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ANALYTIC STUDY REGARDING PHYSICAL DEVELOPMENT AND HEALTH LEVEL AT YOUTH POPULATION AGED BETWEEN 10 AND 15 YEARS OLD

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ABSTRACT. Introduction: Health level of youth population has become an increasing problem highlighting that the dysfunction that appears at this age can be a real problem at adult age, so preventing malfunctions at young age can contribute later at adult age. **Objectives:** The present study examined the level of health and development of students that practice sports activities compared with students that don't practice sports, from the Gymnasium School „Friedrich Schiller" from Targu Mures, Romania. The sample of students was formed by 86 students with an average age of 12.80±1.057 from 5th grade until 8th grade. **Methods:** The methods used were mainly from the experiment methods, we used measurement of height, weight and body mass index, and from statistical and mathematical methods for interpretation like descriptive statistics elements (frequency, mean, median, standard deviation) and analyzed with specific statistical test (the D'Agostino & Pearson test, t-Student test, Mann-Whitney test, the Chi-square test) all measured with the GraphPad Prism program. **Results:** The results of the investigation found significant statistical differences between children that practice sports activities compared with those that don't practice sports activities, we found significant statistical differences between weight of the two groups (value of p = 0.236) and also between body mass indexes of groups (value of p = 0.4132). **Conclusions:** Conclusions of the research highlighted the differences of development regarding weight and body mass index of those two groups, proving that children that practice sports activities have a better health and development level.

Key words: anthropometry, body mass index, physical development.

REZUMAT. ***Studiu analitic privind dezvoltarea fizică şi nivelul sănătăţii la populaţia tânără cu vârsta cuprinsă între 10 şi 15 ani.*** **Introducere:** Nivelul de sănătate al populaţiei tinere a devenit o problemă din ce în ce mai mare, subliniind faptul că deficienţele fizice care apar la această vârstă pot fi o problemă

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reală la vârsta adultă, astfel încât prevenirea acestora la vârste fragede poate contribui mai târziu la vârsta adultă. **Obiective:** Prezentul studiu a examinat nivelul de sănătate şi dezvoltare al elevilor care practică activităţi sportive în comparaţie cu elevii care nu practică sport, de la Şcoala Gimnazială „Friedrich Schiller" din Târgu Mureş, România. Eşantionul de elevi a fost format din 86 de elevi cu o vârstă medie de 12,80 ± 1,057, din clasa a V-a până la clasa a VIII-a. **Metode:** Metodele utilizate au fost în principal metode experimentale, am utilizat măsurarea înălţimii, a greutăţii şi a indicelui de masă corporală şi metode statistice şi matematice pentru interpretare ca elemente statistice descriptive (frecvenţă, medie, mediană, abatere standard) şi analizate cu specific test statistic (testul D'Agostino & Pearson, testul t-Student, testul Mann-Whitney, testul Chi-square), toate măsurate cu programul GraphPad Prism. **Rezultate:** Rezultatele prezentului studiu au constatat în compararea și descoperirea unor diferenţe statistice semnificative între copiii care practică activităţi sportive în comparaţie cu cei care nu practică activităţi sportive. Am găsit diferenţe statistice semnificative între greutatea celor două grupuri (valoarea p = 0.236) și, de asemenea, între indicii de masă corporală ai grupurilor (valoarea p = 0.4132). **Concluzii:** Concluziile cercetării au evidenţiat diferenţele de dezvoltare în ceea ce priveşte greutatea şi indicele de masă corporală din cele două grupuri, dovedind că elevii care practică activităţi sportive au un nivel de sănătate şi dezvoltare mai bun.

Cuvinte cheie: antropometrie, indice de masă corporală, dezvoltare fizică.

Introduction

Growth refers to cell multiplication and size changes, while development refers to the maturation of such structures and their concomitant functions. Today we realize that the whole process, in both definitions, is extremely complex and involves a lot of processes that interact with one another (Frank, Martin & Lauren, 2009). Childhood is an important and sensitive period for both physical and cognitive development. There are limited, published research on the relationship between sport and cognitive functions in children. The results suggest that practicing sport in later childhood positively influences cognitive and emotional functions (Ilona, Malgorzata & Carla, 2018).

