

Factors associated with the amount of physical activity elementary students engage in physical education class: a scope review

Factores Asociados con la Cantidad de Actividad Física que Realizan los Estudiantes de Primaria en la Clase de Educación Física: Una Revisión de Alcance

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Abstract

Introduction: Physical activity provides benefits in children, however, despite this, it has been shown that there is a high prevalence of physical inactivity in children worldwide. However, the physical education class has been used as a strategy to promote physical activity in schools. Therefore, some physical activity recommendations have been set aside for the education class that primary school students are not complying with. Therefore, it is important to inquire about the factors that are associated with the amount of physical activity that primary school children do in physical education class. **Method:** follows the methodology for scoping reviews, searching the following databases: Scopus, PubMed, and Web of Science. Addressing physical activity in the physical education class and extracting the information according to the methodological aspects, interventions and factors reported by each article. **Results:** A total of 14 articles were included, which were classified into methodological outcomes, factors associated with physical activity in the physical education class and their respective categories, and emerging variables. **Discussion:** We propose a series of recommendations for physical education teachers according to the factors reported in the literature after an analysis of their scope and nature. Its weakness was the distribution of the articles among the authors, and the strength of the thoroughness of the methodology process. **Conclusion:** There are factors associated with the amount of physical activity that primary school children perform in physical education class, which are classified as: factors related to students, the teacher, the environment, and other factors.

Keywords: Physical activity, physical education class, associated factors

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Resumen

Introducción: La actividad física proporciona beneficios en los niños, sin embargo, a pesar de esto, se ha demostrado que existe una alta prevalencia de inactividad física en los niños a nivel mundial. No obstante, la clase de educación física ha sido utilizada como estrategia para promover la actividad física en las escuelas. Por lo tanto, algunas recomendaciones de actividad física han sido dejadas de lado para la clase de educación que los estudiantes de primaria no están cumpliendo. Por ello, es importante indagar sobre los factores que están asociados con la cantidad de actividad física que realizan los niños de primaria en la clase de educación física. **Método:** sigue la metodología para revisiones de alcance, buscando en las siguientes bases de datos: Scopus, PubMed y Web of Science. Abordando la actividad física en la clase de educación física y extrayendo la información según los aspectos metodológicos, intervenciones y factores reportados por cada artículo. **Resultados:** Se incluyeron un total de 14 artículos, que se clasificaron en resultados metodológicos, factores asociados con la actividad física en la clase de educación física y sus respectivas categorías, y variables emergentes. **Discusión:** Proponemos una serie de recomendaciones para los profesores de educación física según los factores reportados en la literatura tras un análisis de su alcance y naturaleza. Su debilidad fue la distribución de los artículos entre los autores, y la fortaleza de la minuciosidad del proceso metodológico. **Conclusión:** Existen factores asociados con la cantidad de actividad física que realizan los niños de primaria en la clase de educación física, que se clasifican como: factores relacionados con los estudiantes, el profesor, el entorno y otros factores.

Palabras clave: Actividad física, clase de educación física, factores asociados.

Introduction

The promotion of physical activity is part of physical education due to its implication in children's health (MINISTRY OF NATIONAL EDUCATION, 2022), since physical activity plays an important role in children's physical and mental health (World Health Organization, 2020). Therefore, a minimum amount of physical activity that children should engage in has been stipulated.

However, children do not get the recommended amount of physical activity. The prevalence of physical inactivity in children is greater than eighty percent (80%) (World Health Organization, 2022). Just like there is a prevalence of physical inactivity in physical education class. In the Colombia report card (González Cifuentes et al., 2022), it is mentioned that

fifty-six percent (56%) of school children (5 to 12 years old) do not meet the physical activity recommendations for physical education class. Therefore, it is essential to explore and analyze the factors that are associated with the amount of physical activity that primary school students perform in physical education class.

