Integrated approach in footballers' preparedness modeling

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Mathematical methods have a significant place in modeling. These methods give a possibility to identify features, patterns, trends of a training process, to check the reliability of statements and assumptions. One of the conditions of successful predictions' and models' conduction is an integrated approach. It provides for a series of informative indicators that comprehensively characterize preparedness of players. To protocols, developed a comprehensive model of preparedness of the players, included anthropometric indicators, technical indicators, physical and functional training.

Keywords: modeling, football players, complex approach, basic physique, technical competence.

Introduction. Scientific researches in the field of physical activity [2; 5; 12; 14] and sports training [8; 10; 11] reveal methodological, theoretical and practical basics of the development of motor skills, improve long-term training and competitive activities of various groups. Dynamic processes of young players are considered as information that can be expressed by quantitative and qualitative indicators [1; 4; 6; 7; 15; 16]. In this regard, the complexity of projection and

modeling in football is large amounts of information, which requires the development of effective and affordable methods of its storing, processing and monitoring.

Management of sports training process involves the transfer of a football player as a complex dynamic system from one level to another new level in accordance with set goals and objectives. To successfully manage the training process, the coach should receive information about the state of preparedness of player (his strengths and weaknesses), to read with model characteristics that achieve this goal [7; 9; 13; 16; 17]. Receiving objective information and the development of model rules can only be based on a comprehensive study of various aspects of players' preparedness.

Scientific studies [3; 15; 16] proved the feasibility of development and introduction of model regulations of football teams' training process that would help not only to conduct the selection process and control, but also physical preparedness.

The purpose of the study - to justify an integrated method in modeling of players' physical preparedness.

Materials and methods: analysis and synthesis of the literature, analysis, synthesis, methods of mathematical statistics.

Research results. Discussion. For an objective assessment players' preparedness complex modeling technique is developed and recommended to the implementation into training process practice. It provides certain regulatory parameters that young athletes must have, comparison of these parameters with what happened in reality and conducting appropriate corrective actions.

Using mathematical tools gave a possibility to develop an integrated model of preparedness of young football players of 11-17 years. The scale of evaluation includes indexes, which together comprehensively characterize preparedness of each player. The level of each trait development is determined by a five-point system: 1 point - low; 2 points - below the average level of development; 3 points - average; 4 points - a level of above average and 5 points - the high level of the indicator. Estimations of all parameters are added in points.

On the basis of the total sum of points football players receive an integrated assessment of their preparedness. Increasing number, changing parameters and

adjusting scores for rating scales can be individually conducting by trainers and teachers depending on the specific opportunities and conditions. The more indicators that comprehensively describe the preparation, testing system will include the more qualitative information about the young athlete it will give.

The criteria, included to the integrated model of player, are divided into the following groups: anthropometry, technical and physical preparedness. Model parameters of anthropometry and physical preparedness have been developed using the methods described above on the basis of experimental data accumulated as a result of authors' work.

As a basis of model indexes of technical preparedness of football players, control standards of programs for secondary schools "Fundamentals of health and physical education" are taken into consideration. 11-year-old football players are offered the following tests: 1) right and left legs ball juggling, hips ball juggling, head ball juggling without repeating one leg or one body part to show the result; 2) 5 ball feeding from the place for accuracy from the distance of 7m; 3) 5 attacks on a stationary ball for the accuracy using another methods studied from the circle with a diameter of 1 meter, ball is installed vertically at a distance of 8 m.

For 12-year-old football players control educational standards and requirements of football equipment are as follows: 1) keeping ball to 30 meters with touching it, no less than three times per game; 2) 3 kicks from the distance of 11 m; 3) right and left legs ball juggling, hips ball juggling, head ball juggling without repeating one leg or one body part to show the result.

13-year-old football players take the following tests: 1) 4 kicks with precision from a distance of 9 m (ball crosses the goal line in the air); 2) 9 meters keeping the ball in a straight line (at least 2 touches) with fast running, kicking ball to score a goal; 3) right and left legs ball juggling, hips ball juggling, head ball juggling without repeating one leg or one body part to show the result.

At the age of 14, young players do the following: 1) 5 kicks from distance of 16,5 m; 2) right and left legs ball juggling, hips ball juggling, head ball juggling

without repeating one leg or one body part to show the result; 3) throw the ball at distance of one of the studied methods.

