

Influence of Systematic Football Training on Adolescent Functional Characteristics

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<https://dx.doi.org/10.13005/bpj/2155>

(Received: 30 December 2020; accepted: 17 April 2021)

Surveyed 522 players in Moscow. It is estimated the influence of regular football football on sicatics of football players 12-14-year-old. An assessment of the body size of football players was carried out with regard to their chronological age using the average physical development of adolescent-athletes. It is found that the systematic training in football is longer than 1 year to increase among adolescent-football players of quantities that have a strong physique, as a result of a decline among them, having an average type of physique. Registration of the examined index Pirka-Bedusi, which makes it possible to evaluate the proportionality of the physique, showed that most of the football players of adolescence with experience of systematic sports for more than a year have proportional to the physique. The degree of development of the breathing opportunities of the chest of adolescent-football players at a regularly high level of power preparation is higher than their untranslated peers. The results obtained will assume that regular football activities provide in adolescents to increase physical ability to prolonged cyclic loads due to an increase in endurance.

Keywords: Adolescents; Football; Muscle load; Power preparation; Physiology; Stamina.

The increase in the permanent basis of the general physical activity of young people lays the base for the holistic recovery of the younger generation and increasing the potential duration of its work activity¹.

Numerous modern studies confirm the need for planned physical training in young people with any sports². This need is caused by the need for a wide rehabilitation of a young generation, to reduce its pathological burdens, increase its overall viability and ability to capacity due

to the maximum development of motorcycles of the entire muscle system³. To achieve this goal, it is justified to apply a differentiated approach to the involvement of young people in the training process, taking into account personal preferences and health status. The latter seems very important, since the physical status is a very important feature reflecting the individual biological features of young people, closely related to motor capabilities and ability to adapt to muscle loads. Physical status is largely determined by the available

somatic dimensions and proportions of all parts of the body⁴. For young athletes in different sports, certain features of the physique, form and sizes of the body are characterized, as well as functional characteristics⁵. There is a mass of morphofunctional connections that are the basis of the individuality of each person, its physical possibilities, meaningful to individualization of physical training⁶.

Issues of individualization of training schemes in any sports can be determined only by floor, age, initial level of physical development and current functional status. In the conditions of modernity, it is trying to solve, taking into account the general existing constitutional parameters of athletes, registration of their adaptation potential with their obligatory accounting of the existing typological characteristics of the person⁷. There is reason to believe that it is the assessment of somatotype that allows us to figure out the main intragroup features of the life support of the body and the level of development of his adaptive capabilities⁸. The presence of a positive effect of typological characteristics and especially the physique on the overall effectiveness of physical training in different sports and opportunities with their help to achieve the harmonization of the physical condition of training⁹. At the same time, it is somatotype athlete that reflects biological reliability in various sports situations¹⁰. It is observed that morphofunctional differences between the individual constitutional types determine differences in the features of motor capabilities and in the state of functional and adaptive characteristics in the conditions of regular training¹¹.

Some researchers consider a typical method as the most effective option to achieve individualization of sports training. This opinion is associated with the possibility of this method to rationally implement physical development during physical education, to rationally dose the training load, seeking its adequacy in relation to the existing physique in engaged in its present and maximum utility. It is observed that the somatic indicators are closely related to individual metabolic processes that determine the physical possibilities of the body. In this regard, it is clear that having different somatotypes have different levels of metabolism¹²,

the state of motor skills, high-speed and power capabilities, as well as overall health^{13,14}.

A game sphere is recognized very significant in the life of adolescents. Football is among the very popular and effective options for extension of physical training. These classes, apparently, should be kept taking into account the registration of the dynamics of the physique of adolescents using a number of methods.

The purpose of the study: to find out the features of somatotype of teenage-football players with different exercises of sports.

MATERIALS AND METHODS

The study was approved by the Local Ethics Committee of the Russian State Social University on September 15, 2017 (Protocol No. 9). The study was conducted on the basis of the Russian State Social University Moscow, Russia.

