

Influence of Physical Education on physical activity levels in adolescence. A systematic review

Influencia de la Educación Física en los niveles de actividad física en la adolescencia. Una revisión sistemática

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Abstract

Lack of physical activity, especially in teenagers, has become a major problem worldwide. More than 80% of the adolescent population does not meet the minimum recommendations set by the WHO. To combat low levels of physical activity, Physical Education could be one tool. However, it does not seem to be contributing to improving these percentages. The main objective of this systematic review was to look into the scientific literature so as to analyse the influence of PE sessions on the physical activity levels of adolescents. It was aimed at identifying whether the average levels of moderate or vigorous physical activity in physical education sessions reached the minimum recommended levels, investigating the factors that interfere with the results of these levels and finding out whether the effects of the Spanish secondary physical education curriculum on the physical activity levels of adolescents are within the standards. Twenty-one articles extracted from three different databases were analysed using the same search equation. Physical education has not achieved the minimum percentages established in secondary school; the main variables that have interfered in these results were gender and the contents of the lessons. The results of the studies carried out in Spain have been within the medium threshold. Given the

importance of physical activity levels on the health of any individual, further research is needed. Thus, it would be appropriate for future studies to be based on the same method to avoid the differences that have been found.

Keywords: physical activity, physical education, moderate or vigorous physical activity (MVPA), adolescence, physical activity level.

Resumen

La falta de actividad física, sobre todo en las poblaciones adolescentes se ha convertido en un problema de gran envergadura a nivel mundial. Más de un 80% de la población adolescente no cumple con las recomendaciones mínimas establecidas por la OMS. Para tratar de combatir los escasos niveles de actividad física, la Educación Física (EF) podría ser una herramienta. Sin embargo, no parece estar contribuyendo a mejorar estos porcentajes. El objetivo principal de esta revisión sistemática ha sido revisar la literatura científica para analizar la influencia que ejercen las sesiones de EF en los niveles de actividad física de los adolescentes. Se ha pretendido identificar si los niveles medios de actividad física moderada o vigorosa en las sesiones de EF alcanzaba los mínimos recomendados, investigar los factores que interfieren en los resultados de estos niveles y conocer si los efectos del currículum de la EF de secundaria de España sobre los niveles de actividad física de los adolescentes están dentro de los estándares. Se han analizado 21 artículos extraídos de tres bases de datos distintas a través de la misma ecuación de búsqueda. El estudio ha concluido que la EF no ha logrado los porcentajes mínimos establecidos en secundaria, las principales variables que han interferido en estos resultados han sido el género de los adolescentes y los contenidos de las lecciones. Los resultados de los estudios realizados en España se han situado dentro del umbral medio. Dada la importancia de los niveles de actividad física sobre la salud de cualquier individuo, será necesario seguir indagando en la temática. Sería adecuado que los futuros estudios se basen en un mismo método para evitar las diferencias que se han encontrado.

Palabras clave: actividad física, educación física, actividad física moderada o vigorosa (MVPA), adolescencia, nivel de actividad física.

Introduction

Several studies show evidence of the negative effects of a lack of physical activity on the health of any individual (Guthold et al., 2018). Regular physical activity helps in the prevention of different chronic, and cardiovascular conditions, as well as diabetes, cancer, mental health and other

diseases (Bauman, 2004; Biddle & Asare, 2011). For this reason, the subject of Physical Education (PE) has an added responsibility that will not only affect an individual's adolescence but will be reflected throughout the course of his or her adult life (Haerens et al., 2010). The practice of physical activity is directly and positively related to the health of any individual (Martins et al., 2018).

In order to raise awareness of the importance of being active during the different stages of life, the World Health Organization (WHO) established a clear and summarised set of recommendations. These were adapted to different age groups considering the metabolic needs of the time. For young people aged 5 to 17, it established a minimum of 60 minutes of moderate or vigorous physical activity per day, and for those aged 18 to 64 a minimum of 150 minutes of moderate aerobic physical activity or 75 minutes of vigorous aerobic physical activity per week (World Health Organization, 2010).

