Exergaming and physical education: A qualitative examination from the teachers' perspectives

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ABSTRACT

Active video games, or exergames, which require the physical movement of the participant's body, are being recognized as one possible solution to a diminishing interest in childhood physical activity. Exergaming extends beyond the home and arcade and into the education sector, where it is being used as part of the physical education (PE) curriculum. This study is a qualitative examination of two elementary school PE teachers' reflections of a six-week exergaming program with their fourth grade students. Through a phenomenological approach, semi-structured interviews were conducted, transcribed and analyzed. Analysis through Social Cognitive Theory revealed several themes including the value of exergaming, student motivation, tailoring needs, accountability, self-awareness and challenges with implementation. Teachers in the study reported that exergaming was a positive curricular option that was students enjoyed resulting in high levels of student engagement. The variety of exergame activities provided a diverse learning experience that resulted in sustained engagement by the students. Student accountability appeared to help them focus on the task and enable them to make connections between their exergame movements and other movement activities. Challenges highlighted include the cost of the equipment, confidence in the use of technology and potential overuse. Future studies might consider investigating how teachers can objectively measure the connection between exergaming and student attitudes toward physical activity.

Keywords: exergaming, elementary school, physical education, teachers, children

INTRODUCTION

The infusion of technology into everyday life has become the new norm in society (Townsend & Gurvitch, 2002). How children perceive and interact in their environments is largely influenced by the pervasive use of rapidly advancing digital technology. Technology has contributed many positive enhancements and conveniences in society, but it has also fostered a culture where screens such as televisions, computers, video games, and smart phones, promote a sedentary lifestyle (Straker & Abbott, 2007). The increase of sedentary "screen time" among children is linked to such negative consequences as poor physical and mental health, increases in childhood obesity, higher incidences of cardiac disease in children, and academic difficulties (Hancox, Milne, & Poulton, 2005; Hayes & Silberman, 2007; Robinson, 2001; Vandewater, Bickham, & Lee, 2006; Vandewater et al., 2005; Vandewater, Shim, & Caplovitz, 2004).

Videogames, more so than television, are the culprit for the negative physical and social outcomes (Vandewater et al., 2004). Nearly all (97%) American teens ages 12-17 reported playing video games (Lenhart et al., 2008). An estimated 90 million people worldwide over the age of 10 self-identified as "gamers" (those who regularly play video games; Hansen & Sanders, 2008). Stereotypes of gamers include obesity, isolation, and a skewed sense of reality (Kowert, Festl, & Quandt, 2014; Kowert, Griffiths, & Oldmeadow, 2012). Conversely, there is an increased understanding of the educational benefits related to gaming technology that, until recently, has been overshadowed by these negative stereotypes (Hayes & Silberman, 2007). Positive learning outcomes such as problem solving, memory building, spatial awareness, and visual selectiveness can be developed through video game play (De Lisi & Wolford, 2002; Fery & Ponserre, 2001; Gee, 2007). Video games can also provide the opportunity to practice new skills in a safe and low-risk learning environment (Green & Bavelier, 2003; Hayes & Silberman, 2007; Ko, 2002).

Digital game-based learning (DGBL) environments fit perfectly within the realities of children today where information is streamed quickly and from multiple sources. Due to these fast-paced and multi-sensory environments, children are beginning to find the traditional education delivery methods boring, resulting in a motivational disconnectedness (Hansen & Sanders, 2008). As a result of the rapid changes in technology and the availability of technology to today's students, a new style of learning has emerged: "neomillenial" learning (Dede, 2005). Neomillenial learning involves fluency in multiple media and virtual settings; communal learning with information supplied to the group as well as the individual; a balance between experimental learning, guided mentoring and reflection; nonlinear articulation of ideas; and personalized learning experiences tailored to the individual (Dede, 2005). In order to engage and optimize the effectiveness of the learning environment, curriculum development needs to take into account the neomillenial learning style (Hansen & Sanders, 2008; Manley & Whitaker, 2011; Townsend & Gurvitch, 2002). DGBL allows students to learn through visual, auditory, kinesthetic and reading cues (Van Eck, 2006). By including DGBL in the curriculum, an augmented environment is produced in the classroom. Learning through DGBL technology takes place within a meaningful context where the learning is relevant (to the game), applied, and practiced within a simulated context (Ennis, 2013; Van Eck, 2006). Contextual learning is more beneficial than learning outside of the context. Additionally, the individual learner is gaining information within a social and communal context.

