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THE ANALYSIS AND INTERPRETATION OF THE EXPLOSIVE POWER VALUES CONCERNING THE STUDENTS IN THE 12TH GRADE AT, LAZAR EDELEANU" COLLEGE, PLOIESTI

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Abstract

Purpose. The research conditions allowed us to choose three easy methods that can be applied in high school: the Grintescu method, throwing the rounders' ball, in order to measure the explosive power of the superior limb and the depth jump without take-off.

Method. The research was conducted during school year 2011/2012 during the physical education classes at LazarEdeleanu College, and it was performed on 60 students of the 12th grade. The initial tests were conducted during the month of September and the final tests began at the beginning of June.

Results. The endeavour of our research meant using some research methods and techniques that had at their basis: the experimental method, the investigation method, the measuring and registering results method, and investigation methods such as; the mathematical-statistic method and the graphic one.

Conclusion and discussion. Our research leads us to the conclusion that the methods as well as the means used to develop the explosive power were correctly chosen and took into the account the psyche-motric particularities under all their aspects. By studying different papers that have as subject aspects in this field, I came to the conclusion that the methods selected were in accordance with the objectives I intended to reach, and Finichiu, M. (1998) paper,,The Efficiency Degree of measurement and Evaluation Methods of the Explosive Force'', confirmed through the analysis and comparative technique of the tests that the means selected were the appropriate ones.

Key words: students, explosive power, measurement, evaluation, interpretation

Introduction

The world we live in, the speed of evolution and transformation, the lack of activity, the stress and unhealthy food impose the necessity of physical education at all levels of education, so that we can ensure a rational equilibrium in adapting the body to the changes that occur during the physical and motric changes characteristic to every age stage. The goal of physical education is to preserve the health, to increase the physical and intellectual capacity and to prepare the college graduate to cope with a superior stressful stage of his life. The development of motric capacities at this stage registers remarkable progress, that can be quantified by a brief analysis of the power and factors that condition it, by stressing the fact that the neuromuscular coordination depends on it, as well as the training of its capacity and the enlargement of muscular mass that is so important in a harmonious physical development and for an ideal performance of any activity and by increasing work capacity.

The muscular power is part of the important motric abilities, being used in the great majority of work fields, and especially in motric activities. In the absence of motric abilities, the works in this field confirmed the fact that there can be no normal physical development.

The absence of the power, and in general of motric abilities, makes it impossible to form and consolidate any motricity. There is a tight relation between the

motric ability (conditional and coordinative) and the motric skills, relation that is important from a methodology point of view. It is known that, in order to achieve a motric activity, it is necessary to move at least one segment of our body, having a bigger or smaller weight. This movement always modifies the inertia of that segment and this can be achieved only by using a power. Here, we refer to the contraction or extension of one or many muscles. During the physical education and sport the term "Power" refers to two aspects: power that is characteristic to movement and power as an inherent quality of the human body. The development of these motric qualities is especially complex, and needs to make use of specific exercises and stimuli. In obtaining superior performance of the power, we need to undertake a long process that is based on the following principles:

- Progressivity, continuity
- Efficacy, specificity, variety
- Specificity, individuality, progressivity.

The explosive power, as it is the one that interests us the most in this study, is one of the manifestation forms of two motric capacities that have a vast applicability during the physical education and sport classes and it needs a "good coordination between speed and power" [Tudor, 2005].

The dictionary of medicine and sports describes the "tension release as being the bio-motric quality that

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allows a discontinuous development of movements and consists in the capacity to cope with a motric act and a big tension, followed by an abrupt expansion”.

The main components of tension release are the explosive power and the start power. By, explosive *power* we mean the ability to achieve an immediate raise in the power, per time unit and it depends of the contraction speed of fibre units, on the number and contraction power of the fibres that are engaged in the effort” [Stoica, 2000, page. 68].

We come to the conclusion that many specialists agree that the terms of explosive and start power are one and the same thing but reality infirm this theory, by stressing the fact that by start we understand speed in a power scenario while its main quality is, in fact, power. The explosive power is defined as being the capacity that some individuals have to raise up from the ground as high and easily as possible.

The controversial, spectacular and indispensable motric ability stands for a motric indicator for which the students of the 12th class were tested. The results obtained led us to be able to make an analysis, interpret and draw the conclusions that are specific to any scientific endeavour.

