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Active gaming: The new paradigm in children's physical activity

Lisa Witherspoon Hansen and Stephen W. Sanders

Abstract

Childhood obesity is on the rise and children's participation in physical activity is struggling to maintain the same velocity. Technology often blamed for creating this increase in sedentary lifestyles, however it may also provide the cure. Active gaming is a contemporary approach to exercise that can provide children much needed daily physical activity. The use of active gaming equipment and creation of new facilities for active gaming is increasing throughout the United States. More research is certainly welcome in defining this new movement. However, active gaming appears to be aligned with adolescent culture and makes available a fun alternative to traditional exercise by allowing children to play the digital games they enjoy and also receive the benefits of physical exercise. Benefits as well as concerns and considerations of this movement are discussed in order to clearly appreciate the impact active gaming is currently asserting on daily physical activity patterns of children and adolescents.

Keywords: active gaming, childhood obesity, digital games, exergaming, physical activity physical education, technology

There is considerable evidence that physically active children have lower levels of risk factors for cardiovascular disease, diabetes, high blood pressure, colon cancer and other ailments related to obesity. It is clear to most parents and teachers that childhood obesity is a growing concern, but for a variety of different—and relatively complicated—reasons current physical activity programs in schools appear unsuccessful in promoting sustained physical activity that can provide long-term health benefits. A new paradigm for childrens' physical activity is certainly warranted.

Obesity in adolescence predicts a broad range of adverse health effects in adulthood (Dallal, Jacques & Must, 1992) most notably, heart disease, Type II diabetes, osteoporosis, high blood pressure, and some types of cancer. Children are becoming overweight at increasingly younger ages. Over the past 30 years, the prevalence of overweight children six to 19 years old increased approximately 12% (CDC, 2008b). Additionally, one-in-three children is considered overweight or obese (CDC, 2008a). The prevalence rate of at risk for overweight among two to five year-old-children in the United States is currently over 26% (Ogden et al., 2006). Although obesity is influenced by many factors including hereditary tendencies, environmental and nutritional practices, behavioural factors ageing and pregnancy (Martinez, 2000); physical inactivity, or a lack of regular exercise, is the leading cause for obesity in children. If the challenges of this problem are to be met strategies to increase daily physical activity in children must be investigated and implemented.

Behavioural strategies aimed at decreasing obesity are based on the first law of thermodynamics, which states that the amount of stored energy is equal to the difference between energy intake and work performed (Watts et al., 2005). What children intake in terms of calories must be expended in terms of increased physical activity. Given that non-physically active children are more likely to become non-physically active adults (Powell, & Dysinger, 1987) the development of physically active

habits in young children, and reinforcing these habits in adolescents, helps establish patterns that continue into adulthood (Fox & Riddoch, 2000).

Active Gaming Defined-The Problem Can Be the Solution

Technology has been maligned as one of the causes of decreased physical activity and increased sedentary behaviour. Physical inactivity has increased because frequency of television viewing, computer usage, and digital gaming has consumed time traditionally used for physical activity. Instead of parents sending their children outside to play free time is now increasing involves technology-driven entertainment. In the average American household 88% of children have a digital game console such as Sony PlayStation, Microsoft Xbox, and Nintendo GameCube (Hersey & Jordan, 2007). Eight-five percent of children also have access to computers at home (Hersey & Jordan, 2007) and over 90% of those play digital games on their computers (Chapman & DeBell, 2003). Technology in the form of digital games and related entertainment is clearly an issue in terms of limiting daily time for outdoor physical activity.

Technology can provide an avenue for youth to increase the amount of time spent in play, exercise, and physical activity. Mears and Hansen (2009) define a new genre of physical activity called active gaming. This new way of looking at physical activity brings exercise to children in the form of technology. Active gaming calls for participants to take part in digital and other technology-based games where they are engaged in physical movement in order to play the game. Participants use their bodies as the controllers while increasing heart rate and burning calories. For example, participants might race side-by side against a friend on a snowboard down a snowy mountain, dodging trees, jumping cliffs, and riding rails; or, they may prefer to pedal racing dirt bikes through challenging courses of steep ramps, sharp turns, and dangerous off-road adventures. Adolescents may prefer to test their dancing skills while scoring points for staying on beat while stepping to the tunes of their favourite songs. This innovative technology-driven approach to physical activity and exercise creates a culture of fun and enjoyment that is appealing to children and adolescents. A noteworthy aspect of active gaming is children do not believe they are exercising; they are simply playing digital games and having fun (Hansen & Sanders, 2008).

