

# STATE AND DYNAMICS OF THE SOMATIC TYPES INDEXES AND THE FATTY TISSUE FOR WOMEN, PRACTISING STRENGTH EXERCISES WITH WEIGHTS

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## Abstract

The methods of the somatic scientific research work usually do not include individual analysis of the interrelations among the various skin flaps and the rest of the indexes. More often than not these interrelations are commented through the indexes of bodily fat and the absolute amount of bodily fat. Such approach is of great importance to women, who practice strength exercises with weights, because it gives information about fat accumulation. The method enables us to define precisely the character and degree not only of fat depots, but also the eventual type of corpulence. All this makes it possible for us to find out adequate means and methods of overcoming such unwanted states through physical overtaxing, diets, hormone intervention, etc.

**Key words:** fat tissue, overtaxing, thigh muscle measurements, women

## Introduction

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, 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. (V. Georgiev, 1973) At the end of the 9-th and the 18-th months monitoring measurements were carried out in both groups. The monitoring figures gave us information about the initial data and the somatic type indexes and the fatty tissue. 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

Table 1. Comparative somatic data for the persons in the experimental group, compared to those of some of the Bulgarian sportswomen, practicing various sports.

Sports events	% BF	AQBF, kg	AMM, kg	TMM, kg	ABM, kg
Biathlon	15,90	9,00	21,40	49,10	47,20
Academic rowing	18,60	13,10	22,20	53,60	56,10
Volleyball	13,10	9,30	22,40	52,40	59,70
Wrestling	10,80	6,40	26,00	53,30	49,80
Aerobics	9,00	5,00	22,50	52,40	49,50
Experimental group	11,88	10,1	19,52	49,53	46,90

**BF** = per cent of bodily fat

**AQBF**, kg = absolute quantity of bodily fat

**AMM**, kg = arm pit muscle measurement

**TMM**, kg = thigh muscle measurement

**ABM**, kg = active bodily mass

**FT** = fat tissue

**AQMM** = absolute quantity of muscle mass

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 (Q. Brogly, L. Petkova, 1988).

1. Variation analysis. Through it 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’ criterion.

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

We set ourselves the task to find out whether it is possible to influence and reduce the per cent of fat tissue (%FT) and build firm, shapely and attractive women’s figure.

## Research methods and procedures

The relative quantity of fat tissue for the persons in the experimental group is expressed through the index %BF in Table 1, compared to those of some of the Bulgarian sportswomen, practicing various sports.

We were impressed to discover that the women in the experimental group differ greatly from the sportswomen with respect to the per cent of fat tissue. All of the above-mentioned sports events are very popular in Bulgaria, It is obvious that the women from the experimental group have lower level of fat tissue than the tested sportswomen, who go in for volleyball, academic rowing and biathlon. For these sportswomen the relative strength is of great importance, while the presence of fat tissue might be a problem. Only the sportswomen, going for wrestling and aerobics, have better %FT indexes. The results from the variation analysis show that both indexes of fat accumulation - %BF and AQBF, for the

experimental group mark lower values of variability. The decrease is especially great for AQBF – from 24,10 %V for the first investigation to 19,55%V for the third investigation. The value of %FT index for the first investigation is 20,59 %V and for the third investigation it is 17,96%V ( Table 2 ). These explicit data give us enough ground to say that guided overtaxing with weights leads to decrease of the indexes' values and their grouping about the average values. The ABM and AQMM indexes, which give us information about muscle accumulation, also decrease their variability but to a lesser degree. This leads us to the conclusion that when overtaxed with strength exercises with weights, women are inclined to lose fat tissue rather than accumulating muscle tissue.

Table 2. Average data about the variation values of the indexes, related to fat and muscle mass, experimental group

Indexes	I investigation %V	II investigation %V	III investigation %V
%BF	20,59	19,79	17,96
AQBF	24,10	23,07	19,55
ABM	15,19	15,03	14,39
AQMM	17,74	17,20	15,84

The relative level of bodily fat for the persons in the experimental group can be defined as extremely positive, because most authorities are of the opinion that for women, who do not go in for any sport, the average portion of %BF may be 23-25% (M. Toteva, 1990). The analysis of the absolute quality of bodily fat (AQBF) logically shows a similar tendency, because AQBF appears to be a function of %BF and the person's weight.

Interesting is the fact that the AMM and TMM measurements slightly differ from the correspondent anthropometrical measurements. What follows is that the muscle component considerably exceeds fat accumulation in the limbs of the persons practicing strength exercises with weights. Table 3 shows the somatic peculiarities for the various sports events (V. Georgiev, 1973), compared to those of the tested young women, who practice strength exercises.

