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Exercise Influence on Self-Concept, Self-Esteem and Academic Performance in Middle-School Children

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Abstract: Studies have highlighted the benefits of regular practice of exercise and a positive contribution in the development of cognitive function. Psychological benefits of exercise have been noticed in the academic performance increasing, the self-trust, the emotional stability, the memory and positive body image and well-being. This study had as main objective to analyse the impact of physical exercise in academic performance of middle-school students of a Portuguese public school. The number of participants consisted of a total of 107 students. Of these 107 students, 55 (51.4%) were males and 52 (48.6%) were female, aged between 10 and 12 years and mean ages =11.19 ± 0.81. A total of 41 children (38.3%) from the fifth grade and 66 children (61.7%) from the sixth grade were randomly selected. For data collection instrument, the scale of Self-concept of Susan Harter validated for the Portuguese population was used, where it was proceeded to a descriptive and inferential statistics data analysis to confront the mean levels of self-concept, in the fields of competence, social competence, athletic competence, physical appearance, behaviour conduct and global self-esteem. Results suggest that the practice of physical exercise for students increases the levels of self-concept, self-esteem and school performance of the students.

Keywords: *exercise; academic performance; self-concept; self-esteem; behaviour conduct.*

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Introduction

Society is currently in an Era where new technologies directly influence a child's daily life. Constant innovations in technology have led to changes in the lifestyles of student's communities, strongly reflecting the growth of a concept called sedentary lifestyle (Hamilton et al., 2007).

To get away from this new concept, it is necessary to implement a promotion of the practice of physical activity, highlighting the possibility of contributing to a significant increase in the quality of human life. The practice of physical activity can be considered as a form of leisure that seeks to restore the physical and mental health of practitioners, as it helps to reduce daily adversities (stress, excessive work or study, anxiety, depression), and that is associated with an improvement in people's quality of life (Silva et al., 2010). Physical activity and exercise, when moderate and regular, provides physical, psychological and social gains of high importance, as these significantly contribute to the general well-being of individuals of any age group (Barnea-Goraly, 2005). Regular and moderate physical activity and exercise has several psychological benefits and contributes to the increase of functional capacities and independent living, promoting psychological well-being, contributing to the control of risk behaviour's and improving academic and work performance (Rosa, 2016). The practice of physical activity becomes "*an improvement in the processing of stimuli, in the updating of processes involving memory*" and logical reasoning, triggering more refined reflexes and consequently a greater focus on performing school tasks (higher levels of concentration and memorization) (Chaddock-Heyman et al., 2013). In a more specific analysis, turns out to be of great importance to verify whether the type, frequency and volume of exercise practice directly influences the personality variables of self-concept and self-esteem in relation to academic performance.

Physical activity does not essentially imply the practice of sports, this definition can cover the physical activity performed in everyday tasks, in activities practiced for leisure and regarding children and young people, sports activities practiced at school. According to the European Union Guidelines for Physical Activity, presented by the Commission of the European Communities, in the "White Book of Sports", Physical Activity is defined from a broad point of view as "*any movement associated with muscle contraction that increases the expenditure of energy above resting levels*" (WHO, 2010).

Regarding voluntary physical activity, it is divided into structured physical activity and lifestyle-related physical activity. The first type of physical activity mentioned "*refers to structured, planned, time-limited activity and performed with an intentional and specific objective, in this case the improvement of some attributes of physical fitness or the simple energy expenditure, which is commonly called*

physical exercise" (WHO, 2010). In another context, physical activity that involves the lifestyle component "*includes daily gait movements, all types of movements and displacements performed within daily activities, whether domestic (cleaning or gardening), occupational (work), or as a "way of transport. These activities are typically of light or moderate low intensity, less structured and less predictable*" (Aguiar, 2006). Related to children, physical activity plays a fundamental role in their physical, psychological and mental condition, leading to higher levels of social competence, reinforced self-esteem and lasting feelings of well-being. "*Physically active children tend to have lower blood pressure values and more favourable blood lipid profiles compared to sedentary children*" (Cardeal, 2007). Physical activity plays a key role in physical, psychological and mental condition leading to higher levels of social competence, enhanced self-esteem and lasting feelings of well-being. "*Physically active children tend to have lower blood pressure values and more favourable blood lipid profiles compared to sedentary children*" (Cardeal, 2007).

"The term physical activity is very much in vogue nowadays because it encompasses several definitions, raising many doubts and questions when it comes to defining it precisely and concisely" (Cardeal et al., 2013). To better clarify the concept of Physical Activity, it is useful to distinguish other constructs associated with it, namely the notion of physical exercise, which is often confused, especially regarding adolescents and young people (Batista, 2011). "Physical exercise contributes to the integrity of the cerebral-vascular complex, the increase in oxygen transport to the brain, the synthesis and degradation of neurotransmitters", as well as to decrease blood pressure, cholesterol and triglyceride levels, inhibition of platelet aggregation, increase in functional capacity and thus, improving the quality of life. Physical exercise promotes cerebral oxygenation and this can stimulate not only individual neurons, but a network of nerve cells associated with cognitive functions, such as memory, attention and concentration, favouring overall health.

Several mechanisms triggered by the practice of physical exercise prove that it is beneficial for the cognitive component of an individual and constant investigations have shown that to obtain benefits at a psychological level, exercise should last for at least 20 to 30 minutes (Amorim, 2011; Berchtold et al., 2005). Evidence that moderate physical activity enhances cognition has been studied for some time, showing conclusions that the brain shows marked cognitive improvements with physical exercise have recently been observed and reported (Bois et al., 2005). Carvalhosa (2012) refers that physical efforts provide several benefits directly to the nervous system, inducing the production of neurotrophic factors. One of the factors that is produced when practicing physical activity is the brain-derived neurotrophic factor, which is very important in the synapses of

glutamatergic neurons, which are responsible for cognitive and motor activities in the central nervous system.