Surveyed 522 teenager-football player in Moscow. The examined teenagers trained 4 or 5 times a week with duration of one classes from 90 to 100 minutes. All observed football players were aged 12-14 years. Surveyed, taking into account the experience of sports training, divided into 3 groups: 1 group - control, its composition included adolescents engaged in football to one year (171 people); 2 Group of football players included those who have a sporting experience amounted to from 1 to 2 years (169 people) and 3 groups of adolescents consisted of focus on football within 3 or more years (182 people).

The study uses the method of indexes, taking into account the proportions of the body at the ratio of the size of its individual parts. The proportionality of the physical development of football players was assessed taking into account the ratio of the existing body weight, the circumference of the chest and body length. The paper used the method of determining the fortress of the physique - in other words, the type of somatic status (a combination of stable individual, morphological and functional parameters) by the magnitude of the Pignet index. For its calculation, the growth values were used (cm), the magnitude of the body mass (kg) and the trigger of the chest at the time of exhalation (cm), expressing it in points:

Index Pignet = Body Length (cm) - [body weight (kg) + chest circumference at the time of exhalation (cm)]

In asthenics (thin body), the Pignet index > 30, in hyperstoics (powerful physique) - Pignet index < 10, in normostatics (normal physique) - Pignet index 10-30. At the same time, the magnitude of the Pignet index is more than 30 is considered as a weak physique (from 26 to 35 - weak, more than 36 - very weak), from 10 to 30 - the average physique (10-20 - good, 21-25 - average) and when the index value Less than 10 - the physique is considered strong.

The harmony of adolescents was evaluated by the proportionality of the development of the chest, with respect to the linear size of the body. For this purpose, an Erisman index was used, which makes it possible to determine the shape of the chest (options are possible - a narrow, proportional or wide chest):

Erisman index = chest circle in pause (cm) - 1/2 body length (cm)

With the index value, less than +3.3 cm speaks about a narrow chest, and with the magnitude of the index, a wide chest occurs more than + 5.8.

The body mass index or the Kettle index is a relationship between the value of human growth and its body weight. It indirectly indicates nutritional sufficiency (defining) and calculates according to the formula:

Body Mass Index = (body weight (kg) / body length (m²))

The magnitude of the body weight index allows us to figure out the degree of body weight deviation from ideal. The paper took into account four levels of this index: the body mass index < 18.5 was considered as a sign of chronic energy failure (hypotrophy), its value of 19-25 was considered normal, its value of 26-31 was determined as the presence of excess body weight (hypertrophy), and With its magnitude, more than 31 believed that there is obesity.

The harmoniousness of the physique was founded on the basis of the Rorera index, which

evaluates the compliance of the growth of a person and the mass of his body. It is calculated according to the following formula:

Index Rorera = Body Mass (kg) / Body Length (m³)

With the value of this index < 10.3, it is believed that there is a disharmoniousness of physical development due to the low mass of the body. In the case of an index value in the boundaries of 10.4-13.7, it is considered that there is a harmony of development, with meaning > 13.7 comes again disharmonious physical development due to excess body weight.

The proportionality of development was determined by the index of the Pirke-Beduzi, which makes it possible to take into account the proportionality of the development of growth standing on the growth of sitting, during the calculation by the formula:

Index Pirke-Beduzi = [Height standing (cm) - Sitting growth (cm)] / Height Sitting (cm) x 100%

The magnitude of the index Pirke-Beduzi makes it possible to find out the relative length of the legs: less than 87% - the small length of the legs relative to the linear body size, at 87-92%, physical development is considered proportional, over 92% is a large length of the legs.

The functionality of the respiratory system was found in the magnitude of the life index, which was considered as the ratio of the value of the magnitude of the lungs of the lungs to the magnitude of the body weight:

Life index = Life capacity Ease (ml) / body weight (kg)

The larger the life index, the more optimal level of the development of the breath of the chest. The average value of the vital index for adolescents reaches 55-60 ml / kg.

