Active Gaming: The Future of Play?

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The authors examine technology-driven games—especially active gaming—as an evolving form of children's play. They offer an overview of play and its developmental benefits, describe the literature on the emergence of technology-driven play, and reflect on the diminishment of physical play in contemporary culture. They suggest that active gaming, which they describe in detail, not only meets the research-based definition of play, but also may fill the role of traditional play whose growing absence has left behind a vacuum. **Keywords:** active gaming; play; physical activity; technology; young children

Introduction

Today's children engage infrequently in physical play for a number of reasons. Parents feel uncomfortable allowing their children to play outside after dark—and in some cases during the day—without adult supervision. Playgrounds are not maintained and are often inaccessible. Schools frequently suppress play by eliminating recess and physical education in favor of more time for academics. In addition, contemporary society's immersion in technology has become more than an enthralling trend. In today's high-tech, commercialized world, the outdoor pick-up games once common in neighborhoods have been replaced with digital video games played on computers, iPods, and cell phones. Why this lack of physical play is significant lies in the very nature of play.

Children engage in play because it is natural and they find joy in the experience. Children all over the world play regardless of the culture in which they reside. Children engage in play whenever the opportunity exists (Rogers and Sawyers 1988). Most modern play theorists believe play teaches children life skills (Johnson, Christie, and Wardle 2005; Koster 2005): through play they learn about their world and their relationship to it (Davidson and Quinn 1993). In play, children not only develop the physical, social, emotional, and cognitive domains but their imaginations and creativity as well (Valsiner 1989).

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According to Fein, Rubin, and Vanenberg (1983) and Rogers and Sawyers (1988), there are six factors that make up what we might be call the disposition of play: Play is intrinsically motivated. Play is relatively free of externally imposed rules. Play is carried out as if the activity were real. Play focuses on the process rather than any product. Play is dominated by the players. And play requires the active involvement of the player.

Universally, researchers consider play intrinsically motivated. A child does not need to be directed to play. Children play not to meet basic needs or obligations but for the enjoyment of play itself (Johnson et al. 2005; Fein et al. 1983). The development of intrinsic motivation in children benefits them throughout their lives. When children play, they learn—and they enjoy the experience. Play does not need external rewards or additional encouragement (Leeper, Greene, and Nisbett 1973). In fact, external rewards may taint children's own feelings and motives and, eventually, the external rewards may even replace the internal ones. Self-paced, children-controlled play allows kids to make the most of their lives. We need to let children pick the level of skill and challenge with which they feel comfortable. When children frequently experience failure or frustration with tasks too difficult for them, they are not likely to want to pursue such activities and may learn to avoid them (Rogers and Sawyers 1988).

Importantly, play is generally free of externally imposed rules. On a playground during recess, children create their own games and modify existing games, which encourages their creativity and their taking ownership of the play by making the rules. In physical-education classrooms, a curriculum saturated with direct instruction does not allow children freedom to play. Teachers may overteach or deny children time to explore and learn. When adults inappropriately interfere with activities, children lose interest and stop playing (Rogers and Sawyers 1988). And if adults impose more rules and structure, children's need for external feedback will increase. If adults take too much control of an activity, children may begin to feel helpless (Seligman et al. 1984), which affects their self-esteem and sense of competence because they do not feel in charge of their own play experience (Connell 1985). Children with a strong sense of self-worth are much more likely to become well-rounded, mature individuals (Rogers and Sawyers 1988).

Although the concept of play may remain consistent, the way children actually engage in play continues to evolve in their constantly changing societies. Today, children find technology-driven gadgets such as computers, cell phones, iPods, and video game consoles appealing and motivating. Unfortunately, their

fascination with technology has made them more sedentary and less physically active, which—according to the Centers for Disease Control (CDC)—has increased the number of children facing health problems related to obesity (CDC 2008a, 2008b). Research suggests that discouraging children from active play harms their health (Elkind 2007; Ginsburg 2006; Johnson et al. 2005).

Children spend more time engaged in technology-based media activities than they do in any other activity but sleeping. Reports suggest the average kid between eight and eighteen years of age spends more than six hours a day using technology-driven devices. A growing phenomenon called media multitasking increases that number to eight-and-a half-hours of exposure daily (Roberts and Foehr 2008). And today, children play popular video games and computer games. In the average American household, 88 percent of the children have video game consoles such as Sony Playstation, Microsoft Xbox, or Nintendo GameCube. Eighty-five percent of them also have access to computers at home (Hersey and Jordan 2007), and over 90 percent of these children play video games on their computers (Chapman and DeBell 2003). According to the CDC (2008b), the time children spend with video games and related inactive technology-driven entertainment has the potential to replace the time they once spent being physically active. Playing with technology has obviously become more engaging than traditional physically active play. And as play has become more digital, it also has become more sedentary.

One result of this reduction in physical play is the increase in childhood obesity, and obesity even in adolescence predicts a broad range of adverse health effects in adulthood (Dallal et al. 1992)—most notably, heart disease, Type II diabetes, osteoporosis, high blood pressure, and some types of cancer. Type 2 diabetes, which used to be rare among children, has now become common (Sutterby and Frost 2002). Children are becoming overweight at increasingly younger ages. Over the past thirty years, the prevalence of overweight children between the ages of six and eleven years increased from 6.5 percent to 18.8 percent; and in children between the ages of twelve and nineteen, from 5 percent to 17.4 percent (CDC 2008b). Today, one in three children are considered overweight or obese (CDC 2008a). The prevalence rate for those at risk of being overweight among two- to five-year-old-children in the United States is currently more than 26 percent (Ogden et al. 2006). Although many factors influence obesity, physical inactivity (or a lack of regular exercise) is the leading cause for obesity in children (Martinez 2000). If we are to meet the challenges of this problem, we must investigate and implement strategies to increase daily physical activity in

children. Our approach needs to be innovative to encourage children to choose to be physically active on a daily basis.

Play and Development

We often perceive activities that are fun as less serious than those we find a drudgery. Perhaps it is unfortunate that we frequently refer to play as fun because many adults believe play lacks the rigor that learning and work require. Thus, they equate play with frivolity. Generally, researchers consider play an element important to achieving life's optimal development. They have long recognized play as a critical aspect of child development (Elkind 2007; Koster 2005; Johnson et al. 2005). Play, at a minimum, reinforces cognitive development with respect to representational competence, operational thought, and problem solving. Yet, play also serves as a context and a vehicle for the expression and consolidation of development, providing opportunities for new learning (Johnson et al. 2005). Play is an active form of learning that unites the mind, body, and spirit (Levy 1978).

