated with immersion, satisfaction, and autonomy are related to enjoyment and preference for play.[7] Not surprisingly, fun appears to be integral to and a fundamental component of immersion. The group noted further research was warranted to develop games that offer a sustained fun experience.

Can "Flow" and Immersion Be Interrupted with Health Behavior Messages Before or During Gameplay?

Instructional feedback used to support the gameplayer in some cases may prove a motivator for continuous gameplay.[16] However, many game players of active or sedentary games eschew manuals, skip tutorials, and ignore onscreen instructions, preferring to dive immediately into gameplay and personally discover the game. Immersion when playing videogames corresponds to elements in gameplay such as high motivation to play, showing empathy for content and a lack of interest in doing anything other than playing the videogame.[21] Therefore, the group thought fun would be lessened if a player was interrupted by well-intentioned instructions or overt health messages appearing throughout the game.

The group thought that requiring players to go through setup menus could also be frustrating. When an AVG is used institutionally, it can be confusing for teachers, coaches, and after-school staffers, causing the intended audience of children to lose interest in the game before it has even begun. More inviting and practical are games with default conditions that allow gameplay to begin without setup. In addition, giving players the option to bypass setup routines and tutorials, create or ignore avatars, and choose length of play may enable greater autonomy and improved engagement. Encouraging PA through AVGs seems best be achieved subliminally or using a stealth approach.

How Can We Make AVGS Attractive to Overweight and Obese Children?

AVGs can be a useful intervention strategy for children engaged in sedentary gameplay. Skeletal muscle movements linked to postural musculature promote cellular metabolism, which produces a health benefit. Even small incidental changes in posture (e.g., sit to stand) decrease metabolic risk factors.[24] With this in mind, AVGs that offer small yet effective changes in posture and movement for children unwilling or unable to participate in high-intensity or high-impact activities would be welcome additions to the AVG arsenal.

What Is Missing That Could Be Used to Better AVGs' Potential?

Several in the group noted that many AVGs lack clear victory conditions. By definition, a game is a competition that implies a winner or loser will prevail. Although there is truth in the premise that some games can be fun without winning, for example, ''The Sims'' (a people simulator by Electronic Arts, Redwood City, CA), monotonous play results in boredom. There are no obvious badges or achievements given in ''Wii Sports Resort,'' for example; thus, no mission ever seems complete. For those looking for victory, there may be no thrill other than unlocking a new

game level. A victory condition is also missing in the ''Dance Dance Revolution'' series. Having no clear win may run counter to children's gaming expectations, especially compared with role-playing strategy games or first-person shooters. A clear win bestows players with bragging rights that can be posted online and compared with other players' levels and ranks. If players able to identify themselves as winners, this could lead to positive social comparisons and enhanced competition, serving as encouragement for continued gameplay.

What Is the Next Step for Investigators in This Area?

The group ultimately concluded AVGs have so far failed to achieve long-term desired effects for numerous reasons: Lack of engaging storylines, boring gameplay (e.g., grinding, offering player choices with no consequences, games that are too easy or too hard, games with no player growth or victory conditions, and game mechanic conflict), tedious overt instruction, technical obstacles, and lack of player choice. But there is hope: Game design has become a sophisticated social science that analyzes player types and gender to maximize a game's appeal for a specific audience. Technological advances in game development are rapidly evolving. These two phenomena create opportunities for an impressive new generation of AVGs. Virtual reality headsets such as Oculus Rift married with advanced game controllers such as the Razer (San Diego, CA) Hydra could provide powerful AVG experiences. Popular videogames such as ''World of Warcraft'' (Blizzard Entertainment, Irvine), ''Call of Duty,'' and ''Diablo 3'' (Blizzard Entertainment) could alternate sedentary play with active play using these new technologies and 360° treadmills or boards and Wiimotes (A. Tufankjian, Rochester Institute of Technology, e-mail personal communication, June 30, 2014). The possibilities are endless; game designs must be informed by emerging research so that new AVGs produce measurable positive health outcomes for players, regardless of their reasons for playing the game.

Acknowledgments

T.H. is funded by a National Health and Medical Research Council Early Career Fellowship (number APP1070571). L.E. is funded by National Heart Lung and Blood Institute grant RO1HL111718 ''Enlace: A Promotora-Led Physical Activity Intervention Trial for Latinas in Texas'' and Eunice Kennedy Shriver National Institute of Child Health and Human Development grant RO1HD075936 ''Pediatric Obesity Management Intervention Trial for Hispanic Families.'' Editorial assistance provided by Sarah Shmitt is greatly appreciated.

Author Disclosure Statement

R.B. is a principal at Archimage, a developer of games for health. A.E.M. is a sub-investigator for Neuren. R.M., Z.G., T.H., L.E., and S.A. declare no competing financial interests exist.

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