"Physical exercise can activate specific neural circuits to modify the way information is transmitted along synapses, possibly activating specialized molecules such as brain-derived neurotrophic factor" (Cid et al., 1993). Evidence of brain changes caused by regular exercise is now considered from a perspective of changes in the physiological response, such as the increase in neurotrophic factor produced by the brain during engagement. Subsists a common thought that interventions through exercise report structural and connectivity benefits to the brain (Biddle & Mutrie, 2001). The functional benefits of exercise appear to be related to increased availability of brain derived neuronal factor, which, in turn, induces increased neuronal survival and resistance to brain insults, increased neurogenesis in the hippocampus, increased resistance to depression and facilitating learning (Ciotto & Fede, 2015). Physical exercise seems to implement advantages in terms of cognition. "At an early stage, due to peripheral changes such as increased blood flow, endocrine modulation and metabolic factors, which can later interfere with brain structure and function" (Ciotto & Fede, 2015). The biological processes that are most likely inherent in the preservation of cognition through physical exercise are: hippocampal neurogenesis, angiogenesis, increased expression of neurotrophic factors and neuroplasticity (Casey et al., 2000; Costa, 2001).

"*Among the variables used to assess well-being, self-esteem seems to be the one with the greatest acceptance"* (Bolognini, 1996). This is the most important variable to assess well-being. Along with self-esteem, the skills that determine self-concept are also considered essential for the well-being and optimal functioning of children (Coelho et al., 2016). According to what is registered (Cruz et al., 1996), mental health is not just the absence of mental disorders. It is defined as a state of well-being, when each individual is aware of their abilities, being able to face the constraints of life, working productively and being able to deal with the environment that surrounds it. This one it encompasses social and personal resources as well as physical capabilities. The concepts of self-esteem and self-concept are regularly used as *"synonymous to refer to the knowledge that a person has of himself and that results from his self-reflection*". However, when detailed in what their definition concerns, they present distinctions (Diamon & Lee, 2011). Self-concept (and its dimensions) and self-esteem are essential aspects of everyone's personality, being related to their actions, either positively or negatively. "*It becomes important to explore and understand how self-concept manifests itself differently in adolescents, as it may allow a better understanding of how they adjust to different life contexts*" (Guyton & Hall, 2000).

According to Costa, (2003), self-concept as the idea that each subject builds about themselves, their abilities, attitudes and values in the physical, social and mental domains. In a more analytical perspective, the self-concept can be called "the perception or representation that the individual has of himself, moulding itself, above all, regarding his personal characteristics, capacities and competences in certain domains of achievement (Guay et al., 2003; Harter, 1990; 1996). A study by Faria & Azevedo (2004) with children from 8 to 12 years of age differentiate five domains of self-concept: Scholastic competence, Athletic Competence, Social competence, Behaviour Conduct and Physical Appearance". Children aged between 8 and 12 years are still able to express themselves about their global feeling as a person, that is, their self-esteem.

"Self-esteem is also a determinant of well-being" (Sternberg, 2000). Self-esteem "consists of an important psychological component in human development. For development to occur successfully, emotional and cognitive balance, good mental health and the presence of satisfactory social relationships are needed. In this sense, a positive self-esteem is also necessary." Martins, Peixoto, Mata & Monteiro (1995) describes self-concept as a judgment that a person makes about their own abilities in specific domains, such as such as the cognitive, social or physical domains. It is from cognitive structures with emotional contents that is build our self-image. Self-esteem corresponds to "the degree of personal satisfaction that a person has about himself, his functioning efficiency and the respective attitude of acceptance. This construct is the result of the asymmetries between the perception of oneself (objective vision, what the person is) and the ideal of oneself (what the person would like to be), (Martins et al., 1995). The study and development of factors influencing self-esteem has taken on an enormous role, as beliefs indicate that young people with self-confidence and a positive view of themselves have a greater capacity to increase their self-efficacy and to resist peer pressure, regarding health risk behaviour's (Faria & Azevedo, 2004). Other statements such as Guimarães (2012) refer that "it is essential for the structuring of adolescent self-esteem to develop a favourable attitude on the part of those around them". Psychological and psychological difficulties as well as academic results are among the most studied aspects in terms of self-esteem difficulties. The self-esteem deficit, it can be considered a risk factor for drug use, delinquent behaviour, depression, suicide and stress problems. Research has revealed that individuals who practice physical exercise present positive levels of global self-esteem when compared to individuals who do not practice it (Harter, 1993a). The improvements observed in terms of self-esteem arise when physical exercise is practiced more than three times a week (Harter, 1993b)

and when it lasts more than 1 hour (Carapeta et al., 2000; House, 2000; Peixoto & Almeida, 2010; Teixeira et al., 2006). The practice of physical activity allows to raise levels of self-esteem, through the development of skills and strategies suitable for resolution with a high success rate in certain tasks (Ministry of Science, 2012). In addition, positive self-esteem seems to be associated with higher levels of physical condition, as individuals with a higher physical condition also tend to show a higher body concept than individuals with a lower physical condition (Kaufman, 2002). In other perspectives of Hopkins, Marshall, Batterham & Hanin (2009) and Lam & Riba (2016) self-esteem presents the relationship between success and the subject's level of aspirations in several domains. Indeed, it was found that the competence perceived in domains assessed as important for the subject is highly predictive of their self-esteem (Martins, 2012).

The term "Memory" is defined as the complex functional ability that the brain possesses to retain information. There is no exact point regarding its location in the brain, there are several ways to process the collected information (Vaynman, 2005). According to Neves & Faria (2009). …"*memory is an extremely important cognitive faculty, as it is the core of learning*". If there was no way of mentally storing representations of the past, there would be no selection to take advantage of experiences. Memory involves complex mechanisms that encompass the processing (or encoding), storage and retrieval of lived experiences. These processes take on sequential roles in cognitive processing, in which incoming information is conserved for some time and is later used. Being a sequential process, the stages are interdependent, where, for example, an individual reading a text evaluates its codification as difficult, which will make it difficult to store and, therefore, retrieve information. Thus, coding refers to how the individual transforms this physical and/or sensory input into representations that can be placed in memory (Paz, 2014). The encoding of selected information can take minutes or hours. This codification is susceptible to forgetting and can manifest itself in a partial or total way. The second stage is storage, defined "as the process that keeps information encoded. The most recent memories are encoded in different classes depending on the content of the collected information. During this process, similar types of information are placed in a particular "memorial sector", stored and selected to aid in the processing of new information. Old information is compared with recent information through the similarities and discrepancies they present. During storage, new memories are not stored randomly, but directly associated with memories of the same type. Thus, its recovery becomes faster and more effective" (Owen et al., 2010). The last step of the memorization process, the retrieval still does not have relevant data, being defined as "the individual's capacity to

remember something that was already memorized. In this process, the retention time of the event is important for the choice of functional pathways. Over time, older information uses fewer functional pathways such as the hippocampus, amygdala and cortex.