The Hypothesis and Scope of the Research

The methodology of power development makes use of a large range of methods and specific means that can be used according to the purpose, the maximal abilities of the body, according to sex, age, level of training, the material means and apparatus the teacher disposes of in his experimental endeavour. These studies have as purpose establishing the measures that need to be undertaken in order to ensure a long period of activity and to prevent the degenerative processes of the body, of involution of some functions, due to the lack of motric activities, which is a consequence of limiting movements and physical effort during the work process.

The hypothesis is the validation of the Grințescu method, not necessarily as a calculation formula of the explosive power, that proved to be both right and efficient in time, but also of the goal of being used by students, in order to self-evaluate the level of their explosive power development at a certain point, while they are encouraged to practice systematically and independently final exercises having as goal the increase of the level of physical manifestations and, implicitly, the improvement of the quality of life.

If we are to constantly introduce the depth jump without take-off and throwing the rounders' ball we'll certainly obtain a progress in the performance achieved by students, progress due on the one hand to perfecting the technique and developing the explosive power, on the other hand, a great progress in developing the upper and lower limbs. This second aspect is at the basis of our research.

The development in the motric capacities and qualities during the physical and sport education classes has to be obtained in specific ways and using specific means. We consider that by facilitating and accessing new evaluation methods, the self-evaluation can become stimuli for the systematic and independent practice of physical exercise.

Research Methods

The research was conducted during school year 2011/2012 during the physical education classes at LazarEdeleanu College, and it was performed on 60 students of the 12th grade. The initial tests were conducted during the month of September and the final tests began at the beginning of June.

The following motric indicators were measured: the explosive power of upper limbs as they threw the rounders' ball and the explosive power of the lower limbs for which we used the depth jump without take-off and the explosive power of lower limbs during the exercises of high jump without take off and with two steps take-off. We also took into consideration the values of the antropotetical indicators of each student, as follows: height, the height of the body with one hand up while sanding, and the weight.

The research methods chosen in this research are part of the particular and processing methods as well as analysis and gathered data interpretation.

The testing the initial and final take-off was made using the Grințescu method. The use of this method is an efficient way of testing the students and the results of this test can become criteria of selection for the representative sport teams of this high school and, what is more, it helps evaluating the work of the teacher.

In the specific literature we find the way of determination of the value of explosive power that can be achieved according to the formula: $D = m \times v$; where: D = take-off (kgm/s); m = body weight of student (kg); v = take-off speed (m/s).

Results The results of the research methods are illustrated in the tables and figures below:

Table 1. Motric Indicators – indicator values statistically calculated

| Statistic Indicators | Vertical jump | | Vertical jump with take-off of 2 steps | |
|----------------------|---------------|------------|--|------------|
| | Initial Test | Final test | Initial Test | Final test |
| X | 43,20 | 45,40 | 47,25 | 50,45 |
| S | 2,64 | 2,71 | 2,89 | 3,08 |
| Cv% | 6,11 | 5,96 | 6,11 | 6,10 |
| EEm | 43,20±0,52 | 45,40±0,54 | 47,25±0,57 | 50,45±0,60 |

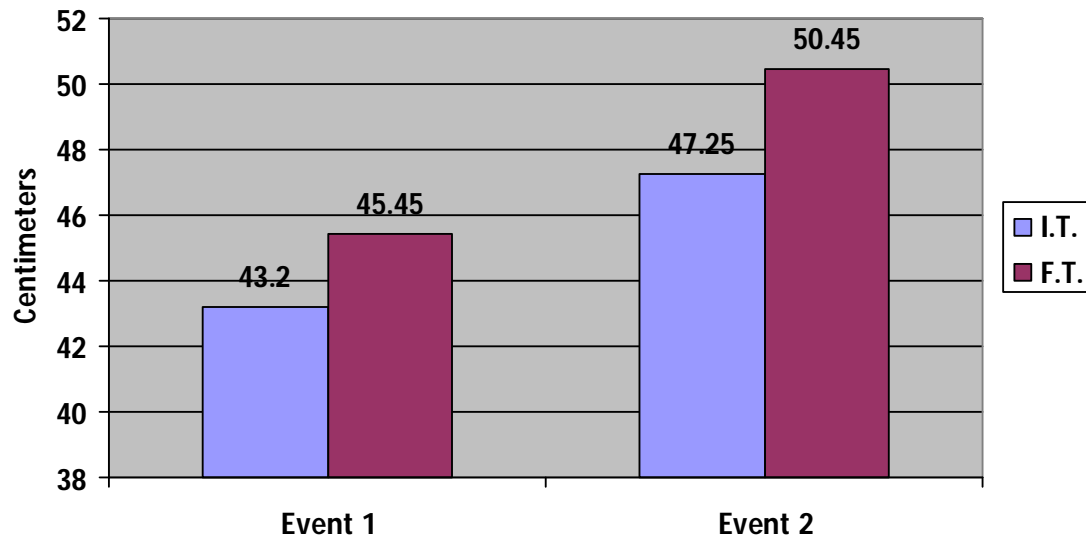


Figure 1. Graphic representation of arithmetic mass of the results obtained during the motric testing.

