

Physical Activity and Fitness Levels for High School Students in view of variables of sex and body mass index

(a study in some high schools of Setif).

مستويات النشاط البدني واللياقة البدنية لطلاب المرحلة الثانوية في ضوء متغيرات
الجنس ومؤشر كتلة الجسم

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Date of submission: 28/01/2020

Date of acceptance: 09/06/2021

Abstract

The study aimed to identify the level of physical activity (PA) and physical fitness (PF) in view of variables of sex (S) and body mass index (BMI) to a random sample of high school students in south region of Setif. the sample included 389 pupils (238 females; 151 males) and aged (15-19 years). To gather data about physical activity and fitness level, they had been applied the physical activity questionnaire for adolescents (PAQ-A), and a fitness test battery (FTB) to measure the level of (PF) components among high school students. The results showed that the physical activity level of students was generally above average, and had an average level in most fitness components, also the study found a significant difference in the (PA) level among students by sex in favor of male students. While, there were no significant differences in the (PA) level according to the (BMI) for each gender. The results indicate that BMI categories did not depending to physical activity (PA) levels. On the other hand, there were significant differences between female and male students in (PF) components, in favor of male students. Also, BMI category influences the fitness levels of students; Weight gain is followed by an increase in the throwing force in adolescent males. While, the low of weight is followed by an increase in the jumping force and agility in adolescent girls.

Keywords: Physical Activity Level; Body Mass Index; Physical Fitness; Components; Adolescents; High School Students.

المخلص

هدفت الدراسة للتعرف على مستوى النشاط البدني واللياقة لتلاميذ المرحلة الثانوية في ضوء متغيري الجنس ومؤشر الكتلة الجسمية، واشتملت العينة المختارة عشوائيا على 389 تلميذا (238 تلميذة و151 تلميذ) بعمر (15 - 19 سنة) من ثانويات منطقة جنوب سطيف، بمعدل 3 أقسام تمثل المستويات الدراسية الثلاث. ولجمع البيانات تم استخدام استبانة النشاط البدني لكوالاسكي وآخرون، كما تم تطبيق بطرية اختبارات اللياقة لتحديد نشاط ولياقة التلاميذ. وقد أسفرت النتائج

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على أن مستوى النشاط البدني عموما في المتوسط وأن الذكور أكثر نشاطا من الاناث، بينما لم توجد فروق معنوية في مستوى النشاط حسب مؤشر الكتلة الجسمية لكل جنس. ومن ناحية أخرى، كانت الفروق معنوية لصالح الذكور في كل عناصر اللياقة، وأن اللياقة البدنية تتأثر بمؤشر الكتلة؛ فكلما ارتفع الوزن عند الذكور زاد مستوى اللياقة في عنصر قوة الرمي، وكلما انخفض الوزن عند الاناث زاد مستوى اللياقة في عنصري قوة القفز والرشاقة.

الكلمات المفتاحية: مستوى النشاط البدني، مؤشر الكتلة الجسمية، اللياقة البدنية، المراهقة، المرحلة الثانوية.

Introduction

Technological development in the present time has made life demands easily and effortlessly, unlike at least the ancestral time. On the other hand, this has made the lifestyle characterized by inactivity and lack of movement among society members. Research and studies have unanimously agreed that lifestyle plays an important role in the prosperity or decline of the health status of individuals in human societies (Setiawan. B, et al, 2014 ; Hootman. J M, et al, 2001 ; Lamonte. M J, & Blair. S N, 2006).

In addition to inactivity and lack of movement, this development in the sedentary lifestyle, has been accompanied by a transition in nutrition behavioral habits, that promotes the consumption of large amounts of calories, often with unhealthy diet, which led to increase prevalence of negative behaviors in society; which brings with it many diseases such as cardiovascular diseases, cancer, obesity, diabetes and other diseases, as well as the association of this lifestyle with cases of premature death.(Setiawan. B, et al, 2014 ; Hootman. J M. et al, 2001 ; Apte. P.P, & Rao. S., 2013 ; Lopez. V P, et al, 2018 ; Wiklund. P, 2016 ; Swift. D L. et al, 2013 ; Chen. L-J, et al, 2007 ; Roxane R. J-M, et al, 2008). For example; according to the World Health Organization in 2005, approximately 1.5 billion adults will be overweight with attendant health risks (Müller. A, et al, 2014).

The World Health Organization has calculated that poor diet and physical inactivity will soon become the leading contributor to disability, disease, and premature mortality (Chen. L-J, et al, 2007, P354)

The evidence indicates that physical activity results in some physical and psychological benefits for young people, including healthy bone and muscle development, reduced incidence of hypertension, healthy blood lipid profile, and enhanced psychological well-being. (Chen. L-J, et al, 2007, P354)

From this point, the value and importance of physical activity is shown as a balance for the consumption and expenditure of physical energy, in the prevention of disease, and in promoting both physical and mental health. (Md. Dilsad A, et al, 2017; O'Malley G, & Thivel D, 2015; Congchao Lu, et al, 2017).