The term working memory "is used to refer to a multicomponent system, capable of storing and manipulating information playing an important role in complex cognitive activity, such as: learning, understanding and argumentation" (Peixoto, 2003). Even considering the importance of working memory and selective attention in the learning process, it is necessary to consider the process of development and maturation, since both childhood and adolescence are marked by a dynamic period in the different dimensions of cognitive development, motor, emotional and perceptive skills (Barnea-Goraly et al. 2005). This development "is associated with the volume of the cortex, especially to the frontal cortex" (Carvalhosa, 2012). According to this, the frontal lobe works as a "central" for human cognition that assimilates, executes and organizes cognitive processes, performs emotional processes and transfers information to other brain areas. Thus, a growing body of studies has shown that "motor development and physical exercise can present a positive correlation with cognitive (working memory) and learning processes" (Simão, 2010). Academic performance is an extremely relevant topic given the fact that it influences many other areas of children and adolescents' lives. Even though, if some indifference may appear, the truth is that it is experienced and felt in a negative way, giving rise to feelings of great incompetence (JacAngelo, 2003).

"Academic performance is defined as a concrete assessment of the knowledge obtained by students. In practice, it refers to the results of summative assessment that teachers apply in a school context. The summative assessment is then a classification that is attributed to the work and tests carried out for the school context and that informs students, parents, teachers and the community in general of the learning acquired by the student" (Guay et al. 2003). In this sense, physical exercise has been reported to increase academic performance, assertiveness, confidence, emotional stability, intellectual functioning, memory, perception, positive body image, self-control, sexual satisfaction, well-being. being and efficiency at work (Paulo, 2014). Physical exercise can help children to obtain higher levels of academic performance. In turn, postulate that while high intensity and short duration exercise promotes mental and intellectual functioning, high physical skills (Lipscomb, 2007; Rigoli et al., 2012).

"An increase in learning, mental health and concentration in the period immediately following physical activity and an association between physical activity and a reduction in the adoption of behaviour's risk" (Silva &

Cubas, 2009). The same author refers that "cardiovascular capacity enhances blood circulation, increasing cerebral blood flow and levels of norepinephrine and endorphins, effects that can reduce stress, improve mood, induce a relaxing effect after exercise and, as a result, improve school performance. Berchtold et al. (2005) agree with the fact that students who exercise regularly get better results at school, as the practice provides good blood circulation and greater blood oxygenation, which ensure higher levels of vitality and consequently a better cognitive performance. Trudeau & Shepard (2008) identifies that an individual who has good aerobic condition can improve their memory capacity, since physical exercise can strengthen specific areas of the brain and that the intake of oxygen during exercise improves connections between muscles. Physical exercise improves cognitive function and has a positive influence on processes involving memory in children (Barnea-Goraly et al., 2005). It can improve the memory capacity, as physical exercise can strengthen specific areas of the brain and the oxygen intake during exercise improves connections between muscles.

The study´s main objective is to analyse the impact of physical exercise on self-concept and self-esteem of middle-school students and the implications in the academic performance.

Materials and Methods

An investigation methodology using systematic verification techniques was adopted, presenting explanations about the effects of physical activity and exercise on academic performance and produced theoretical generalizations with validity and reliability about the data obtained, where the objective is to expand and generalize the theoretical model found, from of the study. The study followed a quantitative, descriptive, analytical and cross-sectional research methodology, where only a single data collection was performed.

Objective

Main objective

The general objective focuses on evaluating the relationship between exercise practice and academic performance of middle-school students in a public school, considering the exercise impact on self-concept and self-esteem.

Specific objectives

The specific goals defined for the study aimed to:

I. Compare self-concept, self-esteem and academic performance variables according to school year, gender, number of hours of exercise practice, as well as the magnitude of the effect;

II. Correlate the variables of self-concept, self-esteem and academic performance according to the volume of hours of exercise practice;

III. Determine predictor variables of self-concept and self-esteem on academic performance.

Variables

The dependent variables of this study were: self-concept (scholastic competence, social competence, athletic competence, physical appearance and behaviour conduct), self-esteem and academic performance. Independent variables were identified for gender, type of sport, practice starting age, years of practice, sport context, volume of weekly training hours.

Participants

The participants (a convenience sample) of this study were a total number of 107 students (N=107) of which 55 (51.4%) are male and 52 (48.6%) are female, aged between 10 and the 13 years old and mean age of 11.19±0.81, attending a Portuguese public middle-school, with 41 children (38.3%) from the fifth grade and 66 children (61.7%) from sixth grade were randomly selected. The evaluated students refer to the national educational programme of the Portuguese public education system, where they accumulate two periods of Physical Education of 45 minutes and 90 minutes, respectively, in which some students increase hours of formal and supervised sports practice in the context of extra-curricular sports, as an option.

Procedures for data collection

After approval of the study by the Ethics Committee, a request to the school Director, was delivered, clarifying the purposes of the study and the number of fifth and sixth grade classes that attended this school. Then, the School Director transmitted the necessary information to the teachers of the 5th and 6th grade classes that were selected to ask them for their collaboration. It should be noted that the objectives and relevance of the study and the guarantee of anonymity and confidentiality of the documents filling were explicit in the questionnaire application. In a second phase, the researchers responsible for the investigation delivered a request to the parents for authorization to participate in the study and an intervention was carried out to collect biometric data also. Informed consent was obtained

from all parents for the children involved in this study, however the student had an option not to participate.

Data collection instruments

For the elaboration of this investigation, a scale that aimed to assess the students' global self-concept and self-esteem essentially, was used, according to students' gender, age group, level of education, number of weekly training sessions and years of practice in a sport. More specifically, the components evaluated in the questionnaire (Harter, 1985) are described as follows:

- Sociodemographic data;
- The activity/exercise practiced by the students;
- The age group to which it belongs;
- Weight and height to assess body mass index;
- The number of weekly practices;
- Age at which the student started to practicing sports;
- How many years has the student been playing that sport;

The scale used (Harter, 1985) was the Perceived Competence Scale for Children, validated for the Portuguese language (Cid et al., 2012).