The power index was calculated as the percentage of muscle strength to the mass of the body. It is considered that the more muscle mass of the body, the greater its power. The dynamics

of the power indexes of the right hand and back of adolescents were studied.

The power index of the hand is the indicator of the relationship between body weight and the muscular power of the brush leading hand:

$$\text{Power Index Hands} = [\text{Power Brush (kg)} / \text{body weight (kg)}] \times 100\%$$

Small hand force - the power index of the hand is <30%, the power is below average - from 31 to 41%, the average force is from 42 to 64%, the force is higher than the average - from 65 to 74%, large force - > 75%. The power index of the hands in adolescents is 65-80%.

The power index of the back is the indicator of the relationship between body weight and the degree of development of the muscles of the back:

$$\text{Power back index} = [\text{Ranged dynamometry (kg)} / \text{body weight (kg)}] \times 100\%$$

In adolescent, the low strength of the back is considered in the case of the power index of the back less than 101%, the force is below the average - from 102% to 119%, the average force is from 120% to 156%, the force above average - from 157% to 174%, - in case more than 175%.

The work was determined by the type of functional response of the neuromuscular system of adolescents with their assignment to groups: "Sprinter", "Mikst" and "Styer". This was carried out in terms of the treason index. For this, the moment of the development of the maximum muscle strength of the brush was determined using a dynamometer (kg), then the stopwatch was fixed in the level of muscle endurance in seconds (C), which was judged by the time of retention of the dynamometer in the voltage state, 50% of the maximum power of the brush. The estimate, taking into account the types of functional response of the neuromuscular system, was carried out according to the formula below:

$$\text{Kaznacheev Index} = \text{Maximum Muscular Strength} / \text{Maximum Muscular Endurance}$$

The value of the treason index below 1.0 was regarded as the prevalence of endurance (type

"Styer"), the value of more than 2.0 was considered a sign of the prevalence of force qualities (type "Sprinter"), in the case of a value within 1.0 to 2.0 the reason to talk about the intermediate type ("Mix"), when at the same time there is a developed endurance and developed power quality.

Digital data were statistically processed using the Microsoft Excel program with the calculation of the value of the average arithmetic (M), the error of the middle arithmetic value (M). The accuracy of the reliability of compared values was carried out using the Student coefficient.

RESULTS AND DISCUSSION

Estimation of the level of the body of the body by estimating the Pignet index made it possible to find out that the average value of this index in the surveyed footballers is higher in 2 and 3 groups compared to the surveyed inspections of the control group (table 1). At the same time, adolescent-football players of the control group possessed a weaker identification (about 40% of cases had a very weak physique). In the 2 group there were few teenagers with an average physique. It prevailed teenagers with a weak physique (more than 50.0%), while the very weak physique had less than in control. It is noticed that with an increase in the experience of physical training (over 3 years), the number of football players with a weak and very weak physique was insignificant. In this group, teenagers with an average physique prevailed. The results of the study of the morphofunctional status of the surveyed showed that as training experience improves the physical development of football players, indicating the beneficia of the general physical development of regular long-term physical training in football.

Given the results of registration of the Pignet index in adolescent-football players mainly take place a hypoxium (aesthenic) type of physique. It is significantly less likely to have a normostic type, and in isolated cases a strong physique is noted, that is, a hypersthenic type. You can think that regular football activities for more than a year are able to significantly strengthen the physique of adolescents, contributing to the transition to the status of medium and even strong physique, thereby reducing the number of adolescents with a weak type of physique¹⁵.

