

Recommendation Letter of CINAPSE 2016

Ricardo Catunda^{1*}, Elisabete Laurindo²

EDITORIAL

In order not only to promote the debate on physical activity and health promotion at school but also to think of qualified joint actions about the problems related to the subject, the Center for Research on Physical Activity in School (NIAFE) held **CINAPSE - the International Conference of Physical Activity and Health Promotion at School: "Building a healthy environment"**, through a partnership among renowned institutions, such as the State University of Ceará; the Federal Council of Physical Education - CONFEF; the Regional Council of Physical Education of Ceará - CREF5 / CE; the Association of the State of Ceará Municipalities - APRECE, and the Sports Virtual Center - CEV, as well as professionals from three countries: Brazil, Spain and Portugal, with representatives from 15 states and 8 researchers groups, where everyone was engaged in fostering discussions about physical activity in the school environment in the perspective of health promotion, involving national and international references and the Brazilian academic community in the debate through Panels, Conferences, Presentation and publication of scientific works, courses, besides the integration of 15 study groups.

The opening panel was focused on **"Recommendations of public institutions about health promotion at school"**, with the speaker Mr. Jorge Steinhilber, president of CONFEF, who highlighted the importance of the involvement of parliamentarians' involvement, particularly regarded as the demand of the implementation of laws and documents already drawn up by expertise people involved in it. On this field, it should be reflected and analysed how all knowledge

acquired is being applied, mainly by physical education teachers, who have an important role in people's lives, moving towards the health area.

With the breakthrough of the Profession Regulation, through Law no. 9696 1998, professionals in the field have sought to specialize and integrate with other knowledge areas, especially in inter-sectoral public policies, such as the bodily practices and promoting physical activity in the Family Health Support Center - NASF, the Health Gyms, the Health in School Program - PSE, the National School Meal Program - PNAE, among others.

We live in a globalized world, which problems related to social issues are portrayed by inactivity, increase of nutritional options - usually the inadequate ones -, the decrease of the population's physical activity, the constraint of children's movement with the use of new technologies growing up, combined with the increased rates of urban violence.

In face of this reality, there is an urgent need to reaffirm the importance of physical activity as an essential condition to a healthy lifestyle at all stages. However, it is at school where we can enhance an awareness movement with families about the importance of their participation, as a means of reinforce proactive actions to develop healthy habits. Therefore, **IT IS RECOMMENDED THAT:**

- ✓ public bodies involved in the implementation and control of public policies should recognize we live in an unstable reality in the Brazilian educational context, caused by the mismatch among managers, teachers, students and community, where there is

¹ State University of Ceará, Fortaleza, Brazil.

² Avantis College, Balneário, Camboriú, Brazil.

* Corresponding author: State University of Ceará, Dr. Silas Munguba Av., 1700, Campus do Itaperi, 60714-903, Fortaleza-CE, Brazil. Email: ricardo.catunda@uece.br

a need to promote professional and qualified interventions in the school context, creating healthy and suitable environments to human needs;

- ✓ public policies can reflect the needs and desires of the people involved;
- ✓ Physical Education, as a curriculum component, ought to be valued as a health promoter in its broader aspects and, professionals with proper skills and knowledge should get involved as protagonists in the execution process of the objectives to be achieved;
- ✓ successful experiences, both in schools and in universities, can be disseminated and replicated in order to generate a common knowledge compilation;
- ✓ we must recognize that 80% of Brazilian children are in public schools, and there is the only place where can provide knowledge about the importance of acquiring healthy habits to promote health throughout life;
- ✓ we must understand it is unquestionable to bridge the academic field of scientific research, seeking their effectiveness through the practical application of the results, promoting concrete interventions in the daily life of Brazilian schools;
- ✓ the profession of physical education, recognized and regulated by Law No. 9,696 / 1998, must be respected and valued in schools;
- ✓ besides physical education classes, it is important and necessary to promote sports activities after their regular schedule, in order to minimize the condition effects of health problems throughout life;
- ✓ it is necessary to optimize children's free time and promote human values and healthy habits;
- ✓ governments must maintain schools in appropriate and safe conditions.

At the Conference I: "**Health promotion: the new trustworthy paradigm of School Physical Education**", given by professor Dr. Adilson

Marques, University of Lisboa / FMH, Portugal, he pointed out the reasons for an area of expertise integrates the school curriculum and therefore is justified, this area needs to have a socially acceptable meaning, in other words, when it is important; when you have a body of specific knowledge. In this sense, the Physical Education in Brazil have been determined by some legitimizing systems throughout history. Initially these systems were considered only as gymnastics activities, later they were used to legitimate the superiority of the countries, to strengthen the body and race vigour, then to the health and nationalism, and also for the sport.

As it has been recorded in the 1950s, when physical activity and health were discussed about, recent studies again have showed the connection between them, pointing a considerable death rate as a consequence of a sedentary lifestyle. In this regard, today's social message sees a legitimizing factor of the physical education in physical activity, sport and exercise, which is more focused on health promotion, but with a condition that is under the teachers' responsibility, the teaching - the way of teaching. It is a *sine qua non* that people have "physical literacy", ie, they need to learn to do - learn to want to do. One can also sees a significant increase in the number of and scientific studies publications on the subject, in one hand expanding knowledge, but on the other hand, the practice of physical activity suffering a downward trend throughout the world.

In this aspect, the main consensus indicates that regular physical activity benefits health. So, **IT IS RECOMMENDED THAT:**

- ✓ every person should be "physically educated" to maintain the health and quality of life;
- ✓ actions involving physical activity and various sports ought to be developed in schools and communities, in order to minimize the prevalence of obesity;
- ✓ the School Physical Education should be legitimized as a proper area of expertise in Education;
- ✓ the Physical Education teacher uses appropriate strategies for teaching;

- ✓ every effort must be invested in prevention: first address health and not disease.

At the Conference II: "**Physical Education Evidence-based**", given by professor Dr. José Airton Pontes Junior, the State University of Ceará, a reflection on some challenges of today as the use of new technologies in physical education classes; the inclusion of children with disabilities and; mainly on effectiveness level of lessons, questioning the poor results at the National High School Exam (ENEM), especially in the North and Northeast regions, which presented a low performance, compared to the other Brazilian regions.

In this sense, **IT IS RECOMMENDED** for Physical Education in school:

- ✓ the use of technology in everyday school life;
- ✓ teacher training with significant practice and the adequate evaluation tools;
- ✓ the condition of quantitative studies on socio-cultural and educational variations in physical education students in teaching, management and the community dimensions;
- ✓ the mapping of reports of successful experiences and interventional research;
- ✓ to develop a "Cochrane" collaboration for making evidence-based decisions through good quality information in the field of Physical Education;
- ✓ to maintain a permanent relationship between school and university, investing in professional masters' degree and projects involving the community;
- ✓ to overcome the laziness and comfortable situation the Brazilian education is placed nowadays;
- ✓ to increase the children's level of stimulation for their full motor development;
- ✓ to include the curricular component "Health promotion" in the syllabus of undergraduate courses in Physical Education, teaching future teachers how to work in an interdisciplinary approach at school.

At the Conference III: "**Physical Education: from research to intervention**", done by Professor Dr. Nadia Cristina Valentini, the Federal University of Rio Grande do Sul, it was emphasized the need for understanding about the true role of physical education in school. We must recognize that there are differences in performance because there are no common goals, but there are difficulties in action which are common. It is therefore urgent to break paradigms and be aware that most of Brazilian children have opportunities of movement only at school and have motor delays with significant impacts, an alarming increase in the reduction of development of their basic motor skills.

Besides the children's low motor competence, another fact to be highlighted is the decreasing proficiency movement in children who start school from the age of 6 years old, demonstrating that the possibility of movement have decreased, rather than increased. Other problems were also observed from the research, such as: the delay of motor skills in 18% of children in Brazil; the high level of impairment in the poorest children; the reduction of appropriate areas for activities which stimulate movement; the decline in physical fitness; the high rates of obesity, especially in the suburban and central urban areas; the fragility of the self-concept, that is, children see themselves as more incapable and; the important finding that children with motor difficulties also present cognitive difficulties.

Faced with the problems presented, it is evident that the qualified intervention of the Physical Education teacher is the main factor to transform this reality, also resulting in some questions elicited: How is the children's cognitive development? How can children's skills be changed? What would stable and consistent solutions be? We must disturb the stability and break the lack of proficiency barrier. We must agree that the traditional P.E. classes do not promote proficiency, movement mastery and success in the correct execution of the movement. Therefore, **IT IS RECOMMENDED:**

- ✓ class time should be optimized to provide children's autonomy;
- ✓ the materials used in class should be diversified to enable the work in different stations;
- ✓ We must respect the own pace of each child;
- ✓ It is essential to vary the levels of challenges and skills of children;
- ✓ It is necessary to allow the exploration of the body by their own;
- ✓ to establish protocols between teachers and students;
- ✓ individual achievements must be valued;
- ✓ to promote parental involvement with the school and their children's lives;
- ✓ the self-monitoring of the child's progress and the learners' engagement in this process must be encouraged;
- ✓ children with special needs or other disabilities must be included in classes and school activities;
- ✓ the awareness that 24 classes with a high quality can modify the children's motor development and motor skills;

At the Conference IV: "**Intervention programs for the development of physical activity and health promotion in school**", performed by professor Dr. Valter Cordeiro Barbosa Filho, the Federal University of Santa Catarina / NuPAF, the concept of health, established by World health organization in 1946, was remembered, and the relationship between health and disease was already established at that time, saying that health is not merely the absence of disease but a state of complete physical well-being. Health is, above all, the normal state of human body's functioning, it's essentially living in good physical and mental disposition, besides the welfare among the individuals.

It is necessary to expand the look at this complex, which is the health care. One must understand there are social aspects which are decisive, like people's working conditions, the commitment of our governments, and also the involvement of the whole community, schools, parents and teachers.

In this context, Physical Education has an important role because it teaches people to act for themselves and for the others, both by physical activity and the moments of discussion and reflection. Physical education must have a crucial role on the proposal of health promotion. We are properly prepared and cannot be limited only to the speech. Thus, **IT IS RECOMMENDED THAT:**

- ✓ physical activity and health programs should be developed in an intrapersonal perspective - attitude, self-efficacy, and interpersonal;
- ✓ topics on health should be included in the curricula of all levels of education;
- ✓ diversified materials should be offered during the class breaks;
- ✓ to produce explanatory leaflets on health conditions;
- ✓ people involved in the subject should participate in the decision-making processes;
- ✓ to promote the approach between the school and the family context, with their different realities;
- ✓ to promote the teachers' training for this new teaching perspective;
- ✓ to know the people with whom we are working, for the necessary school integration;
- ✓ to deconstruct our methodologies. We are used to getting things ready very fast, as if it was natural;
- ✓ to reflect on how our students are being taught. We need to stop saying what they have to do, we need to discuss the guidelines of how to increase the classes quality.
- ✓ it is necessary to leave the comfort zone and complex way of looking to reality in which we live to apply what we have learned, from the possibility of enjoyment, promotion of well-being, health, promotion of pleasure; the cultural construction of teachers and students;
- ✓ to challenge universities to build different and interdisciplinary ways to assist in the process of creating a

different society, able to produce knowledge related to the practice of everyday school routine. The university needs to have "room" at the school;

- ✓ we need to identify what is our role in public policy is.

At the Conference V: "**Teaching Styles for School Physical Education: increasing levels of physical activity in the classroom**", done by professor João Martins, the Faculty of Human Kinetics at the University of Lisbon and Lusófona University / FEFD of Portugal says that physical activity is a public health priority and the school is a privileged and recognized agent to promote this practice, whether in active recreation, in school sports in the physical education classes and the community where they live. He corroborated the idea that the physical education teacher is the agent protagonist of these activities.

Updated data have shown that most people do not meet the minimum and necessary time of moderate to vigorous physical activity a day, either in physical education classes. The great challenge in our area is to make the classes more active and methodologically appropriate. Therefore, **IT IS RECOMMENDED:**

- ✓ to promote the increase of physical activity in the classroom, so that people have pleasure in exercise throughout his life, in leisure time, in health clubs, squares, etc;
- ✓ the need to change the characteristics of the classes, promoting activities in which everyone has opportunities to participate;
- ✓ motivate children and young people to become physically literate – they know to dance, play, make your walk, etc;
- ✓ what goals are set to be followed and awareness of the need for planning lessons, articulated with the whole school;
- ✓ time away from classes is optimized by reducing the time for instructions, in addition to the systematization of the routines;

- ✓ the available materials and spaces the school has should be maximized;
- ✓ to promote the inclusion of everyone;
- ✓ to make challenging classes, effectively in the instructions, minimizing errors and enhancing the leadership and autonomy of students to promote meaningful knowledge for life and lifelong;
- ✓ to give positive feedback, with individual orientations, in a favourable mood for mastery;
- ✓ to use a variety of cooperative activities by promoting a vast teaching repertoire;
- ✓ to organize the class into smaller groups to facilitate and streamline the intervention classes;
- ✓ to observe students' affective, motor, cognitive, social and behavioural aspects;

At the Conference VI: "**Building a healthy environment at school**", done by Professor Dr. Antonio Ricardo Catunda de Oliveira, the State University of Ceará, he addressed three key issues: the school and physical education; international consensus and the educational value of physical education.

On this track, it is clear that the Education and Physical Education have been changing over time, and the configuration of the current society. We recognize the benefits of physical activity for people's health, but we know that his practice has been decreasing over time. In today's context, what are the objectives of physical education in this context? Do we recognize that school is the only way most children can get physical activity instructions for them and their lives?

Some international consensus has been established, such as the UNESCO and WHO, which emphasize the importance of the excellence in Physical Education for the developing skills, abilities, attitudes, values, knowledge and understanding. In this sense, the physical education classes may be sufficient if fully exploited in the most time possible with the students' participation, in a supportive environment, with everyone's involvement and

focusing on the activities to be performed. Therefore, the scenario is favourable to Physical Education, configuring itself as an excellent opportunity to deal with this new challenge it is presented.

Challenges such as students' low engagement in class, the state of lethargy into which Education is found nowadays, the poor utilization of the youngest characteristics, like the preference for activities which offer challenges and problem-solving strategies, the lack of materials and suitable spaces for the practice of physical education, unmotivated teachers and, exceptionally, the first generation with lower life expectancy than their parents. Faced with these highlights of **IT IS**

RECOMMENDED:

- ✓ to maintain community partnerships, involve managers, teachers, family and take advantage of the available inter-sectoral public policies;
- ✓ to use active methods in class;

- ✓ to make the school a healthy environment, motivating, engaging and promoting the well-being;
- ✓ programs targeted to teachers for permanent and progressive qualification;
- ✓ the appreciation of teachers offering better working conditions and salaries, the importance of their role in the school improvement;
- ✓ to promote motivation and commitment of the school community;
- ✓ to ensure physical education based on quality references at all educational levels;
- ✓ attention to Early Childhood Education mandating the presence of licensed teachers in Physical Education;
- ✓ to promote healthy habits through interdisciplinary projects for the practice of physical activities and healthy eating;
- ✓ to think about the school collectively, with goals shared by everyone.



All content of Journal Motricidade is licensed under [Creative Commons](https://creativecommons.org/licenses/by-nc/4.0/), except when otherwise specified and in content retrieved from other bibliographic sources.

Cardiovascular risk factors in adolescents: a study with high school students

Jaina Bezerra de Aguiar^{1*}, Marcos Augusto Araújo Silveira¹, Edson Silva Soares¹, Adriano César Carneiro Loureiro¹

ORIGINAL ARTICLE

ABSTRACT

The purpose of the study was to investigate cardiovascular risk factors (CRF) found in adolescents from a public school in Fortaleza / Ceará / Brazil. The sample consisted of 180 students from the State High School Justiniano de Serpa, which is covered by sub-project of the course of Physical Education of the Institutional Program Initiation Grant for Teaching from the State University of Ceará. For data collection, it was used a questionnaire which included objective questions related to gender, age, alcohol consumption, smoking, physical activity level, and family history. Besides that, a physical evaluation was conducted in which it was collected height, weight, and waist circumference. For data analysis, it was used the absolute and relative frequency to characterize the participants as well as chi-square test for the variables gender and level of physical activity. Results showed the percentage of overweight and obesity was 22.2% and 12.2%, respectively. Furthermore, 16.7% of adolescents had abdominal obesity, 6% reported alcohol consumption, and 1% smoking. In family history, highlighted the presence of diabetes, hypertension, and high cholesterol levels, which together amounted to 65.4%. The results also showed 79.4% of adolescents had insufficient levels of physical activity. It is concluded that the main CRF found were family history, physical activity, and overweight.

Keywords: cardiovascular diseases, school health, physical education and training.

INTRODUCTION

The sedentary lifestyle is a huge damage for society, becoming a determining factor for the great increase of cardiovascular diseases (CVD), as well as other chronic non-communicable diseases. Therefore, there is an incessant search for the population to become, more and more, physically active. Physical activity (PA), as well as physical exercise, is today considered synonym of quality of life (Mendonça, 2012).

Nowadays, a study showed that not only adults are affected by CVD, but also children and adolescents (Burgos et al, 2013). There has been a recent increase in the diagnosis of systemic arterial hypertension in young population. In addition, childhood obesity has been identified as an important risk factor in the development of CVD (Burgos et al, 2013).

This phenomenon is undoubtedly due to a significant decrease in PA, sedentary lifestyle, combined with poor diet and the new behavioural routine of the human being, which

has led to an increase in the incidence of various diseases related to this lifestyle, such as stress, anxiety, cancer, hypertension, diabetes, dyslipidaemias, obesity and, consequently, CVD (Mendes, Alves, Alves, Siqueira, & Freire, 2006).

In contrast, the practice of AF provides several benefits, such as increased self-esteem and well-being, stress relief, full functioning of the immune system, and others (World Health Organization [WHO], 2015). Moreover, it is a relevant protection factor against obesity, diabetes and CVD, some cancers and mental disorders, in other words, being impactful in health promotion and disease prevention (WHO, 2015).

In this context, the present study is justified by the need to investigate the presence of Cardiovascular Risk Factors (CRF) in high school students in the city of Fortaleza. The results of this study can be subsidies for the physical education professional's view within the

¹ State University of Ceará, Fortaleza, Brazil.

* Corresponding Author: State University of Ceará, Dr. Silas Munguba Av., 1700, Campus do Itaperi, 60714-903, Fortaleza – Ceará, Brazil. Email: jaina.bezerra@uece.br

school context. Besides of contributing for the development of more attentive professionals, who assess the health status of the students as well as orienting / stimulating the changes of lifestyle, seeking in fact the adoption of a healthy lifestyle by the students.

The relevance of this study is to contribute for the teaching practice of the physical education professional through health education: alerting him about the social and epidemiological reality of high school students, aiming to improve the quality of life and health promotion, as well as providing clinical data of high school students and their relationship with a major Public Health problem, which are CVD.

Thus, it was intended to answer in the study the question: what are the CRF found in adolescents from a high school institution of the capital city of the state of Ceará? Therefore, the objective of this study was to investigate and analyse the CRF found in adolescents, from a public school in the city of Fortaleza/Ceará.

METHOD

The study was characterized by quantitative and qualitative field research, through a data collection under an objective character, in a closed questionnaire of opinion research and physical evaluation, both of which were cross-sectional.

Participants

This study was based on the database of a survey conducted in 2015 at the State Public High School Justiniano de Serpa, Fortaleza, Ceará, Brazil, which is covered by the subproject of the course of Physical Education of the Institutional Program Initiation Grant for Teaching (PIGT) of the State University of Ceará. The sample of the present research was constituted by 180 students, of both genders and who were present in the classes of physical education of the mentioned school. Only those students who were voluntarily interested in participating of the program and who were regularly enrolled in the school were included.

Instruments and Procedures

The physical evaluation collected data regarding to height and weight (Petroski protocol, 2011), and waist circumference (WC) (protocol of Callaway et al., 1991). The WC values allowed characterizing the amount of body fat located in the abdominal region (according to the critical values proposed by Taylor, Jones, Williams, & Goulding, 2000). For the identification of the nutritional profile of the sample, the body mass index (BMI) was calculated, given by the formula weight (kg) divided by the square of the height (m). The diagnosis of different nutritional status was investigated by BMI for age. The cut point used was provided by the World Health Organization (World Health Organization [WHO], 2006). The questionnaire had objective questions related to gender, age, alcohol consumption, smoking, physical activity level, and family history for CRF.

The participants were formally invited and during the study the objectives of the research and the ethical aspects involving human beings were explained. Data collection techniques and procedures were consultations to the physical evaluations and the questionnaires applied in the school, which occurred in the period from March to June of 2015. The physical evaluations happened in a classroom of the school. They were conducted by the scholarship holders of the program who were trained by one of the researcher professors. The questionnaires were completed by the participants at the same location as the physical assessment data collection.

For the use of the documentary data, the authorization of the coordination of the PIGT was requested through a declaration of faithful depositary, which allowed the use of data already collected.

The research is in accordance with the Resolution No. 466/12 of the Brazilian National Health Council, which establishes guidelines and norms regulating research involving human beings (Brasil, 2012).

Statistical analysis

The questionnaire and the data collected were numbered and quantified. The data were analysed through descriptive statistics using SPSS software version 22.0, and presented in tables and graphs. The absolute and relative frequency was used to characterize the participants and Chi-Square test to observe the possible associations between the variables gender and level of physical activity, adopting as criterion of statistical significance $p < 0.05$.

RESULTS

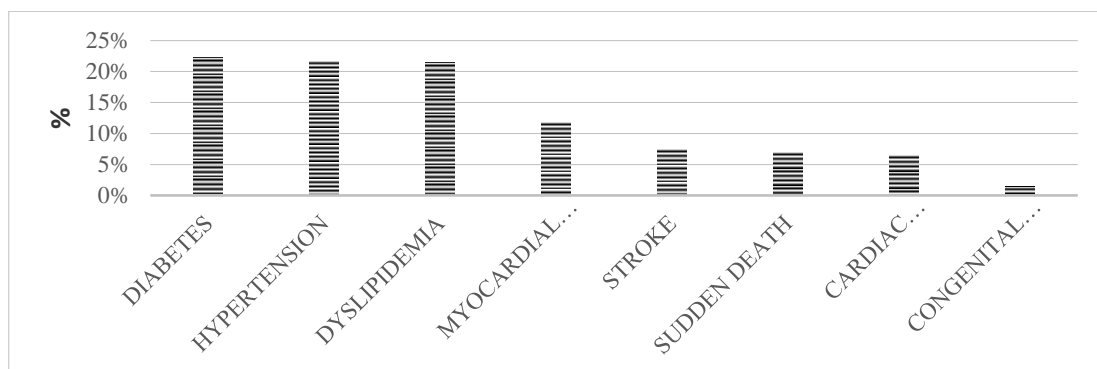
The sample was composed in its totality by adolescents, with age between 13 and 17 years and average age of 15.1 ± 0.73 . In the Table 1, there is their sociodemographic and clinical-epidemiological characterization. The hereditary factor exerts a strong influence on the onset of CVD and other diseases (Walter et al., 2004). After analysing the data, the presence of some diseases that represent a risk to the cardiovascular system can be verified through the family history of adolescents (Graph 1). Only 12.2% of the students reported having no disease in the family history. O Graph II shows the distribution of the sample by gender, obtaining a high prevalence of adolescents with insufficient levels of physical activity (79.4%). Likewise, it is worth mentioning that the levels of physical activity below the recommended level are higher in female adolescents (53.3%) than in the male (16.1%). However, levels above the

recommended are higher in male adolescents (13.3%) than in female (7.2%).

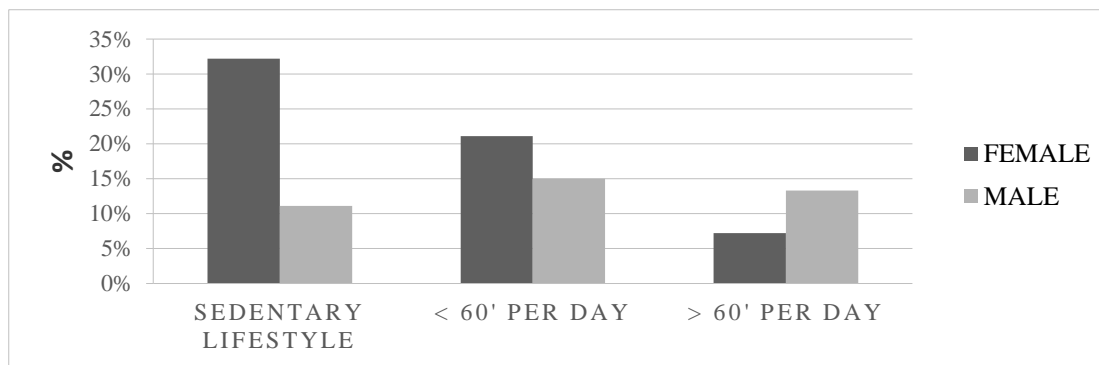
By the chi-square test, we can report the difference between male and female adolescents is statistically significant ($p < 0.001$). This shows that there is a relationship between gender and the level of physical activity. In other words, male adolescents have a more active lifestyle compared to females. By checking and analysing the different variables of the study, it was possible to generate a graph (Graph 3) with the prevalence of CRF. The variables described consider behavioural health habits and the possible inherited genetic load.

Table 1
Sociodemographic and clinical characterization of high school adolescents

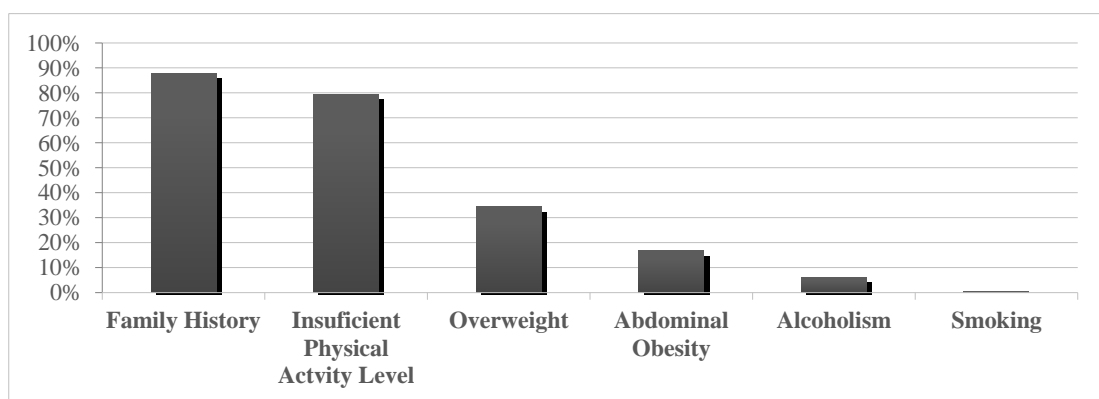
Variables	n	%
Gender (n)		
Male	71	39.4%
Female	109	60.6%
BMI		
Eutrophic	118	65.6%
Overweight	40	22.2%
Obesity	22	12.2%
WC		
Normal	150	83.3%
Risk	30	16.7%
Alcoholism		
No	169	93.9%
Yes	11	6.1%
Smoking		
Yes	1	0.6%
Have smoked	10	5.6%
No	169	93.9%



Graphic 1. Percentage distribution of the sample group by the prevalence of cardiovascular risk diseases in the family history



Graphic 2. Percentage distribution of the sample group by the prevalence of cardiovascular risk diseases in the family history



Graphic 3. Prevalence of CRF in high school adolescents

DISCUSSION

The sample group of adolescents was evaluated to investigate the presence of CRF in these individuals, since there is a strong correlation between the existence and severity of CVD and the presence of their factors in the early stages of life (Quadros, Gordia, Silva, Silva, & Mota, 2016). In conjunction with other studies (Brito et al., 2016, Quadros et al., 2016), we also obtained a higher participation of female adolescents (60.6%). We believe that this fact is related to demographic issues that according to the Brazilian Institute of Geography and Statistics - IBGE (2010a) the female population is more numerous.

By characterized the adolescents through BMI, it was verified that the percentage of overweight and obesity is of 22.2% and 12.2%, respectively. This data corroborates with the findings of Ribas and Silva (2014), in which the number of adolescents with BMI classified as normal is prevalent when compared to the number with excess weight. However, this number of overweight adolescents is a concern,

since BMI in young population is considered a risk for possible coronary diseases in adult life.

It was also verified the WC, since it is known that the fat accumulated and located in the central region has contributed to the development of diseases (Pereira et al., 2010). Table 1 shows that 16.7% of adolescents in the sample had abdominal obesity. This value generates concern since several studies in children and adolescents have observed a significant association between WC and CRF (Bitsori, Linardakis, Tabakaki, & Kafatos, 2009; Pereira et al., 2010;). Other investigated risk factors, such as alcoholism (6%) and smoking (1%) presented a small number of cases, and similar results were found by Farias Júnior, Mendes, Barbosa, and Lopes (2011). Through these results it is possible to suggest that the populations studied seem to be aware of the harm that these habits cause to health and may be a result of health education campaigns and actions carried out in the last decades in Brazil.

It is possible to verify through the graph II, some DCVs related to the family history of the

sample group. Diabetes, hypertension, and dyslipidaemia, which together account for 65.4%, representing a high risk to cardiovascular health. Against this genetic tendency, verified through family history, adherence to and maintenance of healthy lifestyle is recommended - with adequacy of physical exercise; rich diet in fruits and vegetables; access to active leisure; no ingestion of alcoholic beverages; among other protective situations for cardiovascular risk (Gomes et al, 2012).

The results of the study showed a high presence of adolescents with insufficient levels of physical activity (79.4%), with a significantly higher prevalence in female adolescents (53.3% vs 16.1%), so the boys in the present study may be considered more active than the girls (Chart 2). However, their level of physical activity is still considered low, considering that only 13% reached the level of physical activity recommended by the WHO (2015). Insufficient practice of physical activity was also observed as a prevalent CRF in studies such as that of Quadros, Gordia, Silva, Silva, and Mota. (2016) and Farias Junior et al. (2011), being the insufficient practice present in 64.3% and 59.5% of the samples, respectively.

Thus, even physical activity is considered one of the most important actions to prevent the development of obesity and chronic diseases (Brito et al., 2016), it is a practice still little experienced in school life, especially in the female gender (Fermino et al. 2010). Among the main barriers reported for involvement in physical activity during childhood, there is a rise of passive leisure (television and video game) and decline of active leisure (jumping rope, elastic and cycling); in the period of adolescence, the environmental and socio-cultural factors are mentioned (Fermino et al., 2010; Santos, Hino, Reis, & Rodriguez-Añez, 2010).

It has been observed strong associations between the physical activity variables and cardiac risk, indicating an increase in risk as the level of physical activity reduces (Ekelund et al., 2012). The study of Gopinath, Hardy, Kifley, Baur and Mitchell (2014) reports that it is possible that the higher prevalence of high blood pressure among adolescents is related to longer

exposure to unhealthy behaviours, such as inadequate eating habits and insufficient activity practice physical. Accordingly, it is considered relevant to develop actions to promote physical activity in school to confront this CRF in the researched population (Quadros et al., 2016).

It was emphasized that the insufficient level of physical activity was the second most prevalent risk factor among all the factors studied in the present study, behind only the family history (Graph 3). This highlights the importance of interventions on the level of physical activity of children and adolescents.

Related to the presence of overweight, the present study found a higher prevalence (34%) than other national studies, such as Ribas and Silva (2014) (20.4%), Farias Junior et al. (2011) (10%) and 29.4% of Gomes et al. (2012). Despite the consequences, obesity is considered the fastest growing problem in the world. In Brazil, between 1974 and 2009, excess weight among adults almost tripled, culminating in 49% of overweight and 14.6% with obesity. The prevalence of overweight in children (47.8%) and adolescents (21.5%) was highlighted, which presented increases of three and four times, respectively, over the referred time frame (IBGE, 2010b).

Central obesity, due to WC measurement, was present in 17% of the analysed sample. This result is superior to the finding by Romanzini, Pelegrini, and Petroski (7%) and resembles that found by Gomes et al. 2012 (14.8%). In relation to gender, a higher proportion of girls (6.7%) with abdominal obesity were found in a sample of adolescents from the Northeast region when compared to boys (4.9%) (Cavalcanti et al., 2010). These evidences indicate an increase in abdominal obesity in adolescents, and knowing the factors associated with abdominal obesity are important to subsidize intervention programs in adolescents.

CONCLUSION

The presence of several cardiovascular diseases in the family history of the students analysed demonstrated a strong genetic tendency for CVD. Against this genetic tendency it is necessary to adhere to a healthy lifestyle.

However, it was verified through the study a prevalence of young students with insufficient levels of physical activity and with a relevant number of them with overweight and obesity. Therefore, it is important that public policies aimed at young population should orient and stimulate healthy habits of life, such as the importance of physical activity and healthy eating choices, contributing to the adherence of a healthy lifestyle in this population.

It is suggested that studies be carried out to provide longitudinal follow-up with the young students, verifying and monitoring not only genetic and behavioural factors, but also environmental and psychological factors, so as make it possible to direct public intervention policies in the school environment.

Acknowledgments:

Nothing to declare.

Conflict of interests:

Nothing to declare.

Funding:

Nothing to declare.

REFERENCES

- Brasil. (2012). *Resolução 466/2012*. Brasília: Ministério da Saúde, Conselho Nacional de Saúde.
- Bitsori, M., Linardakis, M., Tabakaki, M., & Kafatos, A. (2009). Waist circumference as a screening tool for the identification of adolescents with the metabolic syndrome phenol type. *International Journal Of Pediatric Obesity*, 4(4), 325-331. doi: 10.3109/17477160902914597
- Brito, B., Leal, J., Formiga, L., Frota, K., Silva, A., & Lima, L. (2016). Doenças cardiovasculares: fatores de risco em adolescentes. *Cogitare Enfermagem*, 2(21), 1-8. doi: 10.5380/ce.v21i2.41848
- Burgos, M. S., Burgos, L. T., Camargo, M. D., Franke, S. I. R., Prá, D., Silva, A. M. V. da., Borges, T. S., Todendi, P. F., Reckziegel, M. B., & Reuter, C. P. (2013). Associação entre medidas antropométricas e fatores de risco cardiovascular em crianças e adolescentes. *Arquivos Brasileiros de Cardiologia*, 101(4), 288-296. Epub August 27, 2013. doi: 10.5935/abc.20130169
- Callaway, C. W., Chumlea, W. C., Bouchard, C., Himes, J. H., Lohman, M., A. D, Mitchell, C. D, Mueller, W. H, Roche, A. F. & Seefeldt, V. D. (1991). Circumferences. In T. G. Lohman, A. F. Roche & R. Martorell, (Eds.), *Anthropometric standardization reference manual*. Champaign, IL: Human Kinetics.
- Cavalcanti, C. B. dos S., Barros, M. V. G. de., Meneses, A. L., Santos, C. M., Azevedo, A. M. P., & Guimarães, F. J. de S. P. (2010). Abdominal obesity in adolescents: prevalence and association with physical activity and eating habits. *Arquivos Brasileiros de Cardiologia*, 94(3), 371-377. doi: 10.1590/S0066782X2010000300015
- Ekelund, U., Luan, J., Sherar, L., Esliger, D., Griew, P., & Cooper, A. (2012). Moderate to Vigorous Physical Activity and Sedentary Time and Cardiometabolic Risk Factors in Children and Adolescents. *Journal of the American Medical Association*, 307(7), 704. doi: 10.1001/jama.2012.156
- Farias Júnior, J. C., Mendes, J. K. F., Barbosa, D. B. M., & Lopes, A. da S. (2011). Fatores de risco cardiovascular em adolescentes: prevalência e associação com fatores sociodemográficos. *Revista Brasileira de Epidemiologia*, 14(1), 50-62. doi: 10.1590/S1415790X201100010005
- Fermino, R., Rech, C., Hino, A., Rodriguez Añez, C., & Reis, R. (2010). Atividade física e fatores associados em adolescentes do ensino médio de Curitiba, Brasil. *Revista De Saúde Pública*, 44(6), 986-995. doi: 10.1590/s0034-89102010000600002
- Gomes, E. B., Moreira, T. M. M., Pereira, H. C. V., Sales, I. B., Lima, F. E. T., Freitas, C. H. A. de., & Rodrigues, D. P. (2012). Fatores de risco cardiovascular em adultos jovens de um município do Nordeste brasileiro. *Revista Brasileira de Enfermagem*, 65(4), 594-600. doi: 10.1590/S0034-71672012000400007
- Gopinath, B., Hardy, L., Kifley, A., Baur, L., & Mitchell, P. (2014). Activity Behaviors in Schoolchildren and Subsequent 5-yr Change in Blood Pressure. *Medicine & Science In Sports & Exercise*, 46(4), 724-729. doi: 10.1249/mss.0000000000000166
- Instituto Brasileiro de Geografia e Estatística. (2010). *Características da população e dos domicílios: resultados do universo*. Rio de Janeiro: IBGE.
- Instituto Brasileiro de Geografia e Estatística. (2010). *Pesquisa de orçamentos familiares 2008-2009*. Rio de Janeiro: IBGE.
- Mendes, M. J. F. de L., Alves, J. G. B., Alves, A. V., Siqueira, P. P., & Freire, E. F. de C. (2006). Associação de fatores de risco para doenças cardiovasculares em adolescentes e seus pais. *Revista Brasileira de Saúde Materno Infantil*, 6(Supll. 1), s49-s54. doi: 10.1590/S1519-38292006000500007
- Mendonça, A. (2012). *Promoção da saúde e processo de trabalho dos profissionais de educação física do núcleo de apoio à saúde da família* (Mestrado em Saúde Coletiva). Universidade Estadual de Londrina.
- Pereira, P. F., Serrano, H. M. S., Carvalho, G. Q., Lamounier, J. A., Peluzio, M. do C. G.,

- Franceschini, S. do C. C., & Priore, S. E. (2010). Circunferência da cintura como indicador de gordura corporal e alterações metabólicas em adolescentes: comparação entre quatro referências. *Revista da Associação Médica Brasileira*, 56(6), 665-669. doi: 10.1590/S010442302010000600014
- Petroski, E. (2011). *Antropometria: técnicas e padronizações* (ed. 5). Porto Alegre: Palotti.
- Quadros, T. M. B. de, Gordia, A. P., Silva, L. R., Silva, D. A. S., & Mota, J. (2016). Inquérito epidemiológico em escolares: determinantes e prevalência de fatores de risco cardiovascular. *Cadernos de Saúde Pública*, 32(2), 1-17, e00181514. EpubMarch 04, 2016. doi: 10.1590/0102-311X00181514
- Ribas, S. A., & Silva, L. C. S. da. (2014). Fatores de risco cardiovascular e fatores associados em escolares do Município de Belém, Pará, Brasil. *Cadernos de Saúde Pública*, 30(3), 577-586. doi: 10.1590/0102-311X00129812
- Romanzini, M., Pelegrini, A., & Petroski, E. L. (2011). Prevalência e fatores associados à obesidade abdominal em adolescentes. *Revista Paulista de Pediatria*, 29(4), 546-552. doi: 10.1590/S010305822011000400012
- Santos, M. S., Hino, A. A. F., Reis, R. S., & Rodriguez-Añez, C. R. (2010). Prevalência de barreiras para a prática de atividade física em adolescentes. *Revista Brasileira de Epidemiologia*, 13(1), 94-104. doi: 10.1590/S1415-790X2010000100009
- Taylor, R. W, Jones, J. E, Williams, S. M, & Goulding, A. (2000). Evaluation of waist circumference, waist-to-hip, and the conicity index as screening tools for high trunk fat mass, as measured by dual energy X rayabsorptiometry in children aged 3–19y. *The American Journal of Clinical Nutrition*, 72, 490-495.
- Walter, F., Emery, J., Braithwaite, D., & Marteau, T. (2004). Lay Understanding of Familial Risk of Common Chronic Diseases: A Systematic Review and Synthesis of Qualitative Research. *The Annals of Family Medicine*, 2(6), 583-594. doi: 10.1370/afm.242
- World Health Organization [WHO]. (2006). Multi centre Growth Reference Study Group. Assessment of differences in linear growth among populations in the WHO Multi centre Growth Reference Study. *Acta Paediatrica*, 95, 56–65. doi: 10.1111/apa.13112
- World Health Organization [WHO]. (2015). *Physical activity strategy for the WHO European Region 2016–2025*. Geneva: WHO Global Report.



Evaluation of nutritional status of children aged 0 to 5 years old in Early Childhood Education of the Municipal Education Network of Itajaí/SC

Zilá Gomes de Moraes Flores^{1,3*}, Elisabete Laurindo de Souza^{2,3}, Edeilson de Souza³

ORIGINAL ARTICLE

ABSTRACT

The increasing number of children from 0 to 5 years old, evaluated as overweight in recent years, motivated teams of the Health Program at School and the School Feeding Program of the Municipal School Network of Itajaí/SC (Brazil) to conduct a research in order to verify the nutritional status of students regularly attending the Early Childhood Education centers. We seek to minimize the effects of this condition throughout life. We adopted the cross-sectional, descriptive and field study method, with data collection between April and July 2016, from 64 Early Childhood Education Centers. Data shows that 925 children, representing 1/3 of the total number of students aged 0 to 5 years and 11 months old, are in an overweight situation. From those, 610 were with high weight for the age, corroborating the waistline perimeter data (WP) with children at risk; 175 children were diagnosed with thinness and, of these, 65 also have low weight for their age. Thus, these children require special attention of those involved. We considered, therefore, the study presented extremely important as it may trigger prevention actions and immediate intervention.

Keywords: physical education, early childhood education, childhood obesity, nutrition evaluation.

INTRODUCTION

The World Health Organization (WHO) points out that the biggest public health problem in the world today is obesity, which is growing at a rapid pace. The Organization predicts that about 2.3 billion adults may be diagnosed with being overweight. This is even more worrying as the projection estimates that 700 million people might present an obese state and that the number of overweight and obese children in the world may reach 75 million if nothing is done about it (Brazil, 2014).

The reality in Brazil is also a concern due to the growth of obesity rates in the country. Some surveys indicate that more than 50% of the population is classified as being overweight and obese. Among children, this rate reaches approximately 15%, according to a study done by the National Network of Early Childhood (*Rede Nacional da Primeira Infância - RNPI*, 2014).

The growing interest in the search for reasons about the prevalence and factors

associated with the diagnosis of overweight and obesity in 0 to 5-year-old children has been verified in several studies. The main causes of being overweight are associated with improper eating habits, sedentary lifestyle, overweight and obese parents, socioeconomic status and environmental factors (Onis, 2015; Rivera et al., 2014).

Obesity is defined as an atypical accumulation or excess of fat in the body, which can lead to negative implications for the health condition and to the development of other pathologies such as diabetes, hypercholesterolemia, arterial hypertension, osteoarticular involvement, cardiovascular diseases, and various types of cancers. Malnutrition (Chagas et al., 2013), on the other hand, is defined as a condition resulting in different dimensions of energy and protein deficiency, being aggravated by repeated situations of infectious processes.

¹ Porto das Águas College (FAPAG), Porto Belo, Brazil.

² Avantis College, Balneário, Camboriú, Brazil.

³ Municipal Secretary of Education, Itajaí, Brazil.

* Corresponding Author: Porto das Águas College (FAPAG), Av. Vereador Abraão João Francisco, 3855, Sacada, 88307-303, Itajaí, Brazil. Email: zilamflores@gmail.com

According to RNPI (2014), in Latin America, approximately 3.8 million children aged up to five years old were diagnosed with excessive weight: overweight or obesity. At the same time, the same data was pointed out by the Pan American Health Organization (PAHO, 2014), in its report, which presents obesity as an epidemic. Data from the Food and Nutritional Surveillance System of the Ministry of Health (Brazil, 2014) has revealed a rise in the diagnosis of overweight risk, overweight and obesity in Brazilian children in recent years, increasing the epidemiological panorama of the so-called non-communicable diseases, which are risk factors for other diseases.

Although the data presented shows problems of excessive weight, the table of classification of nutritional status also presents diagnoses of thinness and acute thinness that occur throughout the country, especially in children living in conditions of social vulnerability. According to Conde and Gigante (2007), underweight or malnutrition has been considered, if not the main cause, one of the risk factors relevant to the number of people with disability and the fourth factor for mortality in terms of world population, especially in developing countries. In Brazil, according to IBGE (2006), underweight cases (below $z=2.0$ score) are among the poorest social classes, whose total family income is lower than the minimum wage. The highest frequency is in urban areas, in the North and Northeast regions.

Chagas et al. (2013), in a survey in the six largest municipalities of the state of Maranhão (Brazil), in 2006/2007, with 1214 under five-year-old children, found that in the weight-for-age classification, malnutrition was 4.5%, and in the weight-for-height 3.9% were already classified as malnourished, corroborating with height-for-age of 8.5% of children with previous malnutrition; and 6.7% being overweight.

Lima et al. (2010), in a survey carried out in the northeast of Brazil, on the causes of the decline of malnutrition in that region, confirmed that the prevalence of malnutrition due to being underweight has decreased in Brazil. On the other hand, it has been noticed the prevalence of diagnoses related to overweight in children,

although it is not affirmed that there was a substitution or compensation, but that the interferences of environment, the increase of nutritional options and the possible decrease of children's physical activity, can justify that the cases of overweight and obesity prevail to those of thinness.

Magalhães, Sant'Ana, Priore and Franceschini (2014), in a bibliographical study, analyzed researches with indicators for fat accumulation, among them the Waist Perimeter (WP), stating that the WP measure, when assessing obesity in the abdominal region, revealed that fat excess in the central region of the trunk in children corroborates the results obtained in other indicators, such as the Body Mass Index (BMI).

In the Municipal School Network of the city of Itajaí (Santa Catarina – Brazil), there are about 10 thousand students enrolled in Early Childhood Education, aged 0 to 5 years and 11 months old, distributed in nursery, pre-kindergarten, kindergarten, pre-school, living daily in an educational environment that has the institutional role of caring for and educating young children at all times during their routine (Itajaí, 2015), namely: the entrance and exit, feeding, hygiene, rest, plays, Physical Education classes in the park and in the external areas, among other activities that are experienced daily by the children, being translated into meaningful experiences.

Given that, the present research, developed through a partnership between Avantis College and the Municipal Secretariats of Education and Health of Itajaí/SC, had the objective of verifying the nutritional status of students who regularly attend the Municipal School Network of Itajaí/SC. We intend to support future appropriate nutritional prescriptions, through the 'Health in School' and 'School Feeding' Programs, as well as intersectoral health actions with schools and families, in the pursuit of compliance with Law No. 5853, of September 16th, 2011 (Itajaí, 2011), which establishes the Policy of Obesity and Overweight Combat – 'Lighter Itajaí' in the scope of the Municipality of Itajaí/SC. In this study, the focus was on Early Childhood Education, involving 0 to 5 years and 11-month-old students.

Therefore, this research is justified because, nowadays, many children are at risk due to their body composition condition. According to WHO (2015), about 40% of Brazilian children are diagnosed with overweight and obesity, and, despite that, diagnoses of malnutrition due to being underweight still occurs.

This research was inserted in the Brazil Platform n.º CAAE: 55258116.3.0000.5592, and evaluated and approved by the Committee of Ethics and Research of the Avantis College under the protocol n.º 032069/2016.

METHOD

This is a cross-sectional, descriptive and field study (Thomas, Nelson, & Silverman, 2012). Data was collected between April and July 2016 in 64 Early Childhood Education Centers of Itajai/SC, which belong to the Municipal School Network, with students enrolled and present on the day of data collection. However, it is necessary to emphasize that the research samples did not consider as basis of analysis the students with Down Syndrome, because they are subjects that must be evaluated in a specific manner.

The nutritional diagnosis of the students was defined based on the widely used anthropometric indices indicated by the WHO (2006, 2007 as cited in Brazil, 2011), and adopted by the Brazilian Ministry of Health for the evaluation and classification of the nutritional status of children according to gender: BMI-for-age, weight-for-age, height-for-age for all, and weight-for-height for children up to 60 months of age; as well as Waist Perimeter (WP) classified by Fernández, Redden, Pietrobelli and Allison (2004) for children over 2 years old.

Participants

The sample size covered 6,432 children aged 0 to 5 years and 11 months old, corresponding to 66% of the total number of children enrolled in the 64 Early Childhood Education Centers of Itajaí/SC in the Municipal School Network. The age of the children was defined in months based on the difference between the date of birth reported by the schools and the date when data

was collected. Anonymity and confidentiality were guaranteed to the subjects.

Instruments and Procedures

The instrumentation adopted for data collection included the elaboration of spreadsheets with the students' cadastral information, containing: class, name, date of birth and gender; Mabbis® non-elastic, flexible anthropometric tape; Welmy® baby scale and WCS® horizontal anthropometer to verify the length; Powner® digital scale, with a maximum capacity of 150 kg; WCS® stadiometer, built in wood, with printed scale, varying from 40 to 220 cm. Following the guidelines for the collection of anthropometric measurements from the Ministry of Health (Brazil, 2011), the weight was measured and recorded in kilograms on the scale for babies, weighed without clothing; the other children were weighed on a digital scale placed on a flat even floor, assuming the orthostatic positioning, barefoot, without coats, upper limbs along the body, head with the Frankfurt plan established. The length was measured in children up to 2 years of age with the anthropometer, in the oldest the height was measured also observing the orthostatic positioning, barefoot, the head with the Frankfurt plan established, registered in the nearest millimeter.

The anthropometric evaluation of the students was established from the calculation of the Body Mass Index, verified through the formula:

$$BMI = \frac{\text{weight}}{\text{height}^2}$$

The weight-for-age, weight-for-height and height-for-age indices were used to classify the nutritional status, according to the Percentile Tables of the World Health Organization (WHO, 2006, 2007, as cited in Brazil, 2011), considering the age in months, as already described. These procedures followed the description of measurement and analysis of the 'Guidelines for the collection and analysis of anthropometric data in health services: Technical Standard of the Food and Nutrition

Surveillance System' of SISVAN - Ministry of Health (Brazil, 2011).

For the classification of the cardiac risk of the students, the Perimeter of the Waist (PW) according to Petroski's protocol (2007) was measured, being verified with the anthropometric tape and having as reference the midpoint between the last lower rib and the iliac crest. The data obtained were registered to the nearest millimeter, classified by the percentile tables for PW of Fernández et al. (2004), for children and adolescents from 2 to 18 years of age, by gender, considering the cut-off points for Risk and No Risk.

The researchers decided to add the classification 'Near Risk', for children who, despite not being at risk, present proximity of values of risk classification, serving as an alert.

Statistical analysis

Data was tabulated in the Microsoft Excel® program and are expressed in percentages, considering that the research is still in progress for the data collection with children and adolescents of Elementary and Young Adult Education (called EJA in Brazil).

The statistical results of the research by categories according to the anthropometric indices evaluated are presented in tables. No statistical association was made considering the gender of the students with the other data investigated.

RESULTS

The results of the anthropometric indices, divided by categories, are presented in Tables 1 to 5.

Table 1

Classification of weight-for-age data obtained according to WHO tables (2006/2007 as cited in Brazil, 2011)

Categories	Frequence/Students	Percentual
Very low weight for age	19	0.30%
Low weight for age	46	0.72%
Appropriate weight for age	5757	89.51%
High weight for age	610	9.48%
Total	6432	100.00%

Table 2

Classification of height-for-age data obtained from WHO tables (2006/2007 as cited in Brazil, 2011)

Categories	Frequence/Students	Percentual
Very short height for age	36	0.56%
Short height for age	160	2.49%
Adequate height for age	6236	96.95%
Total	6432	100.00%

Table 3

Classification of BMI-for-age data obtained according to the WHO tables (2006/2007 as cited in Brazil, 2011)

Categories	Frequence/Students	Percentual
Healthy	4013	62.39%
Risk of overweight	1317	20.48%
Overweight	622	9.67%
Obesity	249	3.87%
Severe obesity	56	0.87%
Thinness	121	1.88%
Acute thinness	54	0.84%
Total	6432	100.00%

Table 4

Classification of weight-for-height data obtained according to WHO tables (2006/2007 as cited in Brazil, 2011), for children up to 60 months old

Categories	Frequence/Students	Percentual
Healthy	3336	63.41%
Risk of overweight	1255	23.85%
Overweight	407	7.74%
Obesity	146	2.78%
Thinness	76	1.44%
Acute thinness	41	0.78%
Total	5261	100.00%

Table 5

Classification of waist perimeter data obtained according to Fernández et al. (2004) for children above 2 years old

Categories	Frequence/Students	Percentual
Without risk	3558	68.33%
Close to risk	299	5.74%
Risk	1350	25.93%
Total	5207	100.00%

DISCUSSION

From the data presented, we can verify that the prevalence of malnutrition is low in relation to the values of overweight indicators. Although society discusses obesity as an epidemic, this is worrying as malnutrition and its consequences are forgotten.