Scale Structure

This instrument contains six subscales referring to five specific domains of self-concept and one for the assessment of self-esteem.

Contents of each domain:

Scholastic Competence - Items in this subscale assess the child's perception of their competence or aptitude in the domain of school performance (items 1, 7, 13, 19, 25 and 31)

Social Competence. Items in this subscale assess the child's perception of their acceptance by other children and their feeling of popularity among them (items 2, 8, 14, 20, 26 and 32);

Athletic Competence. Items in this subscale assess the child's perception of their competence in sports or outdoor games (items 3, 9, 15, 21, 27 and 33);

Physical appearance. Items in this subscale assess the child's perception of their appearance, such as: weight, height and appearance (items 4, 10, 16, 22, 28 and 34);

Behaviour conduct. Items in this subscale assess the child's perception of how he/she behaves (items 5, 11, 17, 23, 29 and 35);

In this study, the determination of the self-concept level is calculated by the quotient of the sum of the partials obtained in the domains that compound the self-concept, by the number of domains that constitute it:

Self-Concept Level = (SC+SC+AC+PA+BC)/5.

The self-esteem variable contains a subscale referring to a single specific domain of global self-esteem (items 6, 12, 18, 24, 30 and 36).

Self-esteem. It intends to analyse in what way or form, the child likes herself as a person, if he/she is satisfied with her way of being and/or behaves. It constitutes a global judgment of its value, not being, therefore, a specific domain of competence. The level of self-esteem is determined by the partial obtained in the six subscales presented next. Each of these subscales contains six items, making a total of 36 items (there is one more additional item introduced as an example, but which is not rated). Within each subscale, three of the items are constructed so that the statement reflecting high perceived competence appears on the left side, while in the remaining three the statement reflecting high perceived competence appears on the right side. In the first six items, the different subscales appear alternately in the following order: (1) Scholastic Competence; (2) Social Competence; (3) Athletic competence; (4) Physical Appearance; (5) Behaviour conduct; (6) Global Self-worth. This order will be maintained throughout the entire scale for the 36 items that constitute it.

Scale quotation

Although a rating grid is provided, the procedure is to assign a score from 1 to 4 to each of the items. So, in the previous example, if the child thinks that he often forgets what he learns and then considers himself "Really True for Me", he will have a rating of 1. But if he considers it to be " Sort of True for Me ", he will have a rating of 2 A child who indicates that he can remember things easily, but is " Sort of True for Me ", will have a rating of 3. However, if he considers it to be "Really True for Me ", he will have a rating of 4. Along of the questionnaire there are items that refer to a high perceived competence and items that refer to a low perceived competence. Thus, the quotation for the former is 4, 3, 2, 1 and for the latter it is 1, 2, 3, 4 depending on the degree of identification of the subject with each of the information. The children's scores are recorded, and the different items are grouped according to the subscale they are part of, to facilitate the calculation of the mean for each one of them. Thus, six totals are obtained, one for each of the different subscales that define the child's self-perception profile.

For children aged 5 and older, reading can be done by each one silently. The scale is usually introduced as an opinion survey, exemplifying and showing that there are no right or wrong answers; what you want to know is what people think, what your opinion is. When explaining the format of the questions it is essential to make it clear that for each item only one box can be marked.

Academic performance

Collection of academic data was provided by using a systematic recording grid of students' academic performance for the curricular units (n) of Portuguese Language, Mathematics, Civic Education, Accompanied Study, Sciences, Foreign Language (English or French), History and Geography of Portugal, Drawing and Painting, Music and Physical Education. This variable was obtained at the end of the 1st, 2nd and 3rd terms, through the classifications of the students, assuming five categories: very insufficient (1), Insufficient (2), Sufficient (3), Good (4), very good (5). The calculation formula for this variable was [(∑1st / n) + (∑2st / n) + (∑3rd / n)] / 3 terms (Decree-law 243/2012).

Statistical procedures

For statistical purposes and data analysis, the program (SPSS 21.0) was applied. It is presented descriptive statistical techniques to calculate measures of central tendency of the variables under study (minimum and maximum, means, standard deviations, variances). However, to obtain statistical inferences, normality tests were performed to attest the normal distribution of data, verified by the Kolmogorov-Smirnov test. Normality serves to verify whether the observations of data properly fit to a normal or non-normal distribution. To analyse the reliability of the Self-Concept Scale, internal consistency was provided, specifically Cronbach's Alpha, and that analysis was carried out for all subscales. It is generally accepted that an α value from 0.6 to 0.7 indicates acceptable reliability and above 0.8 indicates good reliability (Cid et al., 2012). In a third phase, correlations and comparisons of variables between groups were assessed. Finally, linear regression analysis was applied to interpret the predictive variables and calculated the effect magnitude. To calculate the effect magnitude, it was evaluated according to Cohen's d values, using the inference method based on the magnitude of the effects (*Cohen's* $d = (M_2 - M_1) / SD\ pooled$, where *SD pooled* $= \sqrt{((SD_1^2 + SD_2^2) / 2)}$. The variation to classify the magnitude of the effects (Cohen's d) were as follows: 0-0.2, trivial; 0.21-0.6, small; 0.61-1.2, moderate, 1.21-2.0, large; > 2.0, very large (Harter, 1993a). A significance level of 0.05 was used for a confidence interval of at least 95%.

Descriptive Analysis

Table 1 consists of the descriptive analysis of the variables under study, where the minimum, maximum, mean and standard deviation values are summarized, as well as the results of the reliability or internal consistency and normality tests for the variables: self-concept, self-esteem and academic

performance. None of the variables presents a Cronbach's Alpha lower than 0.6, since it is generally accepted when an α value from 0.6 to 0.7 indicates acceptable reliability and above 0.8 indicates good reliability (Cid et al., 2012). The scholastic competence subscale is the variable whose data reliability is highest, with 0.84, followed by physical appearance (0.83), behaviour conduct (0.83), athletic competence (0.79), self-esteem (0.78) and social competence (0.60).

