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STUDY ON PHYSICAL DEVELOPMENT IN HIGH SCHOOL BOYS

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Summary

Physical education through physical exercises has accompanied humanity throughout its entire existence. Structured as an independent social phenomenon, with its own qualitative determination, this specific form of human action represents a necessary and permanent component of social life. Physical exercise is a reality of social essence, it is practiced by man and is carried out within certain social relations. If the pubertal stage is dominated by the biological maturation of the sexual organs, the postpubertal stage, adolescence, completes and concludes the growth period not only from its biological aspect but also from a social point of view. In terms of duration, the postpubertal stage varies depending on the interval between the end of puberty and the achievement of adulthood.

Introduction

High school education represents a higher stage in the preparation of students, and at the same time in the bio-psycho-motor development of the human being. More specifically, the high school student, in terms of physical education and sports, must have a general motor capacity and specific to the branches of sports, maintain his health and increase the ability to adapt to various conditions, stimulate his interest in independently practicing physical exercises and sports, develop his team spirit and the competitive one, for the purpose of social integration, be able to analyze and evaluate sports competitions from the perspective of the spectator, as well as the practitioner. All this with the aim of independently organizing his relaxation activity, compensating and preventing the harmful effects caused by sedentary and unilateral activities specific to society [1,4,7,10,12]. He will have to be convinced of the necessity and usefulness, but especially the habit of acting in the desired direction. By its nature, physical exercise could exert a positive influence on any young person regardless of social position, nationality or gender.

We can consider the human body as being made up of overlapping segments, which are kept in balance especially by that state of permanent semi-contraction of the muscles called tone. Any decrease in tone will bring about disorders of posture, especially by accentuations of the physiological curvatures of the spine, the so-called kyphotic or lordotic attitudes - as well as the appearance of scoliotic attitudes. These attitude vices usually appear in childhood, at school age and are primarily due to sedentariness; a more or less sedentary life, if not combated by a rational program of physical exercises, will cause muscle tone to decrease and thus vicious attitudes to appear.

Over the past two decades, researchers have concluded that the most effective way to build and maintain bone health is through exercise [5,6,8,9]. Just like muscles, bone responds to stress, that is, when it is asked to bear more weight than usual. This can be achieved through high-impact exercises such as walking, running, lifting weights, jumping, or dancing. Low-impact exercises such as cycling or swimming will not put as much stress on bone, but they are excellent for overall health and improve muscle endurance.

A well-structured and sustained program can successfully prevent osteoporosis, osteoporotic fractures and is an important factor in the recovery period. Physical exercise builds the skeletal system in childhood, the duration of bone health depending on the resistance it has at the beginning. Recent studies have revealed that physical exercise is as important as nutrition when it comes to building a healthy bone base that lasts throughout life. Physical exercise is important in childhood and adolescence, but especially during puberty.

If the pubertal stage is dominated by the biological maturation of the sexual organs, the postpubertal stage, adolescence, completes and concludes the growth period not only from a biological but also from a social point of view [2,3,11].

As for the duration, the postpubertal stage varies depending on the interval between the end of puberty and the attainment of adulthood. Due to the fact that even in this stage, the physiological age differs from the chronological one, the advance of the physiological age will be maintained in the postpubertal stage. Girls have an advance of 2-3 years compared to boys, gained mostly in the pubertal stage. And in the postpubertal period the higher rate of complete maturation of girls will be maintained, so that they reach the age considered at the end of the growth and differentiation process earlier compared to boys.

Research methodology and organization

In the ascertaining study on the level of development of high school students, 30 boys, 12th grade, 15 from the Technological High School "Iorgu Vârnav Liteanu", Liteni town and 15 from the Technological High School "Oltea Doamna", Dolhasca town participated. The methods applied in the research were the study and generalization of data from the specialized literature, observation of students' participation during physical education classes, the method of anthropometric measurements and the statistical and tabular method.

Results and their interpretation

The tests in the study were carried out at the end of the 2023-2024 school year and there were 6 of them, these being the following:

- height measurement, in centimeters (waist): this was carried out with the tahlimeter from a standing position, heels together, toes slightly apart, back straight against the wall, looking forward, the cursor touches the vertex and records the height;
- body weight measurement, in kilograms: it was carried out in a light posture, using the scale;
- bust height, in centimeters - it was carried out with the tahlimeter, from a position sitting on a chair with the back and head pressed against the graduated rod, the number "0" being at the base of the chair, and the cursor touches the top of the head;
- body mass index (Bouchard) or nutrition index (Quetelet) - G/T - is calculated by dividing weight in grams by waist, in centimeters;

  -400g/for each cm of body height - average physique/good nutritional status;

