



Characteristics of the Approximate-Optimal Training Indicators of Goalkeepers in Modern Football

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Abstract

Objectives. Is to systematize data on determining approximate and optimal indicators of training activities of goalkeepers in football at different stages of sports improvement in order to improve their training.

Material and methods. 14 athletes who are training at MFC “Metalurg” (Zaporizhzhya), playing the role – of goalkeeper: 3 athletes – MFC “Metalurg” (Zaporizhzhya), 3 athletes – MFC “Metalurg, U-19” (Zaporizhzhya), 2 athletes – MFC “Metalurg, U-17” (Zaporizhzhya), 2 athletes – MFC “Metalurg, U-16” (Zaporizhzhya), 2 athletes – MFC “Metalurg, U-15” (Zaporizhzhya), 2 athletes – MFC “Metalurg, U-14” (Zaporizhzhya). Age range: 14-24. Term of preparatory training period: 01.08.2024 – 24.11.2024.

Methods of research. Analysis and systematization of data from scientific literature and the resource of global information system “Internet”; pedagogical observations; analysis of video materials of training sessions and the competitive process, generalization of pedagogical experience and systematization of scientific data; pedagogical observations, analysis and evaluation of indicators of training and competitive activities of football players – goalkeepers; methods of mathematical statistics.

Results. Analysis of the competitive activity of qualified goalkeepers allows us to state that the average goalkeeper in modern football – a participant in the latest world and European championships, UEFA tournaments has the following anthropometric parameters: height – 195 ± 2 cm; weight – 90 ± 2 kg; weight-height index – 0.45 ± 0.01 c.u. The analysis of the data contained allows us to state the presence of certain relationships between the indicators of morphometry and the level of development of motor abilities of football players of various playing roles with the indicators of the effectiveness and efficiency of their competitive activities: goalkeepers show reduced correlations with endurance development; flank defender and midfielder have reduced indicators of the relationship between the effectiveness of competitive activity and morphometric indicators and manifestations of flexibility.

Conclusions. The results of experimental studies allow us to state that in the process of long-term sports training of football goalkeepers, the most significant psychological characteristics of the individual are: a high level of motivation to achieve the set goals, hard work, determination and psychological stability in the process of training sessions and competitive activities. In addition, the following indicators are critically important for the high-quality training of goalkeepers for professional football teams: morphometric parameters (height, limb length, weight, limb structure, muscle structure and ligament-articular apparatus), the level of development of leading motor abilities, manifestations of anticipatory reaction and subjective forecasting (anticipation of the flight of the ball, the moment and direction of the blow, the development of the game situation), physical fitness (general and special) and the pace of learning specific motor and technical-tactical actions of the goalkeeper.

Keywords: football, training indicators, characteristics, goalkeeper, sports preparation.

Introduction

Modern football is characterized by a high level of competition: the volume and intensity of loads in the process of training top-class athletes are almost exhausted or close to the

limits of the functional capabilities of the human body. In this situation, the issues of optimizing the educational, training and competitive activities of football players of different ages, playing roles and qualifications are especially relevant.

In these conditions, the process of long-term sports training and high-quality competitive activity of young football players is of particular importance in terms of optimizing

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the preparation of a qualified reserve for professional football teams. In this area, one of the central places is occupied by the study, analysis and generalization of the characteristics of the educational, training and competitive activity of young goalkeepers in football from the point of view of optimizing the process of preparing a high-quality reserve for professional football teams. The undoubted importance of this problem is due to the practice of modern football – the increased level of competition between professional football teams dictates the need to study, analyze and generalize the process of long-term training of young goalkeepers in football and the development of practical recommendations for coaches, coaches-teachers of children's and youth sports schools and coaches-selectors.

An analysis of literary sources on this issue indicates a significant interest of Ukrainian and foreign scientists in its solution. The study (Doroshenko, Shalfeev, Vorobets et al., 2007) focuses on the characteristics of the leading components of the training and competitive activities of goalkeepers in football in the system of long-term sports training. Shamardin and Khorkavyy (2015) they focus on the rational organizational structure of the system of sports training for goalkeepers in football, which, in their opinion, will allow optimizing the system of long-term sports training in general. Lisenchuk, Leleka, Bogatyrev et al. (2021) note that the existing relationships between the technical, tactical and physical fitness of goalkeepers in football are of critical importance for the training system in the age range of 13-14 years.

