ABSTRACT

Technology assisted physical activity, known as exergaming, requires participants to more-or-less become a part of a video game by engaging in it physically. Researchers have investigated exergames for their ability to affect positive physical, cognitive, social and emotional changes in the participants in classroom and lab settings.

To date, little if anything is known about the effect of an exergame when played remotely over the internet. The ability of the gaming systems to connect over the internet for head-to-head competitive or cooperative play may place exergames at the forefront of the search for the social and emotional curricular pieces which can be used in online physical education (OLPE) courses. Empirical evidence into the efficacy of using exergames in secondary OLPE curricula could help to provide much needed information as to whether exergames might be considered best practice. This paper previews a recently completed research study that can shed some light on this important question.

KEY WORDS

Online Learning, Exergaming, Game Based Learning, Physical Activity, Educational Technology

1. INTRODUCTION

In its infancy the internet was not available to the masses; it took some time before the internet, originally created for universities, caught on with the general population. Once the technology became widely available, society embraced it as it had the television and the radio which preceded it. This technology has opened the door to activities, information, productivity and education not possible in the past. In the years that followed its debut, online education created a new type of learning for a new class of learner. Students, who struggled to succeed in brick-and-mortar classrooms were provided with an avenue to pursue an alternative education stream. To date, 48 states and the District of Columbia offer online educational opportunities for secondary students [1].

One reality of the rapid transition to online learning is that, in many cases, it has outpaced research into best practice. This rush towards e-learning has created an urgent need for research into online learning. Research into online physical education (OLPE) has lagged even farther behind. This has led to the use of OLPE curricula which fall short of a robust traditional curriculum. Most secondary school OLPE courses focus on the cognitive pieces of the curriculum and to a lesser degree fitness for life. The omission of the social and emotional parts of the curriculum and a severe reduction in the ability to monitor physical outcomes in OLPE has created a chasm in the understanding, growth and development of students who take OLPE courses. This void has created a need for innovative and updated curricular content, based on best practice.

2. ONLINE PHYSICAL EDUCATION

It has been suggested in the recent past that OLPE courses offered to secondary students are not real PE and do not meet the standards for authentic PE instruction. When scrutinized, it does seem far fetched that a student would learn about being physically active and physically literate while sedentary in front of a computer screen. This evaluation has led to the view of OLPE as an oxymoron and has created a divide over the viability of this mode of learning in the development of physically literate and active youth. This viewpoint, however, may be changing. With a greater number of secondary students opting to make use of a wider network of entirely online or hybrid/blended (some online and some face-to-face) courses, OLPE may be an oxymoron of the past [2].

In 2007, the National Association for Sports and Physical Education (NASPE) stated that PE teachers were divided on their view of the viability of OLPE [3]. The official NASPE position at that time was that OLPE was a neutral method of learning and the good or bad of the delivery model would be borne out by the impact it had on learning. To this day, some still question the validity of OLPE as a viable educational alternative for face-to-face PE due to a perceived negative impact on learning [4].
There seems to be minimal research to support OLPE, so it is no surprise that many PE teachers still advocate for face-to-face instruction to ensure that appropriate learning and skill development are taking place [3]. Many individuals, including political representatives, question whether or not OLPE should even be offered to students [5].

There are some very real problems with the delivery of secondary OLPE content and even greater problems with the assessment of student learning [3, 6]. In a recent survey of OLPE classes, it was found that nearly 75% of the course offerings did not meet the national guidelines for secondary physical activity (PA) time in a week [4]. This survey also revealed that a majority of OLPE teachers reported using curricula which focused predominantly on the acquisition of cognitive facts with a smattering of lifetime fitness activities while sidestepping the emotional and social aspects of the PE curriculum. Additionally, effective evaluation of OLPE classes has been called into question. Stories of students submitting inaccurate activity logs are what may keep many physical educators from fully embracing OLPE [3-4].