Table 3. Comparative somatic data for the persons in the experimental group (fitness), compared to those of some Bulgarian sportswomen, who go in for various sports

SPORTS EVENTS	ENDO	MEZO	ECTO
Track events (sprint)	2,92	3,67	2,78
Track events (medium races)	2,95	2,97	3,33
Track events (jumps)	2,90	3,38	3,03
Field events (throwings)	4,75	5,35	1,10
Track events (pentathlon)	2,25	3,98	2,30
Swimming	2,89	3,56	3,16
Academic rowing	4,10	4,17	2,30
Kayak	3,73	4,22	1,90
Sports gymnastics	2,11	3,46	3,62
Art gymnastics	1,53	2,83	4,91
Acrobatics	3,10	3,94	3,10
Water jumps	2,84	3,65	2,98
Skiing (Alpine events)	3,78	4,16	1,42
Skiing (running)	2,94	3,74	2,68
Basketball	3,45	2,96	3,13
Volleyball	3,39	3,57	2,82
Handball	3,83	4,40	1,89
Football	3,96	4,23	2,60
Judo	3,87	4,59	1,87
Weight lifting	3,82	6,09	0,75
Sdudents, who do not go in for sports	4,50	3,00	1,50
Experimental group	3,80	4,95	1,95

We can definitely say that the tested persons in the experimental group belong to the so-called "endomorph-mezomorph" type,

characterized by extremely low ectomorpha – 1,95. We can also observe low values in the group of judo sportswomen, skiing (Alpine events) and track events

(throwing). We made the conclusion that the maximum individual endomorphic value is 4,87 , being at the same time the highest value for all sports in Table 3.

The mezomorpha of the tested persons in the experimental group, who practice strength exercises (Table3), is also characterized by positively high values (4,95), preceded only by the values of the sportswomen, who go in for weight lifting (6,09) and track events-throwing (5,75). The analysis of the average somatic data for the various sports events shows that the high mezomorphic values are in inverse proportion to those of ectomorpha, and vice versa (weight lifting, judo, art gymnastics and track events-throwing. The mezomorphic and the ectomorphic components are in inverse proportion. The results from our investigations show that the entire training (training classes, diets and recovering) of persons, practicing strength exercises, enables, guides and helps us to achieve and retain comparatively low ectomorphic

values (1,95) , at the presence of definite mezomorpha (4,95). This fact can definitely be established by comparing the data of the tested persons, practicing strength exercises, ENDO-3,80, MEZO – 4,95, ECTO – 1,95 and those of students, who do not go in for any sport ENDO – 4,50, MEZO – 3,00, ECTO – 1,50. To conclude the somatic investigation, we can point out that it is the optimal training classes with weights which enable the achievement of harmonious physical development, characterized by low level of fat tissue, excellent muscle development on the background of esthetically long limbs. By analyzing the interrelations between the functional anthropological indexes and the anthropological indexes we established certain dependences. As we expected, the bodily weight correlates with considerable dependences and is influenced by the massiveness of the bone construction of the body, because we established considerable dependences on the transverse chest diameter –  $R = 0,538$ ; front and back chest diameter –  $R = 0,593$ ; pelvis diameter –  $R = 0,586$  (fig.1).

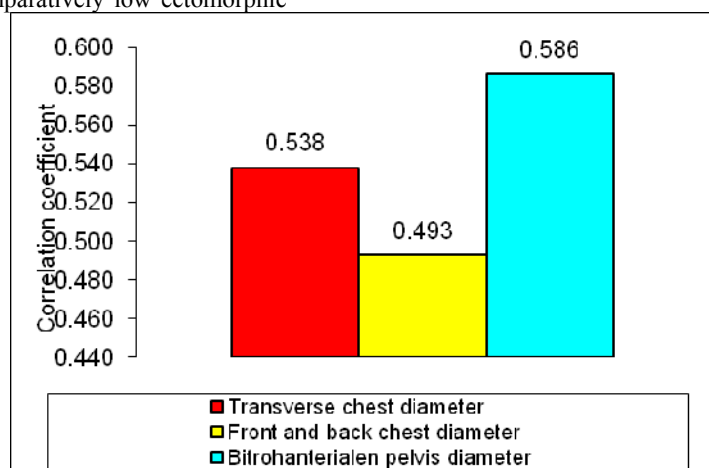


Fig.1

The value of the vital capacity index is influenced by the value of the diameters of the human body, because we established considerable dependences among shoulder diameter  $R = 0,501$ ; front and back chest diameter  $R = 0,460$ ; transverse

chest diameter  $R = 0,489$ ; bicrystal pelvis diameter  $R = 0,5519$  (fig.2). What is interesting in this case is the fact that the established interrelations contradict the belief that the vital capacity depends mostly on the person's height.