A recent review of growth and development in children suggests that higher levels of normal physical activity during growth are protective against adiposity, but causality is uncertain because most studies have been transversal (Jillian, Chris & Barbarra, 2017). The World Health Organization (WHO) recommends moderate physical activity of about 30 minutes a day to avoid some cardiovascular problems, obesity or malnutrition (Colin, Chris & Mark, 2010).

Adolescence is a transition between childhood and maturity, whose onset includes puberty maturation. Puberty has important implications for development and many physical, emotional, cognitive and social development issues, including decision-making and mental health (Elizabeth & Ronald, 2009). Growth occurs mainly in quantitative terms and can be monitored by repeated measurements (at fixed intervals) of weight, height, perimeters, diameters, vital capacities, and by multiplying cells, globules (red and white), tissues, capillary and lymphatic vessels and muscle fibers (Dumitru, 2011). Growth standards have been discovered for many populations, and parameters are often coded in a series of growth charts.

This paper will discuss genetic, nutritional, hormonal and physical factors that could modify the growth process (Alan, Pamela & James, 2000). Anthropometry is used to identify subjects requiring special attention or to assess the response of those subjects to any intervention (Alicia, Witriw & Pablo, 2014). Two of the most important indicators of a child's health are their individual growth pattern and their weight in relation to the height, which can be monitored by accurate anthropometric measurements.

Adolescence, between 10 and 19 years of age, begins with the first signs of secondary sexual development and continues until psychological and morphological changes are approaching adulthood to 20 years, during which time there are rapid changes in puberty maturation, growth physical and psychosocial. It is the period of changes with a single significance, with the acquisition of some features and physical defining characters for the adult (Bagiu, 2007).

Metabolism contains the whole set of chemically outcomes that arise in a living organism which permits it to recreate, develop and support its system. Some chemical responses from a challenging network of paths and cycles in whom the stream of reaction products (metabolites) is decided by several adjustment devices. Usually, metabolism is repartitioned into catabolism, sophisticated molecule disintegration, and anabolism, processes tied to the synthesis of elaborate organic materials (Bart, Koen &Jacques, 2009). It is difficult to isolate the specific effects of regular physical activity, health and physical condition, inherent adaptations of growth and development during childhood and adolescence (Andrew, Neil & Timothy, 2007).

A physical condition related to health includes components of the physical condition related to health, including the condition of neuro-mio-arthro-kinetic apparatus, cardiovascular condition, metabolism, and body composition. The important features of the physical condition in relation to health are: body mass related to height (BMI), subcutaneous fat distribution, abdominal visceral adiposity, body composition, bone density, lung and heart function, arterial pressure, maximum aerobic capacity, glucose metabolism and

insulin, the lipid and lipoprotein profile of the glucagon, and the oxidation-related lipid-hydrated ratio (Serbănescu, 2000).

In many situations, many children and adolescents do not follow physical activity recommendations. Evidence also suggests that obese young people are less physically active than those with a normal weight and spend more time in sedentary activities such as computer games, television use and other electronic means (Andrew, Lars & Nuala, 2011). Routine physical activity for all ages is not just an exercise to improve body appearance. In addition to reducing body mass index (BMI) and body weight, regular physical activity is also associated with improving health and is evident from person to person. Various studies have found that day-to-day physical activity among children and young people is associated with improving health (Timothy, Mary & Cindy, 2014). Obesity in adults and children has become a global public health issue.

The definition of obesity is recognized as important in understanding the prevalence of obesity as well as its monitoring and intervention. There are different indices that can obviously put obesity in children and adults. Body Mass Index (BMI) has been used to monitor adult weight and obesity since the 1980s and in children since 1990 (Yi-Fang, Tim & Hui-Qi, 2009).