If OLPE is to overcome these perceived issues, it needs to address its shortcomings. Firstly, OLPE is different from traditional PE and cannot be compared directly with the gymnasium-based version. This notion may create apprehension and hesitation amongst teachers who are not sure how to make this delivery model relevant and meaningful for both teachers and students. Second, buy-in from teachers could be lower as a result of the concern that OLPE could displace PE teachers with web proctors who have no personal connection to the student and no training in kinesiology, instructional techniques, or the principles of movement and sport. Already some states allow for OLPE instruction by teachers without PE training [4]. How can modeling take place when there is no face-to-face contact? Indeed one of the benefits noted by the NASPE [3] report was that OLPE would help schools offer PE when they lacked trained PE teachers. Third, there is very little empirical evidence to suggest that secondary students can effectively acquire PE knowledge and skills remotely [3-4]. Best practice does not yet exist in this field and there is an urgent need for sound curriculum development based in evidence [2, 6-7]. Without relevant research into best practice, teachers are finding it difficult to expand the curriculum past the cognitive and fitness aspects of PE [4].

Nevertheless, looking to the future, an optimistic NASPE [3] position paper encouraged the exploration of common technology (Internet, computer, etc.) for the implementation of OLPE courses as well as a hybrid/blended model for delivery to alleviate the concerns for learning outcomes. Blended learning is seen by some as the next big surge in online education [1]. The rapid increase in the number of secondary students opting to take online or hybrid/blended courses should be the primary reason to create a robust curriculum. There are, however, other reasons, such as the increase in sedentary behavior exhibited by teenagers in general and the need to get them to become more physically active. The trend toward obesity is due in part to a lack of motivating curricular options especially, for students who are not inclined to move [8]. As more and more youth take OLPE, it is imperative that these students are engaged in curricula which can help to inspire them to be active for life.

3. THE ONLINE LEARNING TRANSFORMATION

If there are so many potential pitfalls with the implementation of OLPE, why is there a continued push to offer PE courses online? The simple answer is that the horse has already left the barn. This colloquial idiom speaks to the reality that many public, charter and private schools across the United States and around the world have already begun to offer online courses and it is too late to go back. While the exact number of students attending online schools or taking at least one online course in the US is not known due to poor accountability, it is estimated to be approximately 5%, or several million students between kindergarten and 12th grade [1]. Blended and online programs created specifically for the use of one school district’s students are the largest and fastest-growing segment of blended and online learning [1]. Five states require that their students take at least one online class before graduating from secondary and three more strongly encourage the same [1, 9].

The cost savings associated with online learning may be one factor which has led to the upsurge in online education at the administrative level. Cost, however, does not explain why students are enrolling in greater numbers than ever before. Changes in technology have allowed for social and educational opportunities which were not available in the past. These changes are now part of the very social and cultural fabric of our world. Today’s youth use technology to interact socially, communicate in real-time, work with their peers and immerse themselves in virtual experiences [10]. It is only natural that some youth would gravitate towards online learning which mimics their social lives, and allows for the integration of technology into their educational growth [6].

Some of the push for OLPE is driven by a diverse student population. Many students are not drawn to the traditional model for PE for a variety of reasons. Students who do not demonstrate an aptitude for PA tend to shy away from settings where success is contingent on being the best. Some students lack confidence in their physical abilities and appreciate a class where intimidation and peer pressure are less ominous [11-12]. Students who choose online courses may have health issues that keep them from participating in a traditional class setting. Other students may just prefer the flexibility of being able to
study at their own pace. OLPE provides an opportunity to fulfill course requirements in each of these situations.

Executed properly, some feel OLPE can make programs better and are positioned to play a vital role in the future of physical education, health education and overall academic success [12]. This assertion originates from research showing that after short bouts (≤ 20 minutes) of PA, students performed better academically [13-14]. In addition to the academic benefits, research has shown that individuals who must sit for long periods of time should engage in short bouts of activity that total 60 minutes throughout the day [15] to prevent an increased risk for diabetes, heart disease, and death. If students can stagger their OLPE courses in between other online classes, short bouts of PA could be realized more effectively than in a traditional classroom.

Researchers have just begun to study OLPE curricula. More needs to be learned before an OLPE course can declare that it meets all of the PE standards [16]. Educational institutions offering OLPE aim to provide programs which meet the needs of the students; unfortunately, not much of the curriculum in use to date has been validated by research [2, 6].