Other researchers identify psychological characteristics, multisensory reactions of the body, and motivational factors of athletes as the leading component of the training process and competitive activity (Singchainara, Harnmak, & Butcharoen, 2022; Quinn, Hirst, & McGovern, 2023; Akbar, Karim, & Zakaria, 2024).

The problematic issues of preventing sports injuries and the most effective construction of the rehabilitation process for goalkeepers in football are highlighted in the studies of medical and rehabilitation specialists (Doroshenko, Malakhova, Chernenko et al., 2019; Muracki, 2020; Muracki, Klich, Kawczynski & Boudreau, 2021).

The research (Goncalves, Clemente, Barrera et al., 2021a; Goncalves, Clemente, Barrera et al., 2021b) includes technologies for taking in to account the specific features of the female body in the formation of a rational construction of the training process for goalkeepers in football with an emphasis on medical, biological and psychological and pedagogical components.

The methodological issues of training highly qualified goalkeepers in football are highlighted in studies with an emphasis on its compliance with more applied concepts, in particular the application of testing theory in football (Abe, Ambe, Okuda et al., 2022; Hrybovska, & Zanevskyy, 2024).

Modern technologies for optimal assessment of the effectiveness of goalkeepers' competitive activities in football are presented in research (Kubayi, 2020; Mikikis, Michailidis, Mandroukas et al., 2021; Szwarc, Chamera, Duda et al., 2023).

The works of scientists devoted to the study, justification and expert analysis of factors that influence the effectiveness of goalkeepers' competitive activities in standard situations (penalties), taking in to account the possibility of the

manifestation of a predictive reaction, which is inherent in top-class athletes, are of considerable interest to researchers (Monteiro, dos Santos, Blauberger et al., 2024; Zheng, van der Zijden, Janssen, van der Kamp, 2024).

The presented scientific material indicates a sufficiently high level of study of the mentioned issues, but the issues of determining the approximate and optimal indicators of the training activities of goalkeepers in football at different stages of sports improvement, which can be used as model characteristics, remain relevant and ultimately unresolved.

Hypothesis. Solving problematic issues regarding the determination of approximate and optimal indicators of goalkeepers' training activities in football at different stages of sports improvement, which can be used as model characteristics, will contribute to the improvement of their sports training.

The purpose of the work: to systematize data on determining approximate and optimal indicators of training activities of goalkeepers in football at different stages of sports improvement in order to improve their training.

Material and Methods

Participants

14 athletes who are training at MFC "Metalurg" (Zaporizhzhya), playing role – goalkeeper: 3 athletes – MFC "Metalurg" (Zaporizhzhya), 3 athletes – MFC "Metalurg, U-19" (Zaporizhzhya), 2 athletes – MFC "Metalurg, U-17" (Zaporizhzhya), 2 athletes – MFC "Metalurg, U-16" (Zaporizhzhya), 2 athletes – MFC "Metalurg, U-15" (Zaporizhzhya), 2 athletes – MFC "Metalurg, U-14" (Zaporizhzhya). Age range: 14-24. Term of preparatory training period: 01.08.2024 – 24.11.2024.

Methods of Research

Analysis and systematization of data from scientific literature and the resource of global information system "Internet"; pedagogical observations; analysis of video materials of training sessions and the competitive process, generalization of pedagogical experience and systematization of scientific data; pedagogical observations, analysis and evaluation of indicators of training and competitive activities of football players – goalkeepers; methods of mathematical statistics.

Organization of Research

Experimental research was carried out during the preparatory period and during the first round of football season 2024-2025:

- PFL (professional football league of Ukraine, 1 league, group "B") – 3 athletes;
- CYFL, U-19 (children's and youth football league of Ukraine, 1 league, 3 group) – 4 athletes;
- CYFL, U-14 – U-17 (Children's and Youth Football League of Ukraine, Elite League, 4 group) – 8 athletes.

Experimental research was carried out in accordance with the standards and criteria for experimental scientific research, as contained in medical research documents (Declaration of Helsinki).

Statistical Analysis

The obtained experimental materials were processed by the package of application programs “IBM SPSS Statistics” with the calculation of the following indicators: arithmetic mean (X); arithmetic mean error (S); % – percentage value.