Schools have not been shy to incorporate computers and various other forms of technology into the classroom and broader infrastructure (c.f.,

http://education.alberta.ca/admin/technology/tools-and-resources.aspx). Physical education (PE) has also benefitted from the technological shift to engage neomillenial learners. In fact, the inclusion of technology in PE is not new: heart rate monitors, pedometers and video analysis have been in use for a long time. Using technology in a PE curriculum is not intended to replace traditional physical activity (PA) or PE teachers, but rather act as a complementary tool that can serve as a bridge to engage the students within their own culture and promote a healthy active lifestyle (Baranowski, Buday, Thompson, & Baranowski, 2008; Hansen & Sanders, 2008; Townsend & Gurvitch, 2002).

Within the educational framework, specific to PE is the trend of active gaming, or exergaming. Exergames combine PA with gaming technology by integrating the player's physical body movement as the controller, thus providing an alternative to sedentary game play (Klein & Simmers, 2009). Some exergames are targeted specifically for health benefits, while others are more focused on entertainment with possible physical benefits as an added bonus (Suhonen, Väätäjä, Virtanen, & Raisamo, 2008). Exergames often have a personal assessment system in place to keep track of performance improvements (Trout & Christie, 2007). Keeping track of progress helps to maintain a high level of motivation (Lieberman, 2006) through the promotion of goal setting and encouragement to proceed. Some even go as far as having a heart rate monitor or approximated caloric expenditure calculator, depending on the purpose of the game (Trout & Christie, 2007). Regardless of the purposeful design of the exergame, they are appealing, engaging, and fun for a wide demographic (Hansen, 2010; Lieberman, 2006).

There is growing empirical evidence of the health benefits for exergame players such as cardio-respiratory improvement (Unnithan, Houser, & Fernhall, 2006), energy expenditure (Bailey & McInnis, 2011; Peng, Lin, & Crouse, 2011; Straker & Abbott, 2007), improved BMI (Ni Mhurchu et al., 2008), improved fundamental movement skills (Sheehan & Katz, 2012, 2013), and an increased understanding physical literacy (Sheehan & Katz, 2010). This evidence has led to the inclusion of exergaming in many schools and school districts. However, there remains very little evidence from the perspective of the PE teacher to support this inclusion. What evidence does exist tends to report on the opinions of pre-service teachers (Jenny, Hushman, & Hushman, 2013; Lin & Zhang, 2011a, 2011b; Zhang & Lin, 2011) more so than those currently in-service (Krause, 2013; Meckbach, Gibbs, Almqvist, Öhman, & Quennerstedt, 2013). The purpose of this qualitative study was to investigate the teachers' perspectives of the benefits and drawbacks of a six-week PE exergaming unit that was successful in demonstrating positive outcomes in elementary-aged children (Sheehan & Katz, 2013).

Theoretical Framework

Social Cognitive Theory (SCT) suggests that part of an individual's knowledge acquisition can be directly related to observing others within the context of social interactions, experiences, and influences from outside media (Bandura, 1989). Adopting that approach allows for the design, implementation, and evaluation of programs (Staiano, Abraham, & Calvert, 2012). (Staiano, Abraham, & Calvert, 2012). Environment, students, staff and behavior are in constant flux as they interact with each other in a PE lesson. This qualitative examination of teachers' views of the use of exergames in a sixth grade PE program fits well with SCT. Through reviewing teacher comments it may be possible to explain how participants acquire knowledge. In addition, it should be possible to explain what the teachers experienced and how the exergaming curriculum affected their view of lesson effectiveness.

On the student level, exergaming may promote the feeling that each player can control his or her own fate. Peer feedback, social interaction, and environmental factors related to exergaming may affect the self-efficacy and self-esteem of the player (Krause & Benavidez, 2014; Song, Peng, & Lee, 2011). Positive outcomes may prompt exergamers towards beneficial intrinsic motivation to move (Staiano & Calvert, 2011). These positive effects may be the result of student trial and error or from watching others involved in an activity (Bandura, 1989) as exergamers learn from each other and from the exergame's virtual environment. The reciprocal interaction of environment, social contact and behavior can be explained by SCT (Vernadakis, Gioftsidou, Antoniou, Ioannidis & Giannousi, 2012). SCT also addresses the teacher responses to the effectiveness of the exergame program as a result of the learning that occurred while engaged and while observing the exergaming lessons.

