

AN ATTEMPT FOR OPTIMIZATION AND ANALYSIS OF THE TRAINING LOAD, CHARACTERIZED BY ABSOLUTE POWER ENDURANCE

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Abstracts

We set a goal – to find out to what degree tenacity, as a quality, can be developed when a special training overtaxing is applied to women, who regularly do strength exercises with weights. The present experimental investigation of the influence of systematical functional overtaxing with strength exercises with weights on the body of the investigated persons, aged 16 – 22. The experimental training lessons cover two periods of nine months each. Two groups were included in the experiment – an experimental group and a monitoring one. There were 30 women in each group. The reliability of the obtained differences during the monitoring measurements in both groups was established with the help of Student's t-test. We applied a linear correlative analysis. These results, among other things showed that: the more elementary the exercises are, with respect to technical performance, the greater the interdependence between the maximum strength abilities and the absolute tenacity; the absolute tenacity together with the maximum strength has the greatest ability for development of all tested indexes.

Keywords: *female pupils and students, exercise with weights, pulse frequency, t-test, correlation analysis*

INTRODUCTION

Endurance can be defined as the capacity of a man to perform physical activity for a long time, which loads his basic functional systems. The main parameters, characterizing the endurance are connected with the aerobic exchange, pulse frequency, concentration of lactate in the blood, oxidation of fats and carbohydrates. The special endurance of a man who plays sports can be defined as a highly efficient, specific performance. When the performance of maximum sport achievements has been seen as a criterion for special endurance, it is called absolute power endurance. The relative power endurance carries information about the individual abilities of the sport persons to perform intensive activity.

We set a goal – to find out to what degree tenacity, as a quality, can be developed when a special training overtaxing is applied to women, which are regularly doing strength exercises with weights.

METHODS

The present experimental study of the influence of systematical functional overtaxing with strength exercises with weights on the body of the included persons, aged 16 – 22, was organized by the Department of Physical Education and Sport at Ruse University "Angel Kanchev". The experimental training lessons cover two periods of nine months each. Two groups were included in the experiment – an experimental

group and a monitoring one. There were 30 women in each group. Before the experiment started, the women underwent a preliminary medical check. No deviations from the normal biological constant values were observed for the relevant population (Georgiev (Георгиев), 1973). At the end of the 9-th and the 18-th months monitoring measurements were carried out within the both groups. The monitoring data gave us information about the initial data and the dynamics of the tenacity development.

All measurements were taken by the same persons, using the same apparatuses. There were three monitoring measurements throughout the experiment.

1. Initial data,
2. Results from the first phase of the functional overtaxing,
3. Final results from the two-year functional overtaxing.

The training lessons were held in the weight lifting gym of the sports complex "Yalta" as well as in the gymnasium of Ruse University "Angel Kanchev". They were supervised by Mr. Obreshkov, a senior lecturer at the University.

We applied the following statistic methods of processing the results of SPSS-16 system

(Brogli & Petkova (Брогли & Петкова), 1988).

1. *Variation analysis.* Through which we found out the average level of the indexes, the way in which they vary (change) and their deviation from the average values. The reliability of the obtained differences during the monitoring measurements in both groups was established with the help of Student's t-test.

2. *Correlative analysis.* We applied a linear correlative analysis to determine the type and the character of interdependence between the tested indexes and their absolute values as well as to define the type and the character of interdependence between the development rate and the regress of certain indexes, correlating the increase and the regress interrelations at the same time.

RESULTS AND DISCUSSION

Tenacity was studied with respect to 6 different exercises. The results from the experimental investigations show that tenacity indexes have been changed considerably – Table 1. The figures in the table show that total tenacity for the 6 exercises have been increased at the end of the first year by 43.1% on the average and by 83.1% at the end of the 2nd year.

Table 1. Development dynamics of tenacity at various stages of the two-year experiment (experimental group).

Indexes	Investigations									Differences of the absolute values and per cent, „t”						
	I			II			III			I - II			I - III			
	\bar{X}_1	v	S_1^2	\bar{X}_2	v	S_2^2	\bar{X}_3	v	S_3^2	Abs. value	%	t	Abs. value	%	t”	
Basic strength exercises with lever																
Maximum number of repetitions for lever lifting from a lying position at 70% from the initial maximum	7,2	15,0	2,9	9,3	24,0	3,0	11,3	25,0	2,6	2,1	28,5	4,5	4,1	56,3	9,1	
Maximum number of repetition for kneeling with a lever on the shoulders at 70% from the initial maximum	7,4	13,0	2,3	9,9	13,2	1,8	12,0	17,0	3,1	2,3	30,9	6,0	5,0	61,7	10,4	
Maximum number of repetition for lever pulling with a narrow grip from start position at 70% from the initial maximum	10,0	17,4	6,9	12,3	17,5	6,3	11,7	17,8	5,0	2,3	22,5	3,3	6,6	66,0	10,2	
Maximum number of repetition for folding and unfolding of the armpit muscles with a 10-kg lever	4,2	17,4	2,2	8,9	18,5	2,5	10,8	23,9	2,6	4,7	111,2	11,6	6,6	156,0	16,0	
Strength exercise without a lever																
Exercises for the abdominal muscles	16,9	16,6	107,8	24,9	35,6	79,0	31,8	26,0	68,7	8,1	48,2	3,1	15,0	89,3	6,0	
Facial bearings	7,9	102,0	63,1	9,3	77,2	52,0	13,4	49,8	36,6	1,4	17,7	0,7	5,5	69,6	3,0	

