

# The Relationship Between Preventive Sports Physical Activity and Academic Compatibility Among Secondary School Students in Algeria

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## Abstract

Academic compatibility and physical fitness are crucial for students' holistic development. While previous research indicates positive effects of sports on achievement and strength, limited evidence exists in Algerian secondary schools. This study explored the impact of preventive sports activity on academic adjustment and muscular strength among pupils in Guelma. Methods: Sixty students (30 males, 30 females) were randomly selected and divided into practitioners ( $n = 15$ ) and non-practitioners ( $n = 15$ ) per gender. Data were collected using the Academic Compatibility Scale (34 items) and the 2 kg Medicine Ball Throw Test. Analysis was performed with SPSS v25, applying descriptive statistics and independent samples t-tests at  $\alpha = 0.05$ . Results: Significant differences favored practitioners in both variables. Male practitioners scored higher in academic compatibility ( $M = 24.93$  vs.  $13.86$ ) and muscular strength ( $M = 11.76$  vs.  $8.24$ ). Female practitioners also outperformed their counterparts in academic compatibility ( $M = 26.40$  vs.  $15.13$ ) and muscular strength ( $M = 7.96$  vs.  $5.36$ ), with all results statistically significant ( $p < 0.05$ ). Discussion: Findings confirm that preventive sports activity improves academic and physical outcomes. Practitioners demonstrated better adjustment and strength, supporting the role of sports in enhancing cognitive, social, and physical development. The study emphasizes integrating regular school-based sports programs to promote students' academic and physical growth.

**Keywords:** School sports, Fitness and Health, Academic achievement, Muscle strength, Participation in sports

## Introduction

Compatibility is a crucial factor in shaping an individual's personality, as it represents a significant and continuous developmental process through which a person acquires effective behaviors that guide life changes and support personal growth. Within this context, compatibility in its various forms – personal, emotional, social, and academic – is widely recognized as a primary indicator of mental health. Each stage of human development requires a set of conditions that must be fulfilled in order for the individual to progress to the next stage. Continued positive compatibility therefore becomes essential for achieving a higher quality of life (Abuhmaidan et al., 2020). Academic compatibility, in particular, plays a critical role in shaping the key components of the educational process and is considered one of the most important contemporary constructs. Educational leaders, especially teachers who maintain direct and daily interaction with students, increasingly emphasize the necessity of enhancing students' academic adjustment. As a fundamental prerequisite for success, academic compatibility is regarded as a form of social adjustment, enabling students to establish balance between themselves and their academic environment – including peers, instructors, and curricular demands – while supporting their cognitive and emotional development (AL-Momani et al., 2023).

Athletic participation occupies an important place among high school extracurricular activities. According to the National Federation of State High School Associations, more than 7.6 million students – representing 55.5% of all high school students – participated in sports during the 2010–2011 academic year. This marked the 22nd consecutive year of increased sports participation (Hwang et al., 2016). Sports and physical education have also been highlighted as strategic tools for promoting sustainable development. As emphasized during the 2002 UN World Summit in Johannesburg, transforming existing educational systems is essential to achieve sustainability. Sports-based education for sustainable development provides students with the knowledge, skills, values, and behaviors necessary to contribute to environmental preservation, social justice, and economic responsibility. Through sports, learners develop essential human qualities such as empathy, teamwork, discipline, inclusiveness, hospitality, and respect for others and for rules (Alade et al., 2021).

Physical exercise has, therefore, become an increasingly significant component of public health and education policy. Physical activity refers to any bodily movement produced by skeletal muscles that results in energy expenditure. Current guidelines recommend at least 150 minutes per week of moderate-intensity aerobic activity, or no less than 75 minutes of vigorous-intensity exercise, or an equivalent combination of both (Ijaz & Shaha, 2023). Sports participation is widely recognized as an effective means to promote healthy behaviors and support the holistic development of children and adolescents. In addition, growing research has examined the relationship between sports involvement and academic achievement. Several studies indicate positive associations, suggesting that the adolescents who participate in sports tend to demonstrate stronger academic performance. Both cross-sectional and longitudinal findings provide converging evidence that sports participation substantially contributes to enhanced academic outcomes (Chen et al., 2021).

