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# IMPACT OF PHYSICAL ACTIVITY ON THE ACADEMIC PERFORMANCE OF SCHOOL-GOING ADOLESCENTS: SPORT AND SCHOOL PERFORMANCE

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## SUMMARY

### Background:

According to various national and international reports, the Moroccan education system still suffers from recurrent dysfunctions reflected in low student achievement. Indeed, different factors influence the scores of students including the rate of physical inactivity. The objective of this study is to evaluate the relationship between physical activity, sedentary behaviours and school outcomes.

### Material/ Methods:

689 students enrolled at Moroccan secondary schools, aged between 14 and 25, were randomly recruited from each grade. For each student, the overall average for the first semester was calculated and classified into three levels: high, medium and low.

### Results:

The school performance of girls is significantly higher ( $p < 0.05$ ) than that of boys while boys are significantly more active ( $p < 0.05$ ) than girls. Physically active students have higher overall school mark averages than inactive students. Indeed, significant positive associations between the level of physical activity and school performance ( $r = 0.176$ ;  $p < 0.001$ ) and with physical education and sports performance were noted. In conclusion, the practice of physical activity should be encouraged among Moroccan students.

### Conclusions:

It has beneficial effects on health in general and especially on the school performance of children and adolescents.

**Key words:** school performance; physical activity; sedentary lifestyle; Morocco.

## **INTRODUCTION**

The Moroccan education system still suffers from recurrent dysfunctions, as several national and international reports point out [1]. Moroccan students are ranked in last place for average performance in mathematical content and cognitive areas [2].

According to the School Performance Evaluation Survey conducted as part of the National Programme for the Evaluation of Prior Learning in 2008 [3], 92% of the second Grade and 84% of the third Grade college high school students scored below average in mathematics. In physics and chemistry, 83% of Grade 2 students and 86% of Grade 3 students scored below average. In life and earth science, more than 90% of students at both levels did not have good grades. As regards the languages Arabic and French, the results of the survey showed that the majority of pupils were unable to obtain the correct average [3].

The factors that lead to this learning degradation are presented by the non-generalization of preschool, the school backwardness, the pedagogical environment linked to the size of classes, the workload of teachers' schedules, the schools state, the access to information and communication technologies and the socio-cultural environment of the family [1]. Furthermore, there are other factors that are primarily related to physical activity. Indeed, there is an ample evidence of how the effects of physical activity on the brain can lead to positive learning outcomes through improved attention, memory and executive functions [4,5,6]. Additionally, in the recent years, various studies have reported the relationship between physical exercise and grades obtained at the primary, secondary and university levels.

Nevertheless, research into the effect of physical activity on adolescent Moroccan pupils and its impact on their performance remains very limited. Therefore, this study aims to investigate the relationship between physical activity, sedentary behaviours and academic outcomes.

## **METHODS**

### **Study population**

This study was carried out on a sample of 689 students enrolled in Moroccan middle and high schools in three major cities: Sidi Kacem, Mechra Bel Ksiri and Jorf El Melha of sidi Kacem province during the 2019/2020 school year.

Students (boys and girls) were selected at each grade level using a simple, random sampling plan that all had good physical ability to participate in sports.

### **Student performance**

School performance was represented in this study by the overall average obtained in the first semester of the 2019-2020 school year. Three performance levels for the first half of the year were chosen: the "strong" level for averages greater than or equal to 12/20, the "medium" level for averages greater than or

equal to 9/20 but less than 12/20 and the “low” level for those less than 9/20.

This average was calculated from the results obtained for the various subjects programmed in the educational programme, namely mathematics, physics, chemistry, biology, languages, history and physical education and sport. The distribution of performance by sex, age and level of education was first studied.

### **Assessment of physical activity and inactivity**

A self-reported questionnaire was used to assess the physical activity and the sedentary activity. The physical activity questionnaire is a modified one based on an original questionnaire that had previously shown a high reliability (ICC=0.85; 95% CL=0.70-0.93) and an acceptable validity ( $r=0.30$ ;  $p<0.05$ ) compared to the pedometer measurements using a practical sample of young boys aged 15 to 25 [7,8]. In a validity study involving both girls and boys aged 14 to 19 years. The current ATLS physical activity questionnaire was also validated against electronic pedometer measurements [9]. The questionnaires were completed by the participants in class.

Data collection was avoided during hot, wet or very cold months, and during national and regional reviews to overcome conditions that may affect the level of physical activity.