Event 1, Vertical jump without take-off; Event 2, Vertical jump with two step take-off; IT, initial testing; FT, final testing.

Table 2. Values of the statistic indicators calculated- Throwing the rounder's ball while standing

| Statistic Indicators | Throwing the Rounders ball while Standing in one Place | |
|----------------------|--|------------|
| | Initial Test | Final Test |
| X | 42,20 | 46,40 |
| S | 2,34 | 3,42 |
| Cv% | 5,54 | 7,37 |

Table 3. The values of the statistic indicators after gathering the anthropometric measurement results

| Statistic Indicators | Body weight | | Height with arm lifted up | | Body height | |
|----------------------|--------------|------------|---------------------------|------------|--------------|------------|
| | Initial test | Final test | Initial test | Final test | Initial test | Final test |
| X | 70,65 | 72,84 | 231,31 | 232,02 | 176,24 | 178,42 |
| S | 10,08 | 10,39 | 14,77 | 14,82 | 6,52 | 6,60 |
| Cv% | 14,26 | 14,26 | 6,38 | 6,38 | 3,69 | 3,69 |

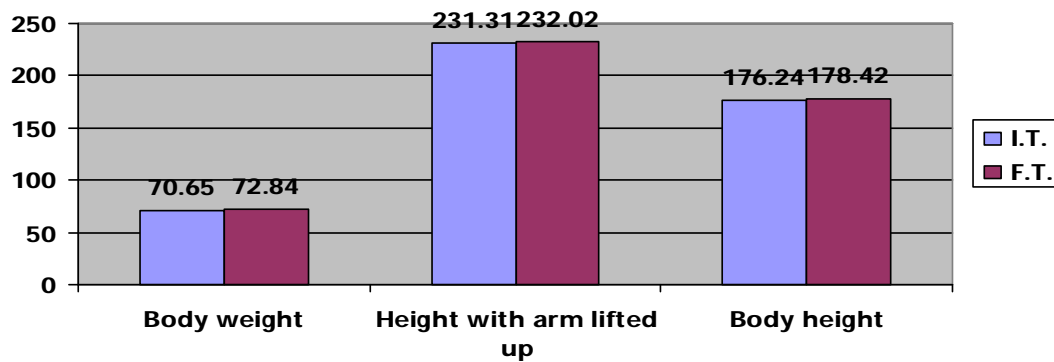


Figure 2. Graphical representation of medium arithmetic values of antropometric parameters IT, initial testing; FT, final testing.



Figure 3. Model event



Figure 4. Model event

Discussions

The test for vertical jump with take-off and two steps was taken in the gymnasium of the high school, in an especially prepared. In order to make these measurements, a fix calibrated lie was used. The students had two jumps each and the best result was registered.

The data recorded were organised in tables and then the data centralised and interpreted statistically, establishing: arithmetic mean (\bar{X}), standard deviation (S), variable coefficient ($Cv\%$) and estimating the medium error (EEm).

The values of the statistic calculated (Table 1), the motric indicators that interested us were the following: After the test of *vertical jump* that tested the explosive power of the lower limb, we came to the conclusion that the arithmetic mean after the initial test was

higher by 2,20 cm as compared to the arithmetic mean registered in the initial test.

The variable coefficient calculated after the two tests indicates a great similarity of the results registered in the initial test but also in the final one, and they are in the range of 0-10%.

The calculation of the estimation of error in the arithmetic mean shows that this lays in the trust interval of $43,20 \pm 0,52$ ($43,72 \div 42,68$), after the initial test and between $45,40 \pm 0,54$ ($45,94 \div 44,86$) after the final one at $p < 0.01$, trust degree 99%.

In the test of the *vertical 2 steps jump* (Figure 1) that tested the explosive power of the lower limbs, we can observe that the value of the arithmetic mean is higher after the final testing by 3,20 cm as compared to the initial one.



The variable coefficient indicates that we are dealing with a group of students that is homogenous in the results but the final testing had quite better results than the initial one.