  -up to 500g/for each cm of body height - increased physique/increased nutritional status;

  -over 500g/for each cm of body height - tendency to gain weight;

  -up to 300g/for each cm of body height - low physique;

  -below 300g/for each cm of body height - unsatisfactory nutritional status;
- Adrian Ionescu proportionality index - results from subtracting half the waist from the bust height, i.e. B - T/2 (B - bust height, T - body height); in students the average value of the index is 3-4 cm;

- Ruffier test, a physical condition assessment test, which is based on heart rate variations in three moments: rest; after effort; recovery. The test consists of performing 30 squats, for 45 seconds and monitoring the heart rate during the recovery period, lasting 1 minute, (P1+P2+P3) – 200 / 16.

Table 1. Results obtained in tests, experimental and control groups, 12th grade

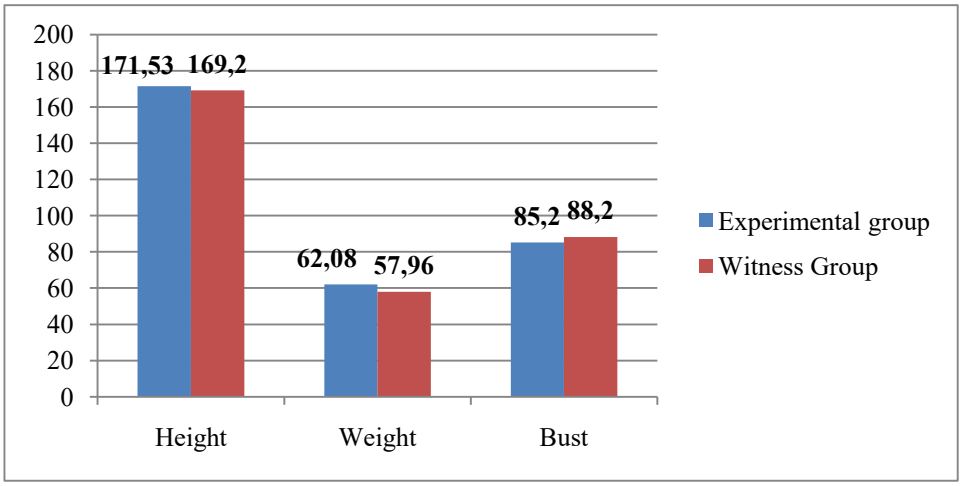
No.	Experimental group						Control group					
	Î. (cm)	G. (kg)	Bust (cm)	G/T	B - T/2	The Ruffier	Î. (cm)	G. (kg)	Bust (cm)	G/T	B - T/2	The Ruffier
1.	170	65,20	79	383,53	0,00	3,50	166	50,40	83	303,61	0,00	5,50
2.	174	67,90	83	390,23	-4,00	2,50	164	61,60	88	375,61	6,00	9,00
3.	183	82,20	91	449,18	0,50	2,75	186	58,20	98	312,90	5,00	7,50
4.	188	76,20	96	405,32	2,00	3,25	165	63,90	84	387,27	1,50	7,25
5.	171	56,90	85	332,75	-0,50	4,25	169	54,00	87	319,53	2,50	6,75
6.	171	54,40	81	318,13	3,50	4,00	166	53,00	82	319,28	-1,00	8,00
7.	154	39,30	72	255,19	0,00	3,00	161	42,20	79	262,11	-1,50	9,50
8.	168	68,30	84	406,55	0,00	4,00	165	50,60	85	306,67	2,50	7,25
9.	174	61,00	90	350,57	3,00	4,00	173	52,60	92	304,05	5,50	5,75
10.	173	62,70	87	362,43	0,50	4,75	174	64,30	97	369,54	10,00	9,25
11.	170	65,50	83	385,29	-2,00	4,50	165	49,30	88	298,79	5,50	7,75
12.	164	42,20	86	257,32	4,00	3,50	166	83,00	82	500,00	-1,00	5,50
13.	172	75,50	94	438,95	8,00	1,75	178	52,40	96	294,38	7,00	8,25
14.	173	55,50	88	320,81	1,50	3,25	170	54,50	90	320,59	5,00	6,00
15.	168	58,40	79	347,62	1,00	3,75	170	79,40	92	467,06	7,00	5,50
Mediate	**171,53**	**62,08**	**85,20**	**360,26**	**1,17**	**3,52**	**169,2**	**57,96**	**88,2**	**342,76**	**3,6**	**7,25**
Median	**1,97**	**3,04**	**1,61**	**14,86**	**0,72**	**0,21**	**1,66**	**2,87**	**1,52**	**17,13**	**0,9**	**0,36**
A.S.	**7,62**	**11,76**	**6,22**	**57,52**	**2,79**	**0,8**	**6,42**	**11,09**	**5,88**	**66,3**	**3,48**	**1,4**
C.V. e%	**4,44**	**18,95**	**7,31**	**15,97**	**238,98**	**22,71**	**3,79**	**19,14**	**6,67**	**19,34**	**96,54**	**19,24**

In terms of height, the averages are 171.53cm in the experimental group, and 169.20cm in the control group, with a difference of 2.33cm. The standard deviation and the coefficient of variability indicate a very good homogeneity of the groups.