Active Gaming Activities

A variety of active gaming technologies have been created over the past decade. Exergames, interactive fitness activities, and active learning games are three game categories that have evolved and these divisions characterize the types of current active gaming activities suitable for both school and home use. Exergames are technology driven activities that require a screen in order for the student to participate in a full body movement activity. Conversely, interactive fitness activities are non-screen based but technology driven requiring the player to use the body to play the game. Active learning games are screen based and provide children with an academic game focus while being physically active to play the game. These games are more commonly used in the academic classroom and not in a physical activity setting such as physical education class in a gymnasium. Table 1 describes examples (not comprehensive) of different types of games commercially available for each of the three categories of active gaming.

Table 1: Categories and Types of Active Games

Exergames	
<u>Rhythmic Dance Games:</u> <i>Dance Dance Revolution</i> (Konami, 1998) <i>iDance</i> (Positive Gaming, 2008) BluFit ¹ <i>ReRave</i> (Step Evolution, 2011)	Dance Games are the pioneering series of the active gaming genre in digital games. Players stand on a platform or stage and try to hit colored arrows or characters with their feet to musical rhythm and visual cues. Players are judged by how well they time their dance to the patterns presented to them and are allowed to choose the music to play during each game.
<u>Virtual Bicycles:</u> GameCycle ² ; Espresso ³ XDream ⁴ eXerbike ⁵	These games resemble traditional bikes using game controllers to control on-screen actions, including steering, speed, turns, firing mechanisms and other game components.
<u>Balance Board Simulators:</u> <i>Tony Hawk: Ride</i> (RoboMundo, 2009); <i>Wii Fit</i> (Nintendo, 2008)	These games use the concept of a balance board or platform as a controller in which the user stands as they play the game. Most games simulate various outdoor recreational activities such as snowboarding, skiing, skateboarding, or various games requiring static or dynamic balance.
<u>Virtual Sport Simulators:</u> <i>Wii Sports</i> (Nintendo, 2006) XaviXPort ⁸ Trazer ⁹ ; Microsoft Kinect	These games simulate individual and team sports with common games consisting of striking sports, bowling, boxing, running and others. For these games the controllers serve as implements that simulate a bat, racquet, or paddle, etc during game play.
Gamercize Pro-Sport ¹⁰	Gamercize is an activity where exercise motion on dedicated step or cycle machines activates the input for digital game play. The game operates normally while the user is exercising; however, without exercise the game being played will be suspended and the user has to restart exercise to continue to play the game.
Interactive Fitness Activities	
HOPSports ¹¹	HopSports is a system that is used in a class or group environment that allows participants to follow an on screen instructor leading an activity. The on-screen instructor is often a known professional athlete or celebrity. All activities are designed as part of a standard based lesson plan in order to develop a particular skill of fitness component.
Sportwall XerTrainer ¹²	Sport walls contain embedded lights that illuminate randomly. When a light comes on, the player contacts the light with a bare hand, glove, striking implement, or thrown ball in order to score points.
<u>Martial Arts Simulators:</u> 3 Kick ¹³ Makoto ¹⁴	These games are designed with multiple towers that can be punched, kicked, or tapped with hands and/or feet. A light and audible tone indicates which portion of the tower is to be contacted which goes off when the player correctly strikes the target. The game assigns a score based upon on speed of contact and more points are allocated the faster the reaction time.
Active Learning Games	
FootGaming ¹⁵	FootGaming(TM) is an activity in which participants move their feet while on a FootPOWR (R) controller in order to control onscreen mouse or keyboard actions. FootGaming uses a custom mat similar in look to an arrow/dance game mat. The addition of the FootPOWR microcontroller enables play of most any 'mouse' game delivered by a computer.
Brain Bike ¹⁶	The brainbike resembles a traditional bicycle but the user controls on-screen brain training and tests, by Neuro-Active, with a PC mouse which uses Gamercize PC-Sport to work only with exercise.
Gamercize PC-Sport ¹⁷	Gamercize is an activity where exercise motion on dedicated step or cycle machines activates the input for a PC or Macintosh computer. The computer operates normally while the user is exercising, enabling the use of any educational or gaming software without the need for special consideration or modification. Without exercise the input, the game being played will be suspended and the user has to restart exercise to continue to play the game.

