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The Relation Between Physical Activity and Academic Performance

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THE RELATION BETWEEN PHYSICAL ACTIVITY AND ACADEMIC PERFORMANCE

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John Dewey taught us that “If we teach today’s students as we taught yesterday’s, we rob them of tomorrow”. It was in this line of thought that this project has started, lasted, and finished. It was in this line of thought that my educational philosophy has shifted but never lost focus on the students.

I raise today as a stronger believer in the power of education who understands collaboration as one of the powerful tools in school and in life. It was in collaboration that I found the strength to continue without looking back and become an educator deeply aware of her responsibility.

Many are the ones who have contributed to this project, who have helped me on this path, and many were the ones that stayed by my side throughout the entire process. When a word of encouragement was needed, you were there; when a push would keep me going, you were there; were light or guidance were desired, you were there; when a laugh, a warm hug, a blink, a crazy idea or a smile were all it took, you were there; even when you did not realize you were needed, you were also there.

So, to you, for you, and because of you, I am surely grateful for.

Abstract

Physical inactivity has been increasingly and dangerously growing across our society due to technological progresses in our daily lives. Consequently, the lifestyle and health of adolescents and young people is showing a tendency to the appearance of negative factors and diseases like obesity or high blood pressure. This project aims to verify the existence of a relation between physical activity and academic performance. Also, it aims to understand how this relation might vary according to different genders and age groups. Research suggests the existence of a positive relation between physical activity and academic performance, especially when physical activity is conducted at a vigorous level. Also, it is proven that physical education programs do not affect negatively school performance even when regular participation takes place. Furthermore, regarding the levels of physical activity, research shows that boys present higher levels of physical activity when compared with the opposite gender. In addition, these levels of physical activity tend to decrease as the age increases. So, physical activity throughout schools should be widely encouraged and promoted.

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CHAPTER I: INTRODUCTION

This project aims to lead to a change in my educational setting by better understanding the benefits associated with physical activity and, consequently, the impact it might have on academic performance. Many are the scientific studies that have been proving the different benefits of regular physical activity towards cognitive function (Rogers, 1990), mental health (Cotman & Berchtold, 2002), the development of healthy lifestyles (Mota, 1997), the development of social skills (Byrd, 2007), as well as the increase of self-esteem connected to the increase of physical and psychological wellbeing (Alves, 2017). Although the positive impact that physical activity has on our health is known, the link between physical activity and academic performance is not clearly defined.

Although being known that physical activity positively affects our health, in our nowadays society, especially in an urban context, physical inactivity seems to affect everyone, including the ones of young ages who are still developing their motor systems (Nelson & Larson, 2006). Children and adolescents spend a significant part of their free time playing videogames or watching television. In addition, the fact that most children do not walk to school, means that the importance of physical activity is constantly being unvalued (Mascarenhas & Almeida, 2005). Thus, it is crucial to promote healthy lifestyles and such should be widely promoted in any educational context (Edwards & Tsouros, 2006).

Structured or not, physical activity is an important factor in every child's life. And although many are the studies that argue that it also improves academic performance, physical activity should not be promoted in schools aiming to promote academic success (Shepard, 1997).

Historical Background

Physical education practices were first understood to be a means of education regarding hygiene habits, social interaction and the key to a healthy body (Bento, 2012). According to Bento (2012), it was the teachers' role to conduct and model the exercises that would, in an energetic way, provide pleasure and prevent boredom on the students. Thus, during this period, physical education was defined as the means to spread hygiene habits and avoid diseases. It was also the common belief that strong and healthy women would generate healthy children who would grow to be ready to defend and fight for their country (Matos, 2012).

At the beginning of the 70's, with the creation of teaching models and norms regarding physical education, it started being recognized as beneficial for physical, psychological, social, and moral purposes. Thus, physical education has suffered a transformation that allowed this subject to start being taught to all and also focused on performance aspects (Graça, 2012).

With the creation of research institutions responsible for studying the impacts of physical activity, schools started to understand that it was essential to educate the students towards an active use of their leisure time (Bento, 2012). The culture of

healthy body and healthy mind started to spread between all citizens. In addition, health began to be understood not only as the absence of disease but mainly as the state of physical, psychological, and social wellbeing (Graça, 2012). This change on the understanding of health and the recognition that physical activity was an efficient means to achieve such state has contributed to the growth of the importance assigned to physical education (Bento, 2012).

Definition of Terms

To better understand the findings and conclusions taken in this literature review, there are three critical terms that we must understand: physical activity, health, and academic performance. Physical activity can be understood as any movement conducted by our muscles, representing energy expenditure (Sallis & Owen, 1999).

Regarding the definition of health, it is crucial to understand that it is more than the simple absence of diseases. Health is a more complex state that comprises physical, psychological, and social wellbeing.

With respect to academic performance, it is commonly used to represent the process that assesses all the knowledge acquired, by a student, in an educational environment. Thus, academic performance evaluates the learning capabilities of a student as well as the learning readiness of the same.

Research Questions

This literature review project aims to research “how does physical activity affect academic performance” so physical education programs can be revised to serve not only the purpose of being beneficial towards our health but also towards academic performance so the learning process can be better informed. The goal is not to increase the levels of physical activity across schools based on a possible expectation that this might represent a gain in academic achievement. But, instead, to better understand the impact that physical activity has on academic performance, if higher levels of physical activity represent higher academic performance, and how these results vary between genders and between different age groups.