Interest in understanding the effects of regular exercise on academic achievement has increased over the past 15 years. Despite this growing attention, it remains premature to conclude definitively that physical activity directly improves academic performance. In practice, many students perceive a conflict between athletic and academic demands. A U.S. survey found that 36% of girls and 26% of boys reported discontinuing sports in order to concentrate on schoolwork. This reflects the common belief that academic success requires reducing engagement in extracurricular activities. However, emerging evidence contradicts this assumption, indicating that sports involvement is positively related to academic achievement rather than detrimental to it (Kuroda et al., 2023).

In light of these considerations, it is important to explore the relationship between high school students' athletic participation and their academic outcomes in order to clarify the nature of this association and identify potential moderating factors such as gender, sport type, and level of participation. This includes examining how educational expectations, academic support, athletic support from significant individuals, and students' own aspirations interact with participation in sports to influence academic compatibility and performance. Such an approach provides a more comprehensive understanding of how athletic engagement contributes to – or interacts with – the broader educational experience of adolescents.

## Materials and Methods

### Participants in the study

Sixty (60) secondary school students from the province of Guelma, Algeria, voluntarily participated in the study. The sample consisted of 30 male and 30 female students. Within each gender group, 15 students regularly engaged in organized sports activities, while the remaining 15 did not participate in any structured physical activity. The selection process followed a simple random sampling procedure from the student lists provided by the participating schools.

The participants were enrolled in the second and third years of secondary education, with ages ranging from 16 to 18 years. Inclusion criteria required that students be physically healthy, enrolled full-time in school, and willing to participate in both academic and physical assessments. Students with injuries, medical restrictions, or special educational needs were excluded. Parental or guardian consent, along with student assent, was obtained, as required for research involving minors.

Comparisons were conducted separately for males (practicing vs. non-practicing) and females (practicing vs. non-practicing) across the same set of academic and physical tests.

### Research design

The study employed a cross-sectional comparative design aimed at identifying differences between physically active and inactive students with regard to academic compatibility and muscular strength. Two standardized assessments were administered during the data collection period, which took place between March and April 2023.

- Academic Compatibility Assessment: conducted between March 25 and April 1, 2023.
- Muscular Strength Assessment: conducted between April 3 and April 8, 2023.

All tests were administered during school hours in a controlled and standardized environment by trained physical education teachers following unified instructions and procedures.

### Assessments

Among the field tests used in the study are the following ones:

- **Academic Compatibility Scale**

The study used the Academic Compatibility Scale originally developed by Youngman (Sihem, 2022). The scale consists of 34 items, including both positively and negatively worded statements designed to assess students' academic adjustment and integration within their school environment.

Participants responded to each item using a dichotomous format ("Yes" indicating agreement and "No" indicating disagreement). Each item was scored either 1 or 0 according to the scoring key, resulting in a total score ranging from 0 (lowest level of academic compatibility) to 34 (highest level).

Higher scores reflected stronger academic compatibility, including better adjustment to teachers, peers, school expectations, and academic tasks.

Because the scale was used in an Algerian/Arabic-speaking context, it underwent translation and cultural adaptation procedures. Content validation was performed by a panel of three experts in educational psychology. Internal consistency reliability (Cronbach's alpha) was calculated for the study sample to ensure acceptable psychometric properties (Sihem, 2022).

- **2 kg medicine ball throw test**

This field test was used to assess upper-body muscular strength.

Purpose – to measure explosive strength of the arms and shoulder girdle. Equipment – a 2-kg medicine ball, measuring tape, marked throwing area. Procedure – Participants stood behind a designated throwing line while holding the ball with both hands at chest height. After receiving standardized instructions and completing a brief warm-up, participants performed three maximal forward throws using an overhead or chest-push technique without crossing the line. The farthest distance (measured to the nearest 5 cm) among the three attempts was recorded as the final score (Johnson & Nelson, 2015).

