DE GRUYTER OPEN

Land Forces Academy Review
Vol. XXII, No 1(85), 2017

THE IMPORTANCE OF ANTHROPOMETRY MEASUREMENTS IN ANALYZING THE IMPACT OF SPORTS ACTIVITIES ON STUDENTS

Marcel POMOHACI
"Lucian Blaga" University, Sibiu, Romania
marcelpomohaci@yahoo.com

Ioan Sabin SOPA
National University of Physical Education and Sport, Bucharest, Romania
sopa_sabin@yahoo.com

ABSTRACT

Our research aims to identify the importance of anthropometry measurements and functional testing of two groups that practice sport different, the first group, the experimental group was formed by 25 students (age 10 ± 2.1 years, 13 boys and 12 girls), that practiced 2 hours a week physical education and other 2 hours a week basketball and volleyball optional courses; and the second group formed by 25 students (age 10 ± 1.8 years, 14 boys and 11 girls), that practiced 2 hours a week classic physical education.

The anthropometric tests included in the research were the measurement of height, weight, different length of superior and inferior segments, bust, spread of arms, biacromial diameter, bitrohanterian diameter and chest perimeter.

Results showed that children from the experimental group, that practiced more sports activities, developed more quickly and had better proportionality index then the sample group. Statistically significant differences were determined within the experimental group both in the initial and in the final tests ($p<0.05$), also significant differences were discovered between the experimental and the sample group in the final measurement ($p<0.05$).

Conclusions of this research showed that more physical activities can influence the development of children both in anthropometric way and in functional and health related.

KEYWORDS: anthropometry testing; sport activities; physical development

1. Introduction

Physical education and sport contribute to the transformation of the child in an adult and its integration into society. By the fact that it empowers him to order motor skills, biological, functional, psychological and moral, those two activities have become indispensable in the harmonious development of human personality.

So health started to be considered a multilateral sized human condition both physically, socially and psychologically, each of these dimensions being bipolar both positive and negative.

DOI: 10.1515/raft-2017-0007

Besides the development of motor ability, physical education and sport significantly influence cognitive and affective development.

The motor activities cause immediate functional answers at the level of the organs and body systems. These responses are highlighted in systems directly involved, but harder to predict and be observed in those involved in secondary plan (Stănculescu, 2015). Due to the complexity of the motor activities, and especially the sports activity with effects in the biological, psychological, social, organizational and structural plan is necessary to define it in many ways. Thus from the definitions that experts propose, we conclude that motor activities and sports in general, have the following characteristics (Dragnea, 2000):

– *"sport is an activity with a lot of contests consisting of a set of motor actions and acts";*

– *"sport brings together all forms of physical activity designed to improve physical fitness and spiritual comfort, establish social relationships or lead to obtaining results in competition at all levels";*

– *"sport is a structure of motor activities coded and institutionalized regies";*

– *"sport designates a motor activity of leisure or competition, held in an institutional manner or independent".*

Objectives in motor plan of motor activities aims (Dragnea et al, 2006):

– the development of fitness components (cardiovascular endurance, muscular strength, power, mobility – flexibility, body composition);

– the development of motor fitness components (balance, segmental coordination, coordination with speed, power, reaction time, speed);

– forming a system of motion and basic skills, of some branches and sports events;

– improving exercise capacity by stimulating major functions.

Psychomotor objectives (Horghidan, 2000):

– the development of body scheme in two ways: as a landmark in the regulation of movements and as the core of self-image;

– the development of normal sensor-motor coordination;

– the development of dynamic and static balance;

– the realization of some rebalancing during puberty;

– formation of the timeline of movement (rhythm, tempo, duration, elements which give the movement of efficiency);

– the development of harmony and laterality;

– educating the general and selective relaxation capacity;

– developing the capacity to kinesthetic differentiation.

Motor activities represent a *"bridge between sedentary and active life"* that *"associated with other types of motor activities"* as stretching contributes to increasing mobility and flexibility and helps to relax the muscular system, improving the quality of life of those participating in such activities (Macovei, 2012).

Motor activities are often associated with a healthy lifestyle thereby *"the important link of a lifestyle that means doing motor acts, according to our options own several times a week, a move that would make pleasure, to consume energy and produce satisfaction"* (Grigore, 2007).