Based on the above, the basis of this research is the need to analyze those factors that can encourage or limit physical activity in the physical education class, given that the physical education class can have an impact on the active lifestyle of students.

Consequently, a general objective was established that focuses on the identification of the factors associated with the amount of physical activity in primary school children in the physical education

class, from which two specific objectives will be derived focused on an analysis of these factors and possible recommendations to promote physical activity during the physical education class.

Method

This article followed the guidelines of Levac et al, (2010) and Arksey & O'Malley (2005) for scoping reviews.

Search criteria

The databases used were Scopus, PubMed, and Web of Science. The search equation was structured based on the PICOT strategy (Martínez-González & Sánchez-Mendiola, 2015). PICOT is a structure designed to facilitate the search or formulation of the research question, this structure consists of four components derived from its acronym; P (population), I (intervention), C (comparison), O (outcomes), and T (terms for article exclusion). It should be clarified that component "C" was not included in this review due to the paradigm in which it is located, it was not necessary to make any type of comparison.

For the search strategy, a search equation was established, which varies according to

the database to be used, but always following the following structure.

The structure was divided into four groups of specific terms based on the PICOT structure: the first group focused on the review population (P), primary school children ("children"; "students"; "and its synonyms"). The second group established the field of analysis of the review, or intervention (I) incorporating the concept of: "physical education". The third group of terms was emphasized in the outcome variable of interest of the review (O) the terms "physical activity" and "MVPA" (moderately vigorous physical activity) were included; "light"; "moderate"; "vigorous." Finally, (T) the necessary filters related to some exclusion criteria according to the topic and scope of the review such as: range of years of publications "2010 -2023" exclusion of articles that included topics of: "medicine"; "covid-19"; "economy"; "adults"; "cognition"; "obesity"; "baccalaureate"; "special education"; "preschool"; "syndrome"; "pathologies" and was limited to articles in English and Spanish only. For a further explanation see (Table 1) which presents the structure of the search equation according to the PICOT strategy.

Table 1.

Structure of the search equation – adapted from the PICOT strategy.

Term	Description	Words
Population	Schoolchildren between 5 and 12 years old.	<ul style="list-style-type: none">• Children• Kids• Students• Boys and girls• Elementary

- Academic Performance
- Intelligence
- Special Education
- ADHD
- Disability*

Source: self made

Screening

For the selection of the articles that were included in this scoping review, a software called Rayyan was used. According to Luque et al (2019), Rayyan is a web application used by researchers in systematic reviews due to its semi-automatic process of managing titles and abstracts. This application allows you to export data and from it, eliminate duplicate articles, and, in addition, account gives you the possibility to vote on whether the article should be included.

The following steps were taken to select the studies:

- All articles found in the databases were downloaded and imported into Rayyan.

- The articles found in each database were combined according to the search strategy. This step will be done in Rayyan.
- Elimination of duplicate items by the automatic process that Rayyan offers.
- Independent reading of the title and abstract of each study.

According to the following eligibility criteria, each author voted on whether the study should be included or not. If no consensus was reached, a third party defined the final criterion. This process was carried out in Rayyan Software.

The inclusion and exclusion criteria are listed in the table 2.

Table 2.
Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> • Articles published between 2010 and 2023. • Full-text articles. • Articles published in peer-reviewed scientific journals. • Articles published in English. 	<ul style="list-style-type: none"> • Articles related to Covid-19. • Articles that are related to children with pathologies. • Articles that do not explicitly include the amount of physical activity that is done in physical education class.

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- Articles that gave an estimate of the amount of physical activity performed in the physical education class.
 - Articles whose population is children between 5 and 12 years old and in school.
 - Literature not published.
 - Articles that report preschool or middle school children.
 - Articles related to topics in medicine, economics, obesity, and cognition.
 - Articles that do not explicitly include the amount of physical activity that is done in physical education class.
 - Presentation reports at conferences.
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Source: self made

Data charting

After the selection of the articles, for data extraction, the articles were divided among the authors, each one performed a full-text reading. Following this, information was extracted from methodological aspects of the articles, information regarding interventions and results in physical activity; and factors associated with the amount of physical activity reported in the literature. In addition, information was extracted from emerging variables reported in the literature.