A recent study by the American Academy of Pediatrics (AAP) reports that free and unstructured play is not only healthy but essential for helping children reach important social, emotional, and cognitive milestones as well as helping them manage stress and become more resilient (Ginsburg 2006). Play is perhaps the only human behavior that integrates and balances all aspects of human functioning—a necessary component for all of us to develop our full potential (Rogers and Sawyers 1988). Ratey (2008) has recently reported valuable information regarding the powerful impact of play on brain development. Play keeps children's minds engaged with the environment, ensuring optimal brain development (Johnson et al. 2005).

Play experiences mediate brain development first by helping create the many synapses formed in the first three years of life. Then, throughout childhood, play helps form the more complex neuronal structures (Ratey 2008; Elkind 2007; Johnson et al. 2005). For all this to occur, play must be meaningful to children, adding to their understanding of the world and their ability to adapt. Thus can play best stimulate brain activity and growth and produce a positive change in the structure of the brain (Johnson et al. 2005).

A large body of research across several academic disciplines indicates that play is critical to children's healthy development (Ashiabi 2007; Graue 2009;

Johnson, Christie, and Wardle 2005; Youngquist and Pataray-Ching 2004). Play facilitates the development of the cognitive domain by helping children try new and challenging tasks, solve problems, make predictions and draw conclusions, make comparisons, determine cause and effect, understand time, focus attention, develop symbolic capabilities, and practice new skills. Play builds the social-emotional domain by helping children interact with, cooperate with, befriend, and trust others; express and control emotions; try on new roles; and negotiate and resolve problems. Play strengthens the physical domain by developing children's motor skills, both large and fine. Play also adds to children's capacities for creative expression by helping them think flexibly; examine new options; extend ideas; improvise; make up rules; test materials; and manipulate the rhythm, form, and volume of sound (Kieff and Casbergue 2000). In these studies, researchers often use the terms playing and learning interchangeably.

Technology, Games, and Play

Jean Piaget (1963) suggests that as children mature they pass through distinctive stages in cognitive development and that the way they engage in play changes as they mature. He describes game play as a popular form of play for children all over the world. In general, games are a cognitively advanced form of play that requires children to conform to external rules while allowing them to enjoy learning new skills and practicing those they have already acquired (Johnson et al. 2005).

Kamii and Lewis (1992) suggest that, compared to traditional drill-and-practice, playing games benefits children more: First, in games the motivation to work comes from the children. Second, in games children invent their own strategies and ways of achieving their goals. And third, in games children supervise and correct each other, which fosters peer interaction.

Beck and Wade suggest that, although the rules in games may be different from the real world, "games deliver a 'reality' that children can relate to in life experiences" (2004, 11). If, Koster suggests, games are models of reality, then the things that games teach us must reflect our own reality. Some games teach children about environment and spatial awareness while other educational games teach content related to nutrition, exercise, math, or science (Koster 2005; Gee 2005). Since games are learning tools, children seeking to advance in a game will

always try to optimize what they learn. This often leads to mistakes in the game from which they, in turn, also learn—to problem solve, if nothing else—and they continue playing, which encourages flexible thinking. In today's society, it seems as if children have a more difficult time learning when taught by traditional methods; that is, they seem more visual than auditory learners. They need, says Koster, to make mistakes themselves to enjoy learning, and they often strongly resist being pushed by parents and teachers. Game play is an effective teaching tool that encourages children to accept—and to learn from—mistakes.

Simulations are games based on a model of a real situation designed to teach principles that operate under particular conditions (Clegg 1991). Simulation games tend to be more complex than dramatic play and other types of games. The complexity of simulation lends itself to teaching academic concepts and skills. Because in simulation games children role play and fantasize, they learn to regard simulations as playful and fun, which leads to high levels of engagement and effort (Johnson et al. 2005).

Video games are a genre of simulation games. Although, at present, video games constitute one of the economy's faster growing markets (EAS 2008), they have been a part of our society for years. Since the early 1990s, according to Koster, video games and computer games have evolved to suit our changing culture; and because children now live in a world immersed in technology, they often find modern electronic games more attractive than traditional games. Koster believes children's attraction to electronic games is instinctive because they are fun to play. Even computer programs and games for infants, toddlers, and preschoolers are growing in number and popularity given the belief that they will prepare kids for the demands of a technology-driven and demanding society. Computer programs attempt to engage children in active thinking and problem solving, providing them with cognitive benefits. Video games and computer games may also be important academically because playing them can help alleviate individual gaps in learning since curriculum materials are presented in a variety of formats that address different learning styles and ability patterns (Johnson et al. 2005). There is, in other words, a game for everyone, no matter their interests, talents, or abilities.

Although many still doubt the value of technology in fostering good play habits in children, attitudes about such play have begun to change with the growing sophistication of new digital devices. Researchers are finding that new forms of play have been made possible by technology and that more elaborate play can be stimulated through the use of some computer software (Johnson et

al. 2005). When children play games, they often refer to the experience as having fun (Hansen 2010; Hansen and Sanders 2008). Digital games have become a popular avenue of play, and they can offer an effective approach to learning. Koster suggests, "That's what games are, in the end. Teachers. Fun is just another word for learning" (2005, 45).

Active Gaming: Physical Play and Gaming

In the past, physical play emphasized the intensity of the activity involved because its underlying philosophy held that the harder children exercised, the greater the physical benefits. The idea was to assign children activities such as push-ups, pull-ups, running laps, and other feats of physical fitness and push them to succeed physically. This approach often met with resistance and discouraged many from participating in daily physical activity. Today, schools feature less rigorous, more moderate physical activity, hoping to encourage children to make it a regular part of their lives. Yet children need to view an activity as a fun way to learn and grow or they will be less likely to adopt it as part of their lifestyle. Not surprisingly, in a recent study, 86.2 percent of adolescents rated "having fun" as the most important concern in their lives (Lindstrom and Seybold 2003).

