Video Games as Nursing Interventions

Paul Pater, DePaul University
Mona Shattell, PhD, RN, FAAN, DePaul University
Paula Kagan, DePaul University
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Paul Pater, MS, RN, Mona Shattell, PhD, RN, FAAN, and Paula Kagan, PhD, RN
DePaul University, School of Nursing, Chicago, Illinois, USA

COMMENTS, CRITIQUE, AND INSPIRATION COLUMN

Edited by
Mona M. Shattell, RN, PhD, FAAN
DePaul University, School of Nursing, Chicago, Illinois, USA

Edited by
Michelle Cleary, RN, PhD
School of Nursing and Midwifery, University of Western Sydney, Australia

Video games and video game systems are a multi-billion dollar industry that is a part of the homes of millions of Americans and even more worldwide (Nayak, 2013). While video games have historically offered entertainment, new games have been developed to offer deeper meaning, and some have been developed for use in healthcare settings, many showing positive effects on patient outcomes when opposed to traditional therapies (Kato, 2010; Merry, Stasiak, Shepherd, Frampton, Fleming, & Lucassen, 2012; Rahmani & Boren, 2012). Two of the authors of this paper (M.S. and P.P.) have in fact been involved in creating such video games. Shattell and Pater have been working with game designer Doris Rusch and documentary film-maker Anuradha Rana from DePaul University, on a project called For the Records (www.fortherecords.org). For the Records is a large-scale transmedia project aimed at young adults with mental illness, their families, and their healthcare providers (Rana, Rusch, & Shattell, 2014; Rusch, Shattell, & Rana, 2014; Shattell, Rusch, & Rana, 2014). For the Records incorporates video games and film in a multimedia open access website and enhances understanding of young adults with bipolar disorder, attention deficit disorder, eating disorder (anorexia nervosa), and obsessive compulsive disorder. We believe that video games have a place in health care by providing a unique opportunity for nurses to expand the repertoire of nursing interventions. Our involvement in For the Records, and Kagan’s interest in innovative nursing practice (Kagan, Smith, & Chinn, 2014) and in documentary film-making as an innovative research methodology (Kagan, 2009), led us to explore the literature on video games as healthcare interventions. The purpose of this commentary therefore, is to review what we found, and to discuss the potential use of video games as non-pharmacological and potentially effective nursing interventions for enhancing health and quality of life.

METHODS

We sought to answer the following question in the review of literature: How have video games been used to treat specific patient problems and populations, and were these video games efficacious? Electronic databases CINAHL (Cumulative Index to Nursing and Allied Health Literature), MEDLINE (PubMed), and ProQuest were searched, along with published articles that were highlighted in the popular press, to find articles that met the following inclusion criteria: (1) studied a video game in a healthcare setting; (2) used live subjects (i.e., is not a simulation); (3) used quantitative methods in an effort to show efficacy of treatments (outcomes); and (4) reported outcomes. Articles in academic and professional journals that were displayed at the 2013 Games for Health Conference were also included. The search term ‘video games’ alone yielded too many results about a myriad of issues (many having to do with the ills of video game addiction and the benefits of owning a Nintendo Wii). With respect to the Nintendo Wii, the aim of our study was to find video games designed and built specifically for particular patient problems and populations, and not games, such as Nintendo Wii Bowling, which was designed for the primary purpose of entertainment. Video games tested in relevant studies must have followed McGonigal’s (2011) four traits of a game – they must have goals, rules, a feedback system, and be designed for voluntary participation.