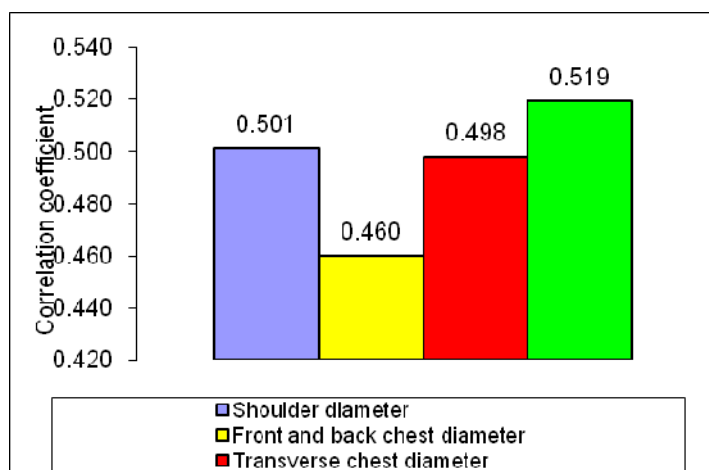


Fig.2

The measurement of the force of both hands, despite the existing functional right-hand side asymmetry, shows dependence  $R = 0,691$ . That is why we have studied only the interrelations

between the right hand and the discussed anthropological indexes. We established medium dependences between neck measurement  $R = 0,63$  and the waist measurement  $R = 0,417$  (fig.3).

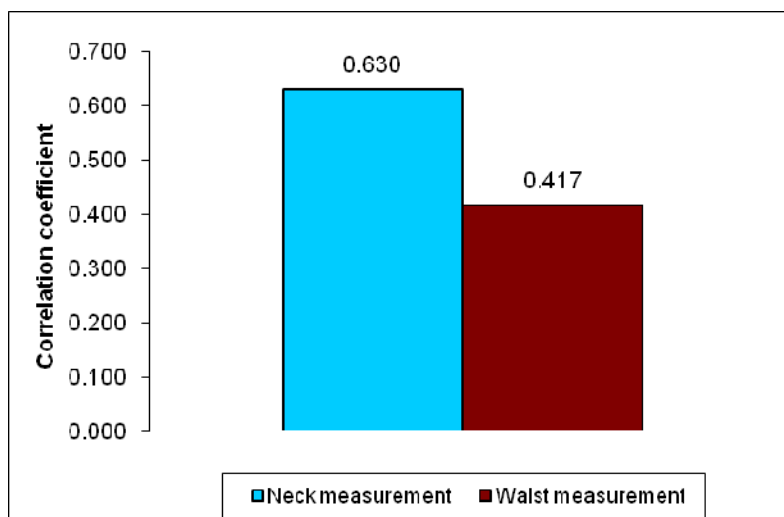


Fig.3

Interesting is the fact that the contraction difference does not influence the maximum manual force  $R = 0,03$ . At the same time the bone component considerably influences the level of the manual force. We established the following

interrelations among shoulder diameter  $R = 0,507$ , transverse chest diameter  $R = 0,519$ , bicrystal pelvis diameter  $R = 0,500$ , bitrohanterialen pelvis diameter  $R = 0,735$ , which are impressive (fig.4).

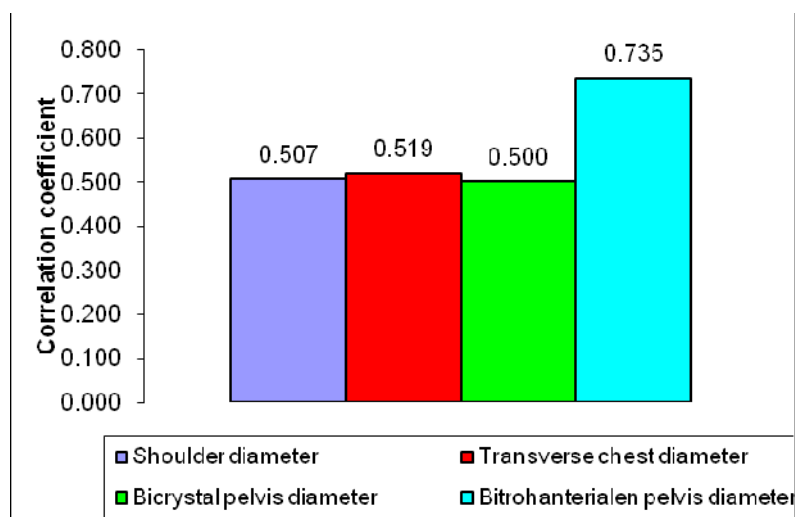


Fig4

With respect to the dependences of the human body we established moderate and considerable correlations, which we are not going to comment because of their affirmative character. The measurement of the flexibility of the spinal cord carries its own information and is not

