

Power fitness training as a corrective and preventive system of muscular imbalance

Abstract

The lack of physical activity negatively affects the level of physical fitness and human health. As a result, there may be a disturbance in the balance of the work of different muscle groups, caused by their weakness. This condition is called muscle imbalance. The correction of the muscular imbalance of the human body can occur within the framework of various physical exercises of a powerful character, in the system of many types of fitness aimed at developing the muscular system. The experimental technique defines the system of selection of physical exercises in the framework of strength training with weights and work on simulators for correction of muscular imbalance by affecting weakened muscles with various physical loads, taking into account the factors of physiological influence, balanced nutrition on the human body and the composition of its body. For the preparation of training programs, the “Doctor Wolff Back-Check” treatment and diagnostic system was used. After carrying out the mathematical calculations, it was revealed that the developed program for correcting the muscle imbalance in the women under test had a positive effect on changes in the tone of their weakened muscles of the trunk. According to the primary morpho-physical state of the women studied, it can be noted that the period of fitness training during six months relatively improved their initial indicators. The results obtained within the framework of the dynamics of the development of powerful capabilities, as well as positive changes in the anthropometric testing of the investigators involved, allow us to state that the developed method of conducting corrective-improving exercises in the system of strength training is indicated for the women who have a muscle imbalance.

Keywords: muscle imbalance, medical-diagnostic system, “Doctor Wolff Back-Check”, correction methods, power training

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Introduction

Physical activity represents a special physiological state of a human being, in which the efforts of the body are aimed at overcoming the physical resistance of the environment. In most cases, physical resistance is represented by gravity.¹ Regular physical activity appears to be a part of a particular culture of movement. During physical exercises in the human body, a number of adaptive processes occur that help him to get used to the conditions of regular physical activity. The lack of physical activity negatively affects the level of physical fitness and human health. At the same time, not only does the workability decrease, but the specific skills that were acquired earlier are also lost. The cessation/reduction of muscle activity leads to a slowing of blood flow in the muscles, a decrease in their tone, oxidative-metabolic processes, which in turn worsens/slow down the metabolic processes in organs and tissues. With hypodynamia, there is a deficit of irritation and excitation of the central nervous system, primarily from the side of the flow of afferent influences coming from proprioceptors of inactive muscles, from mechanoreceptors and many other organs.² As a result, there may be a disturbance in the balance of the work of different muscle groups, caused by their weakness. This condition is called muscle imbalance.^{3,4} The last position and determined the hypothesis of our study. It was assumed that the identification of the features of the morpho-physical state of women, as well as the presence of local muscle imbalance, will allow determining the development of a corrective technique that will affect the components of the body weight involved and, in turn, contribute to the development of the power capabilities of individual body parts.

The purpose of our study was to develop a methodology for correcting muscle imbalance in women in the system of health fitness.

Materials and methods

The correction of the muscular imbalance of the human body can occur within the framework of various physical exercises of a power character, in the system of many types of fitness aimed at developing the muscular system. The experimental technique presupposed a system of selection of physical exercises in the framework of strength training with weights and work on simulators for correction of muscular imbalance by affecting weakened muscles with various physical loads, taking into account factors of physiological influence, balanced nutrition on the human body and the composition of its body. For the preparation of training programs it was used medical-diagnostic system “Doctor Wolff Back-Check”.⁵

Subjects

Classes were held three times a week in the gym of the fitness center “Medico Health Club” in Frankfurt am Main with middle-aged women (38-50 years old) who have uneven muscle development. For the study, 6 months of sessions were taken into account, although the participants of the experiment continued to exercise after it.

The experimental program

The structure of the training is traditionally three-part. The preparatory part assumed a general and special warm-up period of 10 minutes. As part of the general warm-up, cardio-exercisers were used

with the establishment of a light load (45-55% of the Heart rate). A special warm-up involved preparing each joint of the body engaged separately. For this purpose, exercises of general physical orientation were performed, which ensured flexion-extension of the joints, and sweeping and rotational movements were widely represented. The main part of the training lasted 30 minutes and was a kind of circular training: work on the stations. Each station was designated by a certain training device to increase the power capabilities of a muscular group. In some cases, weights were used (dumbbells, barbells), bars/horizontal bar, universal bench. At the same time, according to the established area of muscle imbalance and the level of its pathology, a training plan was developed for each station, including: working weight; number of approaches; number of repetitions; rest (sec); speed of movement; maximum heart rate; the position of the initial angle; pillows for breast; saddle, and the like.