As we have said, some have criticized the influx of technological devices as a significant cause of childhood obesity. These devices captivate children and lead them toward a fun but sedentary lifestyle. Many advocates for making our children become more physically active consider technology-driven games an enemy. But these games are not going away, and it only makes sense to find an innovative way to incorporate them into our efforts to encourage children to become more physically active. Hence, the emergence of a contemporary movement called *active gaming*.

Active gaming bridges the gap between the popular technology-driven games children enjoy and physical activity. These tech-driven activities require participants to move their bodies to control the actions of the game (Hansen 2010; Foley and Maddison 2010; Thin, Hansen, and McEachen 2011; Mellecker 2008; Yang and Graham 2005). Hansen (2010) defines three categories of active games: exergames, interactive fitness activities, and active learning games.

Exergames are technology-driven activities that require a screen and resemble video game play. Game consoles, peripherals, accessories, and games such

as Nintendo Wii, Microsoft Kinect, Sony Move, Gamercize steppers, and *Dance Dance Revolution (DDR)* are examples of more popular exergames. Children stand in front of a screen and participate in virtual sports (football, baseball, tennis, skiing, boxing, skateboarding, and others) and dancing. In some of these active games such as the Gamercize steppers, which are compatible with the Nintendo Wii, Microsoft Xbox 360, and Playstation 3, children are able to play any game as long as they step with a continuous cadence.

Interactive fitness activities are not necessarily screen based but require the player to use his or her body to play the game. Popular interactive fitness activities include martial-arts simulators, Lightspace, and hopsports. In martial-arts simulators and Lightspace activities, children react to lights illuminated on a wall mount, floor apparatus, or upright columns. The faster they hit the lights, the more points they score, and—depending on the activity—they can throw a ball or hit the lights with padded accessories.

Active learning games provide children with an academic focus, forcing them to be physically active to play the electronic game. Foot gaming, Brain Bike, and the Gamercize steppers are examples of the movements common to active learning games. These are often used in the classroom or computer lab, and children play them by following on-screen instructions. Teachers can use active learning games as a station during class, a before- or after-school activity, a reward for finishing work or for good behavior.

Children playing an active game can, for example, imagine standing on a snowboard flying down a snowy mountain or dancing their hearts away as they step to the beat of their favorite music while earning valuable points that advance them to the next challenging level. They can grab friends or play against the computer to participate in virtual sports such as boxing, baseball, tennis, or football. They may choose to jump on bikes and race friends through virtual off-road courses. And they can choose any of their favorite video games as long as they continue to step in cadence. The idea is to keep moving.

The concept of playing technology-driven games to increase physical activity has won interest from health clubs, Young Men's Christian Associations (YMCA), Jewish Community Centers (JCC), recreation centers, doctors, and schools. International, national, and state conferences that focus on healthy gaming, obesity issues, and physical activity have made active gaming an important topic. In general, advocates of physical activity seek to learn more about the active play movement and its uses in reducing obesity by replacing sedentary behavior with physical activity.

A Brief History of Active Gaming

Active gaming is not a new concept. Nintendo and Atari initiated the idea of combining technology with physical activity in the early 1980s when Nintendo released the Power Pad floor mat controller and Atari introduced the similar Foot Craz. Neither of the innovations, however, was much of a success. When Konami released *Dance Dance Revolution* to Playstation in the late 1990s, it became the first truly successful active electronic game—selling over seven million copies. But it was Sony and Nintendo who actually launched the popular movement when they created Eye Toy (2003) and Wii Fit (2010) respectively. The first sold over ten million copies; the second, over twenty-one million. Sinclair, Hingston, and Masek (2011) suggest three reasons for the growth of active gaming. First, the childhood obesity epidemic became a major concern early in the twenty-first century, which made the idea of using active digital games to encourage children to become more physically active appealing. Second, also in the early twenty-first century, the sale of exercise equipment soared, and many viewed active games as a product that could piggyback on those sales. Third, when Nintendo released Wii in 2006 and Microsoft released Kinect in 2010, both companies promoted their systems in the media and in their advertising as a means to make children more physically active. The systems garnered a great deal of attention globally and created a desire to explore active gaming. Today there are hundreds of active games kids can buy, and the active gaming industry continues to grow more popular with the release of new games every year. In addition to releasing new games, companies have focused on improving the games.

Active Game Play Benefits and Critiques

We have already discussed the developmental benefits of play, but are these relevant to the play of active gaming? Although the American Heart Association (AHA 2010) recently announced that active gaming can benefit participants, we need much more research to understand fully this fairly new concept and its benefits. A few studies suggest that active gaming does not benefit children. For example, Baranowski (2012) reported that when children were provided a Nintendo Wii stocked with active games as well as with more sedentary games his study found no difference in activity levels. Despite the rarity of such research, game developers have focused on improving the outcomes of children's participation in active play. Indeed, today the majority of the emerging research supports the use of active gaming in schools, health facilities, and the home. Hansen and Sanders (2011, 2010) spent a year observing children to learn more

about their experiences with active gaming. They identified a number of benefits, and they offered criticisms. They reported several characteristics of active gaming that encourage their use at schools and in homes: Active games are fun. They are motivational. They provide an alternative to sedentary pursuits. They are user friendly. They promote socializing. And they increase physical activity.

Active Gaming Is Fun

Research suggests that children who play active digital games consider them fun (Hansen 2009). When children consider an activity fun, they are more likely to remain engaged in it when they play it and to engage in it again in the future (Robertson-Wilson et al. 2003; Weiss 2000). Thin and Poole (2010) found that the enjoyment of physical activity correlated to improvement in active gaming performance better than it did to conventional exercise. Hansen and Sanders (2008) suggest that when children play active digital games, they do not realize they are exercising. Children may sweat when they play such games, but they also smile and have fun.

When children find an activity interesting and enjoyable, they are more likely to take it up voluntarily (Robertson-Wilson et al. 2003). Voluntary physical activity is important because, in or out of school, most children do not play or exercise the sixty minutes a day recommended by the CDC (CDC 2008a; National Association for Sport and Physical Education [NASPE] 2009). Hansen (2009) found that students who played active electronic games during physical education showed an unremitting interest in the activities and did not want to quit playing when it came time to switch activities or to leave class. The children also expressed an interest in active game play outside of school—in their own homes, at friends' homes, in after-school programs, at health facilities, at YMCAs, in recreation centers, and similar venues. Yang and Graham (2006) looked at children who participated in *Dance Dance Revolution*. The children could stop playing whenever they wanted or they could play for the three-quarters of an hour allotted them. The researchers found that the large majority of children wanted to play *DDR* for the entire forty-five minutes.