Chagas et al. (2013) investigated children from six municipalities in the state of Maranhão (Brazil). They found 4.5% of those evaluated with BMI rating of thinness, and the values of the weight index for the stature of 3.9% in malnutrition at that time. These are values that differ from the 2.0% thinness found in Itajaí/SC, indicating malnutrition for both BMI and weight-for-height, which could trigger diseases such as anemia and hypovitaminosis, exposing the subjects to a high risk of becoming ill and even dying.

The overweight indicators of both BMI and weight-for-height were 34.89% and 34.37%, respectively. Comparing them to the data obtained by the analysis and classification of the WP, 25.93% are at risk; and 5.74% with values very close to the risk percentiles, which totals 31.67% of children over 2 years old. Therefore, through the approximation of results, the confirmation of these values indicates risks for

children to become obese adults, develop noncommunicable diseases linked to obesity, such as diabetes, hypertension, high cholesterol, insulin resistance, and triglycerides, among others (Onis, 2015).

In the study of Vitolo et al. (2008), of 3,957 children aged 1 month to 5 years old, during the National Vaccination Campaign in the city of São Leopoldo (Rio Grande do Sul – Brazil) in 2002, they found that 9.8% of the evaluated children were overweight.

The data presented by Miglioli et al. (2015), in a cross-sectional study investigating the nutritional status of 790 children under five years of age, they found 1.5% of those evaluated through BMI for age with low-weight diagnosis; and through the weight-for-age classification 2.6% were with underweight diagnosis. With the same indicators, 4.7% and 8.6% of the children diagnosed, respectively, with overweight, and 8.9% of the sample with short height-for-age, differing from the data found in this research of 3%, when the data of short stature and very short stature were added.

In this aspect, we can see that, although the sample is smaller, the data presented by Vitolo, Gama, Bortolini, Campagnolo, and Drachler (2008) and Miglioli et al. (2015) are also generally close to the data of the research with the children of Itajaí/SC, in which the BMI indices by age and height-for-age are very close in all their classifications.

In the study carried out in Itajaí/SC, we can verify a higher percentage of children who have high weight compared to that found by Schuch, Castro, Vasconcelos, Dutra, and Goldani (2013). The authors carried out a study with students from public schools in the states of Rio Grande do Sul and Santa Catarina, totaling 4,914 children (2,578 in Rio Grande do Sul and 2,336 in Santa Catarina). In the case of Santa Catarina, in six municipalities, 7.5% of the children were overweight.

PAHO proposed, in the 2014-2019 action plan, to prevent obesity in children and adolescents in Latin America. This plan focuses on modifying a current environment that predisposes obesity to a beneficial environment

that allows the consumption of a nutritious diet and physical activity exercise, and approaching the WHO global tactic on food intake, physical activity and health.

In relation to prevention, the Municipal School Network of Itajaí/SC, through the Municipal Department of Education, included Physical Education (PE) as a compulsory school content, taught by a PE professional in all Early Childhood Education schools in 2014.

It is worth clarifying that in all the years of elementary education, PE has already been an effective curricular component, taught by duly qualified teachers. The practice of physical and playful activity systematized since childhood can contribute to improving the health status of children. Concomitant with the inclusion of PE in Early Childhood Education, a Municipal School Feeding Plan was developed, which established rules and guidelines for local actions, including the substitution of rich in fat and sugar foods for natural ones. The consumption and variety of fruits and vegetables was considerably increased, as well as the inclusion of infant formula instead of cow's milk for children up to 2 years of age, improving the nutritional quality of the menus served to children daily.

The intention of the Municipal Department of Education was to provide students with a healthy, balanced and adequate menu by age group, consisting of some whole foods such as bread, pasta and rice, beans, lentils, eggs, meat, fish, vegetables, varied fruits and natural juices. Another important measure was the deactivation of canteens in all school units in the municipality. The lack of anthropometric data prior to this action was a limiting factor for a comparative analysis to verify if the PE classes, as well as the adequacy of the menus, contributed or not to reduce the cases of overweight.

Another situation considered as limiting to this study refers to the impossibility of covering all the students in the data collection, although it is sensible to say that the sample of 66% is consistent to demonstrate its relevance. Data shows that 925 (1/3) children are in an overweight situation. Among these 610 have

high weight for their age, corroborating with Waist Perimeter (WP) data with children at risk, and 175 children with a diagnosis of thinness – among them, 65 also indicate low weight for age and need special attention.

CONCLUSION

In this study, the high number of overweight children found warn to the development of effective public policies. It is necessary to immediately implement a periodic evaluation routine for all children, since the early childhood education, involving Physical Education professionals, with training in protocols of anthropometric measures and adequate equipment.

The research developed, and the referenced studies show that the disposition for childhood obesity starts at six months. Thus, monitoring the growth pattern becomes effective to monitor and control the occurrence of overweight cases in school-age children and adolescents. This will enable immediate intervention throughout the observation of the increase in the percentiles of the BMI-for-age, weight-for-age, height-for-age, weight-for-height indicators and WP, providing to family members, schools, nutritionists and health-care professionals at school with up-to-date data and information, generating knowledge that supports the adoption of healthy eating habits and practices of physical activities in their daily routine. Thereby, ensuring the maintenance, preservation and expansion of times and spaces for physical activity at school are essential for the transformation of obesogenic environments into healthy environments.

Acknowledgments:

Nothing to declare.

Conflict of interests:

Nothing to declare.

Funding:

Nothing to declare.

REFERENCES

- Brasil. (2014). *OMS quer estratégia global contra crise de obesidade infantil*. Retrieved October 12, 2016, from <http://www4.planalto.gov.br/consea/comunicacao/noticias/2014/oms-quer-estrategia-global-contra-crise-de-obesidade-infantil>.
- Brasil. (2011). *Orientações para análise de dados antropométricos em serviços de saúde: Norma técnica do sistema de vigilância Alimentar e Nutricional – SISVAN*. Brasília: Ministério da Saúde, 2011. Retrieved February 15, 2016, from http://bvsmis.saude.gov.br/bvs/publicacoes/orientacoes_coleta_analise_dados_antropometricos.pdf
- Chagas, D. C., Silva, A. A. M., Batista, R. F. L., Simões, V. M. F., Lamy, Z. C., Coimbra, L. C., & Alves, M. T. S. S. B. (2013). Prevalência e fatores associados à desnutrição e ao excesso de peso em menores de cinco anos nos seis maiores municípios do Maranhão. *Revista brasileira de epidemiologia*, 16(1), 146-156. doi: 10.1590/S1415-790X2013000100014
- Conde, W. L., & Gigante, D. P. (2007). Epidemiologia da desnutrição infantil. In Kac, G., Sichieri, R. & Gigante, D. P. (Eds), *Epidemiologia nutricional* (1ª ed.) [online] (pp. 280-295). Rio de Janeiro: FIOCRUZ/Atheneu.
- Fernández, J. R., Redden, D. T., Pietrobelli, A., & Allison, D. B. (2004). Waist circumference percentiles in nationally representative samples of african-american, european-american, and mexican-american children and adolescents. *The Journal of Pediatrics*, 145(4), 439-44. doi: 10.1016/j.jpeds.2004.06.044
- Instituto Brasileiro de Geografia e Estatística. (2006). *Pesquisa de Orçamentos Familiares 2002-2003: antropometria e análise do estado nutricional de crianças e adolescentes no Brasil* (2ª ed.). Rio de Janeiro: IBGE.
- Itajaí. (2011). Lei n. 5853, de 16 de setembro de 2011. Institui a Política de Combate à Obesidade e ao Sobrepeso 'Itajaí mais leve' no âmbito do município de Itajaí, e dá outras providências. Retrieved August 21, 2016, from http://portaldocidadao.itajai.sc.gov.br/servico_link/28
- Itajaí. (2015). *Diretrizes Municipais para a Educação Infantil*. Retrieved September 10, 2016, from www.educacao.itajai.sc.gov.br/d/85
- Lima, A. L. L., Silva, A. C. F., Konno, S. C., Conde, W. L., Benicio, M. H. D., & Monteiro, C. A. (2010). Causas do declínio acelerado da desnutrição infantil no Nordeste do Brasil (1986-1996-2006). *Revista Saúde Pública*, 44(1), 17-27. doi: 10.1590/S0034-89102010000100002
- Magalhães, E. I. Da S., Sant'Ana, L. F. Da R., Priore, S. E., & Franceschini, S. do C. C. (2014). Perímetro da cintura, relação cintura/estatura e perímetro do pescoço como parâmetros na avaliação da obesidade central em crianças. *Revista paulista pediatria* 32(3), 273-281. doi: 10.1590/0103-0582201432320
- Miglioli, T. C., Fonseca, V. M., Junior, S. C. G., Silva, K. S., Lira, P. I. C., & Filho, M. B. (2015). Fatores associados ao estado nutricional de crianças menores de cinco anos. *Revista Saúde Pública*, 49, 59. doi: 10.1590/S0034-8910.2015049005441.
- Onis, M. De. (2015). Prevenção do sobrepeso e da obesidade infantis. *Jornal de Pediatria*, 91(2), 105-107. doi: 10.1016/j.jpeds.2014.10.002
- Pan American Health Organization. PAHO (2014). *Plan of action for the prevention of obesity in children and adolescents*. Retrieved September 14, 2016, from <http://www.paho.org/bra/images/stories/UTFG/CV/planofactionchildobesity-por.pdf?ua=1>
- Petroski, E. L. (2007). *Antropometria: técnicas e padronizações* (3ª ed.). Blumenau: Nova Letra.
- Rede Nacional Primeira Infância. (2014). *Plano Nacional da Primeira Infância/Projeto Observatório Nacional da Primeira Infância: Mapeamento da ação finalística evitando acidentes na primeira infância*. Fortaleza: RNPI. Retrieved September 23, 2016, from: <http://primeirainfancia.org.br/wp-content/uploads/2015/01/Obesidade-Infantil-v6.pdf>
- Rivera, J. A., Cossio, T. G., Pedraza, L. S., Aburto, T. C., Sánchez, T. C., & Martorell, R. (2014). Childhood and adolescent overweight and obesity in Latin America: a systematic review. *Lancet Diabetes Endocrinol*, 2(4), 321-32. doi: 10.1016/S2213-8587(13)70173-6
- Schuch, I., Castro, T. G., Vasconcelos, F. A. G., Dutra, C. L. C., & Goldani, M. Z. (2013). Excesso de peso em crianças de pré-escolas: prevalência e fatores associados. *Jornal de Pediatria*, 89(2), 179-188. doi: 10.1016/j.jpeds.2013.03.003
- Thomas, J., Nelson, J., & Silverman, S. J. (2012). *Métodos de pesquisa em atividade física* (6ª ed.). Porto Alegre: Artmed.
- Vitolo, M. R., Gama, C. M., Bortolini, G. A., Campagnolo, P. D. B., & Drachler, M. L. (2008). Alguns fatores associados a excesso de peso, baixa estatura e déficit de peso em menores de 5 anos. *Jornal de Pediatria*, 84(3). doi: 10.2223/JPED.1776
- World Health Organization [WHO]. (2015). *Obesity and overweight*. Fact sheet n. 311. Retrieved August 25, 2016, from <http://www.who.int/mediacentre/factsheets/fs311/en/index.html>



Fun and Healthy Every Day: using a website as an educational tool to promote health in school children

Raiane Maiara dos Santos Pereira^{1*}, Isabela Almeida Ramos¹, Stéphaney Vieira Brito¹, Eduardo Bodnariuc Fontes², Carmen Sílvia Grubert Campbell¹

ORIGINAL ARTICLE

ABSTRACT

A sedentary lifestyle and poor nutrition in childhood contribute to increasing levels of poor health among the population. This study aimed to develop a website as a pedagogical tool for health promotion in schoolchildren. Therefore, a total of 39 eutrophic schoolchildren were recruited (22 girls and 17 boys), from 2nd and 5th grades of elementary school (8-10yr), from both public (61.5%) and private (38.5%) schools. Children accessed the TODDS Kids (Fun and Healthy Every Day) website for 1 hour, which was built in HTML5 format on the Wix platform. The participants answered a questionnaire to assess their perception of the site and its content. It was observed that 97.4% of children said they would like to access the site again, and all of them said they would indicate the site to a friend. Scores between 9.14 and 9.56 were attributed to colours, images and information presented on the website. 92.3% and 87.2% reported they intended to be more active and to eat healthier foods after accessing the website, respectively. In conclusion, TODDS Kids website was a well-accepted tool, helping kids to raise awareness about healthier choices and could be used as a pedagogical tool for supporting child health promotion.

Keywords: Software, Health Behaviors, Child.

INTRODUCTION

Excessive energy consumption associated with low expenditure contributes to the development of overweight and obesity, which are associated with innumerable other orthopedic, neurological, gastric, endocrine and cardiovascular diseases (Center Disease Control [CDC], 2011; Mazzocante, Moraes & Campbell, 2012; World Health Organization [WHO], 2014). Public spending on the treatment of diseases associated with overweight amounts to about US\$2.1 billion per year (Brazilian Association for Studies of Obesity and Metabolic Syndrome [ABESO], 2012). Data from 2012 show that in Brazil, 34.8% and 16.6% of boys, and 32% and 11.8% of girls from 5 to 9 years old are overweight and obese, respectively (Mazzocante, Moraes, & Campbell, 2012).

Nowadays, children spend more than two hours a day being entertained on screens such as computers, mobile phones, and TVs, which in addition to stimulating a sedentary lifestyle (Page, Cooper, Griew, & Jago, 2010), also leads to the consumption of unhealthy foods

advertised by television advertisements (Mendes, 2012; Roman, 2011; Fontenelle, 2014; Nunes, 2013; Rodrigues & Fiates, 2012). However, technology can be an instrument of pedagogical support and awareness of the importance of healthy choices (Coutinho, 2007).

In this sense, we believe that access to content shown on educational websites can be an important means of information and communication technology in the teaching-learning process, significantly contributing as material to support health and education professionals. Thus, our objective was to create and evaluate the use of a website as a pedagogical support tool for health promotion in schoolchildren.

METHOD

An exploratory, quasi-experimental, cross-sectional study conducted in two stages: 1 - development of the instrument (choice of name, logo, prototype and conducting of a pilot study); and 2 - testing and data analysis.

¹ Catholic University of Brasília, Brasília-DF, Brazil.

² Federal University of Rio Grande do Norte, Natal, Brazil.

* Corresponding author: Catholic University of Brasília, QNL 14 conjunto A casa 04, Taguatinga, 71966-700, Brasília-DF, Brazil. Email: raianemsp@gmail.com

Participants

The sample consisted of 39 randomly selected children of both genders (22 girls and 17 boys) from 8 to 10 years old, in the 2nd to the 5th grades of the elementary school of public (61.5%) and private (38.5%) schools in the Federal District.

Table 1 shows the mean and standard deviation values of the sample characterization data. On average, the children were considered

to be eutrophic (WHO, 2007), with a good percentage of fat (Lohman, 1992), belonging to socioeconomic class B (Association of Brazilian Research Companies [ABEP], 2012), and physically to moderately active (Barros & Nahas, 2003). Only children without intellectual, visual or reading disabilities, and those whose legal guardians signed the Free and Informed Consent Form participated in the research.

Table 1
Characterization of the sample (mean \pm standard deviation) by age

Variable	8 years	9 years	10 years
Body mass (kg)	31.4 \pm 6.5	31.3 \pm 5.7	34.5 \pm 8.5
Height (m)	1.32 \pm 0.04	1.36 \pm 0.06	1.41 \pm 0.07
BMI (kg/m ²)	18.0 \pm 3.3	16.9 \pm 2.0	17.3 \pm 3.1
BF (%)	19.2 \pm 8.9	17.0 \pm 6.2	21.7 \pm 6.6
PAL (MET)	157.85 \pm 42.1	162.60 \pm 51.2	152.5 \pm 36.0
SES (points)	29.5 \pm 7.6	23.6 \pm 7.4	26.8 \pm 5.1

BMI: Body Mass Index; BF%: body fat; PAL: physical activity level; SES: socioeconomic status.

Instruments e Procedures

Body mass (Tanita UM 080W), height (Sanny®), Body Mass Index (BMI), and Body fat (BF) were measured by tricipital and subscapular skinfold measurement by a Lange adipometer (Maryland, USA) according to the methods proposed by Slaughter (1988). The physical activity level (PAL) was evaluated using the Lifestyle Questionnaire developed by Barros & Nahas (2003); and socioeconomic status (SES) using the questionnaire developed by the Brazilian Advertising Association/Brazilian Market Research Association [ABA/ABIPEME] and adapted by Almeida and Wickerhauser (1991).

A questionnaire based on one developed by Coutinho (2007) was designed to evaluate users' perceptions regarding the navigability and attractiveness of the website, as well as the child's learning. After the intervention, the parents or the person in charge were contacted by telephone inquiry about a possible change in the child's behaviour. The data collection was carried out in two phases, beginning after approval by the Research Ethics Committee of the Catholic University of Brasilia (Opinion no. 803.429).

Phase 1 – Website Development: First, the name TODDS Kids (*Todo Dia Divertido e Saudável*) and the logo (Figure 1) were created based on the idea: “Having a healthy life every day can be fun!” The logo was initially drawn on A4 paper and then vectored in the *Adobe Illustrator* program, and is composed of letters that represent toys and games in different environments, and accessible fruits:



Figure 1. TODDS Kids' Website Logo.

In order to create the prototype of the website, aesthetics and an attractive form of information provided in children's educational websites were initially considered. The website was designed using the HTML5 cloud-based web development platform, wix.com, maintained and operated by Wixpress Ltd. (“Wix”).

During the creation phase we sought to elaborate a variety of playful/fun ways of exposing the information to the children's audience (stories, pictures, small texts, videos, games from other web pages). Thus, a pilot study was carried out with 15 children, from 8 to 10 years old, who navigated the site for 1h. Clarity of information, navigability, suggestions and critiques were evaluated by questionnaire. The children's interaction with the site and the pages of greater or lesser interest were also observed.

Phase 2 - Website application: After instrument consolidation, 39 children were divided into groups of 2 to 5 children who individually and freely navigated the site for 1 hour, using the computers of the computer laboratory of the Catholic University of Brasilia (UCB). Children used headsets to listen to website content and also to avoid distractions from external stimuli. Afterwards, the questionnaire was applied to evaluate the children's perceptions (Graph 1 and Table 2), and knowledge acquired through the site (Table 3).

Phase 3 - Phone inquiry to parents: Ten days after the intervention, a telephone survey was carried out containing four questions directed to the parents or tutors/guardians, where they should answer: yes, to a certain extent or no. Due to the time of data collection being the school holidays period, it was only possible to contact 30 of the 39 parents.

Statistical analysis

The data normality of the sample characterization (PAL, SES, body mass, height, BMI, BF) was tested by the Skewness and Kurtosis protocol, in addition to Shapiro-Wilk. Mean and the standard deviation (SD) were calculated for descriptive statistics. Frequency and percentage rate were also calculated for the post-intervention questionnaire data. For the item "grade", minimum and maximum values and the coefficient of variance ($Cv = SD/mean$) were also calculated, verifying how many

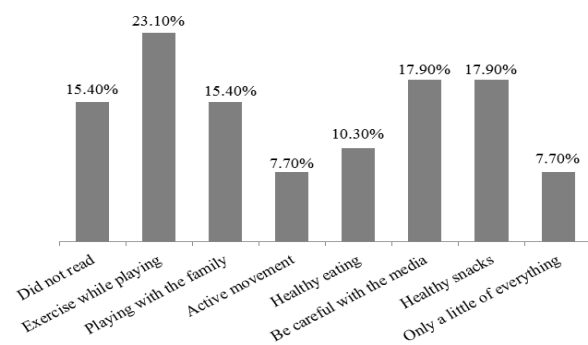
deviated from the mean. Data was tabulated and processed in the SPSS statistical package for Windows, version 20.0.

RESULTS

The navigation bar of the "TODDS KIDS" tool (URL: <http://tododiadivertidoes.wix.com/toddskids>) (Figure 2), provides access to: <Home>, <About us>, <Steps to health>, <Learning with stories>, <More> which give access to: <Videos>, <Also visit>, as well as <Contact us>, and the possibility of downloading the "Schedule/Agenda" created by Pereira et al. (2016) on the <Monitoring Your Health> page. It was possible to verify that the videos attained 38.5% of the children's preference through the questionnaire applied after the session on the website, and whose contents in the form of cartoons referred to children obesity, healthy eating and games. Regarding the lower preference, 76.9% reported that there was no activity that they liked the least, 94.9% approved navigability, and 94.9% would like to meet the research team in person. All children (100%) would indicate access to a friend, and only one did not show interest in accessing it again.

The children were able to access some pages related to healthy habits (My Plate, Nhac, Alana, Let's Move, Smart kids), while the Nhac page was the most accessed by the children (48.7%) due to the presence of games.

The short stories were created by the research team. Graph 1 shows those preferred by children.



Graph 1. Children's Story Preference

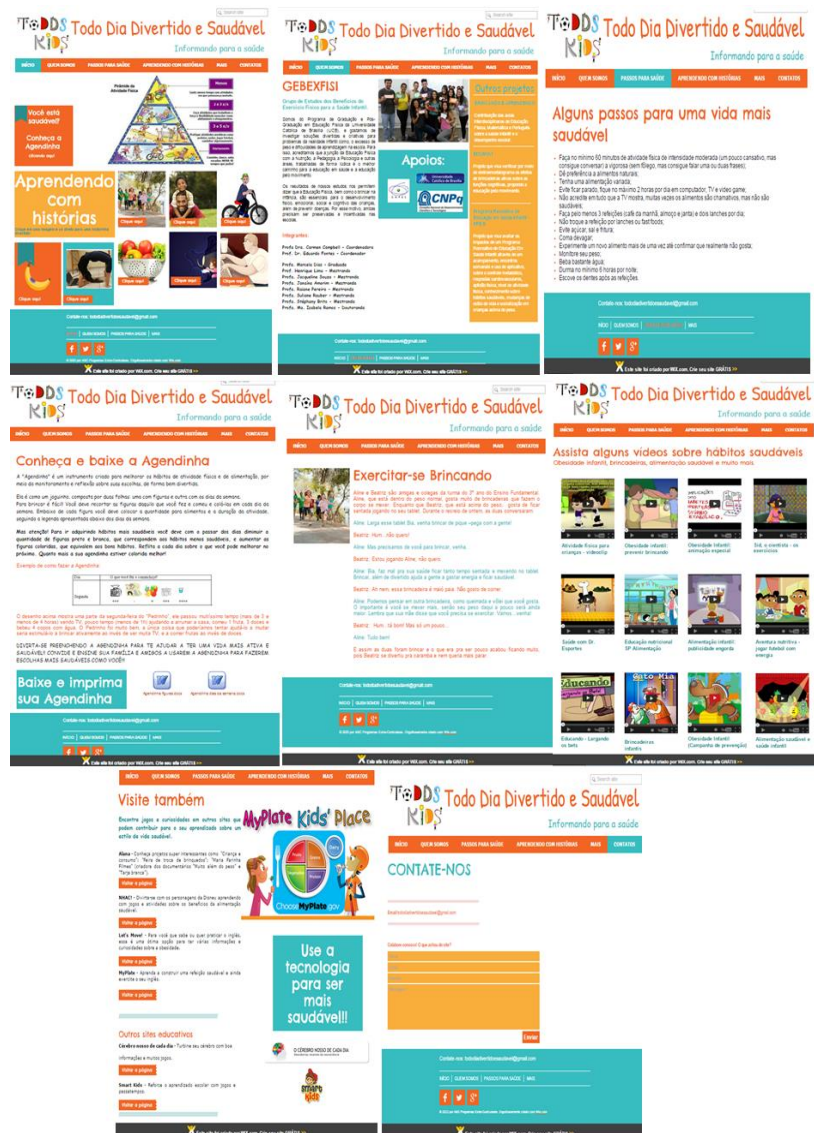


Figure 2. TODDS Kids website pages

In Table 2 shows the evaluation of the website by the children with a grade above 9, when Table 3, the children reported that the healthy snack they ate most frequently is fruit. Among those who reported not wanting to practice more physical activities after browsing the site, the justification was that they were already active.

Table 2 Children's evaluation (0 to 10 points) regarding color, information and images/pictures on the website

	Mean ± standard deviation	C _v
Colors	9.14 ± 1.53	0.17
Information	9.56 ± 0.79	0.08
Images/Pictures	9.4 ± 0.96	0.10

C_v. Coefficient of variance

Table 3 Frequency and percentage rate (%) of answers to questions related to eating habits and physical activity

Question	Yes	No
	n (%)	
Do you eat healthy snacks?	35 (87.9)	4 (10.3)
Do you feel like eating more healthy food after visiting the site?	34 (87.2)	5 (12.8)
Do you feel like doing more physical activity after visiting the site?	36 (92.3)	3 (7.7)
Total	39 (100)	

All children (n = 39) satisfactorily answered the question "Why should I practice physical activity?" 24 (61.5%), 34 (87.2%) and 28 (71.8%) children were able to associate physical activity with healthy eating in their answers to the questions: "According to the website, what should you do to not become obese?"; "Name three attitudes that make you healthier"; "What

did you learn from the site?" Only one volunteer did not answer this last question, claiming to have prior knowledge of the topic.

Table 4 presents responses from parents or guardian/tutors to the telephone survey conducted 10 days after the intervention with the children.

Table 4

Frequency and percentage rate (%) of parents' answers to questions related to healthy habits obtained by telephone survey

Question	Yes	A little	No
	n (%)		
Did your child tell you what they learned on the website they accessed 10 days ago, about children's health?	12 (40)	5 (16.7)	13 (43.3)
Were you more motivated to practice healthy habits after your child accessed the website?	7 (23.3)	7 (23.3)	16 (53.4)
After accessing the website, did you notice if your child has been preferring and asking for healthier habits?	14 (46.7)	2 (6.6)	14 (46.7)
After accessing the website, have you noticed if your child is spending less time in front of the TV/Computer?	7 (23.3)	6 (20)	17 (56.7)
Total	30 (100)		

DISCUSSION

The present study demonstrated that the TODDS Kids website was considered easy to navigate by children, as well as providing them with awareness of healthy habits and could be useful as support material for health and education professionals, as well as parents and/or guardians/tutors.

A pilot study was initially applied with the first version of the website. In it, children's high preference for short and dynamic information was observed, in addition to their fondness for games and videos, emphasizing the power of attractiveness, ludicity and visual effects for this age group. According to Cavalcante et al. (2011), the visual aspect of the instrument is one of the main factors to establish trust with the user.

A combination of cold and warm colors used on the site follow the proposal of Oliveira (2015), who reports that cold colors are processed in the prefrontal cortex and are associated with seriousness and reliable transmission; warm colors are associated to the brain area responsible for the reward state and dopamine release, with green referring to consideration and balance; orange referring to change and the need for repetition of pleasurable

experiences. Thus, the use of these colors being more appealing to both more impulsive and more rational users.

For Fermiano, Bessa, and Cantelli (2013), the colors reinforce the intended message as they refer to emotions, having a strong power of persuasion. In this sense, the combination of the colors used in the site can contribute to a feeling of needing to change to healthier choices, as well as to persuade children with different personalities to become aware of their health.

We observed that 15.4% (n = 6) of the children did not read the stories, while 38.5% emphasized that the videos were their favorite item. This is possibly due to the fact that this is an audiovisual resource with great power of attraction due to its various visual and sound effects (Andrade & Acevedo, 2014; Machado, 2007). However, 30.8% suggested "more games", confirming the findings of Paraskeva, Mysirlaki, and Papagianni (2009), who report that children and young people accumulate approximately 2.5 hours a day in activities related to online multiplayer games, and this weekly workload is considered extensive. However, it is possible to use technology through games by self-reference, and to raise

awareness about technology use, both in terms of time spent and content quality.

Therefore, although technology is largely used in a negative way, electronic games can help teachers as alternative teaching and learning methods (Quiroga, 2009; Paraskeva et al., 2009). Great authors like Piaget, Le Bouche, Wallon, and Freire emphasized the importance of games in the psychosocial development of a child, as well as more recent scholars such as Zea, Sánchez, Gutiérrez, Cabrera & Paderewski (2009). For them, learning while playing allows for the discovery of skills, limitations, abstract thinking and mechanisms of coexistence.

The playfulness of the site may have contributed to the high percentage of correct answers and reports associated with the motivation to practice healthy habits among children after accessing it (Table 3). This is similar to other foreign/international interventions such as “Henry Gets moving” (Nielsen & Rouzier, 2012) and “Take10!” (Kibbe et al., 2011), which verified a significant improvement in body composition, and also in school performance.

The present study sought to provide information for the direct awareness of the child, considering them to be an active and transforming agent of their reality (Libâneo, 2013), making them influential in positive changes in their family (Chenga, Mendonça & Farias Junior, 2014). This can be observed in the responses to the telephone survey by the parents or guardian, in which 46.5% of them considered themselves motivated to improve their habits after the child participated in the intervention (Table 4). This is corroborated by a study by Pereira et al. (2016), where 25% of the parents started a physical activity practice after the child participated in intervention for 2 months at school, emphasizing the importance of interventions in childhood in partnership with family and school.

Based on the limitations of the present study, we suggest that future studies with a larger sample, follow-up time and intervention should be carried out, as well as be extended to family care. Also, anthropometric and physical aptitude assessments, interviews and questionnaires

applied to children should be included to investigate the degree of influence access to the site has on their lifestyle in the long term. However, this initial and innovative study may stimulate the creation of future tools with educational content to be used by health and education professionals, since we observed that the TODDS Kids website can be used as a pedagogical support tool to be used in school for the promotion of child health.

Acknowledgments:

To CNPq, CAPES, Universidade Católica de Brasília - UCB, SESC-DF, study participants.

Conflict of interests:

Nothing to declare.

Funding:

CNPq/CAPES

REFERENCES

- Almeida, P. M., & Wickerhauser, H. (1991). *O critério ABA-ABIPEME: em busca de uma atualização*. São Paulo.
- Andrade, M. A., & Acevedo, C. R. (2014) Práticas de Comunicação de Marketing para Crianças em Websites. *Revista Brasileira de Pesquisas de Marketing, Opinião e Mídia*, 14, 19-37.
- Associação Brasileira de Empresas de pesquisa. ABEP. (2012) Critério Padrão de Classificação Econômica no Brasil – 2008.
- Associação Brasileira para o estudo da obesidade e da síndrome metabólica. (2014). Custos de doenças ligadas à obesidade para o SUS. Retrieved September 26, 2016, from <http://www.abeso.org.br/lenoticia/909/custos+de+doencas+ligadas+a+obesidade+para+o+sus.shtml>.
- Barros, M. V. G., & Nahas, M. V. (2003) *Medidas da Atividade Física: teoria e aplicação em diversos grupos populacionais* (4ª ed.). Londrina: *Midiograf*.
- Chenga, L. A., Mendonça, G., & Farias Júnior, J. C. (2014). Physical activity in adolescents: analysis of social influence of parents and friends. *Jornal de Pediatria*. 90(1), 35-41. doi: 10.1016/j.jped.2013.05.006
- Coutinho, J. G. (2007) *Aprender a Falar, Falar a Brincar: Software Educativo para Intervenção* (Dissertação de Mestrado em Ciências da Fala e da Audição). Universidade de Aveiro, Aveiro.
- Fermiano, M. A. B., Bessa, S., & Cantelli, V. C. B. (2013) Criança Consumo e Neuromarketing. *XXVI Encontro Nacional de professores do PROEPR. Neurociências e educação*. São Paulo.

- Fontenelle, L. Uma infância perdida: publicidade infantil é um abuso contra as crianças. (2014) Alana - Defesa.
- Kibbe, D. L., Hackett, J., Hurley, M., McFarland, M., Schubert, K. G., Schultz, A., & Harris, S. (2011) Ten Years of TAKE 10!®: Integrating physical activity with academic concepts in elementary school classrooms. *Preventive Medicine*, 52(Suppl. 1), S43-S50. doi: 10.1016/j.ypmed.2011.01.025
- Libâneo, J. C. (2013). *Didática* (3ª ed.). São Paulo: Ed. Cortez.
- Lohman, T. G. (1986) Applicability of body composition techniques and constants for children and youths. *Exercise Sports Science Journal*, 14, 325-57.
- Machado, R. C. (2007) *Um software educativo de Exercício-e-prática como ferramenta no processo de alfabetização infantil* (Dissertação de Mestrado). Universidade Federal de Uberlândia, Uberlândia.
- Mazzocante, R. P., Moraes, J. F. V. N., & Campbell, C. S. G. (2012) Gastos públicos diretos com a obesidade e doenças associadas no Brasil. *Revista de Ciências Médicas*, 21(1-6), 25-34.
- Mendes, Beatriz. (2014). Publicidade infantil: proibir ou não proibir? Carta Capital. [online]. São Paulo: *Editora Confiança*. Retrieved September 26, 2016, from <http://www.cartacapital.com.br/sociedade/a-publicidade-infantil-em-debate/>.
- Oliveira, L., & Real, E. (2011). Publicidade, consumo e comportamento infantil. *Intercom – Sociedade Brasileira de Estudos Interdisciplinares da Comunicação XIII Congresso de Ciências da Comunicação na Região Nordeste*. Maceió.
- Paraskeva, F., Mysirlaki, S. E., & Papagianni, A. (2009). Multiplayer online games as educational tools: facing new challenges in learning. *Computers Education*, 54, 498-505. doi: 10.1016/j.compedu.2009.09.001
- Pereira, R. M. S., Rauber, S. B., Ramos, I. A., Andrade, D. T., Militão, A. G., Moraes, J. F. V. N., Simões, H. G., & Campbell, C. S. G. (2016). Recording daily routines with guidance on healthy lifestyle to improve health parameters in children and their families. *Motriz*, 22(3), 164-171. doi: 10.1590/S1980-6574201600030007
- Roman, C. (2014). A publicidade infantil invade a tevê. Carta Capital [online]. São Paulo. *Editora Confiança*, dez. 2011. Retrieved September 28, 2016, from <http://www.cartacapital.com.br/sociedade/os-maleficios-da-publicidade-infantil>.
- World Health Organization (WHO). (2014). Atividade física. Retrieved September 28, 2016, from <http://www.who.int/mediacentre/factsheets/fs385/en/>.
- Zea, N. P., Sánchez, J. L. G., Gutiérrez, F. L., Cabrera, M. J. E., & Paderewski, P. (2009) Design of Educational multiplayer videogames: A vision from collaborative learning. *Advances in Engineering Software*, 40(12), 1251-1260.



Implementation of an intervention program with physical activity and healthy diet for health promotion at school: a possible challenge.

Claudio Marcelo Tkac^{1*}, Luciana Ennes Fridlund¹, Samuel Jorge Moyses¹, Renata Iani Werneck¹, Simone Tetu Moyses¹

ORIGINAL ARTICLE

ABSTRACT

The early development of chronic non-communicable diseases has represented the greatest concern in the health prevention in all countries. The goal of this research was to investigate how a program to promote the health of school children through physical activity and healthy diet can be implemented aiming sustainability and continuity. The participants of this study were 1098 students, aged 6 to 10 years, of both sexes. The students belong to two schools: experimental school (ES-n=592)/control school (CS-n=506). The project was implemented in 2013 (pre-test) and was followed until 2015 (post-test), with an intervention in 2014. The following variables were evaluated: nutritional status, level of blood glucose, cardiorespiratory endurance, fondness for exercises and 4 categories of food. The statistical analysis used was the Wilcoxon test (paired) and the Wilcoxon test (U of Mann Whitney) (independent samples), assuming a significance level of $p < 0.05$. The results showed differences between ES and CS groups in the years 2013 and 2015. The biggest differences occurred in ES 2015. It can be concluded that the intervention was effective and implemented with intersectoral articulations to ensure sustainability and continuity.

Keywords: early intervention, physical activity, healthy eating, school health.

INTRODUCTION

Physical activity is associated with several health promotion benefits, but the majority of children do not reach the recommended levels. Particularly, on childhood obesity prevention, physical activity is embedded in most programs to reduce obesity, with results pointing to an association between high levels of physical activity with low body mass indexes (Metcalf, Henley, & Wikin, 2012).

Historically, the World Health Organization (WHO) has been publishing reports with guidelines for the prevention of chronic non-communicable diseases (NCD's) (WHO, 2005a; WHO, 2008a; WHO, 2009) in which physical activity and healthy eating are considered conditions for the promotion of health in combating the NCD's, in countries, in communities and at school. A report was published recently to end childhood obesity in the world (WHO, 2016), indicating the physical activity as one of the strategies of effectiveness. Therefore, the identification and control of risk

factors to health, that are modifiable, are fundamental to the prevention of NCD's (Gunawardena et al., 2016).

In South America, the recommendations for physical activity interventions for health promotion, indicate at least 180 minutes a day of physical activity in any intensity (preschoolers) and at least 60 minutes of physical activity, often 3 times per week, with moderate to vigorous intensity in middle and high school (Gonzales, Garcia, Martinez, & Sarmiento, 2016). Despite the recommendations about the intensity of physical activity in the school environment, results show (Costa et al., 2016) that during physical education classes, children (7-11 years) do not reach 50% of moderate or vigorous intensity. To the effectiveness of policies for health promotion in school through physical activity and healthy eating, it is necessary that Governments are encouraged to develop and coordinate teams that guide programs in schools, implement monitoring and evaluation systems, and

¹ Pontifical Catholic University of Paraná, Curitiba, Brazil.

* Corresponding Author: Pontifical Catholic University of Paraná, Imac. Conceição, 1155, Prado Velho, 80215-901, Curitiba, Brazil. Email: claudio.tkac@pucpr.br

determine goals and objectives for health promotion policies in school to be disseminated and effective (WHO, 2008b).

In Brazil, health promotion in the school environment has as public policy the School Health Program (PSE), established by Presidential Decree No. 6,286, of 5th December of 2007, which integrates the Ministry of Health and the Ministry of Education seeking to enlarge health actions for students of public schools. The PSE must play a fundamental and decisive role on student's formation, with regard to the construction of citizenship and equity in health care, where the school becomes a locus for health promotion programs for students of all educational levels (Brasil, 2009).

Despite a public policy aimed at the promotion of school health (PSE), physical activity is far from fulfilling its role with effectiveness results for the improvement of students' health condition at all levels. The PSE must promote the articulation between the State and municipal education secretariats and the unified health system (SUS) subsidizing, planning and integrating the PSE actions, intersectorally integrating health and basic education professionals, for implementation of actions of the program (Ferreira, Moysés, França, Carvalho, & Moysés, 2014)

On the above, it is necessary that health promotion projects in school through physical activity and healthy eating, are implemented on the basis of public policy, coordination between health and education departments and establishment of sustainability strategies for belonging to school and not just mere, but rather permanent interventions. Therefore, the objective of this study is to investigate how a health promotion program from elementary school through physical activity and healthy eating, can be deployed with a view to sustainability and continuity.

METHOD

This research began in August 2013 with diagnostic evaluation and all subjects of the research were reassessed in February 2015, so it

is a longitudinal study, the experimental type (groups: experimental and control).

Participants

1098 children of both sexes ($\text{♂} = 554/\text{♀} = 544$), aged 6 to 10 years, participated in this research, all of them students of municipal public schools (elementary school) of a city in the metropolitan region of Curitiba/PR. Survey respondents belong to two schools, namely: ES-experimental school ($n = 592/\text{♂} = 318 \mid \text{♀} = 274$); CS-control school ($n = 506/\text{♂} = 236 \mid \text{♀} = 270$).

The sample consisted by 100% of the students of both schools. The experimental school was chosen by agreement between the School Board and the research group on Motor Behavior (GECOM/PUCPR), while the control school was indicated by the Municipal Secretary of Education. To ensure that schools do not provide socioeconomic differences, pairing was based on the economic level of the students ($p=0.232$). The schools are within a distance of 4 Km, ensuring that there was no contamination of the experimental school in control school.

For all students was guaranteed the right to the data confidentiality with the approval of the project in the Committee of Ethics in Research with Humans, the Pontifical Catholic University of Paraná (Protocol 96,321/2012).

Instruments

To assess the economic condition, the questionnaire of the Brazilian Association of Research Companies (ABEP, 2016) was used, which rates the assessed students in A1, A2, B1, B2, C1, C2 and D. For determination of nutritional status were evaluated the measures of weight and height. Date of birth and sex were noted. All data was evaluated using the software WHOANTHRO PLUS of the World Health Organization. For classification of nutritional status were used the Z score cutting points of body mass index (BMI), from the recommendations of the National System of Food and Nutrition Surveillance (Brasil, 2008).

Evaluation of blood glucose was accomplished with a G-TECH free brand

glucometer, with corresponding reagents tapes. It was adopted the procedure of collecting blood drop pendant with postprandial range (2:00 after the last meal). This procedure was adopted to prevent the assessed student from not fulfilling the 8-hour interval. Therefore, the assessment of blood glucose has always been collected before the school lunch. For classification of glycemia (normal/high) the criteria were the guidelines of the Brazilian Society of Diabetes (SBD, 2016).

The running/walk test of 6 minutes was used to assess and classify the cardiorespiratory capacity, in accordance with the procedures of Sport Brazil Project (Gaya & Gaya, 2016).

The eating habits and consumption of food categories were evaluated with the questionnaire DAFA Typical Day of Physical Activity and Nutrition), validated in 2007 (Barros et al., 2007). This instrument was developed for children as it is based on drawings that represent opportunities for physical activity and nutrition.

Procedures

This survey was initiated in August of 2013, with meetings and authorizations. When the authorization phase was complete, the first data collection (pre-test) was conducted, at the Experimental School (ES) and control School (CS). During the year of 2014 educational interventions were implemented on healthy eating and physical activity. At the beginning of 2015 all students were reevaluated (post-test), using the same instruments and data collection procedures.

Intervention

The intervention during the year 2014 (only in ES) was planned based on values (equity, participation and sustainability) and pillars (autonomy, empowerment, integrity, intersectoral approach and governance) of health promotion (Kusma, Moyses, & Moyses, 2010), as well as the strategies of the document prepared for the WHO workshop on physical activity and public health (WHO, 2005b) which are: awareness, education, conducting programs, skills development, creation of environments

propitious to physical activity, give recognition/awards.

During the intervening period were performed the following actions: lectures on healthy eating (Dietitians); informational materials on healthy eating (Dietitians); directed study about food pyramid (nutrition/physical education teacher); Knowledge fair with an emphasis on physical activity and healthy eating (nutrition/school); prohibition of "unhealthy" snacks at school (direction/teachers); construction of the school vegetable garden (parents/students/teachers/direction); increased levels of physical activity during the school physical education classes (physical education teacher); lectures about activity and physical inactivity (Undergraduate teachers in physical education); visits of students to the University to experience different possibilities for physical activity (school/college); Active gaming activities at school (school/college); training of all teachers of physical education of Municipal Education (Secretariat of Education/University); contest and prizes for drawings (students) on the theme "what a healthy family is". All the interventions were supported by the municipal departments of education and health, the direction of the school and of research groups of private and public universities.

Statistical analysis

All variables used for the statistical analysis were nominal and coded for the statistical treatment (ordinals). For the comparison between the CS and ES groups (independent samples) in 2013 and 2015, the Wilcoxon test (Mann-Whitney U) was used. For comparison of the results of the CS group (2013-2015) and ES (2013-2015) the Wilcoxon test (signed rank test) was used. To determine the percentage of occurrence of cases, between 2013 and 2015, cross-reference tables were used. The calculation of the effect size was accomplished using the following equation: value of test/square root of number of subjects (Field, 2009). All statistical procedures were performed with SPSS software 21.0 and Microsoft Excel. The significance level of $p < 0.05$ was assumed.

RESULTS

The results found in the comparison between the experimental and control groups (table 1), in the year 2013 (pre-test) showed statistically significant difference only in 3 variables: nutritional status, cardiorespiratory endurance and taste for exercises. In the assessment of nutritional status variables 2015, taste for exercises and fondness for grain were not identified with statistically significant.

The In comparison of the pre and post-test assessments, on experimental school (table 2) there was a decrease of nutritional Status of severe thinness, overweight and obesity. On the other hand, the nutritional state of leanness and severe obesity remained with the same occurrence, while the condition of eutrophy has increased.

Table 1
Comparison of health variables between experimental and control group

Variables	<i>p- value</i>	<i>effect size</i>	<i>p- value</i>	<i>effect size</i>
	2013		2015	
Nutritional Status	0.008	0.11	0.174	0.05
Blood glucose	0.806	0.01	0.000	0.26
Cardiorespiratory endurance	0.000	0.32	0.005	0.10
Fondness for exercises	0.000001	0.21	0.588	0.02
Fondness for Fruits	0.496	0.02	0.001	0.12
Fondness for soft drinks	0.086	0.07	0.003	0.11
Fondness for grain	0.348	0.04	0.267	0.04
Fondness for Vegetables	0.924	0.03	0.001	0.13

Table 2
Comparison of variables between pre and post-test in the experimental group

Variables	Classification	% 2013	%2015	<i>p</i>	<i>effect size</i>
Nutritional Status	Severe thinness	1.4	0.3	0.346	0.05
	Thinness	2	2		
	Eutrophic	66.3	74.1		
	Overweight	18	12.9		
	Obesity	9.2	7.5		
Blood glucose	Normal	66.2	99.3	0.000	0.57
	High	33.8	0.7		
Cardiorespiratory endurance	Risk zone	72.2	54.6	0.000	0.24
	Healthy zone	27.8	45.4		
Fondness for exercises	Don't like	0.3	0.7	0.001	0.19
	Like a little	3	0.3		
	Like	8.4	2		
	Really like	18.6	18.9		
Fondness for Fruits	Adore	69.6	78	0.353	0.05
	Don't like	0.3	2		
	Like a little	0.3	1		
	Like	5.1	4.7		
Fondness for soft drinks	Really like	13.5	13.2	0.021	0.13
	Adore	80.7	79.1		
	Don't like	4.4	8.2		
	Like a little	4.1	5.4		
Fondness for grain	Like	8.8	10.2	0.761	0.017
	Really like	18.4	19		
	Adore	64.3	57.1		
	Don't like	4.7	4.7		
Fondness for Vegetables	Like a little	1.4	2	0.040	0.11
	Like	8.5	5.8		
	Really like	13.6	14.2		
	Adore	71.9	73.2		
Fondness for Vegetables	Don't like	16	16	0.040	0.11
	Like a little	9.5	5.8		
	Like	10.2	6.8		
	Really like	19.7	12.6		
Fondness for Vegetables	Adore	44.6	58.8	0.040	0.11

In spite of the differences found, a statistically significant difference between the two evaluations has not been identified. The blood glucose and cardiorespiratory endurance variables present significant difference between the assessments, with best results after the intervention. When it comes to the fondness for exercises, the greatest difference was identified in the "I adore exercise" ($p=0.001$). In the matter of fondness for soft drinks, "don't like" increased and "like" dropped in comparison between 2013 and 2015. In the matter of fondness for grains, a statistically significant difference hasn't been identified. In the matter

of the fondness for vegetables, the most important increase was related to "like". In the results of the CS group (table 3), it was identified a statistically significant difference in blood glucose, with decreased normal blood glucose cases and an increase in cases of high blood glucose. In the item fondness for fruit, there has been an increase in "like" at the same it was identified a decrease in "really like" ($p=0.021$). Another difference was identified in the fondness for vegetables with an increase in "like", but with decreased "really like" and "like" ($p = 0.040$).

Table 3
Pre and post control group variables comparison

Variables	Classification	% 2013	%2015	<i>p</i>	effect size
Nutritional Status	Severe thinness	4.7	0.8	0.909	0.007
	Thinness	6.3	2.4		
	Eutrophic	63.2	77.5		
	Overweight	15.4	12.6		
	Obesity	6.3	4		
	Severe obesity	4	2.8		
Blood glucose	Normal	88.1	65.2	0.000	0.36
	High	11.9	34.8		
Cardiorespiratory endurance	Risk zone	45.2	40.1'	0.267	0.07
	Healthy zone	54.8	59.9		
Fondness for exercises	Don't like	1.6	0.8	0.354	0.058
	Like a little	1.6	0.8		
	Like	0.8	1.6		
	Really like	11.5	9.9		
	Adore	84.6	87		
Fondness for Fruits	Don't like	1.6	0.8	0.030	0.13
	Like a little	0	0.4		
	Like	3.2	2		
	Really like	12.3	5.5		
Fondness for soft drinks	Adore	83	91.3	0.079	0.11
	Don't like	2	6.8		
	Like a little	1.2	2.8		
	Like	14.7	10.8		
	Really like	10	14.7		
Fondness for grain	Adore	72.1	64.9	0.022	0.14
	Don't like	4	4.3		
	Like a little	0.8	3.6		
	Like	4	7.5		
	Really like	14.6	16.6		
Fondness for Vegetables	Adore	76.7	68	0.060	0.11
	Don't like	5.9	18.6		
	Like a little	9.9	5.1		
	Like	39.1	11.9		
	Really like	17	13		
	Adore	28.1	51.4		

DISCUSSION

The results found in the comparison between the experimental and control groups (table 1), in the year 2013 (pre-test) showed statistically significant difference only in 3 variables: nutritional status, cardiorespiratory endurance and fondness for exercises. In the assessment of nutritional status variables in 2015, fondness for exercises and fondness for grain were not identified with statistically significant difference.

It must be taken into consideration that the differences found between the groups (table 1), in 2013 evaluation (pre-test) and 2015 (post-test), are relatively consistent and expected, because interventions addressed to children, based on healthy eating and physical activity, have a great impact on the health of schoolchildren. Behavioral and environmental changes, as much at school as in the family, too, can be effective when focused on educational processes for health promotion (Myers et al., 2014). It should be noted that changes can only be achieved with long periods of intervention time (Adab et al., 2015), that is, before the intervention proposed by this research, we did not have access to which kind of activities were carried out and what kind of obesogenic factors the children were exposed to.

The results found in the comparison of the results obtained in the CS group, between 2013 and 2015 (table 2) showed no major changes, once they were not exposed to the intervention actions. In this sense, the implementation of programs focused on health promotion must be genuinely effective, with the participation of the community and reinforced by public policies that are addressed to this goal (Haggis, Sims-Gould, Winters, Gutteridge, & McKay, 2013).

Based on all of the actions developed in the year 2014, on experimental school, there was a highly positive impact with regard to changes in behavior and diagnosed. Intervention programs implemented in the school environment, with eating education and increased levels of physical activity, in partnership with organizations (departments of health and education) guarantee the sustainability of the initiative and

increase the empowerment on nutrition and possible impacts on obesity, mainly in childhood (Madsen et al., 2015).

Fortunately, planned actions based on public policy, as the PSE and in guiding principles of health promotion tend to generate positive impacts in terms of school health. Active health education, with the increase of the possibilities of participation of children in physical activities and the development of skills for healthy decision-making in homelike increase the consistency and sustainability of interventions focused on health at school (Haggis et al., 2013).

Obviously, not all actions of health promotion in the school environment are effective and/or hold up, as the program “The Active for Life Year 5” (AFLY5) (Kipping et al., 2014) which found evidences that, in order to increase levels of physical activity, the training of teachers is not effective. Therefore, the implementation of intervention programs to increase levels of physical activity and healthy eating at school should be planned, evaluated and controlled to have assurance of effectiveness.

In this research, following the actions and curricular content of physical education may have caused undesirable effects and/or interfered in the results. Therefore, the control of the contents of the school physical education should be agreed with the proponents of the deployment of an intervention project.

CONCLUSION

Based on the implementation of a school-based health promotion program, with physical activity and healthy eating, it can be concluded that it is possible, sustainable and viable to keep constant actions in the school environment, aiming the education of healthy habits, reinforcing pillars of health promotion, as the health care equity. The implementation and sustainability of a program for health promotion in school, should be articulated in an intersectorial way, involving managers of the health and education sectors, the community (students, parents, teachers and the school

direction) in which all can actively and consensually participate in the process.

The results demonstrate that long-term interventions promote positive and significant changes in the profile of school health indicators. They also change behaviors from the empowerment, not only of students as that of managers and parents. Therefore, to follow the recommendations of the Health Organization, values and pillars of health promotion, proposed by collective health, to implement actions aimed to health promotion, result in consistent changes in the current scenario of health at school.