The formula for the body mass index is calculated with the same method for children and adults, but the interpretation of the meaning of the BMI for youth is different from those used for adults. Therefore, for youth, BMI takes into account the age and gender having specific percentiles used for two reasons: the first reason is that the amount of body fat is in a process of modification with age and the amount of body fat vary from girls to boys (Kuczmarski, 2000). Some scientific papers discovered innovative methods for assessing the percentiles of fat based on only two skin folds (triceps and scapula), which have the purpose to discover the real BMI for children and adolescents Boye, Dimitrou & Manz, 2002).

One common clinical measure of overweight and obesity easily attained with no specialized equipment is body mass index (BMI), this mathematical calculation only requires a participant's mass and height (Walsh, Heazlewood & Climstein, 2018). Body mass index (BMI) is a useful screening tool for overweight and obesity diagnostics in children, adolescents and adults, BMI can be detected quickly and inexpensively (Pontaga & Zidens, 2011). The BMI is calculated by dividing the weight (kg) of a person by the respective height (in m2) (Miller et al., 2003) as follows:

$$BMI = \text{Weight (kg)} / [\text{Height (m)}]2$$

Highly BMI is correlated with enhanced risks for hypertension, atherosclerosis, etc. (Witt & Bush, 2005). BMI provides indication regarding overweight if its value fluctuates from 25 to 29.9 kg/ m2, but obesity can be assessed if BMI is more considerable than 30 kg/ m2 (Mathews & Wagner 2008).

The body mass index depends not only on the fat content in the human body, but as well on the muscles and bones mass, as well as, on the water content in the body of sportsmen. Elevated value of the body mass index can be quantified as overweight in sportspeople with considerable skeletal muscles mass. It indicates that preparation in a lot of sports specialties causes growth of the body mass index (Ode et al., 2007). Although BMI is thought to measure excess weight rather than excess body fat, if appropriate cut-off points are used, a high BMI level is a moderately sensitive and very specific indicator of excess adiposity among children (Freedman et al., 2005).

Design of the Research

Subjects and place of the research

The subjects of the research were represented by 86 students from the "Friedrich Schiller" secondary school in Târgu Mureș. All of these subjects were measured, weighed and examined, the data being passed to the tables.

The investigation period ranged between 15.03.2018 and 01.05.2018.

The main objectives of our study, aimed at pre-school children, were the following: establishing anthropometric indices used in research; the anthropometric measurements; comparing the results of the research with those of the specialized literature; developing graphs and tables to highlight the results of the study.

The hypothesis of the research was following the statistical analysis and interpretation, we will highlight a statistically significant difference between the median values of age, weight and BMI in the two groups, athletes and non-athletes. And also the second hypothesis of the research after using the Chi Square Test, we will have a statistically significant association between the type of class and the practice of the sport, as well as between the two sexes and the practice of the sport.

This investigation was overseen in accordance with the Declaration of Helsinki (2013) and approved by the Ethics Committee before the beginning of the study. It also met the ethical standards for Sport and Exercise Science Research. Due to the fact that the General data protection regulation entered into the appliance on 25 May 2018 (Regulation (EU) 2016/679).

Results

Statistical analysis included descriptive statistics elements (frequency, mean, median, standard deviation) and inferential statistics. The D'Agostino & Pearson test was applied to determine the distribution of the analyzed data series. The Mann-Whitney test, a non-parametric test for unpaired data, was used for comparison of medians. To determine the association between the qualitative variables, the Chi square test was applied. The significance threshold chosen for the p-value was 0.05. Statistical analysis was performed using the Graph Pad Prism.