Analysing the results obtained through the Kolmogorov-Smirnov test, it´s observable that the variables whose distribution is normal are, scholastic competence (0.17), social competence(0.43), athletic competence (0.37), behaviour conduct (0.22), self-esteem (0.17) and academic performance (0.63), as the statistical significances are greater than 0.05. Therefore, for these variables, parametric tests are used (T-student for independent samples, unifactorial Anova and Scheffe's Post-hoc multi-comparison test) in the inferential analysis, while for the physical appearance variable (0.05) non-parametric tests were applied (Mann-Whitney test, Kruskal-Wallis and Spearman correlation test). In order to evaluate de effect magnitude in terms of comparisons, it was calculated the *Choen's d.* To analyse the predictor variables of academic performance it was proceeded to linear regressions calculations.

Table 1 - Descriptive statistics and reliability analysis of the variables of scholastic competence, social competence, athletic competence, physical appearance, behaviour conduct, self-esteem and academic performance.

Variables	Minimum	Maximum	Mean	Standard deviation	Kolmogorov Smirnov	Cronbach's Alpha
Scholastic competence	1.17	4.00	2.47	0.67	0.17	0.84
social competence	2.00	4.00	2.99	0.48	0.43	0.60
Athletic Competence	1.00	4.00	2.49	0.70	0.37	0.79
Physical appearance	1.00	4.00	2.85	0.77	0.05*	0.83
Behaviour conduct	1.60	4.00	2.90	0.64	0.22	0.83
Self esteem	1.40	4.00	3.12	0.67	0.17	0.78
Academic performance	2.60	5.00	3.74	0.61	0.63	-

*p≤0.05 - Does not respect the assumption of normality.

Source: Authors' own conception

Results

Table 2 represents the mean values and standard deviation of the dependent variable's scholastic competence, social competence, athletic competence, physical appearance, behaviour conduct, self-esteem and academic performance, depending on the year of schooling. In terms of school competence, sixth-grade students have a higher mean ($\bar{X}$=2.54 ± 0.69) than fifth-grade students ($\bar{X}$=2.37 ± 0.64). In the domain of social competence the mean is also higher ($\bar{X}$=3.03 ± 0.47) compared to fifth grade students ($\bar{X}$=2.92 ± 0.49). In the field of athletic competence, the trend is inverted, with fifth-grade students having a higher mean ($\bar{X}$=2.58 ± 0.74) than sixth-grade students with values of ($\bar{X}$=2.43±0.67). Regarding physical appearance, fifth-grade students have slightly higher mean values ($\bar{X}$=2.86 ± 0. 73) when placed at the same level as sixth-grade students ($\bar{X}$=2.84 ± 0.80). The superiority of the mean of fifth-grade students is also verified in the behaviour conduct domain ($\bar{X}$=2.92 ± 0.69) compared to the mean of sixth-grade students ($\bar{X}$=2.89 ± 0.62). The mean results, for the self-esteem domain, show significant mean values in sixth-grade classes ($\bar{X}$=3.14 ± 0.72) when the comparison is made with fifth-grade students ($\bar{X}$=3.08 ± 0.56). The academic performance presented is higher in sixth-grade classes with mean values =3.81 ± 0.62 compared to fifth-grade classes with means of ($\bar{X}$=3.66 ± 0.59) exhibit salient mean values in sixth-grade classes ($\bar{X}$=3.14 ± 0.72) when compared with fifth-grade students ($\bar{X}$=3.08 ± 0.56). The academic performance presented is higher in sixth-grade classes with mean values ($\bar{X}$=3.81 ± 0.62) compared to fifth-grade classes with means of (X=3.66 ± 0.59). exhibit salient mean values in sixth-grade classes ($\bar{X}$=3.14± 0.72) when compared with fifth-grade students ($\bar{X}$=3.08 ± 0.56). The academic performance presented is higher in sixth-grade classes with mean values ($\bar{X}$=3.81 ± 0.62) compared to fifth-grade classes with means of ($\bar{X}$=3.66 ± 0.59).

Table 2 - Significance level of comparisons for the self-concept, self-esteem and academic performance variables between the fifth and sixth grades.

Variables	School year				(Sig.)
	5th grade		6th grade		
	Mean	Standard deviation	Mean	Standard deviation	
scholastic competence	2.37	0.64	2.54	0.69	0.223
social competence	2.92	0.49	3.03	0.47	0.228
athletic competence	2.58	0.74	2.43	0.67	0.297
Physical appearance	2.86	0.73	2.84	0.80	0.883

Behaviour conduct	2.92	0.69	2.89	0.62	0.853
Self esteem	3.08	0.56	3.14	0.72	0.688
Academic performance	3.66	0.59	3.81	0.62	0.233

*P≤0.05

Source: Authors' own conception

According to table 3 in the variable scholastic competence, the highest mean values belong to female individuals ($\bar{X}$=*2.54 ± 0.72*) and the lowest values are for male students ($\bar{X}$=2.41 ± 0.63). In terms of social competence, the male gender presents mean values a little higher ($\bar{X}$=3.00 ± 0.50) while the mean values for female students are ($\bar{X}$=2.98 ± 0.46). Regarding the athletic competence variable, mean values for males are =2.58 ± 0.70 and for females are ($\bar{X}$=2.40 ± 0.69). In terms of physical appearance, the values have a higher mean for females ($\bar{X}$=2.91 ± 0.84) when compared to males ($\bar{X}$=2.79 ± 0.70). As for the behavior conduct variable ($\bar{X}$=3.13 ± 0.58) it has higher mean values in females ($\bar{X}$=3.13 ± 0.58), with males having values of ($\bar{X}$=2.67 ± 0.62). In turn, the trend remains, with higher mean values in females ($\bar{X}$=3.15 ± 0. 68) when compared with males (=3.08 ± 0.66) in the self-esteem aspect. In the end, there is the variable academic performance where female students have higher mean values ($\bar{X}$=3.94 ± 0.62) than male students ($\bar{X}$=3.57 ± 0.55).

Table 3 - Significance level of comparisons for self-concept, self-esteem and academic performance variables between males and females.