The Benefits of Active Gaming

Providing active gaming equipment and curriculum in school physical education classrooms along with promoting of the concept to parents for use at home may have a positive effect on increasing physical activity. The American Heart Association (AHA, 2010) recently announced their support believing active gaming has the potential to positively benefit participants. The authors, curious to find out more about active gaming, spent a year observing and talking to children as they participated in active gaming experiences in school physical education settings. A number of benefits and criticisms were discovered and recorded. Where appropriate, comments have been included here to underscore children's thoughts about their participation. Benefits of using active gaming in the physical education classroom and in the home environment include: Active games are 1) fun; 2) motivating; 3) provide a choice; 4) user friendly; 5) promote socialization; and 6) increase physical activity.

Active Gaming is Fun

When children participate in active gaming, research suggests they consider the experience to be fun (Hansen, 2009). In a study by Lindstrom and Seybold (2003) fun was rated by 86.2% of adolescents as being the single most important element in life. Active gaming provides children with activities they enjoy. When children consider an activity to be fun, they are more likely to remain engaged and engage in the activity in the future (Robertson-Wilson et al., 2003; Weiss, 2000). Enjoyment is considered one of the most important characteristics of quality physical education programs (Wechsler et al., 2004). Thin and Poole (2010), found that physical activity enjoyment was related to improvement in active gaming performance and was also rated higher than the published norms for conventional exercise. Hansen and Sanders (2008), suggest that when children participate in active gaming they do not realize they are exercising. Children may be sweating when participating in active gaming but they are also smiling and having fun. In a recent study investigating students' experiences participating in active gaming in physical education, students agreed that active gaming was fun. On discussing the active gaming room at his school one student suggested:

For me this room is just amazing...and it's just awesome, everything. I would have these in every single school, because the games they have here, the game room; it would get kids to have more fun. Like for PE, it's just fun too. But this one you just get their little minds going and just have fun (Hansen, 2009, p. 147).

Another student commented: "I think it's awesome, because you're playing games and you're having fun". Students also suggested physical education was more enjoyable now that active gaming was a part of class. One student expressed, "I think it's better now that this (active gaming) is here". Another student agreed by saying, "PE is good the way it is but it's more fun with these games now" (Hansen 2009, p. 160).

Children are more likely to voluntarily engage in an activity if they consider it interesting and enjoyable (Robertson-Wilson et al., 2003). Hansen (2009), found that students participating in active gaming during physical education class enjoyed the experience to a point where they were observed to have an unremitting interest for the activities. The children did not want to cease playing the activities when it was time to change activities or end class time. The children also expressed an interest to voluntarily participate in active gaming outside of school. One student said participation in active gaming, ". . . has been the best days of my life and it's like I've never experienced anything like this before." Another student shared similar feelings when he said active

gaming in PE class “. . . were the best gaming experience of my life, and it was so awesome, and I loved all the games and room... I wouldn't change anything because that room is the best game room in the entire universe. That room is awesome I would love if my house had that exact game room in my house” (Hansen, 2009, p.172). Yang and Graham (2006) found children voluntarily wanted to participate in active gaming when provided the opportunity to do so when participating in *Dance Dance Revolution*. Voluntary physical activity is important as the recommended amount of moderate to vigorous physical activity, 60 minutes daily (NASPE, 2009), is not being met by the majority of children (CDC, 2008a) in or out of schools.



