THE ROLE OF HEALTHY PREVENTIVE SPORTS PHYSICAL ACTIVITY IN IMPROVING THE ACADEMIC ACHIEVEMENT OF STUDENTS GIRLS IN SECONDARY SCHOOL (15 −18 YEARS) IN ALGERIA[1]

Úloha zdravej preventívnej športovo-pohybovej aktivity pri zlepšovaní študijných výsledkov študentov stredných škôl (15 – 18-ročných) v Alžírsku

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Abstract: *The purpose of this study is to determine the role of healthy preventive sports physical activity on the academic achievement of girls in secondary school (15–18 years old) in the state of Guelma, Algeria. 30 students girls were chosen at random from various high schools in the state, 15 of whom participate in physical sports three times a week in the aerobic hall, and the remaining 15 of whom do not. To assess the caliber of their academic achievement, we looked at the scores they received on tests covering scientific subjects in mathematics, the natural sciences, and physics. Additionally, we used the comparative analytical descriptive approach in this study. The software Statistical Package (SPSS) was used for statistical processing, and the study's findings were as follows, The results of the mathematics subject exam show a statistically significant difference between practitioners and non-practitioners, with the difference favouring practitioners at a significance level of ≥ 0.05, The Natural Sciences subject (Natural Sciences Test) scores of practitioners and non-practitioners differ statistically significantly, and the difference is in favour of practitioners, at a significance level of ≥ 0.05, There is a statistically significant difference in the physics subject exam scores between practitioners and non-practitioners, and it is in favour of practitioners at a significance level of ≥ 0.05.*
Keywords: *health, physical activity, sports, academic achievement, secondary school.*

Abstrakt: *Cieľom prezentovanej štúdie je zistiť úlohu zdravej preventívnej športovej pohybovej aktivity na študijné výsledky dievčat na strednej škole (15–18 rokov) v štáte Guelma, Alžírsko. Náhodne bolo vybraných 30 žiačok z rôznych stredných škôl v štáte, z ktorých 15 sa trikrát týždenne venuje pohybovým športom v aeróbnej hale a zvyšných 15 nie. Aby sme zhodnotili kvalitu ich akademického úspechu, pozreli sme sa na skóre, ktoré získali v testoch pokrývajúcich vedecké predmety z matematiky, prírodných vied a fyziky. Okrem toho sme v tejto štúdii použili komparatívny analytický deskriptívny prístup. Na štatistické spracovanie bol použitý softvér Statistical Package (SPSS) a výsledky štúdie boli nasledovné, Výsledky skúšky z predmetu matematika ukazujú štatisticky významný rozdiel medzi odborníkmi z praxe a necvičiacimi, pričom rozdiel uprednostňuje odborníkov z praxe na hladine významnosti ≥ 0,05, Skóre predmetu Prírodné vedy (Test prírodných vied) praktizujúcich a nepraktizujúcich sa štatisticky významne líšia a rozdiel je v prospech ľudí z praxe na hladine významnosti ≥ 0,05, Existuje štatisticky významný rozdiel v skóre skúšok z fyziky medzi odborníkmi z praxe a necvičiacimi, a je v prospech odborníkov z praxe na hladine významnosti ≥ 0,05.*
Kľúčové slová: *zdravie, pohybová aktivita, šport, študijné výsledky, stredná škola.*

Introduction

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The positive effects of physical activity (PA) on teenage wellbeing have been demonstrated by earlier studies. The WHO also advises kids and teenagers between the ages of 5 and 17 to engage in at least 60 minutes of moderate-to-vigorous physical activity (MVPA) every day, including exercises that build bones and muscles. This implies that strength training (RE) and aerobic activity (AE) are essential for meeting these objectives for kids in this years range (Kang, & Kuo, 2024).

