

**FEATURES OF PHYSICAL DEVELOPMENT OF ATHLETES AS THE
BASIS FOR DIFFERENTIATION OF LOADS IN THE TRAINING PROCESS
OF YOUNG KICKBOXERS**

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Purpose: to determine the indicators of physical development of athletes of the group of initial training in kickboxing.

Material and methods: the research was carried out on the basis of the Children's and Youth Sports School "KIPT", Kharkov. 28 kickboxers of 10-11 years old group of initial training of the first year of study were involved in the experiment. The following research methods were used in the work: theoretical analysis and generalization of scientific literature, anthropometric measurements, methods of mathematical statistics.

Results: visual and anthropometric examinations of the athletes' bodies were carried out according to the following indicators: body length and weight, chest circumference. Also, complex testing of athletes' motor qualities was carried out using control exercises provided for by state tests and standards for assessing the physical fitness of the population of Ukraine.

Conclusions: in the course of the study, anthropometric examinations of 10-11 years old youths who are engaged in kickboxing were carried out, which made it possible to establish the features of the body structure of athletes body mass and chest height indices were calculated, as well as the Pignet index to determine the somatic type of athletes. As a result of the study, it was revealed that according to the Quetelet index, the overwhelming number of students had a level of physical development of average and higher; according to the index of proportionality of the development of the chest - a narrow chest. According to the revealed value of the Pignet index, it was established that the majority of kickboxers belong to the asthenic type of constitution. The importance of using a differentiated approach in organizing the training process of athletes, taking into account their somatotype, was revealed. Athletes 10-11 years old of different somatotypes (asthenic, normosthenic and hypersthenic) have significant differences in terms of the development of physical qualities. These are the results of the study experimentally confirmed the need to search for new approaches to the system of physical training of athletes taking into account their individual characteristics.

Keywords: physical development, physical fitness, somatotype, differentiated approach, kickboxers, initial stage of training.

Introduction

Finding ways to individualize and differentiate physical training of athletes in different kinds of sport is the subject of research for many scientists. According to scholars, when applying a differentiated approach, the coach should take into account not only gender and age, but also the individual potential of athletes [12; 15]. This approach allows each sportsman to cope with physical load optimally and provides the best training effects [1; 6]. Regardless the fact that numerous data concerning means and methods of introducing differentiated approach have been registered, its practical implementation requires search for optimum differentiation criteria depending on the kind of sport (or physical activity) and the stage of long-term training. Traditionally, gender-age differentiation criterion is used. The latest

research has been instrumental in identifying other reasons for load differentiation, including physical condition, biological age, level of physical development, somatotype, level of physical fitness. Furthermore, additional criteria are nervous system characteristics, temperament type, cognitive features [5; 13].

One of the informative criterion of differentiation in training practice is sportsman's body type. This criterion has dissimilar informative value at different conditioning stages and is based on taking into account the natural diversity of morphofunctional parameters of an individual. The rationale of this statement is the discovery of the fact that representatives of different somatotypes are notable not only in terms of physical development but also in a number of neurophysical status characteristics including motor abilities. Therefore, it is necessary to know peculiarities of sportsmen's physical development and fitness as well as their body type features for reasonable planning of the loads during training sessions [2; 4; 14].

In the training of combat athletes, the identification of somatotype is of particular importance not only in terms of load differentiation criterion, but also as an important factor of biomechanical component of the technical activities implementation. That is why the definition and analysis of this criterion is worth carrying out at all stages of long-term training including initial training stage.

The work is accomplished according to initiating research project "Theoretical and methodological principles of differentiated approach during physical education classes and sports activities using information technologies" (state registration number 0120U105014) for 2020 – 2023.

Purpose of the study – to identify physical development indices of kickboxers in the initial training group.

Material and Methods of the research

The research has been carried out at the premises of "KhFTI" Children's and Youth Sports School. The study involved 28 kickboxers (boys) aged 10-11, first year students in the initial training group.

The following research methods have been used in the work: theoretical analysis and generalization of scientific literature, anthropometric measuring,

mathematical statistics methods.

Results of the research

The research included visual assessment and anthropometric measurements of body parameters in terms of the following indices: height and body mass, chest circumference. The examination has been done to identify the level of athletes' physical development and to establish compliance of the data of their basic anthropometric indices with the standards of physical development of children in the appropriate age group (table 1).

