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DETERMINING THE LEVEL OF DEVELOPMENT OF WEIGHTLIFTERS IN THE EARLY STAGE BASED ON ANTHROPOMETRIC INDICATORS

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Abstract. Determining the level of development of weightlifters' bodies in the early stage based on the ratio of anthropometric indicators is a crucial objective in modern sports training, as it aims to obtain the most accurate information about the athletes' condition. This study aims to highlight the influence of exercise forms based on symmetric systems of exercise execution in determining the optimal body parameters based on the assessment of anthropometric indicators in the initial training stage. Therefore, new experimental planning forms were implemented to prepare weightlifters aged 10-12, as part of a practical program during a biannual training macrocycle. In order to assess the level of development of the young weightlifters' bodies, tests were conducted using 4 modules of exercises with symmetric execution as the main physical activity. The applied experimental methodology led to determining the level of development of weightlifters' bodies in the early training stage based on the assessment of anthropometric indicators. This was achieved by implementing symmetric exercise systems in practical training activities to establish this level of athlete preparation. Considering the increased physical development of the athletes involved in the examination process, as well as their general training level.

Introduction

In the early stage of training weightlifters, it is necessary to continuously study the level of body development based on the ratio of anthropometric indicators. These indicators predict the formation of beginner athletes who are at a period of abundant growth. The research of aspects related to specific levels of development, functionality of the body, etc. constituted the main objective of this study. Additionally, according to experts in the field [2, 8, 11], the components of anthropometric indicators include somatometric and somatoscopic indices. These indicators can provide accurate and concrete information about the development and growth of the athlete's body parameters, enabling the achievement of superior and diverse training objectives. Simultaneously, anthropometric data provide coaches with useful and real information, allowing them to make regulatory adjustments and modifications to the athletes' training program.

The concept of somatometric and somatoscopic indices in weightlifters also carries a progressive character [1, 4, 5, 7, 10]. Planning the level of development for beginner athletes is closely related to forecasting. Therefore, the overall teaching of young weightlifters is predetermined and regulated according to the planned activities. When determining the level of development of a beginner weightlifter, both strengths and weaknesses should be taken into account. However, the training activity of weightlifters must penetrate the essence permanently, checking the development of the young athlete and record of anthropometric indices. Certainly, the realization of the planned is possible only through a well-arranged, organized and directed process by the competent people: program managers, trainers, technicians, auxiliary staff, adjacent collaborators, consultants in the field of weight lifting (from the field of bodybuilding- strength, strength fitness, representatives of extreme sports, etc.), which can provide some interpretations of the degree of development with information useful and beneficial to the centralized training of the weightlifting athlete (this is required to select the information most relevant to the growth and development of the body the athlete, but from several points of view, given that the tests listed above have a direct tangent and are in close correlation with the specifics of weight lifting). Certainly, the greatest responsibility in this regard is borne by the coach, a direct person, who checks the degree of development of the body and the record of the anthropometric indices of the athletes. It is worth mentioning that in weightlifting, it is particularly important for athletes to achieve a correct body constitution (without any deviations of the vertebral column, joints, muscle groups, etc.), as the entire process of lifting the barbell is based on equal symmetry of the grip and distributing equal weight on the left and right sides of the body. In other words, the technique of lifting the barbell relies on maintaining balance between the body's sides to raise and stabilize the weight above the head. Therefore, in order to achieve such a result, proportional, balanced, and equal development of both sides and parts of the body is necessary. This is the strict motivation behind continuously monitoring the development, growth, and biological and physiological changes occurring in the athlete's body. Based on the objectives of the initial training phase for weightlifters in terms of "anthropometric measurements," the focus of this study was on symmetric training systems included in the training program. These systems were applied over the course of one year of training. To monitor the athletes' body development during the included exercises, anthropometric measurements were periodically conducted, particularly at the initial and final stages of the study. This was done to obtain information regarding the overall correctness of body development, specific changes and growth in body parameters, and the equality of both sides of the body. All the information gathered about the changes occurring in the athletes' bodies provided added value to properly organizing the training process, often leading to adjustments in the exercise program.