Physical activity defined as a global descriptor of voluntary movement at various intensities that an individual performs (Khodaverdi. Z, et al; 2017. P169). That physical

activity comprises all modes of movement caused by muscle activity resulting in increased energy expenditure (Rauner. A, et al, 2013, P2)

Or physical activity is a behavior, which is most often defined in the context of energy expenditure: “. . . any body movement produced by the skeletal muscles and resulting in a substantial increase over the resting energy expenditure (Malina. R M., 2001, P162)

The importance of physical activity participation reveals in the early childhood; studies indicated increased risk of cardiovascular disease in adult life is due to lifestyle behaviors in the earlier stages of childhood and adolescence. (Apte. P.P, &Rao. S, 2013; Gaston G, & Ariane B-G, 2006; Lopez. V P, et al, 2018)

In this context, the global recommendations on physical activity for health, noted that regular participation in physical activity reduces the risk of developing many diseases such as cardiovascular diseases, cancer, obesity, diabetes Type2, considering that physical activity is the main determinant of energy expenditure, and a key element of energy balance and weight control. (World Health Organization, 2010, P10)

However, studies regarding the physical activity participation have revealed weakness in this practice, especially among children and adolescents (Gaston G, &Ariane B-G, 2006; Fang. H, et al, 2017; Gísladóttir. Þ, et al; 2013).

recent data showing an increase in youth overweight and low participation in physical activity. In addition to this low level of physical activity, these data suggest that disengagement begins in early adolescence and continues into adulthood (Gaston G, &Ariane B-G, 2006, P1)

On the other hand, physical fitness is considered as an important element in preventing childhood obesity. Then physical fitness in early childhood is a powerful marker of health (Fang. H, et al, 2017, P1).

Physical fitness is a good summative measure of the body's ability to perform physical activity and exercise and is widely considered to be an important indicator of good health. (García-Hermoso. A, et al, 2018, P436).

In adults, physical inactivity and low aerobic fitness are associated with higher mortality and a higher prevalence of chronic disease. In children, physical inactivity and lack of fitness are associated with increasing prevalence of cardiovascular risk factors (Kriemler. S, et al, 2010, P1).

Numerous studies have reported that preschool children's physical fitness is declining at an alarming rate and that their physical activity is far from achieving the International Physical Activity Guidelines, like the National Association for Sport and Physical Education (NASPE). (Fang. H, et al, 2017, P1).

There is no doubt that our country Algeria is one of the countries in the world where the lifestyle or living way, especially in children and adolescent's category, and its effects on public health. In this context (Abassi, Z, 2008) reported that the percentage of participants in sports clubs and practitioners of sports activities is very low, does not exceed 2% compared with the number of the community members, and this percentage has declined in recent years. The reality of sports in general calls for predicting its consequences for society.

In this way, it is necessary to measure physical activity and physical fitness level of students, as criteria for predicting the future health status of the community, where (Fang. H, et al, 2017, P2) indicate that from the perspective of life-span development, early childhood is a critical period to promote and establish positive health behaviors, with levels of physical activity and physical fitness status tracking from early childhood to adolescence, and will continuously reap lifelong benefit.

In consequence, this study which is part of a broader study, aims to identify the level of physical activity and fitness among high school students, and if these levels varied between males and females, and between BMI categories of each gender.

We want to realize these objectives through answering the following questions:

- Is there a significant difference in physical activity level between high schools' male and female students?
- Is there a significant difference in physical activity level of high schools' male and female students according to BMI categories of each gender?
- Are there significant differences in physical fitness levels between high schools' male and female students?
- Are there significant differences in physical fitness levels of high schools' male and female students according to BMI categories of each gender?

1. Terms

1.1. Physical activity defined as a global descriptor of voluntary movement at various intensities that an individual performs (Khodaverdi. Z, et al; 2017. P169).

In the study, physical activity defined as what Physical Activity Questionnaire for Adolescents assessed.

1.2. Physical Fitness: according to (Vicente M-V, &Mairena S-L, 2008, P108), physical fitness has historically been conceptualized as comprising 3 components: cardiorespiratory capacity (CRC), strength, and agility.

In the study, physical fitness defined as what Physical Fitness Battery Test for Adolescents measured.

2. Methods

2.1 Research Design

The descriptive approach was adopted due to the foundational nature of this study.

2.2 Participants

A random sample has been selected from high school students in south region of Setif, included 389 pupils (238 females; 151 males) and aged from (15-19 years). The sample contained five high schools, one of them selected for the pilot study. Participants who's selected from each high school in the study consisted of three classes represented the three levels of education (first, second, and third-class education).

Pupils were limited to those with a complete measure in both PAQ-A and biometric measures, and at least four components of BTPF was completed.

2.3 Data Collection Procedures

After granted permission from officials at each high school, a questionnaire to measure adolescent's physical activity level, was distributed to all students, in three classes represented the three education levels of each high school, except those not able to participate in fitness testing.

The physical activity questionnaire for adolescents (PAQ-A), (is a self-administered, 7-day recall instrument) was selected after approval of the questionnaire owners; after correspondence with Dr. Kent C. Kowalski of the University of Saskatchewan, Canada.