CHAPTER II: LITERATURE REVIEW

Literature Search Procedures

To locate the literature for this thesis, searches of Educator's Reference Complete, Expanded Academic ASAP, Education Journals, ERIC, Academic Search Premier, and EBSCO MegaFILE were conducted for publications from 1980-2020. This list was narrowed by only reviewing published empirical studies from peer-reviewed journals that focused on the impact physical activity has on health and on academic performance found in journals that addressed the guiding questions. The key words that were used in these searches included "physical activity," "benefits of physical activity," "impact of physical activity on academic performance," "physical activity and academic failure," and "physical activity and academic achievement". The structure of this chapter is to review the literature on physical activity in four three in this order: Physical Activity; Physical Activity and Health; and Physical Activity and Academic Performance.

Physical Activity

Physical activity (PA) is a term commonly used to represent a complex and multidimensional human behavior that involves all bodily movements to which a differentiated meaning is assigned depending on the context where it occurs (Sallis & Owen, 1999). So, PA can either be understood as a biological concept defined by any movement produced by the skeletal muscles that originate an increase in the basal metabolism (Bouchard et al., 1991), or as any type of movement performed by the skeletal muscles that create energy expenditure (EE) which comprises all daily activities

as long as they represent a change in our daily caloric consumption (Caspersen et al., 1985).

Thus, all our daily routines that imply bodily movements, as well as planned activities that are performed in specific spaces just like clubs or sports academies, can be considered PA (Mendonça & Anjos, 2004). In such a manner, the American College of Sports Medicine (2013) defines PA as all corporal movements caused by the contraction of skeletal muscles, originating a significant increase in caloric requirements concerning resting EE. In addition, Biddle (1991) adds that to be considered PA body improvements do not need to occur.

So, once PA should be interpreted in a multidimensional perspective and can include all types of body movements, it is important to understand that PA can be considered structured or formal and unstructured or nonformal (Barata, 2003). It is being the PA that defines our lifestyle and represents our daily routines like walking, running, riding a bicycle, or playing considered unstructured or nonformal. In contrast, the PA that follows a plan and where time, duration, intensity, and volume are clearly defined are considered structured or formal (Barata, 2003).

Thus, PA can vary according to four different domains: frequency, intensity, time, and type (ACSM, 1991). Therefore, to assess the levels of PA, according to Montoye, Kemper, Saris, and Washburn (1996), it is crucial to understand what each domain represents. Frequency refers to the number of sessions per day or week performed. Intensity indicates the EE per minute, and it is measured in kilocalories

(Kcal), Kilojoules (KJ), or metabolic equivalent of task (MET) through the maximum oxygen consumption (VO2 max) and maximum heart rate (HRmax). According to the intensity of the PA, it can be considered light, moderate, or intense (Caspersen et al., 1985). Time specifies the total time spent in activity, and it is expressed in minutes or hours. And type indicates the time pattern (continuous or intermittent) and the class of activity being performed (e.g., running) (Sallis & Patrick, 1994).

Psychological, cultural, social, and environmental factors, as well as age, gender, and physical ability, represent variables that can influence PA, according to Montoye (2000). In addition, different authors (Bouchard, 1994; Montoye et al., 1996) reinforce that the purpose, as well as the emotional or psychological content of the PA can create differences in the physiological results regarding the frequency, intensity, time and type of such PA. Hence, the quantity, variety, and complexity of the different variables that represent PA allow us to categorize and classify PA as PA during sleeping periods, PA during working periods, and PA during leisure periods (Bouchard, 1994). The total sum of these three distinct periods represents the total PA (Montoye, 1985)

Physical Activity and Health

According to the World Health Organization (2002), health can be defined as physical, mental, and social wellbeing. Also, health is influenced by genetics, physical and social environment, as well as human behavior.

Regarding the impact that PA can have on our health state, Pate, Baranowski, Dowda, and Trost (1996) mention that low levels of PA are directly related to the risk

increase of cardiovascular diseases, diabetes, high blood pressure, osteoporosis, obesity, psychological diseases, as well as some types of cancer. Therefore, Sallis and Owen (1999) consider that regular PA reduces the mortality factors and promotes health once it reduces the anxiety and depression levels; increases self-esteem, self-confidence and wellbeing (ACSM, 2000); and improves life quality and social relationships (Sallis & Patrick, 1994). Shepard (1996) defends that an increase in the PA levels is related to improvements in self-esteem, which assists in learning and increased performance. Similarly, on studies conducted to pre-adolescent boys in Hong Kong, the authors verified that a high level of PA at school was also associated with an increase in self-esteem (Tremblay et al., 2000; Yu et al., 2006).

Different studies have researched the relation between PA and academic results and have described it as one that produces positive effects on academic performance (Trudeau & Shephard, 2008) once it increases the levels of self-esteem (Nelson & Larsen, 2006), improve the perception of our body-image (Hausenblas & Downs, 2001), and increases the levels of satisfaction and connection with the school (Brown & Evans, 2002).

In addition, Kesaniemi et al. (2001) defend that the performance of PA only brings positive benefits and that it is one of the healthiest choices we can select to improve our health. Also, the World Health Organization (2011) has classified physical inactivity as the fourth-highest risk of mortality worldwide.

However, the same clear connection between health and PA cannot be established regarding children once the display of diseases related to physical inactivity is rare at young ages and is normally only displayed in adults (Guerra, 2002). But Freedman et al. (2001) alert that some of the risk factors that are exhibited during adulthood might have their origin during childhood and can be avoided through regular PA.