For the lever lifting from lying position exercise (70% from the initial maximum) the increase is 4.05 number of raising between the 2nd and

the 3rd investigations, which is statistically reliable ($P_t > 95\%$). With respect to the 21-year old student I.B. this increase was of 146%. For the

kneeling with a lever on the shoulders exercise the difference between the number of the maximum repetitions (at 70% from the initial maximum) for the first and the third investigations is 4.5 repetitions. This increase is statistically authentic ($P > 95\%$). With respect to the nineteen-year old student S.T. the increase is by 10.5 repetitions (123,5%). The tenacity of the armpit muscles has increased by 6.5 repetitions on the average (156%), the difference being authentic ($P > 95\%$). With respect to the 21-year old student I.V this increase was by 230%. The tenacity of the abdominal muscles has increased with 15 repetitions (98.2%). The best results were those of the 20-year old E.I. – 55 repetitions. The tenacity of the upper limbs was also tested and measured by the facial bearing index. The average data about the tenacity of Bulgarian women aged 16 – 22 (Yanev, Shterev, Dobrev et al., (Янев, Щерев, Добрев et al. 1982), measured by this index, are as follows: 16-year olds – 7 repetitions, 20-year olds – 5.7 repetitions and 22-year olds – 5.9 repetitions. It is obvious that as women get older, their tenacity decreases. Our experimental investigation shows that the tenacity of the women, who took part in the experiment, increased with 5.5 repetitions on the average (69.6%). This increase is statistically authentic ($P > 95\%$). The results from the correlative analysis are contradictory.

For the following indexes – kneeling with a lever on the shoulders (at 70% from the initial maximum) and lever pulling with a narrow grip from a start position (at 70% from the initial maximum) – was established great dependence on the applied basic strength exercises (fig.1 and fig.2).

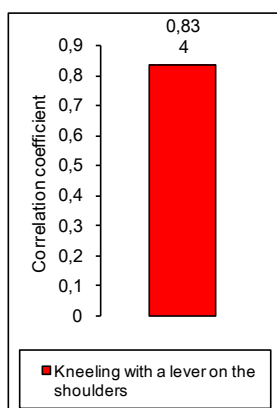


Fig. 1. Correlative values of the maximal number of repetitions at 70% from the initial maximum for kneeling with a lever on the shoulders

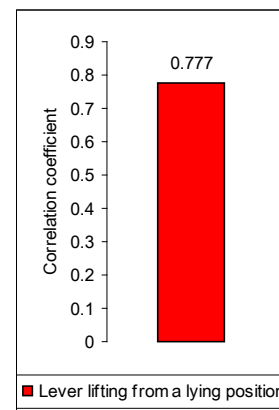


Fig. 2. Correlative values of the maximal number of repetitions at 70% from the initial maximum for lever pulling from a start position

The moderate correlations can be explained by the fact that the tested persons performs the armpit muscle exercise until giving up with a constant weight of 10 kg., their own weight being almost unchanged. This fact convinced us that the absolute strength is the crucial factor for the increase of the tenacity. Zatsiorski (Защиорский, 1982), thinks that if the aggravating value exceeds the maximum strength by 20%, the absolute tenacity is considerably and progressively influenced by the absolute strength level. Zalei (Жалей, 1965), observed the dependence of $r=0,780$ between the absolute strength and the number of gatherings at a horizontal bar. Hadzhiev (Хаджиев, 1967) did not observe any considerable dependence $r = 0,310$ between the maximum strength and the statistic tenacity. There is a moderate dependence among the tenacity, and the static, explosive and dynamic strength (Zara, 1971).

The correlation values between the development of the investigated values of absolute tenacity and the applied basic means of physical effect do not differ very much and do not contradict the upper-mentioned dependence (3rd investigation, experimental group).

Having in mind the biological characteristic features of women's body, the type of training lessons and the results obtained, we drew the conclusion that the training lessons for the tested persons should be aimed toward the development of tenacity as a quality, not at the increase of absolute strength. The method of repetition should be applied as well as a method

of performing an exercise until giving up, using weight of 40-70% of the initial maximum; the repetitions for a single attempt were from 10 to 40. A special interest was given toward the obtained correlation values among the indexes, giving us information about the absolute tenacity and the anthropometrical measurements (fig.3

and fig.4). The correlation coefficient from the 1st and the 3rd investigations for the experimental group speaks on constantly increasing interrelations, which reach the highest values during the third investigation.

