



## Physical education and its implication in the prevention of chronic non-communicable diseases among schoolchildren: an integrative review

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### 1 INTRODUCTION

Chronic Non-Communicable Diseases (CNCDs) are one of the biggest problems for public health in the world, including type II diabetes mellitus, cardiovascular diseases, some types of cancers, and obesity (DUNCAN *et al.*, 2012).

Some of the factors that intensify the involvement of these diseases are the lack of regular physical activity, alcoholism, smoking, consumption of foods poor in fiber and vitamins, trans fat and simple sugars (TAVARES; NUNES; SANTOS, 2010).

The lack of physical activity has a strong association with NCDs, because it is known that the possibility of getting involved increases according to the degree of obesity and accumulation of fat in the abdominal region, in which visceral fat is more associated with metabolic disorders and cardiovascular risks such as dyslipidemia, hypertension and diabetes mellitus (TAVARES; NUNES; SANTOS, 2010).

The diet also has a strong relationship with the involvement of NCDs, because a healthy diet is of great importance to mitigate this risk (BOTELHO, 2018). Thus, it should be taken into account that a good diet consists in keeping the body in its full state of health, i.e., with weight and height according to the individual's biotype, and more, a balanced diet improves the immune resistance to diseases, besides improving the individual's willingness to work, study and have fun, but for this, it is crucial to have a balanced diet that contains various nutrients, and that maintains the proper development of body functions (BOTELHO, 2018).

Considering that physical inactivity and eating habits contribute directly to overweight and obesity and consecutively to the onset of NCDs, the World Health Organization (WHO) points out that the number of obese children and adolescents aged 5 to 19 years worldwide has increased approximately tenfold over the past four decades. On the other hand, if these current trends continue, there will be more overweight children and adolescents. Furthermore, obesity rates in children and



adolescents worldwide have increased from 1% (equivalent to five million girls and six million boys) in 1975 to almost 6% in girls (50 million) and almost 8% in boys (74 million) in 2016. With this, the number of obese people aged 05 to 19 years grew more than tenfold, from 11 million in 1975 to 124 million in 2016 (BRAZIL, 2016).

The fact that children and adolescents spend much of the time of their lives at school makes the school space an ideal place to develop actions and projects aimed at nutrition education and promotion of healthy habits (MAGALHÃES; PORTE, 2018). According to Magalhães and Porte (2018), school Physical Education is a means to teach children habits and attitudes that discipline and guide on a healthier living, because they help to see life in a reflective and participatory dimension in line with learning, through sports practices and sports rules that reflect on the individual's social conduct.

Considering the school as an informer and transformer of people and attitudes, it can be seen as an important tool in the construction of knowledge and behaviors. From this perspective, it is believed that nutrition education and physical exercise can provide transformations inside and outside the school environment, converting students with poor lifestyle habits into future multipliers of healthy habits adoption within their social and family environment (MAGALHÃES; PORTE, 2018).

## **2 OBJECTIVE**

To analyze the scientific discussions about the implications of school Physical Education in the prevention of NCDs.

## **3 METHODOLOGY**

The present study comes from an integrative review, which aims to synthesize the results obtained on a particular topic or issue, providing information in a more comprehensive and orderly way, thus producing a body of knowledge (ERCOLE; MELO; ALCOFORADO, 2014).

The main purpose of exploratory research is to "develop, clarify and modify concepts and ideas with a view to formulating more precise problems or researchable hypotheses for further studies" (GIL, 2008, p.27). On the other hand, descriptive research aims to describe the characteristics of certain populations or phenomena and establish the relationships between variables (GIL, 2008).