Active Gaming Is Motivating

Born into a technology-driven society, the current generation of children learned to manipulate digital devices at an early age. Over 90 percent of American children have at least one video game console at home (Foehr, Rideout, and Roberts 2005; Hersey and Jordan 2007) and spend more time than recommended in front

of a screen (Kaiser Family Foundation 2009). Digital games intrigue children and capture their attention because the games respond to players' actions, reward their technical skills, and help them escape boredom (Beck and Wade 2004). Children receive immediate feedback and instant gratification from playing digital games. Children find the technology of active gaming fun, and this motivates them to play the games (Hansen 2009). Active gaming research supports the finding that because digital gaming is enjoyable, it encourages children to exercise (Widman, McDonald, and Abresch 2006).

In traditional physical-education classes, teachers used competitions like the mile run to motivate children to work harder and to perform better. But children have not always understood, much less enjoyed, these tests of their abilities to reach specific goals or to sustain particular levels of physical activity (Hopple and Graham 1995). The engaging nature of active electronic games may provide a motivational approach to fitness testing in physical education.

Active Gaming Provides Choice

Rogers and Sawyers (1988) state that self-paced, child-controlled play offers one of the best ways for children to develop. Children, they suggest, are more likely to remain engaged in an activity if they have fewer rules and more choices. We know children are more willing to express their thoughts, feelings, and experiences when they have more choice and a bigger voice in their instruction (Dyson 1995). Active gaming provides children with many choices during play (Hansen and Sanders 2008, 2010, 2011). Children select a character with which to identify, choose the game mode and level, and decide the type of competition to play. When Hansen (2009) asked students about active gaming in their physical-education class, they said they liked it because it had so few restrictions. The students suggested the more choices they had, the more enjoyable their active gaming.

Providing children with self-paced activities helps meet the needs for play at all levels of ability. Children play active digital games whether they are overweight or fit, skilled or unskilled (Hansen 2009; Hansen and Sanders 2008). Children who are usually uncomfortable just being active or competing with other children experience success playing active digital games. Unskilled, overweight children can play with skilled, fit children and compete successfully because they choose the level of play (Thin, Hansen, and McEachen 2011). Playing active digital games may reduce children's embarrassment because the games are developmentally appropriate for each child.

Active Gaming Is User Friendly

Because children understand the technology, they find active games easy to explore both independently and with peers (Hansen and Sanders 2010). Beck and Wade (2004) suggest that the current generation of children prefers to learn from playing a game or from instruction by peers as opposed to being taught by adults—they are not motivated by the demands of authority figures. When children need assistance, the game itself provides adolescents with scaffolding. Active games provide on-screen instructions that enable children to develop the skills needed to improve their level of play. The cues, prompts, and hints help users learn and keep going until they can direct their own path forward (Federation of the American Scientists, 2006).

Active Gaming Provides Socialization

Socializing with peers constitutes an important role in active gaming. Hansen (2009) learned that children could play the games equally well independently or with others regardless of whether they chose partners themselves or were assigned them. And whether they played the game alone or with partners, they consistently socialized with their peers. They discussed strategies and instructions, talked to and taunted each other competitively, and sometimes simply discussed random topics.

Active Gaming Increases Physical Activity

A review of eighteen studies assessed active video games as a means of increasing energy expenditure. The results showed that playing active video games expended more energy than resting, playing nonactive video games, and engaging in other common sedentary activities (Foley and Maddison 2010). Specifically, playing active video games can double the energy expenditure over sedentary digital game play (Graves, Ridgers, and Stratton 2008; Graves et al. 2008; Lannigham-Foster et al. 2006; Mellecker and McManus 2008) as well as significantly increase heart rates and step counts, and it may have positive benefits on overall health (Maddison et al. 2007; Mhurchu et al. 2007; Thin and Poole 2010). Furthermore, the energy spent in active gaming can meet the recommended guidelines for moderate to vigorous physical activity (Tan et al. 2002; Unnithan, Houser, and Fernhall 2005; Yang and Graham 2006).

Additional Research Support

Important findings regarding the childhood obesity epidemic suggest voluntary

physical activity increases when kids participate in active gaming (Hansen 2010; Yang and Graham 2005). As we have mentioned, Hansen (2010) found that children not only desire to play active games but that their interest in the games is unremitting. A pilot study examined the feasibility of playing *Dance Dance Revolution* at home to increase physical activity time and decrease sedentary screen time. The research demonstrated that *DDR* reduces sedentary screen time and facilitates slight increases in vigorous physical activity (Maloney et al. 2008). It showed the video game component of active gaming to be both enjoyable and motivational (Hansen 2010; Widan, McDonald, and Abresch 2006).

Additional research regarding the physiological benefits for sedentary college-aged males playing active digital games offers evidence that video game bikes effectively help them exercise routinely and significantly improve their scores on several markers of good health (Warburton et al. 2007). Widman and her coauthors (2006) found the GameCycle—an upper-body ergometer—was an adequate exercise device for improving oxygen intake and maximizing work capability in adolescents.

Physical-education programs around the world have implemented active gaming in both classrooms and gyms, although little research exists regarding its use. West Virginia public schools were the first to introduce an active digital game—the *Dance Dance Revolution* Project—into their curriculum. They conducted a study of students from twenty West Virginia schools and the impact of their using *DDR* in their physical education and health classes. The results demonstrated that some 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 involving thirty-five overweight children aged seven to twelve years found that playing *DDR* at least five times a week instilled positive feelings about coordination, reduced short-windedness, and decreased self-consciousness. On average, the children developed stronger self-esteem, improved their aerobic fitness, and reduced their chances for developing diseases associated with obesity like 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 their daily lives (Brubaker 2006). Based on the positive results of these studies, West Virginia included *DDR* in the state's 765 public schools and developed a school-based *DDR* curriculum still in use today.

As we have mentioned, Hansen (2009) conducted a fifteen-week study of children's experiences with active gaming during physical-education classes.

Through journal entries, interviews, and observational field notes, he gathered data that clearly suggested children desired active gaming and were motivated to participate each week. The children also said they would like to participate in active gaming outside of school hours. They enjoyed playing and socializing with their friends and did not want to stop when the class ended. Again, active game play may appear frivolous to some, but the research clearly demonstrates it not only benefits children but it also motivates them to become and stay physically active.