For sedentary activities, questions were designed to assess the typical time spent each day watching TV, using the computer and smartphone, video games and the Internet, as well as the number of hours of sleep per day. Participants reported their typical time (hours) spent on these activities without distinguishing between weekdays and weekends.

The maximum time spent sedentary was taken to classify the study population into two categories (2 and > 2 hours/day). Recommended sedentary time of up to 2 hours per day [10].

### **Statistical analysis**

Data were analyzed using the Statistics for the Social Sciences software (SPSS version 26.0) and the Excel spreadsheet (version 2016). Quantitative results were represented as means  $\pm$  standard deviation and qualitative ones as were expressed as percentage (%). P-value  $<0.05$  was considered statistically significant. The normality of distribution was tested by the Kolmogorov-Smirnov test and the ANOVA test (1 factor) between 2 or more independent samples was used. The paired t test was adopted to test the meaning between two dependent samples.

## **RESULTS**

### **General characteristics and physical activity profiles of the study population**

The total effective of students who participated in this study is 669 (42.6% boys and 57.4% girls). The general characteristics, the physical activity profile and the

academic performance of participants are presented in Table 1. Results obtained show that the average age of adolescents presents a statistically significant difference according to gender ( $p < 0.000$ ).

We note that the overall grade average of girls (13.99) is higher than that of boys (12.88) with a significant difference ( $p < 0.01$ ), justifying the strong academic performance of girls (72%) compared to boys (65%).

Boys are significantly ( $p < 0.00$ ) more physically active than girls. Most boys participated in sports activities on the streets and in sports clubs with related friends, while a large proportion of girls practiced sports at school or at home with friends of the class or on their own.

Table 1. Descriptive characteristics and physical activity profiles of Moroccan adolescents aged 14-19 years

Variable		Boys	Girls	Total	p-value
		N=285	N=379	N=664	
Genre (%)		42.9	57.1	100	-
Age <sup>a</sup>		16.61±1.71	16.08±1.59	16.31±1.66	0.00
Education level <sup>b</sup>	College	131 (19.72)	188 (28.3)		
	Lycee	154 (23.19)	191 (28.7)	345 (51.95)	0.03
General grade average <sup>a</sup>		12.88±2.68	13.99±2.97	13.17±2.86	0,01
Mets-min/week <sup>a</sup>		4308.81±3056.87	2408.33±2395.35	3224.61±2856.61	0.00
Place <sup>b</sup>	At home	44 (15.4)	140 (36.9)	184 (27.7)	0.00
	At school	41 (14.3)	154 (40.6)	195 (29.3)	
	On the streets	118 (41.4)	57 (15)	175 (26.3)	
	In the sports club	80 (28)	20 (5.2)	100 (15)	
	In the health or recreation centers or other places	2 (0.7)	8 (2.1)	10 (1.5)	
Accompaniment <sup>b</sup>	No one	35 (12.2)	92 (24.2)	127 (19.1)	0.00
	With related friends	164 (57.5)	94 (24.8)	258 (38.8)	
	With class friends	53 (18.5)	137 (36.1)	190 (28.6)	
	With parents	11 (3.8)	30 (7.9)	41 (6.1)	
	With others	22 (7.7)	26 (6.8)	48 (7.2)	
Time <sup>b</sup>	In the morning	87 (30.5)	175 (46.1)	262 (39.4)	0.00
	In the afternoon	23 (8)	18 (4.7)	41 (6.1)	0.00
	In the evening	56 (19.6)	52 (13.7)	108 (16.2)	0.00
	Aftersunset	23 (8)	14 (3.6)	37 (5.5)	
	After diner	11 (3.8)	9 (2.3)	20 (3)	0.00
	No specific time	85 (29.8)	116 (30.6)	201 (30.2)	0.00
School performances levels <sup>b</sup>	High	186 (65)	274 (72)	460 (69.2)	
	Medium	78 (27)	79 (20.8)	157 (23.6)	
	Low	21 (7.3)	26 (6.8)	47 (7.07)	

<sup>a</sup> Results are presented as mean ± standard deviation;

<sup>b</sup> Results are presented as effective (percentage).