METHOD

Participants

This study involved two female elementary school PE teachers. Teacher one (T1) was 35 years old with 10 years of teaching experience and teacher two (T2) was 47 with 20 years of teaching experience. Previous exposure to the exergame curriculum and use in PE was limited to a brief one-week orientation period in the previous year with some fourth grade students provided by the researchers for T1 in order to make sure the equipment worked and determine the amount of space needed for the exergame equipment. Both of the teachers in this study indicated that they were novice exergame users when the program began.

Procedure

This study is the qualitative examination of the teachers' experiences of a six week, fourth grade PE exergaming unit. Student outcomes in the exergaming unit were the topic of another study, described in Sheehan and Katz (2013). Briefly, the study took place at a public elementary school in Calgary, Alberta, Canada. Two classes of students (N=65) led by two PE specialist teachers used a variety of exergames specifically targeting several components of physical fitness including flexibility, balance and postural stability, cardiovascular fitness, rhythmic coordination and hand-eye coordination. A 750ft² elementary school stage was converted to an exergaming teaching station. This living lab is the Canadian Exergaming Research Centre (CERC; www.ucalgary.ca/exergaming). A privacy curtain was installed to eliminate the visual distractions between teaching stations. Exergames used by the students were iDance™ (Positive Gaming BV, Hillegom, Sweden), WiiFit Plus™ (Nintendo, Kyoto, Japan), XR-Board™ (iTech Fitness, Denver, CO, USA) and Lightspace™ (Lightspace Corporation, Boston, MA, USA). Two extra carts with exergaming equipment were kept in reserve in case of equipment malfunctions. Fourth grade students used the lab five days a week for six weeks, for ½ hour each day. Third grade three students used the lab three days a week for six weeks, for ½ hour each day. Students were required to keep personal logbooks to track their performance throughout the unit. They were encouraged to write personal reflections on skills that they found easy or were improving at, and those that needed improvement.

Measurement and Analysis

The study was conducted using a phenomenological approach intended to gain an understanding of the teachers' perceptions about the exergaming program in fourth grade PE (Creswell, 2007; Hesse, Biber, & Leavy, 2011; Marshall & Rossman, 2006). Data collection was completed in two separate semi-structured interviews of approximately 40 minutes each with each of the two teachers (T1 and T2). One-on-one interviews were conducted in the PE office using video recording and a list of open-ended questions. Transcriptions were done verbatim. Through data immersion, careful descriptive and analytical coding was assigned to the transcriptions using NVivo 8 software developed by QSR International. Codes were then reduced to themes that were used to create a narrative of the PE instructors' perceptions of the exergaming program. All research was conducted with the approval of the University of Calgary's Office of Medical Bioethics.

THEMES

SCT and data analysis revealed the following themes and subthemes: student motivation, variety and individual needs, accountability and self-awareness, and challenges.

Overall perceptions

The overall reception of the exergaming program for both of the PE teachers was very positive and they felt the student response was also favorable. T2 was initially worried that a full six-week block of exergaming would be too long. After the first three exergame sessions, T2 saw enthusiasm and performance improvements with the students and found that the exergaming unit went by quickly for both her and the students. However, both T1 and T2 agreed that in the future they would provide the students with a detailed introduction to the equipment and expectations followed by shorter blocks of exergaming throughout the school year. They believed that the periodic use of the exergaming center would be a better utilization of the equipment and would result in sustained interest.

Both teachers described their preference for the iDance and suggested that it was the most vigorous game used in the trial because it noticeably increased the students' heart rates and energy expenditure (pedometers and pulse monitors were used by the children) and the data was available to the teachers. T1 and T2 both found that the XR-Board, which targets the students' balance, was the most difficult activity for the students. T1 postulated that this could be due to the stage that the pre-adolescent children were at developmentally.

The potential that exergaming could play as an integrated teaching tool and as an alternative teaching environment was evident in the comment by T1:

> The fact that kids are in a different kind of exercising world compared to some of the traditional gymnasium activities that might be part of phys ed programs, I think we need to honor that, and help them realize how to make any activity a productive way of their life.