Currently, 81% of adolescents and 27.5% of adults do not meet these guidelines (Guthold et al., 2018, 2020). In the daily life of teenagers, there are different actions that directly and indirectly affect these parameters, but it is necessary to highlight that most of their time is spent inside schools or high schools. For this reason, the educational environment becomes the ideal setting to close the gap with the WHO. This is where PE takes on a responsibility for these values (Murillo et al., 2014). Specifically, as cited in Royal Decree 1105/2014, of 26th December, which establishes the basic curriculum for Compulsory Secondary Education and the Baccalaureate, PE professionals aim to consolidate the regularity of physical activity and avoid a sedentary lifestyle.

Various organisations advise that, during PE sessions in secondary school, a minimum of 50% of the time should be devoted to moderate or vigorous physical activity (Association for Physical Education, 2015) to ensure a minimum level of physical activity during those days students take the subject. However, several studies have shown that these requirements are not met during the sessions (Cantero et al., 2019; Fairclough & Stratton, 2005; Mayorga-Vega et al., 2018; Molina-García et al., 2016; Murillo et al., 2014; Dudley et al. 2012). Yet, there is general agreement that all adolescents, regardless of their singularities, reduce the distances with the marked suggestions on days when they have PE class (Groffik et al., 2020; Mayorga-Vega et al., 2018). In this way, this subject remains one of the main channels to help them reach the established minima. At the same time, it is of vital importance that during the practice of

physical activity they extract positive feelings, since, throughout adolescence, activity patterns are established that extend well into adulthood (Whitehead, 2010; Martins et al., 2018; Zhou & Wang, 2019).

In order to try to reverse the trend towards sedentary lifestyles, further research is needed on the different variables involved in the influence of PE on the physical activity level of adolescents with the aim of closing the gap with the indicated parameters. These variables may derive from different factors that can be classified as: inter-individual, those specific to the subject; pedagogical, those related to the educational environment; or institutional, those triggered by governmental decisions (Delextrat et al., 2020).

Inter-individual factors

One of the most common and significant variables among these in the different articles is gender. It has been found that boys reach higher amounts of moderate or vigorous physical activity than girls (Cantero et al., 2019; Fairclough & Stratton, 2005; Groffik et al., 2020; Mayorga-Vega et al., 2018; Molina-García et al., 2016; Murillo et al., 2014; Zhou & Wang, 2019). There are several factors responsible for these results, but the most commonly mentioned was the type of exercises performed in the PE sessions. These directly affect the level of physical activity, not only because of their demand, but also because of the motivation they trigger in adolescents when performing them. Generally, girls prefer activities in which they can feel included and which they can do cooperatively at a lower intensity. In contrast, most boys prioritise competitive situations at a higher intensity (Fairclough & Stratton, 2005; Martins et al., 2018).

Reference should also be made to the students' physical fitness, with those with a higher percentage of body fat performing less physical activity compared to adolescents with favourable anthropometric parameters (Fairclough, 2003; Li & Rukavina, 2012). Physical fitness is directly related to the classification of young people as active or inactive in terms of physical activity. Those who are considered inactive are significantly further away from the minimum thresholds of moderate or vigorous physical activity (Fairclough & Stratton, 2005; Martins et al., 2018). For the most part, the type of experience gained at earlier ages is the main reason why an adolescent belongs to one lifestyle or another (Li & Rukavina, 2012).

To conclude this point, it is necessary to talk about the socio-economic profile of the adolescent's family. Research supports that young people with a low socioeconomic status are often associated with lower levels of physical activity (Christofaro et al., 2018; Cvetković et al., 2014; Elhakeem et al., 2015; Molina-García et al., 2016; Yamakita et al., 2020). Based on such information, several studies have been able to argue that these values were maintained during the subjects' adulthood (Elhakeem et al., 2015; Juneau et al., 2015).