The weight of the students in the experimental group is 62.08kg, while in the other group the average is 57.96kg, with a difference of 4.12 kg, this difference being due to a more pronounced muscle mass in the experimental class.

The coefficient of variability indicates a good homogeneity of the groups. In general, this labile parameter, influenced by living conditions and internal factors, presents more dispersed individual values, which increase this coefficient of variability. At the bust, the averages are 85.20cm and 88.20cm, respectively, with a

difference of 3cm. The coefficient of variability and the standard deviation indicate a good homogeneity of the samples.



Grafic nr. 1. Comparative analysis of the results obtained for height, weight and bust

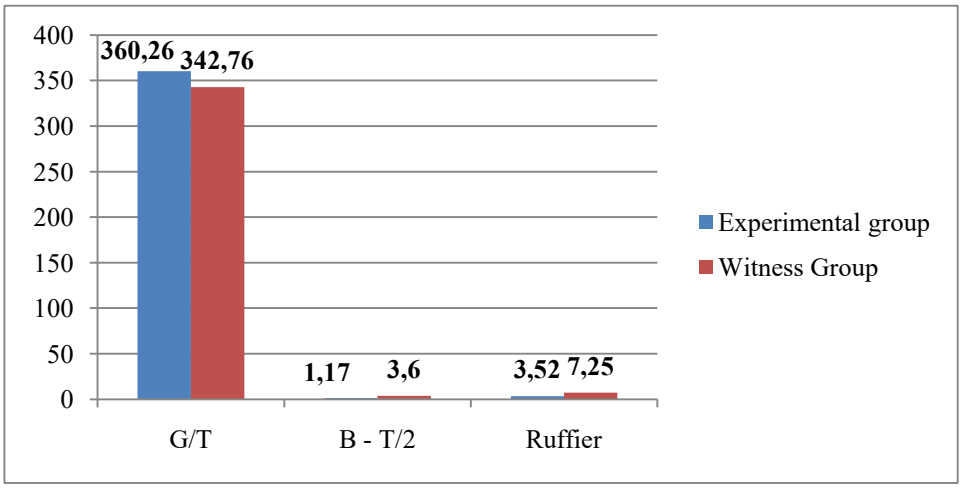
For the body mass index (Bouchard) or nutrition index (Quetelet), the averages are 360.26g for students in the experimental group and 342.76g for those in the control class. In both groups, it is observed that the indices fall between 300-400g/each cm of body height, that is, they indicate an average body mass and a good nutritional status.

This indicator in turn confirms a better development in favor of the experimental group, the difference between the two samples being 17.5g. The coefficient of variability exceeds the value of 30% in the case of both groups, which urges us to use the median, for greater relevance, because the arithmetic mean is no longer representative of the sample, here it is no longer homogeneous. Thus, the median of the experimental group is 0.5, and in the control group 5, this nevertheless confirms the conclusion drawn from the mean, tilting the balance in favor of the students in the experimental group.

In the Adrian Ionescu B - T/2 proportionality index, the average of the experimental group is 3.60cm, and in the control group it is 1.17cm. Knowing that in high school students, aged 14-19, the index has an average value between 3-4cm, it is observed that students who practice physical exercises in their free time fall within this average value.

In the Ruffier Test, for boys the average of the students in the experimental group is 3.52, which falls between 0-5, meaning good, and for those in the control group it is 7.25 and falls within the values 5-10, which means average. The difference

of 3.73 is significant, thus this indicator also shows us a better positioning of the students who are part of the experimental group.



Grafic nr. 2. Comparative analysis of the results obtained in the body composition index, proportionality index and Ruffier Test

Conclusions

Following the analysis and comparative interpretation of the results of the anthropometric development indicators (height, weight, bust height) of the two groups subjected to the research, a significantly higher level results in the experimental group, thus confirming the positive influence of physical exercises practiced during physical education classes on the development of students.

By practicing physical exercises and in free time, not only during physical education and sports classes at school, higher indices of manifestation were observed in the physiological parameters tested (the Adrian Ionescu proportionality index and the corpulence index (Bouchard) or nutrition (Quetelet), the Ruffier test).

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