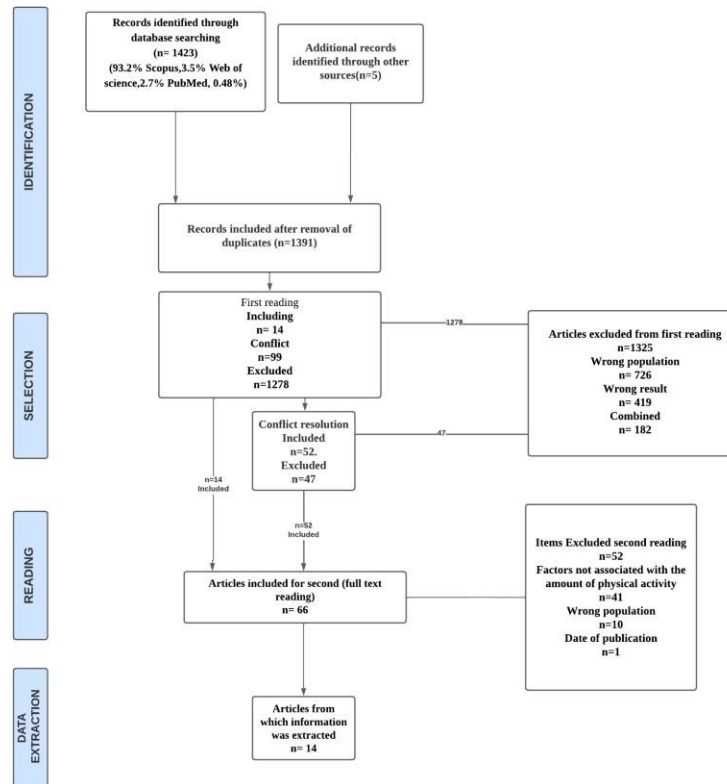
Results

This scoping review included 14 articles for the extraction of information from the total number of articles found in the databases according to the search strategy, diagram 1 shows the flow of the selection of the articles (see diagram 1).

The information was extracted from an Excel table extracting the following information: 1. Methodological results. 2. Factors associated with the amount of physical activity performed by elementary school students in physical education class according to the categories mentioned above. 3. Results of emerging variables.

The articles included in this review can be found in the supplementary material

Diagram 1.
 Flow diagram for inclusion of studies



Source: self made

Results in methodological aspects

According to the year of publication of the articles, it was found that it is the most recent literature that reports factors associated with the amount of physical activity in the physical education class. 2018 and 2020 were the years with the most articles included (21.4% each year) (Chase et al., 2018), (Tanaka et al., 2018), (Silva et al., 2018), (Jaitner et al., 2020), (Klaričić et al., 2020), (Howells et al., 2020). Following the years 2012, 2021 and 2023 (14.3% each year) (Moreno Z. et al., 2012), (Skala et al., 2012), (Wong et al., 2021), (Huertas-Delgado et al., 2021), (Llanos-Muñoz et al., 2023), (de Bruijn

et al., 2023). And finally, the years 2016 and 2019 (7.1% each year), (Powell et al., 2016), (Gråstén et al., 2019). The years 2010, 2011, 2013, 2014, 2015, 2017 and 2022 did not report any articles included in this review.

Regarding the types of studies, most of the articles were quantitative. 71.4% of the articles reported a quantitative study type (Jaitner et al., 2020), (Klaričić et al., 2020), (Chase et al., 2018), (Wong et al., 2021), (Tanaka et al., 2018), (de Bruijn et al., 2023), (Huertas-Delgado et al., 2021), (Silva et al., 2018), (Gråstén et al., 2019), (Howells et al., 2020) tags. 21.4% were mixed studies (Powell et al., 2016),

(Moreno Z. et al., 2012), (Skala et al., 2012). While 7.1% reported a type of qualitative study (Llanos-Muñoz et al., 2023).