Active Gaming: Criticisms

Active gaming has certainly grown more popular, but the idea of using digital technology to promote physical activity has its skeptics. We can understand many of the criticisms, and they should be addressed. Hansen and Sanders (2011) have described the more common criticisms related to active games.

Just Go Outside and Play

Many adults have become frustrated with electronic games and suggest children should just go outside to play. The problem is that, today, children simply will not play outside. They avoid outdoor play for many reasons, some of them environmental. But some researchers suggest that the skills kids develop these days are more suited to sedentary, indoor screen play than to active outdoor play. It is no surprise that advocates of physical activity want children to go outside and become more active, but in today's technology-saturated culture, children may need a new strategy to turn them on to exercise. For these children, active gaming may be an appropriate gateway to a future that involves more traditional physical activity (Hansen and Sanders 2011).

Why Would We Encourage More Screen Time?

We know that the time spent on recreational screen activities—watching television, playing digital games, Internet surfing—should not exceed two hours daily (Kaiser Family Foundation 2009). Yet, the average child spends more time in front of the screen than recommended. Why then would we encourage even more screen time by deeming active gaming appropriate? As we have said, video games are not going to disappear, and children seem to choose technology over traditional physical activity. But let us be clear: the use of active gaming should

not be encouraged over traditional physical activity and play. Instead, ideally, we would use active gaming to replace sedentary, recreational screen time with more active screen time or game playing. A pilot study investigating active gaming's ability to replace sedentary screen time with more physically active screen time demonstrates that children voluntarily selected active screen time over sedentary screen time (Maloney et al. 2008). If children will choose an active game over sedentary play, health advocates surely see its benefit. Our claim then becomes this: using active gaming to turn sedentary screen time into a more healthy experience clearly benefits children who use technology.

Traditional Physical Activity Is Better Than Technological Activity

We all know that physical activity offers many health benefits including improving cognitive performance (Weuve et al. 2004) and helping prevent the development of such chronic conditions as cardiovascular disease and obesity. We need desperately to promote more physical activity of any kind for children. The type of physical activity should not necessarily be our focus. It can be beneficial only if children choose to engage in active gaming in place of being sedentary. Advocating active gaming does not mean we wish it to replace traditional physical activity. As we have discussed, active gaming research supports the notion that it promotes a new form of physical activity and therefore that it is an appropriate means for encouraging children to become and stay more active. Active gaming can be used to supplement traditional activities rather than as a substitute for them.

Active Gaming Breaks the Piggy Bank

Some critics say active gaming is not affordable or that it does not garner a sufficient return on investment. This criticism has merit. Some commercial active games cost several thousands of dollars. Without appropriate funding, these costs may be unrealistic. However, there are many active games that are affordable. A variety of *DDR* pads are available for under twenty dollars, and equipment supporting active games—the Gamercize steppers, Nintendo Wii, Microsoft Kinect, Sony Move, and XaviXPORT—can be purchased for under three hundred dollars each. Additionally, many of the consoles and accessories for active games (Wii, Kinect, and Gamercize, for example) are compatible with a variety of games. Because close to 90 percent of children have a video game console at home (Hersey and Jordan 2007), they need to buy only the active game compatible with their console, making active gaming affordable.

Several funding initiatives provide revenue to buy this technology. Most state and local funding focus on physical activity, obesity, and technology. The U.S. Department of Education's Carol White Physical Education Program offers grants ranging from just over $100,000 to nearly $600,000 specifically for improving physical education programs (United States Department of Education 2009). The Robert Woods Johnson Foundation (2009) offers grants to researchers focusing on childhood obesity. Some of the funding from these agencies has been dedicated to active gaming equipment and program development, so it is possible for schools and communities to find money outside their locales.

Active Gaming Takes Up Too Much Space

That implementing active gaming and storing its equipment takes up too much room constitutes a criticism usually made by those seeking to incorporate active gaming at home or in a facility. And, again, we understand it. But active gaming equipment does not necessarily have to take up a lot of space. Residential active games may simply comprise a typical video game console with small accessories. Many such accessories can be stored easily on a shelf, in a closet, or directly on top of the console. Plug-and-play active games involve a piece of equipment plugged into a console or an electrical outlet (like *DDR*, Cateye GameBikes, and Gamercize steppers), and these may need more storage space but not substantially so—a closet or a spare area in a garage or a bedroom will do. When allocating space for electronic active game play, clear an area just large enough to be safe that allows a full range of motion. The exact amount of space needed depends on the type of game. For schools and facilities wanting to offer children more active games, perhaps designating a specific room or space will prove the most convenient option, so that screens and equipment do not have to be moved often. Another option might be a moving cart. A screen and game console can sit on the cart, which can be rolled into the designated play area when needed.

Durability Is Problematic

Whether we are talking about computers, mobile phones, iPods, iPads, or televisions, technological programs and devices are more than likely to develop problems or even break down. To worry about the durability of active gaming equipment seems valid. Commercialized active games (some brands of *DDR*, Lightspace, martial arts simulators, and other games and apparatus) will certainly prove more durable then residential equipment. However, most active games come with a warranty and an option to extend the warranty. This helps

obviate some of the worry about the life of the equipment, but everyone should consider having a knowledgeable individual handy for minor troubleshooting. Establishing clear communication with the manufacturer before purchasing helps users deal with the technical difficulties that may occur.

Children Will Get Bored

Not uncommonly, children grow bored after playing at any activity too long or too often, so a good question becomes "Will children not get bored with *these* games?" The simple answer could be yes, but many active games are compatible with a traditional game console, which allows children to choose a variety of games to play. Some active games even let children plug their equipment into their computer and expand game play online (Hansen and Sanders 2011).

School systems and health facilities should provide an appropriate instructional environment for active gaming, which is essential for promoting the most effective learning experiences for children. Instructors should have training as well as personal practice on all active games before including these activities in a program. Understanding how to implement active gaming effectively can help sustain the children's interest.

Savior of "Future" Play?