Acknowledgments:

The health and Education Departments of Campina Grande do Sul/PR. To everyone who contributed to this research.

Conflict of interests:

Nothing to declare.

Funding:

Nothing to declare.

REFERENCES

- ABEP. Associação Brasileira de Empresas de Pesquisa. (2016). Questionário para avaliação de condição sócioeconômica. Retrieved September 22, 2016, from <http://www.abep.org>
- Adab, P., Pallan, M. J., Lancashire, E. R., Hemming, K., Frew, E., Griffin, T., ... Cheng, K. K. (2015). A cluster-randomised controlled trial to assess the effectiveness and cost-effectiveness of a childhood obesity prevention programme delivered through schools, targeting 6-7 year old children: the WAVES study protocol. *BMC Public Health*, 15(1), 488. doi: 10.1186/s12889-015-1800-8
- Barros, M. V. G., Assis, M. A. A., Pires, M. C., Grosseemann, S., Vasconcelos, F. De A. G. de, Luna, M. E. P., & Barros, S. S. H. (2007). Validação de um questionário de atividade física e consumo alimentar para crianças de sete a dez anos de idade. *Revista Brasileira Saúde Materna Infantil* 7(4), 437-448. doi: 10.1590/S1519-38292007000400011
- Brasil, M. D. S. (2009). *Cadernos de Atenção Básica - Saúde na Escola. saúde na escola*. Brasília, BRASIL: Ministério da Saúde. Retrieved from http://dab.saude.gov.br/docs/publicacoes/cadernos_ab/abcd24.pdf.
- Costa, B. G. G. da, Silva, K. S. da, Hino, A. A. F., Leal, D. B., Gripa, L. T., & Assis, M. A. A. de. (2016). Context and Intensity of Primary School Physical Education Classes in Brazilian Schoolchildren. *Mathews Journal of Pediatrics*, 1(1), 2-7.
- Ferreira, I. do R., Moysés, S. J., França, B. H. S., Carvalho, M. L. de, & Moysés, S. T. (2014). Percepções de gestores locais sobre a intersectorialidade no Programa Saúde na Escola. *Revista Brasileira de Educação*, 19(56), 61-76. Retrieved from http://www.scielo.br/scielo.php?script=sci_artext&pid=S1413-24782014000100004&lang=pt
- Field, A. (2009). *Descobrimo a estatística usando o SPSS-2* (2ª Ed.). Porto Alegre: Artmed.
- Gaya, A., & Gaya, A. (2016). *Projeto esporte Brasil: manual de testes e avaliação*. (URGS, Ed.) (1ª ed.). Porto Alegre: URGS. Retrieved September 23, 2016, from <https://www.ufrgs.br/proesp/arquivos/manual-proesp-br-2015.pdf>
- Gonzales, S. A., Garcia, J., Martinez, A., & Sarmiento, O. L. (2016). *2º Reporte de clificaciones en actividad física en niños y adolescentes*. Universidad de los Andes. Bogotá: Universidad de los Andes.
- Gunawardena, N., Kurotani, K., Indrawansa, S., Nonaka, D., Mizoue, T., & Samarasinghe, D. (2016). School-based intervention to enable school children to act as change agents on weight, physical activity and diet of their mothers: a cluster randomized controlled trial. *The International Journal of Behavioral Nutrition and Physical Activity*, 13, 45. doi: 10.1186/s12966-016-0369-7
- Haggis, C., Sims-Gould, J., Winters, M., Gutteridge, K., & McKay, H. A. (2013). Sustained impact of community-based physical activity interventions: key elements for success. *BMC Public Health*, 13(1), 892. doi: 10.1186/1471-2458-13-892
- Kipping, R. R., Howe, L. D., Jago, R., Campbell, R., Wells, S., Chittleborough, C. R., ... Lowlor, D. A. (2014). Effect of intervention aimed at increasing physical activity, reducing sedentary behaviour, and increasing fruit and vegetable consumption in children: Active for Life Year 5 (AFLY5) school based cluster randomised controlled trial. *BMJ*, 348(May), g3256. doi: 10.1136/bmj.g3256
- Kusma, S. Z., Moysés, S. T., & Moysés, S. J. (2010). Promoção da saúde : perspectivas avaliativas para a saúde bucal na atenção primária em saúde. *Ciencia e Saude Coletiva*, 15(1), 269-276. doi: 10.1590/S0102-311X201001300003
- Madsen, K., Linchey, J., Gerstein, D., Ross, M., Myers, E., Brown, K., & Crawford, P. (2015). Energy balance 4 kids with play: Results from a two-year cluster-randomized trial. *Childhood Obesity*, 11(4), 375-383. doi: 10.1089/chi.2015.0002
- Metcalfe, B., Henley, W., & Wikin, T. (2012). Effectiveness of intervention on physical activity of children: Systematic review and meta-

- analysis of controlled trials with objectively measured outcomes (EarlyBird 54). *BMJ*, 345(7876), no pagination-no pagination. doi: 10.1136/bmj.e5888
- Brasil. (2008). Protocolos do Sistema de Vigilância Alimentar e Nutricional - SISVAN na assistência à saúde. *Brasília: Ministério da Saúde*.
- Myers, E. F., Gerstein, D. E., Foster, J., Ross, M., Brown, K., Kennedy, E., ... Crawford, P. B. (2014). Energy Balance for Kids with Play: Design and Implementation of a Multi-Component School-Based Obesity Prevention Program. *Childhood Obesity*, 10(3), 251–259. doi: 10.1089/chi.2013.0075
- Brazilian Society of Diabetes [SBD]. (2016). *Diretrizes da Sociedade Brasileira de Diabetes|2015-2016. Diabetes Mellitus Tipo 1 E Tipo2 (1ª ed., Vol. 5)*. São Paulo: A.C. Farmacêutica. doi: 10.1590/S0102-311X2003000700004
- World Health Organization [WHO]. (2005a). *Preventing Chronic Diseases: a vital investment*. World Health Organization. Geneva.
- World Health Organization [WHO]. (2005b). *Review of Best Practice in Interventions to Promote Physical Activity in Developing Countries: Background Document prepared for the WHO Workshop on Physical Activity and Public Health*. World Health Organization. Beijing.
- World Health Organization [WHO]. (2008a). *Preventing Noncommunicable Diseases in the Workplace through Diet and Physical Activity/World Economic Forum Report of a Joint Event*. World Health Organization. Geneva.
- World Health Organization [WHO]. (2008b). *School Policy framework: implementation of the who global strategy on diet, physical activity and health*. World Health Organization. Geneva.
- World Health Organization [WHO]. (2009). *Interventions on diet and physical activity: what works/methodology*. World Health Organization. Geneva.
- World Health Organization [WHO]. (2016). *Ending Childhood Obesity*. World Health Organization. Geneva.



All content of Journal *Motricidade* is licensed under [Creative Commons](https://creativecommons.org/licenses/by-nc/4.0/), except when otherwise specified and in content retrieved from other bibliographic sources.

Knowledge Related to Health in Physical Education Students in the National Assessment of Student Achievement (ENADE)

Leandro Araujo de Sousa^{1*}, Kaio Breno Belizario de Oliveira², Antonio Evanildo Cardoso de Medeiros Filho², Sonia Olivares Moral³, Nicolino Trompieri Filho⁴

ORIGINAL ARTICLE

ABSTRACT

The study aims to analyze the knowledge related to health required the evidence of Physical Education students from the National Assessment of Student Achievement (ENADE) 2014. All Physical Education students from Brazil who declared "present" in the specific component of the test. Students are categorized by gender (male and female), type of institution (public and private) and Brazil region (North, Northeast, Southeast, South and Midwest). Valid percentage of each alternative and the index of difficulty and discrimination of the items were analyzed. We used the SPSS statistical package (version 20.0). Most students answered the items correctly, with good understanding involving healthy habits in childhood and the contributions of physical education in teaching such content. However, many of them interpreted incorrectly, with misunderstandings about elementary questions on this topic. It is concluded that there are some knowledge limitations related to the Physical education students' health, when the ENADE 2014 is used as a parameter.

Keywords: large scale assessment, higher education, proficiency

INTRODUCTION

The evaluation is clearly presented as a complex issue involving multiple sectors of society; however, specifically the educational assessment has been widely discussed covering various audiences, serving as a means for diagnosis, implementation and maintenance practices and educational policies (Bertolin & Marcon, 2015). In this sense, large scale evaluation is shown as a means of finding and / or selection of directions for making decisions about educational practices to improve the student's performance, quality of education and other aspects which influence the educational development (Pontes Junior & Trompieri Filho, 2015).

On that basis, the practice of the assessment on a large scale interacts with the development of students' education and / or educational systems, reflecting on curriculum improvement and training itself for the improvement of education (Gatti, 2009). Thus, the large-scale

evaluation is configured as an essential tool in reviewing and restructuring the public policies, supporting in new decision-making face the evaluated educational system, and having the quality of education as the main goal (Vianna, 2003; Werle, 2011)

Among the large-scale assessments in Higher Education in Brazil, there is the National Assessment of Student Achievement (ENADE), component of the National Higher Education Evaluation System (SINAES), which seeks to assess the performance of entering and graduating students, i.e., assessing their training in respect of program content, the necessary skills and abilities for the labour market which are acquired during training (Brasil, 2011).

ENADE has been applied in many higher education courses since its first edition, in 2004. For many years, Physical Education students have been evaluated on their skills, abilities and knowledge acquired during their training, however, few studies address this issue.

¹ Federal Institute of Education, Science and Technology of Ceará - IFCE, Canindé, Brazil.

² Catholic University Center of Quixadá - Unicatólica, Quixadá, Brazil.

³ University of Salamanca - USAL, Salamanca, Spain.

⁴ Federal University of Ceará - UFC, Fortaleza, Brazil.

*Corresponding Author: Federal Institute of Education, Science and Technology of Ceará - IFCE, 62700-000, Canindé, Brazil. BR 020, Km 303, s/n - Jubaia, Canindé - CE. Email: leandrosousaifce@gmail.com

Thus, evaluating the practice of students (who are ending the teacher’s training course of School Physical Education) concerning the aspects of health required in ENADE can be an important parameter about these professionals’ profile who will be working in schools. Studies point out that it is through the evaluation and co-evaluation that the teacher can seek to improve with respect to their training and pedagogical practice (Fernández-Rio, 2014; Telles, Krüger, Marques, & Krug, 2014).

On the other hand, the inclusion of physical education professional in questions related to health, even contributing in multidisciplinary teams as it occurs in the Centers of Support for Family Health (NASF), requires the professional’s responsibility and qualification to perform a service of preventive, protective and health rehabilitation (Falci & Belisario, 2013), a role which can also be played by the teacher of school physical education. This brings the need for evaluation of health-related knowledge required for the examination.

Therefore, the theoretical and practical training, especially the abilities, skills and attitudes (Libâneo, 2004) is considered one of the segments which contribute to the profession excellence. In this sense, not only the student’s effort but also the quality of course has its influences (Santiago, Pedrosa, & Ferraz, 2016).

Thus, we can start with the following question: what is the health knowledge requested the students of Physical Education in ENADE? In the view of this question, the study aims to analyse the knowledge related to health, required in Physical Education exams of ENADE 2014.

METHOD

Participants

The participants characteristics are contained in Table 1. All students of Physical Education from Brazil which declared "present" in carrying out the specific test component participated. Students are categorized by gender (male and female), type of institution (public and private) and region of Brazil (North, Northeast, Southeast, South and Midwest).

Table 1
Characteristics of the sample according to gender, type of institution and the country

Variables	Year Application		
	2004	2011	2014
Age (Sd)	24.5 (5.7)	26.5 (6.1)	27 (6.8)
Gender (%)	Female	45.6	45.4
	Male	54.4	54.6
Type of Institution (%)	Public	23.7	23.3
	Private	76.3	76.7
Country Region (%)	North	3.0	4.3
	Northeast	8.4	14.3
	Southeast	59.1	51.7
	South	22.6	20.4
	Midwest	6.8	9.3
Total (n)	26775	19227	24362

Data on the performance of students of Physical Education courses were extracted from databases (micro) survey, made available via the Internet by the National Institute of Educational Studies Teixeira - INEP. A sample of students is selected from the institution's own criteria, in which select by stratified random sampling, involving participants from all regions and states of Brazil. The questionnaire has socioeconomic information of students, as well as their

responses to each item, as well as for each component notes, general and specific training. For this study we used only the responses of candidates for the specific component of health items of evidence in 2014, in which the examinations for that course were applied. These items were identified in the tests for the examination which are also available on the website. The items which had been cancelled

and with low level of discrimination from INEP criteria were excluded from the analysis.

Statistical analysis

Items related to health examination were selected in order to perform the analysis. Valid percentages of choice were analysed for each alternative of items in order to identify those ones preferred by students. The answers to these items were also dichotomized into 1 and 0 (corresponding to right and wrong, respectively). Questions without answers or multiple answers were considered wrong. Thus, the parameter of difficulty (p) of the items from the hitting ratio was calculated, having its values ranging from 0 to 1, and the items with less ratio were considered the most difficult ones. The items with average rate of difficulty were considered adequate. It was also estimated the

discrimination parameter of the items by point-biserial correlation between the items and the grade in specific component of the test, being considered discriminative values $r_{bp} \geq 0.20$. Descriptive statistics was used (mean and standard deviation) for the students' grades in the items. Data were analysed via SPSS (version 20.0).

RESULTS

With the test analysis, it was identified three items which were about health-related knowledge; however, one of them was taken out. Figure 1 presents an issue that deals with childhood obesity and its complications into adulthood, requiring the student to assess the role of physical education teacher in front of projects regarding this issue.

QUESTÃO 21 -----

É consenso que a obesidade infantil vem aumentando de forma significativa, e que ela determina várias complicações na infância e na idade adulta. Uma criança obesa tem maior probabilidade de vir a desenvolver patologias em sua vida futura, que lhe dificultarão tanto a vida pessoal como a social. O conhecimento da prevalência de obesidade e dos respectivos fatores de risco é de extrema importância para que possam ser adotadas medidas preventivas. Na infância, o tratamento pode ser ainda mais difícil do que na fase adulta, pois está relacionado a mudanças de hábitos e à disponibilidade dos pais, além de uma falta de entendimento da criança quanto aos danos da obesidade.

AMARAL, O.; PEREIRA, C. Obesidade: da genética ao ambiente. *Revista Millenium*, v. 34, n. 311, 2008, p. 320-324 (adaptado).

Em relação ao que deve ser considerado pelo professor ao planejar, participar e avaliar projetos comunitários relacionados à temática apresentada, avalie as afirmações a seguir.

- I. Os pais têm papel importante na prevenção, no desenvolvimento e no controle da obesidade infantil, influenciando o comportamento das crianças por meio da alimentação e dos hábitos de atividade física.
- II. A escola é um lugar privilegiado na prevenção, cuja as diretrizes de ação no combate à obesidade devem centrar-se nos alunos que apresentam sobrepeso.
- III. Há momentos da vida humana, que incluem o período intra-uterino e os primeiros três anos de vida, em que a má nutrição pode provocar prejuízos físicos e mentais que afetam os indivíduos.
- IV. A variação do metabolismo basal em diferentes pessoas, e na mesma pessoa em circunstâncias diferentes, leva a concluir que com a mesma ingestão calórica, uma pessoa pode engordar e outra não.

É correto apenas o que se afirma em

- A) I e II.
- B) II e III.
- C) II e IV.
- D) I, II e IV.
- E) I, III e IV.

Figure 1. Item 21 of the specific component of the exam ENADE 2014. Source: INEP, 2014.

Figure 2 presents a question related to health education programs in Physical Education in school, requiring an understanding about the contributions of this discipline to schoolchildren's health. Table 2 shows the statistics about the items 21 and 28. In the item 21, option E (the correct one) had the greatest students' acceptance. But option D also had great acceptance. Those who have chosen this one did not recognize that eating behaviours

early in life affect the physical and mental aspects of the child. Option A received considerable acceptance. Those who have opted for this one did not consider that people with similar eating habits get distinct physiological reactions when the basal metabolism is different. Option A (correct) from item 28 had the greatest students' acceptance. Option D was widely accepted. Those who have opted for this one failed to understand that physical

education can provide knowledge about exercise physiology and also that anthropometric assessments provide information for monitoring the students' health. In addition, they also associated, wrongly, neuromuscular activities to good cardio respiratory fitness. Similarly, option

B had great acceptance. Besides the other students' misconceptions, the ones who chosen B considered that physical education classes are sufficient to cause physiological changes in the body and promote adherence to an active lifestyle.

QUESTÃO 28 -----

Programas de Educação Física escolar com ênfase na educação para saúde não se restringe unicamente ao desenvolvimento de ações direcionadas aos aspectos fisiológicos associados à prática de atividades físicas. Evidências demonstram que o controle das características dos esforços físicos a que os escolares são submetidos nas aulas pode exercer significativa influência na aquisição e no cultivo dos hábitos do presente e do futuro no tocante à prática sistemática de atividade físicas.

GUEDES, D. P.; GUEDES, J. E. R. P. Esforços físicos nos programas de educação física escolar. *Revista Paulista em Educação Física*, São Paulo, vol. 15, n. 1, jan./jun. 2001, p. 33-44 (adaptado).

Considerando o texto apresentado, avalie as afirmações a seguir:

- I. As aulas de Educação Física devem estimular o conhecimento da fisiologia humana em situação de atividade física.
- II. Nas aulas de Educação Física, as avaliações antropométricas informa sobre os níveis de aptidão física, constituindo-se meio de acompanhamento do estado de saúde.
- III. Nas aulas de Educação Física, as atividade aeróbicas e neuromusculares são estratégias que garantem melhoras no condicionamento cardiorrespiratório.
- IV. Os professores de Educação Física, em suas aulas, podem utilizar indicadores como percentual de gordura corporal, frequência cardíaca e força dinâmica para orientar os estudantes sobre seu nível de aptidão física.
- V. As aulas de Educação Física são suficientes para induzir adaptações fisiológicas no organismo, promovendo aderência a um estilo de vida ativo.

É correto apenas o que se afirma em

- A) I, II e IV.
- B) I, III e V
- C) I, IV e V.
- D) II, III e IV
- E) II, III e V.

Figure 2. Item 28 of the specific component of the exam ENADE 2014. Source: INEP, 2014

Table 2.
Statistics of items related to health in ENADE, 2014

Item	Alternatives (%)							Parameters
	A	B	C	D	E	IB *	p	
21	13.7	3.1	3.8	29.9	49.2	0.2	0.49	0.39
28	30.0	19.5	14.6	29.4	6.0	0.3	0.30	0.23

* Item left in blank.

As for the parameters, the items showed good levels of difficulty and discrimination, within acceptable margins. This leads to a good metric quality of the items, indicating that despite a few items, they had a reliable assessment.

DISCUSSION

When we discuss about health promotion in schools, managers, teachers and students have the possibility of a new vision for a healthy lifestyle for prevention of chronic diseases (Rocha et al., 2011; Sá, Carvalho, & Gomes, 2014). Spohr, Fortes, Rombaldi, Hallal, and Azevedo (2014) stress that the issue of health remains the agenda for discussions at school,

contributing to habits / actions for the whole population in terms of health promotion.

Simultaneously, Brito, Silva, and França (2012) conclude that actions taken in intervention programs in Brazilian schools are reducing inactivity and integrating health with education activities, although they emphasize the importance of greater participation by the Physical Education professionals in programs to support family's health. Thus, knowledge about the benefits of an active and healthy life for students, family, professional and own co-workers is indispensable (Bankoff & Zamai, 1999; Santos & Marques, 2013).

Yet this perspective, the greater the teachers' knowledge on health promotion at school, the better the possibility to transmit this knowledge to students, therefore, students will have increased awareness of the risk factors that lead to chronic diseases. For instance, the knowledge of high school students presents deficient knowledge about sport and health, as indicated by the results of a large-scale evaluation applied to this level of education in Brazil (Pontes Junior et al., 2016).

This way, Rombaldi, Borges, Canabarro, Corrêa, and Neutzling (2012) conclude that teachers have knowledge in aspects related to physical inactivity, unhealthy diet, smoking etc. These authors still point out that the results are worrying because the school should be the environment to develop the learning on how to deal with the risk factors associated with chronic diseases in adulthood.

Supporting this view, Ferreira, Oliveira, and Sampaio (2013) point out that the concept of health adopted by the participants in the study does not include the extended sense, and also that it is necessary to go beyond the individual and biological aspects of their practices. In this way, teachers from Jaguariúna-SP work with health elements, even though they do not belong to the central axis of their teaching practices, that is, you need a wider understanding of this topic for the development of health in schools (Zancha Magellan, Martins, Silva, & Abraham, 2013).

According to this reality, in other words, to improve the knowledge obtained during and after graduation, the Ministry of Health and Education has contributed through actions at the undergraduate and the postgraduate courses (Falci & Belisario, 2013). From this perspective, there are higher education institutions that make curricular changes in order to bring up the guidelines. According to Costa et al. (2012), these changes are still insufficient, which the author suggests postgraduate courses, in order to minimize the deficits.

Thus, as Table 2 shown in, almost half of the participants pointed out the correct option (E), followed by D, option that is obviously wrong. However, those who chose D considered that

the action guidelines in the fight against obesity should focus on students who are overweight. This statement implies that the ones considered in the proper weight will not become obese.

Therefore, considering that children and teenagers who are overweight or obese are becoming more frequent, there is the need to work some concepts in classroom, and especially practical intervention programs, which foster physical activity. That is why the presence of a Physical education professional is a key factor in the search for results.

Nevertheless, it is worth noting that the interdisciplinary among the subjects can greatly contribute to health promotion at school, such as nutritional monitoring can accelerate the delivery of results, when the goal is a loss, or low caloric intake (Hoehr, Reuter, Tornquist, Nunes, & Burgos, 2014).

Complementing, Araújo, Brito, and Silva (2010) state that when the teacher suggests proposals that get students together, in an attempt to alleviate physical inactivity, he / she contributes in health promotion consequently and must always consider the exercise, sport and physical fitness related to health as one of the main contents of Physical Education.

In order to assist the planning of Physical Education classes with the health theme, high school teachers can make use of students' perceptions scales about the teaching-learning process of the discipline, in order to identify their expectations regarding the objectives associated with health and quality of life (Sousa et al., 2016).

Table 3 shows that only 30% indicated as correct the alternative (A), and 29.4% chose the alternative (D), which there is great similarity statistically. However, when the applicant picked the item D, he or she disagreed the Physical Education classes should encourage the knowledge about human physiology in situations of physical activity, when in fact, both anatomical and physiological knowledge and gathering the minimum knowledge about the body, always linking with physical activities experienced in the students' reality (Melo & Sousa Neto, 2016).

Regarding the aspects and prospects of continuing education of Physical Education course, Salles, Farias, and Nascimento (2015) found that students of both courses have interests to specialize in the area of physical activity and health, specifically, some of the graduates reported that they plan to do some course related to sports training, while the graduates reported they intend to take courses related to exercise physiology. This way it is possible to see interest in parts of some graduates in physiology.

Corroborating, Vanzela, Balbo, and Justina (2007) analysed a sample of students in the 3rd grade of high school to see if they were able to relate the physiological systems in their everyday problems situations. Thus, some of these issues show some relevant points to be addressed in school, such as the performance of the respiratory and circulatory systems during the exercise, and the nervous system and the muscular system in carrying out movements.

Based on this assumption, the understanding of the human organism in its functioning as a whole during basic education is not impossible, but it is not an easy task. Therefore, it is necessary that future professionals must be aware of this task still in college, so that in the profession, they can facilitate student's learning.

CONCLUSION

The singled out and discussed results show that there are limitations in knowledge related to the health of Physical Education students, when the ENADE 2014 is used as a parameter. The questions discussed show that the number of participants who chose the right option was lower than the ones who chose the wrong one.

However, it is emphasized that there are few questions to analyse the health students' knowledge effectively. It is recommended that such a relevant topic to the training and performance of Physical Education teachers may have a larger sample of items in the examination, in order to enable a more efficient student assessment.

Acknowledgments:

Nothing to declare.

Conflict of interests:

Nothing to declare.

Funding:

Nothing to declare.

REFERENCES

- Araújo, R. A., Brito, A. A., & Silva, F. M. (2010). O papel da educação física escolar diante da epidemia da obesidade em crianças e adolescentes. *Educação Física em Revista*, 4(2), 1-9.
- Bankoff, A. D. P., & Zamai, C. A. (1999). Estudo do perfil dos professores do ensino fundamental do estado de São Paulo sobre o conhecimento do tema atividade física e saúde. *Revista Brasileira de Atividade Física & Saúde*, 4(3), 36-42.
- Bertolin, J. C. G., & Marcon, T. (2015). O (des)entendimento de qualidade na educação superior brasileira – das quimeras do provão e do ENADE à realidade do capital cultural dos estudantes. *Avaliação*, 20(1), 105-122. doi: 10.590/S1414-40772015000100008
- Brasil. (2011). Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira – Inep. Ministério da Educação. *Sinaes - 2011*. Retrieved September 22, 2016, from <http://portal.inep.gov.br/superior-187sinaes>.
- Brito, A. K. A., Silva, F. I. C., & França, N. M. (2012). Programas de intervenção nas escolas brasileiras: uma contribuição da escola para a educação em saúde. *Saúde em Debate*, 36(96), 624-632. doi: 10.1590/S0103-11042012000400014
- Falci, D. M., & Belisário, S. A. (2013). A inserção do profissional de educação física na atenção primária à saúde e os desafios em sua formação. *Interface*, 17(47), 885-899. doi: 10.1590/S1414-32832013005000027
- Fernández-Rio, J. (2014). Investigación-Acción en una Experiencia de co-evaluación en educación secundaria en el marco del modelo comprensivo de iniciación deportiva. *Revista de Educación Física*, 30(1).
- Ferreira, H. S., Oliveira, B. N., & Sampaio, J. J. C. (2013). Análise da percepção dos professores de educação física acerca da interface entre a saúde e a educação física escolar: conceitos e metodologias. *Revista Brasileira de Ciências do Esporte, Florianópolis*, 35(3), 673-685. doi: 10.1590/S0101-32892013000300011
- Gatti, B. A. (2009). Avaliação de sistemas educacionais do Brasil. *Revista de Ciências da Educação*, 9(1), 7-18.

- Hoehr, C. F., Reuter, C. P., Tornquist, L., Nunes, H. M. B., & Burgos, M. S. (2014). Prevalência de obesidade e hipertensão arterial em escolares: estudo comparativo entre escolas rurais do município de Santa Cruz do Sul/RS. *Rev Epidemiol Control Infect*, 4(2), 122-126. doi: 10.17058/reci.v4i2.4772
- Libâneo, J. C. (2004). *Organização e gestão da escola: teoria e prática*. 5. ed. Goiânia: Alternativa.
- Costa, L. C., Lopes Junior, C. A. F., Costa, E. C., Feitosa, M. C., Aguiar, J. B., & Gurgel, L. A. (2012). Formação profissional e produtividade em saúde coletiva do Profissional de Educação Física. *Rev. Bras. Ativ. Fis. Saúde*, 17(2), 107-113. doi: 10.12820/RBAFS.V.17N2P107-113
- Melo, E. A. L., & Sousa Neto, V. A. (2016). A relevância da temática saúde e qualidade de vida nas aulas de educação física do ensino médio em uma escola de comunidade carente de Fortaleza. *Revista Redfoco*, 3(1), 2-17.
- Pontes Junior, J. A. F., & Trompieri Filho, N. (2015). Avaliação cognitiva em larga escala dos conteúdos da Educação Física no Ensino Fundamental. In: M. T. Almeida. (Ed.), *Educação física em diferentes contextos*. 1 ed. Assis, SP: Storbem Gráfica e Editora, 1-56.
- Pontes Junior, J. A. F., Silva, A. G., Tavares, E. D., Sousa, L. A., Bastos, F. C., Cruz, F. N. I., Almeida, L. S. (2016). Aspectos psicométricos dos itens de Educação Física relacionados aos conhecimentos de Esporte e Saúde no Exame Nacional do Ensino Médio (Enem). *Motricidade*, 12(S1), 12-21. doi: 10.6063/motricidade.8482
- Rocha, A., Marques, A., Figueiredo, C., Almeida, C., Batista, I., & Almeida, J. (2011). Evolução da saúde escolar em Portugal: revisão legislativa no âmbito da educação. *Millenium*, 41, 69-87.
- Rombaldi, A. J., Borges, T. T., Canabarro, L. K., Corrêa, L. Q., & Neutzling, M. B. (2012). Conhecimento de professores de educação física sobre fatores de risco para doenças crônicas de uma cidade do sul do Brasil. *Revista Brasileira de Cineantropometria & Desempenho Humano*, 14(1), 61-72. doi: 10.5007/1980-0037.2012v14n1p61
- Salles, W. N., Farias, G. O., & Nascimento, J. V. (2015). Inserção profissional e formação continuada de egressos de cursos de graduação em educação física. *Rev Bras Educ Fis Esporte*, 29(3), 475-486. doi: 10.1590/1807-55092015000300475
- Santiago, M. L. E., Pedrosa, J. I. S., & Ferraz, A. S. M. (2016). A formação em saúde à luz do projeto pedagógico e das diretrizes curriculares da educação física. *Movimento*, 22(2), 443-458.
- Santos, M. N., & Marques, A. C. (2013). Condições de saúde, estilo de vida e características de trabalho de professores de uma cidade do sul do Brasil. *Ciência & Saúde Coletiva*, 18(3), 837-846. doi: <http://dx.doi.org/10.1590/S1413-81232013000300029>
- Sá, C. S., Carvalho, R. G. S., & Gomes, L. E. (2014). Saúde escolar de crianças no ensino fundamental: avaliação da prevalência de dor nas costas. *Revista Arquivos de Ciências da Saúde*, 21(2), 77-82.
- Sousa, L. A., Silva, A. G., Medeiros Filho, A. E. C., Silva, C. S., Carvalho, A. B. L., & Pontes Junior, J. A. F. (2016). Objetivos de ensino da Educação Física nos fatores de atividade física e saúde e formação humana: validação da escala de percepção discente. *Motricidade*, 12(S1), 85-94. doi: <http://dx.doi.org/10.6063/motricidade.8482>
- Spohr, C. F., Fortes, M. O., Rombaldi, A. J., Hallal, P. C., & Azevedo, M. R. (2014). Atividade física e saúde na educação física escolar: efetividade de um ano do projeto “educação física +”. *Revista Brasileira de Atividade Física & Saúde*, 19(3), 300-313. doi: 10.12820/rbafs.v.19n3p300
- Telles, C., Krüger, L. G., Marques, M. N., & Krug, H. N. (2014). A formação de professores de educação física: a avaliação das disciplinas teórico-práticas na licenciatura do centro de educação física e desportos (CEFD) da Universidade Federal de Santa Maria (UFSM). *Contexto & Educação*, 29(92), 190-214.
- Vanzela, E. C., Balbo, S. L., & Justina, L. A. D. (2007). A integração dos sistemas fisiológicos e sua compreensão por alunos do nível médio. *Arq Mudi*, 11(3), 12-19.
- Vianna, H. M. (2003). Avaliações nacionais em larga escala: Análises e propostas. *Estudos em avaliação Educacional*, 27(1), 41-76. doi: <http://dx.doi.org/10.18222/eae02720032177>
- Werle, F. O. (2011). Políticas de avaliação em larga escala na educação básica: do controle de resultados à intervenção nos processos de operacionalização do ensino. *Ensaio: Avaliação de Políticas Públicas Educacionais*, 19(79), 769-792. doi: <http://dx.doi.org/10.1590/S0104-40362011000500003>
- Zancha, D., Magalhães, G. B. S., Martins, J., Silva, T. A., & Abrahão, T. B. (2013). Conhecimento dos professores de educação física escolar sobre a abordagem saúde renovada e a temática saúde. *Conexões: revista da Faculdade de Educação Física da UNICAMP, Campinas*, 11(1), 204-217. doi: 10.20396/conex.v11i1.8637638



Lipid profile and associated factors in schoolchildren

Ana Paula de Oliveira Azambuja^{1*}

ORIGINAL ARTICLE

ABSTRACT

The relationship between anthropometric measurements and lifestyle habits of schoolchildren with lipid profile is assessed by a descriptive, cross-sectional study on a sample of 135 school children aged between 6 and 10 years. Variables comprised body mass index, waist circumference, blood pressure, questionnaires on physical activity, dietary habits and metabolic changes. Analysis compares rates by Mann-Whitney test and associations by chi-square test, while effects were measured by odds ratio at 5% significance ($p < 0.05$). There was no significant association between nutritional status and lipid profile. Lipid changes occurred inclusively in children with normal weight. Physical activity was inversely associated with dyslipidemia and suggests that physical activities associated with eating habits may be a preventive mechanism on cardiovascular disease risk factors.

Keywords: dyslipidemia, obesity, food habits, children.

INTRODUCTION

The distribution of body fat (BF) is positively related to Cardiovascular Diseases (CVD) whose combination may be obtained by anthropometric parameters, such as body circumferences, with easy applicability and high accuracy degree (Burke et al. 2008). Dyslipidemias are associated to BF distribution, with unfavorable nutritional conditions, characterized by abnormal concentrations of lipids or lipoproteins in the blood, and determined by genetic and environmental factors (Burke et al. 2008; Franca, Alves, & Hutz, 2004). In fact, they are defined as a categorical factor for CVD development (Kruger & Ribas-Silva, 2014).

Co-relationships in several populations are well established between risks of coronary arterial disease (CAD) and high blood concentrations of total cholesterol (TC), especially low-density lipoproteins (LDL-c), and reduced high density lipoproteins (HDL-c) (Franca, Alves, & Hutz, 2004; Lanti, Puddu, & Kromhout, 2000; Webber, Srinivasan, Mattigney, & Berenson, 1991).

Children's lipid profile is investigated to detect possible high lipid rates and early intervention to ward off physiological changes

that may occur during the teenager period (Franco & Coates, 2002).

According to studies on Brazilian populations, dyslipidemias have 10% - 35% prevalence in children and adolescents, depending on region and criteria (Simão, Prêcoma, Andrade, Correa Filho, & Saraiva 2014). Epidemiological studies on children's and adolescents' lipid profile suggest that cholesterol level in childhood is a predictor factor for cholesterol levels in adulthood (Gama, Carvalho, & Miranda, 2007; Leite et al., 2009).

Inadequate feeding habits during childhood are at the basis of lipid alterations in the life phase. They are actually related to food rich in fat and sugar, coupled to lack of physical activities and mistaken family habits which directly affect lipid profile (Leite et al., 2009; Rechenchosky et al. 2009).

Current paper assesses associations between anthropometric indexes and life style (physical activity and food) to school children's lipid profile.

METHOD

Current descriptive study with a transversal design evaluates the prevalence of weight excess and lipid profile associated with physical

¹ Paulista State University, Bauru, Brasil.

* Corresponding author: Paulista State University, Av. Edmundo Carrijo Coube, Vargem Limpa, 17033-360, Bauru, Brazil. Email: ana_paula_3005@yahoo.com.br

activities and food intake of primary schoolchildren in the municipality of Cruzeiro do Oeste PR Brazil.

Participants

Sample size featured a population of 1224 children (N), a tolerated absolute error of sample of 7% ($\epsilon = 0.07$), 90% confidence interval (error $\alpha = 0.10$; $Z_{\alpha/2} = 1.64$) and an estimated prevalence of 50%, recommended by Luiz and Magnanini (2006) when study contains several variables or when researcher fails to attribute any rate. Since there was a possibility of several schoolchildren being absent for the biochemical tests, 150 children out of those who participated in the project's first phase were selected (anthropometric evaluations). One hundred and thirty-five schoolchildren, males and females, aged between 6 and 10 years, participated in the second phase (lipid profile assessment)

Inclusion criteria for participation comprised enrolment in the schools selected for the second phase; participation in the project's first phase; selection for the new phase; parents' authorization. Exclusion criteria comprised incomplete or absence of data on any information, especially blood collection and analysis; non-compliance with procedures recommended for collection (for instance, an 8 – 12-h fast).

Instruments and Procedures

Variables included weight by scale (Filizola; 0.1 kg precision) and height by stadiometer SECA (Bodimeter 206) to calculate Body Mass Index (BMI) and employed for the classification of the nutritional state, following criteria by Cole et al. (2007). Waist Circumference (WC) was calculated by non-elastic band (0.1 cm precision) and rates were classified following Fernández et al. (2004). Systolic (SAP) and diastolic (DAP) arterial pressure were measured and classified according to the criteria by V Brazilian Guidelines for Arterial Hypertension.

Blood lipid components in current assay comprised total cholesterol (mg/dL), HDL-

cholesterol (mg/dL), LDL-cholesterol (mg/dL), triglycerides (mg/dL) and glycaemia (mg/dL). Reference rates for the first four blood lipid components were recommended by I Guidelines for the Prevention of Atherosclerosis in Childhood and Adolescence of the Brazilian Society of Cardiology (Giuliano et al. 2005). In 2004, the American Diabetes Association recommended lowering from 110 mg/dL to 100 mg/dL for fasting glycaemia.

The project was forwarded to the Committee for Ethics involving Humans of the Institution (n. 556/2009). Data were collected in 2010 after explaining to participants the details on the research work and after obtaining the parents' or tutors' consent.

Statistical analysis

Kolmogorov-Smirnov test verified normality of data. According to results, non-parametric statistics (mean/minimum and maximum) and analysis of variables were applied. Mann-Whitney's test compared mean rates and χ^2 was employed to associate nutritional state and lipid profile. Odds ratio (OR) was employed for effect measurement. Further, 5% significance was adopted ($p < 0.05$). Data were analyzed with Statistical Package for the Social Science (SPSS) 17.0.

RESULTS

Schoolchildren comprised 50.4% (n=68) males and 49.6% (n=67) females. Mean rates of variables did not differ between the genders. Since anthropometric, hemodynamic and blood lipids variables of the sample showed homogeneity between genders, they were analyzed together.

Figure 1 shows that variable TC had the highest change percentage (59.3%), with no children featuring changes in glycaemia levels. Lipid variables LDL-c, HDL-c and TC were not associated with BMI (Table 1), except for variable TG ($p=0.014$), similar to variable WC with significant association only for TG ($p=0.004$).

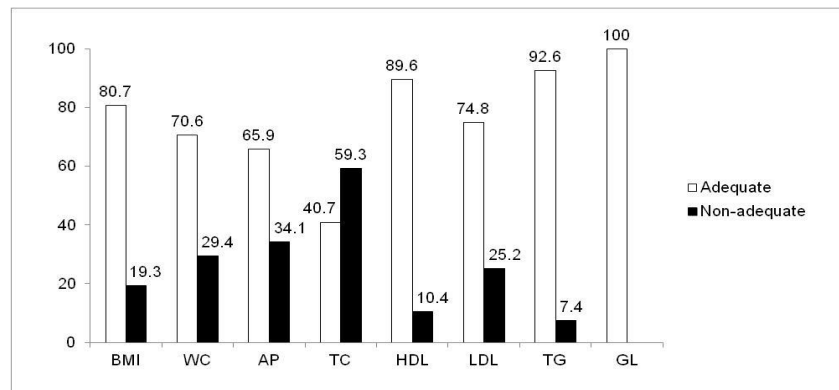


Figure 1. Anthropometric, hemodynamic and lipid variables according to classification in adequate and non-adequate

Table 1
Association between anthropometric and lipid variables

Variables	BMI					
	Weight excess n (%)			Eutrophic n (%)		
	Adequate	Changed	p	Adequate	Changed	p
LDL	17 (70.8)	7 (29.2)	0.553	85 (76.6)	26 (23.4)	0.554
HDL	21 (87.5)	3 (12.5)	0.390	103 (92.8)	8 (7.2)	0.392
TC	8 (33.3)	16 (66.7)	0.293	50 (45.0)	61 (55.0)	0.295
TG	20 (83.3)	4 (16.7)	0.014	107 (96.4)	4 (3.6)	0.014
Variables	WC					
	Increased (%)			Desired (%)		
	Adequate	Changed	p	Adequate	Changed	p
LDL	14 (70.0)	6 (30.0)	0.204	88 (76.5)	27 (23.5)	0.206
HDL	18 (90.0)	2 (10.0)	0.743	106 (92.2)	9 (7.8)	0.744
TC	6 (30.0)	14 (70.0)	0.204	52 (45.2)	63 (54.8)	0.206
TG	16 (80.0)	8 (5.9)	0.004	111 (96.5)	4 (3.5)	0.004

χ^2 test ($p < 0.05$)

Table 2 demonstrates significant associations between results and variables in crude and adjusted analyses: eating while watching TV, time spent watching TV, time before computer or playing games, eating vegetables and legumes, eating fruit and drinking soft drinks. Skipping meals was reported for 43% of children and the habit of eating packet tit-bits was registered four times a week for 34.1% of the children. Both are associated with dyslipidemia ($p=0.000$). Refraining from daily physical activities or the practice of physical activities at least four times a week was reported by respectively 83% and 71.9% of schoolchildren, a

habit highly combined to dyslipidemia, ($p=0.027$) and ($p=0.000$) respectively.

Children who skipped meals had a 1.26 probability of having dyslipidemia than those without this habit, whilst children with the habit of eating tit-bits had a 1.38 more chance for acquiring dyslipidemia than those who do not.

The association between the practice of PAs and dyslipidemia indicated that children who failed to practice daily PAs had 1.26 (IC95%: 1.14-2.23) and 1.31 (IC95%: 1.01-1.67) more probability of acquiring the disease than those who practiced PAs weekly or four times a week.

Table 2

Prevalence of risk factors for cardiovascular diseases and analysis of logistic regression (crude and adjusted) associated to dyslipidemias

Indicators	n (%)	p	Odds Ratio		p	Odds Ratio adjusted* (IC 95%)	p
			crude (IC 95%)				
Eating in front of TV	Yes	91(67.4)	0.087	1.00	0.007	1.00	0.011
	no	44(32.6)		0.66 (0.49-0.91)		0.41(0.71-0.93)	
Skipping meals	Yes	58(43)	0.000	1.00	0.002	1.00	0.006
	no	77(57)		1.26(0.95-1.51)		0.16(0.11-0.44)	
Physical activities/daily	Yes	112(83)	0.027	1.00	0.009	1.00	0.055
	no	23(17)		1.26 (1.14-2.23)		1.11 (0.79-1.53)	
Physical activities/weekly	-4x	97(71.9)	0.000	1.00	0.004	1.00	0.020
	+4x	38(28.1)		1.31 (1.06-1.27)		1.01 (0.75-1.11)	
TV/daily	-4h	49(36.3)	0.204	1.00	0.003	1.00	0.006
	+4h	86(63.7)		1.47(1.12-1.93)		0.38(0.11-0.66)	
PC ou Games/daily	-4h	121(89.6)	0.229	1.00	0.160	1.00	0.269
	+4h	14(10.4)		0.76(0.75-1.23)		0.70(0.20-0.75)	
Eating vegetables/legumes/weekly	-4x	20(14.8)	0.255	1.00	0.144	1.00	0.188
	+4x	115(85.2)		0.88(0.78-1.25)		0.81(0.55-0.88)	
Eating fruit/weekly	-4x	23(17)	0.263	1.00	0.120	1.00	0.116
	+4x	112(83)		0.80(0.71-1.11)		0.61(0.42-0.89)	
Eating salty titbits/Weekly	-4x	89(65.9)	0.000	1.00	0.003	1.00	0.006
	+4x	46(34.1)		1.38(0.88-1.39)		0.81(0.55-0.88)	
Soft drinks/Weekly	-4x	89(65.9)	0.053	1.00	0.523	1.00	0.255
	+4x	46(34.1)		0.78(0.56-1.09)		0.66(0.51-1.29)	

Categorical variables were compared by χ^2 test. OR adjusted for behavioral variables.

DISCUSSION

Results revealed that 19.3% of schoolchildren were overweight, corroborating rates given by Casey et al. (2012) in France (19.7%) but lower (25.4%) than those by Rechenchosky et al. (2009) in a survey in a different municipality in the state of Paraná, Brazil. A study in Rio de Janeiro with 5 – 9-year-old children showed 68.4% of children with some type of change in their lipid profile (Savva et al., 2000), whereas Turkish children had high lipid rates, albeit lower than those mentioned above. The author reported that 42% of children and adolescents had changes in their lipid profile (Atabek, Pirgon, & Kurtoglu, 2006). In current study, schoolchildren who did not have simultaneous changes in their anthropometric, hemodynamic and lipid profile amounted to 34.8%, whilst 32.6% showed at least one change. A study with Chilean schoolchildren from 20 schools in 2015 revealed that 32% had at least one alteration in their lipid profile (Barja et al., 2015).

Results on the lipid profile enhance the fact that 59.3% of schoolchildren revealed high TC rates for their age. Forti et al. (1996) showed

that 57.7% of children and adolescents had altered TC, with proven family links. Result are highly relevant since longitudinal studies such as those by Menotti et al. (2000) have shown a relationship between TC rates diagnosed in childhood with rates during adulthood.

Eutrophic lipid alterations among schoolchildren in current analysis demonstrated 20.2% hypercholesterolemia and indicated the need to evaluate lipid profile during early childhood, even though the study has not provided any significant rates between BMI and lipid alterations. As shown by several studies, overweight is a categorical factor. Kruger and Ribas-Silva (2014) insist that feeding reeducation and physical activities should be practices in the school milieu so that obesity and associated diseases, such as dyslipidemias, would be prevented.

The percentage of children with altered LDL-c was higher than the rates provided by Rechenchosky et al. (2009) in a study with same age schoolchildren in Maringá PR Brazil. The authors reported altered LDL-c levels in 12.3%

of samples, contrastingly to 25.2% in current study.

Lower HDL-c concentrations occurred in 10.4% of schoolchildren analyzed. Rates are actually lower than those in a research with children and adolescents in the city of São Paulo, with rates at 13.5% of children between 2 and 12 years old and at 14.2% of adolescents with a family history of early CVD (Savva et al., 2000). Several studies show that lower HDL-c concentrations accelerate the onset and development of atherogenesis. Lower HDL-c rates are frequently due to heredity, to other atherogenic lipoproteins and obesity, as several studies have shown (Leite et al., 2009; Savva et al., 2000). HDL-c reduction with an increase in LDL-c and serum TG levels increases twenty-fold the development of coronary diseases in adults (Gama, Carvalho, & Miranda, 2007).

The same authors reported TG alterations in 10.4% of children. Rechenchosky et al. (2009) registered alterations in 10% and current study in 7.4% of children. High LDL-c in adults may bring about the onset of CVDs. In the case of TG, more than 7% had higher rates than desired for their age, even though data were lower than those reported by other authors who registered high TG in 14% of children and adolescents with a family history of early CVDs in studies at INCOR, São Paulo, Brazil. A hypothesis was raised that several lipoproteins rich in TG may be involved regardless of the development of atherosclerosis (Webber et al., 1991).

Studies by Savva et al. (2000) with samples of 10 – 14-year old Cypriot children showed that WC is the best predictor for CVDs when compared to BMI. In fact, children with altered WC had higher TC, LDL-C and TG rates. Results in current study demonstrated a significant association between high WC and altered TG.

Dyslipidemia in current research reached 65.9% of children. Dyslipidemias in eutrophic children suggest the influence of other risk factors (but not obesity) on lipid conditions (Savva et al., 2000). Forti et al. (1996) emphasize that dyslipidemias in children and adolescents worldwide is related to inadequate

individual or family feeding habits, such as deficient PAs (Cassey et al. 2012).

TV watching for more than 4 hours daily is a habit practiced by 63.7% of schoolchildren, but was not associated with dyslipidemia in current study. However, a 2006 study in Taiwan insisted on the importance of reducing time spent watching TV and of increasing PAs to prevent metabolic syndrome (Li, Leec, & Tsenga, 2007). Time spent watching TV was positively associated with significantly greater chances of high triglyceride levels and fast glycaemia. The authors state that previous analyses suggested that TV watching increases food intake due to the habit of eating while watching TV.

Li et al. (2007) showed that obesity and PAs significantly determine dyslipidemia. In fact, current study shows that lack of daily PAs or PAs at least four times a week is associated with dyslipidemia.

Fernandes et al. (2009) suggest a positive PAs influence during childhood and adolescence on dyslipidemia in adulthood and may be attributed to the chronic effect of PAs throughout one's life. The above evidences the need for stimulating the regular practice of activities during childhood and adolescence.

Sedentary lifestyle triggers the onset of obesity, arterial hypertension, low HDL-c concentrations and increase in TG, well known for their association with atherosclerosis. Further, lack of PAs in childhood is also prolonged into adulthood (Leite et al., 2009).

According to Françaço and Coates (2002), cardiovascular risk factors should be controlled in childhood and adolescence for CVD prevention through enhancement of cardiovascular health by preventing and controlling obesity, regular practice of physical exercises, control of arterial pressure and particularly healthy feeding habits.

Forti et al. (1996) associated dyslipidemias in children and adolescence related to feeding habits and inadequate individual and familial habits, such as insufficient PAs, similar to current analysis associating the habit of skipping meals, lack of daily PAs and PAs at least four times a week plus and eating tit-bits more than four times a week. PAs has been

inversely associated with dyslipidemia and suggests that PAs may be a preventive mechanism on CVDs risk factors.

It must be underscored that current study had its limitations since it failed to establish a co-relationship between data on family history. However, it is relevant with regard to data in southern Brazil due to lack of investigation focused on hinterland towns with small populations.

The systematic analysis of data on the efficaciousness of interventions to enhance PAs and health with the children's and adolescents' age bracket revealed better results when there is an association of school activities that involve the family and/or the community to change food intake habits for a better health behavior, including the habit of PAs (Menotti et al., 2000; Rechenchosky et al., 2009).

CONCLUSION

Changes in anthropometric, hemodynamic and lipid variables recur in schoolchildren. Since lipid alterations are present even in children with adequate weight, the control of obesity, guidelines for eating habits and PAs should start during childhood.

PT teachers are better prepared to cope with the process and they should be alert to identify and intervene early on risk factors. These teachers are health professionals that should act directly and continually with schoolchildren and thus contribute towards education and health programs in the schools through adequate eating habits and healthy lifestyles, especially increase in PAs, and thus decrease VCD risk factors in Brazil. Consequently, PE should be underscored as a necessary contribution for schoolchildren's health, by means of discussions and the formation of a critical conscience so that they would adopt individual actions for the onset of collective benefits.

Acknowledgments:

Nothing to declare.

Conflict of interests:

Nothing to declare.

Funding:

Nothing to declare.

REFERENCES

- American Diabetes Association (2005). Diagnosis and classification of diabetes mellitus. *Diabetes Care*, 28(Suppl), S37-S42. <http://dx.doi:10.1038/ijo.2012.10>
- Atabek, M.E., Pirgon, O., & Kurtoglu, S. (2006). Prevalence of metabolic syndrome in obese Turkish children and adolescents. *Diabetes Research and Clinical Practice*, 72(3), 315-321.
- Barja Yáñez, S., Gómez, P. A., Del Pino, L. V., Landa, A. D., Valenzuela, O. C., Jofre, M. F., & Santander, F. M. (2015). Dislipidemias em escolares chilenos: prevalência y factores asociados. *Nutrición Hospitalaria*, 31(5), 2079-2087. oi: 10.3305/nh.2015.31.5.8672
- Burke, G. L., Bertoni, A. G., Shea, S., Tracy, R., Watson, K.E., Blumenthal, R.S., ..., & Carnethon, M. R. (2008). The impact of obesity on cardiovascular disease risk factors and subclinical vascular disease. *Archives of Internal Medicine*, 168(9), 928-35. doi: 10.1001/archinte.168.9.928
- Casey, R., Chaix, B., Weber, C., Schweitzer, B., Charreire, H., ..., & Simon, C. (2012). Spatial accessibility to physical activity facilities and to food outlets and overweight in French youth. *International Journal of Obesity*, 36(7), 914-919.
- Cole, T. J., Bellizzi, M. C., Flegal, K. M., & Dietz, W. H. (2000) Establishing a standard definition for child overweight and obesity worldwide: international survey. *British Medical Journal*, 320, 1240-3.
- Fernandes, R. A., Sponton, C. H. G., & Zanesco, A. (2009). Atividade Física na Infância e na Adolescência Promove Efeitos Benéficos na Saúde de Adultos. *Revista SOCERJ*, 22(6), 365-372.
- Fernández, J. R., Redden, D. T., Petrobelli, A., & Allisson, D. B. (2004) Waist circumference percentiles in nationally representative samples of African-American, European-American, and Mexican-American, children and adolescents. *Journal of Pediatrics*, 145(4), 439-444. doi: 10.1016/j.jpeds.2004.06.044
- Forti, N., Giannini, D., Diament, J., Issa, J., Fukushima, J., Bó, C. D., & Barretto, A. C. P. (1996). Fatores de risco para doença arterial coronariana em crianças e adolescentes filhos de coronariopatas jovens. *Arquivo Brasileiro de Cardiologia*, 66, 119-23.
- Franca, E., Alves, J. G. B., & Hutz, M. H. (2004). Apolipoprotein and polymorphism and its association with serum lipid levels in Brazilian children. *Human Biology*, 76(2), 267-275.