The socio-economic variable of adolescents can be linked to the influence of parents on adolescents. Parents who have had few educational opportunities tend to be less aware of the importance of physical activity for their children's health. This leads to low participation in physical activity by their offspring and, in general, to a continuation of behaviours adverse to healthy habits (Cho & Lee, 2017; Cvetković et al., 2014). Several articles have corroborated the hypothesis that adolescents with physically active parents reflect a greater willingness to engage in physical activity (Christofaro et al., 2018; Marques et al., 2017; Mitchell et al., 2012). This is driven by imitation, support and socialisation factors between children and parents (Christofaro et al., 2018; Mitchell et al., 2012; Stalsberg & Pedersen, 2010).

Pedagogical factors

Sessions devoted to activities related to an artistic profile, such as gymnastics and dance, have been associated with a significantly lower percentage of time devoted to vigorous physical activity than those focused on fitness. Regarding moderate or vigorous physical activity, it has been concluded that sessions focused on ball games obtain higher levels than the rest of the sessions (Delextrat et al., 2020). Lessons focused on invasion and fitness games also obtained high levels of moderate or vigorous physical activity time in the whole session, but below the established minimums (Beale et al., 2021; Molina-García et al., 2016).

Regarding class size, many teachers come to consider it as a major barrier to achieving the objectives set (Barroso et al., 2005).

Finally, pedagogical factors also include the variable of the space in which the session is held. Most articles have concluded that the highest values of moderate or vigorous physical activity are obtained in outdoor

spaces. This may be directly related to the type of activities performed in each space. However, it is also directly linked to institutional factors, as most educational institutions have certain limitations in terms of infrastructure (Delextrat et al., 2020; Gill et al., 2016; McKenzie et al., 2006; Molina-García et al., 2016).

Institutional factors

Within the institutional factors, curricular and governmental values can be highlighted. At this point it is necessary to emphasise the number of hours devoted to PE. Although this fact is not significant in terms of the total time of moderate or vigorous physical activity spent in a session, it is necessary to take it into account (Groffik et al., 2020). It is important to highlight the importance the subject has within the healthy habits of adolescents and to emphasise its main role, both inside and outside the school (Haerens et al., 2010; Romero-Chouza et al., 2021). In relation to this point, PE teachers should implement initiatives to be able to dedicate more minutes to activities (Dudley et al., 2012; McKenzie et al., 2000; Molina-García et al., 2016).

The direct relationship between the relevance of the problem and healthy habits means that there is an interest in the search for a solution or improvement. It is necessary to investigate the different values that may affect this fact and the difficulties that PE teachers may encounter in making young people aware of the impact that practising physical activity will have on their lives. This systematic review aims to analyse different studies that have assessed the different variables which may influence the health-related goals of PE professionals. Therefore, the main objective of this study has been to review the scientific literature to delve into the influence of secondary school PE sessions on the physical activity levels of adolescents. Additionally, as specific objectives:

- To identify whether the average levels of moderate or vigorous physical activity of secondary school students in PE sessions reach the minimum recommended levels.
- To investigate the factors that interfere with moderate to vigorous activity levels during secondary school PE sessions.

Method

Research methodology

This systematic review was conducted following the guidelines established by *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) (Page et al., 2021) and the protocols for conducting systematic reviews (Mother et al., 2015).