Results

Analysis of competitive activity of qualified goalkeepers allows us to state that the average goalkeeper in modern football – a participant in the latest world and European championships, European cup tournaments has the following anthropometric parameters: height – 195 ± 2 cm; weight – 90 ± 2 kg; weight-height index – 0.45 ± 0.01 c.u. (conventional unit). Probably, these indicators of height, weight and weight-height index are approximately optimal for successful competitive activity of qualified goalkeepers in modern football.

In addition, the somatotype of highly qualified goalkeepers has distinct features: longer, relative to the body, upper and lower limbs, slightly enlarged hands. A number of features are observed in the postural activity of football players of this role – in the posture, shoulders are slightly forward, which has a beneficial effect on catching balls and performing various game techniques while falling (forward and to the sides). Elongated limbs are considered conservative features, and this is recorded in childhood or adolescence. The position of the shoulders, slightly pushed forward, can be both an element of the formation of natural posture (genetic factor), and the result of many years of educational, training and competitive activity (factor of adaptation to the effects of the external environment).

In addition, experts (theorists and practitioners) highlight several pronounced personal qualities that distinguish highly qualified goalkeepers in modern football.

Motivation: a high level of motivation, which is expressed in the further formation of purposefulness, allows goalkeepers in football to significantly realize their abilities in the process of competitive activity, to maximize their technical and tactical potential in the competitive process.

Focus on achieving the highest possible results is manifested in a conscientious attitude to the educational and training process and competitive activity, especially in the process of individual training.

Hard work. The maximum realization of sports potential is possible only under the condition of the highest possible physical and mental performance. Without this, even with talent, the presence of genetic prerequisites for the formation of outstanding motor abilities, it is almost impossible to achieve the integral indicators of highly qualified goalkeepers.

Determination. Defending the gate, the goalkeeper often enters into tough single combats with opponents. At the same time, manifestations of determination are associated with overcoming the fear of the possibility of injury and with aggressiveness in game actions, on the one hand, and with the development of the reaction of anticipation of the game situation, on the other hand. The use of elements of psycho-emotional impact is necessary to improve the neuropsychic state of the goalkeeper and football players of his team, to instill uncertainty in the actions of the players of the opposing team.

Psychological stability. The competitive activity of a goalkeeper is associated with high responsibility for the final result of the competitive process, which creates additional psychological pressure. Therefore, psychological stability is a dominant psychophysiological criterion that allows to a large extent to level out stress factors in difficult game situations, under pressure from fans and unfavorable climatic factors. It is quite difficult to achieve this psychological state, and it is even more difficult to maintain the required level in a long-term competitive process. Kaka’s training and competitive practice shows that such personal qualities are predominantly possessed by football goalkeepers with sanguine and phlegmatic types of temperament – these personal qualities, to a large extent, determine the success of educational, training and competitive activities in the process of long-term preparation in football.

Based on pedagogical observations of the training and competitive process of football players of various playing roles, indicators of the level of influence of morphometric indicators of body structure and indicators of motor ability development on the effectiveness and efficiency of their competitive activities have been identified and systematized (table 1).

The analysis of the data contained in table 1 allows us to state the presence of certain relationships between the indicators of morphometry and the level of development of motor abilities of football players of various playing roles with the

Table 1. The level of influence of motor abilities and morpho-functional indicators on the effectiveness of competitive activity in football for players of different specializations**, % (n = 14)

Game specialization (role)	Morphometry and motor abilities						vestibular stability
	morphometry	strength	speed	endurance	coordination	flexibility	
Level of influence							
goalkeeper	75-100	75-100	50-75	25-50	75-100	75-100	75-100
central* defender	50-75	75-100	75-100	50-75	50-75	50-75	75-100
flank* defender	50-75	50-75	75-100	75-100	50-75	25-50	50-75
central midfielder	50-75	75-100	50-75	50-75	50-75	50-75	50-75
flank* midfielder	25-50	50-75	75-100	75-100	50-75	25-50	50-75
central forward	75-100	75-100	75-100	50-75	75-100	50-75	75-100
flank* forward	25-50	50-75	75-100	75-100	50-75	25-50	50-75

Notes: ** – when using the tactical scheme 1-4-3-3; * – right or left; 75-100% – high; 50-75% – medium; 25-50% – low

Table 2. Prerequisites for achieving a high level of sportsmanship of goalkeepers in football, (n =14)