The exercises were performed in accordance with the general requirements for breathing in the process of performing strength exercises: uniform, deep, with a somewhat elongated phase of exhalation; the isometric force was done during the exhalation. Correct rational breathing has been given special attention, since without observing this rule, the effect of static efforts of the body may not only be ineffective, but even harmful, causing unfavorable shifts in the functional state of the cardio-respiratory system. The intensity of the developed static force reached 60-75% for all directions, except rotational – for pathological rotation, the intensity decreased to 50%, the load did not exceed 5 seconds. Immediately after the exercises, associated with the effort and tension of the muscle groups, followed the exercises in an arbitrary relaxation. The cool down, or the final part, lasted 10 minutes. As a rule, for this kind of training (power orientation), the lesson ended with stretching exercises of the muscle groups involved in the main part. At the end of the training, the performers carried out breathing exercises of a dynamic nature: the inspiratory phase accompanied movements that increased the chest (for example, spreading and raising hands, straightening the trunk), and exhaling – to the phases of movement that helped to reduce the volume of the chest (for example, lowering or bringing hands back, leaning of the torso). For the education of general endurance it was offered cardio training, which was conducted after a 15-minute rest from the main occupation, lasting from 20 to 60 minutes, which was determined individually. The load averaged according to the 65% of the maximum heart rate. Additionally, a course on Pilates was conducted: twice a week for 45 minutes. The lesson began with the Powerhouse training and general warm-up. Then followed the main part of the lesson, including the following elements: Spine Twist, The Saw, Rolling like a Ball, Seal, Shoulder Bridge, The Hundert, Leg Series, Leg Pull Prone, Push up. All the exercises were performed for 2-3, maximum 5, repetitions. The cool down, as well as in the main training session, presupposed stretching of the muscle groups worked out in the main part.

Results and discussion

Correction of the muscle imbalance involves anthropometric changes. Proceeding from this, we had carried out the following measurements with the help of the “Doctor Wolff Back-Check” treatment and diagnostic system (Figure 1): “weight”, “BMI” (body mass index), “dense tissue”, “body liquid”, “fat tissue”, “body weight without fat”, “waist circumference”, “hip circumference”. After carrying out the mathematical calculations, it was revealed that the

body weight increased slightly ($t = 3.566$) at the level of reliability of the initial and final data $p < 0.05$, and this is justified, since in the process of correction of muscle imbalance the muscle mass increases, which is confirmed by the indices “body fluid” ($t = 4.926$), “fatty tissue” ($t = 4.75$) at the level of $p < 0,01$ and “body weight without fat” ($t = 3.47$) at the level $p < 0.05$. At the same time, there was a positive difference in percentage terms in the range of 1.75-2.6%.

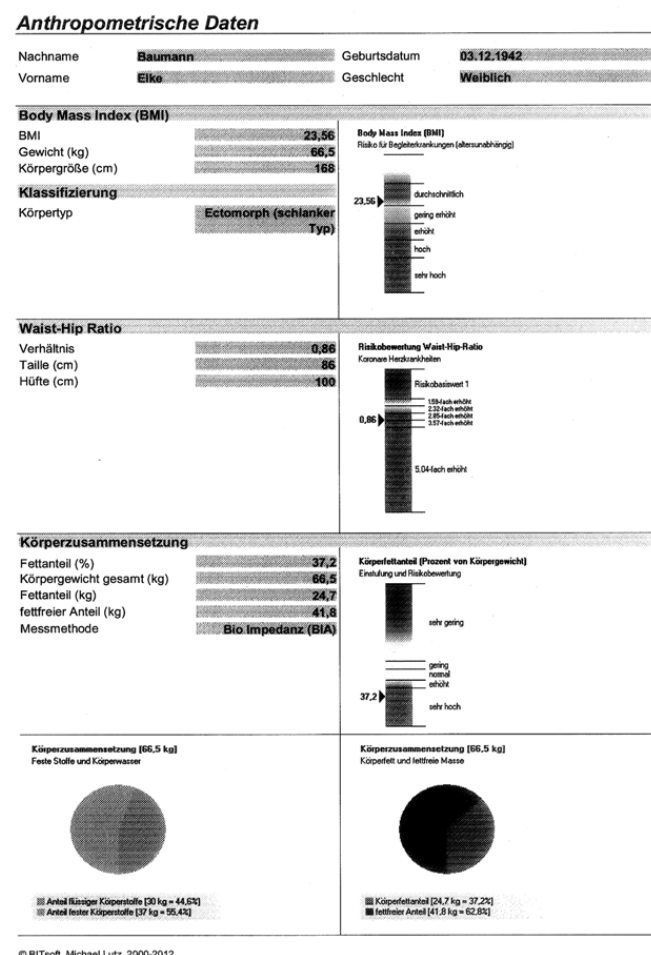


Figure 1 One of the tests, defined within the framework of the “Doctor Wolff Back-Check” treatment and diagnostic system, “Anthropometric data”.

It should be noted that the indicator “BMP” did not change so much ($t = 0.611$), and therefore is not reliable ($p > 0.05$), which is justified for women who are examined, who do not have excess in body weight. The result of the taken circumferences of the body is interesting, where in the correction of muscle mass, the waist indices on average increased by 2.5 cm ($t = 3.968$, $p < 0.01$), and the hips decreased by 1.5 cm ($t = 2.901$; $p < 0.05$).