The calculation of the error in the arithmetic mean shows that it is situated between the trust level of $47,25 \pm 0,57$ ($46,68 \div 47,82$), after the initial testing and between $50,45 \pm 0,60$ ($51,05 \div 49,85$) after the final testing of $p < 0,01$, trust level of 99%.

The test for throwing the rounder's ball was used, on the one hand, with the purpose of testing the explosive power of the upper limb and, on the other hand, to help us select the handball team of the high school. The test was performed on the sports field of the high school, in an especially arranged area. The measurement was made with a metric line.

It must be mentioned that the students, the time span between the two tests, perfected and managed to consolidate the throwing technique, which could be observed in the progress of the performance registered in the last test.

In the test of throwing the rounders ball, illustrated in **Table 2**, we tested the explosive power of the upper limb. We can notice that the value of the arithmetic mean is higher by 4, 20 m in the final test as compared to the initial one.

The variable coefficient indicates that we dealt with a group of students that has a high homogeneity in the registered results.

The anthropometric measurements allowed us to make a connection between the performances obtained from the moment of the initial test to the final one and the increase in anthropometric indicators, a natural increase, if we consider the aspect of the age span – boys of 17-18, as they are still in the period of growth, as opposed to girls.

We were particularly interested in the value of the body weight. The weighing was made with an electronic scale. The height of the body was also measured by using a height meter and for the height of the body with one hand up, a centimetre scale placed on the wall was used.

The body stature is an anthropometric parameter observed in **Table 3**, whose measurement allows us to make the following observation: the arithmetic mean of the students selected is close to the arithmetic mean of the population in our country, and the age span is 17-18 years of age; the arithmetic mean calculated after the final testing was higher by 2, 18 cm, which is a significant increase. The subjects also have a growth as to the parameter of body height with one arm up – a plus of 0,71cm.

The variable coefficient as to body weight in within normal parameters; namely the parameter height-stature – we have a big variable coefficient that is relatively constant in the time span of the two tests, aspect that applies also to the anthropometric parameter that applies to the height of the body with one arm up, next to the ear. The relatively constant value shows us

that the registered results between the two tests and the two group tests register a great homogeneity (0 – 10%). The values resulting from the measurement of *body weight* (body mass) point to a group of subjects being within the limits of average value limits in our country for this age group. The raise in weight of 2, 19 kg, for the time span September- June is significant, but it does not worry us as it is correlated to the growth in height. The results registered present, after calculating the variable coefficient, a medium homogeneity of 10 – 20%. The results of the measurement of the motric indicator as to the height of the subject from ground to the tip of the middle finger of his right hand with the arm raised next to the right ear, registers a progress of 0, 71cm at the final testing, fact that is certainly due to the improvement of the physical body development of the students between the two test.

Conclusions

1. After the gathering and interpreting the primary data we came to the conclusion that there is an evolution in the medium arithmetic values for all tests.

2. The increase in the average arithmetic mean is due to the fact that the participant subjects worked on a greater than usual level of difficulty physical exercises during the physical education exercises.

3. At the end of our research, namely during the final test, we noticed a considerable improvement in the execution technique, especially in the case of length jump without take-off and throwing the runners ball, thing that led to an increase in individual performance. Thus, these results are rather modest

4. The jumps performed in order to register the take-off in 2 steps was made with difficulty due to the lack of coordination, but, at the same time, this test as well as the vertical jump while touching the highest pint on the wall, gave way to emulation and the desire to surpass their limits; the teacher seldom noticed that the students verified themselves their results, fact that confirms the hypothesis that the Grintescu method can be also used so that students can self-evaluate their explosive power at a certain point, as long as they are encouraged to systematically and independently practice physical exercise in order to increase their level of physical condition manifestation and their quality of life.

5. We consider that the low motricity level originally registered is the result of lack of interest from the part of young people, as well as school, society and the lack of competition.

6. The results of the research were useful to the teachers who were in charge of the representative teams of handball and volleyball of the high school, using the registered data after the test chosen by us as primary selection criteria.

7. In the motric evolution of the students, the interpretation and evaluation of results took into consideration especially quantity and quality aspects.



8. We must also mention the fact that, although throughout the year we paid close attention to the subject of our research, the sports classes didn't focus only on force, but they were in accordance with the requests of the teacher's plans activities.

9. By studying different papers that have as subject aspects in this field, I came to the conclusion that the methods selected were in accordance with the objectives I intended to reach, and Finichiu, (1998) paper, "The Efficiency Degree of measurement and Evaluation Methods of the Explosive Force", confirmed through the analysis and comparative technique of the tests that the means selected were the appropriate ones.

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