Enhancing social, motor, and cognitive abilities all depend on maintaining a healthy level of physical exercise. Lower levels of physical activity are well recognized as a critical risk factor for the sharply growing rates of obesity. Additionally, it appears that improved cognitive function, academic achievement, and personal psycho-social conduct are all correlated with fitness, According to a number of academics, physical exercise and cognitive function can be linked throughout childhood. Planning, organizing, problem-solving, working memory, motor control, and inhibitory control are examples of intentional activities that need a greater degree of cognitive control, and they claimed that youth who engage in more physical exercise get better results, We assumed that improved neuroelectric function, increased brain blood flow, and the stimulation of the release of brain-derived neurotropic factor (BDNF) were the causes of the associated neurophysiological alterations in the brain, which would account for the advantageous effect of exercising on academic performance. Through the enhancement of synaptic plasticity, these factors all support development and maintain cognitive functioning (Latino et al., 2023).

Children's psychological health, physical and mental development, and cognitive growth are all significantly impacted by physical activity, Indeed, an increasing amount of evidence suggests that individual disparities in cognitive function and academic accomplishment can be attributed to PA and its physiological follow-up, aerobic fitness. For example, as demonstrated by a recent meta-analysis, an increasing amount of research has demonstrated the relationship between academic success and aerobic fitness, a pertinent indicator of children's cardiovascular health. It's interesting to note that a few recent studies have demonstrated that executive functions mediate the relationship between academic achievement and indicators of children's physical fitness (such as muscular, motor, and aerobic fitness), suggesting that executive functions may be a mechanism to promote academic achievement through sports activity (Yangüez et al., 2024).

The unavoidable demand to teach pupils to achieve recognized academic standards has drawn a lot of attention to schools. Thus, it is necessary to create new, efficient teaching strategies. Given the growing evidence of a favourable correlation between academic achievement and physical activity (PA), PA may be one such strategy. In a subsample of a randomized controlled experiment (RCT) called Physical Activity Across the Curriculum, children who got physically active lessons every day for three years outperformed children who followed the usual curriculum in reading, numeracy, and spelling. In the Fit &

Vardar op School research, elementary school students' spelling and numeracy skills improved after two years of weekly language and numeracy instruction. The findings of the Activity and Motivation in Physical Education trial, where the authors documented notable intervention effects on numeracy skills, also align with these findings (Solberg et al., 2021).

Globally, physical inactivity is a concern, with less than one in five school-age children meeting the recommended levels of physical exercise.1, 2. Therefore, the public health agenda's promotion of physical exercise to enhance children's and teenagers' physical, mental, and cognitive health has compelling justification (Muntaner et al., 2024).

Due to its ability to prevent non-communicable diseases, physical activity (PA) is becoming an increasingly significant part of public policy guidelines. Physical activity is any movement that requires energy and is performed by skeletal muscles. During the course of a week, it is recommended to perform "at least 150 minutes per day of moderately intense aerobic exercise, not less than 75 minutes of intense aerobic exercise throughout the week's work, or a combination of both moderately and vigorous-intensity movement (Ijaz, & Shaha, 2023).

The connection between teenage academic success and physical exercise has been thoroughly studied by researchers, who have concentrated on how physical activity affects both academic performance and cognitive functioning. Meta-analyses have repeatedly shown that physical exercise and cognitive function are positively correlated, with children and adolescents benefiting greatly from physical activity in terms of their academic achievement (Zhang et al., 2018).

The current study intends to demonstrate the benefits that such sports activities can offer to adolescents, youth, and even children in order to improve their academic and cognitive achievement in general. In this sense, we see that regular exercise, whether in physical education classes within the institution or in leisure time, has numerous physical and mental benefits. Therefore, this study is important because it looks at how various types of healthy physical activity and its mental, psychological, and physical advantages impact secondary school students' ability to improve their academic performance.

Methodology

Study participants

30 Thirty female secondary school students (15–18 years old) from the Algerian state of Guelma participated in the study; fifteen of them participated in sports physicals and fifteen did not. They were chosen at random.

Study design

At the conclusion of the first semester, three scientific material exams were evaluated to the research sample, which included both practitioners and non-practitioners of sports physical activity . The study was carried out in January and February of 2024 and was broken down into the following phases:

- an evaluation of the mathematics test results was conducted between January 20, 2024 and January 25, 2024;
- from January 26 to January 30, 2024, the results of the Natural Sciences Test were evaluated;
- the results of the physics test were evaluated from February 02, 2024, to February 07, 2024.