Figure 1: Students Compete in Snowboarding.

Active Gaming is Motivating

The use of technology is a major motivating factor in active gaming. Technology motivates children to want to play and to want to continue to play. The current generation commonly uses digital technologies, including digital games, in their daily lives. Most American children have at least one digital game console at home (Foehr, Rideout, & Roberts, 2005; Hersey & Jordan 2007) and spend more than the recommended time appropriate in front of a screen (Kaiser Foundation, 2009). The digital game component in active gaming provides motivation to engage continuation in the activities. Digital games are intriguing to children because they deliver a sense of ‘reality’ through entertaining technologies that are able to capture children’s attention because the games respond to the player, reward technical skills, and allow players to escape from boredom (Beck & Wade, 2004). Children receive immediate feedback and instant gratification from playing digital games. Active gaming research supports this element by suggesting the digital gaming is enjoyable and provides an internal motivation to exercise (Widman, McDonald, & Abresch, 2006). Research suggests children agree that the technology component of the digital game, motivates them to want to be active (Hansen 2009). Hansen reported children’s comments after participating in active gaming experiences:

All kids play video games. I think that it’s amazing because it’s the first time that I’ve seen anything like this. A lot of children that I know, like, a lot of children that I know like to play games like this. I like to play them, because it tends to be what I like... Like three kick; I didn’t know three kick was invented. So as soon as I tried it was fun...because it’s just fun. Videogames in your school is fun.”
 “Sometimes our PE, some people think it’s boring. And when they play games

when they're exercising they think its fun. So that's why active gaming is here" (Hansen, 2009, p. 173).

Additionally, children appear motivated to initiate engagement in an active game instead of sitting on the sideline and not participating. In many traditional physical education classes, students are not excited to participate in activities and may act as a competent bystander (Tousignant & Siedentop, 1983). The term 'competent bystander' is used to describe students that are competent at not responding to an activity without drawing the teacher's attention to their inactivity. Competent bystanders act like they understand the lesson and pretend to be on task; however, this behaviour is false and often misunderstood by the teacher. Competent bystanders have not been observed when children are engaged in active gaming (Hansen & Sanders, 2010). When provided an opportunity to play, children choose to participate in the games regardless of the physical activity involved because the activities are innately and intrinsically motivating.

Active gaming activities provide children with instant feedback that can also be motivating. This feedback is often in the form of instant gratification. In physical education in the past many teachers have used assessment and grading as a strategy to motivate children to work harder and perform better. These assessment strategies have not always been favoured by adolescents. Many students do not enjoy taking mile run tests and most do not have a clear understanding of what fitness testing really means (Hopple & Graham, 1995). Due to the motivating and engaging nature of active games, these digital activities may become an innovative and appealing approach to fitness testing in physical education.

Traditional assessment methods certainly should still be used in any assessment program but development of technology-based assessments using active games, heart rate monitors, and accelerometers, etc., may be more appealing to the children and more developmentally appropriate.



Figure 2: Active Gaming Fitness Activity of Boxing.

Active gaming provides choice

Active gaming provides children with many choices related to selecting a character in which to identify, choosing the game mode and level; and deciding on the type of competition in which to engage. Self-paced, child-controlled play is one of the best ways for children to optimally develop (Rogers & Sawyers, 1988). Children are more willing to express thoughts, feelings, and experiences when they have more choice and a voice in instruction (Dyson, 1995). If children are pushed by teachers or other external demands, they may resist the demand (Koster, 2005). When children experience activities with fewer externally imposed rules and more choice, they are more likely to enjoy and remain engaged in the activity (Rogers & Sawyers, 1988). In recent research

(Hansen 2009) when students were asked about their physical education class in active gaming they expressed a desire to participate in an environment with few restrictions. The students suggested the more choices they had the more enjoyable their experiences were during active gaming. One student made a clear summarization by saying, “I would go to this game, and once I get tired of this game, move on to another game. And when I get tired of each game, I go to a new one. And I would be with partners I choose because it’s more fun” (Hansen, 2009, p.110). Another student suggested:

I would let them pick their game, and the group goes to their game. I don’t know, I think its better. If I don’t like that game then they don’t want to play it. Let them go to the one that they want, do the exercise game, and then they’ll have fun (p. 149).