So, although the relation between PA and health, at young ages, is not consensual amongst studies once it is not easy to establish a correlation between both (Boreham & Riddoch, 2001), it is stated that PA encourages the adoption of positive behaviors which can positively impact health (Blair & Connelly, 1996; Mota & Sallis, 2002), enhance school performance by increasing memory and focus levels (Carmo, 2011; Department of Health and Human Services, 2000; Esteban-Cornejo et al.,2014; Haapala, 2012), promotes motor development (Blair et al., 2004), reinforces healthy lifestyles and increases social integration (Marques, 1997; Tassatino et al., 2007). In addition, PA during schooling years is understood as an aid towards a healthy and optimal development and growth rather than as a resource to prevent diseases (Telama, 1998; Carmo, 2011); consequently, physical inactivity is intimately related to the decrease of health (D'Avila et al., 2016; Oreskovic et al., 2015).

Castelli et al. (2007) researched the relation between the different components of physical readiness, health, and academic performance, for mathematics and reading, in 259 students of public schools. The findings of this study revealed a connection

between physical readiness and academic performance, showing that the students with better physical readiness performed at higher levels on the academic tests. Moreover, a higher body mass index was discovered to be negatively associated with academic performance. This study brings concrete data to the importance of PA as a way to promote and improve cognitive performance. Thus, according to Sattlemair and Ratey (2009), physical education lessons and programs that comprise a reduced frequency and intensity of PA will not contribute to the improvement of academic performance.

And although the World Health Organization (2009) alerts that participation in PA assists in the development of the children once it provides opportunities for developing self-confidence, self-expression, social interaction, and social integration, Edwards and Tsouros (2006) advert that the opportunities for children to be physically active are being reduced daily due to safety concerns expressed by their parents, as well as due to technological advances and the increase of the popularization of passive activities just like videogames and television (Clements, 2004; Graciosa et al., 2013; Ramos, 2014; Sereno, 2008).

Physical Activity, Age and Gender

According to Sallis and Owen (1999), age and gender represent the two most studied variables regarding PA, where age always displays a negative relation with the first. Also, Araujo et al. (2005) mention that the decrease of the levels of PA start during adolescence (10-18 years old) and increase until adulthood, meaning that adolescence represents the optimal period to start promoting healthy lifestyles which, if entrenched

during this period are more likely to continue to be displayed during adulthood (Novaes, 2012; Telama & Yang, 2000).

Once PA promotes the healthy development of the body tissues, bones, and muscles, improves the cardiovascular system, and assists in maintaining positive mental health, the World Health Organization (2009) reminds that children between the age of five and 17 years old should be submitted to a minimum of 60 minutes, daily, of moderate or intense PA to the benefit of such results. Likewise, Verloigne et al. (2012) reinforce that in addition to the increase of PA, it is also important to decrease the number of hours of physical inactivity.

Thus, knowing that adolescence is the period that presents the highest levels of the decrease of PA as well as commonly this decrease might proceed throughout adulthood, it is important to change this tendency early and with efficacy (Kjonniksen et al., 2008). This can be achieved through the increase of information regarding the benefits of PA, the creation of infrastructures, and the improvement of safety considerations (Baskin et al., 2015; Durand et al., 2011; Fermino et al., 2013).

Regarding the PA recommendations for adults between 18 and 64 years old, the American College of Sports Medicine (2011) recommends a minimum of 150 minutes per week or 30 to 60 minutes during five days per week of moderate activity, or 20 to 60 minutes of intense activity three times per week.

Regarding the relation between gender and PA, Dischman and Sallis (1994) state that boys are more active than girls throughout their life and prefer guided sports.

Opposite to this, girls are generally less active but tend to participate regularly in PA. In addition, boys normally select PA classified as moderate or intense, and their levels of participation in PA vary widely, while girls select light or moderate and normally select artistic PA (Janz et al., 1995; Mechelen et al., 2000; Vella et al., 2013).

A study conducted by Riddoch et al. (2004), with the participation of 2185 children of different European countries, concluded that nine-year-old boys were 20% more physically active when compared with girls of the same age group. In this study, the results have demonstrated that this difference increases with age and so, at the age of 15 years old, boys demonstrated a PA of 26% more than the girls. In addition, in similar studies, results have shown that the girls present an average of 43 daily minutes of PA while boys demonstrate 50 minutes of daily PA (Bielemann et al., 2013; Konstabel et al., 2014; Verloigne et al., 2012). Also, Konstabel et al. (2014) concluded that the PA participation of boys varies between 10% and 34% while the PA of girls varies between 2% and 15%. Thus, we may conclude that girls are more likely not to follow the daily recommendations of PA, which can be due to access in participation or because parents normally encourage more the boys to be physically active (Timperio et al., 2008). From a sport professional point of view, these results demonstrate that professionals should promote more PA as well as its benefits, designing PA specifically for girls due to the low level of results obtained (Seabra et al., 2008).

Physical Activity and Academic Performance

To verify if the educational goals are being achieved as well as to understand what needs to be changed in the educational process, the community, under the command of the teacher, has the need to evaluate the knowledge acquired and the transmission process. According to Fernandes (2005), the evaluation process is a crucial step in the improvement of the educational system once it is due to this assessment that schools enhance their curriculum, their approach of the learning goals, the development of techniques to teach the students to become resilient and independent, the inclusion of the entire school community on the daily activities of the school, as well as the implementation of effective educational measures. People try to find reasons that justify their successes and failures. Thus, the crucial role of assessment is understood as an observational process used to perceive the effects of teaching by assigning qualitative and quantitative attributes to each student and aims to improve educational measures (Cardinet, 1984; Perrenoud, 1999; Stake, 1995).