Search strategy

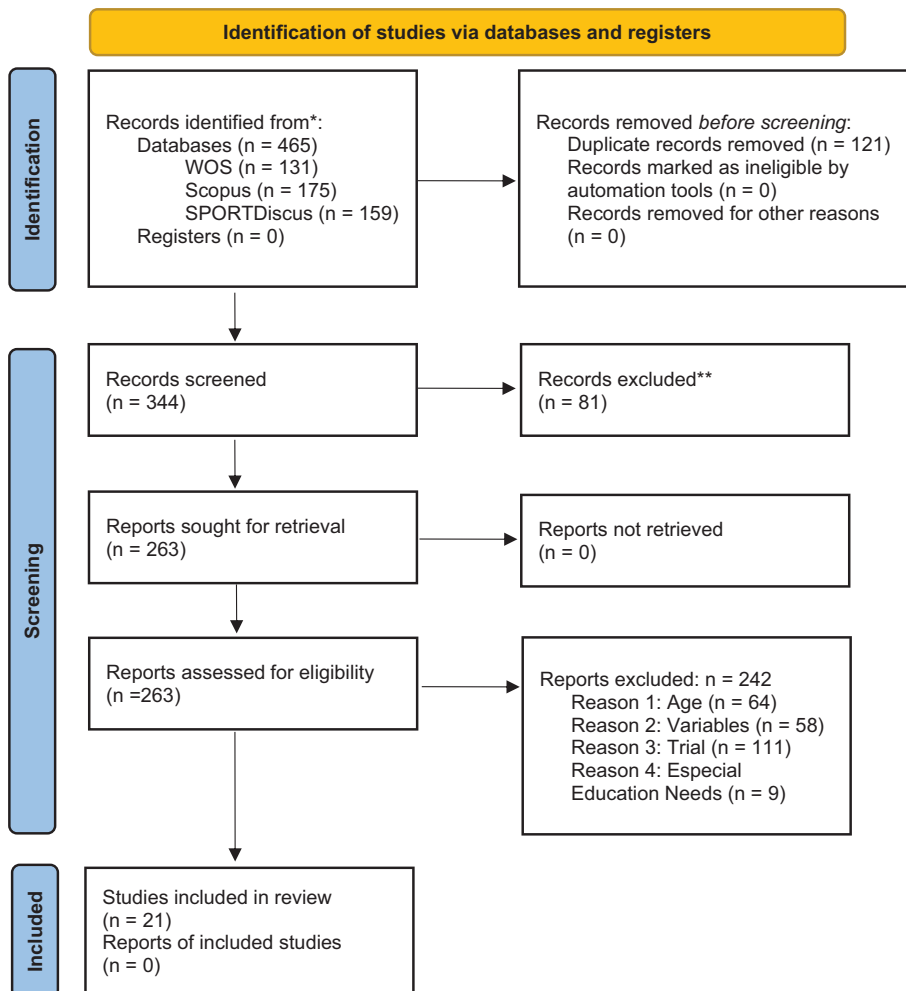
The search in this systematic review focused on three electronic databases, SPORTDiscus, Scopus and Web of Science. The search terms used were physical education, adolescent, youth, secondary, moderate to vigorous physical activity (MVPA) and physical activity level. To relate them to one another, the Boolean operators AND and OR combined with parentheses were used. For terms composed of more than one word to be considered as a single word, inverted commas were added. The final search equation is shown below: “Physical education” AND (adolescent* OR youth OR secondary) AND (MVPA OR “physical activity level”)

Eligibility criteria

In the first place, full articles in English or Spanish from 2012 to 2021 were included. Those that did not focus on subjects aged 12-18 were excluded with the intention of covering only adolescent samples.

Secondly, articles that considered variables related to the level of physical activity during PE lessons were considered valid, while those that did not have a directly related objective were considered dispensable. At the same time, those with the aim of investigating a specific methodology were excluded. After the elimination of duplicates, one author reviewed the title and abstract of the remaining papers. Both authors reviewed the full text of the selected articles. In case of disagreement, an external reviewer was used for the final decision. Finally, the systematic review focused on a total of 21 articles. Figure I shows the totals according to the database and the screening process.

FIGURE I. PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only



Source: Compiled by author

Results

The 21 articles selected for the resolution of the objectives in the present systematic review were of an observational research nature. The main difference in their methodology was the type of instrument used to measure moderate to vigorous physical activity levels (12 accelerometer, 3 heart rate sensor, 2 pedometer, 2 System for Observing Fitness Instruction Time and 1 questionnaire).

TABLE I. Summary of the different articles analysed for this systematic review.

