

Original Article

Physical fitness assessment of young football players using an integrated approach

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Published online: January 30, 2021

(Accepted for publication January 22, 2021)

DOI:10.7752/jpes.2021.01034

Abstract:

The aim of the article is to study the level of physical fitness of young football players using an integrated approach. *Materials:* young football players aged 12-13 participated in the study. The total number of football players who participated in the study was 40 pupils. The study of the general and specific physical fitness level using an integrated approach was conducted under the same conditions, which is a necessary component in the objectivity of final results. As a set of tests we have specially chosen those that are a part of the program for children and youth sports football schools, determine the level of development of the main leading motor abilities of football players, reveal the features of their manifestation during the exercise training. *Results:* assessment criteria were worked out and assessment criteria using an integrated approach were calculated for all tests that base on the program for specialized football sports institutions. Improvement of the positive tendency level of general and special physical conditioning of young athletes was revealed. Thus, with regard to overall physical fitness, it was found that high and above average levels of training improved by 20.0%. Low and below average levels decreased by 25.0% among young football players. Similar changes in indicators occurred when comparing the complex assessment of the special fitness of young football players. High and above average indicators increased by 25.0%, but low and below average indicators decreased by 35.0%. It is established that the difference between the initial and final results of an integrated assessment of physical fitness proved reliable. Thus, changes in indicators of general physical fitness were 40.6 points ($t = 3.762$ at $p < 0.05$), and changes in indicators of special physical fitness were 17.6 points ($t = 3.716$ at $p < 0.05$). *Conclusions:* the use of an integrated approach for the overall assessment of the physical conditioning level allows coaches to obtain an objective picture of the young football players' fitness, as well as to influence the training process quickly and efficiently, with an emphasis on those motor qualities that need further growth. That is, there is every reason to consider the end of the preparatory training period for young football players to be positive.

Key words: assessment criteria, training, testing, coach, ball, ability.

Introduction

Dynamics of development of modern football testifies to steady growth of requirements to the player who has to act effectively in rigid space-time conditions of game activity. Gomez-Piqueras et al. (2019), Smpokos et al. (2018), Pratas et al. (2018) think that the optimal planning of training process technologies, formation of training programs, selection of adequate methods and restorative factors is possible only if the level of readiness of the football player is taken into account.

Testing is one of the leading factors of pedagogical control, the quality of which depends largely on the further improvement of one or the other side of physical fitness in football according to the leading experts in the field of sports (Kostyukevich, 2010; Hakman et al., 2018; Smpokos et al., 2018). Not humiliating the importance of different aspects of readiness and understanding the need for integrated approaches to solving the problematic moments of testing in the system of pedagogical control over the level of football players readiness, we think that the physical fitness determines the quality of the process of competitive and training activities more (Gusev et al., 2014).

Management efficiency in the process of sports training (Huzar, 2001b), computerization of information support of the training process (Huzar, 2001a) largely depends on the objectivity and accuracy of information about the athlete possessed by the coach (Huzar, 2000). When organizing and conducting sports training and competitions, coaches pay special attention to the interdependence between intelligence and competitive activity (Shalar et al., 2019b), the development of physical qualities necessary to achieve high results in the chosen sport (Kozina et al., 2019; Marques et al., 2011; Popovych et al., 2020b; Strikalenko et al., 2020b) and the athlete's psychological readiness for training and competition (Strykalenko et al, 2020a; Shalar, 2019a).

In this regard, the development of control means and methods using an integrated approach is the most necessary measure to increase the effectiveness of the training process (Zhosan et al., 2014; Pratas et al., 2018). Most of the issues regarding the use of testing exercises in the process of pedagogical control over the physical fitness of football players are practically solved. But in the current scientific problems there are a number of unresolved issues related to the number of testing in the annual training period, methodological features of the application and selection of testing exercises for adequate assessment of different styles of football players physical fitness (Gomez-Piqueras et al., 2019; Smpokos et al., 2018; Evangelos et al., 2018; Abbott et al., 2018).