influenced by any of the anthropological indexes. As for the functional dependence  $R = 0,579$  and  $R = 0,671$ , which we observe between the bodily weight on one hand, and ABM and AQMM on the other hand, it can only be explained with the low %BF level - 15,50 for the tested persons.(fig.5).

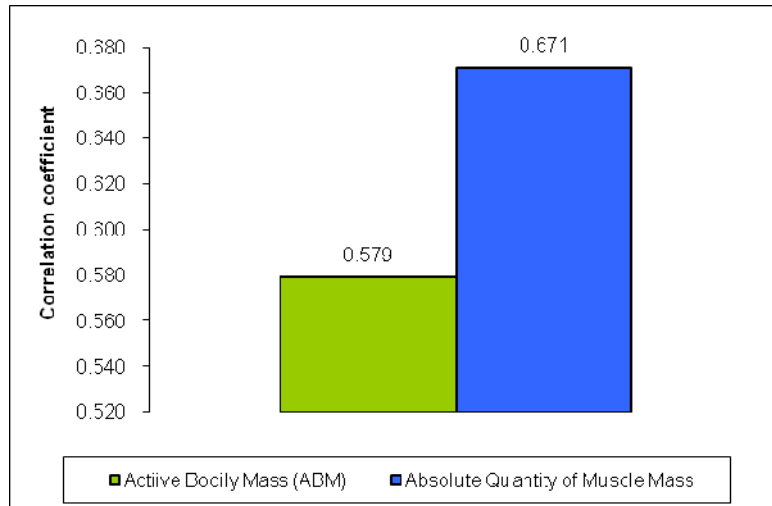


Fig.5

At the same time, with respect to AQMM, we observe medium dependence of the indexes:

vital capacity  $R = 0,423$ ; right hand force  $R = 0,523$  and left hand force  $R = 0,359$ (fig.6).

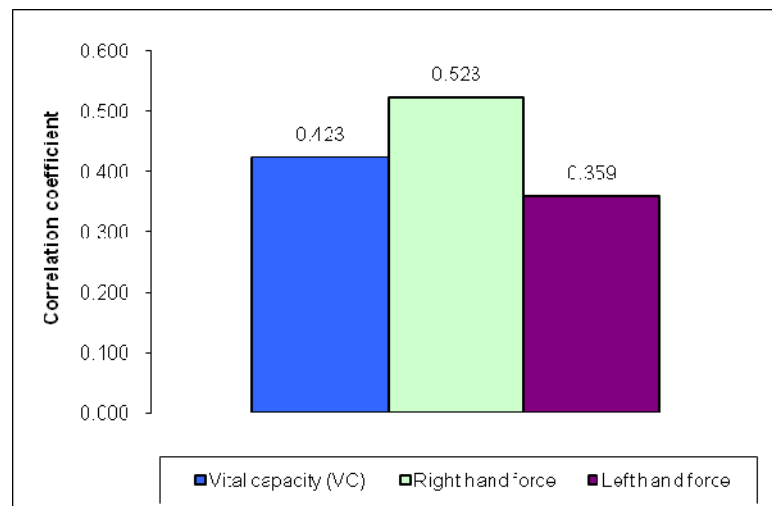


Fig.6

Most research workers establish considerable, even great, dependences between height upright and the bodily weight for persons, who do not go in for any sport. The results, which

we got, speak of the opposite tendency for women, who practice strength exercises. The dependence between the two indexes for these same women is insignificant  $R = 0,181$  (fig7).

