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Research Article

# Influence of school sports on the physical fitness of secondary school students

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## Abstract

This study evaluates the impact of physical education (PE) on the physical fitness of secondary school students aged 15 to 17, using the FITescola test battery, which assesses endurance, strength, and body composition. The research aims to provide empirical evidence supporting the positive effects of PE on adolescents' physical development and overall well-being, contributing to educational policy recommendations. The study involved 108 students from ESJD in Faro, divided into two groups: those who regularly participate in PE (36 students) and those who do not (72 students). Data was collected using five tests from the FITescola battery, including the Shuttle, Push-ups, Abdominal, and Horizontal Thrust tests, administered twice over a school year. The results were analyzed using SPSS software, with statistical tests revealing significant differences in physical performance between PE participants and non-participants. Participants in PE showed superior performance in all fitness tests, particularly in aerobic capacity, abdominal strength, upper limb resistance, and explosive lower limb strength. These findings highlight the importance of consistent PE participation in enhancing students' physical fitness, supporting the argument for the inclusion of regular physical activity in school curricula. The study underscores the need for educational policies that prioritize physical education to improve students' health and well-being, particularly in environments where access to physical activity outside of school is limited.

**Keys words** : Physical Education (PE), FITescola, Fitness, Endurance, Physical performance, Adolescents

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## 1 Introduction

The term "physical fitness" is defined as a set of physical characteristics that are essential for effectively performing various physical activities (Bayles 2023). It is acknowledged that physical fitness is not solely a physical attribute; it is also a factor in psychological well-being, linked to a reduced risk of chronic disease and an improved quality of life (Corbin, Pangrazi & Franks 2000). In this context, physical exercise is

defined as a set of structured and planned movements with the objective of maintaining or improving physical fitness (Bayles 2023). More precisely, physical activity is defined as any bodily movement that generates energy expenditure above the resting level. This encompasses both formal activities, such as school sport, and informal tasks performed in the course of daily life (Meneguci et al. 2021). In the context of increasing sedentary behaviour, the World Health

Organization (WHO) has identified physical inactivity as one of the four main risk factors for global mortality ((World Health Organization (WHO) 2020). In Portugal, as in other European countries, there is cause for concern regarding the levels of physical activity among young people, with recent data indicating a decline in participation in physical activity and sport (Eurobaromètre 2022). In light of this, the WHO recommends that children and adolescents engage in at least one hour of daily physical activity, comprising primarily aerobic exercise and incorporating muscle and bone strengthening activities at least three times a week (World Health Organization (WHO) 2020).

The extant research demonstrates that regular physical activity among children and adolescents has a beneficial impact on physical fitness, encompassing cardiorespiratory capacity, muscular strength and a reduction in body fat. Consequently, this promotes healthy weight and overall well-being (Guthold et al. 2020). In this context, a number of recent studies have confirmed the importance of the school as an environment conducive to the promotion of physical activity. For example, that integrating physical activities into school curricula has a beneficial impact on students' physical and mental health, encouraging an active lifestyle that can positively influence long-term lifestyle habits (Biddle et al. 2019). It can be seen, therefore, that physical education plays a fundamental role in the school setting, not only as a physical activity, but also as a vehicle for personal and social development (Aguiar, Junior & Soares 2022). In Portugal, the physical education and sports programme is part of this approach, offering students equal access to sporting activities and reinforcing the values of equity (BELABBES et al., 2025), and diversity throughout their schooling (Governo Constitucional 2019). Participation in physical education (PE) has been linked with a number of benefits, including enhanced physical abilities and the development of key civic values such as teamwork and respect for rules (Directorate-General

for Education (DGE) 2021). Furthermore, a recent meta-analysis by Biddle et al. (2021) demonstrated that school environments that facilitate structured physical activity, such as PE, enhance the probability of active behaviours outside of school (Biddle et al. 2019). This evidence underscores the favourable impact of such programmes on the lifestyles of young people.