Material-method

As previously mentioned, one of the main methodological approaches in this study was the use of symmetric training systems. This approach involved the synchronization of specially designed exercises (the experimental program consisting of 16 exercises) classified into modules (total of 4 modules) and assigned to be performed according to the body axes, as follows:

Module I: Exercises for the Frontal (Anterior) Axis performed in the Upper and Frontal Regions with the barbell; Exercises for the Frontal (Anterior) Axis performed on multifunctional weight training machines. A total of 4 exercises were planned for this module, two in each case, with the aim of achieving balanced, equal, and proportional movement execution for both weight stability and proportional and symmetrical development of the body sides involved in these actions.

Module II: Exercises for the Frontal (Posterior) Axis performed in the Upper and Back regions with the barbell (two exercises), and Exercises for the Frontal (Posterior) Axis performed on multifunctional weight training machines in the Upper-Back region (two exercises). These two modules involved planning exercises with symmetrical execution in the upward-front and upward-backward directions around the frontal axis. The following modules (three and four) were focused on performing exercises for the Transverse Anterior and Transverse Posterior axes.

Module III: For the Transverse Anterior axis, exercises were performed in the downward-front direction with the barbell (two exercises), and another two exercises, also for the Transverse Anterior axis, in the downward-front direction, performed on multifunctional weight training machines.

Module IV: The planning of exercises for the Transverse Posterior axis involved exercises performed in the downward-backward direction with the barbell (two exercises), and another two exercises on multifunctional weight training machines.

This approach included and mandated (according to the research provisions) the application of anthropometric testing methods to assess **the somatometric indices** of athletes, including height, body mass, chest circumference, and **somatoscopic indices** such as chest shape and muscle development. These measurements aimed to gather information regarding the development and growth of body parameters, record differentiated data, and track transformations occurring in the athletes' bodies during the research period while maintaining functional-morphological limits and the potential for expressing the athletes' physical qualities. The measurement methodology applied in the study used indicators discussed in the literature by domain specialists [3, 6, 9, 12].

Within the undertaken study, the goal was to highlight the influence of the experimental training plan in the initial stage of preparation for weightlifting

athletes and the exercises within the practical program on the athletes' degree of development. Such assessments were conducted through anthropometric research testing (as mentioned earlier), specifically in Module I for somatometric indicators and Module II for somatoscopic indicators.

The aim of the study was to determine the degree of development of the body and the growth of body parameters in weightlifting athletes at the initial training stage, based on the application of symmetric exercise systems. Such exercises would condition proportionality, ambidexterity, and balance in the development of body parts and sides. Additionally, the goal was to assess their influence on achieving optimal body parameters.

The criteria in Module II were determined and evaluated according to the scoring scale presented in Table 1.

Table 1. Scoring scale for evaluating somatoscopic indices.

Score	9.5 - 10.0	9.4 - 9.0	8.9 - 8.6	8.5 - 8.0	7.9 - 7.0	6.9 - 6.0	5.9 - 5.0	4.9 - 4.0	3.9 - 3.0	2.9 – 0
Mark	10	9	8	7	6	5	4	3	2	1

Results, Discussions

Within the measurements according to the criteria of Module I, which considered body height, body mass, left-hand dynamometry, and right-hand dynamometry, diverse results were obtained at different testing stages. Similarly, diverse results were obtained in Module II, where somatoscopic indices were tested, including postural examination, scapular belt examination, waist triangle examination, and inspection of the lower limbs. These assessments of athletes' development compared to those in the experimental group with those in the control group led to the implementation of symmetrical exercise systems in practical activities to determine the degree of development and measure the extent of improvement. These assessments contributed to determining the practical significance of the applied exercises, allowing for conclusions to be drawn regarding the main subjects of the research.