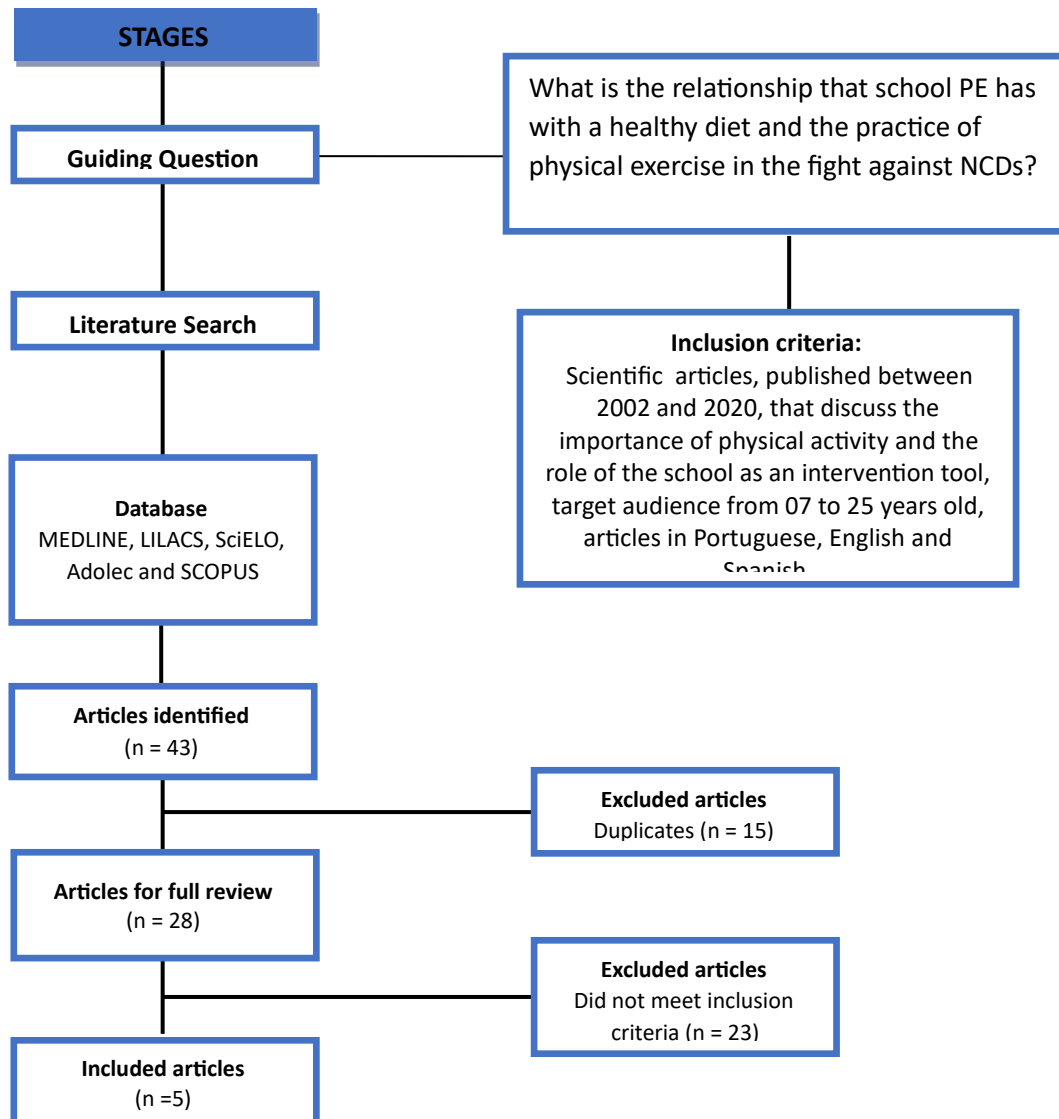
Its elaboration goes through six steps, these being: definition of the research topic, literature search or sampling, data collection, critical analysis of the included studies, discussion of the results, presentation of the integrative review (ERCOLE; MELO; ALCOFORADO, 2014).

The initial search in the databases located 43 studies using the descriptors Chronic Diseases, Food Consumption and School, which were found in the platforms: MEDLINE (16), LILACS (16), SciELO (8), Adolec (3) and Scopus (0). The inclusion criteria consisted of articles published between



2002 and 2020, and articles that addressed the importance of diet in the prevention of NCDs, the importance of physical activity, the role of school in the intervention process, and included studies published in Portuguese, English, and Spanish, covering field research and with target audiences between the age groups of 15 to 25 years. The location and selection of studies are described in flowchart 1.