Table 1. Information regarding students from the fifth grade

No	Class level				Subjects	Age (years)	Gender		Height (cm)	Weight (kg)	BMI	Diabetes				Sports practice		Practiced sports
	V	VI	VII	VIII			M	F				II	I	No	Don't know	Yes	No	
1	1	0	0	0	LA	10	1	0	150	69	30.7	0	0	1	0	0	1	
2	1	0	0	0	RS	12	1	0	150	32	14.2	0	0	1	0	0	1	
3	1	0	0	0	SA	12	1	0	159	70	27.7	0	0	1	0	0	1	
4	1	0	0	0	CA	12	0	1	157	49	19.9	0	0	1	0	1	0	Gymnastics
5	1	0	0	0	CH	11	1	0	157	45	18.3	0	0	1	0	1	0	Tennis
6	1	0	0	0	SG	11	1	0	160	50	19.5	0	0	1	0	0	1	
7	1	0	0	0	BS	11	1	0	144	38	18.3	0	0	1	0	1	0	Tennis
8	1	0	0	0	BD	11	1	0	150	37	16.4	0	0	1	0	1	0	Swimming
9	1	0	0	0	MC	11	1	0	150	34	15.1	0	0	1	0	1	0	Sword fighting
10	1	0	0	0	MA	12	1	0	160	50	19.5	0	0	1	0	1	0	Tennis
11	1	0	0	0	MI	11	1	0	139	30	15.5	0	0	1	0	1	0	Basketball
12	1	0	0	0	PM	12	1	0	164	45	16.7	0	0	1	0	1	0	Volleyball
13	1	0	0	0	HP	11	1	0	149	32	14.4	0	0	1	0	1	0	Football
14	1	0	0	0	VR	11	1	0	139	36	18.6	0	0	1	0	1	0	Football
15	1	0	0	0	DA	12	0	1	160	60	23.4	0	0	1	0	1	0	Swimming
16	1	0	0	0	VA	12	0	1	152	46	19.9	0	0	1	0	1	0	Handball
17	1	0	0	0	MM	12	0	1	167	45	16.1	0	0	1	0	1	0	Athletics

Table 2. Information's regarding students from the sixth grade

No	Class level				Subjects	Age (years)	Gender (M/F)		Height (cm)	Weight (kg)	BMI	Diabetes				Sports practice		Practiced sports
	V	VI	VII	VIII			M	F				II	I	No	Don't know	Yes	No	
1	0	1	0	0	MA	12	0	1	145	32	15.2	0	0	1	0	1	0	Gymnastics
2	0	1	0	0	CM	12	0	1	160	45	17.6	0	0	1	0	1	0	Tennis
3	0	1	0	0	RS	12	0	1	156	45	18.5	0	0	1	0	1	0	Athletics
4	0	1	0	0	CM	13	1	0	158	60	24	0	0	1	0	1	0	Athletics

No	Class level				Subjects	Age (years)	Gender (M/F)		Height (cm)	Weight (kg)	BMI	Diabetes				Sports practice		Practiced sports
	V	VI	VII	VIII			M	F				II	I	No	Don't know	Yes	No	
5	0	1	0	0	IA	13	0	1	162	48	18.3	0	0	1	0	1	0	Tennis
6	0	1	0	0	HI	12	0	1	161	42	16.2	0	0	1	0	1	0	Dance
7	0	1	0	0	PS	13	1	0	161	39	15	0	0	1	0	0	1	
8	0	1	0	0	RR	12	1	0	150	46	20.4	0	0	1	0	1	0	Dance
9	0	1	0	0	CD	12	1	0	162	53	20.2	0	0	1	0	1	0	Swimming
10	0	1	0	0	BD	12	1	0	148	50	22.8	0	0	1	0	0	1	
11	0	1	0	0	BS	12	1	0	177	74	23.6	0	0	1	0	0	1	
12	0	1	0	0	VC	13	1	0	163	47	17.7	0	0	1	0	1	0	Dance
13	0	1	0	0	HR	12	0	1	151	49	21.5	0	0	1	0	1	0	Gymnastics
14	0	1	0	0	PV	12	1	0	154	44	18.6	0	0	1	0	1	0	Football
15	0	1	0	0	DT	12	1	0	168	69	24.4	0	0	1	0	1	0	Fitness
16	0	1	0	0	VI	12	0	1	148	40	18.3	0	0	1	0	1	0	Athletics
17	0	1	0	0	SB	12	0	1	151	41	18	0	0	1	0	1	0	Swimming
18	0	1	0	0	CC	12	0	1	153	38	16.2	0	0	1	0	1	0	Swimming
19	0	1	0	0	IV	13	0	1	154	38	16	0	0	1	0	1	0	Swimming