Technology continues to develop, and it becomes an increasingly significant part of our daily lives. Predictably, many of us have grown into modern-day Luddites who resist change until enough evidence convinces us that this new technology might actually help (Piaget 1954). We cling to the idea that how we and our parents and grandparents played as children is how our children should play today. If it worked back then, we contend, it should work now. Instead, we need to understand and accept this transition period in our culture with respect to both physical activity and play.

Active gaming, indeed, challenges traditional notions about both physical activity and play. We sometimes hear adults complain: "When I was your age, I used to play until the streetlights came on." But in the last ten years, there has been a steady trend in our children's lives away from unstructured outdoor physical play, a trend reflected in the corresponding rise in childhood obesity. Children spend time sedentary in front of screens rather than play outside. The problem with their "choice" not to play outside has been compounded by the

equally steady movement toward reducing the number of, or eliminating entirely, art courses, music classes, and recesses at our schools based on the notion that more seat time equals effective learning (Singer et al. 2009).

As technology has evolved, we have seen the popularity of active games and apparatus such as *Dance Dance Revolution*, Nintendo Wii, and Microsoft Kinect grow dramatically, especially now that active games can be played on devices like iPads or mobile phones using mobile apps such as ARAs (Augmented Reality Apps), sometimes called ARGs (Augmented Reality Games). Everywhere they go, kids now have access to such games, which can encourage them to play and to be more active. The growth of the active gaming market seems to be expanding and improving, which will provide our children with more access to active game play.

There are many reasons why children do not play the outdoors games previous generations once played. The increasing rigidity of our schools and the growing fear among parents about the safety of their children both limit and subjugate young children. Fears of traffic, disease, strangers, academic failure, and bruised egos along with highly structured schedules reduce the time for play and the access to good playgrounds (Louv 2005). Since play is critical for the growth and well-being of children, it seems only natural that a structured system of play should develop. Active gaming fills that niche. It provides a system of play structured both by the technology and the rules of the game. Active gaming confines itself to a limited area, and it frequently involves a single player unless kids choose a more social and competitive game. Thus, active gaming addresses a number of common parental worries while also providing the opportunity for children to play and to be active. Active gaming just might be able to keep active play in our children's lives—and perhaps in our own.

Conclusion

New technology and an overprotective, fearful, and indulgent culture seem to contribute to the increase in childhood obesity. But it also appears that new technology might help fight such obesity. In active gaming, we see the potential of modern technology to help not only our children but also us adults get off the couch and become playful again. In the process, we might even change our shape and the shape of our times.

But there are limits. We do not envision very young children deeply involved in active gaming. The nature and structure of most games are not appropriate

to their stage of development. There are, of course, probably exceptions for both individual children and for gaming systems. After all, we generally do not consider piano or golf developmentally appropriate for most three-year-olds but then there are still Mozarts and Tiger Woodses. Nonetheless, we recognize outliers for what they are, and we continue to recommend caution with very young children.

We suggest it is best to view active gaming as a transitional instrument to foster movement from traditional physical activity based on external motivation to one based more on intrinsic motivation, one that uses technology-driven games children love. The goal is to shift from physical activity as a discipline to physical activity as a freely chosen pastime, a shift from mastery to enjoyment. Based on play theory, this seems like a good direction. It represents, too, a shift from group to individual activity, removing much of the peer pressure associated with competitive group activities. Early research also indicates it offers the potential for nonathletic children to excel, thus keeping kids more engaged in physical activity (Thin, Hansen, and McEachen 2011).

The 1988 film *Big* portrays a type of active gaming before the term was even coined. Actor Tom Hanks plays a twelve-year-old boy stuck in the body of a grown man, In one scene, Hanks wanders into Manhattan's F. A. O. Schwarz toy store and plays "Chopsticks" with Robert Loggia on a giant keyboard laid out on the floor. They literally dance across the keys to the amusement of the store patrons and the movie audience. In a moment of classic cinema, viewers share the joy and exhilaration of a catharsis. Viewers are left wondering why we cannot bring the unbridled joy of childhood into the adult world. Active gaming may give us the opportunity to do just that—or at the very least to help hold off the adult world from its constant intrusion into children's lives.

Can active gaming save the future of play? It may be too early to answer, but we think it trends that way. We need more research to understand how active digital play can affect the current generation. And, it is important to think about this issue as generational. Most of us look at childhood play through the lens of our own past. Such a view may be valuable, but it is historical and a view locked in the context of our own specific experience. The modern childhood experience is different from our own, and it is important to gain an accurate view of today's childhood through more research. We also need research to understand the potential benefits of contemporary, popular activities as well as to test their sustainability. We need to understand children's feelings about physical activity to offer them the engaging experiences that foster future play. We already know

from Katz (1985) that physical play develops in children a disposition toward physical activity—a positive habit throughout their life. We hope that a positive habit like this one, which children carry into adulthood, can help them expand their physical activity into nonelectronic areas as well.

References

American Heart Association. 2010. "American Heart Association and Nintendo." http://www.activeplaynow.com.

Ashiabi, Godwin. 2007. "Play in the Preschool Classroom: Its Socioemotional Significance and the Teacher's Role in Play." *Early Childhood Education Journal* 35:199–207.

Baranowski, Tom, Dina Abdelsamad, Janice Baranowski, Teresia Margareta O'Connor, Debbe Thompson, Anthony Barnett, Ester Cerin, and Tzu-An Chen. 2012. "Impact of an Active Video Game on Healthy Children's Physical Activity." *Pediatrics* 129:636 –42.

Beck, John, and Mitchell Wade. 2004. *The Kids Are Alright: How the Gamer Generation Is Changing the Workplace*.

Centers for Disease Control. 2012. "Healthy Weight–It's Not a Diet, It's a Lifestyle." http://www.gov/nccdphp/dnpa/healthyweight/assessing/bmi/chlidrens.htm.

———. 2008. *National Center for Health Statistics: Prevalence of Overweight among Children and Adolescents: United States, 1999–2002*, http://www.cdc.gov/nchs/products/pubs/pubd/hestats/overwght99.htm.

Clegg, Ambrose. 1991. "Games and Simulations in Social Studies Education." In *Handbook of Research on Social Studies Teaching and Learning*, edited by James P. Shaver, 523–28.

Connell, James P. 1985. "A New Multidimensional Measure of Children's Perceptions of Control." *Child Development* 56:1018–41.

Davidson, Sunny, and Karen Quinn. 1993. "Diagnostic Pictures: A Photoessay." In *A Right to Play*, edited by Marcy Guddemi and Tom Jambor, 63–84.