Providing children with self-paced activities in physical education assures that the needs for all ability levels are being met. Active games meet the needs of children whether they are overweight, unskilled, fit, or skilled (Hansen, 2009; Hansen & Sanders, 2008). The unskilled, overweight child is able to compete or play with the skilled fit child and find success because students are able to choose their level of play and how they would like to compete (Thin, Hansen, & McEachen, 2011). Children may not feel embarrassed being physically active because they are engaged in an active gaming activity that is developmentally appropriate for the individual child.



Figure 3: Students Participate in *Dance Dance Revolution*.

Active Gaming is User-Friendly

Children are familiar with using digital games and similar technologies, active games are easy for them to use. Although it is important for the teacher to have some background with any activity implemented in physical education class, the children are capable of exploring active games and learning independently, via the game, or another peer (Hansen & Sanders, 2010). Children may reach a stage where they need assistance from a more competent counterpart to advance their skills. This assistance can be referred to as scaffolding (Vygotsky 1978). Beck and Wade (2004) in describing digital game play suggest that this generation prefers to learn from the game or from one another, not their elders as they are not as motivated by authority figures’ demands. Peer scaffolding offers a great opportunity for social interaction and leadership roles to emerge. Games and simulations can provide adolescents with scaffolding opportunities, providing learners with cues, prompts, hints, and partial solution to keep them progressing

through learning, until they are capable of directing and controlling their own learning path (Federation of the American Scientists, 2006) In this sense, the digital game itself becomes the guidance needed for children to further develop skills as they learn to use the tools provided on the screen to enhance their level of play. Students participating in active gaming engage in game play and explore the game independently in order to learn how to play using the digital game as a scaffold. The teacher is then able to spend time assessing students, motivating the students, and providing them with specific feedback for more effective learning during active gaming.

Active Gaming Provides Socialization

Socializing with peers is an important component in active gaming. Voluntary physical activity can be defined as children making the choice to participate in physical activity due to intrinsically motivating reasons. For voluntary physical activity to occur, children suggest the activity needs to be enjoyable and in a social environment (Robertson-Wilson et al., 2003; Weiss, 2000). In physical education, when experiences meet students' needs for success in a social environment, future participation in physical activity is encouraged (Robertson-Wilson et al., 2003; Weiss, 2000). Hansen (2009), learned that if children were able to choose their partners, play independently, or were assigned a partner or group, the children were consistently involved in social, peer relations. Students would discuss strategies and instructions about the game, engage in competitive conversations, or simply have discussions on random topics. For example, during one experience participating in active gaming, field notes captured two students working through strategies in a game:

The girls are smiling and laughing playing Batman and Robin. They are talking back and forth about strategies in the game. "I'm up here now" Ashlyn said. The teacher told Angela to go help Robin. Angela said, "I'm trying to help but she keeps going over there and I can't get over there". Ashlyn replied, "I didn't know you can't get there. I will come back. Just wait on me". Angela said, "Ok, but see that (pointing at the screen, don't go there. Go this way because..."(Hansen, 2009, p.162).

Other discussions were focused on the students competing against one another. Students would make competitive remarks such as, "I am better than you", "bring it on", "I beat you", or "will you versus me" while observing the students. The following excerpt demonstrates one competitive game play experience:

Wilson and another girl are challenging one another on *Dance Dance Revolution*. This is the girl that had beat Wilson before. During the entire rotation they are challenging one another. Right now they are waiting behind the pad singing to "Get Busy" and practice stepping. Wilson and his peer are on light mode and play the same song. She got a C and he got a D. Wilson just smiled and said, "Ok, 2 to 1. I will beat you next time". Wilson is back on against his peer this time choosing to play Standard mode. They both are not doing great. The lights go off to finish up for the day and they continue stepping until they finish their song. Looking at the score he says to her, "yeah, I won". She said, "no we both got an E". Wilson said, "No, look at the actual score, right here" as he was pointing to the number score. She said, "Oh, ok". Wilson said with a huge grin and sense of accomplishment, "yeah, 3 to 2, I won". She said, "I'll get you Monday" (Hansen, 2009, p. 162).