Figure 1 - Flow chart of the integrative review steps.



Source: own author.

The method used was exploratory descriptive, in which the exploratory aims to develop, clarify and modify concepts and ideas, with a view to formulating a more precise problem or researchable hypotheses for further studies (GIL, 2008). And descriptive research requires investigating a series of information about what one wishes to research in order to describe the facts and phenomena of a given reality (GIL, 2008). In view of this, the selected articles were analyzed, synthesized, and then displayed in chart 1. The data extracted from the articles were organized so as



to enable the classification and description of the data, producing knowledge about the theme.

## 4 DEVELOPMENT

### 4.1 RESULTS AND DISCUSSIONS

The synthesized information from the selected articles is shown in Table 1.

Chart 1 - Synthesis of the information identified through the integrative review.

<b>Author (s), journal and year</b>	<b>Article Title</b>	<b>Goal</b>	<b>Sample</b>	<b>Conclusions of the study</b>
Silva, Batista and Messias Adolescence and Health Journal (2016)	Evaluation of lipid intake from food sources by adolescents from a public school	To evaluate lipid intake from food sources by adolescents aged 10 to 17 years from a public school.	209 male and female adolescents	There was no significant difference in lipid intake between genders, the most commonly reported lipid forms among adolescents were in fried and sausage foods.
Messias, Souza and Reis Health and Adolescence Journal (2016)	Consumption of ultra-processed foods and food coloring by adolescents in a public school	To verify the consumption of ultra-processed foods and food coloring by adolescents in a public school.	526 adolescents of both sexes.	It observed significant consumption in all participants of foods high in sodium, fat, i.e. processed foods.
Pereira, Pereira and Angelis-Pereira Journal of Collective Health and Science (2017)	Influence of educational intervention on knowledge about food and nutrition of adolescents in a public school.	To identify the eating habits and level of knowledge about food and nutrition of adolescents.	59 participants aged 13 to 16 enrolled in two eighth grade classes at a public school.	The results indicated a prevalence of inadequate eating habits, showing a high consumption of foods rich in fat, sodium, and sugar.
Silva <i>et al.</i> Brazilian Journal of Nursing (2009)	Eating habits of adolescents from public schools in fortaleza.	To analyze the eating habits of adolescents in a public school in Fortaleza.	720 students aged 14 to 19 from twelve educational establishments.	It found an imbalance in the intake of adequate nutrients for adolescents, favoring overweight and consequently the development of chronic diseases such as Diabetes mellitus.
Tuma, Costa and Schmitz Revista Bras. Saúde matern. Infant (2005)	Anthropometric and dietary evaluation of preschoolers in three day care centers in Brasília, DF.	To trace the nutritional profile of children in day care centers in Brasília, DF.	230 children of both sexes.	There was 6.1% overweight and 4.8% stature deficit, and the daycare centers had adequate energy nutrient values.

Source: own author.

The studies of Silva, Batista and Messias (2016) and Messias, Souza and Reis (2016) analyzed that most individuals are eating foods rich in dyes and poor in natural nutrients, foods with an excess of fats, sugars and starches, were the most identified by the research. Thus, the loss of adequate intake for the proper functioning of human body functions, are overloading them with an excess of some



nutrients, which causes and significantly contributes to the onset of NCDs.

Schmidt (2011) portrays that the excessive consumption of sodium in food has been one of the major causes of NCDs, and that its disordered intake is associated with the progressive increase in blood pressure, which consequently has increased the risk of cardiovascular diseases, which are some of the leading causes of death in Brazil and worldwide.

Corroborating with the studies, Pereira, Pereira, and Angelis-Pereira (2017) and Tuma, Costa, and Schmitz (2005), in their research evidence that the prevalence of inadequate eating habits is in force by the exaggerated consumption of foods rich in bad fats and simple sugars.