The assessment of fitness in an educational setting frequently employs the use of standardised tests, such as the FITescola battery, which is designed to evaluate key components of fitness, including endurance, strength and body composition (DGE, 2021). Such assessments provide benchmarks that facilitate the monitoring of progress and the identification of areas requiring improvement (FITescola 2015). Recent research, corroborates the efficacy of these instruments in monitoring and enhancing young people's fitness, particularly in settings where access to consistent physical activity may be constrained outside the school environment (Waddington 2020). The objective of this study is to examine the influence of physical education participation on the physical fitness of secondary school students aged 15 to 17, utilising the FITescola test battery. In light of recent recommendations and theoretical frameworks, our research aims to provide empirical evidence that underscores the importance of physical education (PE) in the physical development of adolescents. Moreover, the objective of this study is to inform educational policy by demonstrating the positive impact of physical education on students' overall health and well-being. This will contribute to the development of educational practices that optimise the beneficial effects of school-based sports.

**2 Methodology**

**2.1 Participants**

Regarding the sample participating in this study, it consisted of 108 students of both sexes, aged between 15 and 17, from ESJD, in Faro, which covers secondary education.

**Table 1**– Study sample.

<b>Sex</b>	<b>Age</b>	<b>Number</b>
<b>Masculine</b>	15	19
	16	27
	17	15
<b>Feminine</b>	15	15
	16	14
	17	18

**2.2 Procedures**

This study was designed for an application that covered the first and second period. The first important task to be carried out consisted of requesting the appropriate authorization from the school and the students' guardians. This authorization allowed the EP to use of certain personal and academic data in this study, namely the results of the FITescola battery tests and anthropometric data. Next, it consisted of determining the number of students who regularly practice physical activity in the ED. This assessment was carried out during the first month and a half, after the start of the

school year.

After this phase, and after the selection of the control and experimental groups, the PE, together with the remaining teachers, carried out the FITescola battery tests on all students in the sample, in the middle of the first period and at the end of the second. period. During this phase, the EP carefully recorded the students' results, thus allowing subsequent statistical analysis of the data, using the SPSS 29 program.

**2.3 Instruments**

With the purpose of evaluating the students' physical

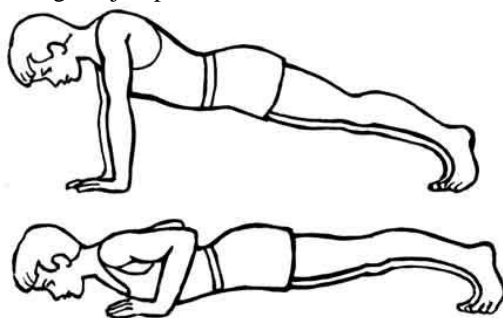
fitness, five tests were carried out, which are part of the

FITescola test battery, as described;



**Shuttle:** is a test used to assess the aerobic capacity of students. It consists of covering a distance of 20 meters as many times as possible, between two lines, following a progressive rhythm determined by an audio

**Horizontal thrust:** aims to evaluate the explosive strength of the lower limbs and consists of executing a long jump, with feet together and without swing running, at the greatest possible distance, with the student having to start with their feet behind the starting line and the distance is measured at the heel, after executing the jump.



**Push-ups:** are a test used to evaluate the resistance of the upper limbs. The objective is to do as many push-ups as possible, following a rhythm defined by an audio. To perform this test, the student starts in a plank position,

with their elbows straight, and then does a push-up until their arms and forearms form a 90-degree angle, returning to the starting position.