Articles that met the inclusion criteria were reviewed and assessed using Whitemore and Knaff’s (2005) methodology for integrative literature reviews, which requires that the data collected from the literature to be ordered, coded, categorized, and summarized into a rational, unified conclusion. Articles that met the inclusion criteria were then read, re-read, and then synthesized into the following categories: background information of video games in health care and benefits of video games for select patient problems and populations (i.e., depression, anxiety, anger management, community psychiatric settings for US veterans, and fall risk, pain management, rehabilitation from stroke, and oncology treatment adherence). We conclude here with a discussion about the viability of video games as nursing interventions, the potential barriers and potential ways to overcome these barriers.
FINDINGS

Background of Video Games in Health Care

Beginning in the 1970s, affordable and accessible, home video gaming consoles and computers became available to the general public. One of the games available for these platforms was Oregon Trail, an educational game about the travels and hardships of pioneers and settlers of the Western US territory. It was the first game where players were required to maintain the health of their digital avatar (and the avatar’s family) in order to advance and win the game (Evans, 2013). Oregon Trail pioneered the idea of health as a central tenet of gameplay. If the player and the player’s family died in the game, the game was over. However, for every family member arriving to Oregon in good health, the player received points. It was the first time good health was rewarded with points in a video game (a high point total is in itself a goal). From Oregon Trail, the concept of ‘serious games’ was created. The term ‘serious games’ describes video games that have the primary purpose for training or education (Annetta, 2010). The term is also used for games designed for the treatment of patients in health care.

Therapeutic uses of video games have been studied since the early 1980s (Kato, 2010; Wilkinson, Ang, & Goh, 2008). Most of these early studies were of pediatric populations (Kato, 2010) as that demographic was first targeted by video game companies and designers. As technology improved in the 1990s, a host of ‘exergames’ (games designed to encourage exercise and an active lifestyle) came to market, most notably with the Nintendo Power Pad. These video games were generally focused on track-and-field-influenced competition events that could be experienced by two players. However, it was not until the exergame Dance Dance Revolution – a game that focused on dancing, memory, and timing – was developed that this style of video game reached the popular consciousness (Evans, 2013).

The Nintendo Wii video game console reached the market in 2006. This was the first console that heavily encouraged and relied upon the player to make body movements to control the player’s digital avatar within the game. Nintendo Wii Sports, a game that included modified versions of bowling, boxing, tennis, and baseball, was developed in the hopes of making physical activity the console’s calling card. This strategy was successful, as Nintendo Wii Sports sold over 81 million units, making it one of the best-selling video games of all time (Nintendo, 2014). The Wii Fit, an accessory device to be used with the Nintendo Wii console, allowed players to stand on the balance-board-like device, while playing balance and exercise (yoga, strength, and light cardiovascular maneuvers) games. Wii Fit was wildly successful market-wise, as it became the third best-selling console game in history (Nintendo, 2014). The Wii Fit has been used therapeutically in some nursing homes and physical therapy practices for exercise and balance testing (Coyne, 2008).

Games designed more recently include games to treat depression (SPARX), to improve range of motion and arm function following stroke (FurballHunt), to improve adherence with oncological drugs (Re-Mission), as well as others. These games are intended to replace or enhance traditional models of care or decrease the symptoms of the patient problem. No literature reviews could be found that explored video games as nursing interventions. In this paper, we will review studies of digital gaming platforms concerning various nursing patient problems and populations. During descriptions of gameplay, ‘patients’ henceforth will be referred to as ‘players’.

Benefits of Video Games for Select Patient Problems and Populations

The following sections provide findings from the literature that speak to specific patient problems and populations. While not inclusive of all such literature, we have featured the most predominate in the literature. These include depression, anxiety, anger management, and treatment in community psychiatric settings for veterans, as well as management for fall risk, pain management, rehabilitation from stroke, and oncology treatment adherence.

Cognitive Behavioral Therapy for Depression

Merry et al. (2012) looked into whether SPARX, a computerized cognitive behavioral therapy (CBT) intervention designed as an interactive fantasy game, would reduce depressive symptoms in a randomized controlled trial compared with current common treatment. A total of 187 teenagers between the ages of 12 and 19, who complained of depressive symptoms and with no high risk of self-harm, were split into groups using SPARX or treatment featuring trained counselors and clinical psychologists, over the course of 4–7 weeks. Merry et al. (2012) found that SPARX was as good as usual treatment (face-to-face therapy), and that “remission rates were significantly higher in the SPARX [group] than in the treatment as usual [group].” Additionally, Merry et al. (2012) suggested that the game may be used as an adjunct in a multi-layered approach to managing depression in adolescents, and may be a more cost-effective treatment.