These insignificant changes speak on the great positive effect of tenacity exercises, with

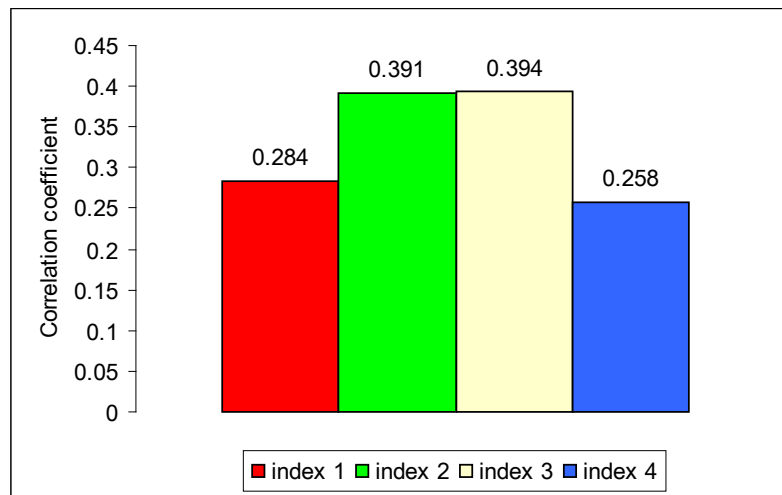
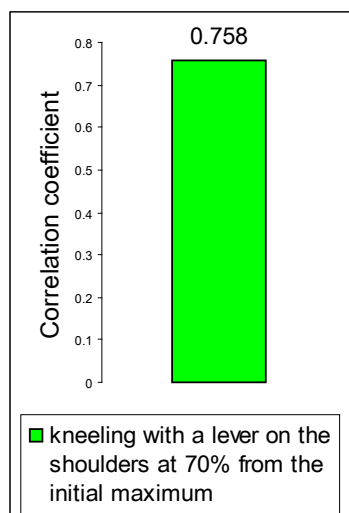


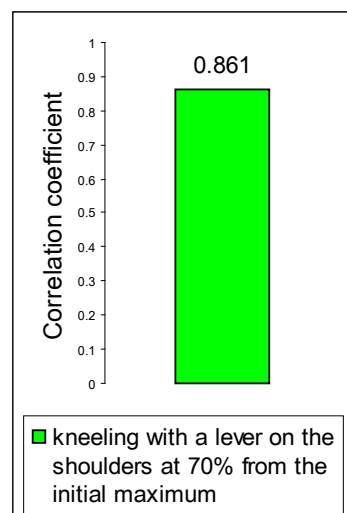
Fig.3. Correlation coefficients between the chest measurements (breathing out) and the basic tenacity exercises

significant reduction of bodily weight of the tested persons in the experimental group. Actually, this change means that the anthropological measurements of some of the overweight

women have reduced, while the measurements of the underweight women have increased on the bases of the increasing partial muscle tenac.



a



b

Fig. 4. Correlation coefficient between the left (a) and right (b) thigh measurements and the index for kneeling with a lever on the shoulders at 70% from the initial maximum

CONCLUSIONS

1. The absolute tenacity, measured by the basic strength exercises at 70% from the initial maximum, is strongly influenced by the maximum muscle strength.
2. The absolute tenacity, detected by constant exercises – folding and unfolding of the armpit muscle with a 10-kg.weight, considerably depends on the state of the maximum muscle strength.
3. The more elementary the exercises are, with respect to technical performance, the greater the interdependence between the maximum strength abilities and the absolute tenacity.
4. The absolute tenacity together with the maximum strength has the greatest ability for development of all tested indexes.

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ОБИД ЗА ОПТИМИЗИРАЊЕ И АНАЛИЗА НА ТРЕНАЖНИТЕ ОПТОВАРУВАЊА КОИ СЕ КАРАКТЕРИЗИРААТ СО АПСОЛУТНА СИЛОВА ИЗДРЖЛИВОСТ

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(Испиражувачка белешка)

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Апстракт

Целта на истражувањето беше да се утврди во кој степен може да се развие способноста на снажна издржливост при специфичното тренажно оптоварување кај женските спортистки кои систематски се занимаваат со вежби за снага со тегови. Во истражувањето кое имаше експериментален карактер за влијанието на систематското оптоварување со вежби за снага со тегови, беше опфатен примерок на испитаници, поделен во две групи од по 30 спортистки на возраст од 16 до 22 години. Експерименталниот тренажен третман беше спроведен во два временски периоди од по 9 месеци. За утврдување на разликите од влијанието на тренажниот процес во текот на контролните мерења меѓу двете групи, применет е Студентовиот *t*-тест. Применета е и корелациона анализа. Добиените резултати од истражувањето, меѓу другото, покажаа дека: доколку вежбањето во однос на техничките барања е поелементарно, дотолку зависноста меѓу можностите за максимална снага и апсолутната издржливост за сила, се поголеми; апсолутната издржливост за сила, заедно со максималната снага имаат најголеми можности за развој на сите третираны показатели во ова истражување.

Клучни зборови: *ученички и студентски, вежби со тегови, фреквенција на пулсот, t-тест, корелациона анализа*

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