In addition, assessment is a very common tool used in a school context to cross the defined curriculum goals with the performance of its school community (Mascarenhas & Almeida, 2005). So, assessment demands the teacher to take into consideration previous results, processes, and answers, so a final judgment against pre-established criteria and goals can be conducted (Rodrigues, 1993; Zabalza, 1992). In addition, the assessment tools used to allow the teacher to better understand and know their students, their needs and to better shape the process of transmission of knowledge so, consequently, assessment is a crucial tool in the school life (Santos,

2006). For Formiga (2004), academic success does not only represent one of the biggest concerns in an educational environment but also in a social and individual context.

The context we live in and the society around us promotes a culture of success and expects high academic performance (Fonseca, 1984). According to the author, academic success is defined by academic performance (AP). And although AP is understood as a multidimensional and complex concept, it is defined as the capability students display regarding the achievement of pre-established goals defined for each school year (Fonseca, 2004). López (1994) highlights that the definition of AP varies according to its focus: focused on the student, his will and capabilities; focused on the results of the school performance which is influenced by the performance of the teacher and his ability to transmit knowledge, or focused on a theoretical and practical approach that understands AP as the result of different educational factors and family interactions. So, we can conclude that the previously mentioned factors might affect AP in a positive or negative way and, consequently, it comprises not only the student but also the institution, the teachers, and the family as important factors on the achievement of academic success.

Opposite to academic success, academic failure arises as a concept important to define. Academic failure is a theoretical concept used to define a situation where educational goals were not achieved (Landsheere, 1994). In addition, it assesses the results and the progress achieved in relation to the educational programs, so the students can be qualified as strong or weak (Benavente & Correia, 1980). Also, academic

failure is commonly associated with learning difficulties, low scores on the exams, and school dropout (Fernandes, 1985). Academic failure can be influenced by a deficient school structure, social or personal needs (Pires, 1991).

According to Benavente and Correia (1980), academic failure starts to be displayed in the early years, is common across all socioeconomic status, and normally repeats itself along with the school life of the same student. Nevertheless, the consequences of academic failure are not exclusive to the students. As mentioned by Fonseca (2004), it also affects the family of the students as well as the school and, consequently, society. Thus, in order to understand academic failure, we have to understand three different dimensions once both academic failure and success depend on the school, its interactions with the society, as well the unique characteristics of the student (Almeida, 1998; Fonseca, 2004; Garcia, 1998;).

In relation to the interactions with the society, this dimension has been thoroughly studied, and a positive relationship between social background and academic success or failure has been established as one that better assists the students whose background is from a high status of the society (Benavente & Correia, 1980; Crahay, 1999; Garcia, 1998; Grácio, 1995). The level of structure that PA presents at school is equally proved to promote social benefits that can influence AP (Taras, 2005). According to the author, students that learn to collaborate, to cooperate, to identify and respect rules or norms, that learn how to work in a group context, and know and like to

test their own physical limits are the ones who create deeper connections with the school and its community.

Dwyer et al. (2001) have researched the different effects of parental involvement indicators in the intellectual and physical development of children and stated that higher social economic status, eating before going to bed, being able to play a musical instrument, and having one of the parental figures who exercise a minimum of twice per week, represents higher school ability. In addition, Fonseca (2004), and Jiménez (1997), highlight the role of the parents and educators in stimulating interest and motivation as well as helping developing language skills once these are fundamental in the social adaptation and on the school results of the child. Thus, the relation established between the school and the family is also an important factor to have into account once this relation also influences the child on the participation in extracurricular activities (Schmidt & Padilla, 2003).

In addition, Hill et al. (2004) have studied the influence of the school level of parents on the academic progress and behavior of their child and have verified that in families which the parents have only achieved low levels of school performance or that have dropout school at an early stage, their children presented higher educational ambitions, better behavior at school and higher academic performance, when compared with their parents. Also, in families whose parents had achieved high levels of school performance, their children also presented high levels of motivation towards

school, as well as high results and school appropriate behavior (Desimone, 1996; Shumow, Vandell, & Kang, 1996).

Despite the above-mentioned results, Pires (1991) has mentioned the important role school has in trying to decrease the difference between social status and its influence on school failure once students prevenient from the lower economic levels of the society tend to represent the highest percentage of academic failure. In addition, studies have shown that socioeconomic status is directly related to higher levels of PA and sport participation, which can explain why children that take part in vigorous PA are the ones that reach higher levels of AP (Raudsepp & Viira, 2000; Santos et al., 2004; Settlemair & Ratey, 2009)

School failure, when analyzed from a social dimension, should be understood as an interconnected and relational concept in which the student, the family, and the school, with their individual experiences and personalities, their social context, their organizational operation, their educational and pedagogical tools, as well as other linked elements, all have an influence on the school progress of the student. Thus, it is fundamental that we stop considering the student as the only element responsible for their school progress and achievement (Almeida, 1998). It is important to note that the school structure, the teaching methodologies adopted, the training and level of knowledge of the staff members, the chosen assessment methods, and even the background of the teachers may sometimes act as catalysts of the needs of the students regarding their academic failure or success (López, 1994).

One more important factor to take into account when analyzing AP, PA, and cognitive results is the quality of instruction once physical education lessons with limited or reduced time of PA will not affect AP (Settlemair & Ratey, 2009). In addition, Carlson et al. (2008), when studying the connection between the time spent in physical education lessons and AP by observing 5316 children between three and 11 years old, verified that from the students who were submitted to a weekly minimum of 70 minutes of PA, girls presented an increase of their performance in mathematics and reading when compared to students who were submitted to lower times of PA. Contrarily to these findings, Carlson et al. (2008) verified that an increase of the PA time in boys did not change their AP. The authors suggest an explanation for this finding based on the physical readiness of boys being normally higher than the girls. Thus, the authors believe that the time spent in PA needs to be higher for boys in order to cause effects.