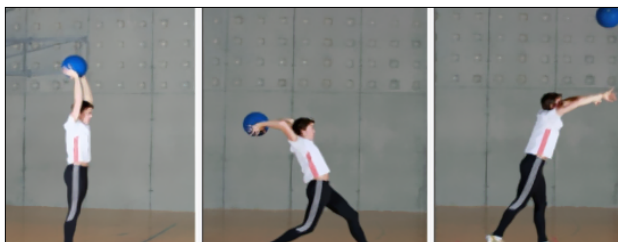


Figure 1 **The 2 kg medicine ball throw test**

(mobilesport.ch, 2012)

### Analysis of statistics

Data analysis was performed using SPSS version 25. Descriptive statistics (mean and standard deviation) were used to summarize participant characteristics and assessment scores. Independent samples t-tests were applied to compare practicing and non-practicing students within each gender group.

Prior to conducting the t-tests, statistical assumptions were examined, including normality (using the Shapiro–Wilk test) and homogeneity of variance (using Levene’s test). The significance level was set at  $p < .05$ , corresponding to a 95% confidence interval. Effect sizes (Cohen’s  $d$ ) were also calculated to evaluate the magnitude of differences between groups.

### Ethical Considerations

The study followed ethical standards consistent with the Declaration of Helsinki. Approval was obtained from the institutional review board of the University of Guelma. Written consent was obtained from parents or guardians, and assent was obtained from all participating students.

Regarding the illustrative figure of the medicine ball test, permission to use the image was secured, and the image does not include identifiable personal information.

### Results

Table 1 displays the results of the academic compatibility test for males. The mean score of practitioners ( $M = 24.93$ ,  $SD = 4.33$ ) was substantially higher than that of non-practitioners ( $M = 13.86$ ,  $SD = 2.47$ ). The independent samples t-test indicated a statistically significant difference between the two groups. We observe from the table that the value of ( $t$ ) computed at a degree of freedom of (28) is equal to (8.589). This is because the degree of significant probability ( $\text{sig} = 0.00$ ) is less than the level of significant significance ( $p < .05$ ). These findings suggest that the male students who engage in regular physical activity exhibit markedly higher levels of academic compatibility compared with their non-active peers.

Table 1

**Statistical analysis of the results for the academic compatibility test for males**

Test grade	Practice variable	
	Practitioners	Non-practitioners
N	15	15
Mean	24.93	13.86
Std. deviation	4.33	2.47
T test	8.589	
df	28	
Significance level	$p < .05$	
Sig	0.00	
Statistical estimate	Significant	

**Source:** Present research

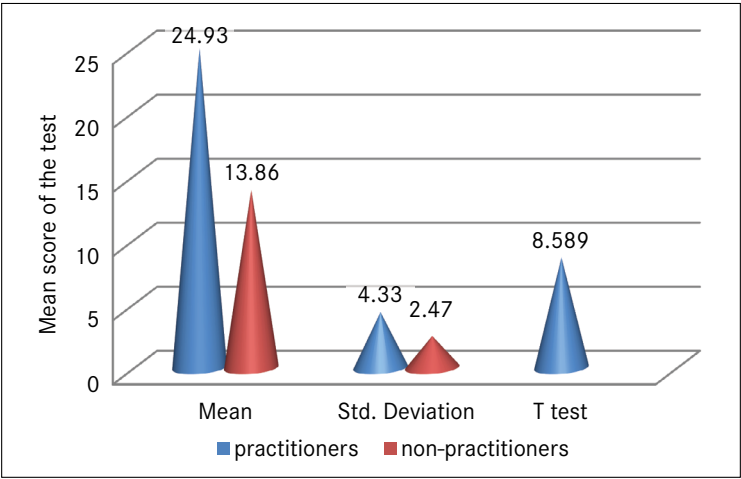


Figure 2 Graph of the Mean and std Deviation of the academic compatibility test for males

Table 2

Statistical analysis of the results for the academic compatibility test for females