Student Motivation

The PE teachers found that student enthusiasm for the program was quite high; however T1 mentioned the interest for PE was also high with most non-exergaming activities. T1 recognized that exergaming was something that most of the students were interested in since many of them had consoles in their own homes. T2 suggested that the use of the games in the PE classroom was a "huge privilege" and the students felt very proud to have this opportunity in their school.

> T1: It was really highly motivating for them; they were really into exergaming. I thought that, depending on what station they were at, the engagement for all of them was almost equal, it didn't matter what station they were at, they were all excited.

The enthusiasm for exergaming continued throughout the entire length of the unit, especially when the students began to notice improvements in their performance. Students reported to the teachers "with great gusto" (T1) their achievement of higher scores, increased heart rates, and general successes associated with the progress they were seeing.

Neither teacher observed a notable preference by gender to one game over another, which is consistent with previous research (Straker & Abbott, 2007).

> T2: I would have thought it would have been more girls on the dance, but there are boys that are just as into it as girls and vice versa… but I'd say they equally enjoyed the experience and they equally participated in all the activities. At that age, they work similarly together and they work well together and they all enjoyed every aspect of it.

Variety and Individual Needs

Both instructors found the number of exergames was useful in maintaining engagement with their classes. It also gave them an appreciation for the diversity of interests within their classrooms. T1 believed that the iDance was going to be the most popular game offered, but was surprised by the mixture of preferences among the students. T2 found that the variety added a sense of challenge for the students to master each station. She noted that each type of activity required different motor skills, which also contributed to the sustained engagement of the students throughout the program.

Both instructors appreciated how each game could be tailored to the individual needs of a student, thus allowing them to achieve success and perform at their optimal level. T1 noted this autonomy gave the students control over their personal learning as opposed to keeping up or holding back to the average level of the class. The exergames were also designed with built-in assessment tools that provided immediate feedback and guidance to the students so they could carry on at their own pace without the approval of the teacher. This level of independence left the teachers with more freedom to give those students who really needed extra attention the time they required:

> T1: As a teacher, it gave me a lot more opportunity to do one-on-one talking with kids because they got feedback from the exergaming stuff… so I was able to talk with other kids that maybe they weren't doing the expected exercise properly.
> T2: I noticed it's almost like one-on-one instruction when they're doing, like, the yoga or the strength on the Wii. Whereas when I'm teaching a group of 25 or 50 kids, and it's one person, I can't always see everybody and give them constant or immediate feedback.

Accountability and Self-Awareness

Students were required to keep personal logs of how they did in each activity during every class, which were available for the teachers to read. The logbooks allowed all students to monitor their progression over the six weeks and made for an efficient daily start-up since the students knew what game level they last completed. It was also a quick reference for the teachers to monitor progress.

In addition to simply writing down the scores each day, students were encouraged to make a critical reflection of their results and how they could improve in the following class. If a student was struggling with an activity, it afforded the student with an opportunity to think about why that was happening and to ask for help if necessary. This helped create a sense of accountability for the students' own fitness as described by T2:

> The accountability it gave to the kids was well worth it because then they didn't feel like they were just going up there [to the CERC] to play; they were going there for learning, to learn about it, and then to record what they did, and then to build on that result to improve on what they've done already in their performance.

The self-reflective component of the logbook permitted the teachers to observe an increase in students' self-awareness of their fitness for most students:

> T1: I think they were starting to understand the feedback [from the exergame]. To begin with, initially those numbers were kind of just numbers, but then as we talked to them about what those numbers meant…they became more attentive to what they meant and to trying harder to improve their result.

The students started making connections between the movement skills used in the exergames and how those skills can be transferred to other physical activities. For example, some students started to recognize that the balance and core strength necessary for the XR-Board would be useful when they actually go snowboarding.

Challenges

Both teachers acknowledged the benefits of using exergaming technology in their PE classrooms, but they also recognize the limitations to generalizability. One major hurdle is the constantly evolving nature of technology, which makes it hard to stay current with the equipment. T2 cautioned that it would be difficult for the average public school to have a program like this. It is costly for schools with limited funding for PE programs to obtain the necessary equipment; therefore, a gradual build-up of equipment may be the best approach to

starting an exergaming component in any school. Another obstacle mentioned by the teachers is finding a space to play and to store securely the equipment. Battery costs for the remote controls were mentioned more than once by T2 as an ongoing expense requiring consideration. T2 suggested that students bring their own batteries as a "club fee" to use the exergaming equipment as well as incorporating costs into the PE budget. T1 recommended that including batteries as part of the required classroom supplies list at the beginning of the year might also work.