Regarding the instruments used to measure physical activity, the reviewed literature reported. The accelerometer was the most used instrument in the included articles; however, it was not the only one. 57.1% of the included articles used the accelerometer as a measuring instrument (Huertas-Delgado et al., 2021), (Howells et al., 2020), (de Bruijn et al., 2023), (Wong et al., 2021), (Gråstén et al., 2019), (Jaitner et al., 2020), (Silva et al., 2018), . Subsequently, 35.7% of the included articles used questionnaires and self-reports (Llanos-Muñoz et al., 2023), (Wong et al., 2021), (Klaričić et al., 2020), (Silva et al., 2018). The pedometer and Sofit were each used in 14.3% of the included articles (Moreno Z. et al., 2012), (Wong et al., 2021), (Powell et al., 2016), (Skala et al., 2012). While only 7.1% used the Fas Scale as a measurement instrument (Llanos-Muñoz et al., 2023).

Finally, regarding the designs reported in the included articles. Most of the articles implemented a descriptive cross-sectional design. 50% of the included articles used a descriptive cross-sectional design (Moreno Z. et al., 2012), (Skala et al., 2012), (Tanaka et al., 2018), (Gråstén et al., 2019), (Jaitner et al., 2020), (Klaričić et al., 2020), (Silva et al., 2018), . However, 28.6% used a quasi-experimental design with a control group and an intervention group (Huertas-Delgado et al., 2021), (Powell et al., 2016), (de Bruijn et al., 2023), (Chase et al., 2018). This was followed by 14.3% that were systematic reviews (Llanos-Muñoz et al., 2023), (Wong et al., 2021). And only 7.1% implemented a case study as a design (Howells et al., 2020).

Results of the factors associated with the amount of physical activity performed by primary school students in physical education class.

Below, the results are grouped into the factors associated with the amount of physical activity performed by primary school students in the physical education class and are grouped according to the categories mentioned above in the theoretical framework (factors related to the students, the physical education teacher, the environment, etc.). other factors).

Student-Related Factors

50% of the included articles report factors associated with students. Of these, 35.7% reported sex as a factor associated with the amount of physical activity during physical education class; females were reported as the least physically active during physical education classes (Moreno Z. et al., 2012), (Jaitner et al., 2020), (Klaričić et al., 2020), (Chase et al., 2018), (Howells et al., 2020).

7.1% of the articles reported motivation as a factor positively associated with the amount of activity children do in physical education class. (Wong et al., 2021). Showing that a student with a high internal motivation about physical education class tends to perform a greater amount of physical activity during class.

Another 7.1% reported age as a factor negatively associated with the amount of physical activity children perform in physical education class; because, as older children progress, the amount of physical activity performed in physical education class decreases (Wong et al., 2021). This means that the older the students, the less physical activity they do during physical education class.

Finally, 7.1% of the articles in this category reported parents as a factor associated with the amount of physical activity that children perform in physical education class (Jaitner et al., 2020). Showing that students with physically active parents tend to engage in more physical activity during physical education class compared to students with parents who have low amounts of physical activity.

Factors related to the physical education teacher

64.2% of the articles included for the extraction of information reported factors associated with the education teacher. 21.4% reported class planning as a factor associated with the amount of physical activity students perform in physical education class (Chase et al., 2018), (Powell et al., 2016), (Huertas-Delgado et al., 2021). Showing that students perform a greater amount of physical activity during physical education class when the teacher has previously planned their class, incorporating aspects such as: objective and model of the class, an example of this is the Sharp Model (Powell et al, 2016), which authors reported as a strategy for the promotion of physical activity in the physical education class.

