



Characteristics of competitive activity of football players of various playing roles in youth national teams

UDC 796.093



PhD **E.M. Kalinin**^{1,3}

V.A. Kuzmichev¹

A.A. Khomyakova^{1,2}

PhD, Associate Professor **A.V. Leksakov**^{1,2}

¹Russian Football Union, Moscow

²Russian State University of Physical Education, Sports, Youth and Tourism (SCOLIPE), Moscow

³Moscow Institute of Physics and Technology, Dolgoprudny, Moscow Region

Corresponding author: emkalinin@gmail.com

Abstract

Objective of the study was to determine the characteristics of the competitive activity of players of different roles in national teams based on data received from GPS equipment.

Methods and structure of the study. In the course of the work, the motor activity of highly qualified players (267 players), who are members of the Russian national sports teams, who played 95 ± 3 minutes, was studied, which was measured by the RealTrack System GPS tracking system, Spain, and then classified according to speed ranges, accelerations and decelerations. Significance of differences was determined using one-way analysis of variance in the Statistica 10.0 software.

Results and conclusions. According to the results of the study, the characteristics of the motor activity of football players of various roles in the conditions of competitions, which are characterized by a certain structure of movements, were obtained. Accounting for positional requirements for competitive activity in the form of various movements is necessary when planning subsequent training sessions of various directions.

Keywords: range, accelerations, decelerations, motor actions, football.

Introduction. Understanding the requirements for physical fitness in football requires an accurate and objective quantitative assessment of the competitive activity of players. It is well known that football is characterized by low-intensity (for example, standing and walking) and high-intensity (for example, running at high speed and sprinting) motor actions [10]. Along with specific actions (e.g. martial arts, turning, heading and kicking, dribbling), motor activities make up the overall load that a player experiences during a match.

Previously, attempts were made to quantify this load, for example, by measuring the heart rate of players [2], determining the distance and intensity of running using video analysis [7,9]. Recently, computer analysis of actions has been increasingly used [8]. All this expanded the understanding of the requirements of individual game roles and football in general. But these analyzes miss such important indicators for football in terms of load assessment as accelerations

and decelerations, which can be assessed using GPS-based equipment [5]. And the data used in the analysis are usually taken from football academies or clubs [1,3], which limits information about motor activity in national teams.

Objective of the study was to determine the characteristics of the competitive activity of players of different roles in national teams based on data received from GPS equipment.

Methods and structure of the study. To achieve this goal, the motor activity of players (267 players, age - 17.7 ± 2.0 years; body length - 182.3 ± 5.7 cm; body weight - 73.6 ± 6.9 kg) was studied in the sports teams of Russia, who played 95 ± 3 minutes. Motor activity was measured with a tracking system from RealTrack System, Wimu PRO, Spain, consisting of a device fixed on the player with two built-in sensors: a navigation satellite system and a GNSS / GPS positioning system with a frequency of 10 Hz, compatible with the Galileo navigation system, as well as an



accelerometer (1000 Hz), magnetometer (100 Hz), gyroscope (1000 Hz), barometer (100 Hz) [4]. All motor actions performed by the players were classified according to speed ranges [10] and acceleration and deceleration ranges [6], which we combined for their simple perception and presentation up to >2 m/s and <-2 m/s. The significance of differences was determined using one-way analysis of variance in the Statistica 10.0 software.

Results of the study and their discussion. All players were divided into roles: central defender, flank defender, central midfielder, flank midfielder, forward (central). Based on the results of the study, a profile of motor activity was compiled, classified by speed and acceleration for each role (Tables 1, 2).

Central defenders are characterized by lower values: total distance volume ($p<0.05$, except for the attacker - $p>0.5$), maximum speed ($p<0.01$, except for the central midfielder and flank midfielder - $p>0.1$), high-intensity running ($p<0.001$), sprinting ($p<0.001$, except for the central midfielder - $p>0.5$), number ($p<0.001$ compared to the central midfielder) and volume of accelerations ($p<0.01$ compared to the flank defender and central midfielder), braking ($p<0.001$ compared to wingback and central midfielder), and intensity of braking ($p<0.05$, except for central midfielder).

Wing defenders are characterized by significantly higher values: maximum speed, "sprint" when compared with the central defender and central midfielder ($p<0.05$). At the same time, the number of accelerations of the flank defenders is lower than that of the central midfielder ($p<0.05$), and the volume does not differ ($p>0.05$). Also, flank defenders are characterized by a greater number and intensity of braking than a central defender ($p<0.001$).

Central midfielders are characterized by higher

values: the volume of the total distance compared to players of other roles ($p<0.001$), high-intensity running compared to the central defender ($p<0.001$), the number of accelerations compared to the central defenders and flank defenders ($p<0.05$), acceleration volume compared to central defenders ($p<0.001$), braking volume ($p<0.05$) and highest braking volume ($p<0.001$ except $H-p>0.1$), lowest maximum speed and sprint volume, the differences are significant ($p<0.05$), except for the central defender.

Wing midfielders are characterized by identical values as wingbacks, since they perform movements on the flanks. Wing midfielders perform one of the largest volumes of acceleration, but at the same time a smaller amount of braking (significant differences, $p<0.05$, between central midfielders), and are characterized by the highest braking intensity (significant differences, $p<0.05$, when compared with a central defender and central midfielder).

Forwards are characterized by significantly higher values: maximum speed, sprint volume ($p<0.05$, except for flank defenders and flank midfielders), intensity of braking ($p<0.05$ when compared with a central defender) and the lowest values of acceleration and braking ($p<0.05$ when compared to the central midfielder).

