

## TECHNICAL SPECIFICATIONS OF QUALIFIED SPORTSWOMEN WHO SPECIALIZE IN RACE WALKING FOR 10 KM.

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**Annotation.** *Purpose:* to identify the main biomechanical characteristics of qualified athletes. *Material:* The study involved nine athletes. Video footage used for hardware-software complex LUMAX (number of dimensions - 891). *Results:* systematized data on more than 15 references. Biomechanical characteristics of vehicles covered nine best athletes in the championship of Ukraine 2013. A comparative analysis of the results with the scientific and methodological literature. Notes the importance of calculating the utilization of anthropometric data (ratio of stride length and growth athlete). *Conclusions:* The main priority for enhancing athletic performance Ukrainian athletes is an increase of 2-3 cm length of stride, with increasing frequency index steps to 3.45 steps per second.  
**Keywords:** athletes, athletic, walking, biomechanical characteristics, technique.

### Introduction

The results level of winners of world sports forums in race walking among women is increasing. This requires improvement of permanent methods of preparing not only of world-class high-athletes at the stages of the maximum realization of individual possibilities and conservation of high sportsmanship but of female athletes who are at the prior stages of preparation of many years [6, 9].

If we consider the fact that changes in the volume and the ratio of means of training at the basic stages of long-term training can lead to speeding up of the training process, the emphasis on improving technical training can create ideal conditions for the achievement of good results in the future [8, 11].

This requires finding new ways of improvement, especially of the technical preparation of athletes specializing in race walking. And for this it is necessary to optimize the technology assessment techniques athletes specializing in race walking [4, 12].

Unlike other kinds of athletics, performance technique of race walking is severely restricted by competition rules, where exists a clear definition of it, based on which in race walking there should not be a phase of flight, or in other words there must always be a contact with a support, as well as a forwarded (supporting) leg should be fully extended in a knee joint from the first contact with the ground until the vertical passing [1, 3, 7].

In turn, the few studies [2, 5, 14, 15] devoted to techniques of race walking deal only with the main characteristics of the techniques of female athletes: traversing speed, length and frequency of steps over a distance.

Finding ways to increase the length and frequency of steps is the basis of technical improvement of athletes that require the identification of the characteristics causing the optimal ratio of these indices. This will determine the methodological approaches to the assessment of technology and create the conditions for the further development of technical skill of speedwalkers.

The studies have been performed according to the "Consolidated Plan of Scientific and Research Work in the field of physical culture and sports for 2011-2015" of the Ministry of Education and Science, Youth and Sports of Ukraine relating to theme 2.2 "Theoretical and methodological bases of preparation of sportsmen of high qualification in terms of professionalization (by example of athletics)", state registration 0111U001721.

### Purpose, tasks of work, materials and methods.

The purpose of the study is to identify the main characteristics of biomechanical techniques of qualified athletes specializing in 10 km race walking.

*Material and methods.* To achieve the objectives the following methods have been used: analysis of scientific and methodological literature, pedagogical observations, anthropometry, video and computer analysis of motor actions of athletes and methods of mathematical statistics.

At the first stage of the research in the analysis of data of scientific and methodical literature (15 sources) there have been studied approaches to assessing the art athletes specializing in race walking.

At the second stage there have been made a biomechanical analysis of techniques a competitive exercise of nine athletes in the championship of Ukraine among the teams of sports schools in 10 km race walking (Ivano-Frankivsk, 2013).

Video filming with the observance of biomechanical requirements has permitted to make a quantitative and qualitative analysis of movements of speedwalkers. To do this there have been used the hardware -software complex «Lumax», basic specifications and features which are detailed in publications of developers [10].

The register of postures of athletes when performing competitions exercises have been made with camcorder "Sony DCR-SR 65" at 25 frames per second, followed by a breakdown on 50 shots.

All the metrological requirements have been taken into account that allowed the camera to place correctly and to minimize systematic and random errors. To digitize kinematics of biolinks of athletes there have been used 20 functioning model of the human body. In this application has a clear sequence of points.

At this stage, the results obtained were compared with the data of scientific and methodical literature.

At the third stage of the research there have been identified key issues and future directions for improvement of the technology assessment techniques athletes specializing in race walking.

**Results of research.**

Athletic performance in sports walking depends on the average speed of movement. In turn, the speed of movement depends on the length and frequency of steps. Thus, identification of these characteristics, as well as their relation is the foundation of technology implementation evaluation of race walking.

For achievement of high world level in race walking for 20 km, figures of women step length during competitive distance must be within 1,06-1,19 m at a frequency of steps 3,34-3,60 per second [13 , 14, 15]. These indicators and their ratio vary in different athletes, which primarily depends on the growth, and the exact length of legs, as well as on the degree of technical and physical readiness.

As a result of our research the average length of steps in eight Ukrainian athletes (average result 50:14.15; S = 1:03.0) has amounted to 1.03 m (S = 0,05), which, of course, much less than the world's leading athletes. The frequency of steps on the average was 3.23 per second (S = 0,05) ( table). In competition winner Inna Kashina (result 45:57.0 ) the frequency of steps was close to 3.45 pitch per second, with a length of steps about 1.05 m (drawing).