2. Objectives

Among the objectives of the research we include:

– making anthropometric and proportionality measurements, motor assessment of students enrolled in the experimental and control group;

– analysis of the results of the anthropometric test, of proportionality index and comparing them with those of the initial tests, so you can see progress or regression favored by motor activities done;

– statistical interpretation of data obtained at anthropometric and motor testing as well as graphic illustration of the results compared;

3. Materials and Methods

Research methods used in the experimental research, in order to develop the entire theoretical, practical and experimental approach, we used specific scientific research methods unanimously known in our field: bibliographic study, observation method, experimental method (with antropometric mesurements, functional development evaluation).

In the anthropometric measurements, we watched the indexes presented above, height, weight, bust, arm span, length of supperior members (LMS), length of lower members (LMI), bi-acromial diameter (D.bia) bitrohanterian diameter (D.bit) and chest perimeter.

Regarding the proportionality indices we have chosen to analyze the following indices: index of Guifrida Ruggeri (IGR), Adrian Ionescu index (IAI), the relationship between biacromial diameter and the height (RAS), the relationship between the biacromial diameter – height (RDBia.S), the relationship between the bitrohanterian and the height (RDBit.S), Burgusch-Goldstein index (IBG), the index of proportionality between thoracic perimeter and body height (IP PT IC), the index of proportionality between shoulder width and body height (LU IC IP) index of proportionality between shoulder width of the basin (IP LB IC) robusticity index (PRI), Bouchard corpulence index (ICB) and body mass index (BMI).

4. The Research Hypothesis

The inclusion in the programs of study of primary school students of several combative means of initiation in practising sports games positively influences the level of development of the bio-metrics and functional capacity.

5. The Sample Group

The research subjects came from the Secondary School Nr. 179 in Sector 1, Bucharest, representing two Classes of IV present in the school in the 2015-2016 school year.

We divided the two classes in: an experiment group (class IV A or Group A) and a control group (Class IV B or Group B).

The experiment group A was formed by:

– 25 students with the age between 10 and 12 years old, 13 boys and 12 girls;

The control group B was formed by:

– 25 students with the age cu between 10 and 12 years old, 13 boys and 11 girls;

Table no. 1

The distribution of the experimental and control group

Group	Number of children		Age	Experiment/ Control
	Girls	Boys		
A	12	13	10 ± 1.2 years	experiment group
B	11	14	10 ± 1.5 years	control group

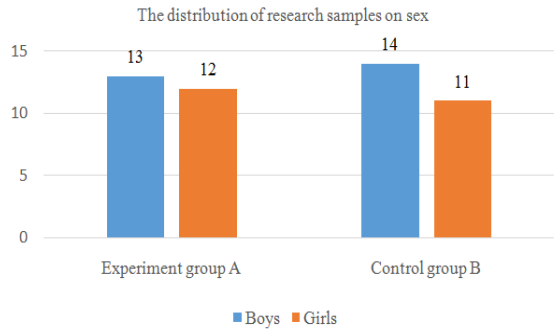

Figure no. 1 The distribution of research samples on sex

Systems and ways applied and their programing at experiment group

The control group performed two hours of physical education a week in which we followed the classic physical education and sports program. Instead, at the experiment group adjacent to the classic two hours of physical education and sport in the program, we used training programs with playful and agonistic games, with dynamic games, races, applicative trails, we also included two hours of playing team sports, boys basketball and girls volleyball, this group also participated in numerous cups and school competitions.

Training programs with agonistic and playful specific, included:

– dynamic games for developing motor skills or for developing basic and specific motor skills;

– relays and sports competitions that followed the correct and harmonious development;

– applicative trails on teams following the physical and basic motor skills development;

– team sports which aimed to develop team spirit and improve group cohesion.

The training programs followed primarily to develop motor skills and basic and specific skills, and especially to develop teamwork, socialization, communication, and cooperation, successfully expressing formative – educational values – of the motor activities.