Conclusions. According to the results of the study and comparative analysis of the players of the Russian national teams of different roles, it was found that the players of different positions perform motional actions peculiar only to them during the game. The greatest amount of movement in a sprint is performed by flank players and attackers, who are characterized by the highest maximum speed that the playing space allows them to achieve and high maximum braking values. Central midfielders have the highest amount of total distance, acceleration and braking, and the lowest top

Table 1. Parameters of intense motor activity of football players of various roles, classified by speed

Role*	Total distance, m	Running at 19.8-25.2 km/h (m)	> 25.2 km/h (m) «sprint»	Speed, max., km/h
	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$	$\bar{x}\pm\sigma$
Central defender (n=92)	10070±695	358±120	74±55	29,5±1,7
Flank defender (n=66)	10690±598\$	567±109\$	163±84\$♣	30,9±1,8\$♣
Central midfielder (n=67)	11468±1043\$#¶§	602±214\$	84±54	29,2±1,6
Flank midfielder (n=24)	10840±737\$	606±142\$	153±84\$♣	30,6±1,5♣
Forward (n=18)	10428±767	602±161\$	204±81\$♣	31,3±1,7\$♣
All (n=267)	10667±948	510±187	115±81	30,0±1,9

Note*: Differences are significant at $p<0.05$: \$ – more than the central defender; # - more than a flank defender ♣ - more than a central midfielder; ¶ – more than a flank midfielder; § - more than a forward.



Table 2. Parameters of intense motor activity of football players of different roles, classified by accelerations

Role*	Accelerations >2 m/c ² ,			Braking >2 m/c ² ,		
	x±σ			x±σ		
	Times	Meters	Max.	Times	Meters	Max.
Central defender (n=92)	203±37	1395±260	5,27	193±33	951±225	-6,37
Flank defender (n=66)	207±30	1568±252\$	5,23	219±31\$	1169±185\$	-6,79\$
Central midfielder (n=67)	225±42\$#	1618±325\$	5,11	236±39\$#¶§	1316±263\$#¶	-6,60
Flank midfielder (n=24)	207±28	1621±214	5,12	204±27	1047±136	-7,39\$♣
Forward (n=18)	198±38	1539±252	5,33	199±37	1128±259	-7,17\$
All (n=267)	210±37	1522±286	5,21	212±38	1115±263	-6,68

Note*: The differences are significant at $p < 0.05$: \$ – more than the central defender; # - more than a flank defender; ♣ - more than a central midfielder; ¶ - more than a flank midfielder; § - more than a forward.

speed due to limited free space in the center of the field. Central defenders demonstrate the least amount of motor activity both in terms of acceleration and braking, and in terms of speed.

References

- Gasanova N.B., Zaitseva T.V., Zolotarev A.P. et al. Sravnitelnyy analiz pokazateley dvigatelnoy aktivnosti vysokokvalifitsirovannykh futbolistok raznykh igrovyykh amplua v usloviyakh sorevnovatelnoy deyatelnosti [Comparative analysis of indicators of motor activity of highly qualified female football players of different game roles in conditions of competitive activity]. Uchenye zapiski universiteta im. P.F. Lesgafta. 2020. No. 3. pp. 97-101.
- Godik M.A., Skorodumova A.P. Kompleksnyy kontrol v sportivnykh igrakh [Complex control in sports games]. Moscow: Sovetskiy sport, 2010. 336 p.
- Shergin A.V. Upravleniye protsessom sportivnoy podgotovki futbolistov vysokoy kvalifikatsii s ispolzovaniyem pokazateley dvigatelnoy aktivnosti sorevnovatel'noy deyatelnosti [Management of the process of sports training of highly qualified football players using indicators of motor activity of competitive activity]. Vestnik Tambovskogo gosudarstvennogo universiteta. 2012. No. 11. pp. 208-212.
- Bastida-Castillo A., Gómez-Carmona C.D., Sánchez E., Ortega J.P. Comparing accuracy between global positioning systems and ultra-wideband-based position tracking systems used for tactical analyses in soccer. European journal of sport science. 2019. No. 19. pp. 1157-1165.
- Dalen T., Ettema G., Hjelde G. et al. Player load, acceleration, and deceleration during forty-five competitive matches of elite soccer. The journal of strength and conditioning research. 2016. Vol. 30. pp. 351-359.
- Dalen T., Loras H., Hjelde G. H., Kjosnes T.N. Accelerations – a new approach to quantify physical performance decline in male elite soccer? European journal of sport science. 2019. Vol. 19. pp. 1015-1023.
- Castellano J., Alvarez-Pastor D., Bradley P.S. Evaluation of research using computerised tracking systems (Amisco and Prozone) to analyze physical performance in elite soccer: a systematic review. Sport medicine. 2014. Vol. 44. pp. 701-712.
- Osgnach C., Poser S., Bernardini R., Rinaldo R. Energy cost and metabolic power in elite soccer: a new match analysis approach / Medicine and science in sports and exercise. 2010. Vol. 42 (1). pp. 170-178.
- Otero-Saborido F.M., Aguado-Méndez R.D., Torreblanca-Martínez V.M. et al. Technical-tactical performance from data providers: a Systematic review in regular football leagues. Sustainability. 2021. Vol. 13. pp. 1-14.
- Rampinini E., Coutts A.J., Castagna C., Sassi R. Variation in top level soccer match performance. International journal of sports medicine. 2007. Vol. 28. pp. 1018-1024.