14.2% of these articles reported the extrinsic motivation promoted by students as a factor positively associated with the amount of physical activity students perform in physical education class (Gråstén et al., 2019), (Llanos-Muñoz et al., 2023). This shows that students who are more motivated by the teacher perform more physical activity during physical education class compared to students who are not given high extrinsic motivation.

Another 14.2% of the articles reported teacher training as a factor positively

associated with the amount of physical activity students perform in physical education class (Wong et al., 2021), (Moreno Z. et al., 2012). It shows that students who have teachers who are specialists in physical education tend to perform more physical activity during physical education class compared to students who do not have a teacher who specializes in this area.

7.1% reported teacher gender as a factor associated with the amount of physical activity students perform in physical education class (Skala et al., 2012). Because of this, students who received physical education class from a female teacher performed more physical activity in physical education class compared to students who received the class from a male teacher.

Finally, 7.1% of the included articles reported that ball classes are a factor associated with the amount of physical activity they perform with students in physical education class (Tanaka et al., 2018). Since, students who take physical education classes with a ball report a greater amount of physical activity compared to students who take physical education classes without a ball.

Environment-related factors

Only 7.1% of the articles included for information extraction reported a factor associated with the amount of physical activity performed by students in physical education class related to the environment (Skala et al., 2012). This factor being the place where the physical education class is taught; It was shown that students who receive the physical education class outside the classroom perform a greater amount of physical activity compared to students who receive the physical education class in the classroom.

Other factors

This is an emerging category that emerged due to factors reported in the literature that did not fit into any of the categories developed in the theoretical framework of this study.

In this category, 21.4% of the articles included for the extraction of information reported factors associated with the amount of physical activity performed by students in physical education class that are not related to the aforementioned factors. Each of the following associated factors were reported in 7.1% of the articles included in this category.

It was found that the duration of physical education class is negatively associated with the amount of physical activity students perform in physical education class (Skala et al., 2012). The shorter the duration of the physical education class, the greater the amount of physical activity that students will get during the physical education class.

Also, the size of the education class is negatively associated with the amount of physical activity students engage in the physical education class (Skala et al., 2012). The fewer students there are, the greater the amount of physical activity they do during physical education class.

On the other hand, the weekly frequency of physical education class is positively associated with the amount of physical activity students perform in physical education class (Silva et al., 2018). The higher the weekly frequency of the physical education class, the greater the amount of physical activity that students do during the physical education class.

Finally, it was reported that the importance of the physical education class within the

institution is positively associated with the amount of physical activity that students perform in the physical education class (Powell et al., 2016). The more important the physical education class is, the greater the amount of physical activity students get during physical education class.

Although the focus of this study was not on intervention studies, the literature reported some articles whose methodology was based on intervention.

50% of the articles included in this review reported having carried out an intervention, which, despite carrying out a search with another objective, in the literature we found articles of interventions. These articles focused primarily on increasing the amount of moderate to vigorous physical activity students engaged in during physical education class. 50% of the included articles did not report any intervention during physical education class. That is, they only measured the amount of physical activity students engaged in during a traditional physical education class. Measuring only moderate to vigorous physical activity (MVPA), except for 7.1% who measured both MVPA and MVPA and MVPA.

92.8% of the articles included for information extraction did not report having performed an intervention on sedentary behaviors during physical education class. While 7.1% did report performing an intervention in sedentary behaviors, with the aim of reducing the time students exposed to sedentary behaviors during physical education class (Powell et al., 2016).

Within these results, it was also found that there are both positive and negative factors associated with the exposure of sedentary behaviors during physical education class,

such as: sex; girls reported more sedentary time than boys.

The location of the physical education class; Students who took physical education classes in the classroom had more sedentary behaviors compared to students who took classes outside the classroom. And finally, the grade of the students; Upper grades reported more sedentary behaviors during physical education class.

Discussion

First, an analysis of the scope and nature of the scientific literature reported up to August 8, 2023, was conducted.