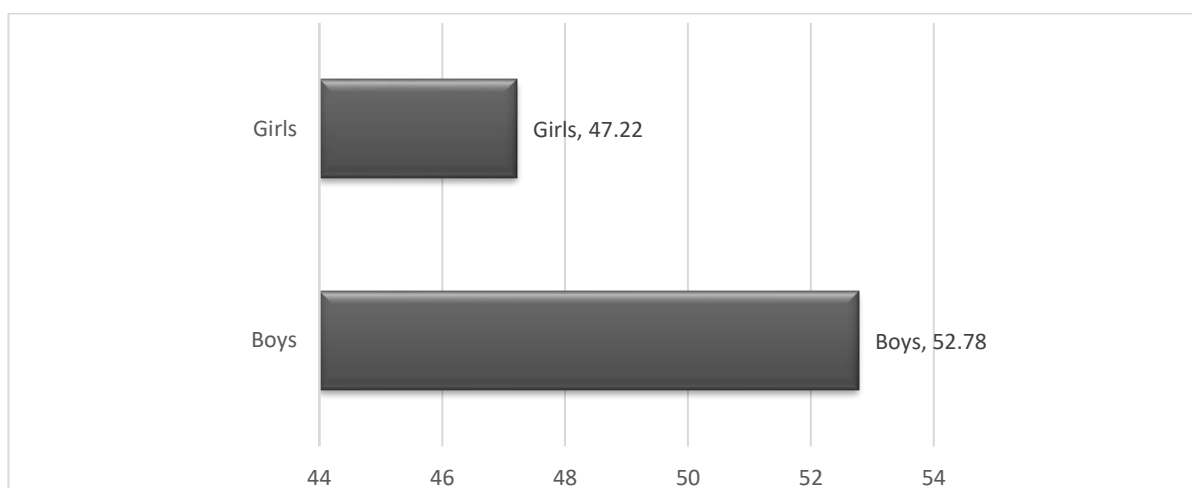
**Abdominal test:** aims to assess the resistance of the muscles in the abdominal area. In this test, students lie on their backs on a mattress, with their head supported, their knees bent at approximately 140 degrees and their feet firmly placed on the floor.

### 2.4 Data Analysis and Processing

SPSS statistical software version 29.0 was used to analyze and treat statistical data in a descriptive and inferential way. To check whether the data followed a normal distribution, the Kolmogorov-Smirnov normality test was applied, considering a sample with more than 50 elements. However, as the data from the Shuttle, Abdominal, Push-up and Horizontal Push tests did not present a normal distribution, the non-parametric Mann-Whitney U Test was used to evaluate the differences between ED practitioners and non-practitioners.

### 3 Results

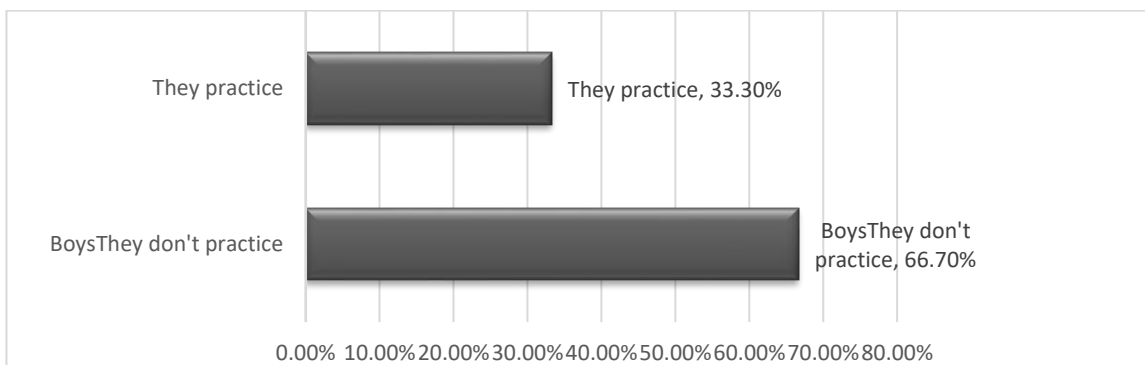
In the sample provided, made up of a total of 108 students, we found that 47.22% are girls, which is equivalent to a total of 47 female students. On the other hand, 52.78% are boys, representing a total of 71 male students, as shown in graph 1:



**Graphic 1**– Percentages of girls and boys.

Regarding participation in DE, we observed that 36 students practice DE, representing approximately 33.3% of the sample. On the other hand, 72 students do not participate in DE, which is equivalent to approximately 66.7% of the sample. These numbers are represented in graph 2:

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**Graph 2-**Percentage of ED practitioners and non-practitioners

**Table 2** -Descriptive analysis of the Shuttle, Sit-ups and Push-ups and Horizontal Impulsion tests; Group 1= Non-ED practitioners; Group 2= ED practitioners.