It was developed to assess general levels of physical activity for high school students in grades 9 to 12 and approximately 14 to 19 years of age. The PAQ-A can be administered in a classroom setting and provides a summary physical activity score derived from eight items, each scored on a 5-point scale (Kowalski. K C, et al, 2004, P11)

In order to validate the questionnaire; the PAQ-A had been administered along with other physical activity measures to 85 high school students during the school year. The students consisted of 41 males and 44 females (grades 8 through 12), ages 13 to 20. The PAQ-A was significantly correlated to all self-report measures (activity rating, $r = 0.73$; LTEQ, $r = 0.57$; and PAR, $r = 0.59$). The PAQ-A was also related to the Caltrac ($r = 0.33$). These results provided support for the convergent validity of the PAQ-A. (Kowalski. K C, et al, 2004, P12)

In the current study, the results of the reliability coefficient of the test and retest method were, ($r = 0.83$) at (27) males (17.85 years) and ($r = 0.78$) at (52) females (17.23 years). Also, reliability was calculated with alpha Cronbach on a sample estimated (50 males, 50 females) and the results were very satisfactory, exceeding (0.60) in all items of the questionnaire, both males and females; where the value of the coefficient of reliability in the eight items in males (0.797) and females (0.764).

On the other hand, the Battery Test of Physical fitness (BTPF), used in this study approved by seven PHD experts, approximately agreed between 85% and 100%. It was consisted of seven components as following: endurance (Cooper test), muscle strength (Throwing force; 3kg medicine ball throw, and jumping force; The Standing long jump or Broad jump), flexibility (The sit-and-reach test), speed (50m), agility (10 meter Agility Shuttle (4x10m)), balance (The stork balance stand test. It was developed to assess general levels of physical fitness for high school students aged from 15 to 19 years. Testing physical fitness took place during the students' physical education class. As well, physical measurements (height and weight) were also made in the same time.

The results of the reliability coefficient in the test and retest method of PFBT were significant at ($P < 0.01$), respectively as in the previous arrangement above ($r = 0.66$; 0.93 ; 0.83 ; 0.96 ; 0.68 ; 0.72 ; 0.58) for (15) males and ($r = 0.54$; 0.68 ; 0.63 ; 0.96 ; 0.56 ; 0.58 ; 0.72) for (15) females.

2.4 Data Analysis

- Percentage (%) of BMI categories among male and female students.
- Means (M), standard deviations (SD) of age, weight, height, physical activity, and physical fitness.
- Test Student (t) to calculate differences between means of PA and PF levels among high school students by gender, and according to BMI.
- Pearson correlation coefficient (r) to calculate reliability of PA and PF components among high school students in test and retest method.
- Alpha Cronbach, to calculate reliability of PA among high school students.
- Statistical package for social sciences (SPSS) program (version 21) was used for statistical analysis.

3. Results

The students' anthropometric characteristics (Age and BMI categories) for the entire sample were presented in (Table 1). According to the manifest results about 30% of the males were underweight, 60% had a normal BMI, and 10% were characterized as

overweight. While among females about 16.38% of the females were underweight, 69.33% had a normal BMI, and 14.29% were characterized as overweight. Regarding to gender groups, the prevalence was relatively high in males in underweight, while in females was relatively high in normal and overweight.

Table 1. Age and BMI categories of high school students' sample

Students	Age(yr)		BMI						Number Of Students
	M	SD	UW		NW		OW		
			N	%	N	%	N	%	
Males	17.24	1.59	46	30%	90	60%	15	10%	151
Females	16.86	1.76	39	16.38%	165	69.33%	34	14.29%	238

UW: Underweight, NW: Normal weight, OW: Overweight. N: Number of students, M: Mean, SD: Standard Deviation.

3.1 Physical Activity Level of High School Students

The level of physical activity in all males was above average (M=2.80), while that level was below average in females (M=2.39) according to (Table 2).

Also, the level of PA was above average in all categories of BMI in male students between (M=2.72) for overweight and (M=2.81) for normal and underweight, while that level was under average in all categories of BMI in female students between (M=2.44) for UW and (M=2.23) for overweight which presented in (Table 2).

3.1.1 Differences between means of PA level among high school students by sex

There is a significant difference between means of PA level among high schools' male and female students in $P < 0.05$ presented in (Table 3).

3.1.2 Differences between means of PA level among high school student's males according to BMI categories.

The manifest results in (Table 4) indicate that no significant differences between means of PA level among high schools' male students according to BMI in all categories.

3.1.3 Differences between means of PA level among high school student's females according to BMI categories.

The manifest results in (Table 5) indicate that no significant differences between means of PA level among high schools 'female students according to BMI in all categories.

Table 2. Physical activity level of high school students

Students	PA level			Students	PA level		
	N	M	SD		N	M	SD
All males	151	2.80	0.71	All females	238	2.39	0.63
UW males	46	2.81	0.69	UW females	39	2.44	0.66
NW males	90	2.81	0.69	NW females	165	2.41	0.60
OW males	15	2.72	0.93	OW females	34	2.23	0.70

Average of PA questionnaire (M=2.50; Score between 1 no activity – 5 always physically active).

Table 3. differences between means of PA level among high school students by gender.

Students	PA level			t	Sig
	N	M	SD		
Males	151	2.8	0.71	6.023	0.01

Females	238	2.39	0.63		
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N: Number of students, M: Mean, Sd: Standard Deviation.

Table 4. differences between means of PA level among high school student's males according to BMI.