There continues to be a perception in education that non-traditional learning modalities can never sufficiently replace the learning potential of face-to-face proximity instruction [17]. The prevailing opinion is that online learning lacks rigor, limits pedagogical creativity, and does not provide sufficient student engagement with content and peers. This viewpoint has slowly been changing largely because of a recent upsurge in higher education research which shows that with improved methodology, online learning can be effective [18]. This bodes well for the future of OLPE at the secondary level.

If designed appropriately, OLPE courses could allow students to access all of the national and international content standards in PE. One area gaining much attention is the use of exergames in the PE classroom. Many researchers have suggested that exergames can help to fill the aforementioned social and emotional curricular void [7-8, 16, 19-21]. Exergames are also able to complement other areas of study as they have been shown to increase cognitive functioning [22] and help with the mathematical prowess essential to success in engineering degrees [23].

4. EXERGAMES

There are three ways to engage an exergame: side-by-side with another person in the same room; individually (or in teams) versus a non-player character (NPC) generated by the gaming system; and remotely against another person. There are three ways to engage an exergame: side-by-side with another person in the same room; individually (or in teams) versus a non-player character (NPC) generated by the gaming system; and remotely against another person. A single gaming console is capable of handling multiple players at once and systems can be connected over the internet to allow for remote, simultaneous play. This format allows for different levels of intensity which may encourage all students to participate.

Exergaming can serve as an entry level fitness activity to get people started in movement activities. By first developing skills in the virtual world, students are inclined to try real life activities [24]. Real life activities can provide a superior level of PA with increased health and activity benefits [24-25]. Thus, successful completion of less threatening exergames helps build player confidence which can lead to a willingness to try real sports activities [7]. Improved skills may be due to the increased effort participants put into the exergames they play despite the perception of exerting less effort [26]. This increased effort may be linked to the view by the students that the activity is seen as entertainment and not as exercise. Exergames that integrate movement with a gaming theme show more promise than those with an exercise theme, especially for participants who are prone to sedentary game play because of the increased entertainment value of the activity [8].

From an educational perspective, encouraging students to move in an emotionally safe environment is paramount. Many PE curricula are based entirely on sports and do not offer enough alternative PA opportunities for students who have a lower level of fitness or who do not feel confident in their abilities. Being forced into PA situations where success is not perceived as possible can lead to low motivation [11]. Students who exhibit low levels of motivation are more likely to retreat from participating and end up overweight and unhealthy. Best practice curriculum needs to address the social and emotional aspect of PA while motivating the learner to move at an intrinsic level [27].

The typical student of an OLPE class is home-schooled [12]. The home-school setting may provide fewer opportunities for social interaction as well as less opportunity for PA resulting in a lower motivation to move. Research shows that playing in groups helps to motivate lower level group members [28]. The ability to choose a cooperative or competitive play mode helps strengthen the perception of the participant that exergames offer a learner-centered activity. This can lead to a lower drop-out rate and higher student achievement and contentment [10].

Despite the growing body of research into exergames, little evidence exists of the benefits for its use in OLPE. Research on exergames has focused on individual or proximal student play. Positive effects for exergames have been found for physical, emotional, social and cognitive aspects of PE. Carefully selected exergames may help to develop students physically as they can increase heart rates to moderate levels [29] and exergames are known to promote an active lifestyle in adolescents [30]. Social interaction can be enhanced when students engage in competitive and cooperative exergame play.
over independent play [31]. Cognitive functions such as improved attention, better academic achievement and improved motor perception are also enhanced [22]. Improved motivation, increased student engagement and positive interest in the activity have also been connected to exergame participation [32].

The use of exergames is not without complications. The purchase price of the systems can be a hindrance. The ability to connect online does open up the system to remote cooperation or competition with virtual participants, but does add cost and technological logistics to the equation. Injuries are more common using exergames than sedentary game systems [33]. These injuries occur most frequently in the form of hand lacerations resulting from hand movements which strike stationary objects typically found in a home. In the educational setting it is up to the instructor to make sure the playing area is safe for the movements required by the exergame being played. In online courses, the instructor will need to advise the students and their guardians on the potential hazards of exergame play.