Authors and year	Type of study	Instrument	Sample	Conclusions	Variables
Aljuhani & Sandercoc, 2019	OBS QT	ACCEL	111 adolescents aged 12-14 from four schools in Saudi Arabia.	PE lessons should be taught daily and teachers must be properly trained to deliver quality sessions.	MVPA with/without PE Physical condition
Azlan et al., 2021	OBS TR QT	ACCEL	56 students (32 boys and 24 girls) aged 13-14 from a school in Malaysia.	Playing fun activities in PE sessions can be a strategy for the promotion of physical activity during school hours. Future studies should examine what other types of games may help to increase the level of physical activity.	MVPA Contents Gender
Brusseau & Burns, 2015	OBS QT	Pedometer ACCEL	232 students (144 boys and 88 girls) aged 12-13 in a US school.	Education practitioners should be aware of the contributions of different content regarding MVPA and step counting to provide researchers with a guide for future studies	MVPA Contents Location
Burns et al., 2015	OBS LO QT	Pedometer	100 students (62 boys and 38 girls, 62 boys) aged 12-14 from a school in the USA.	The decline during the PE course of the MVPA is leading practitioners away from one of their goals. More effective teaching methods should be applied and research into the variables affecting this downward curve should be carried out.	MVPA Physical condition Gender
Comte et al., 2015	OBS QT	Analysis of data from another study ACCEL	508 adolescents (259 boys and 249 girls) aged 16-17 in Canada, 338 did and 170 did not do PE.	The extracted data suggest that secondary school students' participation in PE can lead to improvements in physical activity levels.	MVPA Gender

(Continued)

TABLE I. Summary of the different articles analysed for this systematic review (Continued)

Authors and year	Type of study	Instrument	Sample	Conclusions	Variables
da Costa et al., 2019	OBS	Analysis of data from another study ACCEL	567 students (267 boys and 300 girls) aged 7 to 18 from two schools in Brazil.	PE professionals should raise pupils' awareness of the importance of physical activity. At the same time, motivational activities should be implemented as a strategy for increasing MVPA in schools, both in PE and in recess time.	MVPA Gender Age Physical condition Attitude NEE
Delextrat et al., 2020	OBS QT	ACCEL	307 pupils (201 boys and 106 girls) aged 12-13 from six schools in England.	In planning PE lessons, it will be necessary to consider the location and the type of activity to be performed. Similar studies with a larger number of subjects would be helpful.	MVPA Gender Location Content
Ferreira et al., 2014	OBS QT	ACCEL	191 adolescents (98 boys and 93 girls) aged 12-17 from three schools in Portugal.	The minimum levels of MVPA during PE lessons are not reached. The results obtained serve to highlight the work that remains to be done within education in terms of strategies for increasing MVPA.	MVPA Gender Age
Hobbs et al., 2015	OBS QT	ACCEL	55 girls aged 13-14 from a school in England.	PE is not helping adolescents in the way it was intended to, teachers and education professionals must maximise PE opportunities with a focus on health.	MVPA Content Classroom contexts
Kwon et al., 2020	OBS TR QT	SOFIT	2063 sessions from 40 US schools.	Middle schools have the lowest percentage of time spent on MVPA, and more research should be done at these ages to find out how to deal with the changes that occur to improve MVPA levels.	MVPA Content SES Location
Lyyra et al., 2017	OBS QT	HR sensor	821 students (408 boys and 413 girls) aged 13-16 in 14 schools Finland.	The differences between genders are given by the content to which they are exposed. Teachers need to be aware of the benefits that each type of content promotes and plan with this knowledge while addressing the other objectives.	MVPA Gender Content
Mayor-ga-Vega et al., 2020	OBS QT	ACCEL	122 students (71 boys and 51 girls) aged 12-15 from four schools in Chile	Young people do not comply with MVPA recommendations during PE sessions. Strategies should be sought to increase the time and meet the minimums.	MVPA Gender

TABLE I. Summary of the different articles analysed for this systematic review (Continued)