The tests
The following are some of the tests included in the research:
- the Mathematics Test
- the Natural Sciences Test
- the Physics Test
- Analysis of statistics:
- SPSS version 25 software was used to do the research's statistical analysis.
- the arithmetic mean and standard deviation (SD)
- T test for independent samples.
- a 95 % confidence interval, or & = 0.05, was utilized as the study's significance threshold.

Results

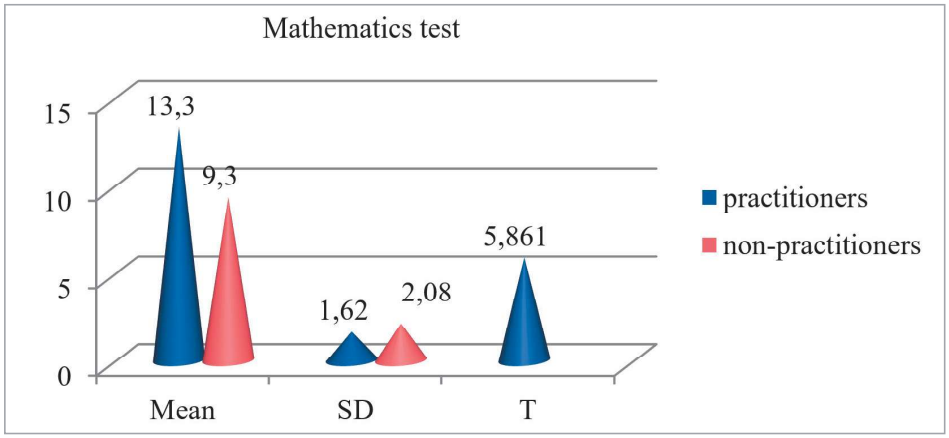
Table 1 Statistical analysis of the results for the Mathematics test

Mathematics test	Practice variable	N	Mean	Std. Deviation	t	df	Significance level	Sig	Statistical estimate
	practitioners	15	13,30	1,62	5,861	28	0,05 =α	0,00	significant
	non-practitioners	15	9,30	2,08					

(Source: own compilation)

According to the Table (1) In the mathematics exam, the arithmetic mean of those who engaged in sports physical activity was 13.30 with a standard deviation of 1.62, higher than the arithmetic mean of those who did not participate, which was 9.30 with a standard deviation of 2.08, as shown in Table (1). To ascertain whether or not this difference is statistically significant, we next look at the outcomes of the next test (t). We can see from the table that (t) equals (5.861) when computed at degree of freedom (28). Because the degree of significant probability (sig = 0.00) is lower than the significance level (& = 0.05), the differences between practitioners and non-practitioners in terms of the mathematics test are statistically significant and in favor of practitioners given the variable of engaging in healthy sports physical activity.

Figure 1 Graph of the mean and standard deviation of the Mathematics test



(Figure source: current research)

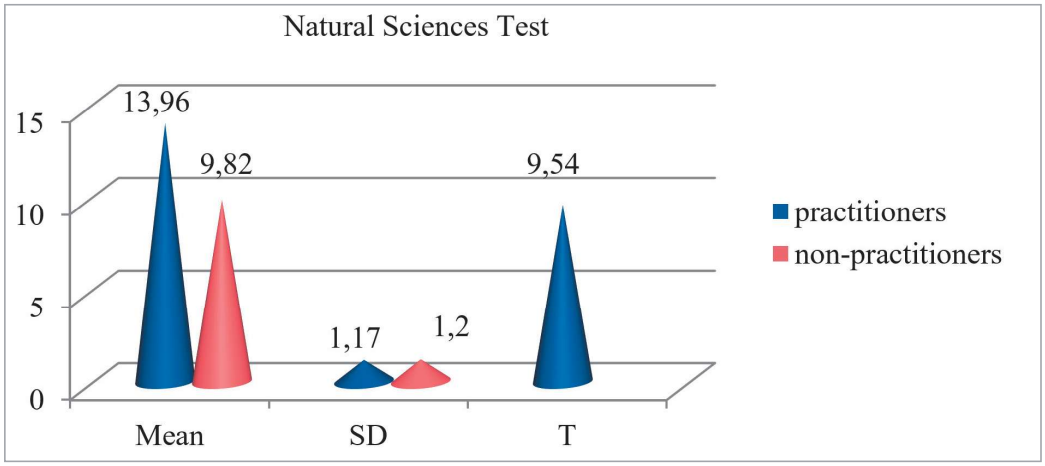
Table 2 Statistical analysis of the results for the Natural Sciences Test