Male students	PA level			t	Sig
	N	M	SD		
Underweight	46	2.8	0.71	-0.014	No sig
Normal weight	90	2.39	0.63		
Underweight	46	2.8	0.71	0.41	No sig
Overweight	15	2.72	0.93		
Normal weight	90	2.39	0.63	0.463	No sig
Overweight	15	2.72	0.93		

N: Number of students, M: Mean, Sd: Standard Deviation,

Table 5. differences between means of PA level among high school student's females according to BMI.

Female students	PA level			t	Sig
	N	M	Sd		
Underweight	39	2.44	0.66	,282	No sig
Normal weight	165	2.41	0.60		
Underweight	39	2.44	0.66	1,332	No sig
Overweight	34	2.23	0.70		
Normal weight	165	2.41	0.60	1,554	No sig
Overweight	34	2.23	0.70		

3.2 Physical Fitness Levels of High School Students

According to (Table 6) the levels of fitness components among male students were varied; between average and Below average fitness. The mean was in Balance (M= 29s), Flexibility (M= 5.99cm), Throwing force (M= 3.61m), Jumping force (M= 2.06m), Agility (M= 10.71s), Speed (M= 7.48s), and Endurance (M= 2187m). Also, these levels of fitness components among students' males according to their BMI (UW, NW, and OW) were varied; between above average and below average respectively. Means were between in Balance (M= 31.54; 29.7; 16.5s), Flexibility (M= 3.63; 7.52; 4.07cm), Throwing force (M= 3.02; 3.80; 4.30m), Jumping force (M= 2.09; 2.06; 1.98m), Agility (M= 10.87; 10.7; 10.48s), Speed (M= 7.4; 7.52; 7.52s), and Endurance (M= 2217; 2183; 2106m).

Table 6. Physical fitness levels of high school male students

Fitness elements	Male students			UW males			NW males			OW males		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD
Balance	150	29	24.66	46	31.54	24.8	89	29.7	24.6	15	16.5	22.34
Flexibility	151	5.99	7.32	46	3.63	7.64	90	7.52	7.13	15	4.07	5.05
TF	151	3.61	1.27	46	3.02	1.19	90	3.80	1.26	15	4.30	0.99
JF	151	2.06	0.24	46	2.09	0.24	90	2.06	0.25	15	1.98	0.17
Agility	151	10.71	1.71	46	10.87	1.57	90	10.7	1.49	15	10.48	3.04

Speed	149	7.48	1.04	46	7.4	0.70	89	7.52	1.24	14	7.52	0.39
Endurance	102	2187	452.5	31	2217	380	63	2183	496	8	2106	386

TF: Throwing force, JF: Jumping force.

Table 7. Physical fitness levels of high school female students

Fitness elements	female students			UW females			NW females			OW females		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD
Balance	237	23.1	21.8	38	25.3	22.9	165	24	22	34	15.7	18.8
Flexibilit	238	2.40	7.93	39	2.59	8.80	165	1.94	7.86	34	4.51	7.35
TF	238	2.50	0.77	39	2.33	0.78	165	2.52	0.80	34	2.49	0.54
JF	238	1.39	0.29	39	1.46	0.23	165	1.40	0.28	34	1.35	0.26
Agility	238	13.1	1.64	39	13.2	1.39	165	12.9	1.50	34	13.6	2.13
Speed	222	9.04	1.19	36	8.78	0.71	152	9.01	0.98	34	9.41	2.09
Enduranc	170	164 4	323	29	172 1	319	117	163 3	319	24	157 5	335

In presented results, according to (Table 7). the levels of fitness components among female students were varied, and often below average fitness. The mean was in Balance (M= 23.09s), Flexibility (M= 2.40cm), Throwing force (M= 2.50m), Jumping force (M= 1.39m), Agility (M= 13.1s), Speed (M= 9.04s), and Endurance (M= 1644m). while, these levels of fitness components among students' females according to their BMI (UW, NW, and OW) were varied; often Below average and poor fitness respectively. Means were between; in Balance (M= 25.3; 24; 15.7s), Flexibility (M= 2.59.; 1.94; 4.51cm), Throwing force (M= 2.33; 2.52; 2.49m), Jumping force (M= 1.46; 1.40; 1.35m), Agility (M= 13.2; 12.9; 13.6s), Speed (M= 8.78; 9.01; 9.41s), and Endurance (M= 1721; 1633; 1575m).

3.2.1 Differences between means of PF levels among high school students by gender

There is a significant difference between means of fitness components levels among

high schools' male and female students at $P < 0.05$ presented in (Table 8).

Table 8. differences between means of PF levels among high school students by gender.

Fitness elements	Male students			Female students			t	Sig
	N	M	SD	N	M	SD		
Balance	150	28.97	24.66	237	23.09	21.89	2.452	$P < 0.05$
Flexibility	151	5.99	7.32	238	2.40	7.93	4.486	$P < 0.01$
Throwing force	151	3.61	1.27	238	2.50	0.77	10.761	$P < 0.01$
Jumping force	151	2.06	0.24	238	1.39	0.29	23.946	$P < 0.01$
Agility	151	10.71	1.71	238	13.10	1.64	13.774-	$P < 0.01$
Speed	149	7.48	1.04	222	9.04	1.19	12.962-	$P < 0.01$
Endurance	102	2187.4	452.5	170	1644.2	322.9	11.439	$P < 0.01$

3.2.2 Differences between means of PF levels among high school student's male according to BMI categories.

There isn't a significant difference between means of Physical Fitness Components levels among high schools' male students according to BMI; UW/NW categories, except in Flexibility and Throwing Force components, at $P < 0.01$, in favor of (NW) normal weight which presented in (Table 9). While the differences between means of PF levels among high school student's male according to BMI; UW/ OW categories were significant in Balance component, at $P < 0.05$, in favor of (UW) underweight, and in Throwing Force component, in favor of (OW) overweight students, at $P < 0.01$ (Table 9). However, the differences between means of PF levels among high school student's male according to BMI; NW/ OW categories were significant in Balance component in favor of (NW) normal weight, at $P < 0.05$.