Figure 4: Students Socialize while Stepping and Playing Digital Games.

Children certainly know active gaming involves peer interaction. When asked about active gaming being social one student suggested (Hansen, 2009), “We socialize on what game we want to play and we get along. If we don’t get along we just talk about it, or just calm down and talk about where we really wanna (want to) go... I’m talking about the game like, oh this is so fun! Then, when it’s done I say, oh I either beat you or you beat me” (Hansen, 2009, p.111). Children appear to enjoy being a part of the virtual world whether it is their character or that of their peers.

Active Gaming Increases Physical Activity

Physical Education programs globally are implementing active gaming in both classrooms and gyms. West Virginia public schools have an active gaming, *Dance Dance Revolution* Project, as part of their curriculum. The West Virginia school system conducted a study that identified the impacts of the *Dance Dance Revolution* (DDR) on students in 20 West Virginia schools that used DDR in physical education and health classes, and found that some of the children lost five to ten pounds after playing the game every day during the first few weeks (Barker, 2005). Another West Virginia public school study with 35 overweight children ages seven to twelve found that playing DDR at least five times a week led children feeling more coordinated, less winded, and less self-conscious. The children developed stronger self-esteem, on average, improved their aerobic fitness, and reduced their chances for developing diseases associated with obesity, such as diabetes and heart disease. Parents of study participants reported that most of the children stopped gaining their typical three or four pounds a month and, with increased self-confidence, started exercising and playing sports regularly in daily life (Brubaker, 2006). Based on the positive results of these studies, the State of West Virginia included DDR in all 765 public schools and has developed a school-based DDR curriculum.

Additional investigations have found that playing active games can double the energy expenditure over sedentary digital game play (Graves, Ridgers & Stratton, 2008; Graves et al., 2008; Lannigham-Foster et al., 2006; Mellecker & McManus, 2008), as well as significantly increase heart rates and step counts and may have positive benefits on overall health (Maddison et al., 2007; Mhurchu, et al., 2007; Thin, & Poole, 2010). Furthermore, research suggests participating in active gaming can meet the recommended guidelines for moderate to vigorous physical activity (Tan et al., 2002; Unnithan, Houser, & Fernhall, 2005; Yang & Graham, 2006).

Active Gaming: Challenges and Considerations

Although active gaming is growing in popularity and the idea of increasing children's physical activity by using 21st century technology is largely accepted by many including physical educators, there are still challenges and questions related to accepting this contemporary concept as a method of increasing children's physical activity. Some concerns have merit and there should be an open discussion between parents, teachers and children related to use of active gaming. Perhaps, active gaming should be promoted as one of many activities children could participate in daily in order to live healthy physically active lifestyles. The authors have found the following challenges and concerns expressed by parents, teachers, and researchers related to the role of active gaming in increasing daily physical activity in today's youth.

Just Go Outside and Play

"When I was your age, I used to play outside until the street lights came on." While this statement may be true for most parents over the age of 40, the issue our culture is dealing with is that children are simply not going outside daily to play. They are not going outside to play like previous generations. The preferred skill set of this generation may have shifted from the active environment to the more sedentary screen environment. It is widely believed that fundamental movement skills and habitual physical activity are related in childhood and adolescence (Booth, Okely, & Patterson, 2001; Hannah et al., 2006). There is a significant relationship between obtaining fundamental movement skills and self-reported participation in organized traditional physical activity in adolescents (Booth et al., 2001). Children with developed motor abilities are more physically active and less likely to be sedentary than children who lack a foundation of physical skills. It is understandable that parent's desire for their children to go outside to play but if this is not happening why not provide an alternative to get children moving. In today's fast paced culture children may need a different approach to turn them on to exercise. Active gaming can be a gateway to provide children with the motivation needed to encourage future traditional physical activity experiences.