Prerequisites	Heredity coefficient, c.u.	Development opportunities, %
morphometry:	0.66	
• height and length of limbs	0.69	0-25%
• weight	0.51	50-75%
• structure of limbs	0.68	50-75%
• muscle structure	0.77	50-75%
flexibility	0.69-0.89	75-100%
speed	0.67	50-75%
strength and speed	0.71	50-75%
the pace of learning and improving goalkeeper techniques	0.59-0.79	25-50%
anticipation reaction:	0.78	75-100%
• trajectory of the ball flight	0.79	75-100%
• moment and direction of impact	0.74	50-75%
• development of game situations	0.81	75-100%
subjective forecasting	0.79	75-100%
motivation	0.73	50-75%
mental and physical performance	0.77	75-100%

Notes: 75-100% – high; 50-75% – medium; 25-50% – low

Table 3. Organizational and chronological structure of long-term training of a goalkeeper in football, n = 14

Period	Stage	The main tasks of sports training	Age range
Initial and preliminary basic training	Definitions of predisposition and inclination to play in goal, mastering the skills and technical and tactical techniques of playing as a goalkeeper	Improving overall motor fitness. Mastering football skills. Developing motor skills.	Up to 10-11 years
Specialized basic training and preparation for higher sports achievements	Teaching game techniques and technical and tactical actions in various game situations and improving them. Development of sportsmanship	Teaching the basic elements of goalkeeper technique and improving them. Comprehensive and targeted development of specific motor skills. Comprehensive development of tactical skills and abilities.	Up to 14-15 years
Maximum realization of individual potential of athletes and maintaining athletic fitness	Improving sports skills and stabilizing their level	Improving special performance. Adaptation of technical and tactical skills and abilities to the conditions of professional football. Integrated preparedness.	Up to 21 years and beyond

indicators of the effectiveness and efficiency of their competitive activities:

- goalkeepers show reduced correlations with endurance development;
- flank defender and flank midfielder have reduced indicators of the relationship between the effectiveness of competitive activity and morphometric indicators and manifestations of flexibility.

Table 2 shows the indicators that reflect the statistical relationships between the individual characteristics of athletes, characterizing the potential for successful educational, training and competitive activities of goalkeepers in football and the possibilities for their development in the process of long-term sports training.

Table 3 systematizes the data of pedagogical observations of football goalkeepers at various stages of long-term sports training.

Discussion

The presented experimental material contains certain positions of scientific novelty, which clarify the direction of training effects in the process of long-term sports training of football goalkeepers. It is also important to focus the attention of researchers (theoreticians and practitioners) on the relationship between certain indicators of the development of motor qualities and psycho-physiological characteristics (anticipation reactions).

These characteristics are critically important for successful training and competitive activities in football (according to data Kostiukevych, Lazarenko, Konnov et al., 2022; Let-hole, Kubayi, Toriola et al., 2024).

In addition, researchers consider the morphometric profile of football goalkeepers to be critically important for successful competitive activities. Although, individual excep-

tions to these rules are, most likely, individual exceptions, based on the specific selection of football players and the tactical scheme of the game (according to data Kaplanova, Sagat, Gonzalez et al., 2020; Primasoni, Syamsuryadin Wahyuti, Arjuna, Miftachurochmah, 2024). As an example, we can recall the legendary football goalkeeper of FC "Barcelona" (Spain) Víctor Valdes Arribas, who, with a relatively short height (183 cm), defended the colors of the Catalan club during 2002-2014 and won many national and international tournaments.

Individualization of training is also critically important for optimizing the athletic training of football goalkeepers and the success of their competitive activities (Tienza-Valverde, Hernandez-Beltrana, Espadab et al., 2023; Spielmann, Otte, & Schumacher, 2024). This allows us to clarify the correspondence of individual model characteristics to the averaged and systematized data that specialists use as model characteristics of football goalkeepers.

There is an alternative point of view, which, as a dominant one, puts forward a comprehensive focus of the training process on the development of various aspects of the preparedness of football goalkeepers – technical and tactical, physical, psychological, taking in to account the development of tactical skills (Ibrahim, de Boodeb, Kingmac, & van Dieën, 2022).

The above indicates the need for further modification of the system of long-term sports improvement of football goalkeepers based on the use of innovative technologies (including instrumental ones), new methods and techniques, taking in to account the choice of the most rational means (Otte, Millar, & Klatt, 2020).