Another challenge brought up during the interviews was the idea of teacher confidence in using the technology. Inevitably, problems occur with the equipment and teachers need to be able to troubleshoot to ensure that the curriculum runs smoothly.

> T2: When something goes wrong, I'm not necessarily sure how to fix it… and so eliminating down time so the kids aren't just standing around waiting for you to figure out how to fix it is important. It also takes time to turn all the equipment on and turn it off, that's why establishing a good routine is important.

Both PE teachers had a backup plan for when technical difficulties occurred. When a piece of equipment was not correctly operating, they used the portable exergaming alternative on one of the two library carts as substitute to the student's scheduled exergaming activity.

DISCUSSION

This study solicited the opinions of two elementary school specialist PE teachers on the use of exergaming as part of the curriculum. Very few studies of this kind exist: the majority of teacher data on exergaming in PE comes from pre-service teachers. This study, therefore, adds to the current body of literature by expanding what we know about specialist PE teachers' desires to include exergaming in the classroom. Social Cognitive Theory helps to frame the results of this study. Students and teachers used observations during the exergame lessons to develop new knowledge based upon their social interactions, present and past experiences.

Using exergames in PE can advance a student's knowledge of health, wellness and fitness. The teachers were excited about the possibility of linking technology to the health and wellness aspect of the curriculum. The teachers in this study stated that the exergaming program was successful at engaging students and maintaining their interest and motivation to be physically active. One student even reported to T1 that they were going to begin using their game console more at home because of the opportunity afforded to this student at school. These responses to exergaming are mirrored in a study of pre-service teachers engaged in teaching exergaming to PE students where the teachers felt as though the exergames were motivating both in the class and had potential to translate to activity outside of the classroom (Jenny et al., 2013). Furthermore, T1 mentioned overhearing a student stating that the individual already knew how to snowboard simply from using the XR-Board. This sense of confidence because of exergaming could be an indication that the student might engage in the actual outdoor sport.

The ability of exergames to be tailored to the individual needs of the students in terms of competence, provides the students with a great deal of autonomy and control over their learning. Being able to progress at their own pace allows students to choose when they are ready for a greater challenge or when they need additional practice to gain more confidence at the current skill level. For those students who are not very physically active in outside of the PE classroom, positive experiences with exergames can be the element that encourages more active pastimes. Technology and exergames have been noted for their ability to encourage participation in PE

class (Gao, Zhang, & Stodden, 2013; Gibbone, Rukavina, & Silverman, 2010), especially for those who lack confidence and skill (Epstein, Beecher, Graf, & Roemmich, 2007; Staiano & Calvert, 2011). Using exergames has also been credited with improved attendance in class, an obvious benefit in promoting PA (Lin & Zhang, 2011a; Warburton et al., 2007)

Teachers in the present study believed that there would be a preference by one gender over another for certain exergames; however, this is not the case as both boys and girls expressed enjoyment of each exergame. While gender differences are noted in the literature for traditional games and sports, where girls are often less active than boys (Chorney & Weitz, 2009), there appears to be no gender bias when using exergames: both genders select exergames fairly equally (Lieberman et al., 2011). Ntoumais et al. (2001) posit that autonomy is a factor in encouraging gender equality in sport; an element embedded within the exergames chosen for this study. From a curriculum development perspective, this is encouraging, as co-educational classes employing the use of exergames may not experience the same lowered participation levels demonstrated by girls in traditional PE classes.

The teachers in this study are confident that the use of logbooks by students served to create further personal meaning to the exergaming efforts in class. The logbooks also provided a level of accountability for each student when reflecting upon their personal performances. Tracking personal progress provided a mechanism for students to become cognitively involved with their fitness through a process of critical reflection. Very little evidence on the use of logbooks in PE exists. One study found that children who used logbooks as part of an intervention to increase PA demonstrated higher activity counts than control children (Pangrazi, Beighle, Vehige, & Vack, 2003). These authors, however, did not parse out the logbook contribution, and therefore the actual impact cannot be determined. Logbook research from other fields of study have reported success. “Learning managers” used student logbooks to encourage dialogue with students and create an opportunity for teacher-student engagement on a more personal level (Borredon, Deffayet, Baker, & Kolb, 2011).