Natural Sciences Test	Practice variable	N	Mean	Std. Deviation	t	df	significance level	Sig	Statistical estimate
	practitioners	15	13,96	1,17	9,540	28	0,05 = α	0,00	significant
	non-practitioners	15	9,82	1,20					

(Source: own compilation)

The arithmetic mean of the participants in the natural sciences test was 13.96 with a standard deviation of 1.17, greater than the arithmetic mean of the non-participants, which was 9.82 with a standard deviation of 1.20, as indicated by the data in Table (2). To ascertain whether or not this difference is statistically significant, we next look at the outcomes of the next test (t). The value of (t) computed at degree of freedom (28) equals (9.540), as we can see from the table. Because the degree of significant probability (sig = 0.00) is lower than the significance level (& = 0.05), the differences between practitioners and non-practitioners in terms of the natural sciences test are statistically significant and in favor of practitioners given the variable of engaging in healthy physical sports activity.

Figure 2 Graph of the mean and standard deviation of the Natural Sciences Test



(Figure source: current research)

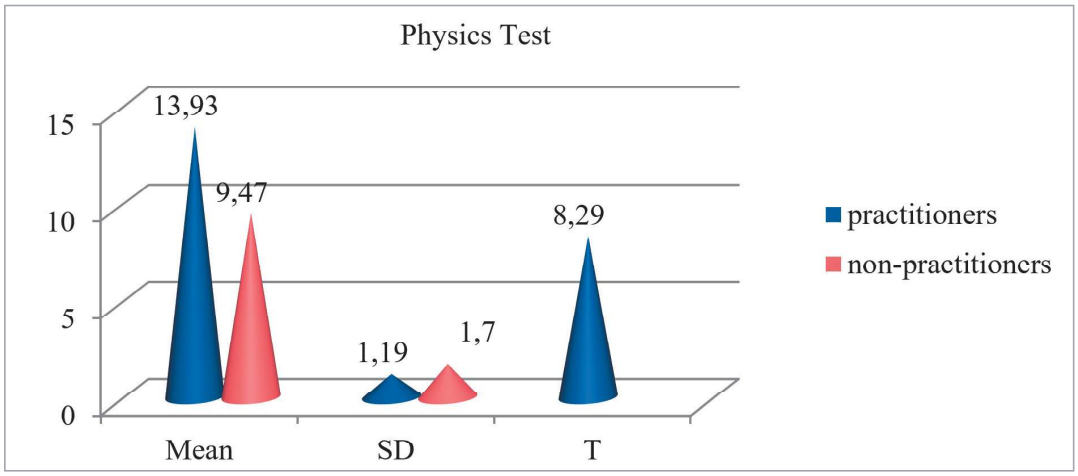
Table 3 Statistical analysis of the results for the Physics test

Physic test	Practice variable	N	Mean	Std. Deviation	T	df	Significance level	Sig	Statistical estimate
	practitioners	15	13,93	1,19	8,290	28	0,05 = α	0,00	significant
	non-practitioners	15	9,47	1,70					

(Source: own compilation)

According to Table (3), the arithmetic mean for the physics exam for sports physical practitioners was 13.93 with a standard deviation of 1.19, which was higher than the arithmetic mean for non-practitioners 9.47 with a standard deviation of 1.70. The results of the subsequent test (t) are then examined to see whether this difference is statistically significant. The value of (t) calculated at degree of freedom (28) equals (8.290), according to the table. Given the variable of participating in healthy physical sports, the physics test differences between practitioners and non-practitioners are statistically significant and favour practitioners because the degree of significant probability (sig = 0.00) is less than the significance level (& = 0.05).