Prospects for further research in this area are based on the need for a more detailed study of the accompanying factors that are related to the areas of extra-training and extra-competitive activities. We are talking about the accelerated rehabilitation of football goalkeepers after cases of sports injuries, determining the most accurate prognostic criteria for successful professional development of athletes of this category, improving motivation and social status, etc.

Conclusions

The results of experimental studies allow us to state that in the process of long-term sports training of football goalkeepers, the most significant psychological characteristics of the individual are: a high level of motivation to achieve the set goals, hard work, determination and psychological stability in the process of training sessions and competitive activities. In addition, the following indicators are critically important for the high-quality training of goalkeepers for professional football teams: morphometric parameters (height, limb length, weight, limb structure, muscle structure and ligament-articular apparatus), the level of development of leading motor abilities, manifestations of anticipatory reaction and subjective forecasting (anticipation of the flight of the ball, the moment and direction of the blow, the development of the game situation), physical fitness (general and special) and the pace of learning specific motor and technical-tactical actions of the goalkeeper.

Conflict of interest

The authors state no conflict of interest.

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Характеристика орієнтовано-оптимальних тренувальних показників воротарів у сучасному футболі

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 7 с., 3 табл., 27 джерел.

Мета роботи: систематизувати дані щодо визначення орієнтовно-оптимальних показників тренувальної діяльності воротарів у футболі на різних етапах спортивного вдосконалення з метою вдосконалення їх підготовки.

Матеріал і методи. 14 спортсменів, які тренуються в МФК «Металург» (Запоріжжя), амплуа – воротар: 3 спортсмени – МФК «Металург» (Запоріжжя), 3 спортсмени – МФК «Металург, U-19» (Запоріжжя), 2 спортсмени – МФК «Металург, U-17» (Запоріжжя), 2 спортсмени – МФК «Металург, U-16» (м. Запоріжжя), 2 спортсмени – МФК «Металург, U-15» (м. Запоріжжя), 2 спортсмени – МФК «Металург, U-14» (м. Запоріжжя). Віковий діапазон: 14-24. Термін підготовчого періоду навчання: 01.08.2024 – 24.11.2024. Методи дослідження: Аналіз та систематизація даних наукової літератури та ресурсів глобальної інформаційної системи «Інтернет»; педагогічні спостереження; аналіз відеоматеріалів навчально-тренувальних занять та змагального процесу, узагальнення педагогічного досвіду та систематизація наукових даних; педагогічні спостереження, аналіз та оцінка показників навчально-тренувальної та змагальної діяльності футболістів – воротарів; методи математичної статистики.

Результати. Аналіз змагальної діяльності кваліфікованих воротарів дозволяє стверджувати, що середньостатистичний воротар сучасного футболу – учасник останніх чемпіонатів Європи і світу, турнірів UEFA має такі морфометричні параметри: зріст – 195 ± 2 см; вага – 90 ± 2 кг; масо-зростовий індекс – $0,45 \pm 0,01$ у.о. Аналіз наведених даних дозволяє констатувати наявність певних взаємозв'язків між показниками морфометрії та рівнем розвитку рухових здібностей футболістів різного ігрового амплуа з показниками результативності та ефективності їх змагальної діяльності: воротарі мають знижені кореляції з розвитком витривалості; у флангових захисників і півзахисників – знижені показники зв'язку ефективності змагальної діяльності з морфометричними показниками і проявами гнучкості.

Висновок. Результати експериментальних досліджень дозволяють стверджувати, що в процесі багаторічної спортивної підготовки футбольних воротарів найбільш значущими психологічними характеристиками особистості є: високий рівень мотивації досягнення поставлених цілей, працьовитість, цілеспрямованість і психологічна активність. стійкість у процесі тренувальних занять і змагальної діяльності. Крім того, критично важливими для якісної підготовки воротарів для професійних футбольних команд є такі показники: морфометричні параметри (зріст, довжина кінцівки, вага, будова кінцівки, структура м'язів та зв'язково-суглобового апарату), рівень розвитку провідних рухових здібностей, прояви випереджаючої реакції та суб'єктивного прогнозування (передбачення польоту м'яча, моменту та напрямку удару, розвитку ігрової ситуації), фіз. підготовленість (загальна і спеціальна) і темп навчання конкретним руховим і техніко-тактичним діям воротаря.

Ключові слова: футбол, тренувальні індикатори, характеристика, воротар, спортивна підготовка.

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