Results

Table no. 2

Statistic indicators resulted at the anthropometric measurements – Experiment group – Initial test

Statistic indicatores calculated	Height	Weight	Bust	Arms span	LMS	LMI	D.Bia	D.Bit	PT
X	132.28	31.80	69.44	129.16	50.08	64.92	26.60	28.24	69.28
M_e	132.00	31.00	69.00	128.00	49.00	65.00	27.00	28.00	69.00
M_o	130.00	29.00	68.00	128.00	49.00	65.00	27.00	26.00	69.00
A_s	3.94	4.13	2.86	5.23	2.52	3.68	2.10	2.30	2.69
Var	15.54	17.08	8.17	27.31	6.33	13.58	4.42	5.27	7.21
A_m	13.00	14.00	10.00	18.00	8.00	15.00	8.00	8.00	9.00
Min	127.00	27.00	65.00	122.00	46.00	58.00	23.00	25.00	65.00
Max	140.00	41.00	75.00	140.00	54.00	73.00	31.00	33.00	74.00
C_v	0.03	0.13	0.04	0.04	0.05	0.06	0.08	0.08	0.04
Skewness	0.82	0.86	0.45	1.02	0.18	0.60	0.20	0.51	0.43
Kurtosis	-0.42	-0.20	-0.78	0.11	-1.22	0.57	-0.28	-0.71	-0.47

Table no. 3

Statistic indicators resulted at the anthropometric measurements – Control group – Initial test

Statistic indicatores calculated	Height	Weight	Bust	Arms span	LMS	LMI	D.Bia	D.Bit	PT
X	130.56	32.08	68.24	127.36	49.36	63.84	26.84	28.04	68.12
M_e	130.00	31.00	68.00	127.00	50.00	63.00	26.00	27.00	68.00
M_o	130.00	30.00	68.00	122.00	50.00	63.00	24.00	26.00	65.00
A_s	3.69	4.45	2.82	5.27	3.25	3.57	2.62	2.84	2.37
Var	13.59	19.83	7.94	27.74	10.57	12.72	6.89	8.04	5.61
A_m	12.00	16.00	10.00	17.00	11.00	14.00	9.00	9.00	7.00
Min	125.00	26.00	64.00	120.00	45.00	56.00	23.00	24.00	65.00
Max	137.00	42.00	74.00	137.00	56.00	70.00	32.00	33.00	72.00
C_v	0.03	0.14	0.04	0.04	0.07	0.06	0.10	0.10	0.03
Skewness	0.27	0.94	0.44	0.42	0.27	0.09	0.43	0.52	0.17
Kurtosis	-1.06	0.39	-0.37	-0.76	-0.74	-0.10	-1.00	-1.02	-1.25

At the initial motor evaluation, we can see the differences between the experimental group and the control group. So taking point by point, we can observe at the parameter "high", the experimental group, with an average of 132.28 cm, it has an extra 1.7 cm compared to the control group, with an average of 130.56 cm.

At the parameter "weight", we found that at the control group, we have an average of 32.08 kg, more than the experiment group with 0.28 kg, we have with an average of 31.80 kg. At the parameter "bust", we find a difference of 1.18 cm between the experiment group average of 69.44 cm and the average of the control group, with 68.24 cm.

At the index of "arm span", we found a difference of 1.8 cm between the experimental group, with an average of 129.16 cm, and the control group with an average of 127.36 cm.

In the case of "the length of the superior members", we recorded a difference of 0.72 cm between the experimental group, with an average of 50.08 cm, and the control group with an average of 49.36 cm.

Regarding the index "the length of the inferior members", we found a difference of 1.08 cm, between the experimental group, with an average of 64.92 cm, and the control group with an average of 63.84 cm.

At the index "bi-acromial diameter" we can observe a difference of 0.24 cm for the control group, with an average of 26.84 cm, comparing to the experiment group, with an average of 26.60 cm.

At the measurement of "bitrohanterian diameter", we can observe a difference of 0.20 cm between the experimental group, with an average of 28.24 cm, compared to the control group with an average of 28.04 cm. At the index "chest perimeter", we found a difference between the average of the experiment group of 0.16 cm (69.28 cm) and the average of the control group (68.12 cm).