DeBell, Matthew, and Chris Chapman. 2003. "Computer and Internet Use by Children and Adolescents in 2001." *Education Statistics Quarterly* 5:7–11.

Dyson, Ben P. 1995. "Students' Voices in Two Alternative Elementary Physical Education Programs." *Journal of Teaching in Physical Education* 14:394–407.

Elkind, David. 2007. *The Power of Play: How Spontaneous, Imaginative Activities Lead to Happier, Healthier Children.*

Entertainment Software Association. 2007. "Essential Facts about the Computer and Videogame Industry: 2007 Sales, Demographic and Usage Data." http://www.theesa.com/facts/pdfs/ESA_EF_2007.pdf.

Federation of American Scientists. 2006. "Harnessing the Power of Video Games for Learning." Report of the Summit on Educational Games, Washington, DC, October 2005.

Foehr, Ulla G., Victoria Rideout, and Donald Roberts. 2005. "Generation M: Media in the Lives of 8–18 Year-Olds." Report released at a forum sponsored by the Kaiser Family Foundation, Washington, DC, March 2005.

Foley, Louise, and Ralph Maddison. 2010. "Use of Active Video Games to Increase Physical Activity in Children: A (Virtual) Reality?" *Pediatric Exercise Science* 22:7–20.

Frost, Joe L., and Paul J. Jacobs. 1995. "Play Deprivation: A Factor in Juvenile Violence." *Dimensions of Early Childhood* 23:14–20.

Gee, James Paul. 2005. *What Video Games Have to Teach Us about Learning and Literacy.*

Ginsburg, Kenneth, the Committee on Communications, and the Committee on Psy chosocial Aspects of Child and Family Health. 2007. "The Importance of Play in Promoting Healthy Child Development and Maintaining Strong Parent-Child Bonds." *Pediatrics* 119:182–91.

Graue, Elizabeth. 2009. "Reimagining Kindergarten: Restoring a Developmental Approach When Accountability Demands Are Pushing Formal Instruction on the Youngest Learners." *School Administrator* 66:10–15.

Graves, Lee, Nicola D. Ridgers, and Gareth Stratton. 2008. "The Contribution of Upper Limb and Total Body Movement to Adolescents' Energy Expenditure Whilst Play ing Nintendo Wii." *European Journal of Applied Physiology* 104:617–23.

Graves, Lee, Gareth Stratton, Nicola D. Ridgers, and N. Tim Cable. 2007. "Comparison of Energy Expenditure in Adolescents When Playing New Generation and Sedentary Computer Games: Cross Sectional Study." *BMJ* 335:1282. http://www.bmj.com/content/335/7633/1282.

Hansen, Lisa. 2009. Six Fifth Grade Students Experiences Participating in Active Gaming during Physical Education Classes." PhD diss., University of South Florida.

Hansen, Lisa, and Steve Sanders. 2007. "Interactive Gaming: Changing the Face of Fitness." *Florida Alliance for Health, Physical Education, Recreation, Dance and Sport Journal* 46:38–41.

———. 2010. "Fifth Grade Students' Experiences Participating in Active Gaming in Physical Education: The Persistence to Game." *The ICHPER-SD Journal of Research in Health, Physical Education, Recreation, Sport and Dance: The Official Journal of the International Council for Health, Physical Education, Recreation, Sport and Dance* 5:33–40.

———. 2011. "Active Gaming: A New Paradigm in Childhood Physical Activity." *Digital Culture and Education* 3:123–39.

Hersey, James C., and Amy Jordan. 2007. "Reducing Children's TV Time to Reduce the Risk of Childhood Overweight: The Children's Media Use Study." http://www.cdc.gov/obesity/downloads/TV_Time_Highligts.pdf.

Hopple, Christine, and George Graham. 1995. "What Children Think, Feel, and Know about Physical Fitness Testing." *Journal of Teaching in Physical Education* 14:408–17.

Johnson, James E., James F. Christie, and Francis Wardle. 2005. *Play, Development, and Early Education.*

Kaiser Family Foundation. 2010. "Generation M2: Media in the Lives of 8– to 18–Year-Olds." http://www.kff.org/entmedia/mh012010pkg.cfm.

Kamii, Constance, and Barbara A. Lewis. 1992. "Primary Arithmetic: The Superiority of Games over Worksheets." In *Play's Place in Public Education for Young Children*, edited by Victoria Jean Dimidjian, 85–93.

Katz, Leonard. 1985. "Dispositions in Early Childhood Education." *ERIC/EECE Bulletin* 18:1–3.

Kieff, Judith E., and Renée M. Casbergue. 2000. *Playful Learning and Teaching: Integrating Play into Preschool and Primary Programs*.

Koster, Ralph. 2005. *A Theory of Fun for Game Design*.

Lanningham-Foster, Lorraine, Teresa B. Jensen, Randal C. Foster, Aoife B. Redmond, Brian A. Walker, Dieter Heinz, and James A. Levine. 2006. "Energy Expenditure of Sedentary Screen Time Compared with Active Screen Time for Children." *Pediatrics* 118:1831–35.

Lepper, Mark R. 1988. "Motivational Considerations in the Study of Instruction." *Cognition and Instruction* 5:289–309.

Lepper Mark R., David Greene, and Richard E. Nisbett. 1973. "Undermining Children's Intrinsic Interest with Extrinsic Rewards: A Test of the 'Overjustification' Hypothesis." *Journal of Personality and Social Psychology* 28:129–137.

Levy, Joseph. 1978. *Play Behavior*.

Lindstrom, Martin, and Patricia Seybold. 2003. *Brandchild: Remarkable Insights into the Minds of Today's Global Kids and Their Relationships with Brands.*

Louv, Richard. 2005. *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder*.

Maddison, Ralph, Cliona Ni Mhurchu, Andrew Jull, Yannan Jiang, Harry Prapavessis, and Anthony Rodgers. 2007. "Energy Expended Playing Video Console Games: An Opportunity to Increase Children's Physical Activity?" *Pediatric Exercise Science* 19:334–43.

Maloney, Ann E., T. Carter Bethea, Kristine S. Kelsey, Julie T. Marks, Sadye Paez, Angela M. Rosenberg, Dianne J. Catellier, Robert M. Hamer, and Linmarie Sikich. 2008. "A Pilot of a Video Game (*DDR*) to Promote Physical Activity and Decrease Sedentary Screen Time." *Obesity* 16:2074–80.