Figure 3 Graph of the mean and standard deviation of the Physics Test



(Figure source: current research)

Discussion

The results of the present study demonstrate that participation in sports improves the physical health and academic achievement levels of students who practice consistently throughout the week. This is because we found that practitioners and non-practitioners of physical sports activity differ in how they evaluate the results of the tests included in this research, favouring practicing female students who scored highly on various scientific tests represented in evaluating the scores of the mathematics test, the natural science test, and the physics test because they consider them important criteria for improving academic achievement and physical fitness .We discovered that this study helps us understand how healthy sports practices affect physical health and improve academic achievement levels and academic performance among high school students, whether in physical education classes or during free time in aerobics halls, swimming, running in nature, cycling, and other sports that maintain physical and respiratory fitness as well as the mental aspect.

Our work supports the findings of earlier research and advances knowledge of the advantages of healthy sports participation for female students who engage in regular physical activity, as well as the effects it has on their academic performance and physical and mental well-being.

Adolescents who engage in daily, intense physical exercise report greater levels of academic accomplishment, according to the study. This association held true for all genders and age groups, indicating that frequent high-intensity physical activity can improve secondary school pupils' academic performance (Zhang et al., 2024). According to the study, adolescents who engage in physical activity perform much better academically. Exercise groups also demonstrated better verbal working memory, and resistance training completely mediated the association between physical activity and science performance, underscoring the significance of regular exercise (Kang, & Kuo, 2024)

According to the study, Moroccan secondary school students' academic performance and physical activity were significantly positively correlated, with physically active students receiving higher overall grades. Promoting physical exercise is crucial for improving teenagers' academic performance and overall health (El Oirdi et al., 2023). Among students in higher secondary school, the study discovered a substantial positive association between academic accomplishment and physical activity ($r = 0.51$, $p < 0.05$), suggesting that playing sports improves academic performance and personal growth without having a detrimental effect on academic outcomes (Ijaz, & Shaha, 2023).

With the goal of improving academic performance and general quality of life by integrating active breaks and physically active learning into the curriculum, the ACTIVE CLASS project assesses the effects of physical activity interventions on academic markers among secondary education students (González et al., 2024). Teenagers in secondary school and other school-aged children benefit academically from acute physical exercise, with notable gains shown in language and arithmetic proficiency. According to the study, including physical exercise in this age range can improve academic performance (Muntaner et al., 2024).

Adolescents' academic performance is greatly improved by classroom-based physical exercise, which lowers anxiety and BMI while enhancing self-efficacy, study abilities, and focus. This intervention shows how including physical exercise into the school day improves kids' performance in general (Latino et al., 2023).

Although academic performance in Chile was mostly correlated with socioeconomic class and school type, the study discovered substantial correlations between academic accomplishment and physical activity levels in Spanish teenagers, suggesting cultural variations in these interactions (Gallardo et al., 2023). High school students' academic performance and physical strength were shown to be positively correlated, whereas males' cardiorespiratory fitness was found to be negatively correlated. Clustered measures of physical fitness and academic success did not significantly correlate (de Almeida et al., 2023).

High school boys' academic achievement and muscular strength were shown to be positively correlated in the study, but clustering physical fitness markers did not show any significant correlation. Additionally, girls' academic performance was adversely affected by age (Prado et al., 2022). According to the results of the ScIM research, school-based exercise interventions considerably raised the reading and numeracy academic achievement of 14-year-old adolescents. This suggests that adding more physical activity to the curriculum can raise secondary school students' academic performance (Solberg et al., 2021).

Pupils that engage in more physical exercise do better academically, as seen by their improved grades and decreased failure rates. Academic success is positively correlated with more hours spent playing sports, underscoring the value of physical exercise in adolescent education (Lombarte et al., 2020). Adolescents in Spanish secondary school who engage in sport have far higher

academic success. Students who were physically active, had excellent executive functions, and were girls performed better academically in a variety of disciplines, according to the research (Escolano, & Bestué, 2021).

Teenagers' academic success is favourably correlated with physical exercise, especially in secondary school. The significance of physical fitness, particularly cardiorespiratory fitness, in academic achievement was highlighted by the systematic review, which indicated that more than 80 % of research reported a substantial link. (Rodriguez et al., 2020). 173 student-athletes from a private high school participated in the study, which examined the relationship between academic achievement and sports participation. It found that participation in sports has a significant impact on academic performance, underscoring the need for better scheduling of academic and athletic activities (Butling et al., 2023).