Table 9. differences between means of PF levels among high school student's males according to BMI

Fitness elements	Underweight (UW)/ Normal weight (NW)	UW/ Overweight (OW)	NW/ OW
	t	t	t
Balance	0.402	2.09*	1.96*
Flexibility	2.939**-	0.206-	1.8
Throwing force	3.481**-	3.751**-	1.45-
Jumping force	0.787	1.69	1.17
Agility	0.764	0.655-	0.370
Speed	0.638-	0.637-	0.003
Endurance	0.339	0.735	0.421

**-. Correlation is significant at level 0.01. * Correlation is significant at level 0.05

3.2.3 Differences between means of PF levels among high school student's female according to BMI categories.

There isn't a significant difference between means of PF Components levels among high schools' female students according to BMI; UW/NW categories, which presented in (Table 10). While, the differences between means of PF levels among high school student's female according to BMI; UW/ OW categories were significant in Jumping Force component, in favor of (UW) underweight, at $P < 0.05$. However, according to the same results in (Table 10) the differences between means of PF levels among high school student's female according to BMI; NW/ OW categories were significant in Balance, and Agility components in favor of (NW) normal weight, at $P < 0.05$.

Table 10. differences between means of PF level among high school student's Females according to BMI

Fitness elements	Underweight (UW)/ Normal weight (NW)	UW/ Overweight (OW)	NW/ OW
	t	t	t
Balance	0.264	1.901	2.062*
Flexibility	0.450	0.996-	1.733-
Throwing force	1.329-	0.993-	0.193
Jumping force	1.395	2.056*	0.943

Agility	0.918	0.984-	2.113*-
Speed	1.315-	1.710-	1.684-
Endurance	1.329	1.580	0.783

**. Correlation is significant at level 0.01. * Correlation is significant at level 0.05

4. Discussion

4.1 Physical Activity Level of High School Students

According to (Kowalski et al, 2004, P11), the scoring level of physical activity in the (PAQ-A); between 1: no activity to 5: always physically active. Then, the score in quartile (75) is above 3.75, the score in quartile (50) is 2.50, and in the quartile (25) is below 1.25. So, the average level scoring of physical activity in the (PAQ-A) approximately (M=2.50). In this context, the results of this study shown the PA level of all male students and in all BMI categories of them was above average respectively between; (M=2.80), (M=2.72) for overweight, and (M=2.81) for normal and underweight, while that level was below average in female students (M=2.39). Also, in all BMI categories of them was between (M=2.44) for underweight and (M=2.23) for overweight (Table 2)

As well, the results shown male students are more physically active than females do. However, results indicate in generally insufficient physical activity in life style of them, which been observed by (Gaston G, &Ariane B-G, 2006; Fang. H et al, 2017; Gísladóttir. P et al, 2013) studies, which revealed weakness in this practice, especially among children and adolescents.

In this context, (Guthold. R, et al, 2019, P9) rapport in their study, the analysis shows that globally, in 2016, more than 80% of school-going adolescents aged 11–17 years did not meet current recommendations for daily physical activity, compromising their current and future health. Although the prevalence of insufficient physical activity has slightly decreased in boys since 2001, there was no change over time in girls, and if these trends continue, the global target of a 15% relative reduction in insufficient physical activity—which would lead, if met, to a global prevalence of less than 70% by 2030—will not be achieved.

4.1.1 Differences between means of PA level among high school students according to sex

The manifest results showed a significant difference between means of PA level among high schools' male and female students at $P < 0.05$ (Table 3). This result reveals the type of life who live all students in south region of Setif, where in global; girls are not interesting to practicing sports, or in PA, contrary to their interest in things that fit their kindly nature in the sense of femininity, especially in this age period, which is characterized by lack of movement and activity, such as being immersed in chatting on social media, or dreaming, and thinking about what the future holds in terms of marriage, procreation and work ..., more than males. Those whose nature is often rigid in the sense of masculinity, which among one of the most important characteristics is the interest in physical, and athletic activity. According to (Kowalski. KC, et al, 2004, P12) The PAQ-A was the only measure sensitive to gender differences. The males were more active than the females. Has also been observed by (Con. Burns.BA, 2012, P217; Gutin. B, et al, 2005, P748); males had higher levels activity compared to females.

In the same context, (Chen. L-J, et al, 2007, P355) found that boys adolescents were more physically active than girls; and the prevalence of physical activity declined with age.