Concerns raised by the teachers that troubleshooting would be difficult with their limited knowledge were assuaged by supports put in place. Having extra consoles available for unit malfunctions saved time. In addition, some students proved to be adept at navigating minor problems that arose.

The cost of introducing an exergaming unit into the PE curriculum is of concern to the teachers in this study and is a topic commonly discussed by researchers, teachers, schools and school districts (Hayes & Silberman, 2007; Meckbach et al., 2013; Trout & Christie, 2007; Yang, Smith, & Graham, 2008). In addition to the costs to purchase multiple exergaming consoles to avoid wait times, there are the individual games to buy and associated maintenance costs. Pre-service teachers mentioned that having large groups and having to wait for a turn was detrimental to the implementation of exergaming programs (Lin & Zhang, 2011a). Teachers in this study suggested offsetting the cost of batteries by placing that responsibility on the students and their parents, however that cost is minimal. Another possibility could be to set up an exergaming club where dues are paid. In the United States, there are granting agencies (e.g., the Carol M. White Physical Education Program) that provide funds specifically for PE; an option that would cover the majority of the set-up costs.

Analyses of the teacher interviews suggest that this experience was successful for both the teachers and students. Exergaming incorporates the students’ cultural context of technological self-assurance and the neomillenial learning style with outcomes related to fitness and personal health in a fun and engaging way. The independence of the delivery method affords

the teachers more freedom to provide extra attention to those students who need it, while not crowding those who exhibit greater independence. Most importantly in terms of learning and behavior modification, according to the teachers the students had many opportunities to take active control over their own learning by making connections to their past experiences using technology.

It is a concern that technology, which cannot provide a robust curriculum that addresses the core components of PE, may supplant the need for PE professionals (Buschner, 2006; Daum & Buschner, 2012; NASPE, 2007). The idea of introducing exergaming into the PE curriculum is not to replace PE specialists but to improve upon student engagement by making PE more relevant to neomillenial learners. There are ways to maximize the benefits of exergames in PE and connect them to other school objectives. Recent research has shown that exergames can benefit students with increases in social, cognitive and emotional growth when played proximally between students (Finkelstein et al., 2011; Graves, Ridgers, Williams, Stratton, & Atkinson, 2010; Haddock et al., 2012) and when played remotely over the internet (Kooiman & Sheehan, 2013; Kooiman & Sheehan, 2014; Kooiman & Sheehan, 2015b). Today's youth use technology to interact socially, communicate in real-time, work with their peers and immerse themselves in virtual experiences (Revere & Kovach, 2011). Exergames should not be feared or viewed with suspicion but can be embraced for the potential they add to PE curriculum (Kooiman & Sheehan, 2015c) and the connections they allow between neomillenial learners.

Future studies might consider investigating the comment heard by T1 regarding "knowing how to snowboard" by playing the virtual version of the sport. Teachers in previous studies have commented that exergames do not teach movements wholly or properly (Jenny et al., 2013) and could therefore create a false sense of confidence. It would be interesting to understand how students translate what they have learned in a PE exergaming unit to other real-life PA opportunities, and how they deal with successes and failures.

The teachers mentioned that they would like to see the exergames used periodically throughout the school year. Knowing that there are physical and academic benefits from exergaming when used in blocks of time, understanding if benefits can be realized when used intermittently needs to be assessed.

Limitations

As the opinions of only two teachers were solicited for this study, the generalizability is limited. Understanding that only those teachers who were involved in the fourth grade exergaming study (Sheehan & Katz, 2013) were interviewed, future research should involve a larger sample of in-service PE teachers. It has been suggested that younger teachers, male teachers, and those who are more intimately familiar with technology, specifically exergaming, are more open to using it in the PE classroom (Gibbone et al., 2010; Jenny et al., 2013; Meckbach et al., 2013). While enjoyment was not quantifiably measured in this study, both teachers were female with many years of experience and they both enjoyed the technological addition to the PE classroom. Future studies may consider the gender and age implications on exergaming in PE.

What is important to distinguish is that not all games are good for all students and not all games can provide positive educational outcomes (Van Eck, 2006). The exergames selected for this study were done with the express intention of increasing energy expenditure and improving several aspects of physical fitness. Other exergames may not necessarily provide the same PA

and educational benefits and may therefore not be as well received by PE teachers as those discussed here. When designing a PE exergaming program, care must be taken when selecting exergames to ensure that they are in line with the goals and objectives of the curriculum.

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