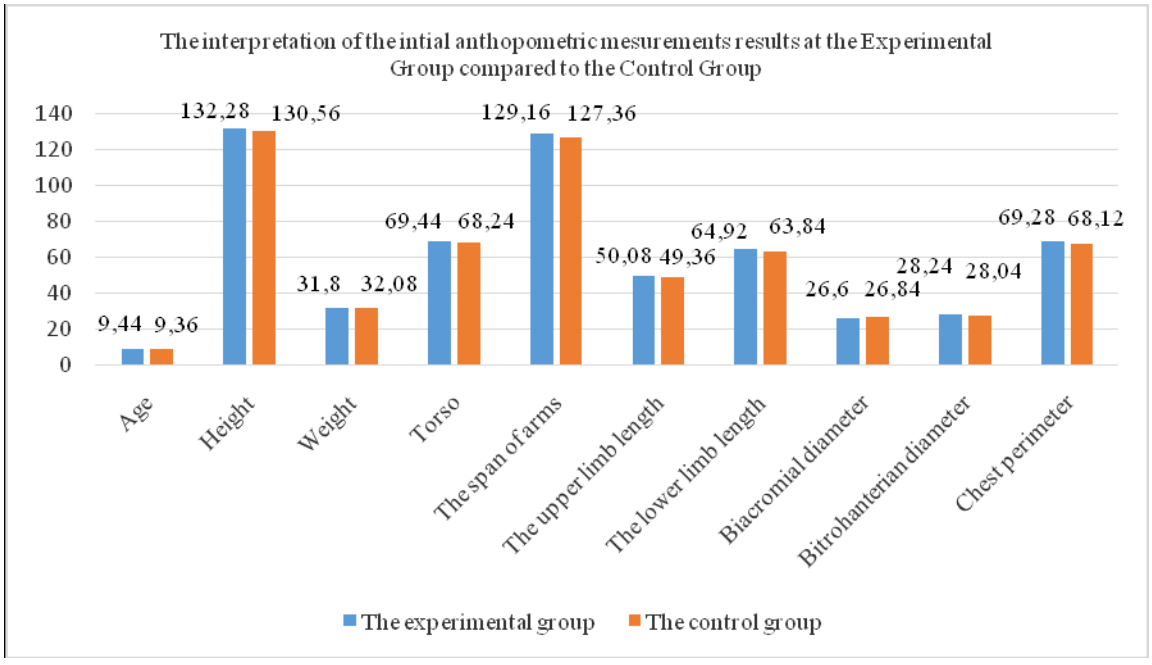

Figure no. 2 The interpretation of the anthorpometric measurment results at the Experiment Group compared with the Control Group – Initial test

Table no. 4

Statistic indicators resulted through the anthropometric measurement – Experiment group – Final test

Statistic indicators calculated	Height	Weight	Bust	Arms span	LMS	LMI	D.Bia	D.Bit	PT
X	136.40	33.44	71.84	131.92	52.52	65.80	27.76	29.36	70.72
M_e	136.00	32.00	72.00	131.00	52.00	65.00	27.00	29.00	71.00
M_o	136.00	30.00	70.00	131.00	52.00	65.00	26.00	28.00	71.00
A_s	4.35	3.90	2.91	5.05	2.33	3.56	2.11	2.25	2.73
Var	18.92	15.17	8.47	25.49	5.43	12.67	4.44	5.07	7.46
A_m	14.00	14.00	11.00	18.00	8.00	15.00	8.00	8.00	9.00
Min	131.00	29.00	67.00	125.00	48.00	59.00	25.00	26.00	67.00
Max	145.00	43.00	78.00	143.00	56.00	74.00	33.00	34.00	76.00
C_v	0.03	0.12	0.04	0.04	0.04	0.05	0.08	0.08	0.04
Skewness	0.87	0.99	0.56	1.03	-0.14	0.63	0.75	0.75	0.53
Kurtosis	-0.40	0.09	-0.09	0.14	-0.88	0.61	0.05	-0.32	-0.55

Table no. 5

Statistic indicators resulted through the anthropometric measurement – Control group – Final test