Aptitude Tests Physics (Fitescola)	Group *	Median and Interquartile Deviation	p-value	Z
Shuttle	1	34.0 ± 24.50	p < 0.001	-0.815
	two	39.0 ± 46.75		
Abs	1	33.0 ± 31.75	p < 0.001	-0.147
	two	34.0 ± 23.75		
Push-ups	1	12.0 ± 6.0	p < 0.001	-2,227
	two	14.0 ± 14.25		
Horizontal Thrust	1	1.65 ± 0.495	p < 0.001	-2,826
	two	1.755 ± 0.5		

The tests carried out revealed statistically significant differences in the performance of the Shuttle, Abdominal and Arm Push-Up tests and horizontal impulsion between individuals who participate in DE and those who do not participate. This result indicates that ED participants showed superior evolution or performance compared to non-participants.

**4 Discussion**

The assessment of students' physical fitness is of paramount importance in physical education programmes. It serves not only to ascertain students' current physical abilities, but also to monitor their evolution and to guide interventions that promote a healthy lifestyle. This study employed the FITescola protocol to investigate the impact of regular engagement in school-based sports on the physical fitness of adolescents. The findings revealed notable discrepancies between the students who engaged in school sports and those who did not, particularly in terms of aerobic capacity, upper and lower limb strength, and abdominal resistance. The results of this study corroborate the beneficial effects of school sports, as evidenced by the findings of recent research in this field. The World Health Organization recommends that children and adolescents engage in at least one hour of moderate to vigorous physical activity on a daily basis to maintain optimal physical and mental health (World Health Organization (WHO) 2020). In accordance with this recommendation, Guthold et al demonstrated that regular physical activity significantly reduces the risk of morbidity associated with a sedentary lifestyle (Herbert et al. 2020). The participating students in our study demonstrated superior performance levels, which underscores the significance of physical education as a conduit for promoting health and well-being. In this

study, the shuttle test was employed to evaluate cardiorespiratory endurance, a pivotal component of adolescent fitness. Regular, structured physical activity, such as school sport, has a positive influence on cardiorespiratory endurance (Biddle et al. 2019). This contributes not only to physical health but also to mental well-being (Herbert et al. 2020). Their work emphasises that active students perform better on school tasks, as cardiovascular endurance improves concentration and reduces stress. Our study corroborates this idea, showing significantly higher commuting performance in active pupils.

The assessment of upper limb strength using push-up tests also demonstrated significant differences between the two groups. Intrinsic motivation is a pivotal factor in students' sustained engagement with physical activity (Shin & Bolkan 2021). Physical education in the school setting represents an optimal conduit for cultivating this motivation. A model of self-determination, this motivation is derived from the supportive environment that teachers establish (Banerjee & Halder 2021). The motivation to include students in PE sessions is influenced by the pedagogical competence of the PE teachers (Ben Rakaa, Bassiri & Lotfi 2024a; Ben Rakaa, Bassiri & Lotfi 2024b). The results of our study align with these findings, demonstrating superior push-up performance among students engaged in school sports. This can be attributed, at least in part, to a motivating

educational environment that not only facilitates physical gains but also fosters a lasting commitment to the sport. The horizontal push-up, employed for the assessment of explosive lower limb strength, also evinces significant discrepancies between practitioners and non-practitioners. The results demonstrate that students who engage in physical education demonstrate superior performance, which supports the assertion that lower limb strength is associated with enhanced fitness from an early age. This indicates that physical education can have lifelong protective effects, emphasising the necessity of integrating it into the school curriculum. Furthermore, analysis of abdominal muscles through sit-up tests demonstrates that students who engage in physical education outperform their peers who do not participate in such activities. The abdominal muscles play a pivotal role in supporting the spine and preventing low back pain, which is a crucial benefit for young people who are increasingly engaged in sedentary activities (Plandowska et al. 2024). These findings emphasise the necessity of integrating muscle-strengthening exercises into the school curriculum to counteract the effects of increasing sedentary lifestyles among teenagers. This could not only enhance their current physical condition but also prevent future health problems.