In modern conditions in football, which are characterized by a significant increase in the intensity and intensification of the training process, the use of an integrated approach to the assessment of physical fitness of young football players should be considered as a prerequisite that will increase the efficiency of the training process of athletes in general and football players in particular (Gamble et al., 2019; Kassiano et al., 2019; Popovych et al., 2019).

An integrated approach takes into account the safety of the training environment, the quality of which affects the effectiveness of young athletes (Blynova et al., 2020; Popovych et al., 2020a). It is advisable to pay attention to current achievements in other areas of human activity, which are associated with adaptation, decision-making, fatigue, excessive physical and mental loads (Blynova et al., 2019; Nosov et al., 2020a; 2020b).

Therefore, study the use of integrated control in the system of training young football players is certainly relevant. *The aim* of the article is to study the level of young football players' physical fitness using an integrated approach.

Materials and methods

The young football players aged 12-13, who attended the sports children's and youth school of Olympic reserve "Crystal" in Kherson, took part in the study. This study was conducted in two initial preparation groups of the third year of study under the leadership of one coaching staff. The total number of football players who participated in both parts of the study was 40 pupils.

Regarding the level of sports qualification of the research contingent, we note that all football players had experience in competitions and had sports categories. The study of the general and specific physical fitness level using an integrated approach was conducted under the same conditions, which is a necessary component in the objectivity of the final results. Set of test tasks aimed at determining the level of leading motor abilities development were performed, both at the open fields (football field) and in the gym.

As a set of test tasks we have specially selected those that are part of the program for children and youth sports schools in football. These tasks determine the development level of the main leading motor abilities of football players; reveal the peculiarities of their manifestation when they were doing competitive exercises training. All the test tasks used in the experiment, both on the first block and on the second one, were familiar to all football players. During the experiment, testing was performed three times in the same conditions for all during a specially assigned control training class. The study lasted for 2018-2019.

Determination of the physical fitness level of young football players was carried out by the following tests: shuttle running 4 x 9 m (ability to regulate space and time parameters of movements); bending and unbending the arms doing squat thrusts (the upper shoulder girdle force is measured), lifting for 1 minute (the abdominal muscles strength is determined), squat on two legs for 30 seconds (the leg muscles strength is determined); long jump from a place, a jump up from a place (the development level of speed and power abilities is estimated), running for 30 meters and 100 meters (complex manifestation of speed abilities is studied); forward tilting of the torso from the sitting position (flexibility of the spine is determined) and longitudinal twine (flexibility in the hip joint is determined); running for 1000 meters (the development level of overall endurance is estimated).

The development level of special physical fitness was determined by the Running Test for 30 m with ball (speed). The level of special coordination development was determined by the "Slalom" Ball Test. The strength of the upper shoulder girdle and the flexibility of the spine were examined using a two-handed ball throw test from behind the head. Strength in the lower limbs was studied by the test of the ball hitting at the range.

Accordingly, after testing young football players the amount of points earned by the athlete as a result of many tests was determined for each individual motor task. The maximum score for all test tasks was 120 points.

At the same time, using the methods of mathematical statistics, quantitative indicators were calculated for each test in scores corresponding to five levels.

After determining the total score, the criteria for determining the physical conditioning level of young football players were developed. So, if a football player has a complex evaluation from 12 to 24 points, his physical conditioning level is low; if this indicator is between 25 and 48 points – below average; the average level was from 49 to 72; above average level of readiness for football players with a score from 73 to 96. The athletes with a total score more than 97 points received a high level of physical conditioning.

The developed criteria allow the coach not only to comprehensively evaluate the level of general and special physical fitness, but also to study the development level of a certain motor ability not by one test, but by several ones.

Results

In game sports, the result achievement depends on the manifestation of different motor abilities. It is quite difficult to find the dominant ability or priority quality that will allow achieving high results. Therefore, a comprehensive assessment of the training level in gaming sports is quite relevant.

According to the results of our assessment, after each section of the general physical fitness level, the coaches have made certain adjustments to the training process and the next mesocycle was planned taking into account the results of complex control. When calculating training loads, the emphasis was on the weaknesses of young football players' preparedness.

Dynamics of changes in indicators of complex assessment of the general physical fitness level of young football players during the experiment is presented at Figure 1.