- Françoso, L. A., & Coates, V. (2002). Evidências anatomopatológicas do início da aterosclerose da infância e adolescência. *Arquivo Brasileiro de Cardiologia*, 78(1), 131-136.
- Gama, S. R., Carvalho, M. S., & Miranda, C. R. M. (2007). Prevalência em crianças de fatores de risco para as doenças cardiovasculares. *Caderno de Saúde Pública*, 23, 2239-45. doi:10.1590/S0102-311X2007000900032
- Giuliano, I. C. B., Carameli, B., Pellanda, L., Duncan, B., Mattos, S., & Fonseca, F. H. (2005). I Diretriz de Prevenção da Aterosclerose na Infância e na Adolescência. *Arquivo Brasileiro de Cardiologia*, 85(Suppl. VI), S1-36.
- Kruger, G. R. O., & Ribas-Silva, R. C. (2014). Perfil lipídico e índice de massa corporal de escolares de um colégio estadual da região centro-ocidental do Paraná. *Revista Adolescência e Saúde*, 11(4), 54-60.
- Leite, N., Cieslak, F., Milano, G. E., Góes, S. M., Lopes, M. F. A., Bento, P. C. B., Prestes, A. L. C., & Randominski, R. B. (2009). Associação entre o perfil lipídico e medidas antropométricas indicadoras de adiposidade em adolescentes. *Revista Brasileira de Cineantropometria e Desempenho Humano*, 11(2), 127-133.
- Li, J. D., Leec, S. J., & Tsenga, R. F. (2007). Associations between the metabolic syndrome and its components, watching television and physical activity. *Public Health*, 121, 83-91.
- Luiz, R. R., & Magnanini, M. M. F. (2006). O tamanho da amostra em investigações epidemiológicas. In: Medronho, R. A., Carvalho, D. M., Bloch, K. V., Luiz, R. R., & Werneck, G. L. (Eds.), *Epidemiologia*. São Paulo: Atheneu.
- Menotti, A., Lanti, M., Puddu, P. E., Kromhout, D. (2000). Coronary heart disease incidence in northern and southern European population: a reanalysis of seven countries study for a European coronary risk chart. *Heart*, 84(3), 238-44. http://dx.doi:10.1136/heart.84.3.238
- Rechenchosky, L., Netto-Oliveira, E. R., Oliveira, M. R. N., Günther, L. S. A., Oliveira Filho, A., Oliveira, A. A. B. (2009). Estado nutricional e perfil lipídico de crianças. *Revista da Educação Física*, 20(3), 431-440. doi:10.4025/reveducfis.v20i3.5323
- Savva, S. C., Tornaritis, M., Savva, M. E., Kourides, Y., Panagi, A., Silikiotou, N., Georgiou, C., Kafatos, A. (2000). Waist circumference and waist-to-height ratio are better predictors of cardiovascular disease risk factors in children than body mass index. *International Journal of Obesity and Related Metabolic Disorders*, 24(11), 1453-1458.
- Simão, A. F., Précoma, D. B., Andrade, J. P., Correa Filho, H., Saraiva, J. F. K. (2014) I Diretriz de Prevenção Cardiovascular da Sociedade Brasileira de Cardiologia. *Arquivo Brasileiro de Cardiologia*, 2(5), 420-431.
- V Diretrizes Brasileiras de Hipertensão Arterial. (2007). *Arquivos Brasileiros de Cardiologia*, 89(3), e24-e79. https://doi.org/10.1590/S0066-782X2007001500012
- Webber, L. S., Srinivasan, S. R., Mattigney, A., Berenson, G. S. (1991). Tracking of serum lipids and lipoproteins childhood to adulthood: the Bogalusa Heart Study. *American Journal of Epidemiology*, 133(9), 884-99.



Impact of motor interventions oriented by mastery motivational climate in fundamental motor skills of children: A systematic review

Paulo Felipe Ribeiro Bandeira^{1,2*}, Mariele Santayana De Souza¹, Larissa Wagner Zanella¹, Nadia Cristina Valentini¹

REVIEW ARTICLE

ABSTRACT

The domain and maintenance of fundamental motor skills are essential for acquisition of more complex skills that are used in sport activities. The aim of this study was review systematically the experimental and quasi-experimental studies which implemented the mastery motivational climate in motor interventions and verify impact in fundamental motor skills of children. A search without language and date restrictions in eight databases was realized. Motor intervention studies that used the mastery motivational climate with focus in strategy for optimize the locomotors and object control skills performance in children 3 to 10 year-old were included. The evaluate of methodological quality was realized by two independents reviewers. Six papers that described motor interventions oriented by mastery motivational climate were included. The participants were children with identified motor delay, with or without cognitive or motor disabilities. All the studies indicated positive effect of intervention programs in locomotor and object control skills. The mastery motivational climate is an efficient methodological proposal teaching to promote development of locomotors and object control skills in children with motor delay.

Keywords: fundamental motor skills; motor intervention; climate motivation; mastery; children; systematic review.

INTRODUCTION

The domain and maintenance of fundamental motor skills are essential for the acquisition of more complex skills, which are used in sports activities (Clark & Metcalfe, 2002; Gallahue, Ozmun, & Goodway, 2013). The competence in fundamental motor skills during childhood is essential for participation in games and sports in adolescence and adulthood (Barnett, Van Beurden, Morgan, Brooks, & Beard, 2008; Robinson et al., 2006; Stodden et al., 2008). Therefore, involvement in physical activities may have a positive effect on increasing physical activity levels and adopting a healthy lifestyle, reducing the problems related to physical inactivity and obesity (Larouche, Boyer, Tremblay, & Longmuir, 2013; Laukkanen, Pesola, Havu, Sääkslahti, & Finni, 2014; Lloyd, Saunders, Bremer, & Tremblay, 2014).

A considerable number of researches in several countries report data from children with delays in fundamental motor skills and below expected competencies in a period of childhood in which they should have a diverse and efficient motor base (Draper, Achmat, Forbes, & Lambert, 2012; Goodway, Robinson, & Crowe, 2010; Hardy, King, Espinel, Okely, & Bauman, 2011; LeGear et al., 2012; Spessato, Gabbard, Valentini, & Rudisill, 2013; Venetsanou & Kambas, 2009). Considering the increasing rates of children with motor delays, researchers and teachers have been concerned with promoting compensatory programs with intervention strategies to minimize motor difficulties. Several studies report that motor interventions with appropriate strategies stimulate development and promote learning of key motor skills (Logan, Robinson, Webster, & Barber, 2013; Lubans,

¹ Federal University do Rio Grande do Sul (UFRGS), Porto Alegre, Brazil.

² Leão Sampaio University Center (UniLeão), Juazeiro do Norte, Ceará, Brazil.

* Corresponding Author: Graduate Program in Human Movement Sciences (PPGCMH) of Federal University of Rio Grande do Sul, Felizardo Street, 750, Jardim Botânico, 90690-200, Porto Alegre, Brazil. Email: paulo.felipe@ufrgs.br

Morgan, Cliff, Barnett, & Okely, 2010; Morgan et al. Myer et al., 2015; Riethmuller, Jones, & Okely; 2009, Robinson et al., 2015, Valentini, 2002).

Researches also report that when methodological strategies that promote the motivation and autonomy of the child in the learning process their gains in motor intervention are optimized (Martin, Rudisill, & Hastie, 2009; Robinson & Goodway 2009; Valentini & Rudisill, 2004, 2002). At the present time, the teaching-learning methodologies implemented in compensatory programs involve less traditional classes with emphasis on the autonomy of the child, such as the motivation climate for mastery (Logan et al., 2013; Martin et al., 2009; Robinson & Goodway; Valentini & Rudisill, 2004a; Valentini, 2002)

Children motivated for mastery tend to accept challenges, to engage more in the task and to recognize that success is related to effort (Valentini, Rudisill, & Goodway, 1999). By engaging more in activities proposed in this climate (Valentini, 2002), children practice more skills and engage themselves more in physical activity and sports. The methodology with Motivational Climate Oriented for Mastery implements the practice of fundamental motor skills from an environment of autonomy for the child. To implement this methodology, the TARGET structure is used, which, through 6 dimensions of the classroom (task, authority, recognition, grouping, evaluation and time), creates a favourable and autonomous motivational climate for students to learn different motor skills of the children (Valentini, Rudisill, & Goodway, 1999a; Valentini et al., 1999b; Valentini, 2002).

The TARGET dimensions allow the mapping of strategies related to the characteristics of the task (proposed activity) that the children engage in, the autonomy of the students, the recognition by the efforts, the groups formation with different characteristics, the monitoring of the learning process and the adequate time for the learning of each child (Valentini et al., 1999a, 1999b).

Given the benefits of Mastery Oriented Motivational Climate for learning fundamental motor skills, the aim of the present study was to systematically review the effectiveness of motor based intervention programs based on Motivation for Mastery in the fundamental motor skills of children.

METHOD

This is a systematic review study. For this study, the PRISMA (Statement) guidelines will be used (Moher, Liberati, Tetzlaff, Altman, & Grp, 2009).

Kind of Studies and Eligibility criteria

The following inclusion criteria were defined: (1) quasi-experimental or experimental studies with a pre- and post-intervention design with a control group; (2) studies used the first or second edition of the Test of Gross Motor Development (TGMD), 2000); (3) had a sample aged less than three years or greater than 10 years and 11 months. Studies were excluded when: (1) they did not use validated test batteries for motor performance evaluation in children aged three to 10 years; (2) when they did not present locomotion skills, object control and broad motor quotient (sum of locomotion skills and object control scores); (3) were characterized as abstracts, theses, dissertations and articles of literature review or systematic and meta-analyses; (4) did not present all complete data from one or more groups, as well as studies without a group control.

Comparator Group and Variables

The Control group with children 3 to 10 who participated in other methods of motor intervention different from the climate of motivation to mastery were considered in the present study. The variables investigated were performance in locomotion skills, object control and the broad motor quotient, characterized as continuous variables.

Sampling

The search for the articles occurred in the Academic Search Premiere databases, CINAHL,

PsycArticles, PsycINFO, Pubmed, Scopus, Sport Discus and Web of Science. In addition, a manual search was carried out in the references of the studies found to verify the existence of more studies that were not found in the search strategy, as well as known studies not located by the databases. The search for the data occurred until April 15, 2015. From a review of the literature, from the consultation to Descriptors in Health Sciences (DeCS) and search terms, Mesh and not Mesh (Pubmed) the following were defined Terms "children" "motor skill", "intervention", "mastery climate" and associated terms. Boolean operators AND and OR were used. The search terms were combined according to the characteristics of each database. There were no language restrictions on the search.

Studies Selection and Data Extraction

The Initially, two independent reviewers selected the studies. The stages of independent selection followed the order: step 1: electing

studies evaluating titles and abstracts; Step 2: reading the article in full when the title and abstract were not enough. After the independent evaluation processes, the reviewers will compare individually chosen studies to identify decision-making differences, and therefore to establish a consensus in the selection of the studies. After defining the included studies, the reviewers read the complete articles selected for data extraction. The eligibility criteria assumed in the survey were considered in this process. Data were extracted by two independent reviewers, using a standardized form considering the main characteristics of the studies: participants, type of intervention and variables, methodological characteristics.

RESULTS

Study Overview

The organization and selection of studies was careful and respected the process that can be observed in Figure 1.

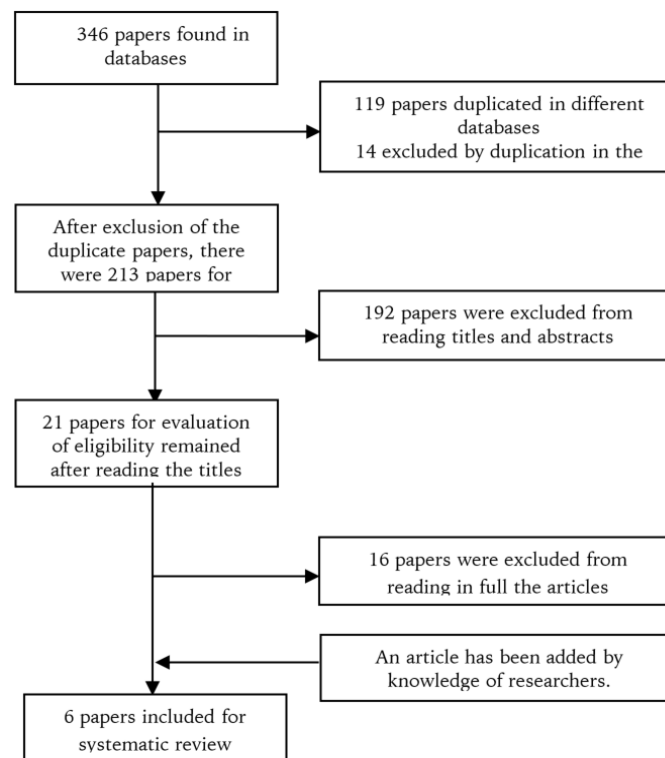


Figure 1. Flow Diagram of search results

The methodological quality of the studies was evaluated by the scale proposed by Goodson, Buhi, and Dunsmore (2006) adapted by Spessato (2012). The studies presented an

average of 9.5 points out of a total of 14. In the study design, in the use of theory or model, and in the methods of analysis, 100% of the studies had a maximum score (Table 1).

Table 1
 Methodological quality assessment of studies

Criteria	Score	n (%)
Uses Theory or Model Explicitly	No - 0	0(0)
	Yes - 1	6 (100%)
Study Design	Transversal - 0	0(0)
	Longitudinal - 1	6 (100%)
	No coefficient present - 0	3 (50%)
Validity of Instruments	Display coefficient only for data parts - 1	0(0)
	It presents coefficients of other studies or of the instrument's own validation - 2	0(0)
	It presents coefficients of all instruments validated in the sample itself - 3	3 (50%)
Methods of Analysis	Qualitative - 0	0(0)
	Univariate / Descriptive Statistics - 1	0(0)
	Bivariate Statistics / ANOVA - 2	6 (100%)
	Multiple Regression / logistics - 3	0(0)
	Multivariate Statistics (discriminant function analysis, path analysis, structural equation model) - 4	0(0)
Sample size	Some kind of effect size is displayed (<i>eta square</i> , R2, Confidence Interval) -5	6 (100%)
	Small >100 - 0	5 (83.3%)
	Average 100-300 - 1	1 (16.7%)
Sample Selection	Large > 300 -2	0(0)
	Non-probabilistic convenience - 0	1 (16.7%)
	No representative nationally random - 1	5 (83.3%)
	Representative nationally random - 2	0(0)

Characteristics of Studies and Participants

From the 6 articles analysed, 4 were conducted in the United States (Logan et al., 2013, Martin et al., 2009, Robinson & Goodway, 2009) and 2 were carried out in Brazil (Valentini & Rudisill, 2004a, 2004b; Valentine, 2002). In relation to the methodological design, five studies were characterized as experimental (randomized) with a pre and post-intervention design with group control (Logan et al., 2013, Robinson & Goodway, 2009; Valentini & Rudisill, 2004a, 2004b; Valentine, 2002); a study was characterized as quasi-experimental with group control (Martin et al., 2009). The children in the studies were between four and 10 years old, in one study, children in a subgroup of intervention and control had physical and cognitive deficits (Valentini & Rudisill, 2004b), in the other studies the children had a typical development (Logan et al., 2013; Martin et al., 2009; Robinson & Goodway 2009; Valentini, 2002; Valentine & Rudisill, 2004a). All studies selected children according to motor performance, children with delays were included in the research, after that stage the children were randomized, except for the study by Martin et al. (2009) in intervention and

control groups. The characteristics of the Studies are described in Table 2.

Characteristics of Motor Interventions

In all studies, the intervention groups were submitted to motor intervention programs using the Motivation Climate for Mastery with the TARGET structure for the design of strategy in the classroom dimensions (Logan et al., 2013; Martin et al., 2009; Robinson & Goodway, 2009; Valentini & Rudisill, 2004a, 2004b; Valentini, 2002). In the studies by Valentini (2002), Valentini & Rudisill (2004a) and Valentini & Rudisill, (2004b) the interventions were conducted in 12 weeks with 24 class sessions lasting between 60 and 70 minutes. In the study by Logan et al. (2013) the intervention lasted nine weeks with 18 sessions lasting 30 minutes; in the study by Martin et al. (2009) were 30 sessions in five weeks and in the study by Robinson & Goodway (2009) were 18 sessions in nine weeks with an average duration of 30 minutes. All interventions were conducted by experienced physical education teachers or by the researchers themselves with the assistance of trainees.

Tabela 2

Descrição dos estudos avaliados.

Authors	Country	Type of Study	Intervention Group	Control Group	Motor Intervention	Test and Variables evaluated	Statistic	Results	Follow-up
Logan, Robinson, Webster, Barber (2013)	United States	Experimental (randomized) pre and post intervention design;	12 children (7 boys and 7 girls, age M = 4.03 SD = 0.64) subdivided into two groups: (1) children with high motor performance (N = 5, M = 39.6 SD = 5.8); (2) children with low motor performance (N = 8 M = 12.4 SD = 7.1)	13 children (8 girls and 5 boys) were subdivided into two groups: (1) children with high motor performance (N = 6, M = 43.5 SD = 7.1); (2) children with low motor performance (N = 7, M = 12.4 SD = 4.6)	Intervention Group: 9 weeks intervention (twice a week - 30 min.) Focusing on motor skills of object control. Control Group: Traditional intervention with focus on the teacher	TGMD-2** Object Control Percentile	ANOVA with repeated measures 2 (skill level) x 2 (intervention-control group) according to the climate (split file) Effect size estimated from η^2 .	Significant intra-group interactions ($p < 0.001$) and between groups (according to the motor performance level in the control variable object) ($p < 0.001$). The children showed better motor performance in object control skills regardless of the weather. Children with low motor performance presented significant improvements when compared to children with high motor performance.	Not measured
Martin, Rudissil, Hastie (2009)	United States	Quasi-experimental design with pre and post-intervention	42 children (24 girls and 18 boys) from a kindergarten school (Age M = 5.72 SD = 1.39)	22 children (10 girls and 12 boys) from a kindergarten school (Age M = 5.43 SD = 0.78)	Intervention Group: 6 weeks of intervention (30 sessions) focused on FMS Control Group: 6 weeks of intervention (30 sessions) with a low teacher autonomy approach.	TGMD-2** Gross Locomotion and Object Control Gross Score	ANOVA with repeated measures 2 (time) x 2 (group) intervention-control Effect size estimated from η^2 Continuity Testing	Significant interactions of time x group in the subscale of locomotion ($p < 0.001$) and in the subscale of object control ($p < 0.001$). The intervention group improved significantly from pre- to post-intervention. In the control group there were no significant improvements	Not measured

Valentini and Rudissil (2004b)	Brazil	Experimental (randomized) pre and post-intervention design	19 children (12 boys and 7 girls, age M = 5.45 SD = 0.51)	120 children (13 boys and 7 girls age M = 5.40 SD = 0.60)	Intervention Group: 12 weeks, 24 sessions (70 min.) Focused on FMS Control group: Low autonomy Traditional classes with a teacher-centered approach.	TGMD * Gross Locomotion and Object Control Gross Score	3 Anova 2 (group) x 2 (time) Effect size estimated from η^2 . Continuity Testing	Locomotion Interaction group x time (p = 0.042) and main group effects (p < 0.05) and time (p < 0.001). In the postintervention the intervention group had better performance compared to the control group (p < 0.001). The two groups presented better performance from pre to postintervention. Object Control Main effect time (p < 0.001). The groups had improvement from pre to post intervention, intervention group (Pre M = 8.90, SD = 2.10 and Post M = 14.45, SD = 1.43) and control group (Pre M = 8.80, SD = 1.96 and Post M = 14.20, DP = 1.28). After the intervention program the children in the intervention group maintained the gains in locomotion; Already the control group had a decline in relation to the postintervention. The intervention group had a statistically superior performance to the control group at follow-up (p < 0.001) In the intervention group gains in the control of the object remained; The control group there was a decline in performance. The intervention group had a statistically superior performance to the control group at follow-up (p < 0.001)
Valentini and Rudissil (2004a)	Brazil	Experimental (randomized) pre and post-intervention design	50 children in 2 groups: (Age M = 7.46 SD = 1.31 15 girls and 16 boys) and (2) Interventive without disability (age M = 8.14 SD = 1.60, 3 girls and 16 boys)	54 children in 2 groups:	Intervention Group: 12 weeks, 24 sessions (60 min each) focused on FMS Control Group: free games classes supervised by a teacher.	TGMD * Gross Locomotion and Object Control Gross Score	Anova 2 (locomotion, object control) x 2 (group) x 2 (subgroup) x 2 (pre and post intervention) with repeated measures. Correlation and plots Box plots to test the normality of the data. Effect size estimated from η^2 Continuity Testing	Locomotion: Significant interaction in the factors groups x subgroups x time (p < 0.04). Significant improvements from pre-post intervention to intervention group (p < 0.001). In the comparison between the groups in the pre-intervention the control group presented better performance when compared to the intervention group, however in the post intervention the intervention group reached the performance of the control group (p = 0.032). In the comparison of the subgroups, the children in the intervention group with and without disability had improvement after the intervention program (p < 0.001 and p < 0.001, respectively). In the comparison between the pre and post intervention subgroups, the interventive subgroups with and without disabilities performed better after the intervention when compared to their peers. Object Control: Significant interaction in the factors groups x subgroups x time (p < 0.04). Significant improvements from pre to post intervention in the intervention group (p < 0.001). In the post-intervention the intervention group presented superior performance in comparison as a control group (p < 0.001). In the subgroup, pre and post-intervention groups improved only from the intervention groups with and without disability (p < 0.001 and p < 0.001, respectively). In the post-intervention the intervention groups with and without deficiency presented better performance (p < 0.001 and p = 0.004, respectively) when compared to their pairs. Not measured

Valentini (2002)	Brazil	Experimental (randomized) pre and post-intervention design	41 children (17 girls and 24 boys, age M = 7.56 SD 1.02)	50 children (16 girls and 34 boys, age M = 7.57 SD 1.13)	Intervention Group: 12 weeks, 24 sessions (60 min.) Control Group: Traditional physical education classes.	TGMD * Gross Control of Locomotion Control of Object	Anova 2 (time) x 2 (group) Continuity tests Effect size estimated from η^2 .	Locomotion Significant group-time interaction (P <0.001). Significant differences in locomotion skills for the Prevention Intervention Group For post-intervention (p <0.001). In the post intervention the intervention group presented superior performance when compared to the control group (p = 0.03). Object Control: significant group x time interaction (P <0.001). There were significant differences in the object control skills for the Pre-for post-intervention (P <0.001). In the post-intervention the intervention group presented superior performance (p <0.001) when compared to the control group.	Not measured
Robinson e Goodway (2009)	United States	Experimental (randomized) pre and post intervention	39 children (20 girls, 19 boys, age M = 47.6 SD = 7.5)	Two groups (1) low autonomy (18 girls and 20 boys, age M = 46.6 SD = 5.9) and (2) Comparator (16 girls and 24 boys, age M = 48.3 SD = 5.0)	Intervention Group: 9 weeks, 18 sessions (30 min.) Focusing on object control skills Group Low Autonomy: 9 weeks, 18 sessions (30 min each) with a teacher-centered approach to teaching focusing on object control skills. Comparison group: 9 weeks, 18 sessions (30 min.) With free play approach observed by teachers.	TGMD-2 ** Gross Object Control	Anova 3 (groups - intervention - low autonomy and comparator) x 3 (time - pre, post and follow-up) Effect size estimated from η^2 . Post Hoc Tukey	Significant Interaction Group x Time (p <0.001) and main group effects (p <0.001) and time (p <0.001). Significant differences were found between the intervention group and the comparator group (p <0.001) after the intervention. There were significant changes in the intervention group (p <0.001) and in the low autonomy group (p <0.001)	In the retention, no differences were found in relation to after-intervention, between the intervention groups and low autonomy, however, statistically significant differences were observed between the intervention group and the comparator group in the retest (p <0.001). Significant post-intervention changes for the retest were observed in the intervention group (p <0.001) and in the low autonomy group (p <0.001).

M = Mean / SD = standard deviation/ % = percentile / FMS = Fundamental Motor Skills

* TGMD (Ulrich, 1985) / ** TGMD-2 (Ulrich, 2000)

Test Batteries, Variables and Statistical Procedures

In order to evaluate the fundamental motor skills, three of the six studies used the Test of Gross Motor Development (TGMD) first edition (Valentini & Rudisill, 2004a, 2004b; Valentini, 2002) and three used the second version of TGMD-2 (Logan et al., 2013; Martin et al., 2009; Robinson & Goodway, 2009). In the studies of Logan et al. (2013) and Robinson and Goodway (2009) were evaluated only the impact of intervention on the percentile and gross object control score, respectively. The other studies evaluated the impact on gross locomotion and object control scores. Regarding statistical procedures, all the studies used ANOVA with repeated measures in the time factor and comparisons between groups and subgroups. The size of the effect was estimated through the partial eta (η^2).

Impact of interventions on locomotion and object control skills

The studies that evaluated the impact of motor intervention based on motivation climate for mastery reported a significant effect of the program on locomotion and object control skills in the children who participated in the intervention (Logan et al., 2013; Martin et al., 2009; Robinson & Goodway, 2009; Valentini & Rudisill, 2004a, 2004b; Valentini, 2002). From six studies four evaluated the impact of the intervention on locomotion skills and object control (Martin et al., 2009; Valentini & Rudisill, 2004a, 2004b; Valentini, 2002), studies by Robinson and Goodway (2009) and Logan et al. (2013) evaluated only the impact of the intervention on object control skills. It is noteworthy that in the latter similar study changes resulting from the intervention program were reported in the intervention and group control.

Only two studies evaluated the impact of the intervention at other times (follow-up). The study by Valentini and Rudisill (2004b) reported that gains from intervention in locomotion and object control skills were maintained after six months in the intervention group. In the group control there was no change

from pre to post intervention after this period and performance was similar to pre and post test performance. The study by Robinson and Goodway (2009) reported that in the follow-up were found significant improvements in the gross locomotion score in the children of the intervention group and the low-autonomy group.

DISCUSSION

The aim of this systematic review was to synthesize the evidences on the impact of motor interventions with the Motivation Climate for Mastery in the motor skills of locomotion and object control of children. The strategies used in the Motivation Climate for Mastery lead children to a motivating and challenging environment, experiencing diversified activities with different levels of difficulty, the child has autonomy to choose its tasks, is recognized by the efforts, works in groups and has strategies of self-evaluation. All these strategies of the Motivation Climate for Mastery allow meaningful and contextualized learning (Ames & Bell, 1990; Ames, 1992).

When the child has significant learning, persistence in motor activities and adequate perceived competence are guaranteed (Kirk, 2005; Valentini & Rudisill, 2004a, 2004b; Valentini, 2002). Following the methodological proposal implemented in the reviewed studies, the more the child performs an activity in a varied way, the more competent it can become; even more, if she is aware that success in the task depends on her work, the possible failures are perceived as an impulse to work harder (Valentini, 2002; Valentini & Rudisill, 2004a, 2004b). The feeling of competence can be strengthened when the child is faced with moderate levels of challenges, which with effort can overcome; perceive itself competent, therefore, it is possible when performing tasks with the objective of self-overcoming (Píffero & Valentini, 2010) factors that contribute to achieving motor proficiency.

It is fundamental that children achieve motor proficiency at the appropriate age. All studies

reviewed reported improvement in scores or percentiles of locomotion and object control skills in children undergoing motor intervention. These results are consistent and follow a positive trend of studies that used the Motivation Climate for Mastery as an interventional approach that have generated positive impact, such as increased physical activity levels (Wadsworth, Robinson, Rudisill, & Getchell, 2013); improvement in eating habits and more controlled physical activity practices (Papaioannou, Milosis, Kosmidou, & Tsigilis, 2007) strengthening the perception of competence (Valentini & Rudisill, 2004a); greater proficiency in specialized tennis skills (Piffero & Valentini, 2010), decreased anxiety (Barkoukis, Tsorbatzoudis, & Grouios, 2008); and more frequent use of competitive athletic learning strategies (Morgan & Carpenter, 2002).

However, few studies are devoted to investigating the gains of motor intervention after the period of its implementation. Of all the studies reviewed, only two studies investigated whether gains were maintained over time after the end of the (follow-up) (Robinson & Goodway, 2009; Valentini & Rudisill, 2004b). In the study by Robinson and Goodway (2009) the gains from the intervention group remained in the follow-up, however the post-follow-up interval was only one week, considered a relatively short time to check changes in movement patterns. The study by (Valentini & Rudisill, 2004b) re-evaluated the children who participated in the intervention and group control. The authors reported that even after six months the gains from the intervention were still present in the intervention group. This information allows us to better understand the effects of this Climate of Motivation over time which probably has generated in children greater meanings in the skills learned. But little is known whether these gains remain and evolve over time.

Of the six studies, only one, conducted motor intervention in a school environment (Martin et al., 2009), but only in six weeks, a shorter period than other interventions and different from the school curriculum. All other studies implemented programs in other

contexts, this information indicates the need for studies that investigate the effectiveness of the Motivation Climate for Mastery in the regular school physical education classes and with a duration that is closer to this school reality. Teachers nowadays facing a growing need to implement educational contexts that accommodate a wide variety of children who have different levels of development in the same group. The Motivation Climate for Mastery is an alternative that leads all learners to engage in the learning process and builds effective perspectives to meet the needs of all children.

None of the interventions reported the time of practice and engagement of children in fundamental motor skills, this information would be important since some theories of motor development indicate that one of the central points of development is related to engagement (Robinson et al., 2015; Silverman, 1991) Interventions from the reviewed studies lasted from six to 12 weeks, suggesting the need for longer interventions that go along with development of the children for a longer period as well.

All interventions assessed total scores or percentiles of total scores on locomotion and object control skills, and no assessed study investigated the impact of interventions on specific motor skills (running, galloping, jumping, kicking, throwing, bouncing, receiving the ball). This information would be important for teachers and researchers to plan interventions based on the most difficult skills and in the future, it would be important for the Physical Education area to plan a curriculum based on age, gender and level of development.

CONCLUSION

The motivational climate for mastery is an efficient methodological proposal of teaching to promote the motor skills of locomotion and control of objects in children with motor delays. The following highlights the strengths, limitations of the study and implications for practice.

Limitations

It were not evaluated other variables related to motor skills, such as the perception of competence, level of physical activity and nutritional status

Implications for practice

Assess specifically the impact of interventions in motor skills not only the total scores or percentages of the total scores of locomotion and control of object; Assess the impact of the intervention over time, and to evaluate whether children proficient remain engaged in physical activities and sports; To include parents in motor interventions; Implement motor intervention programs in school contexts and with a greater period of time.

Acknowledgments:

Nothing to declare.

Conflict of interests:

Nothing to declare.

Funding:

This research was supported by CNPq and CAPES from the granting of scholarships to researchers.

REFERENCES

- Ames, A., & Bell, H. (1990). Motivation: What Teachers Need to Know, 91(3). *Teachers College Record*, 409-421.
- Ames, C. (1992). Achievement goals and classroom motivational climate. In J. Meece & D. Schunk (Eds.), *Students perceptions in the classroom*. Hillsdale, NJ: Erlbaum, 327-348.
- Barkoukis, V., Tsorbatzoudis, H., & Grouios, G. (2008). Construct validity of the physical Education State Anxiety Scale: a multitrait-multimethod approach. *Perceptual And Motor Skills*, 107(3), 651-662.
- Barnett, L. M., Van Beurden, E., Morgan, P. J., Brooks, L. O., & Beard, J. R. (2008). Does childhood motor skill proficiency predict adolescent fitness? *Medicine and Science in Sports and Exercise*, 40(12), 2137-2144. <http://doi.org/10.1249/MSS.0b013e31818160d3>
- Clark, J. E., & Metcalfe, J. S. (2002). A montanha do desenvolvimento motor - Jane Clark. *Motor Development: Research and Reviews*, 2, 163-190.
- Draper, C. E., Achmat, M., Forbes, J., & Lambert, E. V. (2012). Impact of a community-based programme for motor development on gross motor skills and cognitive function in preschool children from disadvantaged settings. *Early Child Development and Care*, 182(1), 137-152. <http://doi.org/10.1080/03004430.2010.547250>
- Gallahue, D. L., Ozmun, J. C., & Goodway, J. D. (2013). *Compreendendo o Desenvolvimento Motor: Bebês, Crianças, Adolescentes e Adultos (7ª Ed.)*. Porto Alegre: ARTMED.
- Goodson, P., Buhi, E. R., & Dunsmore, S. C. (2006). Self-esteem and adolescent sexual behaviors, attitudes, and intentions: a systematic review. *The Journal of Adolescent Health: Official Publication of the Society for Adolescent Medicine*, 38(3), 310-9. <http://doi.org/10.1016/j.jadohealth.2005.05.026>
- Goodway, J. D., Robinson, L. E., & Crowe, H. (2010). Gender differences in fundamental motor skill development in disadvantaged preschoolers from two geographical regions. *Research Quarterly for Exercise and Sport*, 81(1), 17-24.
- Hardy, L. L., King, L., Espinel, P., Okely, A. D., & Bauman, A. (2011). Methods of the NSW schools physical activity and nutrition survey 2010 (SPANS 2010). *Journal of Science and Medicine in Sport*, 14(5), 390-396. <http://doi.org/10.1016/j.jsams.2011.03.003>
- Kirk, D. (2005). Physical education, youth sport and lifelong participation: the importance of early learning experiences. *European Physical Education Review*, 11(3), 239-255. <http://doi.org/10.1177/1356336X05056649>
- Larouche, R., Boyer, C., Tremblay, S. M., & Longmuir, P. (2013). Physical fitness, motor skill and physical activity relationships in Grade 4 to 6 children. *Applied Physiology, Nutrition, and Metabolism*, 39(5), 553-559.
- Laukkanen, A., Pesola, A., Havu, M., Sääkkslahti, A., & Finni, T. (2014). Relationship between habitual physical activity and gross motor skills is multifaceted in 5 to 8-year-old children. *Scandinavian Journal of Medicine and Science in Sports*, 24(2), 102-111. <http://doi.org/10.1111/sms.12116>
- LeGear, M., Greyling, L., Sloan, E., Bell, R. I., Williams, B. L., Naylor, P. J., & Temple, V. a. (2012). A window of opportunity? Motor skills and perceptions of competence of children in Kindergarten. *International Journal of Behavioral Nutrition and Physical Activity*, 9(1), 29. <http://doi.org/10.1186/1479-5868-9-29>
- Lloyd, M., Saunders, T. J., Bremer, E., & Tremblay, M. S. (2014). Long-term importance of

- fundamental motor skills: A 20-year follow-up study. *Adapted Physical Activity Quarterly*, 31(1), 67–78. <http://doi.org/10.1123/apaq.2013-0048>
- Logan, S., Robinson, L., Webster, E. K., & Barber, L. (2013). Exploring preschoolers' engagement and perceived physical competence in an autonomy-based object control skill intervention: A preliminary study. *European Physical Education Review*, 19(3), 302–314. <http://doi.org/10.1177/1356336X13495627>
- Lubans, D. R., Morgan, P. J., Cliff, D. P., Barnett, L. M., & Okely, A. D. (2010). Fundamental movement skills in children and adolescents: Review of associated health benefits. *Sports Medicine*, 40(12), 1019–1035. <http://doi.org/10.2165/11536850-000000000-00000>
- Martin, E. H., Rudisill, M. E., & Hastie, P. A. (2009). Motivational climate and fundamental motor skill performance in a naturalistic physical education setting. *Physical Education and Sport Pedagogy*, 14(3), 227–240.
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Grp, P. (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement (Reprinted from *Annals of Internal Medicine*). *Physical Therapy*, 89(9), 873–880. <http://doi.org/10.1371/journal.pmed.1000097>
- Morgan, K., & Carpenter, P. (2002). Effects of manipulating the motivational climate in physical education lessons. *European Physical Education Review*, 8(3), 207–229.
- Morgan, P. J., Barnett, L. M., Cliff, D. P., Okely, A. D., Scott, H. A., Cohen, K. E., & Lubans, D. R. (2013). Fundamental Movement Skill Interventions in Youth: A Systematic Review and Meta-analysis. *Pediatrics*, 132(5), e1361–e1383. <http://doi.org/10.1542/peds.2013-1167>
- Myer, G. D., Faigenbaum, A. D., Edwards, N. M., Clark, J. F., Best, T. M., & Sallis, R. E. (2015). Sixty minutes of what? A developing brain perspective for activating children with an integrative exercise approach. *British Journal of Sports Medicine*, 1–9. <http://doi.org/10.1136/bjsports-2014-093661>
- Papaioannou, A. G., Milosis, D., Kosmidou, E., & Tsigilis, N. (2007). Motivational Climate and Achievement Goals at the Situational Level of Generality. *Journal of Applied Sport Psychology*, 19(1), 38–66. <http://doi.org/10.1080/10413200601113778>
- Piffero, C. M., & Valentini, N. C. (2010). Habilidades especializadas do tênis: um estudo de intervenção na iniciação esportiva com crianças escolares. *Rev. Bras. Fis. Esporte*, 24(2), 149–163.
- Riethmuller, A. M., Jones, R. A., & Okely, A. D. (2009). Efficacy of Interventions to Improve Motor Development in Young Children: A Systematic Review. *Pediatrics*, 124(4), e782–792. <http://doi.org/10.1542/peds.2009-0333>
- Robinson, L. E., & Goodway, J. D. (2009). Instructional climates in preschool children who are at-risk. Part I: object-control skill development. *Research Quarterly for Exercise and Sport*, 80(3), 533–542. <https://doi.org/10.1080/02701367.2009.10599591>
- Robinson, L. E., Stodden, D. F., Barnett, L. M., Lopes, V. P., Logan, S. W., Rodrigues, L. P., & D'Hondt, E. (2015). Motor Competence and its Effect on Positive Developmental Trajectories of Health. *Sports Medicine*, 45(9), 1273–1284. <http://doi.org/10.1007/s40279-015-0351-6>
- Silverman, S. (1991). Research on teaching in physical education. *Research Quarterly for Exercise and Sport*, 62(4), 352–364.
- Spessato, B. C. (2012). *Competencia motora, atividade fisica e percepcao de competencia: Uma relacao que se fortalece ao longo da infancia* (Tese de Doutorado). Universidade Federal do Rio Grande do Sul, Porto Alegre.
- Spessato, B. C., Gabbard, C., Valentini, N., & Rudisill, M. (2013). Gender differences in Brazilian children's fundamental movement skill performance. *Early Child Development and Care*, 183(7), 916–923. <http://doi.org/10.1080/03004430.2012.689761>
- Stodden, D. F., Goodway, J. D., Langendorfer, S. J., Roberton, M. A., Rudisill, M. E., Garcia, C., & Garcia, L. E. (2008). A Developmental Perspective on the Role of Motor Skill Competence in Physical Activity: An Emergent Relationship. *Quest*, 60(2), 290–306. <http://doi.org/10.1080/00336297.2008.10483582>
- Ulrich, D. A. (1985). *Test of Gross Motor Development, TGMD*. Austin: Prod-Ed.
- Ulrich, D. A. (2000). *Test of Gross Motor Development (2ª Ed.)*. Austin: Prod-Ed.
- Valentini, N. C. (2002). A influência de uma intervenção motora no desempenho motor e na percepção de competência de crianças com atrasos motores. *Revista Paulista de Educação Física*, 16(1), 61–75.
- Valentini, N. C. (2002). Influência e uma intervenção motora e desempenho motor e na percepção de competência de crianças com atrasos motores. *Revista Paulista de Educação Física*, 16(1), 61–75.
- Valentini, N. C., & Rudisill, M. E. (2004a). Effectiveness of an inclusive mastery climate intervention on the motor skill development of children. *Adapted Physical Activity Quarterly*, 21, 330–347.
- Valentini, N. C., & Rudisill, M. (2004b). Motivational Climate, Motor-Skill Development, and Perceived Competence: Two Studies of Developmentally Delayed Kindergarten Children. *Journal of Teaching in Physical Education*, 23, 216–234.
- Valentini, N. C., Rudisill, M. E., & Goodway, J. D. (1999a). Incorporating a mastery climate into physical education: It's developmentally

- appropriate! *Journal of Physical Education, Recreation & Dance*, 70(7), 28–33.
- Valentini, N. C., Rudisill, M. E., & Goodway, J. D. (1999b). Mastery Climate: Children in Charge of their own learning. *Teaching Elementary Physical Education*, 10, 6–10.
- Venetsanou, F., & Kambas, A. (2009). Environmental Factors Affecting Preschoolers' Motor Development. *Early Childhood Education Journal*, 37(4), 319–327. <http://doi.org/10.1007/s10643-009-0350-z>
- Wadsworth, D. D., Robinson, L. E., Rudisill, M. E., & Getchell, N. (2013). The Effect of Physical Education Climates on Elementary Students' Physical Activity. *Journal of School Health*, 83(5), 306–313.



All content of Journal **Motricidade** is licensed under [Creative Commons](https://creativecommons.org/licenses/by-nc/4.0/), except when otherwise specified and in content retrieved from other bibliographic sources.

Physical activity and sedentary time in Physical Education classes and their association with cardiorespiratory fitness in students

Renato Silva Barbosa Maziero^{1*}, Cassiano Ricardo Rech², Valter Cordeiro Barbosa Filho², Wagner de Campos¹

ORIGINAL ARTICLE

ABSTRACT

This study aimed to evaluate the intensity and duration of activities in Physical Education classes and to test their association with cardiorespiratory fitness. It is a cross-sectional study with 614 schoolchildren (51% girls), aged 10 to 17 years old, evaluated by accelerometers in 100 Physical Education classes in Pinhais, Southern Brazil. The intensity of the activities was determined by accelerometry (Actigraph, model WGT3X). The time spent in each intensity (sedentary, light, moderate, intense and very intense) was evaluated. Cardiorespiratory fitness was determined by the Léger test 20 meters. The average duration of the classes was 31.5 minutes (SD = 4.3). On average, boys and girls passed 23.8% and 16.9% (p <0.05) of a class in activities of moderate and vigorous intensity, respectively. The correlation between time in physical activity and cardiorespiratory fitness was significant in boys (Light, moderate and vigorous, respectively: r = 0.12, p = 0.04, r = 0.12, p = 0.04, r = 0.15, p = 0.009). In conclusion, the low correlation between physical activity time in Physical Education classes and cardiorespiratory fitness reinforces the discussion about how this subject can contribute to the public health in young population.

Keywords: motor activity, physical effort, cardiorespiratory fitness.

INTRODUCTION

The Cardiorespiratory fitness (CF) is an important indicator of the health of the young population (Anderssen et al., 2007; Lobelo, Pate, Dowda, Liese, & Ruiz, 2009). Studies have pointed out that low CF is associated with the development of several cardiovascular risk factors, such as overweight and hyperglyceridaemia (Lobelo et al., 2009), high concentrations of total cholesterol (Wedderkopp, Froberg, Hansen, Riddoch, & Andersen, 2003). There is also evidence that this association of CF with cardiovascular risk factors extends into adult life, contributing to the development and worsening of chronic-degenerative diseases (Katzmarzyk, Church, Craig, & Bouchard, 2009).

Among the different factors that may influence the CF, from genetic to environmental factors (Barbieri, 2010), stimulating an active lifestyle represents an important contribution to the development and maintenance of the individual's CF (World Health Organization

[WHO], 2010). Evidence with accelerometer measurements shows that moderate and/or vigorous intensity physical activity (MVPA) is positively related to CF, with moderate intensity having a weaker relationship with CF than vigorous intensity (Gutin, Yin, Humphries, & Barbeau, 2005), which is based on the results obtained by Martinez-Gomez et al. (2010).

One aspect that seems not yet elucidated is the contribution (or relation) of the PA performed during Physical Education classes in the CF. The school has been perceived as the better space for the promotion of PA through bodily practices and the reduction of sedentary behaviours (Hoehner et al., 2013), and Physical Education (PE) classes have been understood as a time and space for contribute to the increase of time in PA of different intensities, both inside and outside the classroom (Araújo, Brito, & Silva, 2010). Experiences at school during PE classes may result in the appropriation of active behaviour, especially when classes are pleasurable and assist in engaging in regular PA

¹ Federal University of Paraná, CEAFS (Center for Physical Activity and Health Studies), Curitiba, Brazil.

² Nucleus of Research in Physical Activity and Health (NuPAF), Federal University of Santa Catarina, Florianópolis, Brasil.

* Corresponding author: Federal University of Paraná, Department of Physical Education, Prof Lothario Meissner Av., 3400, Campus Jardim Botânico, 80210-170, Curitiba, Paraná, Brazil. Email: maziero@ufpr.br

(Hoehner et al., 2013). In Brazil, studies on the time in PA at different intensities in the Physical Education classes were performed previously (Guedes & Guedes, 1997; Hino, Reis, & Añez, 2007) and found that the composition of Physical Education classes is fundamentally of light or sedentary activities. A study with PA measured by accelerometry reinforced these findings, indicating that 22.6% of the time of PE classes were in sedentary activities, and that only 32.7% of classes were composed by PA of moderate to vigorous intensity (Kremer, 2010).

One question is whether the time in PA during Physical Education classes is related to an important attribute related to health and the active lifestyle among school children: the CF. The PA time in Physical Education classes seems to have little contribution to time in out-of-school PA (Kremer, 2010), but studies that analyse this relationship with CF are unknown in the national literature. Collecting evidence on this aspect may contribute to the organization of PE classes that aim to increase active participation in Physical Education classes, as well as whether this participation is justified by the relation with a health aspect, such as CF.

METHOD

This study presented a descriptive and correlational cross-sectional survey, and was carried out with students from the state public network of Pinhais, Paraná, Southern Brazil (human development index of the municipality of 0.761). In 2014, 7.058 individuals were enrolled in elementary school classes and 5.196 in high school in the 13 schools belonging to the municipality (SEED, 2014).

Participants

The study participants consisted of students of both sexes, enrolled in the 13 existing elementary schools and two high schools. Altogether, 420 classes were eligible in the state public education system of the city of Pinhais, Paraná, with students aged 10 to 17.9 years.

The Gpower software test was used a priori to calculate the sample size in the test of hypotheses for correlation, assuming an effect size of 0.15 as a function of not having found

previous studies that used these variables, alpha of 0.05 and power of 0.80. In addition, to correct the error related to the sample selection process according to recommendations for studies with cluster sampling (classes), a delineation effect of 1.2 was added, producing a minimum sample of (n=408). Following the sample calculation, 30% were added for possible losses and refusals. Therefore, the total sample was 537 students.

The selection of the sample of this study was made from the proportional stratified random sampling process. Initially, all the schools participated in the sample, in which the classes were the strata, being the separation of the classes by grades. Next, a draw of the classes was carried out. The number of classes per grade was defined by dividing the total number of students required for the study by 30 (the average number of students per class). In the second stage, the schools were drawn from the sequence numbering of the classes by grade (from the 6th year of elementary school to the 2nd year of high school) and by school, this procedure was carried out for all schools. A random draw of the total of classes was carried out, where the selection of the class indicates the school. To solve the problem of possible losses and refusals of students in each class, a new class of the same grade was drawn to compose the necessary number of students to be evaluated. In the end, 50 classes were evaluated in two classes of thirteen state schools, representing 100% of schools in the city of Pinhais-PR, in the total of 100 evaluations with accelerometers during classes in the schools evaluated.

The students who presented the written informed consent form (WICF) signed by the parents/guardians and the agreement signed by the students at the time of data collection, aged less than 10.0 years old and over 17.9 years old. Schoolchildren with physical disabilities who could have compromised PA levels were excluded from the sample.

Instruments and Procedures

The assessment of the intensity and duration of PA in PE classes, and total PA was performed using accelerometry with the Actigraph

Accelerometer, WGT3X (ActiGraph, Pensacola, FL). The students were instructed to use the accelerometer for seven days for monitoring, including the two days of the weekend to identify the PA behaviours (Trost et al., 2002). Schoolchildren were instructed to wear the accelerometer immediately after waking up, only to be withdrawn at times of bathing, water activities and periods of sleep. To ensure greater adherence to the use of the accelerometer, schoolchildren were contacted via cellular message and telephone calls made by the persons responsible, as well as pamphlets with instructions on the use of the devices. The accelerometer was positioned using an elastic band in the hip aligned to the average axillary line of the students and was programmed with epoch of 60 seconds.

For the present study, the calculation of the duration of the PA intensities in two PE classes in the same week was used, based on the monitoring of the beginning and end of the 45-minute classes. The class was selected at the time the class draw was held. The presence of the participants in the class was controlled by the teacher's presence list and the PE teachers were not informed about the main content of the research so as not to influence the normal progress of their classes. Nevertheless, the students were not monitored by the evaluators during PE classes and the activities developed were not recorded. This care was taken so that the presence of the evaluators did not influence the intensity of the PA during the classes, as well as the type of teacher's class, that could modify its practice motivated by the presence of the evaluators and the knowledge about which variables would be measured. The beginning and end time of the class was considered the same as informed by the direction of the school and the beginning of the activity schedule was reported by the students. The total time in PA outside Physical Education classes was used as a control variable.

The CF was estimated from the prediction of maximal oxygen consumption (predicted VO_2max), by performing the 20-meter back-and-forth test (Léger, Mercier, Gadoury, & Lambert,

1988). The students were classified according to the distribution in appropriate and inadequate ACR, according to cut-off point for both sexes (FITNESSGRAM, 2014).

Some control variables were evaluated. For the socioeconomic classification of the family, the criterion Brazil (ABEP, 2008) was used, this criterion aims at estimating the purchasing power of the individuals and families and the degree of education of the head of the family, separating in the socioeconomic classes (A1, A2, B1, B2, C1, C2, D, E). The biological maturation was determined using the self-evaluation method of pubic hairiness (Tanner, 1962). The test was applied by 1 (one) evaluator of the same sex as the evaluated one. All evaluations occurred in an individualized way to preserve the intimacy of the students. In order to obtain BMI, height and body mass were collected using standardized criteria (Guedes, 2007) and BMI was determined by calculating the ratio (division) between the measures of total body mass in kilograms by height in meters raised to the square. BMI was classified according to the criteria proposed by the cut-off points for sex and age (Cole, Bellizzi, Flegal, & Dietz, 2000).

Ethical aspects of the study

For the collection of data, the norms that regulate the research involving human beings of the National Health Council (resolution n° 466/2012) were followed, being evaluated and approved by the Research Ethics Committee of the Federal University of Paraná under opinion n° 638.917.

Statistical analysis

For statistical analysis we used the simple and relative frequency distribution for the characterization of the sample, the normality of the data was tested using the Kolmogorov-Smirnov test. Considering the non-normality of the data, the comparison between the sexes in the percentage variable of the duration in the activities in different intensities in the two PE classes was performed using the U test by Mann Whitney. The relationship between PA intensity and duration within the two PE classes with the

CF was performed by means of a partial correlation, controlled for socioeconomic status, maturational stage, BMI and total time of PA in moderate to vigorous intensity.

The association between the percentage of time spent in Physical Education classes in activities of different intensities and the classification of CF to health was estimated through multivariate logistic regression. For that, the odds ratio and its 95% confidence intervals (CI 95%) were calculated, with adjustments for potential confounding variables (maturational stage, economic condition, BMI and time in MVPA beyond Physical Education class). The percentage of time in Physical Education class was continuously used to avoid loss of statistical power in the analyses in the categorization of the independent variable.

All analyses were performed with the total sample and by sex. The SPSS Statistics 21® software was used, with the significance level being set at $p < 0.05$ in all analyses.

RESULTS

The final sample consisted of 614 students, 312 girls (50.8%) and 302 boys (49.2%). In the total sample, 70.0% of normal weight, 23.0% were overweight and 7.0% were obese. In the analysis of the maturational stage, 37.0% of the students were in the maturational stage 4 (four) and in relation to the socioeconomic classification 59.28% of the students belonged to the "C" classes (Table 1).