Statistic indicators calculated	Height	Weight	Bust	Arms span	LMS	LMI	D.Bia	D.Bit	PT
X	132.24	35.68	69.68	128.60	50.44	65.08	27.72	29.04	69.16
M_e	132.00	35.00	69.00	128.00	51.00	65.00	27.00	28.00	69.00
M_o	132.00	34.00	68.00	122.00	47.00	66.00	25.00	27.00	68.00
A_s	3.62	4.39	2.93	5.13	3.32	3.39	2.95	2.94	2.29
Var	13.11	19.31	8.56	26.33	11.01	11.49	8.71	8.62	5.22
A_m	12.00	19.00	10.00	16.00	11.00	14.00	12.00	10.00	7.00
Min	126.00	28.00	66.00	122.00	45.00	57.00	21.00	25.00	66.00
Max	138.00	47.00	76.00	138.00	56.00	71.00	33.00	35.00	73.00
C_v	0.03	0.12	0.04	0.04	0.07	0.05	0.11	0.10	0.03
Skewness	0.23	0.93	0.63	0.49	0.04	-0.06	-0.05	0.61	0.24
Kurtosis	-0.91	1.36	-0.14	-0.89	-1.02	0.40	-0.37	-0.85	-1.12

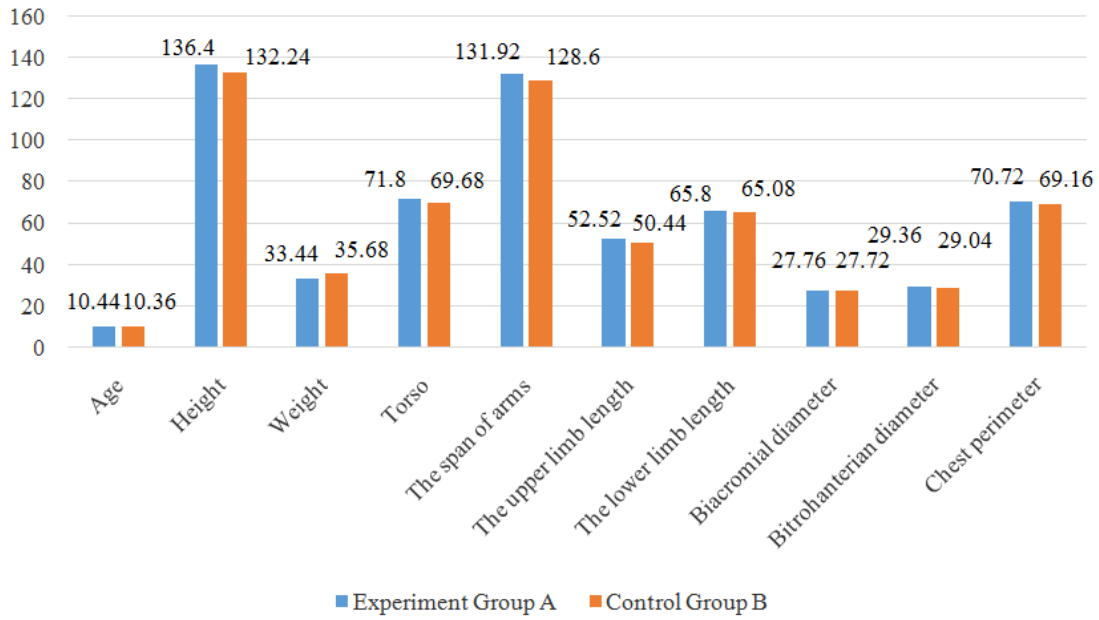

Figure nr. 3 The interpretation of the anthopometric evaluation results at the Experiment Group comparing to the Control Group – Final test

At the final motor evaluation we can observe the differences between the experimental group and the control group, thus, taking it point by point we can note that at the parameter "height", the experimental group has an average of 136.40 cm, with an additional 4.16 cm compared with the control group, which recorded an average of 132.24 cm. At the parameter "weight", we found that the control group, with an average of 35.68 kg, has added 2.24 kg group compared with experiment group, with an average of 33.44 kg. At the "bust" parameter, we found a difference of 2.12 cm between the experiment group average of 71.80 cm, and those from the control group, with an average of 69.68 cm.

At the index "arm span", we found a difference of 3.32 cm between the experimental group, with an average of 131.92 cm, and the control group with an average of 128.60 cm.

At the parameter "the length of the superior members", we recorded a difference of 2.08 cm between experiment group, with an average of 52.52 cm, and the control group with an average of 50.44 cm. Regarding the index "the length of the inferior members", we found a difference of 0.72 cm between the experiment group, with an average of 65.80 cm, and the control group with an average of 65.08 cm.