Thus, it was found in a similar study by Beck *et al.* (2016), that the intake of sodium and fatty acids by adolescents indicate a considerable risk factor for the development of NCDs. Ratifying with Silva, Batista and Messias (2016), the consumption of fatty acids and sodium are often presented in processed foods, such as cookies, chocolates, snacks, among others), and among the participants of their research, 79.82% male and 82.96% female usually consume these foods. Machado *et al.* (2018) point out in a study that the consumption of sodium by adolescents represented above the recommended (about 26% of adolescents) characterizing an inadequate diet that, in the long term, provides opportunities for the onset of NCDs.

A study conducted by Oliveira *et al.* (2016), in 124 Brazilian municipalities, found that 39.6% of adolescents almost always or always eat foods such as snacks and sweet and salty cookies, indicating a high risk of NCDs such as diabetes, hypertension and obesity, since the excessive consumption of these processed foods may be correlated to the onset of these diseases (QUEIROZ, 2016).

Silva, Batista and Messias (2016), relate the excessive consumption of fat-rich foods as the cause of several diseases, including coronary heart disease, obesity and diabetes. It is worth noting that foods rich in lipids can contribute to the development of other diseases such as hepatic steatosis, which is a disorder characterized by the accumulation of fat inside the hepatocytes (liver cells). This increase of fat inside the hepatocytes for a prolonged period of time can generate an inflammation capable of developing into serious conditions such as cirrhosis and even cancer. In these cases, the liver not only increases in size, but also acquires a yellowish appearance (VARELLA, 2016).

Hepatic steatosis in children in the first years of life is mainly caused by some metabolic diseases (which cause changes in the general functioning of the body). In older children and teenagers, the causes are similar to those in adults. Prevention since childhood is of fundamental importance to prevent irreversible damage in adulthood, and inserting content about eating behaviors within the school Physical Education can be a solution to minimize the number of individuals with the disease (VARELLA, 2016).



The IBGE (2019) reports in its survey that obesity is a predisposing factor for the development of cardiovascular disease, reinforcing that about 20 to 30% of NCD cases have some relation to obesity and overweight.

Messias, Souza, and Reis (2016) report that food choices rich in fats, especially saturated fats, salt, sugar, and poor in complex carbohydrates, vitamins, and minerals, combined with a sedentary lifestyle are responsible for the onset of some NCDs, such as diabetes, hypercholesterolemia, cardiovascular problems, hypertension, osteoporosis, and cancer, so the diet becomes a key factor for the proper development and growth of children and adolescents, preventing them from the involvement of diseases in adulthood.

Anand *et al.* (2015) state in their research that eating habits play a crucial role in the health, development and growth of individuals, and that poor diet in childhood and adolescence can lead to the development of NCDs in adulthood. Mainly type 2 diabetes mellitus, hypertension, obesity, among others; the most common of these NCDs found in adolescents has been diabetes mellitus.

According to Marques Junior (2019), diabetes, in turn, presents itself as one of the pathologies the dominant genes, just like SAH. However, these diseases involve genetic and environmental factors, which are the adopted eating patterns that contribute to their development. Besides these genetic and environmental factors being possible triggers for different NCDs.

It is known that a major aggravating factor for childhood obesity is the sum of environmental factors, lifestyle, eating behaviors adopted, idleness, in alliance with genetic factors that contribute to children becoming obese, explaining that the risk of a child becoming obese is low when neither parent is obese. However, another decisive factor is the eating behavior that has been shown to have great potential in the involvement of NCDs (FARIAS *et al.*, 2018).

Rocha (2017) state that sedentary parents, in the vast majority of times, also present harmful eating behaviors, and these behaviors influence the construction of their children's eating habits, and when associated with low levels of physical activity, they become key factors in the development of NCDs.

Anand *et al.* (2015) report that modernization and urbanization have contributed to a negative change in the lifestyle habits of the population, among them, idleness caused by the exacerbated use of technological tools that increasingly distance individuals from physical activity and bring them closer to sedentarism. And with increased exposure to a wide variety and diversity of ultra-processed foods and reduced consumption of fruits and vegetables, the prevalence of poor eating habits intensifies.