The description of the time in physical and sedentary activities in Physical Education classes can be observed in Table 2. Most of the time of

Physical Education classes was in sedentary activities (62.2% and 71.1% for boys and girls, respectively). The time in vigorous physical activities ranged from 0.0% to 30.0% in boys and from 0.0% and 25.3% in girls. The time in very vigorous physical activities ranged from 0.0% to 18.2% in boys and from 0.0% and 15.1% in girls.

Table 1

Characterization of the sample of elementary and middle school students of the state education network of the municipality of Pinhais-PR, 2014 (n = 614)

	Boys	Girls	TOTAL
Age (médian±SD)	14.1±1.64	13.75±1.57	13.88±0.71
Nutritional status (%)			
Normal	229(53%)	200(47%)	429(70%)
Overweight	55(39%)	85(61%)	140(23%)
Obesity	18(40%)	27(60%)	45(7%)
Biological Maturation			
Stage 1	4 (18%)	18(82%)	22(4%)
Stage 2	17 (27%)	45(73%)	62(11%)
Stage 3	83 (42%)	115(58%)	198(32%)
Stage 4	136 (59%)	94(41%)	230(37%)
Stage 5	62 (61%)	40(39%)	102(17%)
Socioeconomic Classification			
Class A	13(100%)	0(0.0%)	13(2%)
Class B	153(97%)	4(3%)	157(26%)
Class C	119(32%)	246(68%)	364(59%)
Class D	17(22%)	59(78%)	76(12%)
Class E	0(0%)	4(100%)	4(1%)
Cardiorespiratory Fitness			
Adequate	73%	59%	348(57%)
Inadequate	27%	41%	266(43%)

The correlation between the time in the intensities of PA in the classes and CF was significant only for the boys in LPA, MPA and VPA ($r = 0.12$; $p = 0.04$, $r = 0.12$; $p = 0.04$, $r = 0.15$; $p = 0.009$, respectively), indicating that the boys who engaged for the most time at these intensities had higher values of $VO_2\max$ (Table 3).

Table 2

Comparison between girls and boys in the various intensities and duration of PA in the two PE classes of the state schools of the municipality of Pinhais-PR, in the year 2014 (n = 614)

Activities	% of the class in physical or sedentary activities		P
	Boys - Median (mín-máx)	Girls - Median (mín-máx)	
SA - PE	62.2%(0.0 – 100.0)	71.1%(0.0 – 90.0)	<0.001
LPA - PE	11.1%(0.0 – 100.0)	10.5%(0.0 – 38.1)	0.09
MPA - PE	17.7%(0.0 – 91.1)	12.2%(0.0 – 82.2)	<0.001
VPA - PE	0.0%(0.0 – 30.0)	0.0%(0.0 – 25.3)	<0.001
MVPA - PE	0.0%(0.0 – 18.2)	0.0%(0.0 – 15.1)	0.270

SA (Sedentary Activity), LPA (Light Physical Activity), MPA (Moderate Physical Activity), MVPA (Very Vigorous Physical Activity), PE (Physical Education).

Table 3

Partial correlation of duration of PA intensities in classes with CF

Activities	VO ₂ maximum (ml.kg.min)		
	Total (n=614)	Boys (n=302)	Girls (n=312)
SA-PE	- 0.12*	0.02	- 0.02
LPA-PE	0.05	0.12*	0.04
MPA-PE	0.10*	0.12*	- 0.04
VPA-PE	0.14*	0.15*	- 0.02
MVPA-PE	0.00	0.04	- 0.03

* $p < 0.05$, Control variables (Maturity Stage, BMI, MVPA). SA (Sedentary Activity), LPA (Light Physical Activity), MPA (Moderate Physical Activity), VPA (Vigorous Physical Activity), MVPA (Very Vigorous Physical Activity), PE (Physical Education). Correlation was time-controlled in MVPA outside of PE classes.

Table 4

Association between weekly time in physical activities in Physical Education classes and the classification of cardiorespiratory fitness in schoolchildren - Bold values indicate statistical significance ($p < 0.05$).

% Duration in activity of different intensities	Classification of CF					
	Total (n=614)		Boys (n=302)		Girls (n=312)	
	Adequate CF		Adequate CF		Adequate CF	
	OR (IC 95%)*	p-value	OR (IC 95%)*	p-value	OR (IC 95%)*	p-value
SA_PE	1.00 (0.99; 1.00)	0.16	0.99 (0.99; 1.01)	0.099	0.99 (0.98; 1.00)	0.22
LPA_PE	1.01 (0.99; 1.03)	0.09	1.00 (0.98; 1.03)	0.90	1.03 (1.00; 1.06)	0.04
MPA_PE	1.01 (1.00; 1.02)	0.06	1.01 (1.00; 1.03)	0.04	1.00 (0.98; 1.01)	0.84
VPA_PE	1.06 (1.00; 1.12)	0.04	1.08 (0.99; 1.17)	0.07	1.00 (0.92; 1.10)	0.83
MVPA_PE	1.05 (0.90; 1.24)	0.52	1.22 (0.75; 2.00)	0.42	1.02 (0.85; 1.21)	0.86

In the total sample, only the percentage of the PE time in VPA presented a significant association with the CF adequate. After adjustment for control variables, a longer time in VPA in Physical Education classes was associated with a greater chance of having a CF adequate. The MPA showed a non-significant tendency ($p = 0.06$) to be associated with CF. In the gender analysis, the percentage of time in the Physical Education class in MPA was positively associated with a greater chance of having the ACR adequate in boys. The VPA showed a non-significant tendency ($p = 0.07$) to be associated with CF in boys. However, only the percentage of PE time in LPA was positively associated with a greater chance of having CF adequate in girls (Table 4).

DISCUSSION

In the analysis of the results regarding to the association between the duration of the intensities of PA in the PE with the CF, a significant relationship was found for boys in LPA, MPA and VPA, indicating that boys who spent more time in these intensities inside the PE classes had a higher CF, independent of the PA performed outside the school. Regarding the

girls, no significant relationship was found in the PA intensities.

When we compare the times in the various PA intensities in PE classes, girls were involved in a higher proportion of sedentary PA than boys (71.1% and 62.2%). Kremer (2010), showed that only 22.6% of PE class time was in sedentary PA, and this difference in relation to the results obtained may have been due to the presence of PE teachers and researchers among the students during the process of the mentioned study, which did not occur in the present study. Moreover, the study by Hino et al. (2007), also found that girls spend more time in sedentary activities during class, as observed in the present study.

The results found in this study indicate that, on average, less than 20% of the time of PE classes, around six minutes, the students were in MVPA. Physical Education classes tend to have limited durations (the average duration of the classes was about 30 minutes, when, in theory, the classes should take 50 minutes), mainly due to the processes related to the organization of schoolchildren. Some studies (Hino et al., 2007; Kremer, 2010) identified that much of the class time was used by teachers to

guide activities, transition and take attendance, which may have contributed to the great time in SA and LPA, which also occurred in the present study, indicating that PE classes apparently do not have their time entirely used.

The low proportion of time spent on the recommended intensities to ensure the health of the young population - MVPA - (WHO, 2010), the short duration of these stimuli and the high time in sedentary PA are important findings, but the causes that lead to this outcome are still few studied. Cultural differences, educational legislation, and ethical procedures in the studies affect the curriculum in the number of PE sessions at the school and in the content described may explain the low relationship found in the duration of the various PA intensities in PE classes with the CF. This short duration of MVPA seems to be insufficient to be a contribution in motor/physical aspects (including CF).

The findings of this study may contribute to the organization of PE classes, helping teachers to rethink the organization of activities, giving greater intensity and duration of MVPA, as well as motivating students to participate in the activities, creating opportunities for all to take part. Create strategies to reduce the transition time between classes, as well as in the optimization of the spaces destined to take attendance and the explanations of the activities. Finally, it may be suggested that continuing teacher training, it is also necessary to increase the efficiency and effectiveness of PE classes in primary and secondary education.

Given the health benefits of regular PA practice (Strong et al., 2005), PE classes are important in school life so that suggested levels of PA are achieved (Mckenzie et al., 1996). It is still necessary that students have a more active participation in PE classes by increasing the duration of PA intensities in PE classes, being motivated with interesting classes which would result in improvements in CF and health.

In particular, there is a need for reflection on the proposed alternatives of physical activities that compose the Physical Education classes and

that are directed to the girls. The low MVPA time during classes and the lack of correlation with the CF indicate that stimulating the regular practice of PA in PE and how it can contribute to health attributes in this population subgroup should be a topic of discussion in the training of teachers who work in this context. This indicates that the differences between boys and girls in weekly PA are mainly due to the difference in participation in intense PA. As the research results are consistent, it is evident the need to create intervention programs in the promotion of PA, where we have attention with the girls in all the age groups.

The present study was important because it includes, in an objective way, the activities of different intensities that compose the PE classes, which brought important contributions to the discussion of the composition of the PE classes and how it can be associated with health attributes in the school population. Nevertheless, the correlations controlled by potential confounding variables related to CF (such as maturational stage and BMI), as well as the time in PA outside the PE class brought robustness to the inferences of the study. Finally, the inclusion of a probabilistic sample also supports the extrapolations of these results to the population of interest. One limitation of this study was the inclusion of schoolchildren only from the public network of a municipality of Paraná, which makes it difficult to extrapolate the findings to other populations and educational networks (such as private schools). The CF measurement by field test, although it is well accepted in the literature and with acceptable validity (Ortega, Ruiz, Castillo, & Sjöström, 2008), is not a direct measure of oxygen consumption and, therefore, is susceptible to measurement errors. Finally, it is recognized that there was no detailing of the types of activities (games, free classes, plays, among others) that were carried out during PE classes, what could subsidize deep discussions about the time in sedentary and physical activities and the interests of schoolchildren.

CONCLUSION

The present study observed that more than 60% of a PE class is composed of sedentary activities, whereas less than 20% is composed of activities that correspond to the recommended health activities (MVPA) in the young population. The correlation between time in PA in PE and the CF was significant only among boys. This low correlation between the time in physical activities in the classes of Physical Education and the cardiorespiratory aptitude reinforces the discussion about how this discipline can contribute to the health of the young public. It may also show that only PE classes in the current model are not sufficient to achieve the recommended PA levels for health benefit gains in this age group. It is hoped that the results of this research contribute to a professional reflection on the organization of activities and how to motivate the students to participate in the activities in the PE classes.

Acknowledgments:

To the State Department of Education of Paraná (Regional Nucleus North Metropolitan Area), State schools of the city of Pinhais for availability and help and all schoolchildren who participated in this study.

Conflict of interests:

Nothing to declare.

Funding:

Nothing to declare.

REFERENCES

- ABEP. Associação Brasileira de Estudos Populacionais. (2008). *Critério Brasil de Classificação Econômica*. Retrieved March 10, 2014, from http://www.abep.org/codigosguias/Criterio_Brasil_2008.pdf.
- Anderssen, S. A., Cooper, A. R., Riddoch, C., Sardinha, L. B., Harro, M., Brage, S., & Andersen, L. B. (2007). Low cardiorespiratory fitness is a strong predictor for clustering of cardiovascular disease risk factors in children independent of country, age and sex. *European Journal of Cardiovascular Prevention and Rehabilitation*, 14, 526–531. doi: 10.1097/HJR.0b013e328011efc1
- Araújo, A. R., Brito A. A., & da Silva, F. M. (2010). O papel da Educação Física escolar diante da epidemia da obesidade em crianças e adolescentes. *Educação Física em Revista*, 4(2), 1-9.
- Barbieri R. A. (2010). *Impacto genético e ambiental na aptidão cardiorrespiratória, atividade física e metabolismo de glicose* (Dissertação de Mestrado em Ciências da Motricidade Humana). Instituto de Biociências do Campus de Rio Claro, Universidade Estadual Paulista. Rio Claro. Retrieved September 15, 2014, from http://repositorio.unesp.br/bitstream/handle/11449/87376/barbieri_ra_me_rcla.pdf?sequence=1
- Chen, L. J., Fox, K. R., & Haase, A. (2006). Obesity, fitness and health in Taiwanese children and adolescents. *European Journal of Clinical Nutrition*, 60(12), 1367–1375, doi: 10.1038/sj.ejcn.1602466
- Cole, T. J., Bellizzi, M. C., Flegal, K. M., & Dietz, W. H. (2000). Establishing a standard definition for child overweight and obesity worldwide: international survey. *British Medical Journal*, 320(7244), 1240-1243. doi: 10.1136/bmj.320.7244.1240
- FITNESSGRAM. (2014). *Statute Pertaining to the Physical Fitness Test. State Superintendent of Public Instruction*. Califórnia: Department Of Education.
- Guedes, D. P. (2007). Implicações associadas ao acompanhamento do desempenho motor de crianças e adolescentes. *Revista Brasileira Educação Física e Esporte*, 21, 37-60.
- Guedes, J. E. R. P., & Guedes, D. P. (1997). Características dos programas de educação física escolar. *Revista Paulista de Educação Física*, 11(1), 49-62.
- Gutin, B., Yin, Z., Humphries, M. C., & Barbeau, P. (2005). Relations of moderate and vigorous physical activity to fitness and fatness in adolescents. *The American Journal of Clinical Nutrition*, 81(4), 746-750.
- Hino, A. A. F., Reis, R. S., & Añez, C. R. R. (2007). Observação dos níveis de atividade física contexto das aulas e comportamento do professor em aulas de Educação Física do Ensino Médio da rede pública. *Revista Brasileira de Atividade Física e Saúde*, 12(3), 21-30.
- Hoehner, C. M., Ribeiro, I. C., Parra, D. C., Reis, R. S., Azevedo, M. R., Hino, A. A., ... Brownson, R. C. (2013). Physical activity interventions in Latin America: expanding and classifying the evidence. *American Journal of Preventive Medicine*, 44(3), e31-40. <https://doi.org/10.1016/j.amepre.2012.10.026>
- Katzmarzyk, P. T., Church, T. S., Craig, C. L., & Bouchard, C. (2009). Sitting time and mortality from all causes, cardiovascular disease, and cancer. *Medicine and Science in Sports and Exercise*, 41(5), 998–1005. <https://doi.org/10.1249/MSS.0b013e3181930355>

- Kremer, M. M. (2010). *Intensidade e duração de esforços físicos em aulas curriculares de EF* (Dissertação de Mestrado em Ciências área do Conhecimento: Educação Física). Universidade Federal de Pelotas. Pelotas. Retrieved September 21, 2014, from <http://guaiaca.ufpel.edu.br/bitstream/123456789/1845/1/Marina%20Kremer.pdf>.
- Léger, L. A., Mercier, D., Gadoury, C., & Lambert, J. (1988). The multistage 20-meter shuttle run test for aerobic fitness. *Journal of Sports Sciences*, 6(2), 93-101. doi: 10.1080/02640418808729800
- Lobelo, F., Pate, R. R., Dowda, M., Liese, A. D., & Ruiz, J. R. (2009). Validity of cardiorespiratory fitness criterion-referenced standards for adolescents. *Medicine and Science in Sports and Exercise*, 41(6), 1222-1229. doi: 10.1249/MSS.0b013e318195d491
- Martinez-Gomez, D., Ruiz, J. R., Ortega, F. B., Casajús, J. A., Veiga, O. L., Widhalm, K., ... Sjöström M. (2010). Recommended levels and intensities of physical activity to avoid low-cardiorespiratory fitness in European adolescents: The HELENA study. *Am J Hum Biol: The Official Journal of the Human Biology Council*, 22(6), 750-756. doi: 10.1002/ajhb.21076
- Mckenzie, T. L., Nader, P. R., Miller, P. K. S., Yang, M., Stone, E. J., & Perry, C. L. (1996). School Physical Education - Effect of the Child and Adolescent Trial for Cardiovascular Health. *Preventive Medicine*, 25(74), 423-431. doi:10.1006/pmed.1996.0074
- Ortega, F. B., Ruiz, J. R., Castillo, M. J., & Sjöström, M. (2008). Physical fitness in childhood and adolescence: a powerful marker of health. *International Journal of Obesity*, 32(1), 1-11. doi: 10.1038/sj.ijo.0803774
- Strong, W. B., Malina, R. M., Blimkie, C. J. R., Daniels, S. R., Dishman, R. K., & Gutin, B. (2005). Evidence based physical activity for school-age youth. *The Journal of pediatrics*, 146(6), 732-737. doi: 10.1016/j.jpeds.2005.01.055
- Tanner, J. M. (1962). *Growth and adolescence*. Oxford: Blackwell Scientific Publications.
- Trost, S. G., Pate, R. R., Sallis, J. F., Freedson, P. S., Taylor, W. C., Dowda, M., & Sirard, J. R. (2002). Age and gender differences in objectively measured physical activity in youth. *Medicine and science in sports and exercise*, 34(2), 350-355. doi: 10.1097/00005768-200202000-00025
- Wedderkopp, N., Froberg, K., Hansen, H. S., Riddoch, C., & Andersen, L. B. (2003). Cardiovascular risk factors cluster in children and adolescents with low physical fitness: The European Youth Heart Study (EYHY). *Pediatric Exercise Science*, 15(4), 419-427. doi: 10.1123/pes.15.4.419
- World Health Organization [WHO]. (2010). *Global recommendations on physical activity for health*. Geneva, Switzerland. Retrieved June 10, 2013, from http://whqlibdoc.who.int/publications/2010/9789241599979_eng.pdf.



Physical Education in School: physical spaces and materials in public school in Fortaleza

Mabelle Maia Mota^{1*}, Aline Lima Torres¹, Bruna Oliveira Alves², Heraldo Simões Ferreira^{1,2}

ORIGINAL ARTICLE

ABSTRACT

Physical Education has specific needs when it comes to physical spaces, materials and / or other conditions available to work with the body in motion. The aim was to then analyze the conditions of operation of physical education teachers in public schools of Fortaleza. To do this, from a descriptive quantitative study and qualitative exploratory, public schools were the scene of the research and their physical education teachers, totaling $n = 73$, were participants in this investigation. A questionnaire on the conditions of physical spaces and materials and a group interview with some teachers were the instruments used to diagnose the conditions of teaching practice in these schools of Fortaleza. In most schools, the physical spaces present themselves inadequate, limited and / or missing, as well as the materials are of poor quality and / or reduced amount. Finally, although a study unfinished, front of the entire context surrounding the school dynamics, it is believed that schools need greater availability of physical spaces and materials as well as other conditions for the physical education teacher can act in a more efficient and satisfactory manner, favoring the teaching and student learning.

Keywords: physical education, education, physical spaces, materials.

INTRODUCTION

The study object of this article is outlined by the performance of the Physical Education Teachers about the conditions of physical spaces and availability of materials at public schools of Fortaleza.

The interlacement among school disciplines shows the entire context that pass through the educational process bringing the peculiarities that each one presents in practice. Physical Education involves the body movement and their contents are entirely connected to the body practice they suggest a diversity of spaces and differentiated materials to contemplate the universe of practice activities required by the theme.

In the research realized by the Brazilian Institute of Opinion and Statistics (IBOPE) about physical structure, only 64% of municipal schools have spaces for physical education, 34% of schools of the northeast uses outside spaces, 55% of schools have sports court, and only 38% of schools have covered sports court. About

basic materials such as soccer balls (87%), ropes (81%), goal post (71%) and nets (67%), the result was also not satisfactory, since they mentioned only minimum conditions for the discipline contents. For other teaching conditions, the study revealed that 25% of schools in the northeast had multiserial classes, which distances the focus of the activities provided, due to the variation of the student's age (IBOPE, 2012).

This research, therefore, carried out a more focused analysis for the conditions of physical and material spaces that involve the performance of Physical Education teachers in the municipal public schools of Fortaleza.

Therefore, the following guiding questions of research activity were formulated: What are the working conditions that the teacher finds in his reality about physical and material structure? How does he evaluate the conditions that are offered to them for their teaching?

In order to answer the questions quoted and to reject or confirm the launched hypotheses, a

¹ Graduate Program in Education (PPGE), State University of Ceará, Ceará, Brazil.

² Professional Master in Health Teaching (CMEPES), State University of Ceará, Ceará, Brazil.

* Corresponding author: Graduate Program in Education of State University of Ceará, Dr. Silas Munguba Av., 1700, Center of Education (CED) – 2 floor - Campus of Itaperi, 60714-903, Fortaleza, Brazil. Email: mabelleemota@gmail.com

field research was inspired by the research at the national level, already mentioned (IBOPE, 2012). The present study resembles the same one by using the questionnaire with objective and subjective questions as instrument of collection and the Physical Education teachers of the public network as subjects of the research. It differs, however, to choose only some aspects to be investigated, since the delimitation of the proposed theme, to apply only to the teachers, excluding the directors, because it's considered unnecessary to use another subject, for addressing the teacher in person and not by phone, due to the greater availability of going to the field; And to focus on the municipal education network of Fortaleza, delimiting and portraying the scenario of this study.

The aim was to analyze the conditions of teaching performance, regarding the physical and material spaces available in the municipal public schools of Fortaleza.

METHOD

In a synthetic and specific way, the study can be characterized as quantitative descriptive and, at the same time, qualitative exploratory. Quantitative in the descriptive phase when using statistical data, while also inserts as qualitative, when interpretative tools express the understanding of meanings (Minayo, 2008).

Participants

The participants of the research correspond to the teachers who teach the discipline of Physical Education in the municipal public schools of Fortaleza, CE. Only one teacher per school has been recruited, as well as the location, at random so that it represents the reality of their work environment. A total of 73 teachers were surveyed, according to data from 2015.

After the authorization of the institution, through the Instrument of Consent, the researcher invited these teachers to participate of the research at a convenient day and time for both. The respondents were informed that the research was registered in the Brazil Platform and approved by the Committee of Ethics in

Research of the UECE under Opinion 1.206.436/2015.

Instruments and Procedures

The first step was the questionnaire that presented objective and subjective questions and was constructed after the application of the pilot test. Compared to what was investigated in the national research, only some aspects were used: conditions of physical spaces and material conditions of the Physical Education discipline. From some items already described, the teacher indicated the number of spaces that the school had, and could add places not mentioned; occurring in the same way for materials. Next, it was necessary to assess their conditions in general on two subjective questions.

In order to assist the researcher in this stage of the study, members of the UECE Group of Physical Education Studies were part of this voluntary data collection phase, as well as some undergraduate students in Physical Education at UECE. Both were submitted by a training conducted by the researcher in order to systematize and unify the process of data collection, avoiding possible biases of research.

The second stage of data collection was performed through a group interview with six teachers from the initial stage of the study. The subjects were questioned about the possible sufficient and / or ideal conditions of physical and material spaces in the school, they reported on other factors that could involve their performance from their evaluation against the conditions that are offered to them in the schools surveyed.

It was carried out in two stages. In the first one, the researchers presented a questionnaire to Physical Education teachers, regarding the physical materials and spaces of the respective schools. In a second moment, one teacher from each school responded together to an interview.

Statistical analysis

At first, there was the analysis of the objective questions of the questionnaire, each physical space and material was counted in order to diagnose the total quantitative present in the schools of the municipal network of Fortaleza.

Thus, it was possible to verify the availability of places and pedagogical materials for the teaching of Physical Education in a broader way.

These data were analyzed through simple descriptive statistics using the Microsoft Office Excel program as an aid in tabulating and reading data in the form of tables and / or Tables. The use of this program allowed a systematized analysis of the most objective aspects: identification data, training and conditions of physical and material spaces of the teacher.

In the interviews, Minayo (2008) was used, from transcription, reading and categorization by themes and discussed in the light of subjectivity. The author deploys this type of analysis in three stages:

a) Pre-analysis: aims to understand and interpret the material collected guiding the final interpretation;

b) Exploration of the material: seeks to find categories of specification of the themes according to the reports of the participants;

c) Treatment of the results obtained and interpretation: systematizes in simple statistics relating to the theoretical framework studied from inferences and interpretations of the information relating them to the theory presented above and launching new readings.

RESULTS

The use of the places by the school community does not exclude the possibilities with the teaching of Physical Education. On the contrary, as the discipline requires the exploration of the body in movement, the physical space has much importance in the execution of the class activities. Inquiring about these spaces to teach classes, teachers reported the availability described in Table 1. In it are exposed the types and quantities of physical spaces of the schools they teach.

One of the teachers, when asked about the enough spaces, reported that the classrooms of each class were used by teachers of other disciplines during the hours of Physical Education, which prevented the availability to the teacher himself at that time needing to

rethink possible interventions of a kind more theoretical.

Highlight for the 51 detected blocks, 69%. Not all schools have this space where much of the content is taught, see the sports modalities, or that would allow to approach other content that requires more space.

In the schools surveyed, some deficiencies are confirmed, in addition to the limitations already presented, omissions about places of psychomotor and / or recreational practices such as playgrounds and toy libraries is evident in the table. Lack of availability may cause teachers to limit their approaches or even improvise spaces. In addition, given the scarcity of public spaces for leisure, culture and healthy social life for children, the school also becomes a safe place to meet those needs at the time of recess or other curricular and extracurricular activities in the school context.

Table 1
Physical Spaces available for Physical Education, 2015

Physical space	Schools (%)
Video Room	67 (91%)
Classroom	66 (90%)
Courtyard	61 (83%)
Library	58 (79%)
Court	51 (69%)
Sand Space	38 (52%)
Playground	12 (16%)
Mat Room	10 (13%)
Dance-Gymnastics Room	8 (10%)
Fitness	1 (1%)
Toy Library	1 (1%)
Athletics Track	0 (0%)
Swimming Pool	0 (0%)

Table 2 shows that, although content treated with priority, Physical Education teachers have little availability of materials linked to these modalities, an average of one to three balls per modality. When it refers to other materials related to these sports and essential for their practice, such as volleyball poles, basketball tables, etc., the incidence is even lower. This fact evidences the improvisation already mentioned in the discussions about the physical spaces. For example, the teacher has no pump to fill the balls or works volleyball with stretched ropes and/or elastics simulating a volleyball net. This will also be present in relation to other materials. Table 3 shows materials that are not

commonly found in schools such as skateboarding, slackline, speedyball, shuttlecock, badminton kit, proprioceptive disk, agility scale, etc. The existence of these and other equipment was possible due to the initiative of the teachers themselves who bought materials to assist their teaching practice, something that was reported in the group interview by certain teachers. Some even expressed discontent at having to take such an attitude to be able to perform certain activities.

Table 2
Available materials related to traditional sports, 2015

Material	Total in schools	Average by school
Indoor Soccer	265	3.6
Basketball	219	3.0
Volley Ball	215	2.0
Handball	128	1.7
Soccer stand	94	1.2
Football	83	1.1
Volleyball post	68	0.9
Basketball Board	57	0.7
Mini soccer stand	48	0.6
Initiation Ball	28	0.3
Pump	5	0.06

Table 3
Available materials related to the non-traditional modality, 2015

Material	Total in schools	Average by school
Table Tennis Ball	147	2.0
Skate board	63	0.8
Table of Table	43	0.5
Kimono	39	0.5
Tennis Ball	35	0.4
Shuttlecock	28	0.3
Badminton kit	25	0.3
Gym Ball	20	0.2
Table Tennis Kit	15	0.2
Percussion	15	0.2
Gym Tape	12	0.1
Fence	7	0.09
Skate Protection	5	0.06
Weight	3	0.04
Pilates Ball	2	0.02
Slackline	1	0.01
Speedy Ball	1	0.01

DISCUSSION

The recognition of the pedagogical space as a didactic instrument favors the search for a place that contributes to the learning involving the articulation between what its components need and what is wanted. According to Escallier (2010), the architecture of school buildings is a matter of the present time. The author exemplifies that England has a plan to rebuild its spaces by 2020, based on its historical

cultural context and the needs of students. Prove of this is the indication that this planning should be composed of a team that involves several professionals and actors participating in the later use of this space. In Brazil, the proposal is presented in an easier and direct way. Attention is initially focused on providing site availability, as is the case with the work already begun in the Growth Acceleration Program (PAC), which includes sports facilities and other facilities in schools that have submitted their proposals.

Directing the vision to the whole school, spaces can be distributed according to a specialized destination, always taking into account the interrelationship and mutual use by agents. The following division of spaces can be taken as an example: merely pedagogical, like the classrooms and the court; Leisure facilities such as patios; Such as the office and concierge; Common areas such as the entrance and corridors; The canteen and the bathrooms; Private / restricted, such as the office, the teacher's room and the kitchen.

As explained by Ferreira (2014), Physical Education underwent several transformations over the years and currently has some differentiated conceptions that guide its conduction in the school. Analyzing Table 1, it can be seen that the availability of physical spaces also refers to the use of the same places by other areas and to the way the teacher intervenes in their performance. Emphasizing the quantities presented before, video/multimedia room, classroom, patio, library, court and spaces with sand were the spaces that stood out the most.

The new conceptions about the teaching of Physical Education may have broadened the view of teachers about their performance in other spaces compared to those that were provided by the discipline previously, when the classes were strictly practical, valuing only the know-how. The fact that the teacher already considers video / multimedia room, classroom and library as places to teach classes already shows that some content can be worked using different audiovisual resources, arousing the attention and curiosity of the student.

The review by Soares, Jesus, Karino, and Andrade (2013) used data from the 2011 School Census to verify the levels of school infrastructure in general, classifying them as elementary, basic, adequate and advanced. A scale of 22 items was analyzed including the existence of spaces and conditions such as kitchen, electricity, sewage, teacher's room, etc. The sports court was included only at the so-called 'adequate' and 'advanced' level of infrastructure, revealing perhaps not as essential to the functioning of the school. This research occurred with 194 932 schools in Brazil and only 15.5% of the schools presented blocks. When referring only to the northeast, this percentage fell to 7.4%. This scenario reveals a much poorer picture than that presented in this review. Still, whether at the national or municipal level, as verified in Fortaleza's reality, it is possible to infer the improvisation of places to teach classes, such as courtyards and open spaces. Sometimes the courtyards can be even in the middle of the rooms, disrupting the classes of the other teachers or even the open spaces can pose risks to the health of those involved.

The Curricular Guidelines of the city of Fortaleza also highlight the exposure to social risks and urban violence in streets, squares, associations and other leisure environments, even believing that these spaces contribute to the construction of toys, games and games socializing experiences. According to the document, Physical Education can collaborate with educational proposals that aim at the solidarity participation of a citizen society that experiences these experiences in its own environment from a pedagogical intention (Teixeira & Dias, 2011).

These quantities only allow working with practical activities in which a large group (about 10 students) has access to only one material. If the teacher intends to perform an activity in pairs or trios, it is impossible, often restricting itself only to collective games due to the lack of materials. This is one of the main difficulties faced by the professor of Physical Education in the research of Gaspari et al. (2006), the lack of physical and material conditions to teach. The same research affirms that, generally, the space

and material are restricted to the practice of futsal / soccer even by the stigma of the discipline, with an overvaluation of know-how. Or even, as confirmed by the study by Santos, Mendes and Ladislau (2014), the use of improvisation to make alternative materials to meet the needs to cover all students. Such an initiative of the teacher can't be considered as definitive for teaching, since the maintainers of the school must provide the availability of materials.

Using proposals of the psychomotor, developmental and constructivist approaches, the teachers work with games, jokes and other activities that involve more the childhood context. Physical Education teachers generally not only use the materials involved in these interventions, but rather, some acquisitions were made from teacher's pedagogical practices such as pedagogical games, for example. The research of Gaspari et al. (2006) reveals that campaigns in the school community to collect materials and transform scrap into teaching materials are mentioned as possible solutions to the scarcity of materials at school.

Cones and hoops, the most present, are materials that have longer durability and are generally not used in other activities. Such suspicion is due to the fact that some materials, when they are borrowed for recreation, for example, get lost or easily spoiled as reported in the interview.

To consider this study as over is to believe that other aspects of everyday school life are not important. The evaluation of the quality of these elements was made even more relevant by showing the concrete reality of what is found in the school, regardless of the numbers found. The greater the amount and type of physical structure and materials available for the subject, the greater the range of interventions proposed by the teacher in order to provide greater bodily experiences to the students. Therefore, new studies are proposed that can diagnose other influencing aspects in the teaching performance, not only in the Physical Education discipline, but in other fields of activity that form the integrality of the student.

CONCLUSION

As far as the conditions of performance sufficient for the teaching of Physical Education, the perspective of fanciful and/or unachievable conditions was not present in the expectations of the teachers. This view is justified by looking at the real objectives of Physical Education and by the teachers' observation that official structures and equipment fit better in specific training places for income modalities and in smaller proportions.

Therefore, regarding the physical structure, the teachers were realistic about the sufficient conditions to teach. They would only need to develop their activities in large and covered spaces that offer protection to students and with the permission of noise. Already as an ideal condition, but of real possibility, I would add the availability of a large and closed room for fighting activities, with a removable mat; Gymnastic or rhythmic activities, with sound equipment; Or other interventions as a very satisfactory condition to offer classes of better quality and motivation for students.

With regard to materials, thinking about what would be sufficient, there's a need for a greater diversity of objects in reasonable quantities, allowing the use for groups of about five students with an object. Already in the ideal condition, this availability was complemented by larger quantities, in which each student had the opportunity to experience the material individually, according to the stimulated activity. This indication, as already mentioned, is not impossible and, somehow, with the teacher's direction, would also favor more effective classes, without surprises regarding the management or conservation of these materials, considering the possibilities of learning provided by satisfactory practices.

Acknowledgments:

To members of the Study and Research in School Physical Education Group of State University of Ceará and volunteer who support in the data collect.

Conflict of interests:

Nothing to declare.

Funding:

Nothing to declare.

REFERENCES

- Escallier, C. (n.d.). Arquitetura escolar e identidade: o espaço pedagógico como instrumento de aprendizagem. In *Actas do Congresso Internacional de La Habana*. Havana. Retrieved from <http://www3.uma.pt/blogs/christineescallier/wp-content/uploads/2010/04/cuba-ped.pdf>.
- Ferreira, J. L. (2014). A complexa relação entre teoria e prática pedagógica na formação de professores. In J. L. Ferreira (Ed.), *Formação de professores: teoria e prática* (pp. 33-49). Petrópolis: Vozes.
- Gaspari, T. C., Souza, O., Jr., Maciel, V., Impolcetto, F., Venancio, L., Rosário, L. F., Iorio, L., Thommazo, A., Di, & Darido, S. C. (2006). A realidade dos professores de Educação Física na escola: dificuldades e sugestões. *Revista Mineira de Educação Física*, 4(1), 109-137.
- Instituto Brasileiro de Opinião Pública e Estatística (IBOPE). (2012). *Relatório de pesquisa: Educação Física nas escolas públicas brasileiras*. São Paulo: IBOPE. Retrieved from: http://senna.globo.com/institutoayrtonsenna/quem_somos/publicacoes/educacao_fisica_escolas_publicas/Relatorio.pdf.
- Minayo, M. C. S. (2008). *O desafio do conhecimento: pesquisa qualitativa em saúde*. São Paulo: Hucitec.
- Santos, N. de S., Mendes, J. de S., & Ladislau, C. R. (2014). Educação Física escolar: dificuldades e estratégias. *Anais do Congresso Sudeste de Ciências do Esporte*, Lavras, MG, Brasil. Retrieved from: www.congressos.cbce.org.br/index.php/5sudeste/lavras/paper/viewFile/6383/3226.
- Soares, J. J., Neto, Jesus, G. R. Karino, C. A., & Andrade, D. F. (2013). Uma escala para medir a infraestrutura escolar. *Estudos em Avaliação Educacional*, 24(54), 78-99. doi: 10.18222/eae245420131903
- Teixeira, F. R. de G., & Dias, A. M. I. (Eds.) (2011). *Diretrizes Curriculares para o Ensino Fundamental do Sistema Público Municipal de Ensino de Fortaleza*. Fortaleza: Secretaria Municipal de Educação.



Relationship between physical activity, physical fitness, and motor competence in school children

Camila Ramos dos Santos^{1*}, Carla Cristiane da Silva², Inara Marques³

ORIGINAL ARTICLE

ABSTRACT

The aim of this study was to verify the relationship between habitual physical activity, physical fitness, and motor competence in school children. In total, 100 children aged 8-10 years took part in this study, subdivided into 2 groups: the Physical Education Group (PEG) characterized only by practical classes of Physical Education; and another group that performed Systematized Physical Activity (SPA). Habitual physical activity was investigated using the *webdafa* questionnaire. The physical fitness battery included a 20-meter running test, throwing a medicine ball, a horizontal jump test, and running for six minutes. Motor competence was measured by the TGMD-2 test. For statistical analysis we used the Spearman correlation, Mann-Whitney and Chi-square Fisher tests. The results demonstrated moderate correlations between habitual physical activity and the 20-meter running test ($r=0.41$) and ($r=0.49$) motor competence. Furthermore, moderate correlations were found between physical fitness and motor competence in the horizontal jump test ($r=0.55$), running for six minutes ($r=0.50$), and 20 meter running test ($r=0.65$). In conclusion, it was observed that the SPA demonstrated better results and the school physical education classes were not sufficient to ensure adequate levels of habitual physical activity, physical fitness, or motor competence in the children in the present study.

Keywords: motor skills, healthy, children.

INTRODUCTION

The Physical inactivity is the fourth leading cause of death worldwide, being considered a global pandemic with a negative impact on health status, resulting in devastating economic and social consequences (Kohl et al., 2012). It is recognized that adequate incorporation of motor practice habits in childhood and adolescence has an important impact on a physically active lifestyle in adulthood (Telama et al., 2014). On the other hand, obesity patterns established in childhood predispose to an increased risk of cardiovascular morbidity and mortality in adulthood (Cote et al., 2013). Thus, it is acknowledged that, although the clinical outcomes of chronic dysfunctions occur in maturity, it is during childhood and adolescence that eating and physical activity habits are established (Yumuk et al., 2015). In this context, the school environment is highlighted, since it is in the school setting that both academic performance and guidelines for a

healthy lifestyle are established (Donnelly et al., 2016; Vanhelst et al., 2016).

On one hand, it is known that regular practice of physical activity relates directly and positively with scores of physical fitness (PA) related to health components (Gallota et al., 2016). On the other hand, the relation between habitual physical activity (HPA), PA, and motor competence (MC) is relatively recent (Robinson et al., 2015; Stodden et al., 2008). In this sense, a systematic review indicated strong evidence that the development of MC was inversely associated with total body mass and positively associated with cardiorespiratory and musculoskeletal fitness throughout childhood and adolescence (Cattuzzo et al., 2016). Participation in sports and organized practices also impacts on MC. Previous studies have shown that children in these environments present better motor coordination, and better levels of PA, MC, and daily task performance when compared to children who are not engaged

¹ Londrina State University, Londrina, Brazil.

² State University of Northern Paraná, Jacarezinho, Brazil.

³ Londrina State University, Londrina, Paraná, Brazil.

* Corresponding author: Londrina State University, Celso Garcia Cid PR 445 km 380, 86057-970, Londrina, Brazil.
Email: camilaramos_3@hotmail.com

in these practices (Fransen et al., 2012; Lai et al., 2014; Lubans et al., 2012; Nazario & Vieira, 2013; Queiroz et al., 2014; Vandorpe et al., 2012).

In this context, the opportunity for structured and systematized practice within the educational process is the responsibility of the teachers of school physical education classes. However, previous studies have indicated negligence in class regarding the elaboration of the programmed content (Fortes et al., 2012; Gallotta et al., 2016; Guedes & Guedes, 2001; Telford et al., 2016). Thus, children demonstrate lower MC levels than expected for the age group, which, consequently, leads to a lower engagement in organized, sport, recreational, and other activities, thus reducing levels of PA and HPA in childhood and adolescence (Fortes et al., 2012; Guedes & Guedes, 2001; Spessato et al., 2012). For these reasons, the objectives of the present study were to verify the relationship between HPA, PA, and MC of children practicing exclusively school physical education classes and another group included in systemized physical activities organized in the period of the day when they were not at school and, secondarily, to determine if the children belonging to the school physical education classes maintained adequate levels of HPA, PA, and MC.

METHOD

A cross-sectional study, in which all ethical issues were approved prior to execution by the local Ethics Committee (CAEE 44106815.4.0000.5231).

Participants

The sample was selected for convenience and was composed of 100 eutrophic prepubertal children, between 8 and 10 years old, of both sexes. The eligibility criteria required the absence of any ongoing drug therapy and/or illness or physiological dysfunction in the included children.

Two groups of schoolchildren with distinct physical activity practices were organized. One of the groups was characterized by exclusive participation in school physical education classes (PEG), composed of 56 children (25 boys and 31

girls) without any extracurricular physical activity practice in the 6 months prior to the project. The classes were given twice a week for 50 minutes and followed a similar operating pattern, with stretching activities, global warm-up with running, structured classroom content and, finally, teacher *feedback* to students. The other group consisted of 44 children (19 boys and 25 girls) who performed systemized physical activity (SPA) in athletics, in addition to the school physical education classes, for at least 6 months prior to the beginning of data collection. The athletics practice was performed 3 times a week for 50 minutes.

Instruments and Procedures

The eutrophic nutritional status was obtained by calculating the body mass index (BMI) from the body mass to height ratio according to the WHO criteria (Onis et al., 2007). In addition, relative fat was calculated from the predictive equations specific to sex and maturational status proposed by Slaughter et al. (1988).

The level of HPA was investigated through the Electronic Questionnaire of a Typical Day of Physical Activity and Food *webdafa* (Legnani et al., 2013). The evaluation of PA was obtained using the PROESP-BR battery of motor tests (2015). In the present study the horizontal jump, 20-meter run, *medicine ball* throw, and six-minute run tests were performed (Proesp, 2015), strictly following this order of execution. All tests were conducted individually, except for the six-minute run, which was performed with groups of 4 children. To investigate the MC, the *Test of Motor Development Second Edition* (TGMD-2) was applied, as proposed by Ulrich (2000) and validated for the Brazilian population by Valentini (2012). As a blinding strategy, three previously trained evaluators who did not participate in the data collection analysed the images. The reproducibility between the three evaluators presented an intraclass correlation coefficient equal to 0.85 for the motor quotient scores. This value is classified as excellent reproducibility according to Atkinson et al. (1998).

All research procedures were carried out in the school environment, respecting the academic

hours and content. The description and timetable of the procedure steps are shown in figure 1, and the duration was, in total, 165 days.

Statistical analysis

The normality of the data was verified by the *Shapiro-Wilk* test and the *Levene's* test for homogeneity. As the data did not present normal distribution or homogeneity, the *Spearman* correlation was applied to the HPA, PA, and MC variables. Correlations were

classified as; weak (r between 0.20 and 0.39); moderate ($r = 0.40$ to 0.59); moderate to severe ($r = 0.60$ to 0.79); and strong ($r > 0.80$) (Cohen, 1992). Subsequently, associations were carried out between the groups with the *Mann-Whitney* and Fisher's exact chi-square tests. All procedures were performed using the statistical package SPSS 20.0 and a significance level of $P < 0.05$ was adopted. The principal investigator of the study was blinded to the statistical procedures.

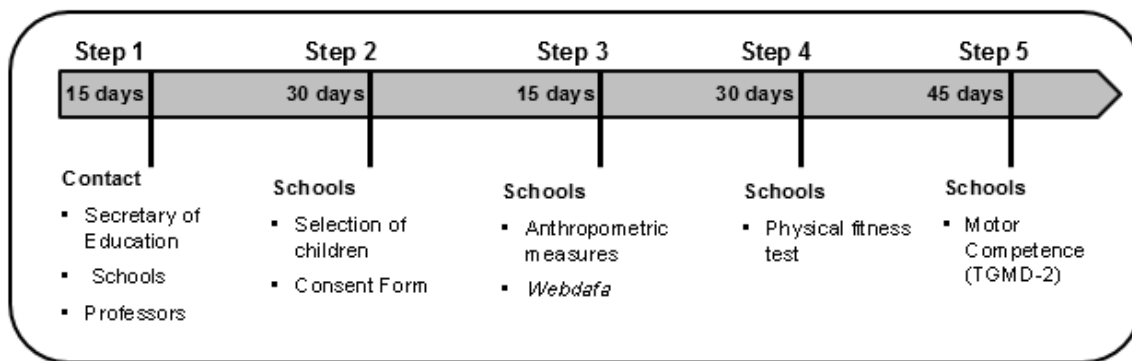


Figure 1. Cross-sectional study subdivided into 5 steps with total duration of 165 days

RESULTS

The anthropometric characteristics of the groups (PEG and SPA) demonstrated homogeneity for the variables age, total body mass, BMI, and lean body mass. In the relative

fat variable, significant differences were observed, with the PEG presenting a higher percentage of fat when compared to the SPA ($P < 0.030$) (Table 1).

Table 1

Characterization of the sample with median (M), interquartile range (Q1-Q3), age (years), total body mass (MC (kg)), height (m), body mass index (BMI (kg/m²)), lean body mass (LBM (kg)) and relative fat (% g (%)) of the groups (PEG and SPA).

	PEG M (Q1;Q3)	SPA M (Q1;Q3)	P value
Age (years)	9.0 (8.0-10.0)	9.0 (9.0-10.0)	0.422
BM (kg)	32.5 (28.2-38.1)	31.1 (29.3-34.3)	0.779
Height (m)	1.35 (1.32-1.42)	1.38 (1.32-1.42)	0.329
BMI (kg/m ²)	17.4 (15.9-19.4)	16.6 (15.7-17.8)	0.165
LBM (kg)	25.6 (23.2-29.0)	26.4 (24.6-28.3)	0.457
Relative fat (%)	17.4 (15.3-22.8)	15.9 (12.9-19.8)	0.026*

Note. Mann-Whitney test to verify the differences $P < 0.05$.

Table 2 presents the degree of correlation between the HPA variables evaluated by the *webdafa* questionnaire, horizontal jump, medicine ball throw, six-minute run, 20-meter run, and MC (TGMD-2). The results demonstrated that HPA indicated a moderate positive correlation ($r = 0.49$) with CM, a moderate negative correlation ($r = 0.41$) with

the 20-meter run, and a positive but weak correlation ($r = 0.28$) with the 6-minute run. However, the 6-minute run test presented a moderately positive correlation ($r = 0.50$) with the motor quotient, indicating that increasing aerobic fitness enhances the motor competence score. The values of the correlations demonstrated an inversely proportional pattern,

that is, negative correlations between the 20-meter run and the other research variables. The moderate to severe negative correlation of $r = -0.65$ with the motor quotient is highlighted, indicating that the higher the speed in the 20-meter run, characterized by anaerobic metabolic predominance, the higher the motor competence scores. In addition, it is important to mention that MC indicated a moderate positive correlation ($r = 0.55$) with the horizontal jump,

that is, the higher the horizontal jumping ability, the higher the motor quotient value.

The comparisons between groups (PEG and SPA) for all variables are presented in Table 3. The results demonstrated, for all variables except for *medicine ball* throw, statistically significant differences between groups, with the SPA presenting significantly higher values when compared to the PEG ($P < 0.001$).

Table 2

Correlations between the webdafa variables, horizontal jump (HJ (cm)), throw (throw), 6-minute run (m), 20 meter run (s), and motor quotient (MQ).

	HJ (cm)	Throw (cm)	Run 6m (m)	Run 20m (s)	MQ
Webdafa	0.219*	0.191	0.280**	-0.413**	0.490**
HJ (cm)		0.187	0.419**	-0.680**	0.559**
Throw (cm)			0.028	-0.417**	0.171
Run 6m (m)				-0.415**	0.503**
Run 20m (s)					-0.653**

Note. Spearman Correlation Coefficient. $P < 0.05$ ** $P < 0.01$

Table 3

Median (M) and Interquartile Range (Q1-Q3) of the webdafa variables, horizontal jump (HJ (cm)), throw (throw), 6-minute run (m), 20-meter run (s), and motor quotient (MQ) between the PEG and SLA groups

	PEG M (Q1;Q3)	SLA M (Q1;Q3)	P value
Webdafa	62 (50-74)	89 (79-103)	0.001*
HJ (cm)	132 (122-146)	156 (144-171)	0.001*
Throw (cm)	236 (200-260)	248 (222-271)	0.068
Run 6m (m)	699 (621-800)	849 (770-900)	0.001*
Run 20m (s)	4.67 (4.29-4.97)	3.82 (3.57-4.00)	0.001*
MQ	73 (67-77)	91 (89-94)	0.001*

Note. Mann-Whitney test to verify the differences $P < 0.05$.

Table 4 presents the values of the associations between the groups (PEG and SPA). The results demonstrated significant differences ($P < 0.001$) for all associations except the *medicine ball* throw. In the HPA variable, the highest percentage of children (80.4%) in the PEG remained in the non-active classification, while the SPA showed higher percentages in the active classification (84.1%), with significant differences between groups ($P < 0.001$). The associations for the six-minute run and 20 meter run variables are emphasized, in which the highest percentage of the PEG were allocated in the weak classification (69.6% and 62.5%, respectively). In the MC analysis, the results indicated a significant superiority for the SPA, with percentages for the motor quotient of

65.9%, classified as average or above average, while in the PEG only 1.8% were indicated as average, while 98.2% of the PEG sample were allocated in the very poor, poor, and below average classifications.

DISCUSSION

The main findings of the present study indicated a moderate relation ($r = 0.49$) between HPA and MC. Among the PA tests, the 20-meter run with a moderate negative correlation ($r = -0.41$) with HPA and a moderate to strong positive correlation ($r = 0.65$) with MC was the most prominent. In this context, the literature also shows positive correlations between HPA and MC variables.

Table 4

Absolute and relative frequency of the groups (PEG and SLA) in the WEBDAFA questionnaire, horizontal jump, throw, 6-minute run, 20-meter run, and motor quotient

	Classification	PEG		SLA		P value ≠ between groups
		n	%	n	%	
Webdafa	Not active	45	80.4	7	15.9	<0.001
	Active	11	19.6	37	84.1	
Horizontal Jump	Weak	09	16.1	2	4.5	<0.001
	Reasonable	11	19.6	2	4.5	
	Good	14	25	2	4.5	
	Very Good	19	33.9	30	68.2	
	Excellent	3	5.4	8	18.2	
Throw	Weak	10	17.6	4	9.1	0.71
	Reasonable	6	10.7	3	6.8	
	Good	13	23.2	8	18.2	
	Very Good	23	41.1	24	54.5	
	Excellent	4	7.1	5	11.4	
6 minute Run	Weak	39	69.6	10	22.7	<0.001
	Reasonable	4	7.1	7	15.9	
	Good	3	5.4	9	20.5	
	Very Good	5	8.9	15	34.1	
	Excellent	5	8.9	3	6.8	
20 meter Run	Weak	35	62.5	4	9.1	<0.001
	Reasonable	10	17.9	1	2.3	
	Good	7	12.5	5	11.4	
	Very Good	4	7.1	30	68.2	
	Excellent	0	0	4	9.1	
Motor Quotient	Very Poor	19	33.9	0	0.0	<0.001
	Poor	28	50.0	0	0.0	
	Below average	8	14.3	15	34.1	
	Average	1	1.8	28	63.6	
	Above average	0	0	1	2.3	

Note. Chi-square; Fisher exact; (P <0.05).

Stodden et al. (2008) proposed a conceptual framework in which MC levels promote participation in physical activity practice. Based on this assumption, literature review studies have found positive correlations between MC and HPA (Barnett et al., 2016; Holfelder & Schott, 2014; Logan et al., 2015; Lubans et al., 2010). However, although the authors reinforce that there is evidence of a cause and effect relationship, the strength of the correlations do not demonstrate high values, indicating limitations for an effective conclusion on the relation between the variables (Barnett et al., 2016; Khodaverdi et al., 2015; Logan et al., 2015; Robinson et al., 2015).

The results of a moderate correlation between PA and MC in the present study corroborate a recent systematic review of Cattuzzo et al. (2016). These associations may be explained by the causal mechanisms of improvement in coordination patterns and in the performance of locomotion and control of objects which are closely related to changes in

the muscular system, such as the recruitment of motor units, coactivation of antagonists, altered proprioceptor sensitivity, and concentric and eccentric muscle activity. Thus, there is a reciprocal combination between elements, in which the increase in one variable possibly results in improvement in the other (Cattuzzo et al., 2016; Stodden et al., 2014).