Table 2 presents the anthropometric indicators assessed in the experimental and control groups at the initial stage of the research. Regarding the indicators from Module I (somatometric index testing), it should be noted that at the initial stage of the research, the subject groups proved to be homogeneous in terms of specific testing forms. Thus, for Parameter 1, representing body height, the initial assessment results were not significant, $t=0.66$, $P>0.05$, where the subjects in the experimental group showed an average height of 152.9±0.01 cm, while those in the control group demonstrated an average of 150.3±0.02 cm (it should be mentioned that such pronounced body height is observed in the growing generation according

to statistical data from the Republican Medical Center in the last decade, specifically referring to the Republic of Moldova). Similarly, the subjects in both groups showed similar body weight: the mean for subjects in the experimental group was 46.0±0.36 kg, while in the control group it was 46.1±0.34 kg. Homogeneity was observed between the examined groups in terms of left-hand dynamometry and right-hand dynamometry, where the subjects demonstrated levels of 8.5±0.75 compared to 8.7±0.75, with t=0.11 and P>0.05 for kg/F assessed in the left hand, and 13.9±0.64 compared to 13.2±0.54, with t=0.45 and P>0.05 for right-hand dynamometry. Thus, we establish that at the beginning of the experiment, the subjects are approximately at the same level of training and development, which is advantageous for subsequent reporting at other examination stages.

In the assessment of somatoscopic indicators, which aimed to visually evaluate according to a 10-point rating scale at the initial stage, the following observations were made: the examination of the subjects' posture was rated at 7.7±0.03 points in the experimental group compared to 7.6±0.03 in the control group. The criterion t=0.29, with a significance level of P>0.05, demonstrates a statistically insignificant difference. The criteria 2, 3, and 4 in this module are also statistically insignificant, where t-values range from 0.00 to 0.49, with P>0.05. This includes the assessment of the scapular belt, which yields equal means of 7.4±0.2 in both examined groups. The examination of the back triangle shows an average of 7.4±0.32 points for the subjects in the experimental group compared to 7.0±0.2, the average obtained by the subjects in the control group.

The inspection of the lower limbs shows a score of 7.9±0.32 for the subjects in the experimental group compared to 7.4±0.21 for the subjects in the control group.

Table 2. Anthropometric indicators evaluated in the subjects of the experimental and control groups at the initial stage of research

Nr. d/o	Indicators	Experimental Group (n=10)	Control Group (n=10)	t	P
Module I.					
Testing of somatometric indices **(x±m)**					
1.	Body Height (cm)	152,9±0,01	150,3±0,02	0,66	*>0,05*
2.	Body Weight (kg)	46,0±0,36	46,1±0,34	0,01	*>0,05*
3.	Left Hand Dynamometry (kg/F)	8,5±0,75	8,7±0,75	0,11	*>0,05*
4.	Right Hand Dynamometry (kg/F)	13,9±0,64	13,2±0,54	0,45	*>0,05*
Module II.					
Testing of somatoscopic indices **(out of 10 points) (x±m)**					
1.	Posture Assessment	7,7±0,03	7,6±0,03	0,29	*>0,05*
2.	Scapular Belt Assessment	7,4±0,2	7,4±0,2	0,00	*>0,05*

3.	Waist Triangle Assessment	7,4±0,32	7,0±0,2	0,3	*>0,05*
4.	Lower Limb Inspection	7,9±0,32	7,4±0,21	0,49	*>0,05*

Note: n=10, K=3,08, p>0,05: t =0,700 -1, 812; p<0,05: t =1,812-2.101 p<0,01: 2.262-4,14; p<0,001: t =4,587 - ∞

(As mentioned, in order to identify any deficiencies or inconsistencies in body development, the research team avoided enrolling children in specialized weightlifting groups (both in the experimental and control groups) to prevent encountering spinal deviations in subjects. This was done to ensure that the subjects have promising thoracic parameters, normal abdominal shape, and well-developed longitudinal and transverse arches of the foot. By implementing such conditions, a range of potential issues that could arise during training sessions was effectively avoided.)