The phenomena of weakness physical activity level of girls touch even developed countries, where indicated (Expertise collective, 2008, P572, 573), that physical activity

is part of the adolescent lifestyle in industrialized countries, especially for boys, it decreases with age, especially for girls. Therefore, to increase the practice of girls, it is necessary to increase the attractiveness of daily physical activity.

In the same frame, according to (Baromètre nutrition santé, 2008), girls are the most physically inactive than boys in France in this age group. In (Oppert. J-M, 2014, P2).

4.1.2 Differences between means of PA level among high school student's males and females according to BMI categories.

Regarding to the physical activity levels of BMI categories among both males and females, presented in (Table 2), we noted that overweight students are less active than normal and underweight students do, and that agree with (Belounis. R, et al, 2019, P310) study, which appears that nearly two-thirds of school children do not attain the level of physical activity conducive to health. Such observation is associated with relatively high prevalence of overweight students. However, the manifested results in (Table 4) indicate that not significant differences between means of PA level among high schools' male students according to BMI in all categories. Also, results in (Table 5) indicate that not significant differences between means of PA level among high schools 'female students according to BMI in all categories.

These results confirm the sedentary of life style by lack of movement or, the insufficient physical activity among male and female students. And that been observed by (Guthold. R, et al, 2019; Fang. H, et al, 2017; Gísladóttir. Þ, et al, 2013; Gaston G, & Ariane B-G, 2006) studies.

In this context, the study of (Tremblay. J-M, 2002, P4), showed that the percentage of "sedentary" increases significantly between the 15-24 age group (22%) and the 25-44 age group (39%), and remains at a high level thereafter.

The used questionnaire in this study evaluate the level of life style activities among adolescents, without interesting for the quality of the physical activity or in intensity of activity. In this mean, the degree of participation of students in physical activity will not give us a concrete result about their physical fitness.

4.2 Physical Fitness Levels of High School Students

According to the results in (Table 6) and (Table 7), the levels of physical fitness components among all students' male, and female, and all BMI categories (UW, NW, OW) of them were various; between average, above / below average and poor fitness in comparison with scores, which been exposed by several studies, such (Seryozha. G, et al, 2014 ; Matton. L, et al, 2006 ; Victor. P. L, et al, 2018 ; Huang. Y-C, & Malina. R M, 2002, P14 ; Verstraete. S JM et al, 2007, P482 ; Manuel. J, & Garzón. C, 2009), respectively in (Table 6), and (Table 7).

The results showed, that male students were more fitness than female students. According to BMI, the results revealed the same conclusion between male and female students. While, in comparison with observed BMI categories of each gender, the results showed that overweight students in both males and females were less fitness than normal and underweight.

4.2.1 Differences between means of PF levels among high school students according to sex

The results presented in (Table 8), indicate significant differences between means of fitness components levels among high schools' male and female students at least at P value < 0.05. It means, that male students are more fitness than females, as well, these results agree with (Victor. P. Lopez; et al, 2018, P361) results concerning the high fitness of boy adolescents against girls, and also, observed by (Huang. Y-C, & Malina. R M, 2002, P14) results study.

The interpretation of these results indicate that adolescent females are less interesting to reach fitness than males. And their femininity nature and roles imposing behaviors like these (lack of movement). Contrary to adolescent males, which often physical fitness components were above average, to average scores compared with fitness scores testing; where fitness considered as one of virility criterions, whose characteristic of males. It seems, that boys involved in physical activities in this period of age, and the results presented in (Table 1) revealed that, adolescent girls had higher %OW than did adolescent males, and that had been observed by (Gutin. B, et al, 2005, P748).

Depending to K.E. Cohen, et al (2014); Adequate physical activities are significant bases for physical fitness in adolescents and young adults. Higher levels of PA, especially moderate-to-vigorous physical activity (MVPA), are significantly associated with improved fitness, such as body composition optimization, enhanced bone health, cardiopulmonary function improvement, and adiposity prevention in adolescents (Fang. H, et al, 2017, P2)

4.2.2 Differences between means of PF levels among high school student's males and females according to BMI categories.

Given to the results of (Table 6) and (Table 7), that overweight students are less physical fitness than those of normal BMI and underweights. However, those results did not live up to significant deference in view of results in (Table 9) and (Table 10). Then, regarding to the results of the last tables 9 and 10, we note that there were significant differences between the BMI categories for each sex in some fitness elements only.

So, there wasn't a significant difference between means of Physical Fitness Components levels among high schools' male students according to BMI categories, except in Balance component at $P < 0.05$, Flexibility at $P < 0.01$ in favor of (NW) and (OW), and in Throwing Force component, at $P < 0.01$ in favor of (NW) normal weight, which presented in (Table 9). While the differences between means of PF levels among high school student's female according to BMI categories were significant in Balance and agility components, at $P < 0.05$, in favor of (NW) normal weight, and in Jumping Force component at $P < 0.05$, in favor of (OW) overweight, (Table 10).

Concerning differences between low BMI and high BMI; the underweight and normal students have more fitness levels than overweight so, that agree with a study of (Victor. P. Lopez; et al, 2018, PP 361, 362), which indicated that fitness levels of overweight and obese youth of both sexes were lower than fitness levels of normal and thin youth.

The results of the study also, showed: Whenever, the weight of adolescent males increases, the levels of fitness increase in throwing force component, and decreases in balance, flexibility, jumping force, speed and endurance. While, among adolescent females every time, the decreases of weight, that increases the fitness levels in balance, jumping force, agility, and endurance components, and decreases fitness level of throwing force component.