Cognitive Behavioral Therapy for Anxiety

In a virtual reality game designed to elicit a controlled fear response in order to treat the fear of spiders, Arntz, Lavy, van den Berg, and van Rijsoort (1993) conducted a study where players would come in contact with a 3D spider. Before and after treatment, players took a self-reporting Spider Belief Questionnaire (SBQ), which ‘measures the strength of belief in a range of improbable ideas about spiders and the self during confrontation with a spider.’ Arntz et al. (1993) found no significant decrease in long-term anxiety or fear, however, they did find a significant decrease in measures on the SBQ, signaling that the treatment may have been helpful concerning the players’ negative beliefs.
Cognitive Behavioral Therapy for Anger Management

At Boston Children’s Hospital, Kahn, Ducharme, Rotenberg, and Gonzalez-Heydrich (2013) conducted a study with 37 children and adolescents aged 9–17, who had demonstrated elevated levels of anger and aggression as determined by scores on the State and Trait Anger Expression Inventory – Child and Adolescent (STAXI-CA), to determine if a video game (RAGE-Control) could help players learn and abide by the tenets of cognitive behavioral therapy to control anger (n = 18), as opposed to treatment as usual (n = 19). RAGE-Control is a fast-paced ‘Space Invaders-style’ game where players’ heart rates are constantly measured. If the players’ heart rate is increased, their ship will shoot ‘blanks’ with the missile plummeting back to the ground. Players received 15-min sessions with the game in addition to receiving the same treatment as the control group. After five sessions, players showed a statistically significant difference in lower heart rates compared with the control group, as well as significantly lower scores on the STAXI-CA. The ‘treatment as usual’ group showed no significant improvements in heart rate or STAXI-CA scores (Kahn et al., 2013).

Community Psychiatric Nursing Concerning US Veterans

Veterans adjusting to life back home have found difficulty transitioning from combat abroad. Approximately 20% of suicides per year in the USA are those of previously deployed military personnel and veterans, despite that they account for little more than 12% of the general US population. Equally as disturbing is that only about half of all previously deployed military personnel who are ‘at-risk’, seek treatment (Department of Veteran Affairs, 2010). A conversation game Family of Heroes trains those who are expected to receive a family member home from deployment, to recognize symptoms of post-deployment stress and to learn how to take steps in facilitate conversations that encourage family members to seek counseling. In total, 50 participants played Family of Heroes, and were also given pre- and post-interventions, along with a 1-month follow-up survey (Albright, Goldman, Shockley, McDevitt, & Akabas, 2012). The control group only received the pre-intervention test and the 1-month follow-up survey. Albright et al. (2012) found that players showed ‘significantly greater changes in preparedness and likelihood to recognize symptoms of post-deployment stress and in approaching their veteran to discuss their concern and motivate them to seek help at the VA.’ Of the veterans approached by players, 22% sought treatment, as opposed to 12% of those who were in the control group. These results suggest that the gameplay had a significant impact on families and their returning veteran family members (Albright et al., 2012).

Fall Risk Management

A study using a re-purposed video game ‘dance pad’ (e.g. Dance Dance Revolution) and a computer display screen asked independently-living people aged 65–90 to stand and step (left, right, forward, and back) in conjunction with a video game meant to assess each person’s stepping ability, reaction and response times (Schoene, Lord, Verhoef, & Smith, 2011). This data was then processed to assign fall risk to each individual. The video game was able to accurately predict the fall risk of an individual up to 75% claiming that, ‘participants with moderate/high fall-risk scores had significantly slower response times than people with low/mild fall-risk scores, and multiple fallers and single/non-fallers showed significant differences in reaction time and response time.’ Each player repeated the assessment five times. Schoene et al. (2011) found that with each session, the player generally improved performance and reduced risk. The simple style of this video game may allow it to be used easily in clinics and home settings for both assessment and treatment (Schoene et al., 2011).