Test grade	Practice variable	
	Practitioners	Non-practitioners
N	15	15
Mean	26.40	15.13
Std. deviation	4.57	1.92
T test	8.786	
df	28	
Significance level	p<.05	
Sig	0.00	
Statistical estimate	Significant	

Source: Present research

As shown in Table 2, female practitioners also demonstrated higher academic compatibility scores ( $M = 26.40$ ,  $SD = 4.57$ ) than non-practitioners ( $M = 15.13$ ,  $SD = 1.92$ ). The t-test confirmed that this difference was statistically significant,  $t(28) = 8.786$ , ( $p < .05$ ). Similar to the results for males, these findings indicate that engagement in physical activity is associated with improved academic compatibility among female students.

The decision to analyze male and female students separately was based on documented gender-related differences in both academic and physical development during adolescence, which may influence both compatibility and muscular performance. Therefore, separate analyses provide a clearer and more meaningful interpretation of group-specific trends.

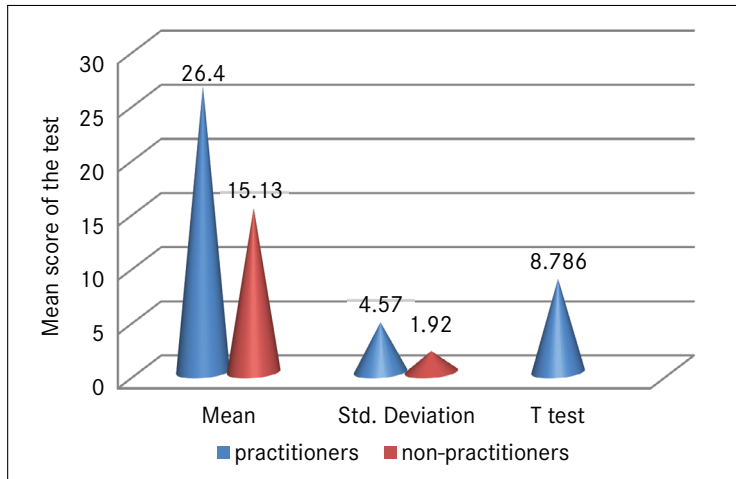


Figure 3 Graph of the Mean and std Deviation of the academic compatibility for females

Table 3

**Statistical analysis of the results for the muscle strength test for males**

Test grade	Practice variable	
	Practitioners	Non-practitioners
N	15	15
Mean	11.76	8.24
Std. deviation	1.28	1.51
T test	6.858	
df	28	
Significance level	$p < .05$	
Sig	0.00	
Statistical estimate	Significant	

**Source:** Present research

Table 3 presents the muscular strength test results for male students. Practitioners achieved a higher mean distance in the 2 kg medicine-ball throw ( $M = 11.76$ ,  $SD = 1.28$ ) compared to non-practitioners ( $M = 8.24$ ,  $SD = 1.51$ ). The difference was statistically significant,  $t(28) = 6.858$ , ( $p < .05$ ). These results highlight the positive impact of regular physical activity on upper-body muscular strength among male adolescents.

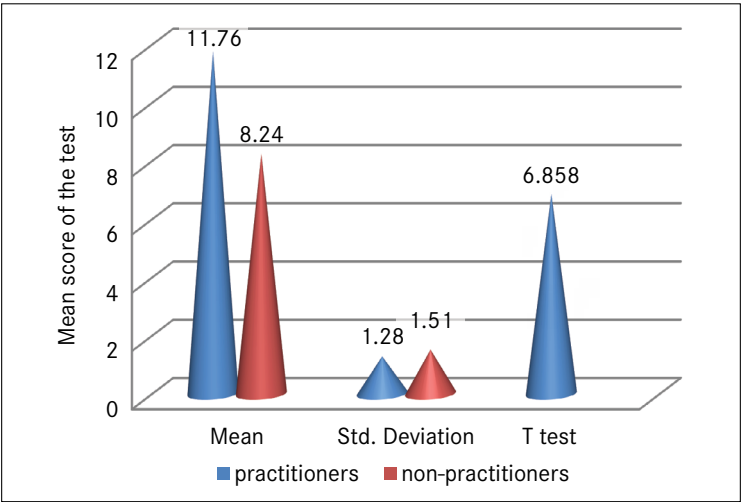


Figure 4 Graph of the mean and standard deviation of the muscle strength test for males