Table 1.

Compliance of anthropometric indices of kickboxers in the initial training group with age standards of physical development (10 years old, n=16, 11 years old, n=12)

Anthropometric indices		Athletes $\bar{X} \pm m$	Standard $\bar{X} \pm m$	t (p>0,05)
Height (cm)	10 y.o.	144,3±1,0	142,0±1,7	1,17
	11 y.o.	145,0±1,2	146,0±1,5	0,52
Body mass (kg)	10 y.o.	33,2±2,1	32,9±4,0	0,07
	11 y.o.	36,1±4,1	35,0±4,1	0,19
Chest circumference at rest (cm)	10 y.o.	69,4±1,7	68,4±3,6	0,25
	11 y.o.	70,4±3,4	69,3±3,9	0,21

The results of anthropometric examination indicate that the average group indices of athletes' physical development do not have significant differences with standard age norms [3; 10]. It allows us to consider physical development in this group of athletes as compliant with norms, and to plan training loads according to age standards.

More significant examination provided for anthropometric indices calculation – body mass and height (Kettle) and chest and height. Physical development of the athletes in this group has been determined based on the calculation (fig. 1).

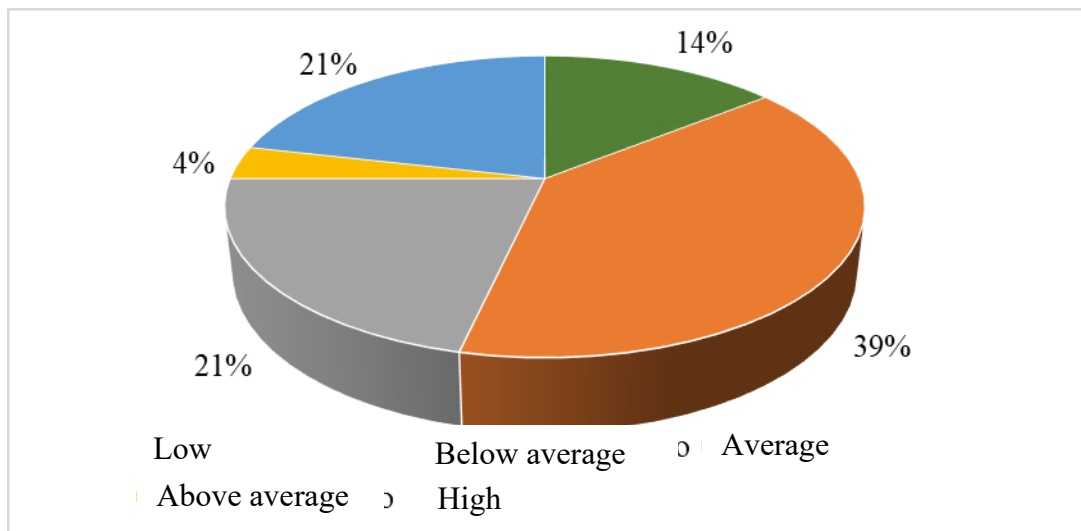


Figure 1. Percentage of boys aged 10-11 with different levels of physical development according to Kettle index

According to the Kettle index, 46% of patients presented with average and higher level of physical development of the athletes in this group. These results indicate satisfactory level of physical development of the examined kickboxers in the initial training group.

Calculation of chest-height index allowed to diagnose the chest development proportionality of the athletes and to determine whether the chest is narrow or broad, or the one that falls within the physiological norm (fig. 2). The examination has shown that the majority of athletes (79%) has narrow chest. These data indicate a lack of chest development proportionality of 10-11 years old boys, that can be attributed to age peculiarities of the child's body, specifically to heterochrony of longitudinal and lateral body size development. In this group of athletes, it may be appropriate to include well-aimed shoulder and chest exercises, both conditioning and related to the specifics of motor activity in kickboxing (back fist and body blocks).

One of the key characteristics in the individual-typological assessment of body development is the concept of body type or somatotype. In the modern sense, body type is a biological feature of the body, a set of morphological and functional characteristics, inherited and acquired, determining aspects of reactivity and body resistance to adverse factors of environment and internal medium. Morphological

presentation of person's body type is a somatotype reflecting the level and harmony of physical development. In the meantime, it is a criterion of human's health condition and physical activity.