5. DISCUSSION

Increasingly, secondary students are enrolled in learning environments which do not allow for nor require attendance in a traditional PE class. For various reasons including family choice, health, or social situations, these students choose to learn remotely. It is clear that OLPE should use the same standards, curricula and assessments as traditional classroom-based PE to provide continuity across learning platforms. This means that methods of delivery for traditional PE and OLPE should differ only in the instructional approach [2]. Based on this premise it is as essential for online instructors of PE to pay close attention to pedagogy and best practice as in a traditional PE setting. Concerns with remote learning in the field of PE include the sedentary nature of distance learning, the lack of social contact and an inability of teachers to visually monitor student progress.

Unfortunately, little research exists on the curricula currently in place for students taking OLPE. Staiano and Calvert [34] wrote a perspective piece which culled the literature and suggested that exergames can be useful for a PE curriculum as well as other areas, but this paper did not include an empirical investigation. Online physical education courses are being created which inadequately address national and international standards for PE. Online PE teachers are being asked to create curriculum on the fly without the benefit of ‘best practice’ to guide them.

The inclusion of exergames in OLPE can tap into the natural tendency for middle school, high school, and college-aged students (young adults) to gravitate towards technology and all things related to video games. Current literature shows that exergames can induce a moderate level of physical intensity [29, 35] to offset the reality that students in traditional learning environments spend a large portion of the day seated for extended periods of time.

Competitive exergames show the most promise for increased participation due to their improved motivational scores [32, 36]. However, simply supplying exergames and gaming systems to students will not produce increases in activity levels [37]. A well prepared teacher is needed who can craft a course of study that meets the needs of the student, and will adjust instruction based upon progress monitoring in much the same way a traditional PE leader would, while also prompting the student towards PA using exergames.

Students in e-courses are typically at home. Exergames have potential to be a worthwhile method for helping students enrolled in OLPE courses gain access to physical education standards in a few ways. Exergaming requires the user to move which results in increased PA. Students enrolled in OLPE have the option of interjecting exergaming to help avoid long sessions of inactivity.

E-Learning students at home generally lack the social interaction necessary for interplay between peers. Without interaction the social and emotional aspects of the PE curriculum can be difficult to address [4]. Remote exergaming against another student can help to connect students for physical activities in ways not possible in the past. Hence, the use of competitive or cooperative exergames played against another remote student in an e-course may benefit the student physically and socially.

Cost of equipment and limited participants are possible restrictions to use. Exergames can be used in a series of exercise centers to alleviate the logistical problems associated with a lack of equipment [38]. This set-up would work well for those students who enroll in blended (hybrid) e-courses, where lab or face-to-face time with teachers and other students is a requirement in conjunction with the remote learning component. This alleviates the cost and maintenance issue that may be experienced by some students.

Whilst there has been no published research on exergaming in OLPE courses, a recent study [39] by the author of this paper has generated empirical evidence that may help position the strategy as an effective PE practice. Four aspects of PE were examined (physical, emotional, social and cognitive) in a group of secondary students (n=124) aged 11-18 in grades 6-12. Results showed that subjects recorded increases in heart rate, visual motor acuity, motivation and relatedness while playing in the remote condition. This emerging data is the first piece of OLPE curriculum that has been researched as to its effect in a remote setting. These findings begin to allow OLPE instructors to integrate exergaming into their curricula with the knowledge that there could be positive effects in all four of the main aspects of PE curriculum.
6. CONCLUSION

Exergaming attracts students of both genders by offering an entertaining activity which gets them up and moving. It taps into their curiosity with technology and helps them access PE curricula in ways they are already familiar with. The games are easily adjusted for intensity and duration. Students can connect with other players at any time from their own homes. There is still more to learn about OLPE curricula and the use of exergames. Data on exergaming as part of PE exists only in the school or lab setting. Research needs to be conducted on the effects of exergaming as a component of OLPE. Meanwhile, preliminary evidence on exergaming in schools can provide OLPE instructors with a starting point. The uptake of e-learning as an educational alternative coupled with evolving exergaming research point to the need for a closer look at the efficacy of using remote exergames to help students in an e-course participate in physical activities which address their physical, emotional, social, and mental curricular needs. Research that investigates the positive links between exergames and PE in an e-course would start to fill the void and extend ‘best practice’ into an area proposed by the new theoretical framework of OLPE exergaming. This framework is built upon a compilation of contemporary studies that recognize a new use for existing technology.

REFERENCES