Table 3. Information's regarding students from the seventh grade

Nr.	Class level				Subjects	Age (years)	Gender (M/F)		Weight (kg)	BMI	Diabetes				Sports practice		Practiced sports
	V	VI	VII	VIII			M	F			II	I	No	Don't know	Yes	No	
1	0	0	1	0	VI	13	0	1	54	19.8	0	0	1	0	1	0	Fitness
2	0	0	1	0	TA	13	0	1	41	14.9	0	0	1	0	0	1	
3	0	0	1	0	CL	13	0	1	40	14.9	0	0	1	0	1	0	Swimming
4	0	0	1	0	HI	13	0	1	47	18.1	0	0	1	0	1	0	Swimming
5	0	0	1	0	TM	13	0	1	42	17.9	0	0	1	0	1	0	Swimming
6	0	0	1	0	BT	13	0	1	67	22.4	0	0	1	0	1	0	Tennis
7	0	0	1	0	HB	14	0	1	63	22.3	0	0	1	0	0	1	
8	0	0	1	0	VA	13	0	1	41	16	0	0	1	0	1	0	Swimming
9	0	0	1	0	BA	13	0	1	41	15.8	0	0	1	0	1	0	Tennis
10	0	0	1	0	RI	13	0	1	38	15.2	0	0	1	0	1	0	Dance
11	0	0	1	0	BM	13	0	1	49	20.4	0	0	1	0	0	1	
12	0	0	1	0	CM	13	0	1	57	17.8	0	0	1	0	0	1	
13	0	0	1	0	BA	14	0	1	80	29.4	0	0	1	0	1	0	Taekwondo
14	0	0	1	0	SL	13	0	1	44	18.8	0	0	1	0	0	1	
15	0	0	1	0	SI	13	0	1	57	22.5	0	0	1	0	1	0	Dance
16	0	0	1	0	GD	14	0	1	57	23.4	0	0	1	0	0	1	
17	0	0	1	0	BC	13	0	1	53	19.9	0	0	1	0	0	1	
18	0	0	1	0	BA	14	0	1	47	17.7	0	0	1	0	0	1	
19	0	0	1	0	SR	13	1	0	40	18	0	0	1	0	1	0	Football

Nr.	Class level				Subjects	Age (years)	Gender (M/F)		Weight (kg)	BMI	Diabetes				Sports practice		Practiced sports
	V	VI	VII	VIII			M	F			II	I	No	Don't know	Yes	No	
20	0	0	1	0	GM	13	1	0	49	19.6	0	0	1	0	1	0	Basketball
21	0	0	1	0	OR	12	1	0	52	19.6	0	0	1	0	1	0	Carting
22	0	0	1	0	CU	14	1	0	40	13.2	0	0	1	0	1	0	Basketball
23	0	0	1	0	GC	14	1	0	54	17.8	0	0	1	0	1	0	Tennis
24	0	0	1	0	CR	13	1	0	50	17.9	0	0	1	0	1	0	Basketball
25	0	0	1	0	MV	13	1	0	67	21.1	0	0	1	0	1	0	Basketball
26	0	0	1	0	OA	13	1	0	85	26.5	0	0	1	0	1	0	Basketball
27	0	0	1	0	BA	13	1	0	77	23.8	0	0	1	0	1	0	Swimming
28	0	0	1	0	LR	13	1	0	60	25.6	0	0	1	0	1	0	Tennis
29	0	0	1	0	CA	13	1	0	50	18.8	0	0	1	0	1	0	Football