Similarly, Dwyer et al. (2001) and Castelli et al. (2007), on studies conducted regarding the relationship between AP and PA programs, the authors tried to understand the role of physical readiness on this connection and verified that constantly a positive association between PA and physical readiness could be established. These results support the study conducted by Grissom (2005), who concluded that there was a strong relationship between physical readiness and AP in girls. Similar to these findings, in a study conducted by Elevand-Sayer et al. (2009), the authors stated that there is

always a positive relation between PA and physical readiness, but this connection is stronger on girls than on boys of the same age.

Regarding the dimension student, it is important to understand that during the first half of the 20th century, intelligence was understood as the only cause for academic failure once there was a clear connection between both variables: learning was understood as a dependent of intelligence (Pires, 1991). So, once the relationship between tests of intelligence and the school results was evident, different authors have concluded that students with higher results on the intelligence tests had the highest chances of performing at the highest level and, consequently, achieving academic success (Almeida, 1998; Fonseca, 2004).

Contrarily to this line of thought, González-Pienda (2003), the interrelation between intelligence and AP is not a clear one once, depending on the learning style, pre-acquired knowledge, and study habits, intelligence might assist or not on the AP of the student. Also, Peixoto (1999) argues that AP is a very complex phenomenon that is influenced by a variety of external factors not exclusive of the personal characteristics of the student. Almeida (1998) has also explained that although learning difficulties are not due exclusively to individual characteristics, the following factors assume a crucial role in the progress of the student: cognitive capabilities which, according to the author, should not be understood as a linear relation between learning levels and academic progress; knowledge bases and pre-acquired knowledge, which will influence how and if new knowledge will be acquired; individual perceptions like self-esteem, expectations

and even our own definition of failure can negatively impact our academic performance; as well as study habits, once, according to the author, students who have not availed themselves with efficient study methods will struggle to achieve high levels of performance.

Lindner (1999) has focused on studying the relation between PA, AP, and self-perception of AP on 4,690 students of ages between nine and 18 years old. The results have shown that PA cannot be considered as a factor that negatively affects AP and that the students with more realistic perceptions of their own AP were the more physically active ones. Nevertheless, data collected has also shown that more frequent and intense participation in PA is associated with lower AP. Thus, it is important to find the correct balance between PA and other more traditional subjects so PA can be used to improve AP (Lindner, 1999). So, according to the author, despite the relation between PA and AP is also influenced by the type of school and students, the academic level of the students can be used as a predictor of their PA level once students with higher AP normally display higher rates of participation in PA when compared to students with lower levels of AP.

Physical education lessons represent a clear opportunity in the promotion of PA amongst children of school age. Different studies have assessed the relation between PA and AP, reinforced the role of PA on our nervous system, on our psychological state, on the regulation of anxiety and depression, on our predisposition to execute daily tasks, on the development of our cognitive function, memory, and learning abilities, on our

AP, and on our wellbeing (Black et al., 1990; Buck et al., 2008; Cotman & Berchtold, 2002; Dubow & Kelly, 2003; Hill et al., 1993; Hillman et al., 1990; Rogers et al., 1990; Settelmair & Ratey, 2009). So, it is clear the impact PA can have on the physical and intellectual development of a child (Hallal et al., 2006).

Although there is a connection between body and mind and that exercising the body brings benefits in the development of our brain capabilities, Etnier et al. (1997) verified that the influence of exercise in the cognitive capabilities brings no improvements when only small temporary changes occur due to a reduced frequency of the PA. However, as the length of the exercise increases, so do the effects on the cognitive capabilities once. According to Sibley and Etnier (2003), body and mind work as a sole entity, and everything that affects one will consequently affect the other. Thus, the authors find it particularly curious that although commonly the main school focus is on the development of cognitive factors, schools do not focus on increasing and improving the levels of PA.

To explain the above-mentioned relation, Sibley and Etnier (2003) have focused on two main categories: physiological factors (an increase in the blood circulation, changes in the brain, changes of the excitement levels), and learning/development mechanisms. Based on the findings, the authors have stated that the effects of PA on AP are higher in ages between 11 and 13 years old and that it is possible that the effects observed are due to the anxiety that characterizes this phase of life where the value assigned to the peers' opinions is highly valued. Thus, in these ages, PA has an indirect

influence on the cognitive performance observed through the reduction of anxiety and an increase in self-esteem (Dwyer et al., 2001). So, it is possible to deduce that the time spent in PA does not represent a negative effect on the cognitive performance neither the AP (Tremblay et al., 2000). In addition, PA should be part of the daily life of school due to its physical and cognitive benefits as well as it should be used as a tool to reduce disruptive behaviours (Lindner, 1999) and school drop-out (Trudeau & Shepard, 2008).

Dwyer et al. (2001), on a study which comprised the observation of 7961 students between the ages of seven and 15 years old, to understand the relation between PA and AP, the authors concluded that in all students of ages between nine and 12 years old, AP is positively influenced by the level of PA performed on the previous week. Thus, the authors stated that PA brings significant improvements to AP and that schools should revise the time spent in physical education lessons.

Mota et al. (2015) have explained that AP is a broad concept that comprises all the results obtained through a variety of assessment tools that aim to evaluate the students while in a school context. In addition, different authors believe that the time dedicated to PA is related to higher AP once it increases socialization, reduces anxiety, and affects intellectual development and health by promoting brain activity (Hillman et al.,2011; Landry and Driscoll, 2012; Rasberry et al., 2011). Thus, the relation between PA and AP has been the center of many kinds of research and investigations that based on the results obtained have concluded that PA has a positive effect on AP (Trudeau & Shepard, 2008; Rasberry et al., 2011; Peralta et al., 2015).