Table 4

Statistical analysis of the results for the Muscle strength test for females

Test grade	Practice variable	
	Practitioners	Non-practitioners
N	15	15
Mean	7.96	5.36
Std. deviation	1.12	1.31
T test	5.812	
df	28	
Significance level	p<.05	
Sig	0.00	
Statistical estimate	Significant	

Source: Present research

Table 4 shows that female practitioners also outperformed non-practitioners in the muscular strength test, with mean scores of (M=7.96, SD=1.12) and (M=5.36, SD=1.31) respectively. The independent samples t-test indicated a statistically significant difference,  $t(28)=5.812, (p<.05)$ . These findings further support the conclusion that participation in sports is associated with enhanced muscular strength among female students.

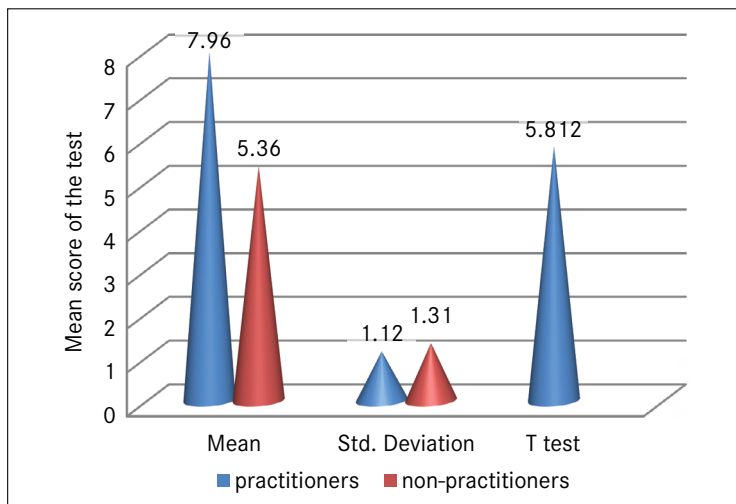


Figure 5 **Graph of the mean and standard deviation of the muscle strength test for females**

Across all analyses, the students who participated in physical activity demonstrated significantly higher academic compatibility and muscular strength than those who did not. These results underscore the potential role of regular sports engagement in promoting both academic and physical development during adolescence. Future studies should examine effect sizes, confidence intervals, and test assumptions of normality and homogeneity more explicitly as well as considering additional contextual variables that may influence these outcomes.

## Discussion

The analysis of the data presented in the tables, based on both the physical fitness tests and the academic compatibility test administered to the study sample, indicates that the differences in academic adjustment and muscular strength among high school students. Although the results show that students who engage in weekly sports activities tend to report better fitness and muscle strength levels, these findings should be interpreted as associations rather than causal effects. The observed disparities between practicing and non-practicing students appear to align with the general pattern that regular physical activity – whether during physical education classes or in leisure time – is positively associated with indicators of fitness and academic compatibility. Numerous studies in the literature support this general trend, offering important context for interpreting the present findings.

Several previous studies have reported positive correlations between sports participation and academic outcomes. For example, Kuroda et al. (2023) found a favorable association between athletic success and academic performance among high school males.

Similarly, Ijaz and Shaha (2023) reported a significant positive relationship between academic achievement and engagement in sports, suggesting that physical activity may contribute to attention, cognitive functioning, and personal development. Chen et al. (2021) also observed a dose-dependent pattern in which greater sports participation was associated with higher self-reported grades among students of different genders and grade levels.