Table 4. Information's regarding the eighth-grade students

No	Class level				Subjects	Age (years)	Gender (M / F)		Height (cm)	Weight (kg)	BMI	Diabetes				Practice sports		Sports practiced
	V	VI	VII	VIII			M	F				II	I	No	Don't know	Yes	No	
1	0	0	0	1	GA	14	1	0	165	56	20.6	0	0	1	0	0	1	0
2	0	0	0	1	VD	14	1	0	169	60	21	0	0	1	0	0	1	0
3	0	0	0	1	ML	14	1	0	177	59	18.8	0	0	1	0	1	0	Tennis
4	0	0	0	1	OP	14	1	0	167	47	16.9	0	0	1	0	0	1	0
5	0	0	0	1	RA	14	1	0	179	72	22.5	0	0	1	0	1	0	Football
6	0	0	0	1	CR	14	1	0	165	51	18.7	0	0	1	0	1	0	Football
7	0	0	0	1	MP	14	1	0	165	47	17.3	0	0	1	0	1	0	Football
8	0	0	0	1	SS	14	1	0	163	45	16.9	0	0	1	0	0	1	0
9	0	0	0	1	LR	14	1	0	166	45	16.3	0	0	1	0	0	1	0
10	0	0	0	1	OS	15	0	1	167	62	22.2	0	0	1	0	1	0	Water polo
11	0	0	0	1	LO	15	0	1	160	48	18.8	0	0	1	0	1	0	Basketball
12	0	0	0	1	VO	14	0	1	166	50	18.1	0	0	1	0	1	0	Basketball
13	0	0	0	1	BA	14	1	0	162	54	20.6	0	0	1	0	0	1	0
14	0	0	0	1	MD	14	0	1	166	56	20.3	0	0	1	0	1	0	Handball
15	0	0	0	1	SB	14	0	1	166	53	19.2	0	0	1	0	0	1	0
16	0	0	0	1	CD	14	0	1	168	56	19.8	0	0	1	0	1	0	Dance
17	0	0	0	1	RT	15	0	1	174	63	20.8	0	0	1	0	1	0	Swimming
18	0	0	0	1	SA	14	0	1	166	64	23.2	0	0	1	0	1	0	Tennis
19	0	0	0	1	BI	14	0	1	166	63	22.9	0	0	1	0	1	0	Table tennis
20	0	0	0	1	FS	14	0	1	156	83	34.1	0	0	1	0	0	1	0
21	0	0	0	1	MN	14	0	1	166	100	36.3	0	0	1	0	1	0	Fitness
22	0	0	0	1	IO	14	0	1	169	75	26.3	0	0	1	0	1	0	Swimming

Table 5. Statistical interpretation of the data

Statistical parameters	Practice sport (64) Mean ± SD (Median)	Doesn't practice sport (23) Mean ± SD (Median)	Value of p
Age	12.80±1.057 (13.00)	13.09±1.125 (13.00)	*0.1445
Weight	51.27±13.67 (48.50)	53.83±11.98 (53.00)	*0.2361
BMI	19.58±3.876 (18.65)	20.62±4.923 (19.90)	*0.4132

