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Virtual games assets: strategy potential to promote health and combat obesity school

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ORIGINAL ARTICLE

ABSTRACT

Evidence indicates the potential of virtual gaming assets to raise and / or maintain the level of motivation in the classroom and promote greater physiological intensity activities. The aim of the study was to compare the level of motivation and level of physical activity among school children of traditional physical education class (EDFT) and school children in physical education classes with the use of active virtual games (JVA). Participated 117 students divided into two distinct groups: EDFT and JVA. For 12 classes, variables motivation and level of physical activity were measured. To assess the level of motivation, it was used Martins motivation scale and Duarte (1997). The level of physical activity was measured by System for Observing Fitness Instruction Time. For analysis comparing the level of physical activity, it was used the U test of Mann Whitney. The motivation was analyzed by Repeated Measures Mixed test. For all analyzes, it was adopted as significance level $p < 0.05$. Data were tabulated in SPSS_22.0 software. The results did not show significant differences in the level of physical activity and motivation between groups. It concludes that the JVA has the peculiarity to promote a practice environment that demands greater physiological intensity.
Keywords: intervention, physical activity, video game

INTRODUCTION

The prevalence of obesity and overweight is increasing on a progressive way, currently being considered as a worldwide epidemic (Organização Pan-americana da Saúde [OPAS], 2014). The World Health Organization indicates obesity as one of the major problems in public health, impacting all age groups. The advancement of obesity is strongly tied to the food ingestion and the physical inactivity (Brasil, 2011, 2012) and it is determined by demographic, socioeconomic, epidemiological and cultural nature, besides the environment, what turns obesity into a multifactorial disease (Brasil, 2012).

In this context, Brazil's Health Ministry developed a plan with strategic actions to face the Noncommunicable Disease (NCDs), aiming to stop the quick growth of obesity, together with the combat of other diverse pathologies. These interventions have been presenting positive results, however, when it comes to raising the level of physical activities and the consumption of low sugar food, the results are not satisfactory (Duncan et al, 2012; Malta & Silva Junior, 2014; Silva, Cotta, & Rosa, 2013). Among the reasons for the poor effectiveness are demographic, cultural and epidemiologic characteristics of the population (Santos & Victoria, 2004) who is being modified due to the influence of the globalization of the human behaviour (Duncan et al, 2012).

Considering these observations, some investigations (Duncan et al 2012; Silva, Cotta, & Rosa, 2013) point to the need of a reformulation of the national strategies on health prevention and health promotion with a goal to approach to a new epidemiological model, characterized by a human behaviour using the technology, among which digital games stands out.

Currently, around 48.8 million Brazilian people use a variety of devices to play a huge diversity of digital games. According to *Escola Superior de Propaganda e Marketing* (ESPM, 2017), Brazil is the number one country in the occidental world in number of social gaming players. In this perspective, the use of digital

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games is being presented by the researchers as an allied in the fight against NCDs once the *gamification* is gradually becoming a characteristic of the human behaviour in this century. Among the big variety of digital games, the current evidences have named the Exergames as a potential tool to contribute in an effective way in the increase of the level of physical activity as well as in reducing body mass above the health level, mainly in children and young people (Gao, Zhang, & Stodden, 2013; Lamboglia et al, 2013; Wu, Wu, & Chu, 2015). Facing such evidences, the use of digital games as a public health strategy is being observed in some developed country (Mccallum, 2012).

Despite the vertiginous growth of investigations interested in understanding the potential use of Exergames in the prevention and promotion of health, currently, the quantity of these researches in Latin America is extremely scarce. The small number of studies in the country aimed at verifying the potential use of exergames within the context of school physical education (Finco & Fraga, 2012; Vaghetti & Botelho, 2010). The understanding of the authors is that this discipline is fundamental in the prevention and promotion of health, stimulating the schoolchildren to raise the daily level of physical activities by a major variety of body practices, have healthy life habits and eat a balanced diet. Nevertheless, there are some researches that indicate that the traditional practices offered by this discipline do not overtake the goals related to health (Hino, Añez, & Reis 2010; Kremer, Reichert, & Hallal 2012). On the other hand, studies related to the Exergames in the school environment are presenting positive results, suggesting that this tool can be utilizes as a support to the Physical Education classes, offering an alternative to uninterested students and increasing the level of energy expenditure (Finco, Reategui, Zaro, Sheehan, & Katz, 2015; Gao & Huang 2012; Lieberman, 2006;).