Requirements for the 15-year-old players are: 1) keeping the ball for 9 meters in a straight line (at least 2 touches) with fast running, making kicks to score a goal to show the result (attempt is successful if the ball enters the goal line, while necessary the second attempt is given); 2) right and left legs ball juggling, hips ball juggling, head ball juggling without repeating one leg or one body part to show the result; 3) throw the ball at a distance of one of the studied methods.

Control exercises of technical training for players of 16 years: 1) 5 kicks of the ball with precision from a distance of 16.5 m; 2) 9 meters keeping the ball in a straight line (at least 2 touches) with fast running, making strikes to score a goal in the area to show the result (attempt is successful if the ball enters the goal line, while necessary the second attempt is given); 3) right and left legs ball juggling, hips ball juggling, head ball juggling without repeating one leg or one body part to show the result.

For players of 17 years old control exercises are as following: 1) 5 ball strikes from a distance of 16.5 meters (ball crosses the goal line in the air); 2) 9 meters keeping the ball in a straight line (at least 2 touches) with fast running, making strikes to score a goal in the area to show the result (attempt is successful if the ball enters the goal line, while necessary the second attempt is given); 3) right and left legs ball juggling, hips ball juggling, head ball juggling without repeating one leg or one body part to show the result.

Estimation of anthropometric data of football players is conducted in terms of indexes of body length and weight. Model values of the length of body are developed using linear approximation, which is graphically shown in Fig. 1.

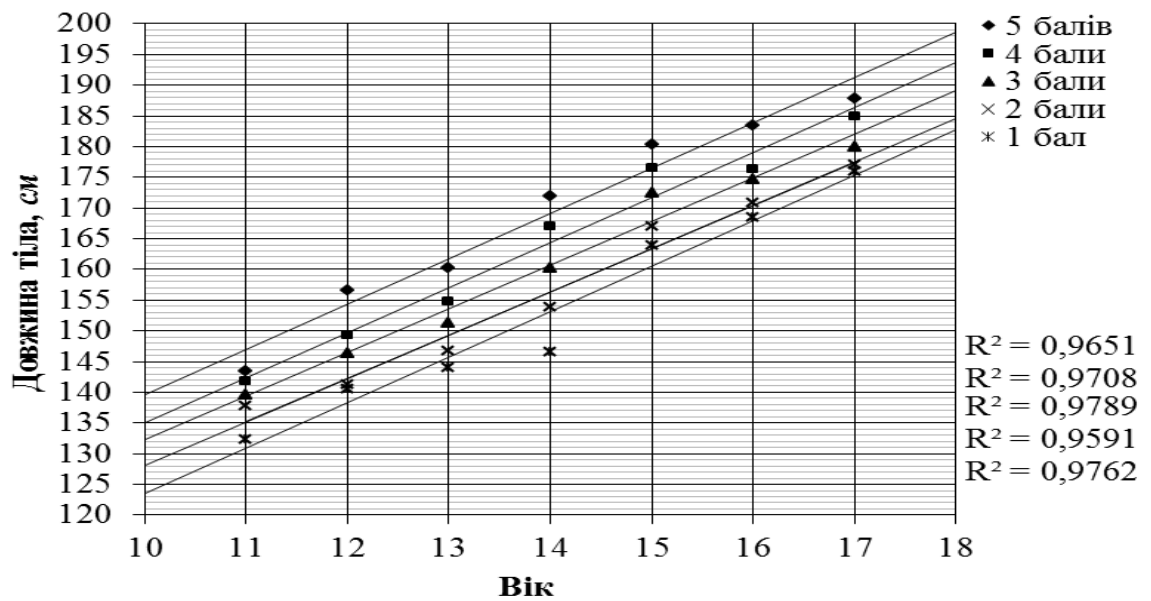**Figure 1.** *Prediction of body length of young football players*