Variables		**Gender**				**(Sig.)**
		Male		Female		
		Mean	Standard deviation	Mean	Standard deviation	
self-concept	scholastic competence	2.41	0.63	2.54	0.72	0.349
	social competence	3.00	0.50	2.98	0.46	0.813
	athletic competence	2.58	0.70	2.40	0.69	0.183
	Physical appearance	2.79	0.70	2.91	0.84	0.269
	Behaviour conduct	2.67	0.62	3.13	0.58	0.000*
global self-esteem	Self esteem	3.08	0.66	3.15	0.68	0.569
academic performance	academic performance	3.57	0.55	3.94	0.62	0.004*

*P≤0.05

Source: Authors' own conception

An analysis of the variables under study according to the number of exercise weekly hours (up to three hours, between four and six hours and seven or more hours of exercise), was performed. The first analysis focused

on the total mean values, where is visible the variables of self-concept (scholastic competence, social competence, athletic competence, physical appearance and behaviour conduct) where the one with the highest total mean value is social competence ($\bar{X}$=*2.99 ± 0.48*). In the self-esteem variable, the total mean value observed is ($\bar{X}$=3.12 ± 0.67). As for the income variable, it is seen that it has total mean values of, respectively ($\bar{X}$ =3.74 ± 0.61). It is found that in relation to students who practice several hours of weekly exercise, in the scholastic competence variable, the mean values are more significant when students practice between four to six hours of weekly exercise ($\bar{X}$=*2.57 ± 0.72*), followed by seven or more hours of practice (=2.45 ± 0.60) with lower mean values when the exercise lasts up to three hours a week.

In the variables of social competence and athletic competence, an increasing trend of mean values with the increase in the number of weekly hours. In the social competence variable and depending on the increasing number of hours, its presented, up to three hours ($\bar{X}$=2.94±0.52), four to six hours a week ($\bar{X}$=2.99±0.46) and seven or more hours ($\bar{X}$=3.06±0.47). The athletic competence variable presents increasing mean values for weekly training up to three hours of ($\bar{X}$=2.43 ± 0.67), between four and six hours of practice ($\bar{X}$=2.45 ± 0.72) and seven or more hours with mean values of ($\bar{X}$=2.64 ± 0.70). As for the physical appearance variable, the focus in terms of mean values of hours of practice is situated on practice of four to six hours ($\bar{X}$=2.99 ± 0.71), followed by practice up to three hours ($\bar{X}$=2.76 ± 0.77) and seven or more hours with ($\bar{X}$=2.69 ± 0.87). The behaviour conduct showed similar mean values regarding exercise practice up to three hours ($\bar{X}$=2.93 ± 0.65) and seven or more hours ($\bar{X}$=2.93 ± 0.58) followed by exercise between four and six hours ($\bar{X}$=2.87±0.68). In the self-esteem variable, the highest mean values are in the practice of exercise between four and six hours ($\bar{X}$=3.21±0.66), the practice of seven or more hours presents mean values of ($\bar{X}$=3.10±0.62) and finally the practice of up to three hours a week ($\bar{X}$=2.99 ± 0.71). It's described the mean values of academic performance assuming higher mean values in practice of four to six hours a week ($\bar{X}$=3.88 ± 0.62).

Table 4 - Significance level of comparisons for the variables self-concept, self-esteem and academic performance according to the hours of weekly physical exercise

Variables	Exercise weekly hours						Sig.
	3 hours		4 to 6 hours		7 or more hours		
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation	
scholastic competence	2.33	0.64	2.57	0.72	2.45	0.60	0.320
social competence	2.94	0.52	2.99	0.46	3.06	0.47	0.626
athletic competence	2.43	0.67	2.45	0.72	2.64	0.70	0.476
Physical appearance	2.76	0.77	2.99	0.71	2.69	0.87	0.327
Behaviour conduct	2.93	0.65	2.87	0.68	2.93	0.58	0.878
Self esteem	2.99	0.71	3.21	0.66	3.10	0.62	0.350
academic performance	3.49	0.55	3.88	0.62	3.86	0.57	0.017*

*P≤0.05.

Source: Authors' own conception

After analysing the means of the variable's scholastic competence, social competence, athletic competence, physical appearance and behaviour conduct, self-concept, self-esteem and academic performance variables, is shown in table 4, if these assume a certain trend according to the exercise practice variables.

Through table 5, its observable that there are no significant differences in the self-concept, self-esteem and income variables between the two school groups, as $\alpha > 0.05$ in all cases.

Table 5 - Scheffe's Post-hoc multi-comparison test between groups in the academic performance variable.

(I) Total weekly exercise	(J) Total weekly exercise	Mean difference (IJ)	Sig.	95% confidence interval	
				Inferior limit	Upper limit
up to 3 hours	4 to 6 hours	**-0.37**	0.03*	-0.74	-0.03
	7 or more hours	-0.37	0.09	-0.78	0.05
4 to 6 hours	up to 3 hours	0.39	0.03*	0.03	0.74
	7 or more hours	0.02	0.99	-0.38	0.42
7 or more hours	up to 3 hours	0.37	0.09	-0.05	0.78
	4 to 6 hours	-0.02	0.99	-0.42	0.38

*P≤0.05.

Source: Authors' own conception

Through the observation of table 6, the mean values in the self-concept variable (in the behavioural dimension) and academic performance are higher in females when compared to males. In terms of significant differences, *t-student* test was performed on the variables that are related to self-concept, self-esteem and academic performance, where it reveals homogeneity using the Levene test. In this case, it is concluded that the variances are equal in both groups, since the significance associated with the test is greater than 0.05. Once the homogeneity of the variances is assumed, values of the *t test* of Equal variances are not assumed. The results indicate that there are differences between females and males in the variables of behaviour conduct and academic performance.

Table 6 - Evidence of R Spearman correlation of academic performance levels, dimensions of self-concept (scholastic competence, social competence, athletic competence, physical appearance, behaviour conduct) and self-esteem, according to the variable practice of physical exercise up to three weekly hours.

Exercise weekly hours	Variables	1	2	3	4	5	6
Up to 3 hours	1. Academic performance	-					
	2.Scholastic competence	0.44*	-				
	3. Social competence	0.16	0.05	-			
	4. Athletic competence	-0.18	-0.11	0.41*	-		
	5. Physical Appearance	0.06	-0.15	0.21	0.05	-	
	6.Behavior conduct	0.06	0.11	0.15	-0.14	0.38*	-
	7. Self-esteem	0.16	-0.06	0.43*	0.11	0.71**	0.50**

*Sig≤0.05 **Sig≤0.01.