Table 3. Anthropometric indicators assessed in the subjects of the experimental and control groups at the final research stage

Nr. d/o	**Indicators**	**Experimental Group (n=10)**	**Control Group (n=10)**	**t**	**P**
Module I.					
Testing of somatometric indices **(x±m)**					
1.	Body Height (cm)	**161,3±0,02**	**159,7±0,02**	**1.4**	***>0,05***
2.	Body Weight (kg)	**55,4±0,11**	**52,7±0,34**	**1,9**	***<0,05***
3.	Left Hand Dynamometry (kg/F)	**27,8±0,24**	**21,7±0,18**	**4.23**	***<0,01***
4.	Right Hand Dynamometry (kg/F)	**28,6±0,27**	**16,0±0,19**	**5.04**	***<0,001***
Module II.					
Testing of somatoscopic indices **(out of 10 points) (x±m)**					
1.	Posture Assessment	**9,3±0,10**	**8.5±0,32**	**2,08**	***<0,05***
2.	Scapular Belt Assessment	**9,1±0,10**	**8,7±0,32**	**1,84**	***<0,05***
3.	Waist Triangle Assessment	**8.8,±0,21**	**8,2±0,21**	**2,19**	***<0,05***
4.	Lower Limb Inspection	**9,5±0,21**	**8,6±0,10**	**2,56**	***<0,05***

Note: n=10, K=3,08, p>0,05: t =0,700 -1, 812; p<0,05: t =1,812-2.101 p<0,01: 2.262-4,14; p<0,001: t =4,587 - ∞

Certainly, it is important to highlight the results of the anthropometric indicators obtained by the subjects in the experimental group and the control group at the final stage of the research. Using the same testing criteria and parameters, the following results were obtained: body mass shows a statistically significant difference with P>0.05, where subjects in the experimental group reach an average of 55.4±0.11 kg compared to 52.7±0.34 kg in the control group; left hand dynamometry in the experimental group averages 27.8±0.24 compared to

21.7±0.18 where t=4.23 and P>0.01; right hand dynamometry exhibits a more pronounced statistical difference with t=5.04, P>0.001 according to the results: 28.6±0.27 in the experimental group compared to 16.0±0.19 demonstrated by the control group. As for the statistically significant differences with P>0.01 - <0.001 in determining the strength of the left and right hand, this is due to working with intensity and proportional effort in the proposed training program for the subjects in the experimental group. Testing the somatoscopic indicators shows statistically significant differences with t ranging from 1.84 to 2.56, and P>0.05 in all four test samples. In the posture examination, the subjects in the experimental group obtain an average of 9.3±0.10 points, compared to the control group, which reaches an average of 8.5±0.32 points. Similar results are observed in the examination of the scapular belt (9.1 compared to 8.7 points); triangle examination (8.8 compared to 8.2 points); and lower limb inspection (9.5 compared to 8.6 points).

Conclusions

All the training exercises provided in the experimental project were valuable. Finally, the anthropometric indicators, both somatometric and somatoscopic indicators prove significant results for the degree of development of the athletes at this stage. Such results can be confirmed as exceptional results and more than sufficient for the promotion of athletes in the second stage: the sports specialization stage, where the athletes will face particularly increased efforts both in volume and intensity. At the same time, the most important thing here is that the athletes achieved an excellent body exterior in the sense of proportionality of development, the sides of the body developed symmetrically, balanced and highlighted. These characteristics ensure a perfect control of the barbell during the overhead lift, and this stability can offer great chances for a more efficient level of development. The research of anthropometric indices in weightlifters at the early stage was able to change the training visions of the weightlifter towards new constructive ideas. In order to achieve the objectives that determine the degree of development of weightlifters of a new type, as well as the opportunities that can condition this process, and based on the results obtained as a result of the present study (determining the degree of development of weightlifters at the initial stage based on anthropometric indices), is recommended: the training program of the novice weightlifter must become a centralized mechanism in educating, training and preparing the athlete with an orientation towards a long period of time; for the creation, training and training of a well-exposed weightlifter and in order to establish the degree of development of the athlete, the training process must be focused on the proportionality of the efforts, and the weight lifting actions must be constantly corrected from the point of view of the symmetry of the sportsmen's efforts. This will certainly provide a well-developed, balanced, proportional and symmetrical body athlete who can claim a much higher level of development for the next stages of training.

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