5. Conclusion

The reality which is in our hands; 40% of males and 30% of females were out from normal BMI, and that means, probability of exposure to several diseases. On the other hand, no differences between physical activity in all BMI categories for both male and female students, and that due maybe to insufficient physical activity levels of them. Although, the higher difference in the level of males' physical activity compared to females, the results indicate that BMI categories did not depending to physical activity (PA) levels, but that often due to diet habits and life style behaviors of them.

On the other hand, the body mass index (BMI) category influences the fitness levels of students. That what indicated: Weight gain is followed by an increase in the throwing force component in adolescent males. While, the low of weight is followed by an increase in the jumping force and agility components in adolescent girls.

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Appendices

Appendix (1): The original copy in English (High School)

Physical Activity Questionnaire

Name: _____ Age: _____

Sex: M _____ F _____ Grade: _____

Teacher: _____

We are trying to find out about your level of physical activity from the last 7 days (in the last week). This includes sports or dance that make you sweat or make your legs feel tired, or games that make you breathe hard, like tag, skipping, running, climbing, and others.

Remember: 3. There are no right and wrong answers — this is not a test. 4. Please answer all the questions as honestly and accurately as you can — this is very important.

1. Physical activity in your spare time: Have you done any of the following activities in the past 7 days (last week)? If yes, how many times? (Mark only one circle per row.)

	No	1-2	3-4	5-6	7 times or more
Skipping	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rowing/canoeing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In-line skating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tag.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Walking for exercise	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bicycling.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jogging or running.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aerobics.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Swimming	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Baseball, softball.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Dance.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Football	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Badminton.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Skateboarding.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Soccer.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Street hockey.....	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Volleyball	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Floor hockey	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Basketball	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ice skating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cross-country skiing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ice hockey/ringette	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other:	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)? (Check one only.)

I don't do PE	<input type="radio"/>
Hardly ever	<input type="radio"/>
Sometimes	<input type="radio"/>
Quite often	<input type="radio"/>
Always	<input type="radio"/>

3. In the last 7 days, what did you normally do at lunch (besides eating lunch)? (Check one only.)

Sat down (talking, reading, doing schoolwork).....	<input type="radio"/>
Stood around or walked around	<input type="radio"/>
Ran or played a little bit	<input type="radio"/>
Ran around and played quite a bit	<input type="radio"/>
Ran and played hard most of the time	<input type="radio"/>

4. In the last 7 days, on how many days right after school, did you do sports, dance, or play games in which you were very active? (Check one only.)

None	<input type="radio"/>
1-time last week	<input type="radio"/>
2- or 3-times last week	<input type="radio"/>
4 times last week	<input type="radio"/>
5 times last week	<input type="radio"/>

5. In the last 7 days, on how many evenings did you do sports, dance, or play games in which you were very active? (Check one only.)

None	<input type="radio"/>
1-time last week	<input type="radio"/>
2- or 3-times last week	<input type="radio"/>
4 or 5 last week	<input type="radio"/>
6- or 7-times last week	<input type="radio"/>

6. On the last weekend, how many times did you do sports, dance, or play games in which you were very active? (Check one only.)

None	<input type="radio"/>
1 time	<input type="radio"/>
2 — 3 times	<input type="radio"/>
4 — 5 times	<input type="radio"/>
6 or more times	<input type="radio"/>

7. Which one of the following describes you best for the last 7 days? Read all five statements before deciding on the one answer that describes you.

F. All or most of my free time was spent doing things that involve little physical effort.... ☐

G. I sometimes (1 — 2 times last week) did physical things in my free time (e.g. played sports, went running, swimming, bike riding, did aerobics) ☐

H. I often (3 — 4 times last week) did physical things in my free time ☐

I. I quite often (5 — 6 times last week) did physical things in my free time ☐

J. I very often (7 or more times last week) did physical things in my free time ☐

8. Mark how often you did physical activity (like playing sports, games, doing dance, or any other physical activity) for each day last week.

	None	Little bit	Medium	Often	Very often
Monday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tuesday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wednesday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Thursday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Friday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Saturday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sunday	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. Were you sick last week, or did anything prevent you from doing your normal physical activities? (Check one.)

Yes No

If Yes, what prevented you? _____

Appendix (2): The Arabic copy of the PA Questionnaire (High School) used in the current study

الاسم واللقب: السن: الجنس:
 المستوى: الثانوية:
 في هذه الاستبانة نحاول كشف مستوى النشاط البدني عندك خلال الأسبوع الماضي (السبع أيام الماضية)، وهذا يشمل أنواع الرياضة أو الرقص الذي يجعلك مرحا أو يشعرك بالتعب في ساقيك أو الألعاب التي ترفع من شدة تنفسك مثل ألعاب المطاردة ، الوثب ، الجري ، التسلق وغيرها.
 تذكر:
 - لا توجد إجابات صحيحة وأخرى خاطئة — فهذا ليس اختبارا.
 - من فضلك أجب على كل الأسئلة بصدق ودقة قدر الإمكان — فهذا مهم جدا.