In addition to the fact that physical education classes, predominantly, don't reach the level of physiological intensity required to a satisfactory level of health, the findings of recent investigation suggest that schoolchildren classified as obese, independent of the sex, see themselves with low or moderate competencies to perform motor tasks. These finding result in a low level of motivation and lack of interest in the practice of motor activities, among them, the ones that are proposed in the physical education classes (Souza, Spessato, & Valintini, 2016). In regard to the motivation for the practice, one of the explanations for the occurrence of the digital games growth is the theory utilized by the virtual reality names as *Flow: the psychology of optimal experience*, presented by Csikszentmihalyi (1990). The theory proposes that during the flow experience, the one practicing it has the performance sensation maximized and the feeling of time control minimized. The study done by Vaghetti (2013) indicated the effectiveness of the Exergames in enhancing the level of motivation in schoolchildren for the practice of school physical education, as well as conduct them to a flow zone experience.

The lack of investigation conducted in national region that aim to verify the effectiveness of the Exergame used within School Physical Education to raise the level of physical intensity in class, help the food balance and enhance the level of motivation in the participation of the classes justify the conduction of the present investigation. Therefore, the present study aimed to verify the Motivation and Physical Activity Level during the Physical Education classes by using the Exergames in order to identify the effectiveness of this new tool in the fight against child obesity in the school environment.

METHOD

The present investigation is characterized by being of quantitative character and control group, once it aimed to compare the behaviour of certain variables in two distinguish groups, one being the intervention group and the other the control group (Thomas, Nelson, & Silverman, 2009).

Participants

Population: Schoolchildren from elementary school from Lucídio Florêncio Ribeiro school, located at the city Campina Grande do Sul, PR.

Sample: It was composed on a probabilistic form, through draw, with 4 children groups of the elementary school from the Lucidio Florêncio Riberio school. The groups 3rdA and 5thA from the morning classes, through draw, composed the group named as Traditional Physical Education Group (TPEG). TPEG was composed by 57 schoolchildren, with 26 females' students and 31 male students. The groups 3rdA and 5th A from the afternoon classes composed the intervention group with the Exergames (ExerGG). The ExerGG had 60 schoolchildren, with 26 male students and 34 female students. The age average for TPEG was 10 years old (± 2.3) and for the ExerGG it was 10 years old (± 0.9).

Instruments and Procedures

To evaluate the level of physical education done by the participants of both groups during the Physical education classes, it was used the System for Observing Fitness Instruction Time (SOFIT) proposed by McKenzie, Sallis and Nader (1991). According to Hino et al. (2010), the method consists in a direct observation with low cost and easy management providing the records of Physical education and contextual information of the physical education classes. The level of motivation was measured by the Adaptation Scale of Motivation to the practice of physical education proposed by Martins and Duarte (1997).

The level of motivation, as well as the level of physic activities of the participants from the groups TPEG and ExerGG was measured throughout 3 months, in a total of 12 classes. In regard to the motivation level, the schoolchildren, before leaving the classroom and walking to the place where the physical education classes were conducted and after visualizing the Likert scale proposed by Martins and Duarte (1997), were asked by the researcher to indicate the picture that represented their level of motivation for that class. The same procedure was conducted at the end of the classes. The level of physic activities of the participants from TPEG and ExerGG was measured throughout the 12 classes according to the protocol proposed by McKenzie et al. (1991). Thus, the behaviour of each student was observed during 4 minutes, with a break of 20 seconds between the observations. It is important to observe that the research right after the project approval by the ethic committee from PUCPR, being registered by the CAAE number.

