



Ergometric criteria for maximum anaerobic power of high qualified football players

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Abstract

Objective of the study was to analyze the speed-strength abilities of highly qualified football players.

Methods and structure of the study. The experiment involved 29 players from two football clubs in the Russian Premier League. The maximum anaerobic power (MAP) of the athletes was determined using bicycle ergometry using a Monark bicycle ergometer. The running speed was recorded using the speedographic method, which allows continuous real-time recording of the running speed curve throughout the entire distance.

Results and conclusions. The conducted research showed that the level of speed-strength abilities of highly qualified football players is at the average level. This suggests that athletes have a reserve that coaches should work on. In the operational control of the speed-strength readiness of football players, it is recommended to use an ergometric analysis of running speed, which makes it possible to determine informative indicators that characterize various aspects of running performance. Based on such an analysis, it is possible to make adjustments when designing training programs by selecting special exercises for developing lagging abilities.

Keywords: *maximum anaerobic power of players, speed-strength abilities of football players, ergometric analysis of running speed.*

Introduction. During a football match, players have to work in an alactic anaerobic mode with maximum speed and power, lasting 3-5 s, performing 30-40 maximum spurts [3, 6]. In such cases, the movement of football players with the ball or to the ball is energetically provided by the total content of adenosine triphosphoric acid (ATA) and creatine phosphate (CP) in the muscles. The reserves of ATA and CP in the human body are small and when performing the most intense work they are enough, depending on individual characteristics and the level of fitness for 6-8 seconds. If you continue to work at the same time, then the reserves of ATA and CP decrease and the output power decreases, that is, the maximum running speed decreases [1]. From this point of view, the maximum starting speed and

maximum muscle power are among the leading factors that determine the physical performance of football players.

Objective of the study was to analyze the speed-strength abilities of highly qualified football players.

Methods and structure of the study. The experiment involved 29 players from two football clubs in the Russian Premier League. The maximum anaerobic power (MAP) of the athletes was determined using bicycle ergometry using a Monark bicycle ergometer. The load on the wheel was set at the rate of 75 g·kg⁻¹ of the body weight of the subjects. An example of a power curve recording is shown in Figure 1.

The running speed was recorded using the speedographic method, which allows continuous real-

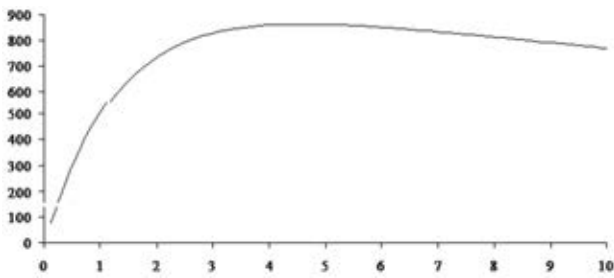


Figure 1. Power-time dependence in the MAP test. On the abscissa - time (s), on the ordinate - power (W).

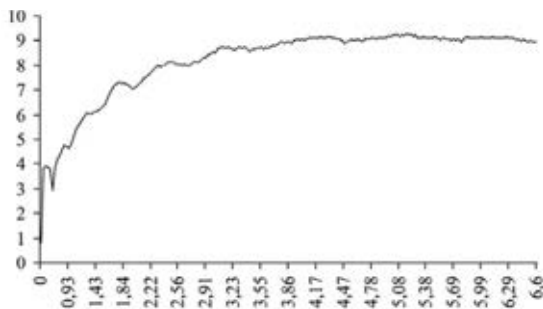


Figure 2. Velocity-time dependence for 50 m run. Abscissa shows time (s), ordinate shows running speed ($m \cdot s^{-1}$).

time recording of the running speed curve throughout the entire distance [2]. An example of running speed recording is shown in Figure 2.

Research results and discussion. The indicators of the maximum anaerobic power of football players are presented in Table 1.

As can be seen from the data in the table, the average value of the maximum power index (W_{max}) was 868.0 W. The value of such an indicator as the time to reach maximum power (T_{max}) is 4.14 s, and the indicator of maximum power retention time (T_{sp}) is 3.38 s. The data presented in the table demonstrate that the level of development of the maximum anaerobic power in the examined football players according to the value of such an indicator as $W_{max/rel}$ - 11.6 W/kg is below the average.