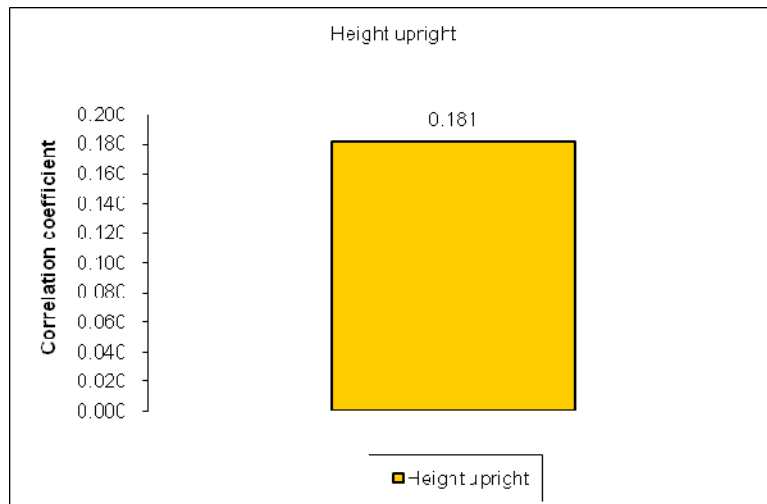


Fig 7

At the same time the bodily weight is considerably influenced by the limbs measurements: right hand armpit measurement –

flexion R – 0,502; right hand armpit measurement – extension R – 0,615, right thigh measurement R – 0,740, right under-thigh measurement 0,578 (fig.8).

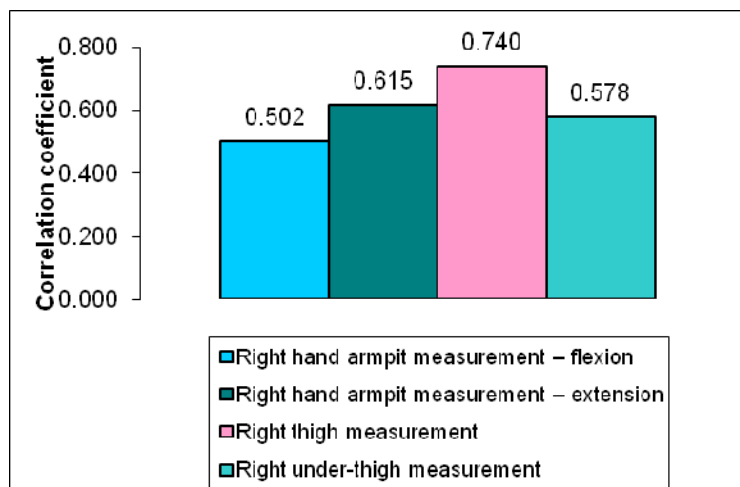
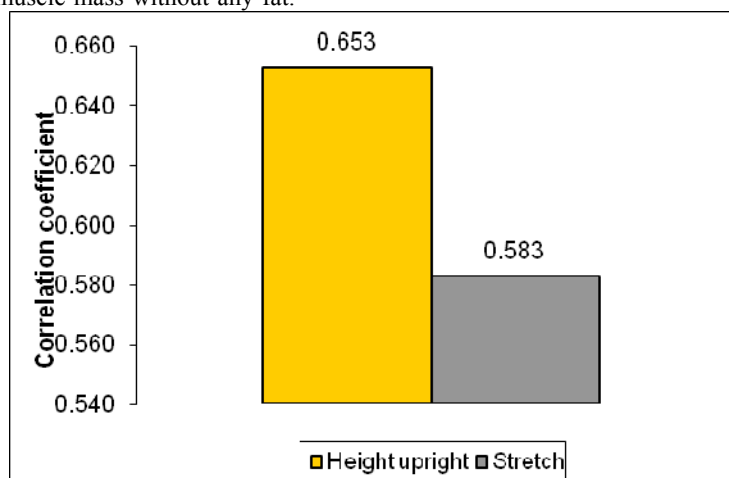


Fig 8

These results make us conclude that the hypertrophic orientation of the strength training and the control of fat accumulation form specific somatic configuration, at which body mass is mostly influenced by muscle mass without any fat.

With respect to the interrelation between VC and the anthropological indexes we confirm the authorities' data, whereas we established the highest dependences for height upright R – 0,653 and stretch R – 0,583 (fig9).



### **Conclusions**

1. As a result of the specific overtaxing of the tested persons we observe slightly visible presence of fat tissue in these same persons.
2. The somatic type of the tested women, who practice strength exercises (3,80 – 4,95-1,95) , can be definitely said to be endomorphic – mezomorph.
3. With respect to the endomorphic and mezomorphic components of the tested persons in the experimental group, we can say that these same persons positively surpass some of the Bulgarian sportswomen in various sports events – swimming, sports and art gymnastics, skiing (running) and others.
4. The specific strength training with weights appears to be a wonderful means of losing fat tissue and building of beautiful and attractive women's body.

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