

EXERGAMES LABORATORY: A COMPLEMENTARY SPACE FOR PHYSICAL EDUCATION CLASSES

LABORATÓRIO DE EXERGAMES: UM ESPAÇO COMPLEMENTAR PARA AS AULAS DE EDUCAÇÃO FÍSICA

LABORATORIO DE EXERGAMES: UN ESPACIO COMPLEMENTARIO PARA LAS CLASES DE EDUCACIÓN FÍSICA

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Keywords:

Videogames.
Cooperative behavior.
Interpersonal relations.

Abstract: This paper presents a study about the use of exergames in structured Physical Education (PE) classes with students that usually show signs of dissatisfaction with sports activities proposed at regular PE classes. While videogames have been historically associated with issues related to obesity and social introversion, exergames brought a new perspective on those cultural artifacts. Twenty-four 8-14-year-old students participated in the study conducted in a laboratory set up in a school in Southern Brazil. They were observed and their PE teachers were also interviewed at the end of project. Results showed that students that usually did not show interest in Physical Education classes started to demonstrate a positive attitude regarding exergame practices, also expressing willingness to cooperate with their peers.

Palavras chave:

Jogos de vídeo.
Comportamento cooperativo.
Relações interpessoais.

Resumo: Este artigo apresenta um estudo sobre o uso de exergames em práticas estruturadas em aulas de Educação Física envolvendo estudantes que geralmente apresentam sinais de insatisfação com atividades esportivas propostas nas aulas regulares da disciplina. Enquanto os videogames foram historicamente associados a problemas como obesidade e introversão social, os exergames trouxeram uma nova perspectiva para esses artefatos culturais. Vinte e quatro alunos entre oito e 14 anos de idade participaram do estudo, realizado em um laboratório criado em uma escola no sul do Brasil. Os alunos foram observados e seus professores de Educação Física entrevistados ao final do projeto. Como resultado, foi possível observar que os estudantes que normalmente não demonstravam interesse pelas aulas de Educação Física passaram a apresentar uma atitude positiva em relação às práticas com os exergames, evidenciando também sua disposição em colaborar com os colegas.

Palabras clave:

Videojuegos.
Conducta cooperativa.
Relaciones interpersonales.

Resumen: Este artículo presenta un estudio sobre el uso de exergames en prácticas estructuradas en clases de Educación Física con estudiantes que generalmente presentan señales de insatisfacción frente a las actividades deportivas propuestas en las clases regulares de la asignatura. Mientras los videojuegos han sido históricamente asociados a problemas como obesidad e introversión social, los exergames han traído una nueva perspectiva para esos artefactos culturales. Veinticuatro alumnos entre ocho y catorce años de edad han participado en este estudio, desarrollado en un laboratorio organizado en una escuela en el sur de Brasil. Los estudiantes fueron observados y sus profesores de Educación Física entrevistados al final del proyecto. Como resultado, fue posible observar que los estudiantes que normalmente no mostraban interés por las clases de Educación Física, pasaron a presentar una actitud positiva en relación a las prácticas con los exergames, evidenciando también su disposición de colaborar con sus compañeros.

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1 INTRODUCTION

Children and adolescents are submerged in a society where technology pervades virtually all segments. In this context, digital games are one of the most widely used technological artifacts. Active videogames, or exergames, were introduced as a way to allow the body to control such games. As a result, they started to be seen as a tool that could help people to adopt a less sedentary lifestyle (TROUT; CRISTIE, 2007), with positive effects on health-related behavior (BARANOWSKI, 2008). However, despite controversy on whether or not those games can improve children's abilities according to public health recommendations, it has been argued that exergames might contribute to regular practice of moderate physical activity (PENG; LIN; CROUSE, 2011). By promoting interaction between players, exergames can also help reducing the feeling of social isolation and loneliness (MUELLER; AGAMANOLIS; PICARD, 2003).

Physical Education is the school curriculum discipline focused on physical activity, among other objectives. Researchers have emphasized the importance of school children performing moderate to vigorous daily exercise involving different activities (STRONG *et al.*, 2005). Based on that evidence, the US Department of Health and Human Services (2009) states that school physical activity programs should help achieve such goals, stressing that Physical Education practices should be pleasant and involve children in some sort of friendly interaction.