At the parameter "biacromial diameter" we can observe a difference of 0.04 cm for the experimental group, with an average of 27.76 cm, compared to the control group with an average of 27.72 cm. At the "bitrohanterian diameter", we can see a difference of 0.32 cm between the experimental group, with an average of 29.36 cm, compared to the control group with an average of 29.04 cm.

At the index "chest perimeter", we find a difference of 1.56 cm between the average of the experiment group (70.72 cm) and the average of the control group (69.16 cm).

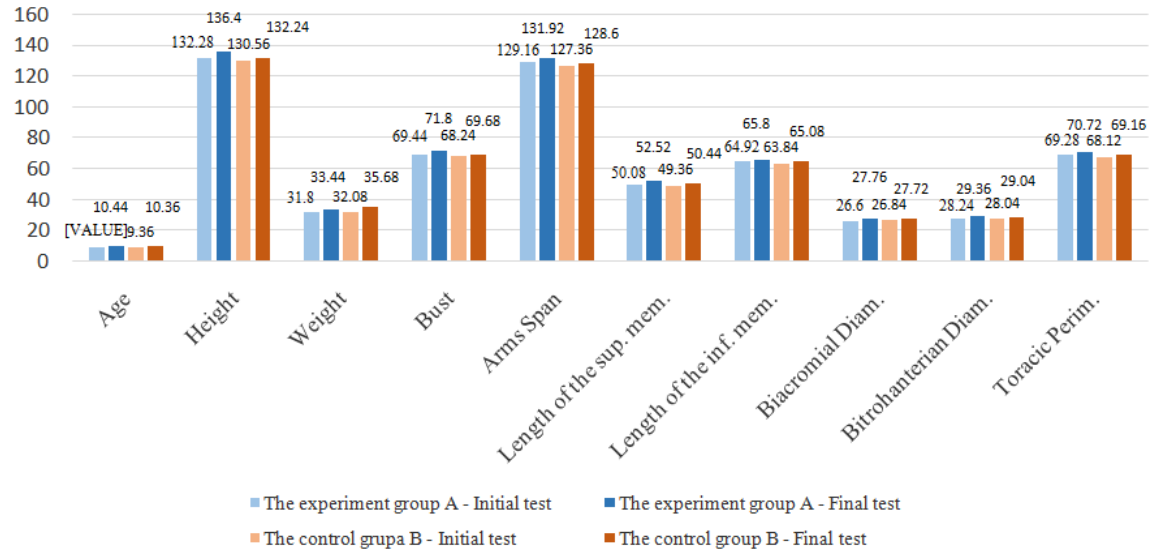

Figure no. 4 The differences between Initial test and Final test at the Experiment Group and the Control group at the anthropometric measurment

Analyzing anthropometric differences between intitial and final tests at the two groups, experimental and control, we see the following:

– in the case of parameter "height", at the experimental group, was registered a significant increase of 4.12 cm, representing a growth rate of 3.11 %, superior to the control group where we registered a growth of

1.68 cm, representing a growth rate of 1.27 %, applying the significance test T-test we noticed that the t value was 3.67562 and the value of p was 0.000299, $p < 0.05$, indicating a significant difference between the two groups of students;

– regarding the index "weight", we registered a superior growth at the control group of 3.60 kg, representing a growth rate of 11.12 %, compared to the experimental group where we had an increase of 1.64 kg, representing a growth rate of 5.16 %, applying the significance test T-test, we noticed that the value of t was -1.90728 and the value of p was 0.031239, $p < 0.05$, indicating a significant difference between the two groups of students;

– within the index "bust", we saw a higher progress in the experimental group with a 2.36 cm growth, representing a progress rate of 3.40 %, compared to the control group where we recorded an increase of 1.44 cm, representing a progress rate of 2.14 %, applying the significance T-test we noticed that the value of t was 2.61682 and the value of p was 0.005917, $p < 0.05$, indicating a significant difference between the two groups of students;

– at the index "arms span", we saw an increase of 2.76 cm at the experiment group, representing a progress rate of 2.14 %, superior to the control group which recorded an increase of 1.24 cm and a progress rate of 0.98 %, applying the T-test of significance we noticed that the value of t was 2.30585 and the value of p was 0.12741, $p < 0.05$, indicating a significant difference between the two groups;