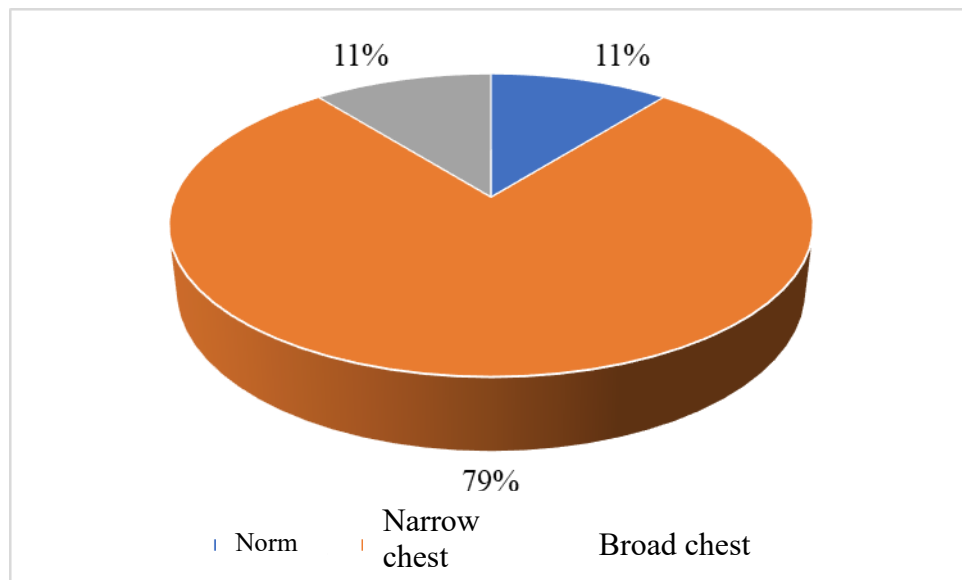


Figure 2. Percentage of boys aged 10-11 with different levels of proportionality of chest development according to chest development proportionality index

Classifications of V. V. Bunak, I. B. Halant, V. H. Shtefko and A. D. Ostrovskiy, Siho, Chaillu and McAuliffe are based on the visual assessment of the researchable object and comparing this assessment with descriptive characteristics of a particular body type. Methods including the assessment of somatotypes based on the calculations in terms of dimensional characteristics involve the research works of B. A. Nikitiuk, S. Sheldon, B. Heath - L. Carter. [9].

To avoid subjectivity when identifying individual constitutional type of the athlete we applied somatometric method that consists in measuring height (cm), body mass (kg) and chest circumference (cm).

These parameters were used to calculate Pinier index by the formula:

$$PI = L - (M + CC \text{ exp.}),$$

where L – height (cm), M – body mass (kg); $CC_{\text{exp.}}$ – chest circumference during expiration (cm).

The Pinier index which is more than 30 points is indicative of asthenic (hyposthenic) somatotype, less than 10 – is of hypersthenic. Index in an amount of 10 to 30 points corresponds to the sthenic body type. The calculation of the Pinier index made it possible to assess the correctness of specification of the constitutional type of athletes by preliminary identification using the somatoscopic method [9].

Analyzing the Pinier index, it has been found that more boys aged 10-11 who are engaged in kickboxing have an asthenic somatotype, which corresponds to a weak body built (fig. 3). Children having weak body built need special careful selection of loads during studying and training process as well as constant monitoring by the coach. That is why training sessions with these students should be planned based on differentiated approach taking into account peculiarities of their physical development.