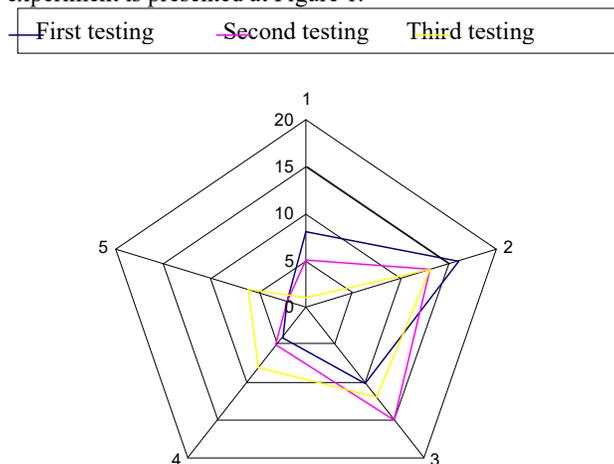


Figure 1. Dynamics of changes in the results of the general physical fitness level of young football players during the experiment

Analyzing the changes that took place during the experiment, we note that there is a clear positive tendency to improve the level of general physical fitness. Thus, at the first testing, 8 (20%) football players had a low level of overall preparedness, 16 (40%) were characterized by a level below average, 10 (25%) by a medium level of readiness, 4 (10%) athletes were marked by a level above average and only 2 (5%) athletes were highly prepared. According to the results of the first comprehensive assessment of the general physical fitness level, training sessions were conducted for two months by coaches, taking into account the complex assessment of physical fitness. After completing the training work in the first cycle, retesting of the general physical fitness level revealed that the number of football players with low levels decreased significantly. Although the number of football players with high levels of physical conditioning did not increase, but significantly increased the percentage of football players with average levels.

At the end of the second training cycle, the third section was performed, which revealed positive changes in overall training. Thus, during the experiment in the group of young football players the readiness results changed as follows: football players with a low level – 1 (2.5%), below average – 13 (32.5%), average – 12 (30%), above average – 8 (20%) and high – 6 (15%).

Comparing the results of the general training assessment with the use of an integrated approach with the indicators for each individual test, it was found that in some cases the youth football players had significant changes in a certain test. The overall level of physical fitness did not increase. Conversely, there were young athletes who were not marked by sharp positive shifts in their individual test exercises training.

Analyzing results obtained during the study, it is established that an integrated approach to determining the level of general physical fitness allows to objectively determine the state of development of certain motor abilities. Most of the coaches were interested in the developed testing methodology, which was confirmed by the effective response to the load during the training process and positively reflected on changes in the general fitness indicators.

The considerable number of football specialists, children's coaches and coaches who train qualified athletes think that the performance of any technical and tactical actions requires the athlete to be versatile. The basis for effective performance of competitive exercises throughout the game is physical training. However, along with the general level of physical training, the level of special physical conditioning is of great importance, namely for the qualitative performance of technical actions. Indicator changes of special physical fitness for five level system during the experiment presented in Figure 2.

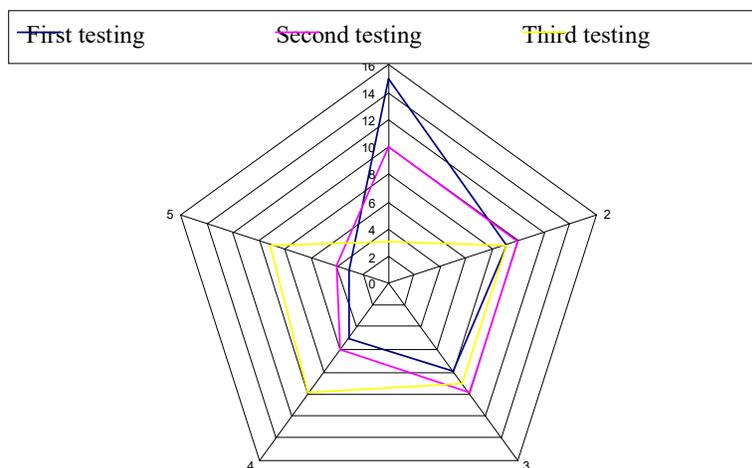


Figure 2. Dynamics of changes in the results of the special physical fitness level of young football players during the experiment