In this context, we need to propose new alternatives to physical exercise, seeking to meet recommendations according to which Physical Education practices should be pleasant to all students. Appreciation for the practice might not only increase the level of physical activity (DISHMAN *et al.*, 2005), but also influence adherence to long-term activities (WILLIAMS *et al.*, 2006). Furthermore, although students' attitude toward Physical Education is generally positive, individual differences might lead them to feel unmotivated to participate in class (STELZER *et al.*, 2004). Data indicate that in some cases, up to 20% of students do not like PE classes (CARLSON, 1995). Certain sports-based experiences in Physical Education have had negative impact on individuals' perception regarding physical activity (ENNIS, 1996). In those experiments, students of both sexes reported strongly disliking the practices. Therefore, the school Physical Education curriculum should incorporate different types of activity that are perceived as pleasant by all students. This was the proposal of the project presented in this article, which focused on creating an exergames laboratory as support for regular Physical Education classes.

Besides health-oriented benefits, student involvement in physical activities can also provide opportunities for social interaction, thus contributing to develop teamwork skills and the ability to cooperate. Scientific evidence has shown that well-designed Physical Education programs can contribute to improve social skills of children and adolescents and involve them in distinct social situations such as cooperation, assistance, experience exchange and problem-solving (GREGORIADIS; GRAMMATIKOPOULOS; ZACHOPOULOU, 2013).

In this article, we sought to understand how the use of exergames can contribute to physical activity and development of social skills. By focusing on these aspects, we sought to understand how practicing these games in small groups can involve children and adolescents who lack motivation to participate in regular Physical Education classes.

2 EXERGAMES IN PHYSICAL EDUCATION CLASSES

Most scientific literature related to exergames and education focuses on the game's potential to improve students' physical health, on involving them in social activities and on improving their academic performance (STAIANO; CALVERT, 2011). Recent research findings have also shown that such games can contribute to training in sports and other activities involving movement (FERY; PONSERRE, 2011) or to development of motor skills (HAYES; SILBERMAN, 2007). Moreover, it has been argued that exergames cannot replace "real sports" and might not facilitate long-term high motivation for sustainable physical activity (WIEMEYER, 2010). Such disparate views on exergames show the need to conduct further research into how those games can be used in formal education environments.

Several such studies are under way, some with conclusive results about the benefits of exergames. For example, Shayne *et al.* (2012) compared the effects of traditional Physical Education and exergames in physical activity among four active children. While at the Physical Education class the teacher led activities in accordance with regular lesson plans, students in the exergames laboratory played a series of games according to certain rules for the practice. The results showed that exergames produced higher physical activity and represented a different opportunity to engage students in social activities. In another study, Sun (2013) found that prolonged use of exergames created greater interest in physical activities for a group of primary school children, including boys and girls. These results led the author to recommend exergame practices as a possible alternative method in Physical Education practices.

Some studies have attempted to show how exergames may also contribute to the development of affective skills in Physical Education practice. Lieberman (2006) described different factors that can promote learning through games, including features that render them appropriate for social interaction: social recognition of game skills, social interaction to improve learning communities, and games as learning environments. A study conducted with a dance simulation game also showed that children who participated in activities with several players enjoyed interaction with their peers and had a lower dropout rate, playing about twice as much as the students who played on their own (Chin *et al.*, 2008).

The study described here presents an experience with an exergames laboratory structured as a complementary space for Physical Education classes. The article presents the laboratory as an educational space mainly aimed at children and preadolescents unmotivated to participate in regular Physical Education classes. The aim of the laboratory was to encourage physical exercise and allow children to work on their social skills as well.

3 METHODOLOGY

This section describes the experience of creating the exergames laboratory. The laboratory was set up in a private primary and secondary school in southern Brazil, equipped with a Wii/Wii Fit and an Xbox/Kinect console, even though only the later was used for the purpose of this research. Two commercial games were selected for the project (Kinect Sports and Kinect Adventures) because of the large variety of activities provided by those two devices, including sports games (table tennis, athletics, beach volleyball, bowling and boxing) and other games that require different body movements, such as jumping, kicking, dancing and stepping.

Twenty-four students of both sexes participated in the experiment – 12 boys and 12 girls. Meetings lasted one hour, allowing participation of a maximum of four students per group, according to age groups: 8-9, 10-11, 12-14. Participants were selected by a committee including the pedagogical coordinator of the Physical Education area, two members of the University research team involved in the project, and four Physical Education teachers.