Statistical analysis

First of all, the objective was to observe the normality on the distribution of the results, once the groups had in its composition more than 50 participants. Since the normality on the distribution was not observed, a nonparametric statistic was chosen to analyse the results. To compare the level of physic activities between the groups the U de Mann-Whitney test was utilized. To compare the initial motivation and the final motivation intra and inter groups, at first it as searched to observe the homogeneity of the results distribution using the Levene test where it was evidenced the absence of homogeneity. Therefore, it was used the covariance analysis test of Mixed Repeated Measures, with sphericity testing of *Mauchly*, where this assumption was not found ($p=0.000$). Considering that, the interaction test of *Greenhouse-Geisser* was utilized. The *Bonferroni* test was also applied to find the difference among the 12 classes. To all the analysis the significance index was $p<0.05$. The data was tabulated on the SPSS 22.0 software. Specifically, to verify the size of the effect in the analysis of the variables the *Cohen* test was applied.

RESULTS

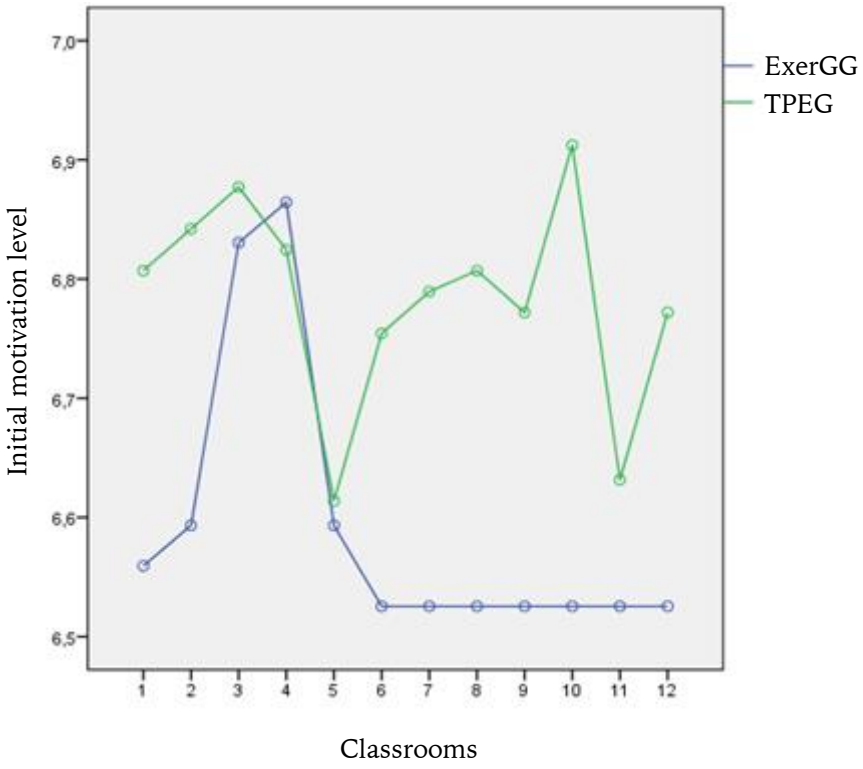
The According to table 1, it is possible to observe that a significant difference was evidenced between groups in the walking behaviour as well as the in the average time of class. It was not identified significant difference on the other behaviours proposed by this measurement instrument. For the walking behaviour the data indicates that ExerGG

presented this type of motor activity in a higher percentage of the class. When observing the average time of the classes, the classes from the TPEG were significantly longer. Yet, even thou the average time of the classes in the TPEG, when observing the accumulated percentage of the ExerGG in the walking and very active activities (considered from moderated to high intensity level of the energetic demand) and lying down and sitting down (considered as low intensity level of the energetic demand), there is a balance of intensity throughout the class. The same thing does not happen in the TPEG, where about 60% of the average class period the investment of time was on low energy demand activities (lying down or sitting down).