Analyzing the final results during the first test, we note that the majority of athletes (15 people) had a low level of special physical fitness. Approximately the same number of young athletes were characterized by medium and below average physical fitness (8 and 9 athletes, respectively). The smallest number of athletes responded to a high level of physical fitness. Later in the experiment, a training plan was developed taking into account the indicators of complex assessment of the readiness level. After the implementation of the developed training programs, a re-cut was carried out using an integrated approach. According to the retest results, 5 (12.5%) persons have decreased the number of athletes with a low level of physical fitness and slightly increased the number of young football players from below average (10), average (10), above average (6) and high (4) level of special physical fitness. Using an individual approach a training mesocycles plan was developed which was based on the results of an interim comprehensive assessment of the special fitness level of young football players. However, all the exercises used during the training work were differentially aimed at increasing the weaknesses of athletes' preparedness. According to the third test, the number of young football players with a low level of special physical fitness has decreased to 3 persons (7.5%) and the number of young athletes with a high level of physical fitness (9 football players) has increased significantly. The distribution of lower-, middle-, and above-average athletes ranged from 9 to 10 athletes. At the conclusion of the study, the coaches noted that in their previous practical activities they often subjectively assessed the level of general and special physical conditioning by one separate test. Very often this did not correspond to the actual state of football players readiness. The use of an integrated approach in the young football players' training process has allowed to change radically the coaches' attitude to the planning of training loads. In order to achieve high sportsmanship in football, it is most important to plan young athletes' workloads properly, which is not possible without objective data on their physical fitness level. The use of an integrated approach enables to solve the tasks at the expense of an objective preparedness assessment. According to the above, comparing the changes in the results of the comprehensive evaluation of the general and special preparedness of the young football players during the experiment, the degree of differences reliability between all stages of testing was determined using an integrated approach. The results of the comparison and the degree of reliability are presented in Table 1.

Table 1. The reliability of changes in the complex indicators of the general and special physical fitness of young football players during the experiment

Stagesofthestudy	Types of training	
	General physical fitness, point	Special physical fitness, point
	X ± s	X ± s
The first stage		
Outputdata	36.8 ± 3.173	14.3 ± 1.812
Interimdata	48.4 ± 4.719	22.5 ± 2.418
t	1.384	0.933
p	p> 0.05	p> 0.05
The second stage		
Interimdata	48.4 ± 4.719	22.5 ± 2.418
Finaldata	77.4 ± 4.645	31.9 ± 2.563
t	2.846	1.974
p	p< 0.05	p> 0.05
The third stage		
Outputdata	36.8 ± 3.173	14.3 ± 1.812
Finaldata	77.4 ± 4.645	31.9 ± 2.563
t	3.762	3.716
p	p< 0.05	p< 0.05

Analyzing the final results of the reliability of the differences of the complex assessment of the physical fitness level, we note that during the experiment the results with each repeated measurement improved, both from general and special physical fitness.

The difference between the input data of the comprehensive physical fitness assessment and the output data increased by 8.52 points, which is 23.2%. However, these changes in the indicators were not significant ($p > 0.05$). Changes between the interim control and the final indicators were even more significant - 29 points (59.9%), which, unlike the first comparison, proved to be significant ($p < 0.05$). Naturally, the disagreement between the initial control and the final control were also significant. In absolute terms, the result increased by 40.6 points, which is more than 100%.

Comparing the results of special physical fitness testing using an integrated approach, it was found that the difference between input and interim data was 8.2 points, which corresponds to 57.3% of increase. The difference between the results of the interim and output data was slightly better and amounted to 9.4 points (41.8%). However, it should be noted that in spite of the large differences in the absolute scores by the Student's criterion, they were not reliable ($p < 0.05$). Only changes in indicators from the initial test to the final one proved to be significant ($p > 0.05$) with an absolute increase of 17.6 points and a percentage increase of more than 100%.

The results of the study indicate that the use of an integrated approach to the overall assessment of physical fitness allows coaches to obtain an objective picture of young players' readiness, as well as to influence on the training process quickly and qualitatively with an emphasis on those motor qualities that require further growth.