Authors and year	Type of study	Instrument	Sample	Conclusions	Variables
Mayorga-Vega et al., 2017	OBS QT	ACCEL	89 students (55 boys and 34 girls) aged 13-14, from four schools in Chile.	The results should serve to alert about the need for change in educational policies with an increase in hours and professionals in PE. These changes should serve to reach the minimums established within the sessions and for the promotion of physical activity in the rest of the contexts.	MVPA Gender Physical condition Class-room context
Molina-García et al., 2016	OBS QT	ACCEL	189 students (74 boys and 115 girls) aged 16 from nine secondary schools in Spain.	Institutions involved in education should make plans to increase levels of MVPA during lessons, based on gender, personal and environmental factors.	MVPA Gender Physical condition Number of students Location SES Content
Murillo et al., 2014	OBS LO QT	ACCEL	20 adolescents (12 boys and 8 girls) aged between 12 and 14 from a school in Spain.	The differences found show the importance of the contextual level and point to the need to implement gender-tailored interventions to increase the perception of competence and thus adherence to physical activity.	MVPA Gender Content
Sanz-Martín et al., 2021	OBS QL	Questionnaire	694 pupils (364 boys and 330 girls) aged 12 to 16 from Spain	PE plays a key role in adolescents' daily physical activity levels. Different strategies should be considered to improve physical activity rates in all contexts.	MVPA With/ without PE Gender
Sutherland et al., 2016	OBS TR QT	SOFIT	100 PE lessons from 10 schools in 10 areas of Australia.	Physical activity levels in disadvantaged secondary schools are below the recommended levels. Improving the quality of PE should be a priority in order to achieve one of its main objectives.	MVPA Teacher SES School
Viciana et al., 2016	OBS QT	ACCEL	231 adolescents (120 boys and 111 girls) aged between 12 and 15 from a school in Spain.	Students do not comply with the daily MVPA recommendations; more research should be done and strategies for different contexts should be provided.	MVPA Gender Age Physical condition Classroom context

(Continued)

TABLE I. Summary of the different articles analysed for this systematic review (Continued)

Authors and year	Type of study	Instrument	Sample	Conclusions	Variables
Williams & Hannon, 2018	OBS quasi-EX QT	ACCEL	446 (240 boys and 206 girls) aged 11-16 from a school in the USA.	The effects of different groupings on the level of physical activity should be further analysed, but other factors related to motivation and attitude towards PE need to be assessed.	MVPA Gender Age
Yuste et al., 2015	OBS QT	HR sensor	182 adolescents (97 boys and 85 girls) aged between 12 and 18, from five schools in Spain.	The sessions do not meet the recommended levels of intensity, and content should be selected that involves a greater physiological involvement of the students.	MVPA Gender Content
Yuste et al., 2013	OBS QT	HR sensor	107 adolescents (60 boys and 47 girls) aged between 12 and 18 from five schools in Spain.	Although a higher level of MVPA is observed in team sports, PE classes do not meet the established recommendations. There is a need to analyse and select activities that involve higher intensity.	MVPA Gender Content

Note: MVPA – Moderate or vigorous physical activity; OBS – observation; ACCEL – accelerometer; TR – transversal; LO – longitudinal; EX – experimental; QL – qualitative; QT – quantitative; SOFIT – system for observing fitness instruction time; SES – socio-economic status; PE – Physical Education; HR – Heart Rate.

Source: Compiled by author

The levels of moderate or vigorous physical activity (MVPA) were the main variable analysed for this review. With respect to this, a difference between the percentages obtained has become apparent. Some authors argue that less than 25% of total lesson time is reached (Aljuhani & Sandercock, 2019; da Costa et al., 2019; Delextrat et al., 2020; Hobbs et al., 2015; Mayorga-Vega et al., 2017, 2020; Molina-García et al., 2016; Yuste et al., 2015), while other articles have placed the results achieved closer to the recommended minima (Lyyra et al., 2017; Murillo et al., 2014; Sutherland et al., 2016; Viciano et al., 2016). Three of the studies analysed compared the mean percentages of moderate or vigorous physical activity on days with PE and days without. In two of them, significant differences in compliance with the daily physical activity minimums were found (Aljuhani & Sandercock, 2019; Sanz-Martín et al., 2021). In another study, no significant results were obtained, but it was highlighted that PE contributed to an increase in moderate or vigorous physical activity (Comte et al., 2015).