Pain Management

Pain management has been the subject of many studies and is often undertreated by those responsible for a patient’s well-being (Turk, Wilson, Cuhana, 2011; Wu, Raja, 2011). A virtual reality game entitled SnowWorld transports the player from the confines of a hospital room to an open glacier canyon where the player can interact with snowmen, penguins, igloos, and robots. Use of this game was experimented as a way to control pain without the use of opioids; specifically while burn patients received wound cleaning and debridement in a hydrotherapy tank. Players in the treatment group received therapy each time – debridement, bandage changes, and wound care. Patients in the control group would not play SnowWorld, but instead received treatment as usual. Hoffman et al. (2011) found a statistically significant reduction in pain that seemed to suggest that immersive virtual reality could be a viable adjunct in pain treatments, even in patients experiencing severe pain. While playing, 11 players reported 35–50% reduction in pain, while non-players reported less than 10% pain reduction on average (Hoffman et al., 2011). Another study used an ‘off-the-shelf’ virtual reality game (not related to SnowWorld) for burn pain reduction during dressing removal and application in 21 adolescents aged 11–17. Using patient self-reporting and pain scale scores (FLACC; Face, Legs, Activity, Cry, Consolability scale). Kipping, Rodger, Miller, and Kimble (2012) found a statistically significant reduction in pain along with significantly lesser rescue doses of opioids used to those playing the game (15%) compared with other adolescents using traditional distraction methods (43%) (Kipping et al., 2012).

Stroke Rehabilitation

Range of motion is often greatly affected in those who have suffered from a stroke. At Northwestern University, a virtual reality 3D Air Hockey game was designed to encourage players to reach as far as possible with the upper limb of the affected side (Acosta, Dewald, & Dewald, 2011). Seven players with chronic unilateral hemiparetic stroke, whose range of post-stroke recov-
ery was from 2 to 15 years, were selected for the study. Players used a robotic arm controller and virtual reality goggles; players used the free-moving controller to hit a puck across a virtual air hockey table for 3 min at a time with 1-min rest periods. The range of motion results were measured and compared against another experiment where the players did not play a game, but instead performed on a robotic arm that provided haptic feedback. While players preferred the game, the haptic feedback trial showed greater results in reaching distances. This finding may show the importance of goal-setting, as players seemingly tended to be more defensive-minded in playing the game, therefore, not reaching as far as one possibly could (Acosta et al., 2011).

Another range of motion study was conducted using seven games specifically designed for use with a robotic exoskeleton (Simkins, Fedulow, Kim, Abrams, Byl, & Rosen, 2012). The exoskeleton provided assistance in movement while the players performed each task required to play the game. Simkins et al. (2012) found that the difficulty in certain games could be too much for players if a goal is constantly outside their range of motion. For instance, a static game where a player must ‘paint’ the screen where the goal is just outside the player’s range of motion was found to be challenging and was ranked highly among players, however, a dynamic game like handball or Ping-Pong, where there is a limited range of motion, often caused players to give up points and become disinterested and frustrated. Setting goals that encourage players to feel like they are making improvements seemed to make a difference in these therapies (Simkins et al., 2012).