The main trait used to select students was their lack of motivation to participate in class – a multidimensional problem that may involve factors such as sedentarianism, obesity, motor difficulties, introversion or simply dissatisfaction with activities proposed in regular classes.

In the words of a Physical Education teacher involved in the project, students invited to participate were those

[...] who perhaps don't like it a lot, those who are a little reluctant to participate in regular Physical Education classes. We sent students we thought could benefit more from the games from a motor and social perspective or simply by practicing physical activity.

Another Physical Education teacher mentioned that

[...] the students selected for the project were those who, for whatever reason, try not to take part in Physical Education classes. [...] Some children don't like to run, it's something that is not part of their daily lives and doesn't give them pleasure. The [exergames laboratory] was a way to motivate them in an activity that is different from the more common practice of team sports in Physical Education.

Over a period of three months, two researchers were involved in data collection. One of them was the instructor who promoted the activities and lessons with six different groups of students aged 8-14; the second researcher took notes on students' interactions and the practices carried out during class. Regular Physical Education classes took place twice a week, so that students who participated in the project were released from one of these classes to be able to join different practices with exergames. Therefore, the students had a regular PE class and the second class at the exergames laboratory every week during the three months of the project.

Classes were organized to offer activities to four students at a time, using Kinect Sports and Kinect Adventures. In most of the first practices, students were asked to use certain games chosen by instructors in order to introduce the games available to them and vary the practices in terms of physical intensity. After the first month, sometimes they were allowed to choose the games they wanted to use among those already listed for the project.

The non-participant observer (second researcher) was not directly involved in activities with students. His role was only to record their interactions, noting dialogues and reporting situations that showed involvement and collaboration among participants. Notes were taken in the laboratory and later expanded into written reports on what could be heard, seen and witnessed during observation, according to protocols defined by Bogdan and Biklen (2006). The researcher who worked on participant approach, in turn, interacted with students, explaining the games and giving them tips on how to use them. It was possible to observe the dynamics and the different types of social interaction among participants.

Relevant behaviors and actions observed during the meetings with students are described in the two subsections below, considering the aspects of engagement in physical activity and social interaction/collaboration. Those students' PE teachers were also interviewed so that we could know their views on the project and the activities in the laboratory.

3.1 Engagement in physical practice

In an educational context, Chapman (2003) defines engagement as the intensity and emotional quality with of students' involvement in learning activities. Students who engage in activities put effort and concentration in carrying out tasks, showing behavioral involvement and enthusiasm. Natriello (1984) points out that the aspects related to engagement mean that students are more willing to get involved in routine activities. Based on these considerations, during the project, the instructors tried to find evidence of engagement in practices with exergames by focusing on three specific aspects, each detailed below.

3.1.1 Willingness

Willingness refers to students' spontaneous involvement in the activities proposed. Some of their speeches clearly demonstrated that, such as student A's comment showing how his willingness to participate in Physical Education classes has changed with respect to practices in the exergames laboratory:

[...] I don't like Physical Education and so it was a way for me to go to class. I really enjoyed the practice. Because after all you end up exercising and doing the activities you have to do, but in a much more fun and more virtual way.

Student B's comment also shows his positive view of the practices developed in the laboratory and his willingness to participate in activities:

[...] I liked it a lot. It's not that boring stuff. I don't like to play football, to do sports outside, but I enjoy playing videogames a lot. So it seemed a very cool idea, mixing exercise with the videogames, because it brings study and pleasure together.

Evidence collected in interviews with the school's Physical Education teachers also showed that the introduction of exergames was positive in terms of students' willingness to participate in classes:

[...] We could see a positive effect on some of the students who were selected to participate. We began to notice stronger motivation [in them] to participate in regular Physical Education classes. It may have helped those students to know their own bodies.

Rikard and Banville (2006) state that students often have good willingness for the practice of Physical Education, mainly as a result of the fun factor. However, some studies show that many students do not like the proposed practices or consider Physical Education boring due to repetitive activities (KROUSCAS, 1999). Thus, creation of new spaces that enable new practices, such as the exergames laboratory, becomes an important factor.