Why Would We Encourage MORE Screen Time?

Time spent on recreational screen activities (watching TV, playing digital games, internet surfing, etc.) should not exceed two hours daily (Kaiser Foundation, 2009). The average child spends more time in front of the screen than recommended. Many parents and teachers would suggest that encouraging additional use of screens would not be an appropriate teaching or parenting strategy.

Advocates of active gaming are not suggesting children spend more time in front of a screen. The intent of active gaming participation is to replace sedentary, recreational screen time with physically active screen time. A pilot study investigating active gaming's effect on replacing sedentary screen time with more physically active screen time supported this concept by demonstrating children voluntarily selected to participate in active screen time opposed to sedentary screen time (Maloney et al., 2008). Turning sedentary recreational screen time into a healthy experience using active gaming may prove beneficial for children who are going to participate in extended use of technology.

Traditional Physical Activity is Better than Technological Activity

The concept of expanding use of active gaming is not to be confused with replacing traditional activity. Parents and physical educators understand the value of traditional physical activity. Physical activity is associated with better cognitive performance and helps maintain cognitive function (Weuve et al. 2004). In addition, a physically active

lifestyle can help prevent the development of many chronic diseases including cardiovascular disease and obesity. It is imperative to increasingly create ways to help children incorporate more physical activity in their daily lives.

Active gaming research supports this new form of physical activity and learning. Recent investigations have found that not only does participating in active gaming double the energy expenditure over participating in similar sedentary activities (Graves, Ridgers & Stratton, 2008; Graves et al., 2008; Lanningham-Foster et al., 2006; Mellecker & McManus, 2008), but active digital games can also significantly increase heart rate and step counts as well as have benefits on overall health (Maddison et al., 2007; Mhurchu et al., 2007). Active gaming can be used as a supplement to traditional activities and a tool to help accomplish physical education objectives. Active gaming should not be considered a substitute for traditional fitness.

Active Gaming Breaks the Piggy Bank

Active gaming has been identified as being an expensive investment and many parents and schools may deem the expense to be unrealistic. It is estimated that an active gaming lab in a middle school (Grades six to nine) with 25 different gaming stations could cost \$60,000-\$80,000 depending on the type of equipment purchased. School administrators would understandably need to make decisions related to costs versus the benefits. However, there are active games that are affordable. A variety of *Dance Dance Revolution* pads are available for under \$20 a pad and active games—such as the Gamercize steppers, Wii, Xavix Sports, etc.—can be purchased for under \$300.00 each. Additionally, depending on the active game selected (Gamercize, Cateye GameBike, Wii, etc.) the activities are compatible with multiple digital games which fosters sustainability with children. Creating a full functioning active gaming room may not be a reasonable task immediately; yet, taking small steps toward this goal to continue to add new activities each year or as funding is available is feasible. At home, 88% of children have a digital game console and 85% a computer with over half having internet access (Hersey & Jordan, 2007). Considering many active games are operated using a traditional game console (Wii, PlayStation 2, PlayStation 3, Xbox 360, etc.) or through online game play, the gateway for children to be active in their homes is increasingly available.

Schools will find that there are several funding initiatives available that can provide resources for purchasing this technology. The federally funded Carol White Physical Education Program Grants provide physical education programs with funding in amounts ranging from just over \$100,000 to nearly \$600,000 (United States Department of Education, 2009). These grants are specifically targeted for the improvement of physical education programs and can provide funding to facilitate such program initiatives. In addition, the Robert Wood Johnson Foundation (2009) grants for the prevention of childhood obesity provide much needed funding initiatives so researchers can investigate the impact of active gaming on physical activity levels among children and adolescents. State and local funding is also available for physical activity and technology initiatives providing multiple possibilities for funding school and community based active gaming equipment and program initiatives.