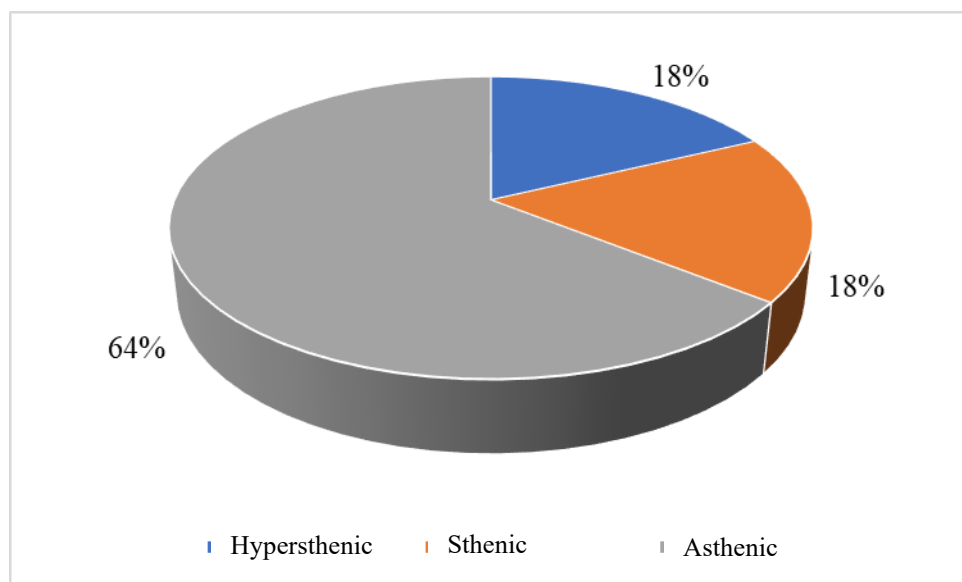


Figure 3. Percentage of 10-11 years old boys with different level of body built strength according to the Pinier index

Integrated testing of athletes' motor skills as a part of study has been conducted as a part of study. Level of physical fitness has been evaluated on the completion of muscular endurance test provided by national diagnostics and standards for assessing physical fitness of the population of Ukraine [11]. The results of physical fitness

testing were analyzed taking into account the somatotype of athletes, which was identified earlier (table 2).

Table 2.

Indices of physical fitness of the kickboxers of different somatotypes in the initial training group фізичної

Criteria	Asthenic (n=18)	Sthenic (n=5)	Hypersthenic (n=5)
Push-ups (rep.)	8,5±0,8	11,4±5,2	14,2±3,8
Modified pull ups (in lying position) (rep.)	1,6±1,2	2,5±0,7	3,8±0,9
Forward bend sitting (cm)	4,3±0,7	2,0±1,3	2,4±0,9
30 m run (s)	5,8±0,1	6,6±0,2	6,0±0,2
Steady running without reference to time (m)	720,0±48,9	933,3±36,2	840,0±97,9
Shuttle run 4×9 m (s)	11,8±0,1	12,2±0,3	11,9±0,3

Analysis of the test results has allowed to establish that the athletes with sthenic body type have significantly higher results in the exercises which require endurance (at the level of $p < 0,05$). The athletes with hypersthenic body type showed the best results in the exercises imposing primary demonstration of strength qualities. It is worth mentioning that these differences in comparison with the results of the athletes of other somatotypes are not reliable ($p > 0,05$). Asthenic athletes were the most successful in doing exercises demanding flexibility ($p > 0,05$) and rapidity ($p < 0,05$).

The findings of motor training of the athletes of different somatotypes show deviations of the results of asthenics and hypersthenics from the average group for a number of muscular endurance tests. For instance, hypersthenics have lower than average results in the following tests: forward bend sitting, 30 m run and 4×9 m shuttle run. Asthenics show similar peculiarities in the tests: push-ups, forward bend sitting, 4×9 m shuttle running. Meanwhile, the sthenics demonstrate average and higher level of development of all motor abilities in relation to the average group index.

Conclusions / Discussion

Resulting from the analysis basic morphological parameters of 10-11 years old kickboxers have been specified. Total body size of the examined kickboxers does not differ significantly from the weight and height of the average child of the appropriate age group.

The Kettle and the chest development proportionality indices were calculated. It has been found that according to the Kettle index the majority of the students had average and higher level of development; according to the chest development proportionality index – they had narrow chest. According to the identified values of the Pinier index, we can conclude that most kickboxers belong to the asthenic type of constitution.

As the result of study it has been found that the 10-11 years old kickboxers of three somatotypes in the initial training group (asthenics, sthenics, hypersthenics) have significant differences in terms of physical fitness parameters as well as primary development of physical qualities. The results of study experimentally confirmed the necessity of finding new approaches to improving the system of physical training of kickboxers, taking into account their individual characteristics.

Directions for future research are to develop differentiated approach to determining the amount and intensity of loads in the training process of kickboxers at the initial stage of training, taking into account the level of physical development and the somatotype.

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