3.1.2 Enthusiasm

While the concept of willingness is related to students' spontaneity to engage in a certain activity, enthusiasm goes a little further, seeking to demonstrate students' degree of motivation and engagement. Many of their speeches showed their enthusiasm with the activities. Student C commented: "[...] This football game is really cool because I can play it" (an allusion to the lack of possibility for girls to play that particular sport). Student D, in turn, spoke enthusiastically

about bowling: “[...] Strike! Another one! I’m really good at this game”. A little later, he asked if he and his classmates could play again.

Interjections like these, followed by smiles and celebratory dance steps, were frequent in the laboratory, demonstrating students’ positive perception about activities with exergames. It was clear from the beginning of the project that students felt enthusiastic about using games, which is in line with the fact that those were students who started their first discoveries about the world by already interacting with technology (SUN, 2013).

In the interview with teachers, one of them mentioned the motivational issue when asked about the use of technology in Physical Education. According to the educator’s perceptions, due to the demand for students to use technology in everyday life, he considers the use of new devices for Physical Education important, mainly for motivational reasons. Manley and Whitaker (2011) also stress those ideas by pointing out that the use of exergames can be considered a novelty, and innovative teaching approaches can increase students’ enthusiasm for the discipline’s content.

3.1.3 Situational interest

Guthrie and Wigfield (1997) say that interest has distinct facets, including those of personal interest and those of situational interest. While personal interest is related to the most stable and lasting feelings, situational interest is more spontaneous and transient, being related to developing certain tasks in specific contexts. The observation conducted here focused on the latter, which is the type of interest that can be influenced by teachers or proposed activities.

Some comments made by students led us to believe that the use of games in the exergames laboratory aroused their situational interest as pointed out by student F: “[...] It was a different way to practice physical activity. I found it very interesting, something new. Few people have that at home, so I think it was very interesting and attractive”. Another comment reinforces this point: “[...] I found the activities very interesting because they brought videogame together with a different way of practicing sport itself, resulting in a playful thing.”

Student G also argued: “[...] I found one of the games very useful, that one showing how to do the exercises, such as abdominal ones, and the muscles worked in those exercises. I found it very interesting, you learn along”.

Data collected during the three months demonstrated that students who joined the project were interested in the activities proposed in the laboratory, often showing curiosity and raising questions about games, activities, sports and the exercises they had to do.

In interviews with Physical Education teachers, many speeches showed students’ situational interest:

[...] At first, the students thought they would skip Physical Education classes to play videogames, [...] but as the project progressed, we could feel their motivation. [...] If you consider a boy who did not have a very active life, a student who spends a lot of time indoors, he began to feel the movements of his body, to move, play, throw a punch (referring to boxing on Kinect Sports). [...] He may have begun to discover his own body.

The same teacher also commented on the use of exergames and technologies in the classroom: “[...] Students were motivated in the beginning, [...] we can talk of the XBOX itself at first or we can talk about a tablet to demonstrate the didactic part of a game”.

Such comments show that the introduction of the activities using technology in the exergames laboratory changed students' situational interest, bringing positive implications even to those who normally do not like to join the practices proposed in regular Physical Education classes. Results presented by Baracho, Gripp and Lima (2012) also point out that there is a pressing need to expand the possibilities of body practices in the scenario of contemporary digital culture, and Physical Education's role is to explore those possibilities.

The implementation of the exergames laboratory is also consistent with other studies indicating that a large number of students would enjoy having more variety and novelty in activities proposed for Physical Education (RIKARD; BANVILLE, 2006).

3.2 Social interaction and collaboration

The collaboration process is directly linked to communication, trust and the development of positive social interaction skills (ORLICK, 1977). It is through collaboration that students learn to share, to put themselves in others' shoes and thus develop teamwork skills.

By observing how students interacted with each other, we recorded how collaboration and conflict resolution occurred among participants. Students' natural willingness to help their peers with more difficulty to play was clear. Support was usually given through verbal instructions and logical game rules. Moreover, the attitude of the most confident students served as a model for those who needed additional support for the activities. Clearly, students also started to collaborate more in class. That collaboration had positive impact on all students who used to have difficulties in initial practices. Little by little, they began to feel more integrated into the group and confident to carry out the activities proposed. It was possible to observe that, in small groups, it was easier for students to get in touch with each other. Encouraging remarks made by participants were also seen as evidence of social interaction:

- Student I, seeking to encourage other colleagues to score more points in bowling: “[...] Come on, you can do it!”; “[...] You'll score more points, do your best!”
- Student J, rooting for other colleagues while awaiting his turn: “[...] Go ahead, you are doing well!”