The variable that was used the most in the studies analysed and that showed the greatest influence on physical activity levels was gender. The studies have shown that boys obtain higher percentages of moderate or vigorous physical activity than girls and, consequently, manage to come closer to the established minimums, both in PE lessons and in the whole day (Azlan et al., 2021; Comte et al., 2015; da Costa et al., 2019; Ferreira et al., 2014; Lyyra et al., 2017; Mayorga-Vega et al., 2017, 2020; Molina-García et al., 2016; Murillo et al., 2014; Viciano et al., 2016). Two studies by the same authors obtained inverse results, with girls spending 23.47% of the total PE class in moderate or vigorous physical activity and boys 19.99% (Yuste et al., 2013, 2015). The contradiction may go hand in hand with the type of instrument used in the studies, where a heart rate sensor was used in the two latter studies and accelerometers, pedometers or other observation instruments were used in the others.

The second variable with the greatest influence on physical activity levels was the content of the sessions. The articles that have taken invasive sports into account agree that they are those that provide higher levels of moderate or vigorous physical activity during PE sessions (Brusseau & Burns, 2015; Delextrat et al., 2020; Hobbs et al., 2015; Lyyra et al., 2017; Molina-García et al., 2016; Murillo et al., 2014; Yuste et al., 2013, 2015). On the other hand, the lessons aimed at corporal expression have been found to have the lowest percentage (Delextrat et al., 2020; Lyyra et al., 2017; Molina-García et al., 2016; Murillo et al., 2014; Yuste et al., 2015). Within fitness, it has been observed that sessions in which strength was worked on have achieved more minutes of moderate or vigorous intensity (Molina-García et al., 2016). Network sports and games have not shown significant differences, but differences were observed with free-choice sessions being less productive than the previous ones (Azlan et al., 2021; Delextrat et al., 2020). The content of the PE sessions seems to be closely related to the gender variable, since invasive sports have the greatest effect on moderate or vigorous physical activity levels, and also have a greater perception of competence (Murillo et al., 2014). Consequently, girls move further away from the recommended percentages during PE sessions that address this content (Azlan et al., 2021; Comte et al., 2015; da Costa et al., 2019; Ferreira et al., 2014; Lyyra et al., 2017; Mayorga-Vega et al., 2017, 2020; Molina-García et al., 2016; Murillo et al., 2014; Viciano et al., 2016).

In addition to gender and content, there have been less common variables across studies such as the relationship between levels of moderate or vigorous physical activity and its positive relationship with the performance of outdoor sessions (Delextrat et al., 2020; Molina-García et al., 2016). One of the studies conducted in the USA compared different school levels and found no significant differences between indoor and outdoor sessions in adolescents over 14 years of age (Kwon et al., 2020). Socioeconomic status also showed variations in intensities, with those with a lower socioeconomic status also having lower percentages of moderate or vigorous physical activity (Kwon et al., 2020; Molina-García et al., 2016; Sutherland et al., 2016). It is also important to note that three of the selected articles indicated that the older the adolescents were, the further away they moved from the established PE recommendations (da Costa et al., 2019; Ferreira et al., 2014; Williams & Hannon, 2018).

Considering the articles analysed, it can be seen that there are some differences between the different countries from which results were obtained. The USA (49%), Finland (41.14%) and Australia (39%) have obtained the highest percentages, but it is important to emphasise that only one article per country has been sampled (Kwon et al., 2020; Lyyra et al., 2017; Sutherland et al., 2016). The country with the lowest percentage of moderate or vigorous physical activity with an average of 11.83% is Chile (Mayorga-Vega et al., 2017, 2020). It can be concluded that Spain (23.7%) is at a mid-point compared to the rest of the countries; it could be placed at the same level as England and Saudi Arabia (Aljuhani & Sandercock, 2019; Delextrat et al., 2020; Hobbs et al., 2015; Molina-García et al., 2016; Yuste et al., 2013, 2015).