Discussion

Leading football experts agree that the modern athlete should be able to perform rapid spurts, have a fast reaction, be characterized by a high level of hardiness, have a rich technical and tactical methods, original operational thinking, have significant sniper abilities, deep understanding, clear conception versatile gameplay, athleticism, great hard work and talent (Bolotin, & Bakayev, 2017; Gamble et al., 2019; Gomez-Piqueras et al., 2019). However, Solomonko et al., (1997) and Zelentsiv et al., (1996) think that basic properties are following: general and special physical fitness, that is, the ability to run the ball well, perform strong and accurate assists, goal kicks. This is practically not possible without sufficiently developed speed, coordination, strength, as well as hardiness and flexibility. This is due to the fact that virtually no football player can execute complex tactical action or interaction without a high level of mastery of game technical techniques and low level of physical training. As for the improvement of these components, it is worth using technical equipment in training young football players (Zhosan et al., 2014). Also, a team that has sufficient level of only one side of preparedness is not always the winner (Evangelos et al., 2018; Abbott et al., 2018).

In our previous study, we dealt with psychological training (Strykalkenko et al., 2020; Shalar et al., 2019), namely the impact of emotional and cognitive components on understanding in a football team (Huzar et al., 2014). Also, an important pedagogical aspect in the training of young football players is the education of responsibility through objective assessment of discipline, activity in sports (Edeliev et al., 2008) and the formation of personality based on sports education (Shalar et al., 2009).

In the specialized resources the issues of the theory and practice of football players' sports training of different level and sportsmanship are widely covered. However, aspects of pedagogical control using an integrated approach in the general and special physical training of young football players have been much less disclosed (Hakman et al., 2018; Kassiano et al., 2019). In accordance with the above mentioned there isn't a method of application of this testing in the available science lists.

It is worth agreeing with the statements of leading scientists in the field of sports training Lisenchuk et al., (1997), who state that in addition to individual tests to determine the development level of a certain motor ability in modern physical training and sports training, complexes of tests (systems) can be used for more effective assessment of the physical, functional, technical readiness level. In some cases, the athlete may be characterized by a high level of development of one ability, while having a slight manifestation in the development of other abilities. Therefore, it is quite difficult for a coach to determine objectively the athlete's readiness in the present conditions. An integrated approach, in addition to testing individual motor abilities, allows the coach to evaluate the level of readiness and more specifically to adjust further work, to direct the training effect in the right direction. It will certainly allow increasing the sports result, both individual athlete and teaming.

Conclusions

1. While working on the study we have developed a set of tests for determining the level of general and special physical fitness of young football players. Our complex consisted of two blocks of tests: to determine the overall coordination, speed, flexibility, overall hardiness, strength and special force, coordination and speed. For all tests based on the program for specialized football sports institutions, evaluation criteria were developed and evaluation criteria were calculated using an integrated approach

2. According to the results of the study, we note that during the experiment a clear positive tendency to improve the level of general and special physical fitness was revealed. Thus, with regard to overall physical fitness, it was found that high and above average levels of training improved by 20.0% and low and below average levels decreased by 25.0% among young football players. Similar changes in indicators occurred when

comparing the complex assessment of the special fitness of young football players. High and above average levels increased by 25.0%, but low and below average levels decreased by 35.0%. That is, there is every reason to consider positive the end of the preparatory period of young football players' training.

3. According to the results of mathematical and statistical processing of results, it is experimentally established that the differences between the initial and the final results of the complex assessment of the physical fitness level were found to be significant. Thus, changes in indicators of general physical fitness were 40.6 points ($t = 3.762$ at $p < 0.05$) and changes in indicators of special physical fitness were 17.6 points ($t = 3.716$ at $p < 0.05$).

However, our study does not claim to be exhaustive and has a number of promising areas for further research. One of the main ones is: the application of an integrated control in technical and tactical training, the summary definition of different aspects of preparedness, the development of evaluation criteria for the results of an integrated testing for football players of different age groups.

Conflict of interests. The authors note that there is no conflict of interests.

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