



## RESEARCH REGARDING THE EFFICIENCY OF THE BODY STRENGTH DEVELOPMENT PROCEDURES ON THE ECTOMORPH SUBJECTS

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### Abstract

*Starting from the recognition of the fact that for searching an efficient method to develop the body strength, a long period of time is necessary, period in which stress, the will to abandon, disillusion, can be accumulated. It has been considered opportune to find out a procedure to develop the body strength for each somatic type.*

*The purpose of this research is to demonstrate which out of the ectomorph subjects being situated in the 3 groups (using different procedures) obtained better performances at the barbell bench press exercise.*

*If the somatic types are different through definition in what regards the characteristics, then for the efficiency of the body strength development certain development procedures are to be found for each somatic type.*

*We observe that the H calculated in the experiment is bigger than the critical H from the Chi-square table, in which case the research hypothesis is confirmed.*

**Keywords:** *ectomorph, procedure, weights, training.*

**JEL classification:** *I20, I23*

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### 1. Introduction

According to Baechle, T. and Earle, R. (2008, p. 4) “physical exercise and sport performance involve effective, purposeful movements of the body. These movements result from the forces developed in muscles, which, acting through lever systems of the skeleton, move the various body parts.”

According to Crossley, J. (2012, p.3) “the kinetic chain is the total sum of the nervous action and muscular action used to move bones and joints involved in any particular movement.”

Each individual is different and has different requirements; therefore from this somatic point of view we are not all the same. The expression “somatic type” is the living proof out of which we can deduct the allegiance of an individual to one of the three groups, unanimously recognized as a classification mode of different human characteristics, the most of them being part of the genetic inheritance of the respective person (for example the shape of the skeleton and the thickness of the

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bones etc. are gene characteristics that cannot be modified) as well as another series of characteristics where modifications can be done (for example the size of the body mass etc.).

According to Zatsiorsky, V. and Kraemer, W. (2006, p. 3) “strength conditioning theory is part of a broader field of knowledge, the science of training athletes, also termed training science or theory of sport training.”

After Schwarzenegger, A. (1999, p. 47) opinion “bodybuilding is a sport of form, but instead of movement the form involved is that of the body itself-the size, shape, proportion, detail, and aesthetic quality of the physique as developed in the gym, prepared by dieting, and displayed by performing bodybuilding poses.”

After Cârstea Gh. (2000, p. 72) opinion “strength is the ability of the body to overcome internal and external resistance through muscle contraction.”

Starting from the recognition of the fact that for searching an efficient method to develop the body strength, a long period of time is necessary, period in which stress, the will to abandon, disillusion, can be accumulated. It has been considered opportune to find out a procedure to develop the body strength for each somatic type.

## **2. The methodology of the research**

The purpose of this research is to demonstrate which out of the ectomorph subjects being situated in the 3 groups (using different procedures) obtained better performances at the barbell bench press exercise – this we can state from the results obtained in the 1RM test (one maximum repetition).

The present research is just one part of a more complex experiment.

### *2.1 The research hypothesis*

If the somatic types are different through definition in what regards the characteristics, then for the efficiency of the body strength development certain development procedures are to be found for each somatic type.

### *2.2 Research methods*

In the research we will use the following research methods: the bibliographic study, the observation method, the experiment method, the statistic method.

## **3. The research content**

The research took place in Lupeni Theoretical Highschool, and it was conducted in the interval: autumn 2010 to summer 2011.

- 3 groups x 8 subjects.



- Age 17-18 years old.
- Duration: September 2010 – June 2011.
- Place: Lupeni Theoretical Highschool.
- The program duration: 40 weeks, 90 training sessions.
- Number of participants: 24.
- Place of the experiment: the gym.
- Duration of trainings: 40-50 minutes.
- The frequency of the trainings: 3 per week.

**Table 1 Distribution of the subjects by the procedures used in training**

Group	Name forname	Somatic type
1. The procedure of weight training	C. D., Ș. Mi., N. Z., P. P., M. L., C. Al., M. D., B. Cr.	Ectomorph
2. The procedure of training to failure	H. R., B. P., C. Al., U. V., S. N., C. C., A. O., Ș. Ma.	Ectomorph
3. The procedure of circuit training	B. C., M. Al., C. G., G. A., N. A., M. F., Ș. C., R. V.	Ectomorph

The procedures used in the experiment are the following: the procedure of weight training; the procedure of training to failure; the procedure of circuit training. (Cârstea, Gh., 2000, p. 74-78)

The experiment was undertaken for 40 weeks: between 13<sup>th</sup> September 2010 to 17<sup>th</sup> June 2011 and covers 6 training stages.

Stage 1 and stage 2

The intensity used in training

Weeks 1-2: 75% from 1RM, 2 series of 10 reps

Weeks 3-10: 75% from 1RM, 3 series of 10 reps

Stage 3 and stage 4

The intensity used in training

Weeks 10-20: 80% of 1RM, 3 series of 8 reps

Stage 5 and 6

Intensity used in training

Weeks 20-30: 85% of 1RM, 3 series of 6 reps



Training days: Monday, Wednesday and Friday

- Monday: pectoral, triceps, anterior deltoid
- Wednesday: back, biceps, lateral and posterior deltoid
- Friday: thighs, calves, abdomen

On each stage, the exercises used for developing each muscular group were modified.

A test exercise has been chosen for each important muscular section. The barbell bench press exercise has been chosen for the pectoral muscle.