Source: Authors' own conception

To verify if there are significant differences between the level of weekly hours, the self-concept, self-esteem and academic performance variables, the unifactorial Anova parametric test was selected and applied to compare means. Considering the results obtained, there are statistically significant differences in terms of the number of exercise weekly hours and academic performance as the significance value is 0.017, therefore p≤0.05. However, as there are differences in academic performance, it was analysed where these differences actually were. This value led to a *post-hoc* multi-comparison analysis with Scheffe's proof to verify between which groups differences are observable. From the analysis of the multi-comparison test between Scheffe groups, it was verified significant differences between the

groups of up to three hours and four to six hours, as the significance value is less than 0.05. Although there were no differences between the group that practiced 7 hours or more and the group with up to 3 hours of weekly physical exercise, a positive evolution was observed in favour of the group that practiced more hours of weekly physical exercise. The number of hours of practice per week appears as a relevant factor in the academic performance of students, although from 7 hours onwards it no longer exerts a significant effect. The first analysis was performed using the one-way ANOVA, a test used to compare means between several groups, where it was analysed whether the dependent variables of the study had at least two means that differed from each other regarding the different types of exercise practice. physicist. According to the obtained results, there are statistically significant differences in terms of behaviour conduct and academic performance, with a value of $p \leq 0.05$. A multiple comparisons (post-hoc) test allowed to identify which group(s) differ.

After applying again Spearman's correlation statistical test for students who practice physical exercise for four to six hours a week and it was found that:

- There is moderate positive and statistically significant correlation between academic performance and academic competence;
- There is a positive and statistically non-significant correlation between academic performance and social competence;
- There is a positive and statistically non-significant correlation between academic performance and athletic competence;
- There is a negative and statistically non-significant correlation between academic performance and physical appearance;
- There is a positive and statistically significant correlation between academic performance and behaviour conduct;
- There is a negative and statistically non-significant correlation between academic performance and self-esteem;

Among the number of positive correlations existing in the variables under study, the correlation results in table 7 indicate two negative correlations at the level of the physical appearance and self-esteem variables.

Table 7 - Proof of R Spearman's correlation of academic performance levels, dimensions of self-concept (scholastic competence, social competence, athletic competence, physical appearance, behaviour conduct) and self-esteem according to the variable practice of physical exercise four to six hours a week.

Exercise weekly hours	Variables	1	2	3	4	5	6
	1. Academic performance	-					
	2.Scholastic competence	0.70**	-				
	3. Social competence	0.09	0.48**	-			
4 to 6 hours	4. Athletic competence	0.13	0.30*	0.39**	-		
	5. Physical Appearance	-0.01	0.22	0.38**	0.26	-	
	6.Behavior conduct	0.39*	0.31*	0.07	0.21	0.40**	-
	7. Self-esteem	-0.04	0.20	0.41**	0.29*	0.80**	0.35*

* Sig≤0.05;**Sig≤0.01.

Through the application of Spearman's correlation statistical test for students who practice 7 or more hours of weekly physical exercise, it was found that:

• There is moderate positive and statistically significant correlation between academic performance and academic competence;

• There is a positive and statistically non-significant correlation between academic performance and social competence;

• There is a positive and statistically non-significant correlation between academic performance and athletic competence;

• There is a negative and statistically non-significant correlation between academic performance and physical appearance;

• There is a positive and statistically non-significant correlation between academic performance and the behaviour conduct;

• There is a negative and statistically non-significant correlation between academic performance and self-esteem;

The analysis of the correlations between academic performance and the other variables in table 8 confirms the existence of several positive correlations (social competence, athletic competence and behaviour conduct), moderate positive correlations and statistically significant (scholastic competence).

Table 8 - Evidence of R Spearman's correlation of academic performance levels, dimensions of self-concept (scholastic competence, social competence, athletic competence, physical appearance, behaviour conduct) and self-esteem, according to the variable practice of physical exercise seven or more weekly hours.

Exercise weekly hours	Variables	1	2	3	4	5	6
	1. Academic performance	-					
	2.Scholastic competence	0.67**	-				
7 or more	3. Social competence	0.24	0.52**	-			
hours	. Athletic competence	0.14	0.29	0.38	-		
	. Physical Appearance	-0.02	0.41*	0.32	.52**	-	
	6.Behavior conduct	0.41	0.28	0.18	0.05	0.17	-
	7. Self-esteem	-0.11	0.32	0.44*	.49*	0.82**	0.12

* Sig≤0.05;**Sig≤0.01.
Source: Authors' own conception

A linear regression test was applied, in table 9, to find whether Self-concept (independent variable or predictor) predicts good levels of academic performance (dependent variable) represented by the symbol R2. The results presented in table 9 reveal that the global Self-concept explains 41% (R2=0.412), with scholastic competence having a Beta value = 0.617 and behaviour conduct a Beta value = 0.113, the Beta value is better the more approaching zero, as this means that there are less theoretical risks, however social competence (-0.026), athletic competence (0.055) and physical appearance (-0.078) have negative values, this result is expected, as the Beta when negative it refers to an inverse relationship.

The global self-esteem variable explains = 0% (R2=0.000) of academic performance, having a Beta value = 0.008. As for the variables that make up the Self-concept, it should be noted that scholastic competence explains 39% (R2=0.388), with a Beta value=0.623. Social competence explains approximately 2% (R2=0.019) of academic income. In turn, athletic competence and physical appearance do not explain academic performance, as R2=0.000 in both cases, with negative Beta values, respectively -0.001 and -0.040. The behaviour conduct explains 7% (R2=0.07) where the value of Beta=0.264. Finally, the physical exercise indicator, explains 5% (R2=0.051) of academic performance, where the beta value is assumed to be positive (Beta=0.226).

Table 9 - Linear regression for the variables of global self-concept, scholastic competence, social competence, athletic competence, physical appearance, behaviour conduct, global self-esteem and exercise indicator as a predictor of academic performance for middle-school students (5th and 6th grade).