1- هل حدث وقمت بأي نشاط من النشاطات التالية في وقت فراغك خلال السبع أيام الماضية (الأسبوع الماضي)؟ إذا كان نعم، كم مرة (ضع علامة X على دائرة واحدة بكل صف).

7 فأكثر	6.5	4.3	2.1	لا	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	الوثب
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	التجديف
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	الالتزلج لى الطريق
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	لعبة المطاردة
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	المشي للتمرين
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	ركوب الدراجة الهوائية
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	الهرولة أو الجري
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	الايروبك
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	السباحة
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	الرقص
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	كرة القدم
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	التزلج على اللوح
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	الكرة الطائرة
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	التسلق
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	كرة السلة
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	بناء الأجسام
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	كرة اليد
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2- في السبوع الماضي كم من الوقت كنت نشطا جدا خلال حصص التربية البدنية؟

<input type="radio"/>	لا أمارس التربية البدنية
<input type="radio"/>	قليلا جد
<input type="radio"/>	أحيانا
<input type="radio"/>	غالبا جدا
<input type="radio"/>	دائما



3- في السبوع أيام الماضية، ماذا فعلت كالعاد إلى جانب تناولك للغداء؟

<input type="radio"/>	جلست (أتحدث، أقرأ، أعمل الواجبات المدرسية)
<input type="radio"/>	وقفت أو تجولت في المكان
<input type="radio"/>	ركضت أو لعبت قليلا
<input type="radio"/>	ركضت ولعبت قليلا
<input type="radio"/>	ركضت ولعبت بشدة معظم الوقت

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Appendix (3): The Physical Fitness Battery Test.

Component	Test	Equipment	Procedure	Scoring
Balance	The stork balance stand	<ul style="list-style-type: none"> • Stopwatch • flat, non-slip surface • paper and pencil. 	With shoes removed and while standing on the preferred foot, participants raises the heel to balance on the floor, the hands on the hips (place the free foot against the inside knee of the supporting leg) for 60 seconds or until they lose balance. If balance is lost, start over, again timing until they lose balance. Better of two trials.	Number of attempts in 60 seconds (number in 60 s).
Extent flexibility	Sit-and-reach	<ul style="list-style-type: none"> • Sit-and-reach box (custom-built [36 cm long, 45 cm wide, 32 cm high] so that a score of "15 cm" corresponds to participant reaching their toes) 	Box placed against a wall. Participants (sitting on the floor with their bare feet against the box and their knees and arms straight) reach slowly forward as far as possible without jerking. The end-point position is held for at least 2 seconds before the measurement is taken. Better of two trials.	Distance reached to the nearest centimetre (cm), measured from the fingertips. Performances reaching beyond the toes are recorded as >15 cm (e.g., a child reaching 7 cm past his/her toes scores 22 cm), and those failing to reach the toes are recorded as <15 cm.
Lower body jumping force	Standing broad jump	<ul style="list-style-type: none"> • Measuring tape • Marked line 	Participants jump (with double-leg take-off) horizontally for the greatest possible distance, swinging their arms and bending their knees preparatory to take-off. Better of two trials.	Distance in centimetres (cm) measured from the marked starting line to the landing point at the back of the heel.
Upper body throwing force		<ul style="list-style-type: none"> • Medicine ball 3kg • Measuring tape • Marked line 	The athlete sits on the floor with his legs fully extended, feet (~60 cm) apart and with the back against a chair. The ball is held with the hands on the side and slightly behind the center and back against the center of the chest. The forearms are positioned parallel to the ground. The athlete throws the medicine ball vigorously as far straight	Distance thrown measured in centimetres (cm). The distance from the chair to where the ball lands is recorded.

			forward as he can while maintaining the back against the chair. The distance thrown is recorded.	
Running speed	50 Meter Dash	<ul style="list-style-type: none"> • measuring tape or marked track, • stopwatch, • cone markers, • flat and clear surface of at least 70 meters. 	The test involves running a single maximum sprint over 50 meters, with the time recorded. Start from a stationary standing position (hands cannot touch the ground), with one foot in front of the other. The front foot must be behind the starting line. Once the subject is ready and motionless, the starter gives the instructions "set" then "go.". The tester should provide hints for maximizing speed (such as keeping low, driving hard with the arms and legs) and the participant should be encouraged to not slow down before crossing the finish line. Single trial.	Time measured to the nearest 0.1 second (s)
				
Running speed-agility	4x10 m agility shuttl	<ul style="list-style-type: none"> • marker cones or marking tape, • measurement tape, • stopwatch, • flat non-slip surface, with two lines 10 meters apart. 	Mark distance 10 m apart on a non-slip surface with cones. Using a standing start, participants run as fast as possible to the cone and return to the starting cone, crossing both cones with both feet. Repeat for three more cycles (4 cycles in total covering 40 m). Single trial.	Time measured to the nearest 0.1 second (s)
				
Cardiorespiratory/endurance	Cooper 12-minute Run Test	<ul style="list-style-type: none"> • flat oval or running track, • marker cones, • recording sheets, • stop watch. 	Place markers at set intervals around the track to aid in measuring the completed distance. Participants run for 12 minutes, and the total distance covered is recorded. Walking is allowed, though the participants must be encouraged to push themselves as hard as they can to maximize the distance covered. Single trial.	Distance covered measured in metres (m)