Thus, the school becomes a suitable and appropriate environment to develop content aimed at nutrition education, and considering the direct relationship between the practice of physical activity and healthy eating, school Physical Education becomes an ideal curricular component to develop the



reduction of NCDs. In addition, the school aims to provide the student with non-routine contents, which lies in the possibility of training individuals who maintain an increasingly conscious relationship with their daily lives, behaviors and appropriate social relations, mediated by the appropriation of the most elaborated objectivations by the human race, generic objectivations for themselves, such as science, art and philosophy (DUBET, 2011).

Thus, the school should promote content aimed at the adoption of healthy habits integrated or based on national and international policies (GALISA, 2014).

The school must then serve as a teaching space with diverse content, due to its prominent role in the formation of the citizen, stimulating autonomy, the exercise of rights and duties, the control of health conditions and quality of life, as well as in obtaining healthy behaviors and attitudes.

Develop the content of nutrition education in physical education classes, not only in a simply informative way, but by creating a communication between students through their cultural experiences and diverse eating behaviors, and thus develop an active, interactive process, in which the student feels encouraged to understand and put into practice. For educating consists in teaching and training, motivating the exchanges between the student and the educator through words of easy understanding, combined with a favorable environment for learning (GALISA, 2014).

Thus, food education as a content of school Physical Education is a possibility to change the reality of many children and adolescents, since, when they enter school, children become more independent in relation to food choice, because they get to know different foods from those they were used to in the family environment, thus, guidance becomes an important ally to make the best food choices. For students to really understand the importance of healthy eating, it is essential that they are provided with reflections that help systematize knowledge through the interaction between thinking, feeling, and doing. The student should stop being just an observer and starts to actively participate, arguing, expressing their opinions and doubts, and it is worth emphasizing the importance of encouraging students to know, value and accept new foods, through the acquisition of good eating practices (SILVA; COSTA; GIUGLIANI, 2016).

Tuma, Costa and Schmitz (2005), in their research, identified that the schoolchildren were having a balanced diet in schools and daycare centers, however, despite the macronutrients being adequate to supply energy for a certain age group, insufficient micronutrients were verified. In addition to these factors, the authors expose the economic aspect as a significant factor for poor eating behavior.

Silva *et al.* (2009) found in their study that eating habits go through several influences, and that the eating behavior adopted is directed by family, culture and policies, because eating is not only the result of an individual choice, but also a social reflection. Thus, the work discusses about poverty as a determining factor for the development of an inappropriate eating behavior, because healthier



foods, "in natura", have high cost, and this ends up directing the most financially vulnerable people to develop bad eating behaviors, i.e., the inclusion of processed foods with high concentration of preservatives, such as bologna, sausages, canned meats among others, which are more accessible because they have lower cost. Moreover, these people with lower purchasing power are usually the most lacking in information related to the involvement of NCDs.

Therefore, Zannetti *et al.* (2008) emphasize in their studies the importance of the family role as a manager of attention directed to the eating habits of its members, in order to minimize the adoption of unhealthy eating patterns, and thus reduce the incidence of NCDs among young people and the general population.

Therefore, physical education, as a curricular component responsible for promoting health, not only physical, but also social and mental of the individual, needs to include content about food education so that students are aware of the importance of a balanced diet combined with physical exercise as a means of preventing NCDs.

## 5 CONCLUDING REMARKS

The presence of the content of nutrition education as a curricular component of school Physical Education is necessary as an alternative in reducing the incidence of NCDs among schoolchildren. In this study, we noticed the lack of research on eating behavior carried out within the scope of school physical education.

It is necessary to develop actions aimed at promoting healthy eating habits in the school environment, in a scheduled, continuous and systematic way, appropriate to specific target audiences, based on consistent methodological aspects, taking into account the cultural aspects of individuals, and interacting the exchange of cultural information, in addition to inserting a more playful and dynamic way, especially for children and adolescents. Thus, school Physical Education emerges as a curricular component capable of promoting health, through the possibility of encouraging not only the practice of sports and physical exercises, but also good eating habits.

Although this integrative review identified unhealthy eating behaviors in children and adolescents with the possibility of directly contributing to the onset of NCDs, further studies are needed to develop and analyze the use of content of food education in physical education at school, planned according to the age group of schoolchildren and to assess changes in behavior and formation of new eating habits for a longer period of time.





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