Table 1
Comparison between groups: Level of physic activity during class

GROUP		Lying down %	Sitting down %	Standing %	Walking %	Very active %	Period of class (min/sec)*
TPEG	N	12	12	12	12	12	12
	Average	0.02	24.71	26.97	**17.38	14.62	***27.81
	Median	0.00	25.57	27.41	30.96	11.17	26.66
	DP	± 0.11	± 18.29	± 15.19	± 19.04	± 10.46	± 6.67
	Minimum	0.00	0.20	0.02	4.15	0.00	20.00
	Maximum	0.58	70.14	53.75	80.45	37.34	47.00
ExerGG	N	12	12	12	12	12	12
	Average	0.06	23.37	37.10	**33.76	18.33	34.48
	Median	0.00	4.72	34.16	17.03	17.42	***33.75
	DP	± 0.33	± 35.06	± 23.82	± 12.17	± 17.17	± 7.05
	Minimum	0.00	0.00	0.00	0.00	0.00	16.00
	Maximum	1.65	100.00	82.57	46.64	52.78	47.00

(*About 50 minutes of class) (**p= 0.002/d= 0.29); (***p= 0.01/d =0.31)



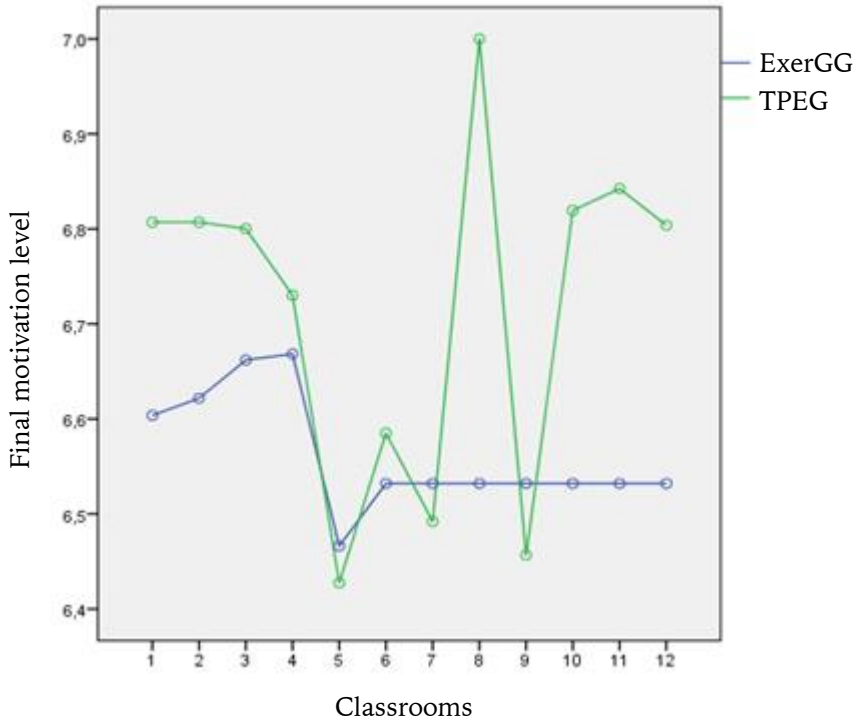
Graphic 1. Comparison between groups of the initial motivation average throughout the intervention period.

When analyzing the initial motivation average on both TPEG and ExerGG, throughout the 12 classes, it is observed similarity between results. This similarity is evidenced by the statistical analysis where no significant statistical difference in the initial motivation on the participants of each group during the evaluation period (p=0.090/ η^2 0.15). Results

also evidence that during the evaluated period there were significant variance intra group on the variable initial motivation (p=0.006/ η^2 0.26). Graphic 1 indicates that the most impacting difference to both groups happened between classes 4 and 5, and this was confirmed by the *Bonferonni* test. (p=0.000).

Graphic 2.

Graphic 2 demonstrates the results of the variable final motivation of the participants of TPEG and ExerGG. Similar to the initial motivation, it is observed closeness between the averages of motivation, and they are very close to the maximum motivation proposed by the research instrument (7). Statistical analysis ratify the described results once it was not observed any significant difference in the final motivation on the comparison of the groups (p=0.095/ η^2 0.16). Statics also evidence a significant difference between the average in the intra group comparison in TPEG and ExerGG (p=0.006/ η^2 0.26). Graphic 2 help us understand this difference that for TPEG happened among classes (p=0.002/ η^2 0.26) and for ExerGG occurred between classes 4 and 5 (p=0.001/ η^2 0.38).