Different authors (Trudeau & Shepard, 2008; Rasberry et al., 2011; Peralta et al., 2015) have verified a positive relation between AP and PA. An increase in the levels of PA during the school period can represent an increase of the excitement levels and, consequently, a reduction of the boredom levels, which will consequently represent greater attention and focus levels (Shephard, 1997). in a study conducted by Byrd (2007), the author concluded that the students who have maintained a higher level of PA, when compared to their less physically active colleagues, were also the ones who have achieved the highest AP levels. Similarly, programs that have reduced a minimum of 240 minutes weekly of the time spent in the classroom, and substitute it with PA, have verified positive improvements on the results of the tests of Mathematics (Sallis & Owen, 1999; Shephard, 1997; Shephard et al., 1984).

Taras (2005) explains the above results once PA improves the blood circulation. Thus, the levels of noradrenaline and endorphins on the brain consequently increase, which assists in the reduction of the levels of stress, reduces the swifts of mood, which produces a calm effect after PA. Thus, for the author, an increase in AP is observed. Also, it was proved that a good aerobic condition could help increase the memorization ability and, consequently, the performance on assessments due to the fact that during PA, the flow of oxygen in the brain increases, which improves the muscle connections as well as specific areas of the brain (Shepard & Trudeau, 2000; Symons et al., 1997). So, schools that include in their curriculums programs of intense PA have verified positive results regarding AP once there were improvements in the focus, oral and written

interpretation, and mathematical calculation (Franklin, 2007; Kolbe et al., 1996; Symons et al., 1997). Nevertheless, Donnely et al. (2013) argue that although there is a clear connection between PA and AP, this relation is still not considered for assessment purposes.

A variety of experimental studies have tried to assess the effects on AP of an increase of time dedicated to the physical education lessons (Shephard, 1997; Sallis et al., 1999; Coe et al., 2006; Carlson et al., 2008). The results have not only proved that PA affects positively AP but also that the time dedicated to PA should increase in order to achieve higher AP.

A study conducted by Mota et al. (2015) has stated that the existent literature and researches on this matter have proved a positive relation between PA and AP when the total time of PA per week is above 120 minutes. The same study mentions that reducing the students' weekly PA will not bring benefits to their AP. Thus, Esteban-Cornejo et al. (2015) believe that the participation of students in a minimum of three weekly lessons of physical education will directly improve their AP. Also, research has verified that a planned program of PA has resulted in reading improvements as well as that reducing the number of hours of more traditional subjects when compared to the hours allocated to physical education has not affected the global results of AP (Murray et al., 2007; Tremblay et al., 2000; Trudeau & Sheppard, 2008).

Based on the results of a five-year study conducted to 3000 students of 13 different schools in Portugal that aimed to evaluate the relationship between

cardiovascular health and AP, Wong and Gomes (2012) state that PA has a positive effect on AP and that students with higher levels of PA have achieved higher levels of AP on the subjects of Mathematics, Sciences, and Languages.

Sallis et al. (1999) have observed 759 children during PA over a period of two years. The children were divided into three groups: physical education lessons with a specialist teacher for 80 minutes of PA per week, 65 weekly minutes of PA with a trained teacher, 38 weekly minutes of PA without specific supervision or guidance. The biggest changes were observed in the group that was doing physical education lessons with a specialist teacher. These children have developed better cardiovascular endurance and muscular endurance. Regarding AP, the groups lead by specialist teachers and trained teachers, although dedicating more time to PA, have observed a lower decline in their AP. Also, the group lead by the specialist teacher, who spend the most time in PA, was the only group that did not present a decline in their AP throughout the two years of observations. Thus, the study concluded that an increase of the time dedicated to PA does not negatively affect the AP of the students. Shepard (1997) and Coe et al. (2006) have reached to same conclusions in their studies where both authors have observed groups of students to whom an extra weekly lesson of physical education was assigned. And although the results showed that an increase of the time spend in PA does not affect negatively AP, the studies also have shown that PA needs to be moderate to intense to affect AP. In addition, Coe et al. (2006) verified that the students involved in vigorous PA would perform at higher academic levels when compared with the students

that performed none or weak PA. Thus, we can assume that a minimum intensity of PA needs to be defined in order to cause positive changes to the AP of a student.

So, although a variety of studies have identified a positive relationship between PA, and AP, the complexity of this same relation makes it hard to specifically identify all the mechanisms involved. Etnier et al. (1997) defend that PA helps improve physical readiness specifically through changes that occur at a physiological level which will create changes at a cognitive level and, consequently, changes at a physical level will also take place. Tremblay et al. (2000) also mention the contribution of psychomotor development, the reduction of stress, and an increase in self-esteem in the creation of a positive relation between PA and AP. Additionally, Shephard (1997) highlights the quality of instruction, the quality of the PA programs, the students' attitudes as well as learning difficulties as important contributors to this relation. Along, Castelli et al. (2007), point the students' motivation as the crucial factor in this complex relationship.

Although many studies have presented evidence that more physically active children tend to demonstrate less behavioral issues and, consequently better AP, and although the concerns regarding AP has been increasing, the importance assign to physical education lessons has been decreasing from year to year (Gil et al., 2013).