In the comparisons between the groups, the SPA demonstrated superior and significant values to the PEG group in the HPA, MC, horizontal jump, 20-meter run, and six-minute run (P <0.001). With regard to meeting the criteria for health, the results showed that a significant percentage of the SPA sample was classified in the top score in all parameters analyzed. On the other hand, the PEG presented worrying results, with 83.9% of children in this group classified as poor and very poor for MC, underlining that, in HPA, about 80.4% of the group were classified as non-active by the *webdafa*. In addition, there were poor PA classifications in both the aerobic 6-minute run

(69.6%), and the anaerobic 20-meter test (62.5%). The results of the present study are in agreement with others previously reported in the literature which indicated that the practice of organized physical activity potentiates MC levels, motor coordination, PA, and body weight *status* in children, when compared to their peers who are not engaged in the same stimulatory environment (Fransen et al., 2012; Lai et al., 2014; Lubans et al., 2012; Queiroz et al., 2014; Vandorpe et al., 2012). Fransen et al. (2012) analyzed the levels of PA and participation in sports in children with low, medium, and high MC. In the analyses, children with higher MC, measured by the *Bruininks-Oseretsky* test, demonstrated higher levels of PA through the *Eurofit physical fitness test* (EUROFIT). In addition, greater engagement in organized physical activities was indicated. Thus, the authors reinforce that children with high MC have greater possibilities to develop adequate levels of PA and a greater probability of inclusion in programmed practices, in contrast to children with low and average MC.

Additional results from the present study indicate that school physical education classes were not sufficient to improve HPA, PA (six minute run and 20 meter run), or MC. Similar to these findings, intervention studies with physical activity programs in the school environment have identified that general content, short effective classroom time, motivation, and teaching strategies do not guarantee the achievement of desirable health criteria (Gallotta et al., 2016; Lai et al., 2014; Lonsdale et al., 2013; Telford et al., 2016).

Analysing the school physical education classes, Spessato et al. (2012) evaluated 1248 children between 3 and 10 years of age with the TGMD-2 test. Overall, 69% of boys and 82% of girls scored below the test average. The authors questioned the fact that Physical Education classes are developed in 45 minutes, twice a week, and although many of them include free or sports content, they do not involve instruction and correction of motor skills. From these observations, some elements seem fundamental for the classes to potentiate motor competence, among them the following stand

out: 1) to evaluate level of motor competence and draw up an activity plan for improvement; 2) offer varied types of practice in motor skills in situations of different contexts with instruction and feedback; 3) develop tasks appropriate to the needs of students (Spessato et al., 2012).

Corroborating with these indicatives, the results of the present study are worrisome, due to the high percentage of schoolchildren in ratings below the expected for the age group in the HPA, PA, and MC variables. As limitations, we can highlight the non-use of direct instruments for the measurement of HPA, the absence of a sample calculation as the sample was selected for convenience, and the absence of qualitative analysis of the school physical education classes. However, it is possible to indicate practical implications from the results of the present study, in which it is suggested that teachers of physical education at school regularly evaluate the PA and MC of the children to better adapt the structured activities in class. In future studies mapping of the activities performed is proposed in addition to which the use of direct HPA instruments could minimize these biases and reinforce the findings of the present study.

CONCLUSION

Positive correlations were observed between HPA, PA, and MC in children aged 8 to 10 years. Additionally, it is clear that the children participating in the SPA presented better results in all variables when compared to their peers who exclusively participated in the school physical education classes. Thus, physical education classes seem not to be sufficient to guarantee adequate levels of HPA, PA, and MC in the children in this study.

Acknowledgments:

Nothing to declare.

Conflict of interests:

Nothing to declare.

Funding:

Nothing to declare.

REFERENCES

- Atkinson, G., & Nevill, A. M. (1998). Statistical methods for assessing measurement error (reliability) in variables relevant to sports medicine. *Sports Medicine*, 26(4), 217-238.
- Barnett, L. M., Lai, S. K., Veldman, S. L. C., Hardy, L. L., Cliff, D. P., Morgan, P.J., & Okely, A. D. (2016). Correlates of gross motor competence in children and adolescents: A systematic review and meta-analysis. *Sports Medicine*, 46(11), 1663-1688.
- Cattuzzo, M. T., Henrique, R.S., Ré, A. H. N., Oliveira, I. S., Melo, B. M., Moura, M. S., & Stodden, D. F. (2106). Motor competence and health related physical fitness in youth: A systematic review. *Journal of Science and Medicine in Sport*, 19(2), 123-129.
- Cohen, J. (1992). Quantitative Methods in Psychology. A power Primer. *Psychological Bulletin*, 112(1), 155-159.
- Cote, A.T, Harris, K. C., Panagiotopoulos C., Sandor G, G., & Devlin A, M. (2013). Childhood obesity and cardiovascular dysfunction. *Journal of the American College of Cardiology*, 62(15), 1309-1319.
- Donnelly, J. E., Hillman, C. H., Castelli, D., Etnier J. L., Lee, S., Tomporowski, P., Lambourne, K., & Szabo-Reed, A. N. (2016). Physical Activity, Fitness, Cognitive Function, and Academic Achievement in Children: A Systematic Review. *Medicine & Science in Sports & Exercise*, 48(6), 1197-1222.
- Fortes, M. O., Azevedo, M. R., Kremer, M. M., & Hallal, P. C. (2012). A Educação Física na cidade de Pelotas-RS: Contexto das aulas e conteúdos. *Revista de Educação Física/UEM*, 23(1), 69-78.
- Frasen, J., Pion, J., Vandendriessche, J., Vandorpe, B., Vaeyens, R., Lenoir, M., & Philippaerts, R. M. (2012). Differences in physical fitness and gross motor coordination in boys aged 6–12 years specializing in one versus sampling more than one sport. *Journal of Sports Sciences*, 30(4), 379-386.
- Gallotta, M. C., Emerenziani, G. P., Iazzoni, S., Iasevoli, L., Guidetti, L., & Baldari, C. (2017). Effects of different physical education programmes on children's skill- and health-related outcomes: a pilot randomised controlled trial. *Journal of Sports Sciences*, 35(15), 1547–1555.
<https://doi.org/10.1080/02640414.2016.1225969>
- Gaya, A., Lemos, A., Gaya, A., Teixeira, D., Pinheiro, E., & Moreira, R. (2015). *Manual de testes de avaliação*. Projeto Esporte Brasil.
- Guedes, D. P., & Guedes, J. E. R. P. (2001). Esforços físicos nos programas de educação física escolar. *Revista Paulista de Educação Física*, 15(1), 33-44.
- Holfelder, B., & Schott, N. (2014). Relationship of fundamental movement skills and physical activity in children and adolescents: A systematic review. *Psychology of Sport and Exercise*, 15(4), 382-391.
- Khodaverdi, Z., Bahram, A., Stodden, D., & Kazemnejad, A. (2016). The relationship between actual motor competence and physical activity in children: mediating roles of perceived motor competence and health-related physical fitness. *Journal of Sports Sciences*, 34(16), 1523-1529.
- Kohl, H. W., Craig, C.L., Lambert E, V., Inoue S., Alkandari J, R., Leetongin G., & Kahlmeier S. (2012). The pandemic of physical inactivity: Global action for public health. *Lancet*, 380(9838), 294–305.
- Lai, S. K., Costigan, S. A., Morgan, P. J., Lubans, D. R., Stodden, D. F., Salmon, J., & Barnett, L. M. (2014). Do school-based interventions focusing on physical activity, fitness, or fundamental movement skill competency produce a sustained impact in these outcomes in children and adolescents? A systematic review of follow-up studies. *Sports Medicine*, 44(1), 67-79.
- Legnani, E., Legnani, R.F.S., Rech, C.R., Barros, M. V. G., Campos, W., & Assis, M. A. A. (2013). Concordância e fidedignidade de um questionário eletrônico para crianças (*webdafa*). *Revista Brasileira de Cineantropometria e Desempenho Humano*, 15(1), 38-48.
- Logan, S. W., Kipling Webster, E., Getchell, N., Pfeiffer, K. A., & Robinson, L. E. (2015). Relationship Between Fundamental Motor Skill Competence and Physical Activity During Childhood and Adolescence: A Systematic Review. *Kinesiology Review*, 4(4), 416–426.
<https://doi.org/10.1123/kr.2013-0012>
- Lonsdale, C., Rosenkranz, R. R., Peralta, L. R., Bennie, A., & Lubans, D. R. (2013). A systematic review and meta-analysis of interventions designed to increase moderate-to-vigorous physical activity in school physical education lessons. *Preventive Medicine*, 56, 152-161.
- Lubans, D. R., Morgan, P. J., Cliff, D. P., Barnett, L. M., & Okely, A. D. (2010). Fundamental movement skills in children and adolescents. *Sports Medicine*, 40(12), 1019–1035.
- Lubans, D.R. Morgan, P. J., Weaver, K., Callister, R., Dewar, D. L., Costigan, S. A, & Plotnikoff, R. C. (2012). Rationale and study protocol for the supporting children outcomes using rewards, exercise and skills (SCORES) group randomized controlled trial: a physical activity and fundamental movement skills intervention for primary schools in low-income communities. *BMC Public Health*, 12(1), 427–438.

- Nazario, P. F., & Vieira, J. L. L. (2014). Sport context and the motor development of children. *Revista Brasileira de Cineantropometria e Desempenho Humano*, 16(1), 86-95.
- Onis M., Onyango A. W., Borghi E., Siyam A, Nishida., & Siekmann J. (2007). Development of a WHO growth reference for school-aged children and adolescents. *Bull World Health Organ*, 85(9), 660-667.
- Queiroz, D.R., Ré, A. H. N., Henrique, R. S., Moura, M.S., & Cattuzzo, M. T. (2014). Participation in sports practice and motor competence in preschoolers. *Motriz*, 20(1), 26-32.
- Robinson, L. E., Stodden, D. F., Barnett, L. M., Lopes, V. P., Logan, S. W., Rodrigues, L. P., & D'Hondt, E. (2015) Motor competence and its effect on positive developmental trajectories of health. *Sports Medicine*, 45(9), 1273-1284.
- Slaughter, M. H., Lohman, T. G., Boileau, R. A., Horswill, C. A., Stillman, R. J., Van Loan, M. D., & Bembien, D. A. (1988). Skinfold Equations for Estimation of Body Fatness in Children and Youth. *Human Biology*, 60(5), 709-723
- Spessato, B. C., Gabbard, C., Valentini, N., & Rudisill, M. E. (2013). Gender differences in Brazilian children's fundamental movement skill performance. *Early Child Development and Care*, 183(7), 916-923.
- Stodden, D. F., Gao, Z., & Langendorfer, S. J. (2014). Dynamic relationships between motor skill competence and health-related fitness in youth. *Pediatric Exercise Science*, 26, 231-241.
- Stodden, D. F., Goodway, J. D., Langendorfer, S. J., Roberton, M. A., Rudisill, M. E., Garcia, C., & Garcia, L. E. A. (2008). Developmental Perspective on the Role of Motor Skill Competence in Physical Activity: An Emergent Relationship. *Quest*, 60(2), 290-306.
- Telama, R., Yang, X., Leskinen, E., Kankaanpää, A., Hirvensalo, M., Tammelin, T., & Raitakari, O. T. (2014). Tracking of physical activity from early childhood through youth into adulthood. *Medicine & Science in Sports & Exercise*, 46(5), 955-962.
- Telford, R. M., Olive, L.S., Cochrane, T., Davey, R., & Telford, R. D. (2016). Outcomes of a four-year specialist-taught physical education program on physical activity: a cluster randomized controlled trial, the LOOK study. *International Journal of Behavioral Nutrition and Physical Activity*, 13(64), 1-11.
- Ultich, D. A. (2000). Test of Gross Motor Development Examiner's Manual. (2^a ed). Austin, Texas: Pro Ed.
- Valentini, N. C. (2012). Validity and reliability of the TGMD-2 for Brazilian children. *Journal of Motor Behavior*, 44(4), 275-280.
- Vandorpe, B., Vandendriessche, J., Vaeyens, R., Pion, J., Matthys, S., Lefevre, J., Philippaerts, R., & Lenoir, M. (2012). Relationship between sports participation and the level of motor coordination in childhood: A longitudinal approach. *Journal of Science Medicine in Sports*, 15(3), 220-225.
- Vanhelst, J., Béghin, L., Duhamel, A., De Henauw S., Molnar, D., Vicente-Rodriguez G., Manios, Y & Gottrand, F. (2016). Relationship between school rhythm and physical activity in adolescents: the HELENA study. *Journal of Sports Science*, 6, 1-8.
- Yumuk, V., Tsigos, C., Fried, M., Schindler, K., Busetto, L., Micic, D., Toplak, H. Obesity Management Task Force of the European Association for the Study of Obesity. (2015). European Guidelines for Obesity Management in Adults. *Obesity Facts*, 8(6), 402-424. <https://doi.org/10.1159/000442721>



Stages of change for physical activity and socioeconomic correlates in schoolchildren from Fortaleza, Ceará, Brazil: a cross-sectional study

Iraneide Etelvina Lopes^{1*}, Aleksandra da Silva Bandeira², Valter Cordeiro Barbosa Filho³

ORIGINAL ARTICLE

ABSTRACT

This study aimed to identify the prevalence and factors associated with Stages of Change for Physical Activity (SCPA) in adolescents. A cross-sectional study was conducted with 386 students from public schools in Fortaleza, Ceará. The following question was used: "In relation to your physical activity habits, would you say that:" classifying the answers in five SCPA (pre-contemplation, contemplation, preparation, action and maintenance). Sex, age, number of people who live, work situation, family income and parental education were independent variables. The Chi-square test was used ($p < 0,05$). The prevalence of students in SCPA was 17,7%, 19,2%, 21,6%, 14,8%, and 27,0% for pre-contemplation, contemplation, preparation, action and maintenance, respectively. Boys had elevated proportion in the action and maintenance stages ($p = 0,01$). Adolescents whose family had income greater than R\$ 1000,00 had higher proportion in the maintenance stage when compared to those with lower income ($p = 0,01$). The other variables were not associated with SCPA ($p \geq 0,05$). In conclusion, elevated prevalence of adolescents in inactive SCPA was identified. It is important to direct strategies that generate interest for physical activity, especially girls and adolescents with lower income.

Keywords: adolescent behaviour, motor activity, social class

INTRODUCTION

The benefits provided by the practice of physical activity (PA) in adolescence are fundamental for the physical and bone development of the young population, besides it is a preponderant factor in influencing the adoption of this habit in adult life (Seabra, Mendonça, Thomis, Anjos, & Maia 2008; World Health Organization [WHO], 2010). International recommendations for children and adolescents are directed toward the accumulation of at least 60 minutes of moderate to vigorous daily PA (WHO, 2010). However, it is observed that the lifestyle of children and adolescents has been characterized by the least amount of body movements in recent years (Murphy, Mcneilly, & Murtagh, 2010).

Some behavioural theories have been used to understand adherence to PA. One of them is the Transtheoretical Model (TM), which is based on five stages of behaviour change (SBC):

precontemplation, contemplation, preparation, action and maintenance, following an order from the "least favourable to behaviour" to the "most favourable to behaviour" (Matta, 2012; Silva, Smith-Menezes, Almeida-Gomes, & Sousa, 2010). This model can aid in the understanding of aspects of social cognitive theory and learning theory (Boscatto, Duarte, & Gomes, 2011), as well as facilitate the planning of strategies to promote PA according to the SBC in which the individual is at a given moment.

The stages of behaviour change for physical activity (SBCPA) are characterized by assuming in their conception cognitive, social and environmental factors, where its application consists in identifying the current and/or intentional habits of change in the future for the practice of PA (Boscatto et al., 2011). The literature presents the evaluation of SBCPA in adolescents as a decisive factor in the identification of inappropriate habits, as well as

¹ Federal University of Amapá, Macapá, Brazil.

² Federal University of Santa Catarina, Florianópolis, Brazil.

³ Catholic University Center of Quixadá, Uicatólica, Quixadá, Brazil.

* Corresponding author: Federal University of Amapá, Juscelino Kubitschek, Jardim Marco Zero, 68902-197, Macapá, Brazil. Email: iraneide12@gmail.com

an important strategy to promote PA with this population (Hintze, Cattai, Silva, & Junior 2012; Silva, Pelegrini, Grigollo, Silva, & Petroski, 2011; Viana & Andrade, 2010).

In a systematic review on the prevalence and factors associated with PA in Brazilian adolescents, it was pointed out that only two of the 48 studies included had evaluated the SBCPA (Barbosa Filho, Campos, & Lopes, 2014). Moreover, the discussion about socioeconomic factors (for instance, age, income, parental schooling, occupation) that may be associated with SBCPA represented a poor area of studies. A study in this perspective may contribute by indicating the population subgroups with the highest propensity to the inactive stages of SBCPA, which may help in the definition and direction of strategies and public policies to promote PA in the young population.

Thus, the present study aims to analyse the prevalence and factors associated with SBCPA in a sample of public school students from the city of Fortaleza, Ceará.

METHOD

This was a descriptive, analytical, correlational, cross-sectional survey study using a quantitative methodology (Thomas & Nelson, 2007).

Participants

The study sample consisted of 386 adolescents of both sexes, aged between 11 and 18 years old, enrolled in the 7th, 8th and 9th grades of elementary school, in the morning and afternoon shifts of four public schools of the city of Fortaleza, Ceará. These schools were selected intentionally because of the availability and acceptance of school direction to participate in the study.

Instruments and Procedures

For the identification and classification of SBCPA, it was considered as physically active a young person who accumulates at least 60 minutes of physical activity every day of the week, as recommended by the World Health Organization (Who, 2010). To this end, each adolescent answered the following question: “In

regard to your habits of practicing physical activities, you would say that:”, with five response items indicating each SBCPA, namely: (1) maintenance, “I have been physically active for more than 6 months”; (2) action, “I have been physically active for less than 6 months”; (3) preparation, “I am not, but I intend to become physically active in the next 30 days”; (4) contemplation, “I am not, but I intend to become physically active in the next 6 months”; and (5) precontemplation, “I am not and do not intend to become physically active in the next 6 months”. This question has been used to identify SBCPA in studies with Brazilian adolescents (Barbosa Filho et al., 2014).

The information on the demographic characteristics (sex, age), socioeconomic characteristics (number of people with whom they live, work situation, family income and parental schooling) were reported by the adolescents in a structured questionnaire and with closed response options. The questions used were based on an instrument previously applied with Brazilian adolescents (Silva et al., 2013).

The application of this questionnaire was carried out in the classroom with the group of students present on the day of data collection. After the distribution of the questionnaires and possession of a copy, the researcher read each question, and then the students marked their answer individually, moving on to the next question. Data collection was performed in September and October 2013.

Statistical analysis

The descriptive data analysis for categorical variables was performed using distributions of absolute and relative frequency. The SBCPA comparisons between the categories of demographic and socioeconomic variables were performed using the Chi-square test. The level of significance was set at 5% ($p < 0.05$). The data were entered and analysed in SPSS version 20.

Ethical Concepts

The authorization of the managerial nucleus (the direction/coordination) of the school was obtained by means of official signature and

voluntary adherence of the respondents to participate in the study. The parents and/or guardians authorized the participation of the students in the research by signing the informed consent form. The confidentiality of the identity of the respondents was guaranteed and the information obtained was only used for scientific purposes.

RESULTS

A total of 386 adolescents were investigated, the majority being female (52.1%) and aged between 11 and 14 (68.8%). According to Table 1, most respondents do not work (80.1%), live with 4 to 6 people (59.8%) and have family income up to 1000,00 reais (69.5%). The most cited fathers and mothers schooling was to have reached up to middle school 50.5% and 51.5%, respectively (Table 1). Regarding to the SBCPA, 27.0% of adolescents reported being in the maintenance phase. The proportions of adolescents in the preparation, contemplation, precontemplation and action in the SBCPA were 21.6%, 19.2%, 17.4%, and 14.8%, respectively (Table 1).

When comparing the sexes, there was a significant difference between boys and girls, where male adolescents presented a higher prevalence in the maintenance stage when compared to the girls ($p = 0.01$). While the girls were more frequent in the precontemplation

stage compared to the boys ($p = 0.01$). There was no significant difference between the age groups ($p = 0.82$) (Table 2).

Table 1
Demographic and socioeconomic characteristics and EMCAF of adolescents from Fortaleza, Ceará

Variable	N	%
Sex		
Female	201	52.1
Male	185	47.9
Age*		
11 to 14 years	265	68.8
15 years and over	120	31.2
Number of people you live with *		
1 to 3 people	100	26.3
4 to 6 people	228	59.8
More than 7 people	53	13.9
Occupation*		
works	76	19.9
Does not work	306	80.1
Family income*		
Up to R \$ 500,00	60	23.2
Between R \$ 501,00 and R \$ 1000,00	120	46.3
More than R \$ 1000,00	79	30.5
Parenting schooling *		
Elementary School	137	50.5
High school	84	31
Higher education	50	18.5
Mother's education *		
Elementary School	154	51.5
High school	101	33.8
Higher education	44	14.7
EMCAF		
Pre-contemplation	67	17.4
Contemplation	74	19.2
Preparation	83	21.6
Action	57	14.8
Maintenance	104	27.0

EMCAF= Behaviour change stage for physical activity; * Some variables had missing data and the total of the categories does not represent a sum of 386 adolescents.

Table 2

Comparison of EMCAF according to the demographic characteristics of adolescents from Fortaleza, Ceará

Variable	EMCAF N(%)					p	
	Pre	Contemplation	Preparation	Action	Maintenance		
Sex	Female	42 (21.0)	49 (24.5)	55 (27.5)	33 (16.5)	21 (10.5)	0.01*
	Male	25 (13.5)	25 (13.5)	28 (15.1)	24 (13.0)	83 (44.9)	
	Total	67 (17.4)	74 (19.2)	83 (21.6)	57 (14.8)	104 (27.0)	
Age	11 to 14 years	49 (18.6)	48 (18.2)	57 (21.6)	41 (15.5)	69 (26.1)	0.82
	15 years and over	18 (15.0)	26 (21.7)	26 (21.7)	16 (13.3)	34 (28.3)	
	Total	67 (17.4)	74 (19.3)	83 (21.6)	57 (14.8)	103 (26.8)	

EMCAF = Behaviour change stage for physical activity, * Significant difference with $p < 0.05$.

Table 3 refers to the comparison of socioeconomic characteristics (number of people with whom they live, occupation, family income and schooling of the father and mother) with the SBCPA. Concerning to income, it was observed that 47.4% of those surveyed who have family income up to R\$ 500.00 are in the maintenance and action stages; 28.3% of the adolescents who

have income between R\$ 501.00 and R\$ 1000.00 are in the preparation stage. And 48.1% of adolescents who have income greater than R\$ 1000.00 are in the maintenance stage. There were statistically significant differences for the variable in question ($p = 0.01$). The other variables were not associated with the SBCPA ($p \geq 0.05$).

Table 3

Comparison of EMCAF according to the socioeconomic characteristics of adolescents from Fortaleza, Ceará

Variable	EMCAF N(%)					p-value
	Pre	Contemplation	Preparation	Action	Maintenance	
People you live with *						
1 to 3 people	17 (17.0)	20 (20.0)	19 (19.0)	18 (18.0)	26 (26.0)	0.97
4 to 6 people	40 (17.6)	42 (18.5)	53 (23.3)	30 (13.2)	62 (27.3)	
More than 7 people	10 (18.9)	11 (20.8)	10 (18.9)	8 (15.1)	14 (26.4)	
Total	67 (17.6)	73 (19.2)	82 (21.6)	56 (14.7)	102 (26.8)	
Occupation*						
works	13 (17.3)	14 (18.7)	14 (18.7)	9 (12.0)	25 (33.3)	0.68
Does not work	52 (17.0)	60 (19.6)	68 (22.2)	48 (15.7)	78 (25.5)	
Family income*						
Up to R \$ 500.00	65 (17.1)	74 (19.4)	82 (21.5)	57 (15.0)	103 (27.0)	0.01*
Between R \$ 501.00 and R \$ 1000.00	8 (13.6)	11 (18.6)	12 (20.3)	14 (23.7)	14 (23.7)	
More than R \$ 1000.00	23 (19.2)	21 (17.5)	34 (28.3)	13 (10.8)	29 (24.2)	
Parents schooling *						
Elementary School	10 (12.7)	11 (13.9)	11 (13.9)	9 (11.4)	38 (48.1)	0.96
High school	41 (15.9)	43 (16.7)	57 (22.1)	36 (14.0)	81 (31.4)	
Higher education	20 (14.6)	29 (21.2)	25 (18.2)	22 (16.1)	41 (29.9)	
Mother's education *						
Elementary School	14 (16.7)	19 (22.6)	18 (21.4)	11 (13.1)	22 (26.2)	0.76
High school	9 (18.0)	9 (18.0)	7 (14.0)	9 (18.0)	16 (32.0)	
Higher education	43 (15.9)	57 (21.0)	50 (18.5)	42 (15.5)	79 (29.2)	

EMCAF= Behavior change stage for physical activity, * Significant difference with $p < 0.05$.

DISCUSSION

Among the SBCPA of those surveyed in the study, the ones with the highest number of adolescents were the maintenance and preparation stages. However, in general, it can be seen that there was a balance in the distribution of the subjects in relation to the SBCPA. Despite this, it is important to note that more than half of the sample is identified in the stages of precontemplation, contemplation and preparation, in which they characterize individuals who are not active, regardless of time.

These results are in agreement with the study by Maciel and Veiga (2012) that investigated the SBCPA in 416 adolescents between the ages of 14 and 19 belonging to the secondary schools in the cities of Belo Horizonte and Contagem/MG. In which they found the majority of the participants in the stages of precontemplation, contemplation, preparation and relapse, thus classified as physically inactive in leisure. In a study carried out with 281 high school students from a city of Sergipe, it was identified that 65.8% of the adolescents were classified in the stages referring to a physically inactive behaviour: precontemplation, contemplation, preparation (Silva, Smith-Menezes, Almeida-Gomes, & Sousa, 2010).

On the other hand, Viana and Andrade (2010) show that there are divergences in the practice of physical activity in the adolescent population, the results of the study analysed by these authors vary in very high or modest proportions, where there is a prevalence of 67.6% of the adolescents who practice some type of physical exercise with regularity (stages of action and maintenance). Corroborating with these data, the study by Silva, Pelegrini, Grigollo, Silva, and Petroski (2011) investigated the SBCPA of 601 high school students from the Midwest of Santa Catarina with an average of 15.7 years old and had the following results: 41.9% and 14%, respectively, in the maintenance and action stages. That is, 55.9% of the participants considered active. These investigations demonstrate different forms and criteria to identify the SBCPA, such as collection and characteristics of the samples and the recommendation of the daily and weekly amount of physical activity practice.

The importance of using the behavioural stages model is emphasized because this theory is considered a tool to promote the practice of physical activity in the population. Mainly, when there is scope for differentiating individuals as to their intention to begin practicing physical activity (for those physically inactive) and the

time they practice (for those physically active) (Dumith, Domingues, & Gigante, 2008).

The values related to the association between the SBCPA and sex indicate a prevalence of male students in the maintenance stage, that is, boys have higher PA practice habits than girls. These results are in accordance with the study of Oliveira et al. (2012) in which the SBCPA of 4.207 adolescents between 14 and 19 years old was investigated. The authors showed that the frequency of adolescents in the maintenance and action stages (physically active) was also significantly higher among boys. Other studies that analysed the adolescents' SBCPA presented higher percentages for inactive behaviours, also with an emphasis on the physical inactivity of women (Silva, Smith-Menezes, Almeida-Gomes, & Sousa 2010; Souza & Duarte, 2005).

The decline in the practice of physical activity in adolescence, especially among girls, occurs due to cultural factors, stimulation of games that emphasize home care, dolls and the permanence of girls at home (Malta et al., 2010). This information is confirmed in the literature, where there is clarification regarding men being more active than women (Hallal Knuth, Cruz, Mendes, & Malta, 2010; Tenório et al., 2010).

Overall, in the present study, there was a balance in the association of subjects' ages with the SBCPA. However, in a study carried out to evaluate the stage of readiness to change of behaviour (SRCB) of the feeding and the PA of 145 adolescents, aged between 10 and 18 years old, interested in joining the Multiprofessional Obesity Treatment Program (MOTP) Hintze et al. (2012), verified that older adolescents (13 to 17 years old) were in more advanced SRCB compared to younger adolescents (11 and 12 years old). Significant differences were also found between the SBCPA and age at a study in Korea, with adolescents aged between 13 to 18 years old. Where, it was found that those with lower age (13-15 years old) had more advanced stages of readiness compared to the usual practice of physical activity, in relation to adolescents between 16 and 18 years old (Kim, 2004).

The different results found among the studies mentioned above are possibly due to the

differences between the samples studied, because the regions in which the research was carried out had different social and behavioural contexts.

Among the results obtained from the comparison of the SBCPA related to socioeconomic characteristics, it is important to highlight that parents' schooling has become an important indicator of economic level. In the present study, although there is no significant difference of this variable when related to the SBCPA, a balanced distribution can be highlighted in the results. Where, regardless of parents' educational level, most adolescents are in the maintenance stages. On the other hand, the level of physical activity may be related to the level of education, with the highest probability of practicing physical activity in people who have completed higher education and less in those with lower education levels (Florindo & Ribeiro, 2009).

Another relevant aspect that can be observed regarding the socioeconomic characteristics of the individuals was observed in the income that had a significant influence on the analysis of the results. It is observed that the highest percentage of school children who are in the maintenance stage (actives) are those with high family income (over R\$ 1000.00). Confirming what was found in a study by Bungum and Vincent (1997), which shows that the socioeconomic level can influence the number of opportunities offered to young people, since the richest may be involved in both structured activities as those of gyms and clubs and free activities in parks, in the neighbourhood or in playgrounds, while the poorest theoretically would only have the second option.

The present study analysed the prevalence of the SBCPA of adolescents from a region not yet investigated and sought to verify the association of these stages with demographic and socioeconomic factors. This initial step was important to highlight the framework of intention in which the young are in the regions investigated. The answers of this study are directed to facilitate the development of strategies of interventions directed to the physical activity. Where, there is a need to

emphasize and motivate the female audience to engage in physical activity. Regarding to the limitations of this study, it is possible to mention the deficiency in the association of the SBCPA with other variables related to behavioural factors for physical activity such as active time in physical education classes and adolescents' preferred leisure activities.

CONCLUSION

Although the SBCPA of the majority of adolescents investigated have been presented in a balanced manner, the prevalence in the stages of behaviour associated with physical inactivity (precontemplation, contemplation and preparation) is still permanent compared to the stages of action and maintenance. The boys stood out with more significant possibilities for adopting the practice of PA in relation to girls. Similarly, low-income adolescents were more likely not to engage in physical activity. Thus, it is important to emphasize and prioritize actions to promote physical activity that can reach and motivate female adolescents and low family income.

Acknowledgments:

Nothing to declare.

Conflict of interests:

Nothing to declare.

Funding:

Nothing to declare.

REFERENCES

- Barbosa Filho, V. C., Campos, W. D., & Lopes, A. D. S. (2014). Epidemiology of physical inactivity, sedentary behaviors, and unhealthy eating habits among brazilian adolescents: a systematic review. *Ciência & Saúde Coletiva*, 19(1), 173-194. doi: 10.1590/1413-81232014191.0446
- Boscatto, E. C., Duarte, M. F. S., & Gomes, M. A. (2011). Estágios de mudança de comportamento e barreiras para a atividade física em obesos mórbidos. *Revista Brasileira de Cineantropometria e Desempenho Humano*, 13(5), 320-332. doi: 10.5007/1980-0037.2011v13n5p329
- Bungum, T. J., & Vincent, M. L. (1997). Determinants of physical activity among female adolescents. *American Journal of Preventive Medicine*, 13(2), 115-22.
- Dumith, S. C., Domingues, M. R., & Gigante, D. P. (2008). Estágios de mudança de comportamento para a prática de atividade física: uma revisão da literatura. *Revista Brasileira de Cineantropometria e Desempenho Humano*, 10(3), 301-307. doi: 10.5007/1980-0037.2010V12N5P367
- Florindo, A. A., & Ribeiro, E. H. C. (2009). Atividade física e saúde em crianças e adolescentes. In D. de Rose Júnior (Ed.), *Esporte e atividade física na infância e na adolescência: Uma abordagem multidisciplinar*. Porto Alegre: Artmed Editora.
- Hallal, P. C., Knuth, A. G., Cruz, D. K. A., Mendes, M. I., & Malta, D. C. (2010). Prática de atividade física em adolescentes brasileiros. *Ciência & Saúde Coletiva*, 15(supl.2), p.3035-3042. doi: <http://dx.doi.org/10.1590/S141381232010000800008>
- Hintze, L. J., Cattai, G. B. P., Silva, D. F., & Junior, N. N. (2012). Estágio de prontidão para mudança de comportamento de adolescentes interessados em ingressar no Programa Multiprofissional de Tratamento da Obesidade. *Revista Paulista de Pediatria*, 30(2), 237-43. doi: <http://dx.doi.org/10.1590/S0103-05822012000200013>
- Kim, Y. (2004). Korean adolescents' exercise behavior and its relationship with psychological variables based on stages of change model. *Journal of Adolescent Health*, 34(6), 523-530. doi: 10.1016/j.jadohealth.2003.07.025
- Maciel, M. G., & Veiga, R. T. (2012). Intenção de mudança de comportamento em adolescentes para a prática de atividades físicas de lazer. *Revista Brasileira de Educação Física e Esporte*, 26(4), 705-16. doi: <http://dx.doi.org/10.1590/S1807-55092012000400014>
- Malta, D. C., Sardinha, L. M. V., Mendes, I., et al. (2010). Prevalence of risk health behavior among adolescents: results from the 2009 National Adolescent School-based Health Survey (PeNSE). *Ciência & Saúde Coletiva*, 15(supl.2), 3009-3019. doi: <http://dx.doi.org/10.1590/S1413-81232010000800002>
- Matta, R. O. B. (2012). *Aplicação do Modelo Transteórico de Mudança de Comportamento para o estudo do comportamento informacional de usuários de informação financeira pessoal* (Tese de Doutorado). Faculdade de Filosofia e Ciências da Universidade Estadual Paulista, São Paulo.
- Murphy, M. H., Mcneilly, A. M., & Murtagh, E. M. (2010). Public health nutrition physical activity prescription for public health. *Proceedings of the Nutrition Society*, 69(1), 178-184. doi: 10.1017/S0029665109991741
- Oliveira, N. K. R., Barros, M. V. G., Reis, R. S., Tassiano, R. M., Tenório, M. C. M., Bezerra, J., ... Farias Junior, J. C. (2012). Estágios de mudança de comportamento para a atividade física em

- adolescentes. *Motriz*, 18(1), 42-54. doi: <http://dx.doi.org/10.1590/S1980-65742012000100005>
- Seabra, A. F., Mendonça, D. M., Thomis, M. A., Anjos, L. A., & Maia, J. A. (2008). Determinantes biológicos e sócio-culturais associados à prática de atividade física de adolescentes. *Caderno de Saúde Pública*, 4(24), 721-73.
- Silva, D. A. S., Smith-Menezes, A., Almeida-Gomes, M., & Sousa, T. F. (2010). Estágios de mudanças de comportamento para atividade física em estudantes de uma cidade do Brasil. *Revista de salud pública*, 12(4), 623-34.
- Silva, D. A. S., Pelegrini, A., Grigollo, L. R., Silva, A. F., & Petroski, E. L. (2011). Diferenças e similaridades dos estágios de mudança de comportamento para atividade física em adolescentes de duas áreas brasileiras. *Revista Paulista de Pediatria*, 29(2), 193-201. doi: <http://dx.doi.org/10.1590/S0103-05822011000200010>
- Silva, K. S., Lopes, A. D. S., Hoefelmann, L. P. et al. (2013). Health risk behaviors project (COMPAC) in youth of the Santa Catarina State, Brazil: ethics and methodological aspects. *Revista Brasileira de Cineantropometria & Desempenho Humano*, 15(1), 1-15. doi: <http://dx.doi.org/10.5007/1980-0037.2013v15n1p1>
- Souza, G. S., & Duarte, M. F. S. (2005). Behavior change stages related to physical activity in adolescents. *Revista Brasileira de Medicina do Esporte*, 11(2), 104-108. doi: [10.1016/j.rppede.2016.03.017](https://doi.org/10.1016/j.rppede.2016.03.017)
- Tenório, M. C. M., Barros, M. V. G., Tassitano, R. M., Bezerra, J., Tenório, J. M., & Hallal, P. C. (2010). Atividade física e comportamento sedentário em adolescentes estudantes do ensino médio. *Revista Brasileira de Epidemiologia*, 13(1), 105-17. doi: <http://dx.doi.org/10.1590/S1415-790X2010000100010>
- Thomas, J. R., & Nelson, J. K. (2007). *Métodos de pesquisa em atividade física* (5ª ed.). Porto Alegre: Artmed.
- Viana, M. S., & Andrade, A. (2010). Estágios de mudança de comportamento relacionados ao exercício físico em adolescentes. *Revista Brasileira Cineantropometria do Desempenho Humano*, 12(5), 367-374. doi: [10.5007/1980-0037.2010V12N5P367](https://doi.org/10.5007/1980-0037.2010V12N5P367)
- World Health Organization [WHO]. (2010). Global recommendations on physical activity for health. *World Health Organization*: Geneva.



Perception of Body Image in Teenagers in Physical Education Classes

Ricardo Catunda^{1,2*}, Adilson Marques^{2,3}, Carlos Januário³

ORIGINAL ARTICLE

ABSTRACT

This study showed the objectives to evaluate the self-perception of body image in adolescents, raising the issues related to the physical aspects and the physical education classes. The design of this research was qualitative and quantitative nature, associated with the field research of experimental and comparative type. In the experimental phase was the implementation of an intervention program in relation to body image. In the quantitative study, met the perception of body image of 102 students with a mean of 15.5 (± 1.2) years of age, 50 adolescents from the experimental school (49.0%) and 52 adolescents in the control school (51.0%), enrolled in classes of 1st and 2nd year of high school in the public-school network. In experimental school there was a significant improvement to the program in the perception that the girls had on their body image. In the qualitative study parse through 8 focus groups (48 students) the issue focus of research from personal experiences. The students showed a high rate of dissatisfaction with the body and the willingness to take risk behaviors in pursuit of the ideal body with better results after the program. The approach on body image in Physical Education was nonexistent.

Keywords: body image, physical education, adolescents, intervention program.

INTRODUCTION

The level of satisfaction with the body image of adolescents is a reason for growing attention of national and international organizations related to education and health promotion, governments, and researchers. The media, such as television, magazines (fashion and fitness) and the recent phenomenon of social networks, the most used by adolescents, propagate a model for the body whose lean pattern, besides being a reference for a healthy body (Marques, Diniz, Carreiro da Costa, Contramestre, & Piéron, 2009). It is recognized by the athletic and muscular profile, making it perfect and unattainable for cultural ideals to be conquered by adolescents, especially girls. These reasons are sufficient for social pressures to adapt to the current body model to become a goal to be achieved, especially among women, producing among other consequences the body dissatisfaction (Conti, Costa, Peres, & Toral, 2009).

The pattern of beauty valued in the society associated to thinness ends up emphasizing aspects related to shape, disregarding the diversity of the physical, socioeconomic, cultural and health constituencies present in the population (Damasceno et al., 2006; Kakeshita & Almeida, 2006; Teixeira et al., 2006). Although there are values of body mass index (BMI) and percentage of body fat (% BF) suitable for health, it is believed that the physical type can be determined culturally, with the acknowledged influence of parents and pairs in the development of body image (McKinley & Randa, 2005; Tantleff-Dunn & Gokee, 2004).

Being under subculture influences, as it is characteristic of adolescence, the young woman does not always reflect on the means to pursue her aesthetic goals (McKinley & Randa, 2005), being exposed to identifiable risks (restrictive diets, psychological disorders such as bulimia, anorexia and vigorexia, excessive practice of physical exercise and use of anabolic steroids) in

¹ State University of Ceará, Fortaleza, Brazil.

² Faculty of Human Kinetics, University of Lisbon, Lisbon, Portugal.

³ Center for Research on Physical Activity in School, NIAFE/CNPq, Ceará, Brazil.

* Corresponding author: State University of Ceará, Dr. Silas Munguba Av., 1700, Campus do Itaperi, 60714-903, Fortaleza-CE, Brazil. Email: ricardo.catunda@uece.br

the search for the ideal body. In addition, they have inherent difficulties of age to counter pressures and internalization of the media to which they are exposed (Knauss, Paxton, & Alsaker, 2007). As result it is not always expected, and the pursuit of the perfect body is unfeasible, the frustration that girls experience may lead to damage to self-esteem and cause depression (Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006), causing emotional and physical instability (Thompson, Coover, & Stormer, 1999; Wertheim et al., 2009).

Actions related to body image in adolescence need to be treated as a public health problem due to injuries caused by the dissatisfaction of adolescents with their body. For these actions, it became a consensus that the school constitutes an ideal environment for interventions in education and health promotion, requiring the pedagogical support and commitment of Physical Education teachers. As in the last decades the problem has stabilized with a high incidence of affected adolescents, there are indications for evaluation and promotion of body image from efficient programs and interventions (Levine & Smolak, 2006; Yager, Diedrichs, Ricciardelli, & Halliwell, 2013). Several investigations showed that interventions in schools aimed to improve body image of adolescents, recognizing as appropriate this potential environment of interactions (Levine & Smolak, 2006; Ortiz, Veloz, Solis, & Montano, 2010; Richardson & Paxton, 2010; Wilksch & Wade, 2009), being the researchers external from the school where the study was conducted. It was not found specific participation of the Physical Education teacher. This fact is evidenced, since body image is a multidimensional construct (Adami, Fernandes, Frainer & Oliveira, 2005) which have, among others, affective, cultural, and motor aspects that are common approaches to Physical Education.

The dimensional expansion of its applicability has been consolidated the formative character with which Physical Education has been presented in the school environment (Catunda, Sartori, & Laurindo, 2014). Therefore, Physical Education is characterized as a unique discipline, being the only one to promote health

and the various languages of the human movement directly, through the teaching of an active and healthy lifestyle (Sallis et al., 2012) besides of developing cultural, motor, cognitive, affective, and social aspects.

It is in this panorama that the school has been pointed as privileged environment of intervention. The hypothesis that knowledge about health-related physical activity is linked to increased levels of physical activity in adolescents demonstrates the importance of the school promoting through Physical Education activities that potentiate this recommendation (Andersen, Harro & Sardinha, 2006). Since knowing how much physical activity the adolescent should do to benefit from the health effects could be a facilitator for the formation of healthy habits (Harrison et al., 1992) recognized as a predictor of a positive appreciation for body image (Marques et al., 2009).

In the context described, the objective of the research was to evaluate self-perception of body image, factors associated with weight concerns and satisfaction with appearance, and to know if the intervention program influenced the perception of the young female on body image.

METHOD

The design of this research has a qualitative and quantitative nature associated to field research of experimental and comparative type

Participants

The sample consisted of 102 students with a mean of 15.5 (\pm 1.2) years of age, ranging from a minimum of 13 to a maximum of 18 years. In this study, a non-probabilistic non-intentional sample consisted of 50 students from the experimental school (49.0%) and 52 students from the control school (51.0%). The sample of teachers was consisted of two teachers of the experimental school and two teachers of the control school.

Inclusion criteria for the students were: to be enrolled, to attend regularly the school, to be able to participate in the classes of Physical Education, and to sign the term of informed consent. Exclusion criteria were: medical impediment for not participating regularly in

physical education classes, and absence in the sessions where the researcher observed the classes. The sample of teachers was composed of the totality of high school teachers. Participants were informed of the guarantee of anonymity and confidentiality of the information that would be under the researcher's tutelage.

Instruments and Procedures

In order to verify the level of adolescents' dissatisfaction with body image, we applied the Body Dissatisfaction Scale in Adolescents (BDSA), developed by Baile, Grima, and Landívar (2003), and the Brazilian version translated by Conti, Slater and Latorre (2009). In the deepening of the study central question, we used the technique of focal group that was applied to all groups investigated, making a total of 8 groups with 6 participants each, totalizing 48 adolescents. Among the applications of the instruments, we developed a training program only for teachers from the experimental school on the teaching of physical fitness. Teachers participated in a theoretical exposition and practical experiences of the methodology to be worked with students from the experimental group during the period of 29 days. After the training phase, the teachers applied the activities during three consecutive classes in each of the groups surveyed, with the purpose of increasing the physical activity time of students during the classes with the experimental group compared to the control group. For this pedagogical experience, we used the context of modified games during application of the intervention program to teachers (Light & Georgakis, 2008).

In order to start the research, a request for authorization was issued to the school directors, by means of an agreement that explained the research and its development procedures. In addition, the students' underage of 18 years-old and their legal guardian had, obligatorily, to sign the Informed Consent Term (ICT), in addition, the teachers signed the ICT authorizing the study during Physical Education classes.

For the teachers from experimental school, we presented the research project, explained the data collection procedures, the instruments to be applied, the Physical Education experimental

training program to which they would be submitted, and set the date for the researcher's presentation to the students. For the data collection procedures, an agenda was developed in agreement with the teachers, containing an initial phase, pre, and post application for the experimental school, and an intervention program for teachers between the two phases. The control school had application in two moments without the intervention program.

Statistical analysis

For all variables of the questionnaires, the descriptive statistics were applied, calculating percentages, mean, standard deviation, minimum, and maximum values. For the continuous and ordinal variables that could be treated as quantitative, the normality of their distributions and the homogeneity of variances, respectively, were evaluated with the Kolmogorov-Smirnov or Shapiro Wilk test, depending on whether the group was about 50 individuals, and with the Levene test. Whenever one of the groups analysed had a subject number equal to or greater than 30, the central limit theory was evoked.

With the results from BDSA, in the first and second moment of its application, the internal consistency was calculated, obtaining alpha values of 0.87 and 0.84, respectively. Then a score was calculated that translated the general perception of the corporal image of each student. However, for the analysis of the body image constructs presented in the BDSA (Conti et al., 2009), we used the exploratory factorial analysis, for the extraction of the factors by the main components method, followed by a Varimax rotation. The application of the factorial analysis to the 32 items of the EEICA, after checking its adequacy, through the Bartlett sphericity test ($\chi^2(496) = 1871,106, p < 0.001$) and the Kaiser-Meyer-Olkin statistic $KMO = 0.803$), allowed the extraction of 7 components according to the eigenvalue rule superior to 1, which explained 65.8% of the total variance of the original variables. However, the grouping of the items did not follow the one described by Conti et al. (2009) and it was not possible to interpret the items grouped in each component.

In this way, we chose to compute new variables from items that had the same meaning, after checking their internal consistency through Cronbach's alpha. The constructs created were: self-perception of body image, concerns about weight, means used to achieve the ideal body, rejection of the body today, difficulties with dress, satisfaction with appearance, control of eating and fear of gaining weight, with values of consistency of $\alpha = 0.7$.

With the qualitative analysis we wanted to complement the quantitative data, looking for possible implicit explanations in the speeches, documents and testimonies, establishing configurations and flow of cause and effect. For this purpose, we used the method of content analysis (Bardin, 1977). From the messages of the subjects and from the interview guide, the categories of message analysis were defined. From the categories were named the subcategories, in order to classify more specifically the units of record. Quantitative data

were processed using the Statistical Package for Social Sciences (SPSS) version 22. The significance level for the analyses was 0.05.

RESULTS

The results regarding to body image perception before and after the intervention program are presented in Table 1. Before the intervention program, the experimental school had a BDSA total score of 21.88 ± 16.54 (highest dissatisfaction), while the control school adolescents presented a lower value (less dissatisfaction). Nevertheless, the values did not present significant differences ($t(100) = 0.894$, $p = 0.373$). On the other hand, in the self-perception of body image, the adolescents from experimental school initially presented a value superior to the one of the adolescents from control school (2.91 ± 0.76 vs. 2.58 ± 0.85), being the differences between schools statistically significant ($t(100) = 2.071$, $p = 0.041$).

Table 1

Perception of body image (BI) at the beginning and end of the intervention program in the experimental and control schools

Variable	Experimental School			Control School		
	Initial	Final	p^a	Initial	Final	p^a
Total Score	21.88 ± 16.54	19.29 ± 12.65	0.373	17.08 ± 11.32	19.19 ± 15.64	0.438
Self-perception of BI	2.91 ± 0.76	2.58 ± 0.85	0.041	2.65 ± 0.72	2.67 ± 0.95	0.913
Weight Concerns	2.98 ± 0.89	2.27 ± 0.96	<0.001	2.66 ± 0.77	2.39 ± 0.98	0.123
Appearance Satisfaction	2.33 ± 1.28	2.04 ± 1.31	0.373	1.91 ± 1.10	2.05 ± 1.22	0.550

The comparison between the initial and final moments of the intervention program can be observed in Table 2. In the experimental school, it was verified that the program promoted a significant improvement in the adolescents' perception of their body image, since the values registered were significantly lower for the total score of BDSA ($t(49) = 4,846$, $p < 0.001$), self-

perception of body image ($t(49) = 2,450$, $p = 0.018$), concerns about weight ($t(49) = 2.517$, $p = 0.015$), and satisfaction with appearance ($t(49) = 2.564$, $p = 0.013$). For the control school, the values of the variables related to body image differed slightly between the two moments of intervention, with no statistically significant difference being recorded.

Table 2

Effect of intervention program on body image perception for experimental and control

Variable	Experimental School			Control School		
	Initial	Final	p^a	Initial	Final	p^a
Total Score	21.88 ± 16.54	17.08 ± 11.32	<0.001	19.29 ± 12.65	19.19 ± 15.64	0.927
Self-perception of Body Image	2.91 ± 0.76	2.65 ± 0.72	0.018	2.58 ± 0.85	2.67 ± 0.95	0.246
Weight Concerns	2.98 ± 0.89	2.66 ± 0.77	0.015	2.27 ± 0.96	2.39 ± 0.98	0.150
Satisfaction with appearance	2.33 ± 1.28	1.91 ± 1.10	0.013	2.04 ± 1.31	2.05 ± 1.22	0.942

^a Tested with t-test for paired samples

After the application of BDSA, the adolescents were invited to participate in a deepening of the study in the questions about the physical aspect, the Physical Education classes and the corporal image, presented in Table 3, in which we used the focal group technique.

Regarding to body rejection, the students stated that the biggest reason for rejection was to be considered lean (56.3%). For 31.3% of the students, another reason with more frequent registration was rejection because they were obese. Plastic surgery was the mean that young women indicated more frequently to solve problems of dissatisfaction with the current body (59.7%).

Table 3
Distribution of reasons and situations related to the physical aspect

Categories	n of citations (%)
Category 1: Rejection to the body in social relations	
She felt rejected for being thin	9 (56.3%)
She felt rejected because she was obese.	5 (31.3%)
She felt rejection with the height	1 (6.2%)
She felt rejection with the appearance	1 (6.2%)
Category 2: Body image and social relationships	
Professionally disrupts	2 (9.1%)
Affects affective relationships	11 (50.0%)
Does not influence	9 (40.9%)
Category 3: Means used in search of the ideal body	
Plastic surgery	37 (59.7%)
Diets	16 (25.8%)
Gymnastics Academy	6 (9.7%)
Category 4: Current Body Satisfaction	
Dissatisfaction with thinness	35 (38.1%)
Obesity Dissatisfaction	31 (33.7%)
Dissatisfaction with various reasons	14 (15.2%)
Satisfied	12 (13.0%)

In the questions related to Physical Education (Table 4), the adolescents' perceptions about the classes showed that the effective participation, the feeling of effectiveness, and the positive interaction with teachers, would raise the level of satisfaction of 76.9% who affirmed to feel the sensation of well-being in class.

The results related to the body image approach in Physical Education classes, the majority of adolescents (75.0%) affirmed the absence of a body image approach in classes. Regarding the influence of physical education

classes on body image formation, 48.1% of the young women stated that they had an expectation for influence, evidencing the importance of teachers discussing issues related to body in general and body image formation.

Table 4
Distribution of reasons related to Physical Education classes

Categories	n of citations (%)
Category 5: Perceptions about Physical Education classes	
Feeling of well being	30 (76.9%)
Feeling of embarrassment/Absence of well-being	8 (20.5%)
Does not participate in practical classes	1 (2.6%)
Category 6: Body image approach in Physical Education classes	
Approach, discussions and dialogues present	2 (6.2%)
Superficial and disintegrated class approaches	6 (18.8%)
Absence of approach	24 (75.0%)
Category 7: Influence of physical education on the formation of body image	
Positive Influence	12 (44.5%)
Does not exert influence	02 (7.4%)
Expectations that influence	13 (48.1%)

DISCUSSION

The adolescents from experimental school showed greater dissatisfaction with the body image before the intervention program, compared to the girls in the control school, without, however, presenting significant differences. Several studies in the national and international literature have shown that body dissatisfaction is highly prevalent among adolescents, and the results are similar to the present study (Al Sabbah et al., 2009; Bearman, Martinez, & Stice, 2006; Schneider et al., 2013), in which adolescents pointed out many parts of their body that they desired to change (Conti, Frutuoso, & Gambardella, 2005), psychological implications such as depression (Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006), self-esteem and depressive mood (Mond et al., 2011).