Active Gaming Takes Up Too Much Space

Finding the space to allocate active gaming activities at home or at school is another argument against active gaming. Common questions include, “Where and how do we store the games when they are not being used” and “Where do we place the screens if we do not have wall space?” “Where will we find space in the school to set up the equipment?” Active gaming equipment does take up a lot of space. Teachers have

suggested (Hansen, 2009) the following related to space allocation and active gaming. First, designate a space to place the active gaming equipment that will not require the teacher to remove the activities daily. Delegating a room or small area in a specific permanent location in the school is ideal but certainly not necessary. Another option is to use a moving cart. A screen and game console can sit on the cart and the activities can be rolled or moved into the gym or classroom as needed. A third suggestion is to purchase a mobile or modular commercial unit. These units house the screens, consoles, and cords.

Durability is Problematic

Some have suggested active gaming is problematic due to the lack of reliability in terms of durability of the technology. Whether you are on a computer, driving a car, using an iPod, or trying to set your DVR, the chances are that at some point technology is going to “break down”. Most active games are purchased with a warranty with an option to extend the warranty. This provides the needed security to extend the life of the equipment. However, a major concern to consider when purchasing any active gaming technology is the manual assistance to care for typical “trouble shooting” situations. School systems should be prepared to have someone appointed to not only care for the purchased products, but to have open communication lines with the company or companies that have supplied the equipment. Any questions regarding the servicing of products should be considered and discussed prior to making any purchase. Without discussing individual manufacturers or specific products it is safe to suggest that there are many durable products provided by the active gaming industry.

Children Will Get Bored

“Children will simply get bored of these activities too quickly” is another concern for some teachers and parents. The notion that playing any activity too long and in the same way becomes less appealing and motivating may be true. However, many active games are compatible to a traditional game console allowing children to choose a variety of games in which to play. Some active games even allow children to plug the equipment to their computer and expand game play online.

School systems should consider that an appropriate instructional environment for active gaming is essential in order to promote the most effective learning and motivating experiences for children. Teachers should have training as well as personal practice on all purchased active games before including these activities in the curriculum. Using active gaming as a tool to accomplish learning objectives can be successful to sustaining the attentions span of children.

Conclusion

Active gaming certainly has a place in the physical education classroom and in the home environment. Children in the USA—and in other developed countries—are becoming overweight and obese and the home and school environment is failing to provide activities that motivate kids to move and be more physically active. Physical education teachers must find ways to make learning more meaningful for children and to accept that enjoyment in an activity drives meaningful learning. Active gaming may be in its infancy but as the concept continues to grow and develop we may see acceptance as an important method to increase children’s daily physical activity. Active gaming is an appropriate compliment to traditional exercise that can motivate children to become more physically active. Elkind (2007) suggested that the education system is one of the last social institutions to be changed by technology. If Elkind is on the right track, it is

time for both parents and schools to adapt. Imagine what a physical education class would look like if fitness was approached in a way that allowed children to do what they love, playing digital games, while still being motivated to be physically active? Imagine what the home environment would look like? As one fifth grade student participating in active gaming in physical education class stated, “If everyone in this world had a room (of active games) the world would be a better place” (Hansen, 2009, 148). We believe that the integration of technology and physical activity must be embraced in schools. The adoption of this technology makes learning more meaningful for students and increases the amount of physical activity in their lives.

Notes

- ¹ A wireless multiplayer DDR system.
- ² Add-on for GameCube, see <http://www.3rivers.com/gamecycle.php>
- ³ <http://www.expresso.com/>
- ⁴ <http://trixter.net/>
- ⁵ Add-on for PlayStation2, see <http://www.exerbikeusa.com/>
- ⁶ <http://www.xavix.com/products/index.html>
- ⁷ <http://www.trazer.com/>
- ⁸ Add-on for PlatStation3, Wii and Xbox 360, see <http://www.gamercize.net/>
- ⁹ <http://www.hopsports.com/>
- ¹⁰ <http://www.xergames.com/>
- ¹¹ <http://www.fitinteractive.com/3kick/index.htm>
- ¹² <http://www.makoto-usa.com/new/index.html>
- ¹³ <http://www.footgaming.com/>
- ¹⁴ <http://www.thebrainbike.com/>
- ¹⁵ <http://www.gamercize.net/pcsport.htm>

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