#### 4. Results

In the case of data analysis, for a clearer understanding of the tables and graphics we have used the following subjects:

- G1 – the group of subjects that use the procedure of weight training in each somatic type.
- G2 – the group of subjects that use the procedure of training to failure in each somatic type.
- G3 – the group of subjects that use the procedure of circuit training in each somatic type.

In the next pages we are presenting, the statistical indicators: the nonparametric Kruskal-Wallis test for testing the statistical hypothesis (analog Anova by the parametric tests), the interpretation of the results and for establishing the hierarchy of the groups and the graphic representation of the progression rate.

**Table 2 Statistical indicators for ectomorphs at the barbell bench press exercise**

Statistical indicator	Ectomorphs					
	G1i	G1f	G2i	G2f	G3i	G3f
Mean (kg)	60.12	79.63	60.12	73.63	60.12	73.13
Median (kg)	60.00	80.00	60.50	73.50	60.00	73.00
Standard deviation (kg)	1.55	1.92	1.80	2.26	1.24	1.81
Maximum value (kg)	63.00	82.00	62.00	77.00	62.00	76.00
Minimum value (kg)	58.00	76.00	57.00	71.00	58.00	71.00
Amplitude (kg)	5.00	6.00	5.00	6.00	4.00	5.00
Coefficient of variation (%)	2.6%	2.4%	3.0%	3.1%	2.1%	2.5%

Following the data obtained with the help of the statistical calculations we can state that in group G1 the arithmetic mean has grown from the initial testing to the final testing, the difference being registered is 19.51kg, in group G2 the difference registered is 13.51 kg and in the last group is 13.01 kg.

Also, the median has grown from the initial testing to the final testing, difference in group G1 being of 20.00kg, in G2 13.00 kg and in G3 also 13.00kg.



We have observed differences in regard to the maximum value, this growing from G1 group in the initial testing to the final testing with 19.00 kg, in the group G2 the growth being of 15.00 kg and in the G3 the maximum value rising with 14.00 kg.

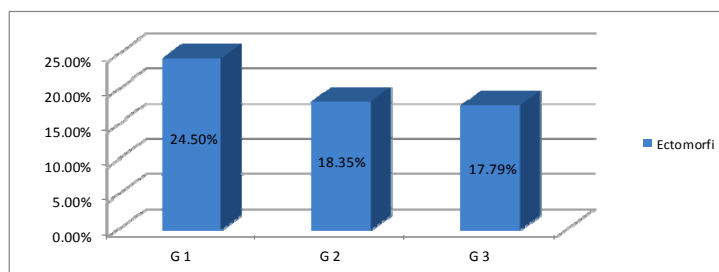
The minimal value obtained after the final testing in group G1 is bigger with 18.00 kg in comparison with the initial testing. The G2 group the difference between the initial testing is of 14.00 kg, and in G3 the growth is of 13 kg.

Coefficient of variation shows a decrease at G1 of 0.1% between the initial testing and the final testing, but in G2 we can notice an increase of  $Cv = 0.1\%$  between the initial testing and the final testing, and in G3 the growth is 0.4%. We can conclude that all the samples are homogenous.

**Table 3 Kruskal - Wallis test for ectomorph subjects at the barbell bench press exercise**

Confidence threshold set - $\alpha$	<b><math>\alpha = 0.05</math></b>
Null hypothesis (H0)	<b><math>m_1=m_2=m_3= 0</math></b>
Alternative hypothesis (H1)	<b><math>m_1\#m_2\#m_3\# 0</math></b>
Degrees of freedom df	<b>2</b>
Total number of subjects	<b>24</b>
H critic (Chi-square tables)	<b>5.99</b>
H calculated	<b>16.49</b>
Confidence level calculated - $p < 0.05$	<b>0.000262</b>

The verification of the statistical hypothesis with Kruskal - Wallis test has shown that there is at least a significantly difference between the median of the groups,  $p < 0.05$ . We can observe, though comparison, that the H calculated ( $H=16.49$ ) is bigger than the value of tabular H for the chosen significance threshold (5.99 for  $p < 0.05$ ), in order to reject the null hypothesis. We can conclude that H calculated is statistically significant, the null hypothesis is rejected, and the research one is accepted, so there are significant differences between the medians of the three groups.



**Chart 1 The progression rate at the ectomorph subjects for the barbell bench press exercise**



The progression rate shows that G1 had better results than G2 and G3. The subjects from G1 had a growth rate of 24.50%, the G2 18.35% growth and the ones in G3 a growth of 17.79%. This highlights the greater progress that was recorded by the subjects from G1 group.

## 5. Conclusions

The procedure in which the ectomorph subjects have obtained better results was the procedure of weight training. The other two procedures have recorded a lower growth which shows that for the ectomorphs the procedure in which they can obtain the best results is the procedure of weight training.

We observe that the H calculated in the experiment is bigger than the critical H from the Chi-square table, in which case the research hypothesis is confirmed.

In the barbell bench press exercise, the arithmetic average (table nr.2) indicates a normal distribution and reflects correctly the central tendency of the array of values. The dispersion of the results presents a homogenous structure for all groups. In regard to the progression rate, the subjects from G1 have had a growth of 24.50%, the subjects from G2 group a growth of 18.35% and the subjects from G3 a growth of 17.95 %. This shows the higher progress registered by the subjects from G1 group. To verify the statistical hypothesis with the Kruskal-Wallis test has shown that there is at least a significant difference between the medians of the groups,  $p < 0.05$  and in this way the null hypothesis ( $H_0$ ) is rejected and we accept the alternative hypothesis ( $H_1$ ).

The above mentioned conclusions support the hypothesis of the research, and it gives us the necessary indicators to try in the future, similar sort of experiments.

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