An important indicators of the overall physical condition should include the Erisman index, which helps to estimate the shape of the chest¹⁶. It is known that in the case of systematic physical exertion, an increase in the size of the chest and the degree of its mobility increases, the frequency and depth of respiration acts increase due to the growth of the needs of working muscles and internal organs in oxygen^{17,18}. The average values of the Erisman index in football players were higher in 2 and 3 groups compared with the control group by 27.3% and 69.7%, respectively. The negative value of this index indicates the narrowness of the chest. This is usually characterized by teenagers of asthenic physique. By the values of this index, we can say that as the term of football workouts increases the number of asthenic physique decreases and in the 3 group it becomes minimal.

To clarify the peculiarities of physical development and the level of power adequacy, a very common variant of calculating the body mass index is applied, which is called the Kettle index. The average value of the body mass index in the surveyed footballers in the control group was $18.2 \pm 0.23 \text{ kg/m}^2$, in 2 groups - $18.9 \pm 0.18 \text{ kg/m}^2$, in group 3 - $19.8 \pm 0.25 \text{ kg/m}^2$, which shows

the absence of differences on this indicator in the absence of an excess or body weight deficit in all cases. During the analysis of individual values of the football players, the magnitudes of the body mass index became clear that in the control group most of the surveyed have a normal body weight for their age and the importance of growth in the presence of disharmony in physical development due to body weight deficit in a small number of cases. In the 2th group of football players even more adolescents had a body mass index corresponding to the norm, while the shortage of body mass or its excess was met in less than 10% of cases. Among the footballers 3 groups, the overwhelming number of athletes had a normal index of body mass index and only about 5% had a slight excess body mass. This circumstance was associated, apparently, with the advent of excess appetite against the background of regular physical training related to constant energy consumption^{19,20}.

The determination of the harmonicity of the physique of the surveyed footballers on the Rorera index indicated that the average value of this index in 1 group was $13.3 \pm 0.24 \text{ kg/m}^3$, in 2 - $11.7 \pm 0.20 \text{ kg/m}^3$ and in 3 groups - $11.3 \pm 0.28 \text{ kg/m}^3$. When considering the individual characteristics

Table 1. Anthropometric Teenagers-Football Players Indices

No.	Indicator	Groups of football players, M±m		
		First group, n=171	Second group, n=169	Third group, n=182
1.	Pignet index, point	36.0±0.75	29.6±0.94	21.8±0.42
			p<0.01	p ₁ <0.01
2.	Erisman index, ñm	-5.6±0.75	-4.2±0.67	-3.3±0.57
			p<0.01	p ₁ <0.01
3.	Body mass index, kg/m ²	18.2±0.23	18.9±0.18	19.8±0.25
4.	Index Rorera, kg/m ³	13.3±0.24	11.7±0.20	11.3±0.28
			p<0.05	p ₁ <0.01
5.	Pirke-Beduzi index, %	93.2±0.94	96.2±0.76	93.7±1.03
6.	Life index, ml/kg	41.3±0.57	47.4±0.37	49.2±0.42
			p<0.05	p ₁ <0.01
7.	Kaznacheev index, point	0.5±0.07	0.7±0.05	0.8±0.08
			p<0,01	p ₁ <0.01
8.	Power index leading hand, %	36.4±0.82	42.8±0.77	52.7±0.65
			p<0.01	p ₁ <0.01
9.	Silence back index, %	55.6±0.85	85.9±0.72	89.5±0.92
			p<0.01	p ₁ <0.01

Note: p – is the accuracy of differences in the first and second groups; p₁ – is the accuracy of differences in the first and third groups.

of the harmony of the physique on the magnitude of the Rorera index, signs of disharmonious development in the 1st group were not more than 20% of the football players due to the low mass of the body, in the 2 group these signs were no more than 10.0%, whereas in the 3 group they were more than 5.0% of athletes. In all other cases, among the football players there was a secondary or other words harmonious development. In group 3, the number of adolescents with harmonious physical development turned out to be the greatest compared to 1 and 2 groups.