Graphic 2. Comparison between groups of the final motivation average throughout the intervention period.

DISCUSSION

The motivation related to the Exergames is being explained by many factors. According to Epstein, Beecher, Graf, and Roemmich, (2007) the motivational interest can occur due to the socially interactive nature of the tool. To Hawkins (2009), the participants are less prone to be motivated to play when they have positive feelings related to physic activities/exercises proposed by the game. Some researchers are relating the motivation for the games with the so-called Theory of Flows. This theory explains the mental flow state that the activity can exercise on an individual (Sheehan & Katz, 2012; Vaghetti, Mustaro, & Botelho, 2011). According to the results, it is possible to observe on the variable motivation there were no significant difference between groups and both groups presented high motivational interest during the intervention period. This aspect contrasts the current literature that indicates that individuals exposed to a long period practicing Exergames tend to have their interest diminished, originating a reduction on the

motivation and adherence (Sun, 2012; Sun, 2013; Wiemeyer, 2010). The exergames have the potential to bring to the physical education classes a variety of contents in a playful, fun and motivating way, offering the children and young people the opportunity to experience unusual sports and activities that they never practiced before (Palma & Ramos, 2013). That way, the age group of this research is classified as second childhood, from 07 to 12 years old and according to Gallahue, Ozmun, and Goodway (2013), it is considered a period where the child is eager for movement and any activity that provides freedom to learn as well as to move it is considered as a highly satisfactory activity.

Other positive aspects that are being demonstrated by the literature about the utilization of the Exergames are the high potential to increase the intensity and duration of the physical activity during the classes, besides that it presents improvements in motor skills, strength, balance and engagement (Hawkins, 2009). According to Lamboglia et al, (2013) the exergames are a tool that can contribute to a more active life style, with positive effects in the human behaviour related to individual`s health. In the study of Maddison et al. (2011), it was observed that the energetic waste of an individual that practices exergames during a short period of time (5 min) was comparable with the level of intensity slight to moderate for traditional physical activities such as walking, jumping and trotting. On the study conducted by Silva (2014), the level of intensity found was 82% of maximum heart rate, being characterized as vigorous activity. Some recent research results demonstrate that exergames can also have a positive effect on the body in the mass index and excess body composition and obese children, and it can be a tool to fight against children obesity (Lieberman, 2006; Guy, Ratzki-Leewing, & Gwadry-Sridhar, 2011).

The results about the level of physical activity involving exergames are aligned with the literature in which it has been observed that the classes with exergames provide to the schoolchildren the permanence of an expressive period of time in level of activities considered as moderated or vigorous (Lieberman, 2011; Pereira, Rodrigues, Campos, & Santo, 2013). The study of Shayne, Fogel, Miltenberger, and Koehler (2012), where the effects of exergames and the traditional physical education were compared among four active children indicated that the students were very involved in the practice of exergames and it was possible to involve the students in different ways of physical activities/exercises. In the study of Fogel, Miltenberger, Graves, and Koehler(2010), the results showed that the practice offered more time of physical activity when compared to conventional physical education classes. Sheehan and Katz (2013) also pointed the viability of using exergames as a practical in the physical education classes. Finco, Reategui, and Zaro (2015) add that the exergames provide situations where the students can increase the frequency that they practice physical activities and can be an alternative for the ones with lack of interest.

CONCLUSION

The evidences of this investigation allow us to conclude that there was no significant difference in the level of physical activity, as well as the level of motivation in the beginning and in the end of the classes from the schoolchildren of the elementary school that participated on the practices of the traditional physical education classes and the ones that participated in the physical education classes that utilized the exergames. The results also indicated the potential of utilization of the exergames as a strategy for physiological use in the physical education classes in a playful and motivating way, assisting in reaching the international recommendation for health maintenance.

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