	Variables	Beta	T	P	R^2
Global self-concept	scholastic competence	0.617	6,290	0.000	0.412
	social competence	-0.026	-0.262	0.794	
	athletic competence	-0.055	-0.571	0.570	
	Physical appearance	-0.078	-0.780	0.438	
	Behaviour conduct	0.113	1,147	0.255	
Global self-esteem	Self esteem	0.008	0.074	0.941	0.000
Self-concept	scholastic competence	0.623	7,336	0.000	0.388
	social competence	0.139	1,288	0.201	0.019
	athletic competence	-0.001	-0.008	0.993	0.000
	Physical appearance	-0.040	-0.366	0.715	0.002
	Behaviour conduct	0.264	2,552	0.012	0.070
Exercise indicator	Number of weekly trainings	0.226	2,177	0.032	0.051

Source: Authors' own conception

To analyse the magnitude of the effect on the variables under study in children from middle-school (5th and 6th grade), depending on the years of practice, two groups were assessed (less than or equal to three years of practice and more than three years of practice). Statistical procedures were applied to determine the magnitude of the effect of years of practice with the variables of self-concept, self-esteem and academic performance where is presented, in table 10, the values described by Cohen to classify them. It was obtained a trivial effect on scholastic competence (0.20), social competence(0.20), athletic competence (0.13), behaviour conduct (-0.02). This test is based on comparing means between groups so the values can be negative, which does not mean that the effect is negative. A small effect on physical appearance (0.29) and self-esteem (0.44) is evidenced, and academic performance had a moderate effect (0.67).

Table 10 - Effect Size on Self-Concept variables (scholastic competence, social competence, athletic competence, physical appearance, behaviour conduct), self-esteem and academic performance as a function of Years of Practice, for fifth and sixth grade students.

Variables	years of practice		Cohen's d	Effect Size (r)
	≤ 3 years	> 3 years		
scholastic competence	2.50±0.69	2.37±0.63	0.20	0.10
social competence	3.02±0.46	2.92±0.54	0.20	0.10
athletic competence	2.51±0.71	2.42±0.66	0.13	0.07
Physical appearance	2.90±0.77	2.68±0.76	0.29	0.14
Behaviour conduct	2.90±0.65	2.91±0.65	-0.02	-0.01
Self esteem	3.19±0.65	2.89±0.71	0.44	0.22
academic performance	3.85±0.60	3.46±0.56	0.67	0.32

Source: Authors' own conception

Discussion

According to the objectives of the study, regarding to the school year, there were no statistically significant differences in self-concept when comparing students from the fifth and sixth grade. These results are not in line with other studies (Trudeau & Shepard, 2008) that have identified differences in terms of age where younger adolescents tend to present a more positive view of themselves in the different dimensions of self-concept compared to older adolescents (Aguiar, 2006). There is a progressive differentiation over age, in terms of the dimensions of self-concept. In the self-esteem variable, studies involving the Self-Perception Profile reveal the inexistence of differences in self-esteem, introduced by age, during the period before adolescence (Neves & Fariam, 2009; Paz, 2014). It should be noted that in the self-concept variables (athletic competence, physical appearance, behaviour conduct) fifth-grade students have higher means, although without statistically significant differences, when compared to sixth-grade students. In the variables of self-concept (scholastic competence and social competence), self-esteem and academic performance the mean values are slightly higher, where there are no statistically significant differences, in sixth-grade students when compared to mean values of fifth-grade students. These results agree, although partially, with the study of Guay et al. (2003) that obtained results that point to an increase in perception of scholastic competence and a decrease in the dimensions of physical appearance and social competence with older ages. Regarding gender, the results indicate the existence of higher levels of self-concept in

females in the dimensions of scholastic competence, physical appearance and behaviour conduct when compared to the male gender in which the values of these individuals are higher in the dimensions of social competence and athletic competence, and these levels were also observed (Berger & Mclnman, 1993; Biddle & Mutrie, 2001). The presence of statistically significant differences in the behaviour conduct and academic performance variables, in favour of the female gender, is in line with a study (Paz, 2014) , in which there is a trend in favour of girls, revealing more positive self-representations in areas related to scholastic competence and the behaviour conduct. The social competence dimension is positively and statistically significantly correlated with athletic competence and self-esteem. Regarding the physical appearance dimension, it is significantly associated with the student's self-esteem and behaviour conduct. The last existing correlation for the practice of up to 3 hours of exercise per week focuses on the statistically significant association between student behaviour conduct and self-esteem. As for students who practice physical exercise for four to six hours a week, they present significant correlations in the variables of scholastic competence and behaviour conduct. The scholastic competence dimension is significantly associated with the social competence, athletic competence and student behaviour conduct dimension. In turn, the social competence dimension is related to athletic competence. The existing correlations for students who practice seven or more hours of weekly exercise are identified at the level of academic performance in the dimension of scholastic competence, with these being significantly relevant. In the dimension of scholastic competence, there is a positive statistical significance between this dimension and social competence. Following the observation of correlations, there is a statistically significant positive relationship between the social competence dimension and self-esteem and a statistically significant negative relationship (negative values represent an inverse relationship between the variables involved). We found a significant positive correlation between the athletic competence and physical appearance dimension and athletic competence and self-esteem. The results obtained in the verification of academic performance predictors were favourable, where we found that global self-concept is a good predictor of academic performance, as R2=0.41, that is, global self-concept explains 41% of the data variance, followed by scholastic competence that explains 39%, with R2=0.39. Also, the behaviour conduct , the number of weekly training sessions and social competence explain respectively 7%, 5% and 2%.

Academic self-concept proved to be a good predictor of academic performance, where extracurricular activities are considered influencing factors in the academic performance of students (JacAngelo, 2003). After

analysing the magnitude of the effect on the variables under study, according to the two groups defined: less than or equal to three years of practice and greater than three years of practice. Based on Cohen's classification values, the obtained results pointing to a trivial effect on scholastic competence, social competence, athletic competence, and behaviour conduct. A small effect was found on physical appearance and self-esteem. Finally, academic performance had a moderate effect. This effect is in line with studies such as Hopkins et al. (2009), Lam & Riba (2016) and Martins et al., (2012), that showed the practice of regular and continued exercise can help students improve their performance, its academic performance, self-esteem and self-concept.

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