Table 2. Note average according to the physical activity level

		Note			p-value
		N	Mean	SD	
Physical activity level	Active	410	13.9195	2.59560	0.001
	Inactive	254	11.9719	2.87406	0.001

SD: Standard deviation

Table 3. Correlation between physical activity and school performance

	Age	Education level	Total physical activity	PES	General note
Age	1	0.830**	-0.020	0.162**	0.063
Education level	0.830**	1	-0.090	0.249**	0.134**
Total physical activity	-0.020	-0.090*	1	0.129**	0.176**
PES	0.162**	0.249**	0.129**	1	0.474**
General note	0.063	0.134**	0.176**	0.474**	1

PES: Physical education and sports

In addition, a large proportion of adolescents (boys and girls) preferred to engage in physical activity during the morning and another portion has no specific time. Statistically significant differences were reported according to gender for the accompaniment, place and time period of physical activity ( $p < 0.000$ ).

### Comparison of general educational note averages between the two groups (active and inactive)

The school performance (overall note average) of participants by physical activity is presented in table 2. Overall, a large difference in the overall educational averages between physically active and inactive students was recorded. The general note averages for the first group are significantly higher than those for the second group. Indeed, sports students have a note average of 13.91/20 against 11.97/20 for non-sportive students.

### Correlation between physical activity and school performance

Results of the correlational analyses between, the total physical activity and the school performance, between the total physical activity and the performance in physical education and sport and between the overall note average and the performance in physical education and sport are shown in table 3.

The results reveal significantly positive associations between the physical activity level and the school performance ( $r = 0.176^{**}$ ;  $p < 0.001$ ) and physical education and sports performance ( $r = 0.129^{**}$ ;  $p < 0.05$ ). Moreover, a very strong relationship ( $r = 0.474^{**}$ ;  $p < 0.001$ ) between the general note average and the performance in physical education and sports was reported.

## DISCUSSION

The present study showed that most girls (44.3%) were physically active at schools and at home with or without friends of the class, while 29.7% of boys

were physically active on the street and sports clubs with related friends. In this context, a study carried out in Kenitra showed that 67% of teenagers practiced physical activity at school with classmates and 27% of boys practiced physical activity with friends at school, on the street and in sports clubs [11].

Based on our results, 39.4% of respondents also confirmed that the morning was the preferred time of day for physical activity. These results are consistent with those of Kenitra [11].

Compared to school achievement, in recent years, many studies have reported a positive relationship between physical exercise and grades at the primary, secondary and university levels [12]. According to our results, students engaged in physical and sports activities have significantly better school performance than those who do not. A recent study has shown that out-of-school physical and sports students have significantly higher general note school averages compared to non-active students [13]. Other research has shown that students who are physically active perform better scholarly than those who are not [14; 15]. Also, recent studies have reported that regular physical activity improves students' school results and productivity as well as their ability to concentrate for long periods of time [16]. According to many meta-analyses, a positive association between physical and sports activity and school performance has been demonstrated [17,18,19,20]. However, some authors find no association between these two variables [21,22,23]. At the same time, Sævarsson and colleagues have shown that children who are in good physical condition could perform up to twice as well on school tests as those who have not a good physical condition [24]. Conversely, the increase in theoretical educational time at the expense of physical education time in schools would hinder learning and results [25,26,27]. In addition, researchers from 8 different countries and disciplines made a consensus statement on the beneficial effects of physical activity on fitness, health, cognitive functioning, engagement, motivation, psychological well-being and social inclusion of children and young population aged 6 to 18 [28,29]. Daily physical activity improves student performance and school success, stimulates memory, observation, and develops problem-solving and decision-making skills. It also clearly regulates behavioural problems by adopting a positive attitude and a sense of creativity [30,28]. In this direction, numerous research has shown the positive effects of physical activity on the brain, resulting in improved learning, attention, memory and executive functions [4,5,6]. It also improves cognitive functions, in particular concentration and memorization, the importance of which is well known in learning processes [31,32,12]. Regular physical activity can improve concentration and academic performance, and even improve test scores for math, reading and writing [33,34]. It has effects on school achievement through the improvement of cognitive functions, such as attention, concentration and working memory [16, 13,31]. Research shows the need to increase physical activity among children and adolescents to improve their academic results [35]. The very positive and time-stable school performance of sports students is an additional argument for encouraging extra-curricular sports among children [24]. Among the factors that

encourage sedentary lifestyles is the contribution of schools by the nature of the educational program to the development of physical inactivity [29]. Indeed, in recent years, many school systems have eliminated recreation and/or physical education from their curriculum due to the growing pressure to increase educational outcomes [18].

## CONCLUSION

All those involved in education, training, health and the parents should be informed that the practice of physical activity should be encouraged among Moroccan children and adolescents. It has beneficial effects on health in general and especially on school performance.

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