Considering the negative implications that the low perception of the body image may have on the psychological level in the adolescents, in some countries projects have been developed whose objective is the improvement of the body image, as for example the program Happy being me (Bird, Halliwell, Diedrichs, & Harcourt, 2013) and Bodythink (Shanel, Richardson, Paxton, & Thomson, 2009). These programs, implemented in a school context, have contributed to the reduction of factors

associated with negative body image, eating disorder (Bird et al., 2013; Shanel et al., 2009) and improvement of self-esteem (Richardson et al., 2010).

We affirm that adolescents' recognition of body image has a great importance, since body dissatisfaction stimulated by the ideal leanness pattern is commonly related to eating disorders, restrictive diets, abuse of purgative methods and excessive practice of physical exercises (Ramalho et al., 2007), being necessary to confront the problem by the school in order to reduce the high rates of adolescent dissatisfaction with the body, especially girls in relation to excess of body fat (Graup et al., 2008; Martins, Pelegrini, Matheus, & Petroski, 2010). The few programs implemented regarding health in the school need greater participation of Physical Education professionals (Brito, Silva, & França, 2012).

For the self-perception of the body image, the results presented in relation to the experimental school showed that the adolescents presented a negative perception of the body, demonstrating that the female gender is minded to greater body dissatisfaction (Branco, Hilário, & Cintra, 2006; Martins, Nunes, & Noronha, 2008), different from the control school adolescents who showed a positive perception of the body image, being in this case the differences between groups statistically significant. After completion of the intervention program, the experimental school showed a significant improvement in the adolescents' perception of their body image. In the control school, there was a slight difference in the variables values between the two moments of the intervention, not being found statistically significant difference.

Analysing the values related to body image perception in the two moments evaluated (before and after the intervention program), considering the comparisons between schools and values within each school, the results indicate that the intervention program had a positive effect on adolescents' perception of their body image, emphasizing the role of the Physical Education discipline in addressing body related issues and the need to develop more school programs which promote changes in body image

concepts (Alves, Vasconcelos, Calvo, & Neves, 2008). These programs may involve more adolescents in coeducation, in physical activities with compatible demands their abilities and participation capacity, through modified games with adapted rules (Van Acker, Carreiro da Costa, Bourdeaudhuij, Cardon, & Haerens, 2010).

The adolescents showed dissatisfaction with their weight, both because they felt lean and because they were above ideal weight independent of BMI. Studies have shown that female adolescents are more concerned with weight than men with body image disorders (Smolak, 2012), compromising their psychological well-being (Wardle & Cooke, 2005) and showing poor performance in performing tasks which require the support of body weight (Morano et al., 2010). Regarding to satisfaction with appearance, the adolescents pointed out parts of the body that they said they did not like and were determined to seek change at any cost, using means such as plastic surgery, diets and physical exercises. As the goal was not always achieved, body dissatisfaction was common. The adolescents at the experimental school had a positive self-perception of body image compared to the adolescents from the control school.

After the intervention program, the adolescents from experimental school showed a significant improvement in their perception of body image. In control school, there was a slight difference between the two moments. When we analysed the two moments (before and after the program) between schools considering comparisons and values, we identified that the intervention program had a positive effect on the adolescents' perception of their body image.

The adolescents chose as main objectives valued in the classes of Physical Education, the search for information on the health and the sporting experience, which suggests a positive intention referring to the health approach at school. Regarding the perception of the classes, the adolescents affirmed a relation with "being healthy" and "improvement of physical capacities", affirming that the classes should bring more direct health benefits. The teacher of

Physical Education is determinant for this approach, since the movement is the essence for recognition and construction of corporal image (Schilder, 1999). Regarding to body image approach in the classes, most of subjects reported total absence of approach (Catunda, 2015). Our results confirm the hypothesis of insecurity referred to teachers in the approach to the theme, due to the lack of knowledge in the formation corroborating with other studies (Ricerardelli et al., 2010; Yager, Diedrichs, Ricciardelli, & Halliwell, 2013).

CONCLUSION

The discipline of Physical Education presents a favourable potential to influence the acquisition of a positive body image in adolescents. However, it was not identified in the practice and in the planning of the teachers mention to body image. Schools do not take advantage of the condition of Physical Education as the only discipline capable of acting directly on the promotion of young women's health.

We identified that the intervention program had a positive effect on the adolescents' perception of their body image. In this aspect, we highlight the role of Physical Education in offering activities compatible with the level of motor development of adolescents, making them feel able to participate and perform tasks successfully, bringing improvements to self-esteem and positive self-assessment of their body image.

Regarding the body image approach in the classes, most of students mentioned a total lack of approach. We identified the existence of an expectation that Physical Education classes will influence development and provide a positive relation with body image.

Acknowledgments:

Nothing to declare.

Conflict of interests:

Nothing to declare.

Funding:

Nothing to declare.

REFERENCES

- Acker, R. V., Costa, F. C. da, Bourdeaudhuij, I. D., Cardon, G., & Haerens, L. (2010). Sex equity and physical activity levels in coeducational physical education: exploring the potential of modified game forms. *Physical Education and Sport Pedagogy*, 15(2), 159–173. doi: 10.1080/17408980902877609
- Adami, F., Fernandes, T. C., Frainer, D. E. S., & Oliveira, F. R. (2005). Aspectos da construção e desenvolvimento da imagem corporal e implicações na Educação Física. *Revista Digital de Buenos Aires*, 83. Retrieved from: <http://www.efdeportes.com/efd83/imagem.htm>.
- Adams, T., & Brynteson, P. (1992). A comparison of attitudes and exercise habits of alumni from colleges with varying degrees of physical education activity programs. *Research Quarterly for Exercise and Sport*, 63(2), 148–152. doi: 10.1080/02701367.1992.10607574
- Al Sabbah, H., Vereecken, C. A., Elgar, F. J., Nansel, T., Aasvee, K., Abdeen, Z., ... Maes, L. (2009). Body weight dissatisfaction and communication with parents among adolescents in 24 countries: international cross-sectional survey. *BMC Public Health*, 9(52). doi: 10.1186/1471-2458-9-52
- Alves, E., Vasconcelos, F. A. G., Calvo, M. C. M., & Neves, J. (2008). Prevalência de sintomas de anorexia nervosa e insatisfação com a imagem corporal em adolescentes do sexo feminino do Município de Florianópolis, Santa Catarina, Brasil. *Cadernos de Saúde Pública*, 24(3), 503-512. doi: 10.1590/S0102-311X2008000300004
- Anderssen, L. Harro, M., & Sardinha, L. (2006). Physical activity and clustered cardiovascular risk in children: across sectional study (The European Youth Hearth Study). *Lancet*, 368(9532), 299-304. doi: 10.1016/S0140-6736(06)69075-2
- Baile, J. I., Grima, F. G., & Landívar, E. G. (2003). Desarrollo y validación de una escala de insatisfacción corporal para adolescentes. *Medicina Clínica*, 121(5), 173–177.
- Bardín, L. (1977). *Análise de conteúdo*. Lisboa: Edições 70.
- Bearman, S. K., Martinez, E., & Stice, E. (2006). The skinny on body dissatisfaction: a longitudinal study of adolescent girls and boys. *Journal of Youth and Adolescence*, 35, 217-229. doi: 10.1007/s10964-005-9010-9
- Branco, L. M., Hilario, M. O. E., & Cintra I.P. (2006). Perception and satisfaction with body image in adolescents and correlations with nutrition status. *Archives of Clinical Psychiatry*, 33, 292-296. doi: 10.1590/S0101-60832006000600001
- Brito, A. K. A., Silva, F. I. C., & França, N. M. (2012). Programas de intervenção nas escolas brasileiras: uma contribuição da escola para a educação em saúde. *Saúde em Debate*, 36(95), 624-632. doi: 10.1590/S0103-11042012000400014

- Bird, E., Halliwell, E., Diedrichs, P., & Harcourt, D. (2013). Happy Being Me in the UK: A controlled evaluation of a school-based body image intervention with pre-adolescent children. *Body Image, 10*, 326-334. doi: 10.1016/j.bodyim.2013.02.008
- Catunda, R. (2015). *Influência dos padrões estéticos na imagem corporal de adolescentes do gênero feminino: um estudo com professores e alunos na Educação Física escolar* (Tese de Doutorado). Faculdade de Motricidade Humana da Universidade Técnica de Lisboa, Lisboa.
- Catunda, R., Sartori, S. K., & Laurindo, E. (Eds.). (2014). *Recomendações para a Educação Física escolar*. Rio de Janeiro: Conselho Federal de Educação Física.
- Conti, M. A., Frutuoso, M. F. P., & Gambardella, A. M. D. (2005). Excesso de peso e insatisfação corporal em adolescentes. *Revista de Nutrição, Campinas, 18*(4), 491-497. doi: 10.1590/S1415-52732005000400005.
- Conti, M. A., Slater, B., & Latorre, M. R. D. O. (2009). Validação e reprodutibilidade da Escala de Avaliação de Insatisfação Corporal para Adolescentes. *Saúde Pública, 43*(3), 515-524. doi: 10.1590/S0034-89102009000300016
- Conti, M. A., Costa, L. S., Peres, S. V., & Toral, N. (2009). A insatisfação corporal de jovens: um estudo exploratório. *Physis: Revista de Saúde Coletiva, 19*(2), 509-528. doi: 10.1590/S0103-73312009000200015
- Damasceno, V. O., Vianna, V. R. A., Vianna, J. M., Lacio, M., Lima J. R. P., & Novaes, J. S. (2006) Imagem corporal e corpo ideal. *Revista Brasileira Ciências Movimento, 14*, 81-94.
- Graup, S., Pereira, E. F., Lopes, A. S., Araújo, V. C., Legnani, R. F. S., & Borgatto, A. F. (2008). Associação entre a percepção da imagem corporal e indicadores antropométricos de escolares. *Revista Brasileira Educação Física Esporte, 22*(2) 129-38. doi: 10.1590/S1807-55092008000200004
- Harrison, M., Burns, C., McGuinness, M., Heslin, J., & Murphy, N. (2006). Influence of a health education intervention on physical activity and screen time in primary school children: 'Switch Off-Get Active'. *Journal of Science and Medicine in Sport, 9*(5), 388-394. doi: 10.1016/j.jsams.2006.06.012
- Kakeshita, I. S., & Almeida, S. S. (2006). Relação entre índice de massa corporal e a percepção da auto-imagem em universitários. *Revista Saúde Pública, 40*(3) 497-504. doi: 10.1590/S0034-89102006000300019.
- Knauss, C., Paxton, S. J., & Alsaker, F. D. (2007). Relationships amongst body dissatisfaction, internalisation of the media body ideal and perceived pressure from media in adolescent girls and boys. *Body Image, 4*(4), 353-360. doi: 10.1016/j.bodyim.2007.06.007
- Levine, M., & Smolak, L. (2006). *The prevention of eating problems and eating disorders: Theory, research and practice*. Mahwah, NJ: Lawrence Erlbaum Associates.
- Light, R., & Georgakis, S. (2008). Invasion Games in Physical Education: Assessing Knowledge-in-Action in using the Team Sport Assessment Procedure. In *Loughland Proceedings of the Authentic Assessment Practices for Student Learning Conference*, 35-50. Sydney, 16-17 August, 2007.
- Marques, A., Diniz, J., Carreiro da Costa, F., Contramestre, J., & Piéron, M. (2009). Percepção de saúde, competência e imagem corporal dos alunos que frequentam os estabelecimentos militares de ensino em Portugal. *Boletim SPEF, 3*, 51-63.
- Marques, A. (2010). *A escola, a Educação Física e a promoção de estilos de vida activos e saudáveis – estudo de caso* (Tese de doutoramento). Faculdade de Motricidade Humana da Universidade Técnica de Lisboa, Lisboa.
- Marques, A., & Costa, F. C. (2013). Educar para um estilo de vida activo. Caracterização das aulas de um grupo de professores de Educação Física. *Boletim da Sociedade Portuguesa de Educação Física, 37*(1)109-123.
- Martins, C. R., Pelegrini, A., Matheus, S. C. & Petroski, E. L. (2010). Insatisfação com a imagem corporal e relação com estado nutricional, adiposidade corporal e sintomas de anorexia e bulimia em adolescents. *Revista de Psiquiatria do Rio Grande do Sul, 32*(1)19-23. doi: 10.1590/S0101-81082010000100004
- Martins, D. F., Nunes, M. F. O., & Noronha, A. P. P. (2008). Satisfação com a Imagem Corporal e autoconceito em Adolescentes. *Psicologia: Teoria e Prática, 10*(2) 94-105.
- McKinley, N. M., & Randa, L. A. (2005). Adult attachment and body satisfaction. An exploration of general and specific relationship differences. *Body Image, 2*(3), 209-218. doi: 10.1016/j.bodyim.2005.04.003
- Mond, J., Van den Berg, P., Boutelle, K., Hannan, P., & Neumark-Sztainer, D. (2011). Obesity, body dissatisfaction, and emotional well-being in early and late adolescence: Findings from the Project EAT study. *Journal of Adolescent Health, 48*(4), 373-378. doi: 10.1016/j.jadohealth.2010.07.022
- Morano, M., Dario Colella, D., & Capranica, L. (2010). Body image, perceived and actual physical abilities in normal-weight and overweight boys involved in individual and team sports. *Journal of Sports Sciences, 29*(4), 355-362. doi: 10.1080/02640414.2010.530678
- Ortiz, P. M. T., Veloz, D. C., Solís A. F., Montano, F. E. M. & Esparza, G. V. (2010). Insatisfação con la imagen corporal asociada al Índice de Masa Corporal en adolescentes. *Revista Cubana de Enfermería, 26*(3), 144-154.
- Paxton, S. J., Neumark-Sztainer, D., Hannan, P. J., & Eisenberg, M. E. (2006). Body dissatisfaction prospectively predicts depressive mood and low self-esteem in adolescent girls and boys. *Journal*

- of *Clinical Child and Adolescent Psychology*, 35(4), 539-549. doi: 10.1207/s15374424jccp3504_5
- Ramalho, A., Gardotti, C. M., Borges, M. B. F., Oliveira, M. D., Palavras, M. N., Paula, S., & Duarte, S. M. (2007). Imagem corporal na adolescência. *Junguiana*, 25, 133-142.
- Ricciardelli, L., Yager, Z., Paxton, S., McCabe, M., Mussap, A., & Toumborou, J. (2010). (Unpublished Research Report). *Research Report: Body Image in Schools*. Deakin University and La Trobe University.
- Schneider, S., Weiss, M., Thiel, A., Werner, A., Mayer, J., Hoffmann, H., ... Diehl, K. (2013). Body dissatisfaction in female adolescents: extent and correlates. *European Journal of Pediatrics*, 172(3), 373-384. doi: 10.1007/s00431-012-1897-z
- Richardson, S. M., & Paxton, S. J. (2010). An evaluation of a body image intervention based on risk factors for body dissatisfaction: A controlled study with adolescent girls. *International Journal of Eating Disorders*, 43(2), 112-122. doi: 10.1002/eat.20682
- Sallis, J. F., McKenzie, T. L., Beets, M. W., Beighle, A., Erwin, H., & Lee, S. (2012). Physical education's role in public health: steps forward and backward over 20 years and HOPE for the future. *Research Quarterly for Exercise and Sport*, 83(2), 125-135. doi: 10.1080/02701367.2012.10599842
- Schilder, P. (1999). *A Imagem do Corpo: as energias construtivas da psique*. São Paulo: Martins Fontes.
- Richardson, S. R., Paxton, S., & Thomson, J. (2009). Is BodyThink an efficacious body image and self-esteem. *Body Image*, 6(2), 75-82. doi: 10.1016/j.bodyim.2008.11.001
- Smolak, L. (2012). Appearance in childhood and adolescence. In N. Rumsey & D. Harcourt (Eds.), *Oxford Handbook of the Psychology of Appearance* (pp. 114-123). London: Oxford University Press.
- Tantleff-Dunn, S., & Gokee, J. L. (2004). Interpersonal influences on body image development. In T. F. Cash & T. Pruzinsky (Eds.), *Body image: A handbook of theory, research, and clinical practice* (pp. 108-116). New York: Guilford Press.
- Teixeira, P. J., Going, S. B., Houtkooper, L. B., Cussler, E. C., Metcalfe, L. L., Blew, R. M., ... Lohman, T. G. (2006). Exercise motivation, eating, and body image variables as predictors of weight control. *Medicine and Science in Sports and Exercise*, 38(1), 179-188.
- Thompson, J. K., Covert, M. D., & Stormer, S. M. (1999). Body image, social comparison, and eating disturbance: a covariance structure modeling investigation. *The International Journal of Eating Disorders*, 26(1), 43-51.
- Wardle, J., & Cooke, L. (2005). The impact of obesity on psychological well-being. *Best Practice and Research: Clinical Endocrinology and Metabolism*, 19(3), 421-440. doi: 10.1016/j.beem.2005.04.006
- Wertheim, E., Paxton, S., & Blaney, S. (2009). Body image in girls. In L. Smolak & J. K. Thompson (Eds.), *Body image, eating disorders, and obesity in youth: Assessment, prevention, and treatment* (2nd ed.) (pp. 47-76). Washington DC: American Psychological Association.
- Wilksch, S. M., & Wade, T. D. (2009). Reduction of shape and weight concern in young adolescents: A 30-month controlled evaluation of a media literacy program. *Journal of the American Academy of Child and Adolescent Psychiatry*, 48(6), 652-661. doi: 10.1097/CHI.0b013e3181a1f559
- Yager, Z., Diedrichs, P. C., Ricciardelli, L. A., & Halliwell, E. (2013). What works in secondary schools? A systematic review of classroom-based body image programs. *Body Image*, 10(3), 271-281. doi: 10.1016/j.bodyim.2013.04.001



The performing of a secondary physical education department committed to the Portuguese physical education national curriculum

Adilson Marques^{1,2*}, Nuno Ferro³, João Martins^{3,4}, Francisco Carreiro da Costa^{1,4}

ORIGINAL ARTICLE

ABSTRACT

This study examined the performance of a secondary physical education (PE) department committed to the Portuguese PE National Curriculum. PE department head perceptions, PE teachers' educational beliefs, school and PE department characteristics, PE curriculum, and PE classes were analysed. The main goal set by PE teachers was to prepare students for an active and healthy lifestyle. PE teachers showed a shared commitment about what is important to teach and the best way to have an organized learning environment. They worked as a team, focusing their teaching in students' learning. They showed high expectations, believing that students can succeed, which suggested a strong moral purpose. Teachers share different PE values orientations, however, students engaged in MVPA for more than 50% of the available class time. This reflected the teachers' collective compromise to follow the same PE objectives, along with making students' interests a top priority. To promote teamwork and coherent curricular decisions, as well as good educational practices in a school, the PE department is probably a crucial component to providing a positive learning environment.

Keywords: physical education department, health promotion, physical education

INTRODUCTION

The role of schools and physical education (PE) in the promotion of an active and healthy lifestyle has been largely recognized (Pate et al., 2006; Sallis & McKenzie, 1991; Sallis et al., 2012). It has been stated that if PE intends to promote an active and healthy lifestyle the main goals should be for the students to take part in appropriate amounts of physical activity (PA) during class time, and to become equipped with the knowledge, attitudes and physical skills to be active outside school and throughout life (MacNamara et al., 2011; Simons-Morton, 1994).

In spite of this recognition, research examining PE classes has consistently shown that students spend a limited amount of time engaged in moderate-to-vigorous PA (MVPA) (Fairclough & Stratton, 2006a; Scraggs et al., 2003), and students' knowledge and conceptions of fitness concepts are narrow, vague, and often inaccurate (Keating et al., 2009; Marques,

Martins, Sarmiento, Rocha, & Carreiro da Costa, 2015; Stewart & Mitchell, 2003). Moreover, studies concerned with the impact of PE on the practice of PA show that PE has not been especially successful in PA facilitation (Piéron, Ruiz, & García Montes, 2008; Rikard & Banville, 2006). These findings support the opinion of those who argue that PE is inadequately educating young people (Haerens, Kirk, Cardon, & De Bourdeaudhuij, 2011).

Castelli and Rink (2003) carried out a study whose purpose was to compare high (HPS) and low (LPS) performing secondary PE programs. Using both quantitative and qualitative methods, this investigation examined reform efficacy, teacher perceptions, program characteristics, department and school characteristics, and facilitators and inhibitors, in four HPS and four LPS schools. Relationships between PE members were an aspect that has distinguished HPS and LPS schools. HPS

¹ Centro Interdisciplinar de Estudo da Performance Humana, Faculty of Human Kinetics, University of Lisbon, Lisbon, Portugal.

² Centro de Investigação em Saúde Pública, Escola Nacional de Saúde Pública, Nova University of Lisbon, Lisbon, Portugal.

³ Faculty of Human Kinetics, University of Lisbon, Lisbon, Portugal.

⁴ Faculty of Physical Education and Sports, Lusofona University of Humanities and Technologies, Lisbon, Portugal.

*Corresponding author: Faculty of Human Kinetics, University of Lisbon, Lisbon, Portugal, Estrada da Costa, 1499-002 Cruz-Quebrada, Portugal. Email: amarques@fmh.ulisboa.pt

department members have demonstrated positive relationships, by communicating effectively, and taking a team approach to planning and data collection, while LPS department members acted as individuals, and presented informal and procedural communication, even though teachers did not necessarily lack resources, planning time, or teacher development. These results are in line with the characteristics of effective schools (Sammons & Bakkum, 2011). Despite the diversity of indicators regarding school effectiveness, strong leadership and a shared vision (Fullan, 2001), positive learning environment, good team work and team coherence (Reynolds & Teddlie, 2000) are indicators that have largely been considered vital.

Despite widespread acknowledgment of the power of professional collaboration, the norm in most schools is teachers working in isolation (DuFour, 2011; Hargreaves, 1995). Thus, through separateness, teaching becomes a trial and error process whereby the individual must depend heavily on his or her own ability to grow and solve problems.

Considering that we know little about which PE department organization and functioning characteristics are related to a supportive PA climate in schools, the purpose of this study was to analyse the functioning of a PE department of a secondary school located among the top places of the Portuguese academic achievement ranking, committed to follow the Portuguese National Curriculum of Physical Education (NCPE) (Carreiro da Costa, 2005). PE department head perceptions, PE teachers' educational beliefs, school and PE department characteristics, PE curriculum, and PE classes were examined. Notes from school and PE documents were also considered.

METHOD

The study was carried out in a public secondary school during one academic year. The first author was a participant researcher, working among teachers, in the PE department, for more than 9 months. During this time: (a) the head of

the PE department was interviewed; (b) PE teachers were questioned; (c) PE classes, meetings, and the organization of extracurricular activities were observed; (d) formal and informal conversations were held; (e) and school and PE department documents were analysed. The main ideas from these observations and conversations were written and used as field notes. The study was conducted according to the ethical standards in sport and exercise science research (Harriss & Atkinson, 2009) and the protocol received approval from both the institutional review board of the Faculty of Human Kinetics and the Portuguese Minister of Education. Prior to the data collection, the school was contacted and the authorization to carry out the study was granted. Informed written consent was obtained from each participant, from the students the approval was obtained from their legal guardians.

Participants

The school, situated in an urban location, had 1100 students enrolled, and is considered a reference in the Portuguese educational context, being in the top position of the best schools in academic achievement. The school principal has been leading the school for several years, working in order to have a stable group of teachers, and by implementing strategies to improve students' academic achievement. The facilities for PE were good, and the PE department was known for teaching according to the NCPE. The PE department was comprised of 10 teachers (6 women, 4 men), ranging from 25 to 58 years of age. Their peers perceived PE teachers as competent professionals, each had a Master's degree, and their teaching experience varied from 1 to 35 years. Some of them were leaders of national associations related with PE and sport, and two of them were co-authors of the NCPE.

Instruments and Procedures

Aiming to identify conceptual and methodological options, and the organization of the PE department with respect to the NCPE guidelines, an interview was conducted with the

head of the department. The interview was focused on his PE philosophy and how he imparts these ideas to other PE teachers. Some specific aspects of the NCPE were discussed, namely, promoting healthy lifestyles, the organization of teachers' work, the quantity and quality of PA extracurricular activities provided, and his opinion about PE time allocation. The interview was semi-structured and lasted approximately 60 minutes. The interview was recorded and then transcribed verbatim.

To assess teachers' educational beliefs, and to analyse how these beliefs influence decisions regarding curriculum content, the shortened version of the Value Orientation Inventory (VOI) (Chen, Ennis, & Loftus, 1997), validated for the Portuguese population (Vieira, 2007) was applied to the PE teachers. Each teacher of the PE department received the shortened version of the VOI, and they were asked to complete and return it within one week. Teachers had to rank and order each of the five items within each of the 10 sets according to his/her priorities (5=highest priority; 1=lowest priority). The score for each value orientation was calculated by adding up the rankings for the items within each orientation, across the 10 sets. Therefore, each teacher completing the VOI produced five scores (i.e. one for each value orientation) which range from 10 to 50. Scores 0.6 standard deviation above the mean were considered to reflect a high priority, while scores 0.6 below the mean reflected a low priority; scores within 0.6 standard deviation of the mean were categorized as neutral (Ennis & Zhu, 1991).

PE classes were analysed by the first author through the System for Observing Fitness Instruction Time (SOFIT) (McKenzie, Sallis, & Nader, 1991). This system has demonstrated reliability, validity, and feasibility (Rowe, Mars, Schuldheisz, & Fox, 2004), and was selected for the study due to its inclusion of the factors of curricular context and teacher behaviour, as well as factors associated with health-related fitness (Kulinna, Silverman, & Keating, 2000). A total of 30 classes were observed (three classes led by each teacher). On a rotation basis, the PA levels of four randomly selected students (i.e. lying

down, sitting, standing, walking, very active), the lesson contexts in which they occurred (management, general knowledge, physical fitness knowledge, fitness activity, skill practice and scrimmage, game play, other), and teacher behaviour (i.e. promotes fitness, demonstrates fitness, instructs generally, manages, observes, other-task) were observed and coded throughout each lesson.

A wireless microphone linked to a headphone was used to better understand the teacher's verbal instructions. A tape recorder using pre-recorded audio tapes paces the observation time by using a standard 10-second observe/10-second record format. Data collection followed the same procedures used in previous studies (Kulinna et al., 2000; Rowe et al., 2004). Descriptive analysis and percentage occurrence of intervals were calculated for each SOFIT sub-category. The categories of walking and very active were combined to create a measure of time spent in MVPA.

Observer training was done with the use of videotaped lessons. Data collection only began after intra observer agreement exceeds 0.85 achieved for three classes of 45 minutes between two times separated by one week. The values recorded for the first, second and third classes were 87%, 88% and 92%, respectively. Intra observer agreement was calculated using the formula (agreements/observed intervals) x.100.

Heart rates (HR) of 40 students (4 associated with each PE teacher) were measured during three lessons. The students observed via the SOFIT were fitted with the HR telemeters (Polar Precision Performance SW Version 4.00.022) while changing into their PE uniforms. HR was recorded once every 5 seconds for the duration of the lessons, and total lesson time was equivalent to total recording HR time on the telemeter. Telemeters were set to begin recording when the teachers officially began the lessons, and were stopped at the end of lessons. The telemeters were then removed and data was downloaded for analysis. Based on previous work (Armstrong, 1998; Armstrong & Welsman, 2006), moderate activity (brisk walking) generates a HR of about 140 bpm. This value was used as a threshold to interpret the

HR data. Mean and standard deviation of HR in PE lessons were calculated. Additionally, percentage and time spent in HR ≥ 140 bpm were also calculated. Differences in lesson time spent in HR ≥ 140 bpm in 45- and 90-minute classes were analysed using paired-samples t test. Previously, exploratory analyses were conducted. Shapiro-Wilk test revealed that data was normally distributed, and subsequent Levene's test confirmed the data's homogeneity of variance.

A document analysis of current materials for the PE department was also conducted. Reviewed documents included the PE program of school adapted from NCPE, annual plans from all grades (7th to 12th), initial assessment protocol of all grades, a self-evaluation questionnaire to apply to students at the end of the academic year (7th to 12th), evaluation test to assess health-related knowledge for each grade, a questionnaire to assess if the NCPE was being followed in each grade, evaluation criteria for each grade, Fitnessgram protocol used at school, school sport guidelines, and the annual report of trainee teachers. Due to lack of space we will not present the results of the inductive content analysis.

RESULTS

Goals of PE, methodological guidelines and the organization of the PE department

The results consist of the interview with the head of the PE department, conversations with PE teachers, and notes taken during department meetings and from the documents analysed. The main goal set by the PE department was to prepare students for an active and healthy lifestyle. Teachers sought to do so through an eclectic program, teaching a variety of sports. They claimed that the sports contained within the NCPE could be transformed into tools to be used by students in order to become physically active, and to practice PA autonomously. The PE department head said:

“What is implicit and explicit in our decisions is related to the preparation of students for their entire life, promoting an active lifestyle. This is the basic premise of what we

propose to do. The question is how can we do that? Well, using the NCPE, which is an eclectic curriculum, we try to teach students a wide range of physical activities for students to use to practice PA autonomously.”

For both the head of the department and PE teachers, the NCPE was an important document that helped guide their practices. However, not all of the teachers had the preparation necessary to teach all of the sports that are part of the NCPE. For this reason, in order to be prepared and correctly teach the activities from the NCPE, teachers organize courses within the department, in which each teacher has the responsibility to train their colleagues, teaching them how to teach the sport activities in which they are specialists. If there was a gap, and no one was able to train others in some specific sport, the teachers either assumed the responsibility for attending courses outside the school, or a specialist was invited to come to the school to deliver a training course. Thus, at the beginning of each academic year, PE teachers expressed their difficulties and planned the training process. For instance, while the research was taking place, the PE department invited a specialist to deliver a practical course on teaching handball; and commissioned the Portuguese Federation of Badminton to facilitate training in the teaching of badminton. These training programs took place during the first months of classes, so that teachers were prepared to teach these sports.

The PE curriculum at the school has made up of three defined areas, as defined by the NCPE: (1) PA (which includes sports, dance and expressive rhythmic activities, traditional games, and outdoor recreation activities), (2) Knowledge (which includes the learning of the development and maintenance of physical fitness, and knowledge concerning the interpretation and participation in sport in a social perspective), and (3) Physical Fitness (where they develop physical capacities). The PE department head stated:

“The NCPE defined clearly three major guidelines for teaching. One is related to PA, and the aim is to teach students for them to be

able to practice regularly. The other has to do with theoretical knowledge to enable students to understand how important PA and fitness is to improve health. The third is physical fitness, and in each class students have to work to improve their fitness levels, because there is a relationship between fitness and health.”

The PE department head added that teachers were supposed to teach more than one PA in each PE lesson, sometimes at the same time, with students performing different tasks according to their needs. Teachers should use the class time to explain the objective of each exercise, allowing students to better understand the real purpose of each exercise.

Apart from the implementation of the NCPE, extracurricular activities have great importance in school, being represented in several forms. They could be tournaments (organized by students, in which students, staff and teachers all participate), school sports, or activities for parents and former students. In school sports, the school provides 6 activities, as can be seen in table 1.

Table 1

School sport activities provided by the school

Activity	Sessions per week	Mode
Expressive rhythmic activities	2	Recreation
Badminton	2	Competition
Korfball	2	Recreation
Futsal	2	Competition
Golf	2	Competition
Volleyball	4	Competition

The School sports were a complement to PE lessons, and were undertaken for a dual purpose. The first perspective was related to athletic performance. It was a space where students could compete with other students from other schools in a formal competition. The second role served to improve students' performance in sports in which they had more difficulties. It seems that school sports worked as a support for PE classes. For instance, this relationship between school sports and PE was the reason why the volleyball team had more hours to practice, and had more students enrolled, because teachers identified that most students had learning difficulties in this particular sport. Characterizing the school sports

activities, from the informal conversations, the head of the PE department stated:

“The school sports are a subsidiary of PE. We assume school sports in two different perspectives. The first is related with sports competition. The aim is to improve, but always using a formative approach. The other perspective, which is relatively recent in our school, is related to the sports in which students have difficulties in PE. In school, students play sports to practice and improve their performance. Naturally this will have a repercussion in PE marks at the end of the academic year. Sometimes we joke around with the parents; they send their kids to have extra lessons of mathematics outside school for them to achieve good marks, so we do the same in school sports to help them to achieve better marks in PE.”

With the intention to increase the educational opportunities for students to improve their motor skills in PE and physical fitness, the head of the department asked the school principal to allow more time to work with those students who had more difficulties. The request was granted. Every week more than 30 students (previously identified as having more difficulties) had an extra 45-minute, small-group PE session focused on physical fitness as well as the sport with which they were struggling.

PE teachers' value orientation

Data from VOI showed that teachers in the PE school department share different PE value orientations (table 2). Three teachers gave priority to the disciplinary mastery value orientation (T7, T8, T10); and three teachers gave priority to two value orientations, namely: T2 presented simultaneous preference to self-actualization and social reconstruction, T4 valued both self-actualization and ecological integration, and T9 favoured both the disciplinary mastery and social reconstruction orientation. T1 held mainly the social reconstruction value orientation, T3 gave priority to the learning process value orientation, and T6 gave priority to ecological integration. Finally, T5 showed a neutral value orientation.

Table 2
PE teachers' value orientations

	Disciplinary Mastery	Learning Process	Self-Actualization	Ecological Integration	Social Reconstruction
Teacher 1	Low priority (26)	Neutral (34)	Neutral (29)	Low priority (24)	High priority (37)
Teacher 2	Low priority (20)	Neutral (30)	High priority (40)	Neutral (24)	High priority (37)
Teacher 3	Neutral (37)	High priority (43)	Low priority (23)	Low priority (21)	Neutral (26)
Teacher 4	Low priority (27)	Neutral (30)	High priority (37)	High priority (29)	Neutral (25)
Teacher 5	Neutral (32)	Neutral (34)	Neutral (31)	Neutral (25)	Neutral (28)
Teacher 6	Neutral (39)	Neutral (29)	Neutral (30)	High priority (29)	Low priority (33)
Teacher 7	High priority (41)	Neutral (28)	Neutral (26)	Neutral (28)	Neutral (27)
Teacher 8	High priority (46)	Low priority (26)	Neutral (27)	Neutral (27)	Neutral (24)
Teacher 9	High priority (41)	Neutral (31)	Low priority (20)	Neutral (25)	High priority (33)
Teacher 10	High priority (44)	Neutral (33)	Neutral (29)	Neutral (28)	Low priority (16)
M±SD	35.30±8.64	31.80±4.71	29.20±5.96	26.20±2.53	27.30±6.11

Table 3
Percentage of lesson time for student activity, lesson context, and teacher behaviour

Category	Teachers (%)										M±SD	
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10		
Student activity	Lying down	2.9	0.9	0.1	0.0	0.6	1.4	0.1	0.5	0.0	0.0	0.7±0.9
	Sitting	9.1	12.7	11.7	21.4	19.3	9.3	8.6	15.7	6.5	11.4	12.6±4.8
	Standing	24.6	23.1	27.5	32.4	27.1	27.8	28.1	27.5	39.3	28.1	28.5±4.5
	Walking	37.0	37.2	30.8	32.8	34.1	31.1	33.7	35.4	34.5	37.2	34.4±2.4
	Very active	26.4	26.1	30.0	13.4	18.9	30.4	29.2	21.0	19.7	23.3	23.8±5.6
	MVPA	63.4	63.3	60.8	46.2	53.0	61.5	62.9	56.4	54.2	60.5	58.2±5.7
Lesson context	Management	20.9	22.6	24.2	29.3	17.2	24.6	22.3	21.1	23.2	12.7	22.4±4.4
	Physical fitness	0.3	3.6	8.4	2.0	8.1	2.7	6.0	3.7	1.7	1.5	3.9±2.8
	General knowledge	11.0	10.5	8.0	21.0	18.5	4.2	4.5	19.1	15.7	6.4	11.9±6.3
	Fitness	7.0	18.0	18.0	8.0	4.3	20.9	28.8	17.0	10.6	16.6	14.9±7.4
	Skill practice	21.1	15.9	3.4	3.4	24.2	10.9	12.0	30.1	24.8	19.3	16.5±9.1
	Game play	39.7	29.4	38.0	36.3	27.7	36.7	26.4	9.0	24.0	43.5	30.9±10.1
Teacher behaviour	Other	0.0	0.0	0.0	0.0	0.5	3.5	0.0	0.0	0.0	0.0	0.4±1.1
	Promoting fitness	3.0	16.2	21.5	12.2	6.8	20.1	21.4	14.2	7.6	5.6	12.8±6.9
	Demonstrating fitness	0.0	0.0	2.9	0.2	0.0	0.0	2.3	0.0	0.4	0.0	0.6±1.1
	General instruction	60.5	54.1	43.4	46.0	73.3	31.4	38.1	46.9	59.8	65.4	51.9±13.0
	Class management	22.0	25.0	23.6	27.8	17.2	25.7	19.1	30.7	29.1	17.2	23.7±4.8
	Observing	14.8	4.7	8.7	13.7	2.7	21.1	19.2	8.2	2.7	11.8	10.8±6.5
Off task	0.0	0.0	0.0	0.1	0.0	1.7	0.0	0.0	0.5	0.0	0.2±0.5	

PE classes

Table 3 represents the proportion of lesson time for the main SOFIT categories (student activity, lesson context, and teacher behaviour). Overall, students spent the majority of their lesson time walking (34.4%), which is classified as MPA, followed by standing (28.5%), and in VPA (23.8%). Students from nine teachers engaged in MVPA for more than 50% of the available time during the three lessons observed. Six of the teachers have offered more than 60% of MVPA. Only one teacher did not provide 50% or more of MVPA. The lesson activity time was mainly devoted to game play (30.9%), with

students generally performing without major intervention from the teacher, followed by time focused on management (22.4%). In most of the observed classes teachers taught more than on PA, and during time devoted to game play the students performed more than one sport. As for the activity time devoted to activities in which the major purpose was to improve the students' fitness in terms of cardiovascular endurance, strength, or flexibility, the average was 14.9% (ranging between 4.3% and 28.8%). Only 3.9% of the lesson time was centred on delivering information related to physical fitness. Through information gathered based on observation and

conversation with teachers, the lower time centred on information related to physical fitness was due to the fact that it was expected that the students had already acquired this knowledge because it had been mentioned frequently throughout the year (SOFIT data were collected near the end of the academic year). With respect to teacher behaviour, 51.9% of their time was spent providing general instruction, followed by class management (23.7%), matching with 22.4% in the category with the same name but belonging to the level of lesson content. Promoting fitness took 12.8% of the class time, and teachers spent only 0.6% demonstrating fitness. When teachers were asked about this value, they indicated that the students were already familiarized with most of the exercises.

HR monitoring

The intensity of the PA provided to students shows an average of 131.9 bpm, ranging from 117.3 to 142.5 bpm (table 5). The average duration of PE lessons was 74 minutes. Students engaged in MVPA for 30 minutes of lesson, which represents 40% of the lesson time. In the 45-minute lessons, students were 20.8±9.7 minutes with levels of HR below 140 bpm and 23±10.6 minutes above 140 bpm. In 90-minute lessons, the averages were 42.2±15.3 minutes below 140 bpm and 37±16.9 minutes above 140 bpm. According to paired-samples *t* test, there were no statistically significant differences in mean levels of HR between 45 and 90-minutes classes ($t(23)=1.477, p=0.153$). The average time in which students were engaged in activities with an intensity below and above 140 bpm was not significant in 45-minutes ($t(23)=-0.542, p=0.593$) and 90-minutes classes ($t(23)=1.253, p=0.223$).

Table 4
Heart rate measures

	Teachers (bpm)										M± SD
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	
Lesson 1	153.5	131.8	142.5	117.5	138.0	157.0	141.5	130.8	138.3	139.0	139.0±11.2
Lesson 2	141.8	133.5	133.5	133.0	141.8	154.3	125.0	109.0	132.0	136.8	130.3±10.6
Lesson 3	127.0	131.0	140.0	101.3	115.0	116.3	129.5	118.0	121.3	128.0	126.5±14.4
M±SD	140.8±13.3	132.1±1.3	138.7±4.6	117.3±15.9	131.6±14.5	142.5±22.8	132.0±8.5	119.3±11.0	130.5±8.6	134.6±5.8	131.9±8.3

Table 5
Heart rate values below and above 140 bpm

Teachers	Mean class time	HR below 140 bpm		HR above 140 bpm	
		% of lesson time	Minutes	% of lesson time	Minutes
T1	78	49.3	38	50.7	40
T2	64	56.0	36	44.0	28
T3	62	54.8	34	45.2	28
T4	68	77.0	53	23.0	16
T5	93	60.6	57	39.4	37
T6	94	50.6	47	49.4	46
T7	76	56.6	43	43.4	33
T8	50	79.9	40	20.1	10
T9	61	57.5	35	42.5	26
T10	89	60.4	54	39.6	35
Mean	74	60.3	44	40.0	30

DISCUSSION

This study analysed the functioning of a PE department of a secondary school focused on NCPE with respect to health and PA promotion. School PE teachers favoured an educational perspective of health-related PE (Johns & Tinning, 2006), and created an education climate that favoured the development of a

physically literate person (Castelli, Barcelona, & Bryant, 2015) by ensuring: (1) that students possessed the knowledge and motor skills to be able to value PA and (2) that they were able to design intentionally their PA and fitness exercises and practice, throughout their lives, in order to maintain and/or improve their health status.

The characteristics of the curriculum and the diversity of the PA entailed some difficulties for the teachers, because not all of them had the necessary preparation to teach all activities. To solve this situation, they organized a training plan, in which each teacher would teach their area of expertise to the other teachers. This attitude of the PE department clearly showed the importance they gave to the NCPE, while teaching the PA in a useful perspective so that, in the future, students could use what they have learned as a tool to practice PA autonomously. The way teachers organized the training plan, and planned the activities for the entire year, demonstrates that they work as a professional learning community (Hord, 1997; Schmoker, 2004). These types of communities are characterized by a shared vision and a focus on: collegiality, students' learning, individualizing the teaching process, and providing additional time for students with more difficulties.

Students engaged in MVPA for 58.2% of the lesson time. Only the students of one teacher did not reach 50% of lesson time in MVPA. On the other hand, six teachers have offered more than 60% of MVPA. This data was higher than those found in the literature (Fairclough & Stratton, 2006b; McKenzie, Marshall, Sallis, & Conway, 2000) and meets what is recommended for the PE class time (USDHHS, 2000). The fact that only one teacher had not achieved 50% of class time in MVPA takes on particular relevance when one considers that teachers don't share the same PE value orientations. This may reflect on the teachers' collective compromise to follow the same PE objectives, and valuing students' interests above all else. We also see the educational work characteristics of the school PE department, where the focus is on complying with the NCPE, and the principles and strategies to be employed to maximize the number of students engaged in active learning for the maximum amount of available time. These principles were successfully followed in the SPARK PE programs by non-PE specialist teachers, who have achieved the 50% MVPA goal in their lessons (McKenzie, Sallis, Kolody, & Faucette, 1997). This data seems to support

the recommendation that health-enhancing PA in PE should be deliberately planned (Fairclough & Stratton, 2005a, 2005b; Martin, Kulinna, Eklund, & Reed, 2001). The teachers' collective compromise to maximize students' time on task and to provide them with sufficient PA is probably a key ingredient to engaging students in MVPA and to avoid the influence of PE value orientations that do not support this goal.

Across all observed lessons most lesson time was apportioned to game play and skill practice, while teachers were giving general instructions. This addresses the knowledge and understanding, and motor skill development goals of PE. Apart from the time achieved in MVPA it could be said that, if time devoted to instruction was reduced, students could enhance their time in MVPA. Mersh and Fairclough (2010) indicated that when making judgments about PA and sedentary behaviour in PE time, it is important to do this in relation to the planned lesson objectives. If lesson segments designed to give instruction result in effective pedagogy, they should be viewed as a necessary part of PE and its potential to foster long-term positive PA attitudes and skills (Castelli & Rink, 2003; Cone, 2004). This means that active and inactive segments in PE classes, through enjoyable and motivating learning environments, are required to promote students' PA education by enhancing their knowledge and understanding (Brynteson & Adams, 1993; Dale, Corbin, & Cuddihy, 1998).

Regarding time devoted to management, teachers spent, on average, 22.4% of their total intervention on lesson context and 23.7% of their behaviour. Siedentop (1991) mentions that if classroom management time represents more than 20% of total intervention, it means that teachers faced some difficulties in organizing the class. Since most teachers are experienced, it is unlikely that they had difficulties. The high percentage of time devoted to classroom management was due to the diversity of activities that were taught in the same class. Several times, while some students were playing or practicing skills, teachers organized other students for another task. This explains why

both time devoted to management and MVPA were high.

According to the Portuguese education system, students from grades 7 to 9 have 135 minutes of PE per week, and students from grades 10 to 12 have 180 minutes. Schools have the autonomy to allocate this time as they want; in this school, students in grades 7 to 9 had a 45-minute plus a 90-minute class, and those who attended grades 10 to 12 had two 90-minute classes. Although the schools had the autonomy to allocate PE time, the NCPE recommends PE lessons of 45 minutes in order to provide students with a greater number of times to practice PA per week. PE teachers required that the PE time allocation should be as has been prescribed by the NCPE; however, their claim was not recognised by the school principal.

The results of comparative analysis between 45-minute and 90-minute classes showed no significant differences in mean levels of HR, suggesting that from a pedagogical viewpoint, both options are adequate and contribute to improved physical fitness. According to this data, the time allocated in a 45-minute class provided students with the opportunity to exercise at least three times a week. If we then add school sports, opportunities available for all students (free of charge), students could practice PA at least 5/6 times a week. This is almost sufficient to meet the youth PA recommendation (World Health Organization, 2010). It also demonstrates that schools can provide opportunities to help students to meet PA recommendation; PE and school sports play an important role.

Studies have found that teachers from secondary schools gave priority to social reconstruction value orientation, and delineating curricular goals for social responsibility, while disciplinary mastery value orientation was not favoured (Behets & Vergauwen, 2004; Ennis & Chen, 1995). These results are not in accordance with ours. Most of the PE teachers from the investigated school centred their attention on the contents of PE, appearing disciplinary mastery and ecological integration as the most valued value orientations. This may be the result

of the commitment of the PE department to promoting students' learning, teaching the PA from the NCPE, as well as preparing students to be fit, and acquire the knowledge that allows them to be autonomous.

Curriculum scholars argue that value orientations influence curricular decision-making and determine choices related to content, pedagogy, and assessment (Carreiro da Costa, 2005; Curtner-Smith & Meek, 2000; Ennis & Chen, 1995). This study has revealed that although teachers possess different value orientations, the goals for PE were similar in classes, as was the concern to provide high levels of intensity in these classes. We believed that the commitment expressed in the documents, and the collective work, contributed to minimize the individual differences. This demonstrates the importance of collective work and overlapping individual beliefs when the goal is promoting health-related PE.

CONCLUSION

The results seem to confirm the hypothesis that the diversity of educational beliefs shared by PE teachers in a school does not prevent them from pursuing common objectives. On the other hand, considering that a relationship between the belief system of the individual teachers and their teaching behaviours was not found, this result may become a valuable asset to argue that the importance given to the work climate characterizing the school PE department cannot be forgotten. This is especially pertinent as one considers a strategy aiming to improve the quality of PE and pupils' learning, specifically when the aim is optimizing the role of PE in PA (Solmon, 2015).

PE teachers showed a shared commitment about what is important to teach and how best to organize learning. They worked as a team, focusing their teaching in students' learning. They showed high expectations, believing that students can succeed. This suggests that they possess a strong moral purpose. They behave like an organized group whose members: 1) share a common goal, 2) wish to improve the quality of education, 3) have a desire to learn from each other, and 4) value contextualized and

collaborative professional learning. These characteristics are consistent with the literature about effective and better schools correlates (Lezotte & Snyder, 2011; Reynolds & Teddlie, 2000; Sammons & Bakkum, 2011) and are in line with the characteristics of the high performing secondary PE programs (Castelli & Rink, 2003). To promote teamwork and coherent curricular decisions, as well as good educational practices in a school, the PE department is probably a key determinant to provide a positive, motivating, and success-oriented learning environment with the potential to influence students' present and future participation in PA. Thus, PE teacher education programs have the responsibility to educate graduates that possess the ability to identify not only the correlates of better schools but also those of high PE programs, which value team work and are able to work accordingly, and assume that students' interests should take precedence over the differences that may exist in a PE department in relation to the aims of PE.

Acknowledgments:

Nothing to declare.

Conflict of interests:

Nothing to declare.

Funding:

Nothing to declare.