CHAPTER III: DISCUSSION AND SUMMARY

Summary of Literature

Participation in PA and, consequently, children's physical aptitude is decreases once children spend more hours performing passive activities (Clements, 2004; Edwards & Tsouros, 2006; Etnier et al., 1997; Graciosa et al., 2013; Ramos, 2014; Sereno, 2008). For assessment purposes, the American College of Sports Medicine that a weekly minimum of 150 minutes be spent in moderate activity (ACSM, 2011). Thus, it is crucial to promote the benefits of PA and its benefits on health such as the decrease of risk factors and the increase of AP. This way educators and parents will be informed regarding the importance of PA as well as strategies to avoid the appearance of diseases related to physical inactivity (American College of Sports Medicine, 1991; Barata, 2003; Biddle, 1991; Freedman et al., 2001; Montove et al., 1996; World Health Organization, 2011). According to different authors, the benefits of regular physical activity include improvements of cognitive function, mental and physical health, social skills, and self-esteem and should be specially promoted during adolescence (ACSM, 2000; Araujo et al., 2005; Black et al., 1990; Blair, & Connely, 1996; Boreham, & Riddoch, 2001; Brown, & Evans, 2002; Buck et al., 2008; Cotman & Berchtold, 2002; Hallal et al., 2006; Hill et al., 1993; Hillman et al., 1990; Hillman et al., 2011; Kesaniemi et al., 2001; Kjonniksen et al., 2008; Landry, & Driscoll, 2012; Novaes, 2012; Pate et al., 1996; Rogers et al., 1990; Telama, & Yang, 2000; World Health Organization, 2002).

Knowing that PA varies according to the frequency, intensity, time, and type, it is important to assess how each domain varies to realistically verify its effects on AP

(Montove, 1985; Montove et al., 1996; Sallis & Patrick, 1994). So, PA lessons that do not promote a sufficient length and intensity of aerobic activity will not produce improvements in PA, control of body weight, increase of memory, increase of focus, health improvements neither AP (American College of Sports Medicine, 2013; Bouchard et al., 1991; Carmo, 2011; Caspersen et al., 1985; Department of Health and Human Services, 2000; Guerra, 2002; Mendonça & Anjos, 2004; Sallis & Owen, 1999; Sattlemair & Ratey, 2009; Telama, 1998). Although Lindner (1999) and Bouchard (1994) defend the existence of a tendency of students with a high perception of their physical skills to participate more frequently and intensely in PA, Castelli et al. (2007) have verified a positive connection between AP and PA independently of the physical level of the students. Thus, different authors defend that the number of hours spent in PA at school should increase as to positively impact the AP, health and, consequently, the social integration (D'Avila et al., 2016; Hausenblas & Downs, 2001; Marques, 1997; Montove, 2000; Shephard et al., 1984; Oreskovic et al., 2015; Shepard, 1996; Shepard, 1997; Sibley & Etnier, 2003; Tremblay et al., 2000).

The comparison of different results of PA and AP, in a school context, and consequent analysis to improve the outcomes suggested, can only be established through an evaluation of the educational process and the performance of the entire school community (Cardinet, 1984; Fernandes, 2005; López, 1994; Mascarenhas, & Almeida, 2005; Perrenoud, 1999; Stake, 1995. Such results need to be compared against previous results, processes, and strategies so conclusions can be reached (Rodrigues, 1993; Zabalza, 1992. Thus, assessment represents a crucial tool in every school, and its

achievement or not should shape the definition of educational and individual concerns (Formiga, 2004; Santos, 2006). In addition, although academic failure defines a situation where the proposed goals were not achieved against educational programs as to qualify the students, it is important to understand that it is also commonly associated with the achievement of low results and can be caused by both social or personal needs as well as a deficient school structure (Fernandes, 1985; Landsheere, 1994).

Carlson et al. (2008), in a study that aimed to compare genders, verified that although improvements were observed on the AP of the girls when submitted to more extended periods of PA, such relation was not possible to establish on boys. Dischman and Sallis (1994) have stated that independently of their age, boys are generally more active and prefer moderate or intense sports when compared to girls. As well, and although less active in sports, girls do take part in sports or moderate PA more regularly, especially if they demonstrate higher levels of physical readiness (Bielemann et al., 2013; Eevand-Sayer et al., 2009; Janz et al., 1995; Konstabel et al., 2014; Mechelen et al., 2000; Riddoch et al., 2004; Timperio et al., 2008; Vella et al., 2013). Thus, by promoting PA and its benefits amongst girls, sports professionals will be improving the life-quality and the academic results of our population (Seabra et al., 2008). Nevertheless, authors believe that more prolonged exposure to physical education lessons would assist every student in improving their AP, self-confidence, self-esteem, reading levels, and social integration (Dwyer et al., 2001; Grissom, 2005; Murray et al., 2007; Peralta et al., 2015; Settelmair & Ratey, 2009; Trudeau & Sheppard, 2008; Wong & Gomes, 2012; World Health Organization, 2009).

On an opposite view, some authors have reinforced that allocating more hours to PA programs is not sufficient once AP is a complex phenomenon influenced by different factors like the characteristics of the student, relation with the family, the motivation of the parents towards school, socio-economic level of the parents as well as other social factors that influence the students and their school life thus, it is also important to reduce physical inactivity (Almeida, 1998; Benavente & Correia, 1980; Conzález-Pienda, 2003; Dubow & Kelly, 2003; Fonseca, 1984; Fonseca, 2004; Garcia, 1998; Hill et al., 2004; Jiménez, 1997; Peixoto, 1999; Pires, 1991; Raudsepp & Viira, 2000; Santos et al., 2004; Schmidt & Padilla, 2003; Shephard, 1997; Shumow et al., 1996; Verloigne et al., 2012). This can be achieved by the creation of sport infrastructures available to every citizen as well as by investing in the promotion of information regarding the effects of physical inactivity (Baskin et al., 2015; Duran et al., 2011; Fermino et al., 2013). Despite these results, different authors defend that academic success is easier achieved on students who are originated from a high status in society (Crahay, 1999; Grácio, 1995).