The speed abilities of football players are presented in Table 2.

As can be seen from the data presented in the table, the value of the maximum running speed indicator (V_{max}) was $7.48 m \cdot s^{-1}$, and the value of such an indicator as the time to reach the maximum running speed (T_{max}) was 4.89 s. The average value of the time to maintain the maximum running speed (T_{sp}) was 2.16 s. The running time of a five-meter segment (T_{5m}) was 1.17 s, 10-meter (T_{10m}) - 1.93 s, 15-meter (T_{15m}) - 2.60 s, 30-meter (T_{30m}) - 4.39 s and 50-meter (T_{50m}) - 6.68 s. The value of such an indicator as the distance to reach the maximum running speed (S_{max}) was 34.33 m. The value of the running speed indicator on a five-meter segment (V_{5m}) was $4.31 m \cdot s^{-1}$, and on a 10-meter segment (V_{10m}) - $5.18 m \cdot s^{-1}$.

As a result of the survey and analysis of the data obtained, it was found that the level of development of speed abilities in the examined football players is lower than in foreign players of the corresponding qualification [4, 5]. For example, on a 15-meter

Table 1. Calculated indicators of maximum anaerobic power in the MAP test

No. p / p.	Indicators	The average meaning	Standard deviation
1	W_{max} , W	868,0	59,7
2	T_{max} , s	4,14	0,95
3	T_{sp} , s	3,38	0,78
4	$W_{max/rel}$, W/kg	11,6	0,92

Table 2. Calculated indicators derived from the analysis of the 50 m running speed curve

No. p / p.	Indicators	The average meaning	Standard deviation
1	V_{max} , $M \cdot C^{-1}$	7,48	0,31
2	T_{max} , C	4,89	0,64
3	T_{sp} , C	2,16	0,81
4	T_{5M} , C	1,17	0,08
5	T_{10M} , C	1,93	0,09
6	T_{15M} , C	2,60	0,09
7	T_{30M} , C	4,39	0,11
8	T_{50M} , C	6,68	0,18
9	S_{max} , M	34,33	5,68



segment, our football players lose 0.15 s to the football players of the Swedish national league, which at such speeds is about 1 m.

Conclusions. On the basis of the study, it can be concluded that the level of speed-strength abilities of highly qualified football players is at the average level. This suggests that athletes have a reserve that coaches should work on. In the operational control of the speed-strength readiness of football players, it is recommended to use an ergometric analysis of running speed, which makes it possible to determine informative indicators that characterize various aspects of running performance. Based on such an analysis, it is possible to make adjustments in the design of training programs by selecting special exercises for developing lagging abilities.

References

1. Volkov N.I. Bioenergetika napryazhennoj myshechnoj deyatelnosti cheloveka i sposoby povysheniya rabotosposobnosti sportsmenov [Bioenergetics of intense muscular activity of a person and ways to improve the performance of athletes]. Doct. Diss. (Biol.). Moscow, 1990. 101 p.
2. Samborsky A.G., Samborsky A.A. Sovremennye instrumentalnye i kompyuternye tekhnologii ocenki skorostno-silovyh sposobnostej sportsmenov [Modern instrumental and computer technologies for assessing the speed-strength abilities of athletes]. *Teoriya i praktika nat. kul'tury*. 2004. No. 11. pp. 11-12.
3. Bangsbo J., Lindquist F. Comparison of various exercise tests with endurance performance during soccer in professional players. *Sports Med.* 1992. No. 13. pp. 125-132.
4. Brewer J., Davis J.A. A physiological comparison of English professional and semi-professional soccer players. *Sport Sci.* 1992. No 10. pp. 146-147.
5. Kollath E., Quade K. Experimental measurement of the professional and amateur soccer players sprinting speed. In Reilly T., Clarys J., Stibbe A. (eds) *Science and Football II*. E., F.N. Spon, London. 1993. p. 31-36.
6. Luhtanen P. Video analysis of technique and tactics. In Santilli G. (ed.) *Congress Proceedings of the International Conference Sports Medicine Applied to Football*. – CONI, Rome. 1990b. p. 77-84.