This kind of speech was very common during classes in the exergames laboratory. Further evidence that the practices in the laboratory promoted social interaction is that students' groups gradually began to self-organize to play. They began to define pairs, the order of players and their favorite games. They also began to settle small disagreements on their own, without any intervention by the instructor. There was even an episode where a student said to another that activities should not be so competitive in order to “calm the waters” and keep cordial relations among all. Conflict resolution is seen as educators' responsibility and involves different strategies to overcome such situations (STIHEC, VIDEMSEK, VRBNJAK; 2011). One of those is collaborating with and listening to each other – a strategy used by the student in an attempt to solve the disagreement that arose among the group.

There was also collaboration between opposite-sex students: students H, I, J and K organized to make mixed pairs to play some of the games, pointing out that pairs in regular Physical Education classes always include two boys or two girls.

Some students also showed progress especially regarding shyness and introspection. Since the groups were smaller (maximum of four students), students felt more integrated than in larger groups, which are more common in regular Physical Education classes.

In interviews recorded with Physical Education teachers, some comments showed how the project helped students in their collaborative and social practices. One teacher said:

[...] With regard to social interaction, students certainly begin to interact more in Physical Education classes, but they're doing that anyway [at that age]. We begin to see a more extrovert attitude [by students participating in the project], they are less reluctant to expose themselves. People communicate through their bodies. When I pass the ball to someone who is not afraid to make a mistake or I ask for a ball just by looking at the other, I'm communicating.

However, the same teacher noted that shyness is a difficult aspect to deal with. He stressed that he did not have enough evidence to make a definitive statement about permanent changes regarding students' introversion. Still, the exergames laboratory instructor made an important comment in his interview:

[...] It was clear that introvert students became more resourceful and uninhibited as the project moved forward, and at some point they started to give tips on others' games. Students who did not use to be very active in Physical Education classes became very motivated in the lab, also showing more interest in sport and health issues.

Another relevant comment by the teacher demonstrated the laboratory's potential to engage students, even those who struggled to participate in regular Physical Education practices:

[...] The other day we were talking about a student who was starting in our school, very shy, always alone. We invited him to the project, and his improvement was visible. It's hard to say for sure whether the exergames laboratory was responsible for the change, but otherwise it would be quite a coincidence. [...] The project is no longer in progress, but the student started the year very well. He has motor and technical limitations, but today he tries to participate [in classes] in his own way. I believe that these results are related to the work done in the exergames lab.

The development of social skills in students is a topic of study of many Physical Education researchers. Some of those studies show that specific activities in Physical Education classes can improve students' social skills and lead them to prefer group activities (GOUDAS; MAGOTSIOU, 2009). According to the survey data presented here, activities developed in exergames laboratory also facilitated social interaction among students, helping them to improve their social skills.

4 FINAL REMARKS

The main contribution of this project was to show how an exergames laboratory can be a tool to support regular Physical Education classes by offering an alternative to unmotivated students in PE classes. Research evidence has been presented that weekly practices in laboratory exergames complemented PE classes, involving those students in physical activity and also working on their social skills.

With regard to regular physical activity, the results showed that exergames provide situations where regularity of students' practices can be increased, involving them in activities proposed in class. These results are in line with other studies showing that people's systematic

involvement in recreational and sports activities with appropriate extent and intensity can have significant effects (MAVRIC *et al.*, 2014). Other studies have also shown that introduction of exergames in Physical Education can influence students' attitudes and intentions as well as systematic practice of physical exercises (LWIN; MALIK, 2012).

The results of the study also showed that collaboration happened in the exergames laboratory in many different ways, with students supporting each other throughout their practices and becoming more confident with their performance in the group. After becoming involved in the project, driven by the novelty of physical activity with games, students also manifested interest in learning more about different sports and the importance of regular physical activity.

These results point to a positive situation for the introduction of exergames in school practices, following the global trend of using new technologies in education. However, Vagheti and Botelho (2010) point out that for exergames to be put into regular practice in Physical Education classes, teachers would have to know them in a more systematic and thorough way. The use of those devices in learning activities should be planned so that they can meet curriculum expectations, taking into account students' specific characteristics.

As a suggestion for future works, we aim to investigate how exergames can help students to monitor and better understand their own physical condition by tracking their performance in games.

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