A clear connection between the development of PA, especially at an intense level, and AP was highlighted by different authors (Blair et al., 2004; Esteban-Cornejo et al., 2015; Franklin, 2007; Haapala, 2012; Shepard & Trudeau, 2000; Tassatino et al., 2007) who defend the increase of such programs at schools (Byrd, 2007; Coe et al., 2006; Donnely et al., 2013; Mota & Sallis, 2002; Mota el at., 2015; Nelson & Larsen, 2006; Taras 2005; Yu et al., 2006). Such connection is presented as a result of increased focus, mathematical calculation, and improvements on oral and written interpretation

(Desimone, 1996; Kolbe et al., 1996; Rasberry et al., 2001; Symons et al., 1997). Although this connection is defended by many authors, physical education programs still are not recognized by the importance they have (Gil et al., 2013).

Limitations of the Research

After trying to locate literature that studied the impact of PA on health and AP through searches that included the keywords “physical activity,” “benefits of physical activity,” “impact of physical activity on academic performance,” “physical activity and academic failure,” and “physical activity and academic achievement”, the research questions had to be narrowed down. This choice was because that the results obtained did not allow me to answer questions regarding differences between genders or nationalities. Through the analyzed studies, I realized that not many studies compared the results obtained between different age groups or between students with other healthy characteristics. Most of the studies analyzed did not focus on the students’ background or tried to understand the results. So, although I initially was only focused on understanding the existence or not of a link between PA and AP, after initial research, I understood that it was similarly significant to understand how PA affects AP. Also, trying to understand if these results vary between genders and between different age groups reveals itself to be as important as the initially proposed questions.

Implications for Future Research

Many are the studies that propose to investigate school outcomes and how PA influences the previous. But after reviewing the bibliography, I believe that understanding how the physical education lessons should be shaped to better assist AP

would be valuable to every school. Understanding the increases and decrease of PA in both genders is crucial to help us better understand the effects of movement and exercise in the students' daily lives and their learning. An advance in the studies proposed above might represent higher funding towards PA interventions and, consequently, increase the AP of every student.

Although the relation between PA and AP seems evident across studies, due to the inconsistency of the methodologies used on data collection, this relation cannot be thoroughly explained. Thus, the measurement of PA levels should be consistent across studies, always focusing on both intensity and frequency to avoid leading to undesired differences and explanations of these two concepts relation. Albeit a relation between PA and AP can be established, understanding its meaning to verify if PA promotes AP or if AP promotes participation in PA would be beneficial to the tailoring of academic strategies. Also, despite some proofs that support a relation between PA and AP, it is not proven that an increase in the levels of PA represents a clear increase in the levels of AP. Thus, to answer this need, and understand the length of the effects, studies with a larger sample need to be conducted.

The effects of PA on AP have been primarily studied, but, as a specialist teacher, I feel the need to better understand how specific teacher training designed to improve the teaching methods and techniques would affect AP. Such studies would be beneficial for schools to understand and justify their hiring needs and for teachers to invest in their training to better lead our students towards success.

Implications for Professional Application

Physical education lessons represent an enormous opportunity for schools to promote PA in children of school age. Strong scientific evidence that links regular participation in PA with higher AP levels has been presented and thus should be envisaged by educators and schools. Keeping in mind the findings of the different studies, teachers and schools' management can better understand what measures need to be put into practice to assist our students in reaching their highest potential. It also assists physical education teachers in promoting sports programs, which have been gradually losing their importance and recognition across schools.

These studies also reinforce the importance of teachers and schools to understand that specific training in physical education and PA is so crucial that physical education lessons should only be led by specialist teachers. At the same time, as an educator, I understand the need to continuously invest in my training as a way to guarantee that my lessons are designed to best suit the universe of students for whom I am responsible for once the quality of instruction is a crucial factor in the relation between PA and AP.

Believing that the relationship between physical education lessons and AP has been tested limited due to the low quality of the PA programs being observed, it is possible to assume that the benefits resulting from this relation have been underestimated. I believe that any advantage on the AP of a student is reflected by an improvement of their cognitive development thus, knowing that PA assists with cognitive development, the time dedicated to physical education lessons will not affect negatively the AP. Also knowing the social, mental, and physical benefits that PA is

proven to cause in every student and the negative consequences that PA can, in due course, present educators need to avail themselves with these knowledge tools so to advocate for their students' healthy future.

Therefore, as a professional of the physical education field, I defend that extra time dedicated to these programs will be reflected on an increase on the AP and on the notion of self of the students. Consequently, through improvements on self-confidence and self-regulation, by promoting an increase in the number of hours spent in PA programs, improvements in socialization and positive behaviors will also occur. Thus, knowing that an increase in PA, when conducted by specialized trained teachers, will only bring advantages to our students, it is important to make changes to our current curriculums rapidly.

Conclusion

PA is closely related to improvements in health (Mota, 1997). At school age, PA programs are proved to reduce risk behaviors (Byrd, 2007), assist in the development of social and cognitive skills (Rogers, 1990), improve mental health (Cotman & Berchtold, 2002), and improve AP (Shepard, 1997). But, to achieve positive results in the improvement of AP, PA needs to have into consideration the time, duration, intensity and volume of the activity so to not create a negative effect (Montoye et al., 1996). Thus, PA should be widely promoted and insistently encouraged across schools with the previously mentioned factors in mind.

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