Martinez, J. Alfredo. 2000. "Body-Weight Regulation: Causes of Obesity." *Proceedings of the Nutrition Society* 59:337–45.

Mason, Mark. 2000. "Teachers as Critical Mediators of Knowledge." *Journal of Philosophy of Education* 34:343–52.

Mellecker, Robin R., and Alison McManus. 2008. "Energy Expenditure and Cardiovascular Responses to Seated and Active Gaming in Children." *Archives of Pediatrics and Adolescent Medicine* 162:886–91.

Must, Aviva, Paul F. Jacques, Gerard E. Dallal, Carl J. Bajema, and William H. Dietz. 1992. "Long-Term Morbidity and Mortality of Overweight Adolescents—A Follow-Up of the Harvard Growth Study of 1922 to1935." *New England Journal of Medicine* 327:1350–55.

National Association for Sport and Physical Education. 2009. "Appropriate Use of Instructional Technology in Physical Education." http://www.aahperd.org/naspe

/standards/upload/Appropriate-Use-of-Instructional-Technology-in-PE-2009-2.pdf.

Ogden, Cynthia L., Margaret D. Carroll, Lester R. Curtin, Margaret A. McDowell, Carolyn J. Tabak, and Katherine M. Flegal. 2006. "Prevalence of Overweight and Obesity in the United States, 1999–2004." *The Journal of the American Medical Association* 295:1549–55.

Olfman, Sharna. 2005. "What about Play?" *Rethinking Schools Online 19*. http://www.rethinkingschools.org/restrict.asp?path=archive/19_03/play193.shtml.

Piaget, Jean. 1954. *The Construction of Reality in the Child*.

———. 1963. *The Origins of Intelligence in Children.* Translated by Margaret Cook.

Ratey, John. 2008. *Spark: The Revolutionary New Science of Exercise and the Brain*.

Robert Woods Johnson Foundation. 2009. "Program Areas." http://www.rwjf.org/programareas

Roberts, Donald F., and Ulla G. Foehr. 2008. "Trends in Media Use." *The Future of Children* 18:11–37.

Robertson-Wilson, Jennifer, Joseph Baker, Erin Derbyshire, and Jean Côté. 2003. "Childhood Physical Activity Involvement in Active and Inactive Female Adults."*AVANTE* 9:1–8.

Rogers, Cosby S., and Janet K. Sawyers. 1988. *Play: In the Lives of Children.*

Rubin, Kenneth H., Greta G. Fein, and Brian Vandenberg. 1983. "Play." In *Handbook of Child Psychology: Vol. 4. Socialization, Personality, and Social Development*, edited by E. Mavis Hetherington, 693–774.

Sinclair, Jeff, Phillip Hingston, and Martin Masek. 2007. "Considerations for the Design of Exergames." Paper presented at the 5th International Conference on Computer Graphics and Interactive Techniques in Australasia and Southeast Asia, Perth Australia, December 2007. https://blog.itu.dk/MOSP-F2010/files/2010/04/sinclair07.pdf.

Singer, Dorothy G., Jerome L. Singer, Heidi D'Agostino, and Raeka DeLong. 2009. "Children's Pastimes and Play in Sixteen Nations: Is Free Play Declining?" *American Journal of Play* 1:283–312.

Sutterby, John A., and Joe L. Frost. 2002. "Making Playgrounds Fit for Children and Children Fit for Playgrounds." *Young Children* 57:36–41.

Tan, Ben, Abdul Aziz, K. Chua, and Kong Chuan Teh. 2002. "Aerobic Demands of the Dance Simulation Game." *International Journal of Sports Medicine* 23:125–29.

Thin, Alasdair G., Lisa Hansen, and Danny McEachen. 2011. "Flow Experience and Mood States While Playing Body Movement-Controlled Video Games." *Games and Culture* 6:414–28.

Thin, Alasdair G., and Nicola Poole. 2010. "Dance-based ExerGaming: User Experience Design Implications for Maximizing Health Benefits Based on Exercise Intensity and Perceived Enjoyment." In *Transactions on Edutainment IV*, edited by Zhigeng Pan, Adrian David Cheok, Wolfgang Müller, Xiaopeng Zhang, and Kevin Wong, 189–99.

Unnithan, Viswanath B., William Houser, and Bo Fernhall. 2006. "Evaluation of the

Energy Cost of Playing a Dance Simulation Video Game in Overweight and Non-overweight Children and Adolescents." *International Journal of Sports Medicine* 27:804–9.

U.S. Department of Education. 2009. "Carol M. White Physical Education Program." http://www2.ed.gov/programs/whitephysed/index.html.

Valsiner, Jaan. 1989. *Human Development and Culture: The Social Nature of Personality and Its Study*.

Warburton, Darren E. R., Shannon S. D. Bredin, Leslie T. L. Horita, Dominik Zbogar, Jessica M. Scott, Ben T. A. Esch, and Ryan E. Rhodes. 2007. "The Health Benefits of Interactive Video Game Exercise." *Applied Physiology, Nutrition, and Metabolism* 32:655–63.

Weuve, Jennifer, Jae Hee Kang, JoAnn E. Manson, Monique M. B. Breteler, James H. Ware, and Francine Grodstein. 2004. "Physical Activity, Including Walking, and Cognitive Function in Older Women." *The Journal of the American Medical Association* 292:1454–61.

Widman, Lana M., Craig M. McDonald, and R. Ted Abresch. 2006. "Effectiveness of an Upper Extremity Exercise Device Integrated with Computer Gaming for Aerobic Training in Adolescents with Spinal Cord Dysfunction." *The Journal of Spinal Cord Medicine* 29:363–70.

Wikipedia. 2011. "Exergaming." http://en.wikipedia.org/wiki/Exergaming.

Yang, Stephen, and George Graham. 2006. "Exergames: Being Physically Active While Playing Video Games." *EKIBOLOS (Biannual Bulletin of the Hellenic Academy of Physical Education)* 4:5–6.

Youngquist, Joan, and Jann Pataray-Ching. 2004. "Revisiting 'Play': Analyzing and Articulating Acts of Inquiry." *Early Childhood Education Journal* 31:171–78.