In the conducted study, the proportionality of the physicist of football players was estimated using the calculation of the index of the Pirke-Beduzi, which gives you the opportunity to judge the ratio of the length of the legs and the length of the body, taking into account the ratio of the growth value standing relative to the growth size of sitting. This indicator allows us to conditionally divide adolescents on "long-legged" and "short-legged". Consideration of the obtained values of the index Pirke-Beduzi showed that the average values in three observation groups did not have reliable differences: in the control group, this index was $93.2 \pm 0.94\%$, in 2 - $96.2 \pm 0.76\%$ and 3 Group - $93.7 \pm 1.03\%$. The individual assessment of the index values of the Pirke-Beduzi showed that in 1 group there were about 20% of football players with short legs in relation to the size of the body (index Pirke-Beduzi - $<85\%$), in 2 groups there were less than 12.0%, and in 3 - less than 7.0%. The big length of the legs (index Pirke-Beduzi $\rightarrow 90\%$) more often met among football players, more durable sports: in group 2 (more than 70.0%) and 3 groups (more than 65.0%). There were about 60.0% in control.

In the course of the study, a life index was estimated in all groups of football players. The life index showed the magnitude of the air volume - the lungs life capacity, which falls on a kilogram of the body mass of the athlete. Clearly, the larger the importance of the life index, the better physical development^{21,22}. As a result of the study, it was replaced that the larger the experience of physical training, the more this index becomes. Thus, in the 2 group compared with the control, this indicator was higher by 14.8%, and in group 3 - above 19.1%, reaching 47.4 ± 0.37 ml/kg, respectively, 49.2 ± 0.42 ml/kg and 41.3 ± 0.57 ml/kg. The data

obtained said that in 2 and 3 groups of teenagers of football players, the breathing capabilities of the chest are better developed than in control.

An assessment of the type of functionality of the neuromuscular apparatus in the surveyed footballers made it possible to establish that in the control group the value of the treasuree index was ranged from 0.3% to 0.6% ($0.5 \pm 0.07\%$), in the 2nd group was within the borders from 0.5% to 0.8% ($0.7 \pm 0.05\%$) and in 3 groups ranging from 0.5% to 0.9% ($0.8 \pm 0.08\%$). Given this information, it becomes clear that all the examined teenagers' football players were "styers", which indicates their ability to perform long-term cyclic physical exertion on endurance^{23,24}.

As a result of the studies, the surveyed footballers of the control group establishes a small force of the leading hand. The highest values of the indicator of the power index of the hand were detected in adolescent-football players in 3 groups ($52.7 \pm 0.65\%$). This level was inferior to the values of the second observation group ($42.8 \pm 0.77\%$), but those prevailing over the control group by 17.6%. The differences between the power indexes of the leading hand (mainly right) in football players between 2 and 3 were statistically reliably and was 23.1%.

The assessment of the reinforcement of the back index revealed in all groups of observation of a small strength of the back. The greatest level of this index is noted in football players of the third group ($89.5 \pm 0.92\%$). This level of the second group was yielded by 4.2%, and the control was inferior to 60.9%. Given the data obtained, it can be said that football trains back muscles, increasing their functionality as the training period increases, however, without contributing to the exit even on the average level of their strength development²⁵.

CONCLUSION

As football experience increases, adolescent athletes are traced to strengthening morphofunctional status, which confirms their beneficiaries for the general physical development of young football players. Regular football training for a longer one year contribute to an increase in the prevalence among the athletes of the middle and strong physique and a decrease in the occurrence of its weak type. This was accompanied by football

players with a growing overall harmonicity of development and increasing endurance in relation to long cyclic physical exertion.

ACKNOWLEDGEMENT

The team of authors thanks the administration of the Russian State Social University for the opportunity to conduct research on its basis.

Conflict of interest

No conflict of interest.

Sources of financing

The study was conducted at the expense of the authors.

Ethics Committee Resolution

The study was approved by the Local Ethics Committee of the Russian State Social University on September 15, 2017 (Protocol No. 9).

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