REFERENCES

- Armstrong, N. (1998). Young people's physical activity patterns as assessed by heart rate monitoring. *Journal of Sports Science and Medicine*, 16(Suppl. 1), S9-16. doi: 10.1080/026404198366632
- Armstrong, N., & Welsman, J. (2006). The physical activity patterns of European youth with reference to methods of assessment. *Sports Medicine*, 36(12), 1067-1086. doi: 10.2165/00007256-200636120-00005
- Behets, D., & Vergauwen, L. (2004). Value orientations of elementary and secondary physical education teachers in Flanders. *Research Quarterly for Exercise and Sport*, 75(2), 156-164.
- Brynteson, P., & Adams, T. (1993). The effects of conceptually based Physical Education programs on attitudes and exercise habits of college alumni after 2 to 11 years of follow-up. *Research Quarterly for Exercise and Sport*, 64(2), 208-212. doi: 10.1080/02701367.1993.10608798
- Carreiro da Costa, F. (2005). Changing the curriculum does not mean changing practices at school: the impact of teachers beliefs on curriculum implementation. *The art and science of teaching in Physical Education and Sport*, 257-277.
- Castelli, D., Barcelona, J., & Bryant, L. (2015). Contextualizing physical literacy in the school environment: The challenges. *Journal of Sport and Health Science*, 4(3), 156-163. doi: 10.1016/j.jshs.2015.04.003
- Castelli, D., & Rink, J. (2003). Chapter 3: a comparison of high and low performing secondary Physical Education programs. *Journal of Teaching in Physical Education*, 22(5), 512-532. doi: 10.1123/jtpe.22.5.512
- Chen, A., Ennis, C. D., & Loftus, S. (1997). Refining the value orientation inventory. *Research Quarterly for Exercise and Sport*, 68(4), 352-356. doi: 10.1080/02701367.1997.10608016
- Cone, S. (2004). Pay me now or pay me later: 10 years later and have seen any change? *Journal of Teaching in Physical Education*, 23(4), 271-280. doi: 10.1123/jtpe.23.4.271
- Curtner-Smith, M., & Meek, G. (2000). Teachers' value orientations and their compatibility with National Curriculum for Physical Education. *European Physical Education Review*, 6(1), 27-45. doi: 10.1177/1356336X000061004
- Dale, D., Corbin, C., & Cuddihy, T. (1998). Can conceptual Physical Education promote physically active lifestyle? *Pediatric Exercise Science*, 10(2), 97-109. doi: 10.1123/pes.10.2.97
- DuFour, R. (2011). Work together: but only if you want to. *Phi Delta Kappan*, 92(5), 57-61. doi: 10.1177/003172171109200513
- Ennis, C. D., & Chen, A. (1995). Teachers' value orientations in urban and rural school settings. *Research Quarterly for Exercise and Sport*, 66(1), 41-50. doi: 10.1080/02701367.1995.10607654
- Ennis, C. D., & Zhu, W. (1991). Value orientations: A description of teachers' goals for student learning. *Research Quarterly for Exercise and Sport*, 62(1), 33-40. doi: 10.1080/02701367.1991.10607516
- Fairclough, S., & Stratton, G. (2005a). Improving health-enhancing physical activity in girls' physical education. *Health Educational Research*, 20(4), 448-457. doi: 10.1093/her/cyg137
- Fairclough, S., & Stratton, G. (2005b). 'Physical education makes you fit and healthy'. Physical education's contribution to young people's physical activity levels. *Health Educational Research*, 20(1), 14-23. doi: 10.1093/her/cyg101
- Fairclough, S., & Stratton, G. (2006a). Effects of a physical education intervention to improve student activity levels. *Physical Education and*

- Sport Pedagogy*, 11(1), 29-44. doi: 10.1080/17408980500467613
- Fairclough, S., & Stratton, G. (2006b). Physical activity, fitness, and affective responses of normal-weight and overweight adolescents during physical education. *Pediatric Exercise Science*, 18(1), 53-63. doi: 10.1123/pes.18.1.53
- Fullan, M. (2001). *Leading in a culture of change*. San Francisco: Jossey-Bass.
- Haerens, L., Kirk, D., Cardon, G., & De Bourdeaudhuij, I. (2011). Toward the development of a pedagogical model for health-based physical education. *Quest*, 63(3), 321-338. doi: 10.1080/00336297.2011.10483684
- Hargreaves, A. (1995). Development and desire. A post-modern perspective. In T. Guskey & M. Huberman (Eds.), *Professional development in education: New paradigms and perspectives* (pp. 9-34). New York: Teachers College Press.
- Harriss, D. J., & Atkinson, G. (2009). International Journal of Sports Medicine - ethical standards in sport and exercise science research. *International Journal of Sports Medicine*, 30(10), 701-702. doi: 10.1055/s-0029-1237378
- Hord, S. (1997). Professional learning communities: What are they and why are they important? *Issues about Change*, 1(6).
- Johns, D., & Tinning, R. (2006). Risk reduction: recontextualizing health as a physical education curriculum. *Quest*, 58(4), 395-409. doi: 10.1080/00336297.2006.10491890
- Keating, X., Harrison, L., Chen, L., Xiang, P., Lambdin, D., Dauenhauer, B., ...Castro-Pinero, J. (2009). An analysis of research on student health-related fitness knowledge in K-16 Physical Education programs. *Journal of Teaching in Physical Education*, 28(3), 333-349. doi: 10.1123/jtpe.28.3.333
- Kulinna, P., Silverman, S., & Keating, X. (2000). Relationships between teachers' belief systems and actions toward teaching physical activity and fitness. *Journal of Teaching in Physical Education*, 19(2), 206-221. doi: 10.1123/jtpe.19.2.206
- Lezotte, L. W., & Snyder, K. M. (2011). *What effective schools do: Re-envisioning the correlates*. Bloomington, In Solution Tree Press.
- MacNamara, A., Collins, D., Bailey, R., Toms, M., Ford, P., & Pearce, G. (2011). Promoting lifelong physical activity and high level performance: realising an achievable aim for physical education. *Physical Education and Sport Pedagogy*, 16(3), 265-278. doi: 10.1080/17408989.2010.535200
- Marques, A., Martins, J., Sarmento, H., Rocha, L., & Carreiro da Costa, F. (2015). Do students know the physical activity recommendations for health promotion? *Journal of Physical Activity and Health*, 12(2), 253-256. doi: 10.1123/jpah.2013-0228
- Martin, J., Kulinna, P., Eklund, R., & Reed, B. (2001). Determinants of teachers' intentions to teach physically active Physical Education classes. *Journal of Teaching in Physical Education*, 20(2), 129-143. doi: 10.1123/jtpe.20.2.129
- McKenzie, T., Marshall, S., Sallis, J., & Conway, T. (2000). Student activity levels, lesson context, and teacher behavior during middle school physical education. *Research Quarterly for Exercise and Sport*, 71(3), 249-259. doi: 10.1080/02701367.2000.10608905
- McKenzie, T., Sallis, J., Kolody, B., & Faucette, F. (1997). Long-term effects of a physical education curriculum and staff development program: SPARK. *Research Quarterly for Exercise and Sport*, 68(4), 280-291. doi: 10.1080/02701367.1997.10608009
- McKenzie, T., Sallis, J., & Nader, P. (1991). SOFIT: System for Observing Fitness Instruction Time. *Journal of Teaching in Physical Education*, 11(2), 195-205. doi: 10.1123/jtpe.11.2.195
- Mersh, R., & Fairclough, S. (2010). Physical activity, lesson context and teacher behaviours within the revised English National Curriculum for Physical Education: A case study of one school. *European Physical Education Review*, 16(1), 29-45. doi: 10.1177/1356336X10369199
- Pate, R. R., Davis, M. G., Robinson, T. N., Stone, E. J., McKenzie, T. L., Young, J. C., . . . Council on Cardiovascular, N. (2006). Promoting physical activity in children and youth: a leadership role for schools: a scientific statement from the American Heart Association Council on Nutrition, Physical Activity, and Metabolism (Physical Activity Committee) in collaboration with the Councils on Cardiovascular Disease in the Young and Cardiovascular Nursing. *Circulation*, 114(11), 1214-1224.
- Piéron, M., Ruiz, F., & García Montes, H. (2008). La opinión del alumnado de enseñanza secundaria sobre las clases de Educación Física: Un desafío para los profesores y los formadores. *Revista Fuentes*, 8, 159-175.
- Reynolds, D., & Teddlie, C. (2000). The process of school effectiveness. In C. Teddlie & D. Reynolds (Eds.), *The international handbook of school effectiveness research* (pp. 134-159). London: Falmer Press.
- Rikard, G., & Banville, D. (2006). High school student attitudes about Physical Education. *Sport, Education and Society*, 11(4), 385-400. doi: 10.1080/13573320600924882
- Rowe, P., Mars, H., Schuldheisz, J., & Fox, S. (2004). Measuring students' physical activity levels: validating SOFIT for use with high-school students. *Journal of Teaching in Physical Education*, 23, 235-251. doi: 10.1123/jtpe.23.3.235
- Sallis, J. F., & McKenzie, T. L. (1991). Physical education's role in public health. *Research quarterly for exercise and sport*, 62(2), 124-137. doi: 10.1080/02701367.1991.10608701
- Sallis, J. F., McKenzie, T. L., Beets, M. W., Beighle, A., Erwin, H., & Lee, S. (2012). Physical education's role in public health: steps forward and backward over 20 years and HOPE for the

- future. *Research Quarterly for Exercise and Sport*, 83(2), 125-135. doi: 10.1080/02701367.2012.10599842
- Sammons, P., & Bakkum, L. (2011). Effective schools, equity and teacher effectiveness: a review to the literature. *Revista de Currículo y Formación del Profesorado*, 15(3), 9-26.
- Schmoker, M. (2004). Tipping point: From feckless reform to substantive instructional improvement. *Phi Delta Kappan*, 85(6), 424-432. doi: 10.1177/003172170408500605
- Scruggs, P., Beveridge, S., Eisenman, P., Watson, L., Shultz, S., & Ransdell, L. (2003). Quantifying physical activity via pedometry in elementary Physical Education. *Medicine & Science in Sport & Exercise*, 35(6), 1065-1071. doi: 10.1249/01.MSS.0000069748.02525.B2
- Siedentop, D. (1991). *Developing Teaching Skills in Physical Education*. Mountain View: Mayfield Publishing Company.
- Simons-Morton, B. (1994). Implementing health-related physical education. In R. Pate & R. Hohn (Eds.), *Health and fitness through physical education* (pp. 137-146). Champaign, IL: Human Kinetics.
- Solmon, M. A. (2015). Optimizing the role of physical education in promoting physical activity: A social-ecological approach. *Research quarterly for exercise and sport*, 86(4), 329-337. doi: 10.1080/02701367.2015.1091712
- Stewart, S., & Mitchell, M. (2003). Instructional Variables and Student Knowledge and Conceptions of Fitness. *Journal of Teaching in Physical Education*, 22(5), 533-551. doi: 10.1123/jtpe.22.5.533
- USDHHS. United States Department of Health and Human Services. (2000). *Healthy People 2010: Understanding and improving health* (2nd ed.). Washington, DC: U.S. Government Printing Office.
- Vieira, F., & da Costa, F. C. (2007). *As orientações educacionais dos professores de educação física e o currículo institucional*. Instituto Piaget, Horizontes pedagógicos
- World Health Organization [WHO]. (2010). Global recommendations on physical activity for health. *World Health Organization*: Geneva, Switzerland.



All content of Journal **Motricidade** is licensed under [Creative Commons](https://creativecommons.org/licenses/by-nc/4.0/), except when otherwise specified and in content retrieved from other bibliographic sources.

The relationship between pedagogical practices with physical activity levels in classes of Physical Education

Ana Luisa Batista Santos¹, Luciana Fialho Rocha¹, Danielle Bezerra Sá¹, Felipe Nogueira Catunda¹, Ricardo Catunda^{1,2*}

ORIGINAL ARTICLE

ABSTRACT

Socioeconomic status (family income that may affect access to healthy nutrition, culture, sports, leisure, and health), repressive family and school environments with inappropriate or demotivating teaching methods are among various factors which influence the nonadherence to physical activity, contributing for a sedentary lifestyle. The difficulty of access to sports and leisure brings up one of the major problems in education and public health, the impairment of physical inactivity in children and adolescents. This study aims to analyze pedagogical practices developed in Physical Education classes and its consequences on the students level of physical activity. The research is quantitative with experimental character which included two public schools of Ceará. The sample was consisted of 2 teachers and 6 students from each school. The instrument used in 96 observations was the System for Observing Fitness Instruction Time. The results demonstrate the need for a joint effort between the school management and teachers of Physical Education to develop strategies that facilitate and promote the adoption of physically active lifestyle by the students.

Keywords: physical education and training, school health, health promotion.

INTRODUCTION

The level of physical activity may be influenced by internal and external factors, such as: psychological factors (low self-esteem, shyness, anxiety), physiological (growth deficit) and motor (motor coordination deficit); socioeconomic level (family income which can affect access to healthy nutrition, culture, sports, leisure, and health), repressive family environments, and school environment with inadequate or demotivating teaching methods, contributing to low levels of populational physical activity. Therefore, it is possible to mention the number of barriers that hamper engagement of schoolchildren in regular physical activity practices (Hearst et al., 2012).

A nationwide survey of 9th grade students from public and private schools found that only 43.1% of Brazilian adolescents are physically active, with boys more active than girls; as well as adolescents with more educated mothers are also more active. In this context of physical

inactivity, a meta-analysis found that the north-eastern region is one of the areas with the highest numbers of physically inactive youths, and 79.2% are exposed to sedentary behaviour (Barufaldi et al., 2012).

The limited access to sports and leisure brings to light one of the problems with great repercussion in the area of education and public health, the impairment of physical inactivity in children and adolescents. A study conducted in New Zealand has indicated children who go to school using motorized transport are more sedentary in their daily activities than those who move actively (going to school on foot or by bicycle), and emphasized knowledge of associated factors to sedentary lifestyle is relevant for the elaboration of strategies which aim to increase levels of physical activity practice (Hinckson et al., 2014).

The increase of physically inactive individuals is due, in part, to the access to physical exercise practices restricted to Physical Education classes

¹ State University of Ceará, Center for Research on Physical Activity in School (NIAFE/CNPq), Fortaleza, Brazil.

² Faculty of Human Kinetics, University of Lisbon, Lisbon, Portugal.

* Corresponding author: State University of Ceará, Dr. Silas Munguba Av., 1700, Campus do Itaperi, 60714-903, Fortaleza, Brazil. Email: ricardo.catunda@uece.br

at school. The raised discussions around the study of physical education as a compulsory curricular component, as well as the organized selection of contents to be worked, has been widely established over the years (Barroso & Darido, 2009). Thereby, Physical Education is characterized as a singular discipline, being the unique to directly promote health and several languages of human movement, through the teaching of an active and healthy lifestyle. The pedagogical practice adopted by the teacher in classes may reflect on behaviour, attitude and, considerably, on students' level of learning.

In order to promote students behavioural change through the reflection of pedagogical practices used in Physical Education classes, teacher must involve them in the construction of learning process, with creativity and autonomy, facilitating the development of social skills.

Considering the pertinence of this theme for teachers, regarding to the evaluation of teaching methodologies adopted, the present study seeks to analyse pedagogical practices developed in Physical Education classes and its consequences in the level of students' physical activity. Whereas, the results of this behaviour can evaluate the quality of class performance referring to promotion of physically active lifestyle of students. Therefore, it is assumed that the results of this study will provide subsidies for Physical Education teachers about importance of planning and conducting classes which provide satisfactory levels of physical activity and approach health promotion in order to stimulate the adoption of a physically active lifestyle.

METHOD

It is a descriptive study with quantitative and experimental nature.

Participants

Two schools, which belonged to the Official Education Network and were maintained by the Government of the State of Ceará, participated in the study. They were located in communities with several challenges such as unemployment, prostitution, teenage pregnancy, lack of basic sanitation, insecurity, and few options for active

leisure. In addition, high disapproval rates and urban violence, lack of parental guidance, unmotivated students, fragile school-community interaction, requirement of continuing training for teachers were related by school managers and registered on field diary as obstacles to the development of quality education.

The structure for Physical Education classes at the experimental school counted on multi-sport gymnasium, sand court for beach volleyball, and rooms for theoretical and practical classes. The pedagogical material available to be used on classes was predominantly balls, directed to teaching of collective sports (volleyball, futsal, basketball, and handball). The control school followed the same pattern of the experimental school, with similar structure and pedagogical material, except for sand court availability. The choice of these schools was justified by the need to compare institutions and students with similar characteristics for the application of the intervention training program.

Four Physical Education teachers from both high school institutions were included in the study, who were 31.5 years and had professional experience of 3.2 years (average). They presented, in 50% of the sample, certification in graduated courses. The identity of the teachers was kept confidential, safeguarding their privacy. Thus, we standardized the identification as teachers P1 and P2 (experimental school), P3 and P4 (control school).

As inclusion criteria for participating teachers, we had: to be permanent teacher of the investigated schools, to teach Physical Education class for the students involved in the research, and to accept to participate in the research, allowing the observation of classes. Teachers P1 and P2 also agreed to participate in the training for the application of the intervention program of Physical Education.

The sample of students was consisted of 6 students from each school, who had an average of 15.5 (\pm 1.2) years of age, varying between the minimum of 13 and the maximum of 18 years.

Inclusion criteria for students were: to be enrolled, to attend regularly the school, and to be able to participate in Physical Education

classes. Exclusion criteria were: medical impediment for not participating regularly in Physical Education classes.

Instruments

The instrument used was the System for Observing Fitness Instruction Time (SOFIT). This system was used to analyse the curriculum in action and the quantity and quality of student activity, the context of the class and the teacher behaviour. It is an observation tool designed by McKenzie, Sallis, and Nader (1991). This observation system examines decision phases. The first phase refers to the activity of individual students and it is done through the observation of pre-selected students, determining their level of physical activity periodically. The second phase analyses the context of class, and the third phase observes the teacher behaviour. It is a technique of observation by interval recording during useful time of class. The behaviour is recorded in a specific datasheet created for this purpose. SOFIT enabled to compare the data about context of class, teacher behaviour, and students' level of physical activity during the classes of Physical Education.

We initially conducted training with the observers in order to develop their necessary skills for achieving results above the reference value (85%), which were assessed by the Bellack index to measure fidelity of the level of agreement. An observation and recording training was carried out with the use of filmed classes.

Procedures

An intervention program was developed only for experimental schoolteachers about teaching of physical fitness. Teachers from experimental group participated in theoretical exposition and practical experiences of the method to be worked with students for 29 days. After the training phase, teachers used the methodology developed during the program through the application of activities during three consecutive classes in each group surveyed, in order to allow a greater participation of students in the tasks. Content related to physical exercise and energy expenditure, muscular strength and flexibility,

health and quality of life and knowledge about the body with practical experiences of self-perception of body image were addressed. The objective was to assess if this intervention program would give better results in the experimental group.

For this pedagogical experience, the context of modified games was used during the application of intervention program to teachers (Light & Georgakis, 2008). In modified games, activity focuses on game and not on technical skills as in traditional approaches (Light, 2004). Classes begin with modified games, reducing skill requirements and allowing rules to be flexible, leading to greater participation of less skilled students.

It was observed low capacity of teachers to problematize in the game, raising questions in order to motivate students to presented solutions as teamwork. In playful situations provided by the game, students experienced motor, cooperative, collective experiences, and strategies in which interaction and effectiveness are facilitated by moderate initial complexity, enabling participation in accordance with their level of development. The use of modified games with simplified rules has the potential as a co-educational tool to increase levels of moderate to vigorous physical activity intensity (Van Acker et al., 2010), which corresponds to the physical activity guidelines in both gender, regardless of the context of class.

The theoretical exposition and practical experiences of the intervention program were conducted as a training system with the intention of guaranteeing that classes would be developed in accordance with the objectives outlined in this investigation. The application training occurred in four weeks, with eight meetings, being the orientation of work conducted out by the researcher.

The training sessions began with theoretical exposition on the discipline of Physical Education, body image, gender issues, teaching methodology, planning, and didactic decisions. Posteriorly, studies on the theme of modified games, levels of participation of adolescents in traditional classes and on the method of modified games were presented. Moreover,

invasion games were discussed and how they develop in teaching context in Physical Education classes.

From the third session, the practical experiences were applied. We used a group of high school students from the experimental school that did not participate in the research, with the same age of the groups investigated. Initially, the researcher assumed the conduction of the "training class", being filmed the session for later analysis and study with the teachers before assuming the class. It was done a step-by-step process which made possible for teachers to participate in each stage, discussing, positioning themselves, asking questions, and suggesting. The researcher payed attention to ensure that the understanding and learning of the conduction by the teachers were effective. Then, each teacher took over the class for a period, the researcher being attentive to the development of the activities and making notes for discussion with the teachers after the intervention.

For the next three sessions, it was agreed that each teacher would take a "training class", one teacher being an observer when the other was not driving the class. This procedure allowed them to make notes for a discussion at the end of each session. In the last session, an evaluation was made on teachers' understanding of modified games and a reflection on the perspective of student participation.

At the end of each class time was reserved for a moment of conversation, in which students were encouraged to talk about participation in the activity, positive and negative aspects, experiences on the theme of the day, relationship of the approach with everyday

practices, and expansion of knowledge, being this moment followed by the observers of the research group for later verification of information that deserved prominence in the study.

After the program for teachers, it was identified by trial that it was possible to start the application of the modified games technique and the theoretical approach of body image. It was requested that each teacher prepared three classes to be applied with the experimental group, enabling the observation of the classes using SOFIT as an instrument.

Statistical analysis

The data treatment was performed after a systematic organization and tabulation of collected data. For all the variables of the instrument, the descriptive statistics were calculated through percentages, mean, standard deviation, minimum, and maximum values. Quantitative data were processed using the Statistical Package for the Social Sciences (SPSS) version 22.

RESULTS & DISCUSSION

The results were obtained by observing the 4 teachers (2 from experimental school - P1 and P2; 2 from control school - P3 and P4) and 6 students from each school, before and after the intervention program, totalling 96 observations on the behaviour of teachers and students as well as context of classes through SOFIT.

Regarding the teacher behaviour in Physical Education classes, Table 1 presents its results before the application of intervention program.

Table 1

Behaviour of teacher in Physical Education classes before the application of intervention program

Category	Experimental school (%)			Control school (%)		
	P1	P2	Average	P3	P4	Average
Demonstration	3.2	2.8	3.0	0.4	3.1	1.8
General instruction	43.6	66.9	55.3	31	39.1	35.1
Organization	31.9	18.1	25.0	44.7	35.1	39.9
Observation	9.7	11.3	10.5	17.3	9.3	13.3
Physical fitness promotion	7.5	0.9	4.2	1.6	1.2	1.4
Other behaviours	4.1	0	2.1	5	12.2	8.6

It is evident that more than half of the time class of experimental school (E.S) was spent on

instruction, followed by a quarter of the class time in organization. If values are summed,

these behaviours account for more than 80% of the class time, which clearly shows possible problems in management of class time. Consequently, a reduced potential of learning time for the students, which corroborates the values presented for the students' behaviours. For the control school (C.S), the time lapse of organization consumed 39.9% of the class time, followed by 35.1% in general instruction. In both schools, a short time dedicated to promotion of physical fitness was identified (averages: E.S - 4.2%, C.S - 1.4%), when compared to the time used for instruction, organization and observation.

It was observed that students used class time to organize their personal objects, to use the bathroom, to hydrate themselves and to go from the classroom to the gymnasium (in the two schools the distance classroom/gymnasium is approximately 30 meters). On the way, there was dispersion for indiscipline. In addition to the time spent on the way, upon arriving at the gymnasium, the teacher still had to organize the materials to be used in class. Before starting, teachers also had to solve problems of students who did not want to participate in class for various reasons (illness, demotivation, dislike of activities, not wanting to sweat and return to the room, absence of changing rooms, choosing to stay seating on the bleacher using the cell phone and chatting).

The excess of time used to organize the class goes against the recommendations of Almeida and Franco (2011), who recommend that physical education classes should have a greater time dedicated to the practice (of physical activity) in order to effectively promote teaching and learning. Therefore, it is extremely important that the teacher knows how to manage class time and potentiate learning. Other essential elements for an effective physical education are the planning, development, revision and re-arrangement of the pedagogical work. Table 1 shows the exactly the opposite in which: teachers have difficulties in management of class time, since the highest frequencies were found in behaviours of instruction and organization.

Lima (2012) found similar problems to the present study when he reiterates that the physical education teacher, in his pedagogical practice at school, faces several challenges that hinder his effective performance. The devaluation of physical education, salary precariousness, insufficiency of physical spaces, and material resources are some of the adversities found in the teachers' daily life which interfere in the development of classes and on their work as a whole.

After the intervention program was carried out, the results of the teacher's behaviour took a new configuration, as can be seen in Table 2.

Table 2

Behaviour of teacher in Physical Education classes after the application of intervention program

Category	Experimental school (%)			Control school (%)		
	P1	P2	Average	P3	P4	Average
Demonstration	3.9	8.0	6.0	0.8	0	0.4
General instruction	37.2	36.6	36.9	31	48.2	39.6
Organization	27.8	19.5	23.7	41.7	21.7	31.7
Observation	18.3	18.7	18.5	18.9	21.9	20.4
Physical fitness promotion	4.1	4.4	4.3	0	0	0.0
Other behaviours	8.7	12.8	10.8	7.6	8.2	7.9

For the experimental school, there was a reduction of instruction time, going from 55.3% to 36.9%, with similar values among teachers. There was also a brief reduction in organization time (23.7%) and increase in demonstration time, which was more pronounced in P2. The promotion of physical fitness showed little change, with averages. The time that the

teachers dedicated to observation was 18,5% of the class. The other behaviours increased from 2.1% to 10.8%, which shows, as previously mentioned, possible unpredicted behaviours in the lesson plan. In the classes of control school, the most common behaviours of teachers were dedicated to general instruction (39.6%), organization (31.7%), and observation (20.4%).

There was no record of any behaviour dedicated to promotion of physical fitness.

A survey carried out with physical education teachers from municipal schools of Porto Alegre (RS) verified that number of classes, excessive number of students to assist, number of hours dedicated to pedagogical practice, lack of time for qualification, affects both qualities of personal and professional teachers lives. It was also observed that classes are applied in open spaces, constantly subject to the interruption of parents and other individuals who are present in these spaces, which impairs the concentration of students and makes difficult the pedagogical practice of the teacher, reflecting on the class development (Santini & Molina Neto, 2005). These findings contribute to the understanding of data in the table 2 that presents the insufficiency of contents about physical fitness promotion, which must be part of the didactic-pedagogical structure of physical education classes.

For many physical education teachers, this school culture has become comfortable and ensured (Darido & Neto, 2005). For others, the feeling of conflict and impotence is still frequent. Some analyse these situations as obstacles in the development of pedagogical proposals that, for a long time, have been constructing a de-motivating school culture for both teacher and student. However, the physical education teachers must fulfil the duties of educator, promoting the empowerment of students who can help them to find strategies to improve the quality of teaching.

The organizational model adopted by schools should be considered, since it adds elements inherent to the teachers' behaviour. Therefore, it is pertinent highlight that the status of Physical Education in the schools studied is influenced by

the commitment and the motivational capacity teachers, being evident in the difference of students' involvement with the discipline. The experimental school follows the annual content plan, but the applied strategy is not very dynamic, which leads the students to a low participation. On the other hand, the control school does not follow the pre-established content program in the pedagogical project, which makes classes a time of recreation and improvisation, lacking continuity and progression in teaching. Even so, there is a good participation of the students, because they use a lot of games.

In view of the exposed context of planning/monotonous classes/low participation and improvisation/dynamic classes/high participation, it can be considered that the planning of the experimental school needs to be elaborated considering the students' demand, which in this case calls for greater dynamism in class. While in control school, must be implemented a planning that promotes the progression of teaching. The management of class time directed to the theoretical and practical approach to physical fitness must be improved in both schools.

Since school is a prominent place for promotion of physical fitness, physical education must create a pedagogical project that reaches the majority of students and motivates them to participate in classes through the development of dynamic classes with greater time destined to physical fitness, showing the benefits of physical activity for health promotion and enhancing situations of encouragement to the adoption of an active lifestyle (Gaya et al., 2012).

Regarding the class context, Table 3 shows the data obtained before the intervention program was applied.

Table 3
Context of Physical Education classes before the application of intervention program

Category	Experimental school (%)			Control school (%)		
	P1	P2	Average	P3	P4	Average
Physical fitness	37.9	19.2	28.6	7.3	14.9	11.1
Game	0	0	0	42.8	27.4	35.1
Knowledge transmission	31.3	57.6	44.5	20.0	18.3	19.2
General information	28.1	11.6	19.9	18.3	24.9	21.6
Exercises	0.8	3.7	2.3	11.4	13.6	12.5
Others	1.9	17.9	4.9	0.2	0.9	0.6

The highest frequencies of experimental school were related to transmission of knowledge (44.5%), to physical fitness (through exercises and teacher demonstration) (28.6%), and to general information (19.9%). Between the two teachers, in the 3 classes observed of each one, there was no record regarding the practice of games. For the control school, unlike the experimental school, most of the class time was dedicated to games (35.1%), followed by general information (21.6%), and knowledge transmission (19.2%). It is worth mentioning that the time spent for physical fitness was only 11.1%.

The results of class context after the intervention program are presented in Table 4, which shows some changes in the experimental school related to the categories: games and physical exercises.

In the experimental school, a reduction in the amount of class time spent on knowledge transmission (44.5% vs. 21.9%) was verified, which was transferred to games (21.9%) and to exercises (14%) that also can be used to increase the level of physical activity achieved in physical education classes.

Table 4

Context of Physical Education classes after the application of intervention program

Category	Experimental school (%)			Control school (%)		
	P1	P2	Average	P3	P4	Average
Physical fitness	14.9	15.5	15.2	21.0	7.5	14.3
Game	20.9	22.9	21.9	40.5	49.8	45.2
Knowledge transmission	20.9	22.8	21.9	20.7	18.1	19.4
General information	21.4	24.2	22.8	17.8	21.8	19.8
Exercises	17.3	10.7	14.0	0	2.8	1.4
Others	4.6	3.9	4.3	0	0	0

Regarding to the students' level of physical activity in the classes of physical education, Table 5 presents the data of the students' behaviour, from experimental and control schools, before the intervention program.

The most common adolescents' behaviour in both groups was standing (52.7% and 62%). The categories, which characterize very active

and moderate to vigorous levels of physical activity also presented higher values in the control school, data previously mentioned about the greater participation of experimental school students. It is also pointed out that for the adolescent of the experimental school about a quarter of the class time was spent sitting.

Table 5

Student behaviour on Physical Education classes before the application of intervention program

Category	Experimental school (%)			Control school (%)		
	P1	P2	Average	P3	P4	Average
Lying down	5.5	0	2.8	0.4	0	0.2
Sitting	19.0	33.5	26.3	16.0	0.6	8.3
Standing	56.3	49.1	52.7	44.0	79.9	62.0
Walking	7.7	4.9	6.3	22.8	11.4	17.1
Very Active	11.5	12.5	12.0	16.8	8.1	12.5
Moderate to Vigorous ¹	19.2	17.4	18.3	39.6	19.4	29.5

¹ The behaviour moderate to vigorous is a sum of the time spent walking and in very active activity

The results of adolescents' behaviour after implementation of the intervention program are presented in Table 6.

For both schools, in about half of the class time the adolescents were standing, without locomotion (49.1% and 50%). The time spent in physical activity with moderate to vigorous

intensity was 35.6% and 29.8% of the class time for the experimental and control schools, respectively. It is worth emphasizing that there was a pronounced increase of class time spent in moderate to vigorous behaviour in the classes of both teachers from experimental school, which could be the result of the intervention program

effect. On the other hand, the same did not happen with the adolescents from control school.

Despite the recognition of physical fitness as a standard of physical conditioning capable of providing to the individual vigorous physical activity practice, which is analysed under aspects related to health and motor/sportive performance (Bouchard & Shepard, 1992). By analysing tables 5 and 6, it was verified the low frequencies related to class time in moderate to vigorous intensity physical activity, even with a slight increment of these values after the intervention program and that, nevertheless, do not exceed the numbers related to the class time in which the adolescents were standing, without locomotion. These findings explain the lack of planned and dynamically implemented interventions aimed at increasing levels of physical activity among schoolchildren.

Even though, there are still few studies in Brazil that deal with the effectiveness of physical education in school and level of physical activity

promoted in its classes. Some investigations with children and adolescents observed positive results of physical education classes in reducing physical inactivity and improving body composition in schoolchildren (Azevedo Jr, Araújo, & Pereira, 2006; Cunha, 2002; Farias et al., 2009; Hallal et al., 2011; Menezes et al., 2006; Ribeiro & Florindo, 2010).

Therefore, it is suggested the modification of the pedagogical practices evaluated in this study, since it was observed difficulty in the management of class time directed to health promotion, class contexts guided in the transmission of knowledge and in the game, besides students with low levels of physical activity. It is worth reinforcing that the challenge to be faced by teachers exceed the scope of the classroom/gymnasium, since in addition to these, other influencing factors, such as socioeconomic aspects of students and school structure, may be interfering in the low participation of students in class.

Table 6

Student behaviour on Physical Education classes after the application of intervention program

Category	Experimental school (%)			Control school (%)		
	P1	P2	Average	P3	P4	Average
Lying down	0.5	1.2	0.9	0	0	0
Sitting	15.8	13.1	14.5	35.6	4.9	20.3
Standing	45.6	52.5	49.1	31.3	68.6	50.0
Walking	17.4	15.1	16.3	20.3	15.6	18.0
Very Active	20.7	18.1	19.4	12.8	10.9	11.9
Moderate to Vigorous ¹	38.1	33.1	35.6	33.1	26.5	29.8

¹ The behaviour moderate to vigorous is a sum of the time spent walking and in very active activity

CONCLUSION

It was concluded that the study answers the proposed objectives, once it was verified that pedagogical practices adopted by teachers were not enough to make students to reach satisfied physical activity levels. Therefore, the necessity of a joint effort between school management and teachers of Physical Education in order to develop strategies to facilitate and promote the physically active lifestyle by students must be evidenced. Once, debate about Physical Education at school and promotion of physical activity and health is current and with extreme relevance.

Acknowledgments:

Nothing to declare.

Conflict of interests:

Nothing to declare.

Funding:

Nothing to declare.

REFERENCES

- Almeida, F. J., & Franco, M. G. (2011). *Avaliação para aprendizagem: o processo avaliativo para melhorar o desempenho dos alunos*. São Paulo: ática educadores.

- Azevedo Jr, M. R., Araújo, C. L. P., Pereira, F. M. (2006) Atividades físicas e esportivas na adolescência: mudanças de preferências ao longo das últimas décadas. *Revista Brasileira de Educação Física e Esportes*, 20(1), 51-58. <http://dx.doi.org/10.1590/S1807-55092006000100005>
- Barroso, A. L. R., & Darido, S. C. (2009) A pedagogia do esporte e as dimensões dos conteúdos: conceitual, procedimental e atitudinal. *Revista da Educação Física*, 20(2), 281-289. <http://dx.doi.org/10.4025/reveducfis.v20i2.3884>
- Barufaldi, L. A., Abreu, G. de A., Coutinho, E. S. F., & Bloch, K. V. (2012). Meta-analysis of the prevalence of physical inactivity among Brazilian adolescents. *Cadernos de Saúde Pública*, 28(6), 1019-1032. <https://doi.org/10.1590/S0102-311X2012000600002>
- Bouchard, C., & Shepard, R. J. (1992). Physical Activity, fitness, and health: the model and key concepts. In: Bouchard, C., Sheppard, R. J., & Stephens, T. (Eds.), *Physical Activity, fitness, and health: international proceedings and consensus statement*. Champaign, IL: *Human Kinetics*.
- Cunha, C. T. (2002). *Impacto do programa educativo no gasto energético de escolares nas aulas de educação física: ensaio randomizado controlado* (Dissertação de mestrado). Universidade Federal de São Paulo, São Paulo.
- Darido, S. C., & Neto, L. S. (2005). O contexto da educação física na escola. In: Darido, S. C., & Rangel, I. C. A. (Coord.), *Educação Física na escola: implicações para a prática pedagógica*. Guanabara: Koogan.
- Farias, E. S., Paula, F., Carvalho, W. R. G., Gonçalves, E. M., Baldin, A. D., & Guerra-Júnior, G. (2009). Efeito da atividade física programada sobre a composição corporal em escolares adolescentes. *Jornal de Pediatria*, 85(1), 28-34. <https://doi.org/10.1590/S0021-75572009000100006>
- Gaya, A., Lemos, A., GAYA, A., Teixeira, D., Pinheiro, E., & Moreira, R. (2012). Manual de aplicação de medidas e teste, normas e critérios de avaliação. *Projeto Esporte Brasil (PROESP-Br)*. Porto Alegre: UFRGS.
- Hallal, P. C., Knuth, A. G., Cruz, D. K. A., & Malta, D. C. (2011). Monitoramento da prática de atividade física no Brasil. In: Avaliação de efetividade de programas de atividade física no Brasil. *Ministério da Saúde*.
- Hearst, M. O., Patnode, C. D., Sirard, J. R., Farbaksh, K., & Lytle, L. A. (2012). Multilevel predictors of adolescent physical activity: a longitudinal analysis. *International Journal of Behavioral Nutrition and Physical Activity*, 9(8). <https://doi.org/10.1186/1479-5868-9-8>
- Hinckson, E. A., McGrath, L., Hopkins, W., Oliver, M., Badland, H., Mavoa, S., ... Kearns, R. A. (2014). Distance to School is Associated with Sedentary Time in Children: Findings from the URBAN Study. *Frontiers in Public Health*, 2. <https://doi.org/10.3389/fpubh.2014.00151>
- Light, R., & Georgakis, S. (2008). Invasion Games in Physical Education: Assessing Knowledge-in-Action in using the Team Sport Assessment Procedure. In *Loughland T Proceedings of the Authentic Assessment Practices for Student Learning Conference* (pp. 35-50). Sydney.
- Light, R. (2004). Coaches experiences of game sense: opportunities and challenges. *Physical Education and Sport Pedagogy*, 9(2), 115-132. <http://dx.doi.org/10.1080/1740898042000294949>
- Lima, V. M. M. (2012) A complexidade da docência nos anos iniciais na escola pública. *Revista Nuances: um estudo sobre a educação*, 22 (23), 151-169. <http://dx.doi.org/10.14572/nuances.v22i23.1767>
- McKenzie, T., Sallis, J., & Nader, P. (1991). SOFIT: System for Observing Fitness Instruction Time. *Journal of Teaching in Physical Education*, 11(2), 195-205. <https://doi.org/10.1123/jtpe.11.2.195>
- Menezes, A., Assunção, M. C., Neutzling, M., Malcon, M., Hallal, P. C., Marques, A., ... Victora, C. (2006). Effectiveness of an education on smoking, diet and physical activity among adolescents. *Final report from the Federal University of Pelotas; Pelotas, Brazil*.
- Ribeiro, E. M. C., & Florindo, A. A. (2010). Efeitos de um programa de intervenção no nível de atividade física de adolescentes de escolas públicas de uma região de baixo nível socioeconômico: descrição dos métodos utilizados. *Revista Brasileira de Atividade Física e Saúde*, 15(1), 28-34. <http://dx.doi.org/10.12820/rbafs.v.15n1p28-34>
- Santini, J., & Molina Neto, V. (2005). A síndrome do esgotamento profissional em professores de educação física: um estudo na rede municipal de ensino de Porto Alegre. *Revista Brasileira de Educação Física e Esporte*, 19(3), 209-222. <http://dx.doi.org/10.1590/S1807-55092005000300004>
- Van Acker, R., Carreiro da Costa, F., Bourdeaudhuij, I., Cardon, G., & Haerens, L. (2010). Sex equity and physical activity levels in coeducational Physical Education: exploring the potential of modified game forms. *Physical Education and Sport Pedagogy*, 15(2), 159-173. <http://dx.doi.org/10.1080/17408980902877609>



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

Rafael Kanitz Braga^{1*}, Camilla Aparecida Franco de Lima¹, Samuel Jorge Moyses¹, Simone Tetu Moyses¹, Renata Iani Werneck¹

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

¹ Pontifical Catholic University of Paraná, Curitiba, Brazil.

* Corresponding author: Rua Ângelo Greca, 536, cs 2, 82630-145, Curitiba, Brazil. Email: rafael.braga@pucpr.br.

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 utilized 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

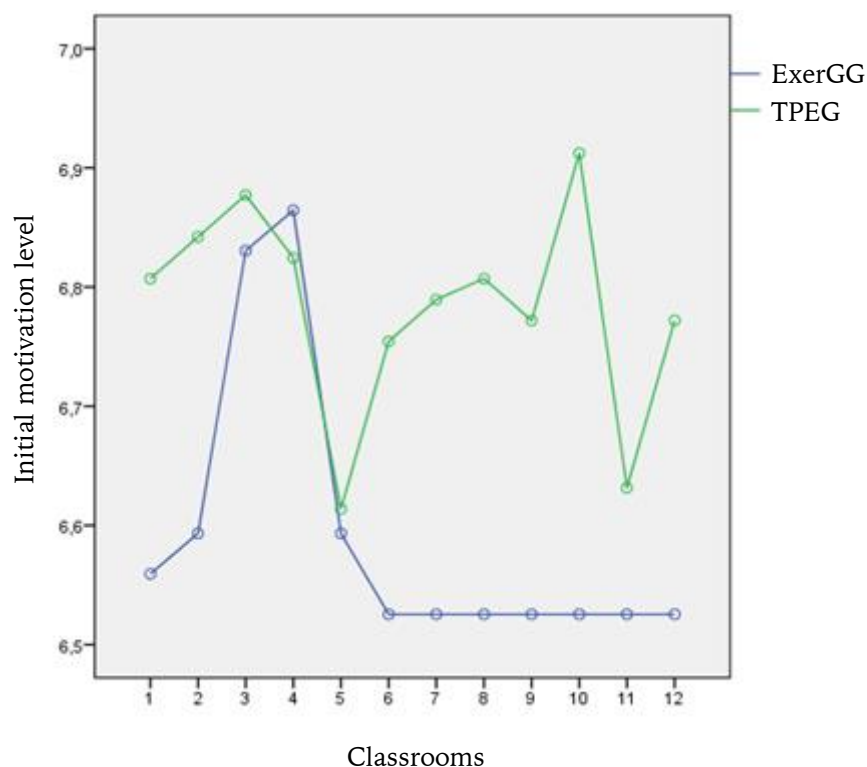
presented this type of motor activity in a higher percentage of the class. When observing the average time of the classes, the classes from the TPEG were significantly longer. Yet, even though the average time of the classes in the TPEG, when observing the accumulated percentage of the ExerGG in the 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

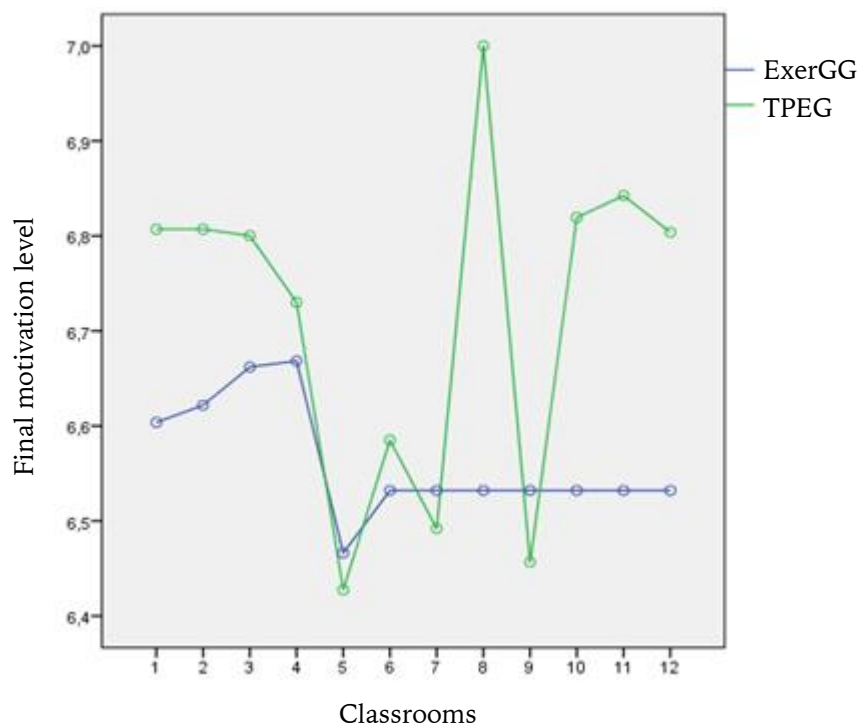
statistical analysis where no significant statistical difference in the initial motivation on the participants of each group during the evaluation period (p=0.090/ η² 0.15). Results

also evidence that during the evaluated period there were significant variance intra group on the variable initial motivation ($p=0.006/ \eta^2 0.26$). 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 ($p=0.095/ \eta^2 0.16$). Statics also evidence a significant difference between the average in the intra group comparison in TPEG and ExerGG ($p=0.006/ \eta^2 0.26$). Graphic 2 help us understand this difference that for TPEG happened among classes ($p=0.002/ \eta^2 0.26$) and for ExerGG occurred between classes 4 and 5 ($p=0.001/ \eta^2 0.38$).



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; Vagheti, 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.

Acknowledgments:

Nothing to declare.

Conflict of interests:

Nothing to declare.

Funding:

Nothing to declare.

REFERENCES

- Brasil. (2011). *Plano de ações estratégicas para o enfrentamento das doenças crônicas não transmissíveis (DCNT) no Brasil 2011-2022*. Ministério da Saúde, Secretaria de Vigilância em Saúde. Departamento de Análise de Situação de Saúde.
- Brasil. (2012). Política nacional de alimentação e nutrição. Secretaria de atenção à saúde. Departamento de atenção básica. *Brasília: Ministério da Saúde*.
- Csikszentmihalyi, M. (1990). *Flow. The Psychology of Optimal Experience*. New York (HarperPerennial).
- Duncan, B. B., Chor, D., Aquino, E. M. L. D., Benseñor, I. J. M., Mill, J. G., Schmidt, M. I., ... & Barreto, S. M. (2012). Doenças crônicas não transmissíveis no Brasil: prioridade para enfrentamento e investigação. *Revista de saúde pública*, 46(1), 126-134.
- ESPM. (2017). *Comportamento, consumo e tendências do gamer brasileiro*. Available in: <https://www.pesquisagamebrasil.com.br/>. Access: 08/05/2017.
- Epstein, L. H., Beecher, M. D., Graf, J. L., & Roemmich, J. N. (2007). Choice of interactive dance and bicycle games in overweight and nonoverweight youth. *Annals of Behavioral Medicine*, 33(2), 124-131. doi: 10.1007/BF02879893
- Finco, M. D., & Fraga, A. B. (2012). Rompendo fronteiras na Educação Física através dos videogames com interação corporal. *Motriz: Revista de Educação Física*, 18(3), 533-541. doi: 10.1590/S1980-65742012000300014
- Finco, M. D., Reategui, E. B., & Zaro, M. A. (2015). Laboratório de exergames: um espaço complementar para as aulas de educação física. *Movimento*, 21(3), 687-700.
- Finkelstein, S., Nickel, A., Lipps, Z., Barnes, T., Wartell, Z., & Suma, E. A. (2011). Astrojumper: Motivating exercise with an immersive virtual reality exergame. *Presence: Teleoperators and Virtual Environments*, 20(1), 78-92.
- Fogel, V. A., Miltenberger, R. G., Graves, R., & Koehler, S. (2010). The effects of exergaming on physical activity among inactive children in a physical education classroom. *Journal of applied behavior analysis*, 43(4), 591-600. doi: 10.1901/jaba.2010.43-591
- Gallahue, D. L., Ozmun, J. C., & Goodway, J. D. (2013). *Compreendendo o Desenvolvimento Motor: Bebês, Crianças, Adolescentes e Adultos* (7ª Ed.). Porto Alegre: ARTMED.
- Gao, Z., & Huang, C. (2012). Children's motivation, perceived exertion, and physical activity levels in exergaming. *Research Quarterly for Exercise and Sport*, 82(Suppl.1), 70-71.
- Gao, Z., Zhang, T., & Stodden, D. (2013). Children's physical activity levels and psychological correlates in interactive dance versus aerobic dance. *Journal of Sport and Health Science*, 2(3), 146-151. doi: 10.1016/j.jshs.2013.01.005
- Guy, S., Ratzki-Leewing, A., & Gwadry-Sridhar, F. (2011). Moving Beyond the Stigma: Systematic Review of Video Games and Their Potential to Combat Obesity. *International Journal of Hypertension*, 2011, Article ID 179124. <https://doi.org/10.4061/2011/179124>
- Hawkins, D. (2009). Using game equipment to teach. *Curriculum Review*, 48(6), 10-11.
- Hino, A. A. F., Rodriguez-Añez, C. R., & Reis, R. S. (2010). Validação do "SOFIT" para avaliação da atividade física em aulas de Educação Física em escolares do ensino médio. *Journal of Physical Education*, 21(2), 271-278. doi: 10.4025/reveducfis.v21i2.7739
- Kremer, M. M., Reichert, F. F., & Hallal, P. C. (2012). Intensidade e duração dos esforços físicos em aulas de Educação Física. *Revista de Saúde Pública*, 46(2), 320-326.
- Lamboglia, C. M. G. F., Silva, V. T. B. L. da, Filho, V., De, J. E., Pinheiro, M. H. N. P., Munguba, M. C. da S., ... Silva, C. A. B. da. (2013). Exergaming as a Strategic Tool in the Fight against Childhood Obesity: A Systematic Review. *Journal of Obesity*, 2013, Article ID 438364. <https://doi.org/10.1155/2013/438364>
- Lieberman, D. A. (2006). What Can We Learn From Playing Interactive Games? In P. Vorderer & J. Bryant (Eds.), *Playing video games: Motives, responses, and consequences* (pp. 379-397). Mahwah, NJ: Lawrence Erlbaum Associates
- Lieberman, D. A., Chamberlin, B., Medina, E., Franklin, B. A., Sanner, B. M., & Vafiadis, D. K. (2011). The power of play: innovations in getting active summit 2011. *Circulation*, 123(21), 2507-2516. doi: 10.1161/CIR.0b013e318219661d
- Maddison, R., Foley, L., Mhurchu, C. N., Jiang, Y., Jull, A., Prapavessis, H., ... & Rodgers, A. (2011). Effects of active video games on body composition: a randomized controlled trial. *The American journal of clinical nutrition*, 94(1), 156-163.
- Malta, D. C., & Silva Jr, J. B. D. (2014). Plano de Ações Estratégicas para o Enfrentamento das Doenças Crônicas Não Transmissíveis no Brasil após três anos de implantação, 2011-2013. *Epidemiologia e Serviços de Saúde*, 23(3), 389-395.
- Martins C. O., & Duarte, M. D. F. S. (1997). A influência da música na atividade física. *Revista Brasileira de Atividade Física & Saúde*, 2(4), 5-16.
- McCallum, S. (2012). Gamification and serious games for personalized health. *Studies in Health Technology and Informatics*, 177(2012), 85-96. doi: 10.3233/978-1-61499-069-7-85
- McKenzie, T. L., Sallis, J. F., & Nader, P. R. (1992). SOFIT: System for observing fitness instruction time. *Journal of teaching in physical Education*, 11(2), 195-205. doi: 10.1123/jtpe.11.2.195
- Organização pan-americana da saúde (2014). *Plano de ação para prevenção da obesidade em crianças e adolescentes*. Washington, D.C.

- Palma, N., & Ramos, J. L. (2013). Atividade física, obesidade e videogames ativos na Escola: estudo de hábitos e práticas de jogos em jovens do ensino básico e secundário. Presented at the Conferência da sociedade portuguesa de ciências dos videogames, Coimbra.
- Pereira, J. C., Rodrigues, M. E., Campos, H. O., & dos Santos Amorim, P. R. (2013). Exergames como alternativa para o aumento do dispêndio energético: uma revisão sistemática. *Revista Brasileira de Atividade Física & Saúde*, 17(5), 332-340.
- Santos, I. S. dos, & Vitoria, C. G. (2004). Serviços de saúde: epidemiologia, pesquisa e avaliação. *Cadernos de Saúde Pública*, 20, S337-S341. <https://doi.org/10.1590/S0102-311X2004000800027>
- Shayne, R. K., Fogel, V. A., Miltenberger, R. G., & Koehler, S. (2012). The effects of exergaming on physical activity in a third-grade physical education class. *Journal of applied behavior analysis*, 45(1), 211-215. doi: 10.1901/jaba.2012.45-211
- Sheehan, D., & Katz, L. (2012). The practical and theoretical implications of flow theory and intrinsic motivation in designing and implementing exergaming in the school environment. Loading... The Journal of the Canadian Game Studies Association, 6(9), 53-68.
- Sheehan, D. P., & Katz, L. (2012). The practical and theoretical implications of flow theory and intrinsic motivation in designing and implementing exergaming in the school environment. *Loading...*, 6(9), 53-68.
- Sheehan, D. P., & Katz, L. (2013). The effects of a daily, 6-week exergaming curriculum on balance in fourth grade children. *Journal of Sport and Health Science*, 2(3), 131-137. doi: 10.1016/j.jshs.2013.02.002
- Silva, L. S. da, Cotta, R. M. M., & Rosa, C. de O. B. (2013). Estratégias de promoção da saúde e prevenção primária para enfrentamento das doenças crônicas: revisão sistemática. *Revista Panamericana de Salud Pública*, 34, 343-350.
- Souza, M., Spessato, B., Coutinho, M., & Valentini, N. (2016). Estado nutricional, idade e sexo influenciam os níveis de atividade física de escolares? *Revista Brasileira de Atividade Física & Saúde*, 20(6), 598-607. doi: 10.12820/RBAFS.V.20N6P598
- Staiano, A. E., & Calvert, S. L. (2011). Exergames for physical education courses: Physical, social, and cognitive benefits. *Child development perspectives*, 5(2), 93-98.
- Sun, H. (2012). Exergaming impact on physical activity and interest in elementary school children. *Research quarterly for exercise and sport*, 83(2), 212-220.
- Sun, H. (2013). Impact of exergames on physical activity and motivation in elementary school students: A follow-up study. *Journal of Sport and Health Science*, 2(3), 138-145. doi: 10.1016/j.jshs.2013.02.003
- Thomas, J. R., Nelson, J. K., & Silverman, S. J. (2009). *Métodos de pesquisa em atividade física*. Artmed Editora.
- Vaghetti, C. A. O. (2013). *Exergames em rede: a Educação Física no cyberspace* (Tese de Doutorado em Educação em Ciência). Universidade Federal do Rio Grande, Rio Grande. Retrieved from <http://repositorio.furg.br/handle/1/4824>
- Vaghetti, C. A. O., Botelho, S. S. da C. (2010). Ambientes virtuais de aprendizagem na educação física: uma revisão sobre a utilização de Exergames. *Ciências & Cognição*, 15(1), 76-88.
- Vaghetti, C., Mustaro, P. N., & Botelho, S. D. C. (2011). Exergames no ciberespaço: uma possibilidade para Educação Física. In *Anais do X Simpósio Brasileiro de Jogos e Entretenimento Digital* (pp. 7-9). Salvador.
- Wiemeyer, J. (2010). Serious Games-The challenges for computer science in sport. *International Journal of Computer Science in Sport*, 9(SI), 67.
- Wu, P. T., Wu, W. L., & Chu, I. H. (2015). Energy Expenditure and Intensity in Healthy Young Adults during Exergaming. *American journal of health behavior*, 39(4), 556-561. doi: 10.5993/AJHB.39.4.12