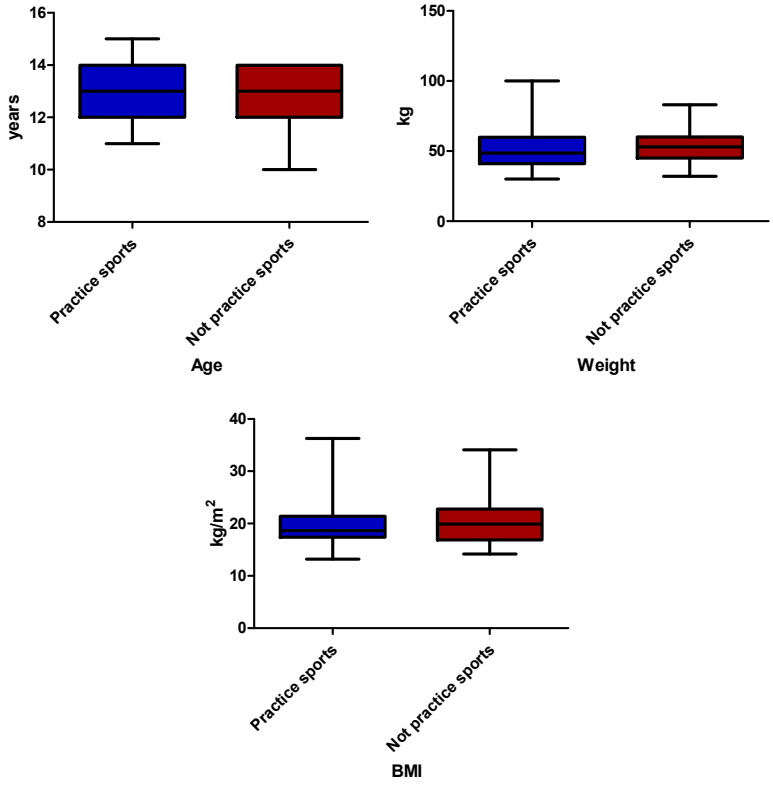

Figure 1. Statistical interpretation regarding age, weight and BMI

In Table 5 and Figure 1, we used the Mann-Whitney test, with a value of significance of $p<0.05$, and found that there is a statistically significant difference between the median of age values for the 2 groups.

Also, in Table 5 and Figure 1, the second step was measuring with the Mann-Whitney test, with a value of significance of $p<0.05$, we discovered that there is a statistically significant difference between the mean values of weight in the 2 groups.

The last step using the Mann-Whitney test, with a value of significance of $p<0.05$, we observed that there is a statistically significant difference between the median BMI values for the 2 groups, the results were also highlighted in Table 5 and Figure 1.

Table 6. Statistics regarding children that practice sport and those that doesn't practice sports

Parameters		Practice sport (64)	Doesn't practice sport (23)	Value of p
Grade	V	13	4	0.5095
	VI	16	3	
	VII	21	8	
	VIII	14	8	
Gender	Female	34	10	0.5820
	Male	30	13	

Discussions

As a result of the measurements made on the 4 classes of students from the gymnasium cycle, we found that girls performing moderate physical activity have a height relative to optimal weight, in other words, a lower BMI than those who do not practice physical activity on a regular basis.

For the fifth grade, we centralized the following results: 152.5 cm height for females, 153.3 cm height for males, weight 50 kg for females, 43.6 for males, 19.2 Body mass index for females and 19 for males. Students that practice sport: 4 females and 9 males.

In relation to the sixth grade, we found: 153.8 cm height for females, 160 cm height for males, weight 41.8 kg for females, 53.5 for males, 17.6 Body mass index for females and 20.7 for males. Students that practice sport: 10 females and 6 males.

In the seventh grade, the results were: 171. 8 cm height for females, 167 cm height males, weight 54 kg for females, 56.7 for males, 19.2 Body mass index for females and 20.1 for males. Students that practice sport: 11 females and 10 males.

In terms of the eighth grade: 165.8 cm height for females, 167.8 cm height males, weight 64.4 kg for females, 53.6 for males, 23.5 Body mass index for females and 18.9 for males. Students that practice sports: 10 females and 8 males.

Physical activity and sports practice through recreation period have been provided as an effective component to achieve an individual and social improvement (Comez-Marmol et al., 2017), because of the favorable concept society has about them and as well due to its appeal and its possible capability to convene, particularly between adolescents (Escarti, Gutiérrez, Pascual, & Marín, 2010; Ginesta, 2007; Menéndez & Fernández-Río, 2016).

A study similar to ours, conducted by Andy R. Ness, Sam D Leary, Calum Mattock, and Steven N Blair, Objectively Measured Physical Activity and Fat Mass in a Large Cohort of Children, attempts to highlight the importance of physical activity within a group of about 5,000 children aged 12 years old. In the above study, a cross-sectional analysis was performed on 5,500 12-year-olds enrolled in the Avon Parents and Children study. Total physical activity and moderate and vigorous physical activity minutes (MVPA) were measured using the Actigraph accelerometer. Fat weight and obesity were measured using the Prodigy lunar emission dual-beam absorption scanner. Strong negative associations between MVPA and fat mass were found which were unchanged after adjustment for total physical activity. They found a strong negative association between dose response and MVPA and obesity.