The factor associated with the amount of physical activity performed by elementary school students in the physical education class most reported in the literature was the sex of the students. As mentioned by authors such as (Moreno Z. et al., 2012), (Jaitner et al., 2020), (Klaričić et al., 2020), (Chase et al., 2018), (Howells et al., 2020), females tend to perform less physical activity in physical education class. Therefore, it is important to know what girls do during this class and what makes them have less physical activity compared to boys, which may be related to the activities proposed by the physical education teacher and the tastes of the students.

The second most reported factor in the literature was the physical education teacher's lesson planning. In (Chase et al., 2018), (Powell et al., 2016), (Huertas-Delgado et al., 2021) it is shown that the better the planning of the physical education class, the greater the amount of physical activity that students do. Despite reporting this factor, the articles do not indicate a suggested planning model for carrying out the physical education class,

but they do mention aspects such as the objective of the class and the importance of setting a clear objective in favor of the promotion of physical activity. The lack of planning on the part of the physical education teacher may be related to the conceptions that are held about the physical education teacher.

Factors such as the motivation that physical education teachers impart to their students, and the specialized training of physical education teachers are also associated with the amount of physical activity that students perform in physical education class. These factors had the same amount of reporting in the physical literature (Gråstén et al., 2019), (Llanos-Muñoz et al., 2023) (Wong et al., 2021), (Moreno Z. et al., 2012). Specifically, extrinsic motivation is the one that is associated with a greater amount of physical activity during physical education class. And, on the other hand, the more trained the teacher has and specialized in physical education, the greater the amount of physical activity the students do in class. This marks the importance of the profile of the person who teaches this class.

The least found factors in the literature were: students' motivation towards physical education class, amount of physical activity by students' parents, teacher's gender, ball classes, environment where physical education class is taught, duration, size, frequency, and importance of physical education class. These are factors that are associated with the amount of physical activity students engage in physical education class but were underreported in the literature included in this scoping review.

On the other hand, according to the categorization of the factors associated

with the amount of physical activity performed by students in the physical education class, it was found that the largest number of factors reported in the literature are in the category of factors related to the physical education teacher with a total of seven factors. Followed by student-related factors and other factors with a total of 4 factors placed in each category. Finally, the category that reported the least associated factors was related to the environment, reporting only one factor.

It is important to mention that factors associated with the amount of physical activity of elementary school students in physical education class already reported in the literature were corroborated in this scoping review. Such as the sex of the students, which, as well as being the most reported factor, was also found in the background of this review Bogantes et al (2020). The intrinsic and extrinsic motivation of the students was also a factor that has been reported prior to this study Ferriz-Valero et al. (2023). There were also factors found in the background that were not reported in this scoping review, such as physical education class attendance (Silva et al, 2018). The didactics of teaching by the physical education teacher (Alvarado Romero, 2020), which may be related to the planning of classes (a factor mentioned above). And the sedentary behavior of students (Tanaka et al, 2018), which, because of the reported literature, was included in "other factors" of this scoping review.

As a second specific objective, it was proposed to provide recommendations to physical education teachers according to the factors found on how to increase the amount of physical activity of their students in the physical education class.

In relation to the factor that is most reported in the literature (sex of the students), because this is a factor that cannot be changed, it is important that the physical education teacher avoid activities that involve only male students or that are of interest only to them. On the contrary, carry out activities proposed under the interests of the girls or divide the class group into boys; This is for each group to carry out different activities or compete between groups.

Regarding the planning of classes by physical education teachers, it is advisable to avoid all kinds of improvisations when teaching the physical education class. For a possible strategy, authors such as (Powell et al., 2016) can be consulted, who propose a model composed of five components, of which the promotion of physical activity in class and the reduction of sedentary behaviors are rescued, this to promote active learning time during class, and one of the axes of this model is physical activity. Also a (Chase et al., 2018) whose intervention was based on setting a goal of taking a certain number of steps during physical education class to increase the amount of physical activity of students.