Methodologically, it is important to note that this study focused on a small sample of students from a single school, which limits the generalisability of the results. Nevertheless, despite this limitation, the results obtained are consistent with those of broader research, such as the study by Marques et al. (2020), which observed similar benefits of structured physical activity on the physical and mental performance of Portuguese youth. To enhance the external validity of the findings, future studies could incorporate samples from diverse geographical regions or even different countries, thus enabling comparisons of the impact of school sport in different cultural and socio-economic contexts. The practical implications of this study are evident: educational institutions and physical education instructors can play a pivotal role in enhancing the health and well-being of young people by fostering and structuring participation in sports activities. The integration of a regular sports programme within schools could have enduring effects on young people's physical fitness and overall development, equipping them with the foundations for an active and healthy lifestyle. Furthermore, educational policymakers may wish to utilise these findings to justify the enhancement of physical education programmes and the recognition of teachers as health promoters. It is also noteworthy that this study paves the way for further research. For instance, socio-economic factors, family support and personal motivation could be incorporated into the analyses to further elucidate the variables that influence young people's engagement in physical activity. A longitudinal analysis would also facilitate a more comprehensive understanding of whether the positive effects observed in this study are sustained beyond the school year and whether they influence sporting habits in adulthood.

In conclusion, the findings of our study reinforce the pivotal role of school-based physical activity in enhancing the physical condition of adolescents. Our results align with a growing body of evidence that supports the numerous benefits of physical activity on the physical and mental health of young people. It offers significant insights into the promotion of active lifestyles from an early age and provides a robust foundation for educational interventions and policies that integrate sport into the educational system. By facilitating enhanced physical and mental growth (Ben Rakaa et al., 2025), school physical education represents a pivotal investment in public health and the long-term well-being of future generations. On the one hand, the integration of UDL into PE has been demonstrated to engender a series of positive effects, with the potential to transform the discipline into a universally accessible field. This transformation is predicated on systemic collaboration between educators, policy-makers and communities (LOURENÇO et al., 2025).

## **5 Conclusion**

The results of this study allow us to conclude that the practice of physical activities in the ED has a positive influence on the physical fitness of young people, which is reflected in a beneficial way in the results of all FITescola tests carried out. In this sense, it is expected that the results of this research will be useful in guiding PE teachers in planning their classes and, consequently, in implementing more effective practices to promote healthy lifestyles, such as participation in DE. Therefore, teachers play an essential role in promoting the health and well-being of their students, contributing to the integral development of each individual.

Despite an increase in the practice of DE in schools, this trend is not yet significantly reflected in the lifestyle habits of the general population. Although this provides important opportunities for young people to engage in physical and sporting activities, there are several factors that limit the impact of this practice on the adoption of healthier lifestyles. DE is seen as an extracurricular activity, separate from the students' daily lives. Although it is an integral part of schools, it is not always included effectively in the educational curriculum. Furthermore, the quality and diversity of sports available may be limited, not meeting students' individual preferences and interests.

There is also a lack of adequate monitoring and support for the transition from habits acquired in the ED to adult life. Since many young people do not receive guidance on how to continue practicing sport regularly after leaving school, there is a decrease in their physical activity over time. Culture and habits rooted in society also influence adherence to sport. In many cases, there is still a preference for sedentary activities or a less active lifestyle, which can make it difficult to practice regular physical exercise, even among those who actively participated in ED.

Despite the theoretical foundation and methodological precautions adopted, this research has some limitations to be considered. One of these limitations refers to the state of physical and mental health of the students on the

day the tests were carried out, as this may influence the results obtained, as well as the commitment of the students in carrying out the tests and the seriousness with which they took the tests. same. Another limitation is the small sample size, which may affect the generalization of the results.

For future research, it would be interesting to explore other aspects of physical exercise in DE modalities, such as the social relationships that arise from this practice, the motivation of students to practice physical exercise outside PE classes and analyze how it can impact emotional well-being of students and their desire to continue exercising regularly. Understanding these factors can provide valuable information to develop more effective health promotion strategies, adapted to the school context.