Finally, a study was conducted utilizing the game Furball Hunt, which is based on teaching players upper extremity motor skills (Kottink, Prange, Krabben, Rietman, & Buurke, 2014). This re-learning technique challenged players to direct their reaching movements with the affected arm and hand on a horizontally placed screen. Players have to chase birds with their affected limb by repeatedly reaching and interacting with the table-like screen. Reaching scores ($n = 10$) in this game were measured using the Action Research Arm test and the Fugl-Meyer assessment and then compared with scores from another trial conducted simultaneously using time-matched traditional methods ($n = 10$). Although the action research arm scores were slightly higher in the Furball Hunt group, the authors found no significant differences between the two groups (Kottink et al., 2014).

Oncology Treatment Adherence in Adolescents and Young Adults

Self-administered medication adherence is a frequent cause for concern when managing chronic illnesses, such as acute lymphoma. A randomized trial of 375 participants, aged 13–29, was conducted between 2004 and 2005 at over 30 medical centers in Australia, Canada, and the USA, to determine if a game entitled Re-Mission could improve medication adherence in those who were prescribed prophylactic antibiotics and oncological drugs (Kato, Cole, Bradlyn, & Pollock, 2008). Re-Mission is a game that focuses on positive self-care behaviors by players who control an animated nanobot that helps players fight cancer cells and manage common adverse effects of treatment. Via electronic pill monitoring and serum metabolite assays, Kato et al. (2008) found that adherence was greater in the group who played Re-Mission than in the control group, who played Indiana Jones and the Emperor’s Tomb. Interestingly, adherence self-reports did not improve over that of the control group. The video game did significantly improve knowledge related to cancer and self-efficacy (Kato et al., 2008).

DISCUSSION AND IMPLICATIONS

The major findings that emerged from our review of literature were that video games appear to be helpful nursing interventions. In general, the video games that were most effective tend to educate, empower, and encourage. Video games educate patients about particular health issues, empower patients about health issues, and encourage patients to adhere to treatments. While all of these video game interventions showed some positive patient outcomes, the simplest games (non-virtual reality) might be the most-cost effective, and thus the most viable option. However, recent developments in virtual reality technology, such as the Oculus Rift, may make budgetary concerns over these therapies non-existent. As the evolution of technology continues, the availability and impact of serious healthcare video games should expand.

Although no studies could be found about nurses’ attitudes towards video games as nursing interventions, a simple internet search of ‘attitudes towards video games’ shows a bevy of popular media articles specifically about violence and addiction. Video games may be seen as a ‘waste of time’ by non-gamers, or that video games in general provide no intrinsic value beyond a playful distraction, or to serve as a brainwashing mechanism for the ultra-violent misogynist patriarchy. Video games are rarely seen as an avenue to provide an enriching and illuminating experience capable of being a change agent beyond its virtual borders. And ‘serious games’ and ‘games for health’ may be new concepts for many.

Attitudes aside, many nurses may not be imbued with the technological and coding knowledge needed for debugging, repairing, and calibrating games that require exoskeletons or even smaller accessories if a piece of equipment were to fail. The costs inherent in purchasing new equipment and then training staff to use that equipment may be too great.

Increasing the simplicity of video games and offering an abundance of uncomplicated games may be the more immediate intervention. Games such as these are only the beginning of a wave of promising technological answers to patient care problems and nurses will benefit by becoming more aware of these technological advances. For further research and development, nurses may be asked to discern which technologies are trouble-free and which work to improve patient outcomes. Prior
though, nurses should be aware of the rapid development of the serious game movement, that beyond entertainment, and provide a voice and guidance in the creation of future video games meant to become a useful therapy for patients.

CONCLUSIONS

The findings of this review of literature on video game use in health care show that video games can be used to treat specific patient problems and populations and have the potential to provide outcomes as good as or better than current best practices utilizing medications and traditional medical model interventions. Patient outcomes may well be served by the gaming experience, overall improving patient outcomes in the areas of mental health, pain management, oncological education, medication adherence, fall risk management, and stroke rehabilitation. The gaming framework, as demonstrated by the literature, appears to encourage improvement as patients engaged in gaming constantly reflect upon their conditions, stimulating the imagination needed to create change in their lives.

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