Discussion

The results indicate that PE professionals do not achieve the minimum of 50% of session time in moderate or vigorous physical activity set by the Association for Physical Education (2015). Therefore, adolescents' physical activity levels are insufficient to achieve health benefits (Oliveres et al., 2015). It should be noted that PE remains a facilitating channel to achieve the recommendations of the World Health Organization (2010). Likewise, it has been found that within the different contexts

of adolescents' daily lives, after-school time is the moment when most physical activity is practised. If the total time available in each setting is taken into account, PE achieves higher percentages than recess time and free time after school (Mayorga-Vega et al., 2017; Viciana et al., 2016).

In order to address this problem, it is necessary to ascertain the factors that interfere with the levels of moderate or vigorous physical activity of adolescents during PE sessions. Several studies consider that the identification of factors influencing physical activity levels is an important prerequisite for planning and developing effective educational programmes (Biddle et al., 2004; Sterd et al., 2014).

The analysis of the results has positioned gender as the variable that seems to influence pupils' physical activity levels the most. Male pupils are closer to the recommended levels of physical activity than female pupils. These data coincide with several studies that look into the practice of physical activity in relation to gender (Alvariñas-Villaverde & Pazos-González, 2018; Fernández-Villarino et al., 2019; Marques & Carreiro da Costa, 2013; Mielgo-Ayuso et al., 2016). The second variable that most seems to influence physical activity levels is directly related to gender, and that is the content of the PE sessions, as students' motivation will be different depending on their gender. Different studies on the gender perspective coincide in associating the practice of competitive sports with male students (Alvariñas-Villaverde et al., 2009) and the practice of cooperative and non-competitive physical activity with female students (Fernández-Villarino et al., 2019). In this regard, several works point to the importance of designing PE sessions that are motivating and respond to the needs of all students (Martins et al., 2017). In this way, and through student involvement, a multitude of physical activity possibilities at different levels should be offered to promote a healthy lifestyle in the long term (Durden-Myers et al., 2018). In relation to motivation, a study by Fernández-Villarino et al. (2017) suggests that engaging in physical activity outside the school environment is closely related to positive experiences in PE. In addition, Moreno-Murcia et al. (2012) consider that increased levels of physical activity are related to factors associated with personal autonomy and responsibility.

Throughout the development of this systematic review, different limitations have been observed. Firstly, the selection of articles did not take into account the instrument used during the corresponding studies. More research should have been done in this regard and an equal number of

different methods should have been obtained in order to make a more reliable comparison. Furthermore, no research was found that mentioned institutional factors. At the same time, the length of the sessions should have been taken account of, as it would have made the analysis easier if articles had been selected that dealt with the same length of time per session. What is more, a focused systematic review could have been selected to provide more extensive results on the comparison of percentages between countries. The main strength of the research is that it is the first systematic review focused on analysing the factors that influence the levels of physical activity of school-age individuals. From this point, the foundations could be laid for effective educational programmes to increase physical activity levels inside and outside the school context in order to prevent pathologies associated with a lack of physical activity and sedentary lifestyles.

Conclusions

The average levels of moderate or vigorous physical activity of the students in the PE sessions do not reach the minimum of 50% of said PE session. It has been shown that there are different factors that influence these parameters, with gender and content being the most frequently mentioned variables. Both have been directly related since invasive sports, those that provide higher levels of intensity, are the ones that motivate girls the least. There are other variables to consider such as age, location of the session and socio-economic level, among others. Finally, Spain falls within the average threshold according to the articles analysed.

In order to improve the percentages of moderate or vigorous physical activity of students in PE sessions, further research is needed to provide effective solutions. Given the importance of this subject in relation to the adolescents' lifestyles, it would be essential for the different authors to agree and carry out the research using the same method. In this way, results based on the same process would be achieved, which would facilitate comparisons between the different variables and teachers would be able to plan courses based on this information.

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