Previous studies have not been able to characterize the association between physical activity and obesity, probably because most were based on inaccurate measurements of physical activity and obesity. Finally, we can say that physical activity plays an essential role in a child's physical health. Also, other studies discovered that overweight BMI and obesity conducts to flattening of the thoracic kyphosis and increasing lumbar lordosis (Grabara & Pstragowska, 2008). Thus, lordosis was observed to develop in numerous cases of overweight or obese people due to the protruding stomach. As can be observed, the spine keeps the body strait and through this it develops arch at the lower back to hold the body strait (Wyszyńska et al., 2016).

It has been suggested that fat mass may be the cause of the outward appearance of a "flat" foot in obese individuals (Wearing et al., 2012).

As we can observe other studies focused their attention on varum knee deficiencies proving that BMI is a big factor causing this dysfunction affirming that nowadays, the effect of high levels of BMI on knee alignment has gone trialled on adolescence population, and the larger the valgum dysfunction was remarked among obese adolescence in late puberty (Boye et al., 2002; Taylor et al., 2006).

Scientists have discovered that behavioral factors correlated with overweight and obesity among youngsters also feature insufficient physical activity (Eaton et al., 2010; Troiano et al., 2008), extreme sedentary period, such as screen time (Costigan et al., 2013), and unhealthful eating tendencies, covering drinking sweet beverages (Welsh, Sharma, Cunningham, & Vos, 2011), consuming fried snacks at or from a fast food spot (Andreyeva et al., 2011), and not consuming regular breakfast (Haug et al., 2009).

In recent scientific papers was found that involvement of adolescents in sports activities has much less influence on motor abilities than that of natural biological growth and maturation, compared with those that did not train, boys who train for a sport had significantly better results only in 2 motor tests, which

were confirmed by factor analysis to be valid tests of coordination, these results suggest that the morphological status of 13-year-old children better predict coordination performance than speed performance (Lazarevic et al., 2011).

Regularly monitoring of body composition in sport is an important indicator of health and physical development in adolescent athletes (Matus & Cech, 2018), such as identification of eating disorders, overtraining, disease or to compare body composition with sports performance. Rating of body constructor is also part of identification, selection and development of young talented athletes (Malina & Beunen, 2008), such as identifying the basic elements in body composition for the needs of sport. In young athletes the level of BMI and fat mass lower than common population, what is given especially the type of practiced sport (Strong, 2005).

Some scientific papers discovered innovative methods for assessing the percentiles of fat based on only two skin folds (triceps and scapula), which have the purpose to discover the real BMI for children and adolescents (Boye et al., 2002). Also other scientific papers discovered a significant relationship between the body mass index in the football players and the lean body mass that was explained by growth of the skeletal muscles mass and also found a significant relationship was detected between the body mass index and the fat content in the body, therefore the increased value of BMI also depends on the greater content of fat tissue in the body (Potanga & Zidens, 2011).

Conclusions

After researching and interpreting the results, we came to confirm the hypothesis that: girls who practice sport in an organized way have a lower body mass index than those who do not practice a particular sport.

Also hypothesis number one was confirmed, and following the analysis and statistical interpretation we highlighted a statistically significant difference between the median values of age, weight and BMI in the two groups, athletes and non-athletes.

The second hypothesis was infirmed, and after using the Chi Square Test we did not have a statistically significant association between the type of class and playing sports, as well as between the two genders and playing sports.

Anthropometric indices have a value closest to normal in girls who have an increased physical activity. As a result of the study of the four gymnasium classes, we came to the conclusion that girls with intense physical activity have a lower body mass index than those who are sedentary, more optimal weight and higher physical strength.

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