With a body length measures, using graphic models shown in Fig. 2, we determined the proper weight of the young football player.
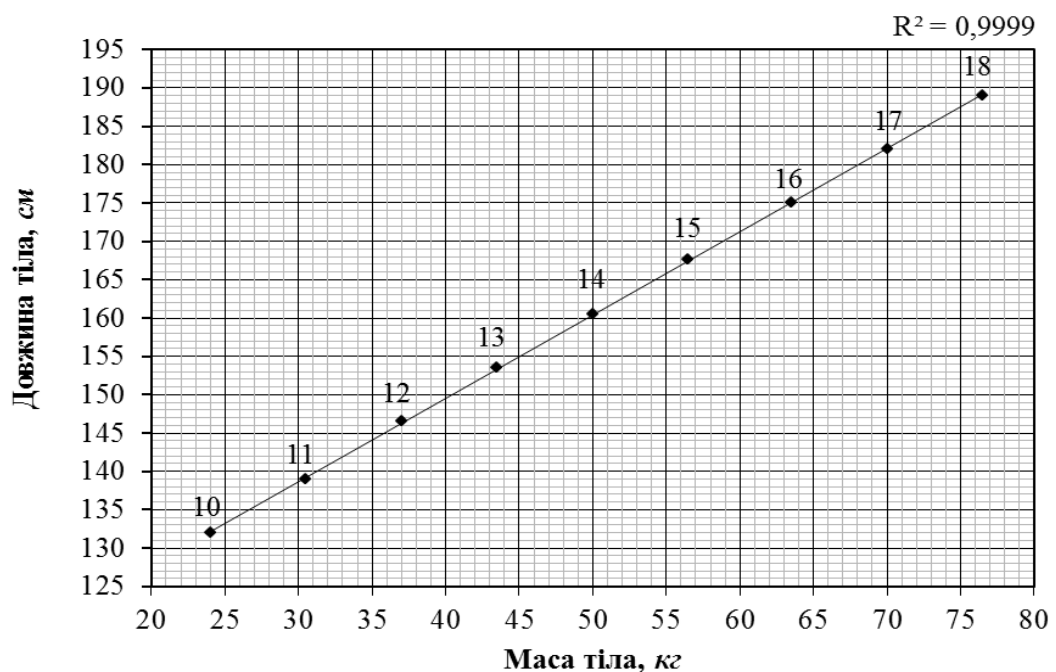

Figure 2. The model calculation of the length and weight of young football players through the use of scales regression in Microsoft Excel

Physical preparedness is evaluated by motor tests. Legerity - in terms of shuttle

run 3 × 10 m, power-speed qualities - the results of the standing long-jump, starting speed for running time at a distance of 30 m, flexibility studied in terms of splits, to explore distant speed, run for 50 m distance is used. Special endurance is studied using 7 × 50 m running. To calculate the MSC the calculation method based on veloergometric test PWC_{170} was used.

Consider the example of the offered integrated model in practice. Anthropometric unit analysis testified that player A height - 137.8 cm has weight 26.3 kg. This is in accordance with the regulations of 2 and 1 point.

Technical preparedness assessment revealed that the football player completed 4 assists and received 4 points for it. He completed 5 precise strikes, which corresponds to 5 points. Number of ball juggling was 12 that also correspond to 5 points.

Testing of special physical preparedness of football players revealed that he doing splits has hip joint mobility - 1 point. Power-speed qualities of this football player are equal to 2 points, as he conducted long jump at 165 cm. Starting speed of A football player is developed by 4 points since he ran 30 meters at 5.02 s. Much worse are distant speed indicators, 1 point, according eventually overcoming 50 m distance equal to 8,98 sec. Legerity is also not of a high level, 3 × 10 m 11-year-old football player overcame by 8,60 s, corresponding to 2 points. Evaluation of aerobic capacity in terms of ICN enables to detect the average level of development (3 points), this figure was at level 63 ml / min / kg.

The total amount of points is 2 + 1 + 4 + 5 + 5 + 1 + 2 + 4 + 1 + 2 + 3 = 30, according to the protocol of complex model preparedness (Table. 3.5) corresponds to the average level of development.

So, based on the above mentioned, we can make a conclusion that football player A has an average level of preparedness. In addition, the protocol takes a possibility, on the basis of a detailed analysis, to identify the strengths and weaknesses, and make adjustments to the training process. We consider that the application of the offered integrated approach will help to optimize training process of young football players.

Conclusions. Mathematical methods play an important role in predicting and modeling. These methods allow detecting features, patterns, trends and checking the reliability of statements and assumptions. The scope of mathematical methods' application is as wide as range of forecasts and models in football.

One of the conditions of successful predictions' and models' conduction is an integrated approach. It provides for a series of informative indicators that comprehensively characterize preparedness of football players. To developed protocols of a comprehensive model of football players' preparedness belong anthropometric indexes, indicators of technical and physical preparedness, and those characterizing functionality. Integrated models cover a wide age range - from 11 to 17 years.

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