– within the index "length of the superior members", at the experiment group we recorded an increase of 2.44 cm, representing a progress rate of 4.87 %, superior to the control group where we recorded an increase of 1.08 cm and a growth rate of 2.19 %, applying the significance T-test we noticed that the value of t was 2.56549 and the value of p was 0.006741, $p < 0.05$, indicating a significant difference between the two groups;

– regarding the index "the length of inferior members", we recorded at the experimental group a increased of 0.88 cm, representing a progress rate of 1.37 %, lower than at the control group where we had an increase of 1.24 cm, representing a rate of progress 1.88 %, at the significance T-test we noticed that the value of t was 0.73241 and the value of p was 0.23374, $p < 0.05$, which indicates a significant difference between the two groups of students;

– within the parameter "biacromial diameter", we recorded an increase of 1.16 cm, representing a progress rate of 4.36 % in the experimental group, superior to the control group which recorded an increase of 0.88 cm, representing a progress rate of 3.24 %, applying the significance T-test we noticed that the value of t was 0.05515 and the value of p was 0.478123, $p < 0.05$, which indicates a significant difference between the two groups;

– at the parameter "bitrohanterian diameter" we observed at the experimental group an increase of 1.12 cm, representing a progress rate of 3.97 %, superior to the control group which recorded an increase of 1 cm, representing a progress rate of 3.57 % applying the significance T-test we noticed that the t value was 0.43233 and the p value was 0.33372, $p <0.05$, which indicates a significant difference between the two groups of students;

– in the case of the index "chest perimeter", we registered within the experimental group an increase of 1.44 cm, representing a progress rate of 2.08 %, superior to the control group which recorded an increase of 1.04 cm, representing a progress rate of 1.53 %, applying the significance T-test we noticed that the t value was 2.19017 and the p value was 0.016701, $p < 0.05$, indicating a significant difference between the two groups of students.

6. Conclusions

The inclusion into educational training programs, at primary school students, of an agonistic method with a character of initiation into the practice of sports games positively influence the development of bio-motor ability. Thus considerable progress in the experimental group compared to the first test and also compared to the control group for the following parameters: height (where we registered a growth rate of 3.11 % in the experimental group compared to the control group where we record a growth rate of 1.27 %) bust (we observe a growth rate of 3.40 % in the experimental group compared to the control group where we see a growth rate of 2.14 %), the span of arms (where we recorded a growth rate of 2.14 % in the experimental group, compared to the control group where we have a growth rate of 0.98 %), the length of superior members (we registered at the experiment group a growth rate of 4.87 %, compared to the control group where we have a growth rate of 2.19 %), biacromial diameter (we notice a growth rate of 4.36 % in the experimental group compared to the control group where we have a growth rate of 3.24 %), bitrohanterian diameter (we recorded a growth rate of 3.97 % in the experimental group compared to the control group where we have a growth rate of 3.57 %), thoracic perimeter (notice a growth rate of 2.08 % in the experimental group compared to the control group where we see a growth rate of 1.53 %).

In conclusion, we can say that results of this research showed that more physical activities can influence the development of children both in and the anthropometric way and in functional and health-related.

REFERENCES

Dragnea, A. (2000). *Teoria educaţiei fizice şi sportului.* Bucureşti: Cartea Şcolii.

Dragnea, A., Bota, A., Teodorescu, S., Stănescu, M., Șerbănoiu, S. & Tudor, V. (2006). *Educaţie fizică şi sport. Teorie şi didactică.* Bucureşti: Fest.

Grigore, V. (2007), *Exerciţiul fizic. Factor activ pentru prevenirea îmbătrânirii şi instalării bolilor degenerative*, Bucureşti: Didactică şi Pedagogică.

Horghidan, V. (2000). *Problematica psihomotricităţii*. Bucureşti: Globus.

Macovei, S. (2012). *Stretching*. Bucureşti: AFIR.

Stănculescu, L.M. (2015). *Extracurricular sports activities – opportunities for psychological, physical and social integration of 10 to 12 year old students*. Ph.D. Theses, Bucureşti: UNEFS.