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## 6 References

1. Aguiar, T. de A., Junior, E.F. da C. & Soares, R.A.S., 2022, 'Profile of physical education students and interest in the areas of performance in education and health', *Research, Society and Development*, 11(10), e43111031856–e43111031856.
2. Banerjee, R. & Halder, S., 2021, 'Amotivation and influence of teacher support dimensions: A self-determination theory approach', *Heliyon*, 7(7).
3. Bayles, M.Paternostro., 2023, *ACSM's exercise testing and prescription*, 2nd edn., Wolters Kluwer.
4. Biddle, S.J.H., Ciaccioni, S., Thomas, G. & Vergeer, I., 2019, 'Physical activity and mental health in children and adolescents: An updated review of reviews and an analysis of causality', *Psychology of Sport and Exercise*, 42, 146–155.
5. Corbin, C.B., Pangrazi, R.P. & Franks, B.D., 2000, 'Definitions: Health, Fitness, and Physical Activity.', *President's Council on Physical Fitness and Sports Research Digest*.
6. Directorate-General for Education (DGE), 2021, *Programa Estratégico do Desporto Escolar 2021-2025*.
7. Eurobaromètre, 2022, *Sport and physical activity*, European Commission.
8. FITescola, 2015, *FITescola: O Programa dos Alunos Ativos*.
9. Governo Constitucional, 2019, *XXIV Governo Constitucional, República de Portuguesa*.
10. Guthold, R., Stevens, G.A., Riley, L.M. & Bull, F.C., 2020, 'Global trends in insufficient physical activity among adolescents: a pooled analysis of 298 population-based surveys with 1.6 million participants', *The Lancet Child and Adolescent Health*, 4(1), 23–35.
11. Herbert, C., Meixner, F., Wiebking, C. & Gilg, V., 2020, 'Regular Physical Activity, Short-Term Exercise, Mental Health, and Well-Being Among

- University Students: The Results of an Online and a Laboratory Study', *Frontiers in Psychology*, 11, 491804.
12. Meneguci, C.A.G., Meneguci, J., Sasaki, J.E., Tribess, S. & Virtuoso, J.S., 2021, 'Physical activity, sedentary behavior and functionality in older adults: A cross-sectional path analysis', *PloS one*, 16(1).
13. Plandowska, M., Labecka, M.K., Truszczyńska-Baszak, A., Płaszewski, M., Rajabi, R., Makaruk, B. & Różańska, D., 2024, 'The Effect of an Active Break Intervention on Nonspecific Low Back Pain and Musculoskeletal Discomfort during Prolonged Sitting among Young People—Protocol for a Randomized Controlled Trial', *Journal of Clinical Medicine* 2024, Vol. 13, Page 612, 13(2), 612.
14. Ben Rakaa, O., Bassiri, M. & Lotfi, S., 2024a, 'Defining the Effect of Teachers' Medical History on their Inclusive Teaching Practice: Analyzing Feelings of Competence and Knowledge in Inclusive Physical Education', *Physical Education Theory and Methodology*, 24(5), 777–783.
15. Ben Rakaa, O., Bassiri, M. & Lotfi, S., 2024b, 'The Influence of School Pathologies on the Feeling of Pedagogical Incompetence in Teaching Inclusive Physical Education', *Physical Education Theory and Methodology*, 24(4), 626–634.
16. Shin, M. & Bolkan, S., 2021, 'Intellectually stimulating students' intrinsic motivation: the mediating influence of student engagement, self-efficacy, and student academic support', *Communication Education*, 70(2), 146–164.
17. Waddington, G.S., 2020, 'Fitness, level of lesion and red blood cell distribution in chronic spinal cord injury', *Journal of Science and Medicine in Sport*, 23(2), 105.
18. World Health Organization (WHO), 2020, *Guidelines on physical activity and sedentary behaviour*.
19. BELABBES, L., BEN RAKAA, O., & HAFIDI ALAOU, M. S. (2025). Impact of the PE programme on gender equality and personal development: an empirical study of school basketball. *Cuestiones de Fisioterapia*, 54(3), 4988–5006.
20. LOURENÇO, C., BEN RAKAA, O., EL BOUHALI, I., BASSIRI, M., & LOTFI, S. (2025). Universal Design for Learning in Physical Education: Bridging Gaps in Teacher Training and Policy for Inclusive Practice. *Cuestiones de Fisioterapia*, 54(4), 5906–5924.
21. Ben Rakaa, O., Bassiri, M., & Lotfi, S. (2025). Promoting Inclusion and Well-Being Through Inclusive Physical Education and Parasports: an Approach for Adolescents with Motor Impairment. *Physical Education Theory and Methodology*, 25(1), 130–138.