The foregoing shows that the development program for correcting the muscle imbalance in the women under test has had a really enough positive effect on the changes in the tone of their weakened muscles of the trunk. The level of correction of muscular imbalance can be determined with the help of strength indicators of individual muscle groups, for which measurements were made within the framework of the exercises “Flexion” and “Extension”. At the same time, the recommended indicators were calculated using the *Doctor Wolff*

Back-Check treatment system, then the measured data were taken, and then the following measurements were calculated: the difference between the recommended and measured “Flexion” and “Extension” indicators; they recommended and achieved ratio. Moreover, the recommended index was calculated both before the beginning of

the lessons according to the developed method and at the end of the experiment, as the force values of the exhausted muscle groups changed, and other requirements were imposed on them. Table 1 shows the results of the correction of muscular imbalance in the trunk region in the women studied.

Table 1 Dynamics of average group strength indicators of the muscles of the frontal region of the trunk and back

Parameters	№№	№№	$\bar{X} \pm m \bar{x}$		t	ρ
			initial	final		
Flexion	R(kg)	1	18.9±0.283	18.8±0.424	0.097	> 0.05
	M(kg)	2	38.6±0.768	41.0±0.354	4.589	< 0.01
	DM/R (kg)	3	19.6±2.05	22.4±1.778	2.047	> 0.05
Extension	R(kg)	4	28.4±0.424	28.25±0.654	1.259	> 0.05
	M(kg)	5	35.75±1.856	45.25±2.21	7.342	< 0.001
	DM/R (kg)	6	7.35±1.432	16.2±2.864	4.665	< 0.01

n = 6 (f = 5) for ρ < 0.05, t = 2.447; ρ < 0.01, t = 3.707; ρ < 0.001, t = 5.959

Abbreviations: R, recommended indicators; M, measured indicators; DM/R, Difference between the measured and recommended indicators

As we see, both measured (M) indicators demonstrate the reliability of the initial and final data: “M/Flexion” at the level ρ < 0.01; t = 4.589; “M/Extension” at the level of ρ < 0.001; t = 7.342). In addition, there is a significant difference (ρ < 0.01, t = 4.665) of the measured and recommended parameters for the “DM/R-Extension” parameter, which determines the power capabilities of the back muscles. At the same time, the same indicator, but in the parameter “DM/R-Flexion”, representing the power capabilities of the muscles of the frontal region of the trunk, did not reveal a reliable value (ρ > 0.05, t = 2.047). However, in general, it can be noted that the results obtained are positive, as they are confirmed by the improvements obtained in the percentage ratio. The indices of “DM/R-Flexion” improved by 14.1%; the indicators of “DM/R-Extension” – by 37.05%. The results determining the strength ratios of the muscles of

the sagittal regions of the trunk look slightly different (Table 2).

Here, five of the six indicators demonstrate the reliability of the results. At the same time, three indicators: “R/Linkeseite” (t = 6.708), “M/Linkeseite” (t = 6.94) and “R/Rechteseite” (t = 6.16), revealed a high level of reliability of the initial and the final data ρ < 0.001. Indicators “M/Rechteseite” (t = 5.246) and “DM/R-Rechteseite” (t = 3.933) are reliable at a level of ρ < 0.01. And only the data “DM/R-Linkeseite” (t = 0.454) are not indicative (ρ > 0.05), which does not spoil the overall impression of the results. Given the primary morpho-physical state of the women under study, it can be noted that the period of fitness training in six months has relatively improved their initial indicators. In our opinion, longer-term corrective-health training sessions could demonstrate even better results.

Table 2 Dynamics of average group muscle strengths of muscles of trunk sagittal areas

Parameters	№№	№№	$\bar{X} \pm m \bar{x}$		t	ρ
			initial	final		
Linkeseite	R(кг)	1	29.5±1.837	21.9±1.848	6.708	< 0.001
	M(кг)	2	30.25±2.126	21.5±1.927	6.94	< 0.001
	DM/R (кг)	3	0.75±0.88	-0.4±0.141	0.454	> 0.05
Rechteseite	R(кг)	4	28.75±1.237	21.9±1.848	6.16	< 0.001
	M(кг)	5	28.75±1.149	22.25±1.972	5.246	< 0.01
	DM/R (кг)	6	-0.75±0.088	-0.4±0.141	3.933	< 0.01

n = 6 (f = 5) for ρ < 0.05, t = 2.447; ρ < 0.01, t = 3.707; ρ < 0.001, t = 5.959

Abbreviations: Linkeseite, left side; Rechteseite, right side; R, recommended indicator; M, measured indicator; DM/R, difference between the measured and recommended indicators.

Conclusion

The analysis of specialized literature in the field of health-corrective fitness training allowed to note that studies on the problem of muscle imbalance have developed. However, they are purely informational in nature, which does not allow us to determine the details of the corrective-improving technique. In most cases, this is private information. The results obtained by us, within the framework of the dynamics of the development of power capabilities, as well as positive changes in the anthropometric testing of the subjects involved, allow us to state that the developed technique for conducting corrective-improving sessions in the system of strength training is recommended for the women who have muscle imbalance.

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Conflict of interest

Author declares that there is no conflict of interest.

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