Continuing with motivation, this can be seen from two directions, both the one provided by the physical education teacher to the student, and the one that the student has towards the physical education class. In the first direction, it is recommended to avoid behaviors or methodological strategies on the part of the teacher that cause the disinterest of the students during the physical education class, such as: incentives during the classes for constant participation, positive points reflected in the grade of each student for the development of activities, or penances for those who do not carry out the activities.

Also, to counteract this possible demotivation, Ferriz-Valero et al., (2023) carry out an active learning research through a gamification model in the physical education class, one of the results of which was the positive attitudes and behaviors of the students during the class.

Regarding teacher training, it is appropriate that the person who teaches the physical education class is a teacher specialized around physical education, that is, it is not recommended that a person without knowledge about this area teaches the physical education class in schools, since with specialized training it is expected to increase the amount of physical activity that students perform in the class.

Given that the literature reported ball classes as a factor that is associated with the amount of physical activity that students perform in physical education class, we should review (Tanaka et al., 2018) whose intervention is based on ball games during physical education class. However, when carrying out this type of intervention, it is important to consider the other factors associated with the amount of physical activity of the students and to provide as much participation as possible.

Since the place where the physical education class is taught is a factor associated with the amount of physical activity of the students, it is advisable to avoid physical education classes in closed spaces such as classrooms. This is confirmed (Bølling et al., 2023), in their study of the effectiveness of classes outside the classroom and their relationship with students' physical activity. However, both the physical education teacher and the institution must have a contingency plan for factors such as the weather in the event of not having an

outdoor space, and that the class can be brought forward in the same way without affecting the amount of physical activity that students do in physical education class.

Although the objective of this scoping review was related to providing strategies to physical education teachers to increase the amount of physical activity in the classroom, some emerging factors were found that are also included in these strategies to promote physical activity.

For the other factors that are more related to the institutional part, such as the duration, size, frequency and importance of the physical education class, a possible strategy would be to make a proposal in the institutional framework in order to publicize these factors and how they are associated with the amount of physical activity of the students in order to solve or propose possible solutions and thus increase the quality of the physical education class. amount of physical activity of students during class.

Finally, it should be clarified that factors associated with the amount of physical activity performed by students in physical education class were reported that cannot be changed or some type of intervention can be carried out to increase the amount of physical activity that students perform in physical education class, as well as the sex of the teacher who teaches the physical education class. and the physical activity of students' parents. However, this can help reading parents to be physically active and thereby encourage an active lifestyle in their children.

Conclusions

In keeping with the overall objective of this scoping review, factors associated with the amount of physical activity

performed by elementary school students in physical education class were identified. The literature reported associated factors that were grouped into the following categories: student-related factors (sex, motivation, age, and physical activity of parents); factors related to the physical education teacher (gender, motivation, lesson planning, ball lessons and training); factors related to the environment (place where the physical education class is held); and other factors (duration, size, frequency and importance of the physical education class), it should be noted that there are factors that are associated both positively and negatively with the amount of physical activity.

Among the methodological aspects of the articles included in this scoping review, it was found that the most reported type of study was quantitative, followed by mixed and finally qualitative. On the other hand, the Actigraph triaxial accelerometer was the most used instrument to measure the amount of physical activity within the included articles, however, articles with measurement instruments such as: self-reports, pedometer, fas scale and questionnaires were also found. Likewise, regarding the date of publication, the recent literature is the one that most reported factors associated with the amount of physical activity performed by primary school students in physical education class. And, finally, the

descriptive cross-sectional design is the most implemented within the included articles.

On the other hand, for future research it is important to delimit the age range of the population in a more specific way, because most of the literature is reported in very wide age ranges or are age ranges that are not located only in primary or only in secondary. Also, due to the results of this scoping review, future research may be oriented towards intervention projects according to the factors developed in this study.

Finally, within the results of emerging variables, it was found that sedentary behaviors are also within the physical education class and there are some factors associated with them.

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