Aerobic exercise has a significant impact on scholastic success, especially in math, according to the study. Enhancing physical fitness may help children's cognitive abilities related to academic success, since executive processes, particularly cognitive flexibility, regulate this relationship (Yangüez et al., 2024). According to the research, children's academic success is positively impacted by moderate to vigorous physical activity (MVPA), and this relationship is mediated by executive function and cardiorespiratory fitness. This finding emphasizes the significance of sports activity programs for improving academic performance (Visier Alfonso et al., 2021).

The research discovered that whereas resistive capacity and fluid intelligence were favourably correlated with academic success in high school pupils, cardiorespiratory fitness was not. Encouraging physical exercise is advised to improve both general public health and academic achievement (El Jaziz et al., 2020).

With substantial score gains in both urban and mixed residential regions, the study discovered that a high-intensity interval exercise program greatly enhanced academic accomplishment among Mongolian primary school pupils, underscoring the beneficial effects of exercise on academic performance (Takehara et al., 2021). By enhancing assertiveness, confidence, emotional stability, intellectual functioning, memory, and self-control, sports exercise has been shown to improve academic performance and eventually lead to improved academic results for students (Honório et al., 2021). The relevance of these characteristics in improving students' academic success is shown by the study's findings that mastery-approach goal orientation, attitudes toward the teaching profession, and high school GPA all predict academic accomplishment in physical education and sports students (Şahin et al., 2018).

There was no statistically significant difference in math ability between student-athletes and non-athletes, according to the research. Students should be encouraged to participate in sports without worrying about their academic success, according to the study's conclusion that sports involvement had no detrimental effects on academic achievement (Biswal, 2018). According to the study, teenagers' academic success and a number of fitness metrics, most

notably cardiorespiratory fitness, were favourably connected. Compared to their overweight/obese and unfit peers, fit and normoweight people performed better academically, indicating that fitness may lessen the detrimental effects of obesity (Martinez et al., 2021).

Even though only 14.2 % of university students regularly engaged in sports, the study identified a substantial and positive correlation between achievement qualities and sports participation, suggesting that greater accomplishment levels are associated with more sports involvement (Wali et al., 2021). Although research methods and results vary throughout the literature, the review shows a generally positive relationship between students' academic accomplishment and physical activity (PA), with several studies indicating positive benefits on cognition and academic performance (Howie, & Pate, 2012). According to the study, college students' academic performance is much enhanced by regular physical activity, especially jogging for 16 to 25 minutes once a week. This suggests a substantial correlation between exercise fitness and higher academic accomplishment (Du et al., 2023).

Conclusion

Based on the data gathered and analysed from the evaluation of the tests, the study's findings indicate that female students who participate in healthy physical sports activities, whether at school or in their free time, have good physical health and academic results. This is in contrast to students who do not practice in the areas of mathematics, the natural sciences, and physics. Consequently, practitioners receive a standard deviation (1.62) and an arithmetic mean (13.30) in the evaluation of the mathematics test. On the same test, non-practicing pupils receive a standard deviation of 2.08 and an arithmetic mean of 9.30. Practitioners receive a standard deviation of 1.17 and an arithmetic mean of 13.96 for the natural sciences test. The results of the physics test for the practicing students showed an arithmetic mean of 13.93 and a standard deviation of 1.19, while the non-practicing students in the same test received an arithmetic mean of 9.82 and a standard deviation of 1.20. In contrast, the non-practicing students in the same test received an arithmetic mean of 9.47 and a standard deviation of 1.70. According to the data and findings, students who participated in sports and other forms of physical exercise performed better on the three exams given to them than students who did not. Accordingly, Students who participate in healthy sports and physical exercise have better physical health and have better academic and cognitive outcomes than their peers who do not. we draw the following conclusions, The results of the mathematics subject exam show a statistically significant difference between practitioners and non-practitioners, with the difference favouring practitioners at a significance level of ≥ 0.05, The Natural Sciences subject (Natural Sciences Test) scores of practitioners and non-practitioners differ statistically significantly, and the difference is in favour of practitioners, at a significance level of ≥ 0.05, There is a statistically significant difference in

the physics subject exam scores between practitioners and non-practitioners, and it is in favour of practitioners at a significance level of ≥ 0.05.

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