Other research further supports the association between sports involvement and academic indicators. Alade et al. (2021) highlighted that sports participation is positively correlated with academic achievement and school engagement. Lombarte et al. (2020) found that increased time spent in sports was associated with improved academic results and fewer failed subjects. Likewise, Garcia and Subia (2019) reported that academic performance and involvement in school athletics tend to be positively correlated. Hwang et al. (2016) showed that participation in athletics may reinforce academic identity without negatively influencing educational aspirations. Additional studies emphasize psychological mechanisms – such as enhanced self-esteem and positive school climate – that may mediate this association (Abisha & Vincent, 2015).

Historical evidence also suggests that high school athletics are linked to improved academic outcomes such as graduation rates and standardized test performance (Bowen & Greene, 2012). However, Gadžić (2009) noted that athletes' superior academic results might be partly explained by external factors rather than sports participation alone, underscoring the relevance of potential confounders.

In terms of muscular strength, numerous intervention studies support the general observation that physical activity contributes to improvements in strength-related measures among adolescents. Research has shown that physical education programs can effectively increase muscular strength through structured training involving jumps, isometric exercises, and resistance work (García-Baños et al., 2020). High-intensity interval training (Abarzúa et al., 2019) and strength programs incorporating push-ups, medicine ball throws, and horizontal jumps (Cardoso et al., 2020) have also been found effective. Both free weight and elastic resistance training can lead to significant strength gains in adolescents (Lubans et al., 2010), while kettlebell-based programs appear to improve strength, posture, and overall training motivation (Kirsanova, 2020).

Specific resistance modalities such as ballistic strength training (Granacher et al., 2011), CrossFit-inspired programs (Mokhtar et al., 2022), and mixed bodyweight-resistance band protocols (Zhao et al., 2022) have also demonstrated measurable improvements in strength, endurance, and mobility. Functional Strength Training programs (Liao et al., 2022) and school-based resistance training (Kennedy et al., 2022) further highlight the importance of training specificity in determining strength outcomes. Earlier evidence confirms that even lighter resistance exercises performed with proper technique and frequency can be effective for adolescents (Marin et al., 2013; Ten Hoor et al., 2018; Wolbers, 1956).

Although these studies provide valuable theoretical and empirical support for interpreting the current findings, it is important to acknowledge that the discussion in this research should avoid suggesting that sports participation improves academic compatibility in a causal manner. Given the cross-sectional nature of the present study, the results can

indicate associations between physical activity and both academic and physical measures, but causal relationships cannot be established.

Furthermore, several potential confounding variables may influence the relationship between sports participation and academic compatibility. Factors such as prior academic performance, personal motivation, socioeconomic background, parental involvement, and general lifestyle habits could contribute to both higher engagement in sports and better academic outcomes. Recognizing these variables adds nuance to the interpretation of the findings and prevents overgeneralization.

## Conclusion

The findings of this study indicate that participation in regular sports and physical activity – whether during physical education classes or leisure time – is associated with better academic adjustment and improved physical health among secondary school students. Practicing students consistently demonstrated higher performance in indicators related to academic compatibility and physical fitness compared to their non-practicing peers, suggesting that engagement in healthy sports activities may contribute positively to both cognitive and physical development.

The study relied on a limited sample size and cross-sectional design, which restricts the ability to generalize the findings or infer causal relationships between sports participation and academic outcomes. Additionally, the measurement tools used were basic and may not fully capture the complexity of academic or physical performance variables.

Ethically, the study was conducted with the approval of the relevant educational institution and in accordance with required procedures for research involving minors, including obtaining informed parental consent and ensuring confidentiality of student data.

Overall, the findings underscore the potential value of promoting structured physical activity within school environments as part of efforts to support students' academic well-being and physical health. Educators and policymakers may consider integrating more effective and enjoyable physical activity programs to encourage regular participation among students.

Future research should aim to employ larger and more diverse samples, adopt longitudinal research designs, and utilize validated and standardized measurement instruments to obtain more robust evidence. Investigating the differential effects of specific types of sports or training programs may also provide deeper insights into the mechanisms linking physical activity to academic and developmental outcomes.

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**Conflict of interest.** *The author declares no competing interests.*

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