It should be noted that the length of the right-handers step with his left foot was 3-5 cm longer than with the right foot. Duration of the support phase also shows little difference in the various execution steps of the legs: the length in the right leg support with 0.27 second (S = 0,01), left - 0.29 second (S = 0,02), which confirms the great strength exhibited by the right foot.

However, in addition to finding the optimal ratio of the length and frequency of steps, it is important to determine the ratio of stride length and growth of the athlete (or rather to use an indicator of leg length, but it is practically not represented in scientific and methodological literature), which can be presented as the utilization factor of anthropometric data -  $K_a$ :

$$K_a = L / H, \text{ where } L - \text{stride length, } H - \text{height.}$$

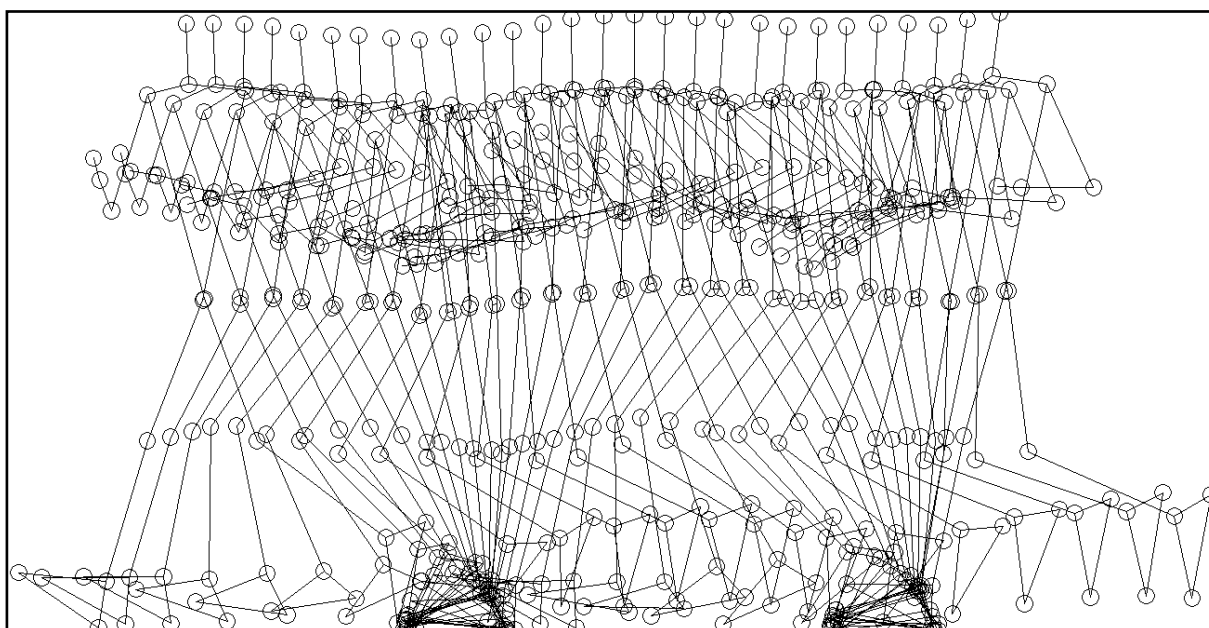
Based on current data of scientific and methodical literature [14, 15], which shows the individual characteristics related to growth and the length of the steps of leading athletes of the world, we can determine the model coefficient of use of anthropometric data -  $K_a = 0,68$  (S = 0,03).

As a result of research, the average utilization rate of anthropometric data of qualified Ukrainian athletes is - 0,63 (S = 0,15), the winner in the competition - 0.65.

Table  
*Biomechanical characteristics of the techniques of skilled athletes who specialize in 10 km race walking (n=8)*

Distance, km	Characteristic										
	result	height, sm	weight, kg	average speed, m/second	stride length, m	frequency of steps, step per second	single support phase duration, second	duration of depreciation in a single support phase, second	angle of foot setting on the ground, grade.	angle of repulsion, grade	angle in the knee joint, grade
1	50:14.15 (±1:03.0)	164,4 (±3,62)	50,0 (±4,60)	3,35 (±0,14)	1,04 (±0,05)	3,23 (±0,05)	0,28 (±0,01)	0,11 (±0,01)	66,43 (±0,21)	48,7 (±2,62)	175 (±2,24)
2				3,19 (±0,42)	0,99 (±0,06)	3,23 (±0,05)	0,28 (±0,01)	0,11 (±0,02)	65,31 (±1,89)	48,8 (±1,81)	174 (±2,67)
3				3,29 (±0,33)	1,02 (±0,05)	3,23 (±0,05)	0,28 (±0,01)	0,11 (±0,02)	66,43 (±0,34)	48,7 (±1,78)	175 (±1,35)
4				3,36 (±0,11)	1,04 (±0,05)	3,23 (±0,05)	0,28 (±0,01)	0,11 (±0,01)	66,44 (±0,19)	48,3 (±1,76)	175 (±1,55)
5				3,38 (±0,09)	1,05 (±0,05)	3,23 (±0,05)	0,28 (±0,01)	0,11 (±0,01)	66,38 (±0,26)	49,0 (±2,10)	174 (±2,58)
6				3,34 (±0,07)	1,04 (±0,05)	3,23 (±0,05)	0,28 (±0,01)	0,11 (±0,02)	66,49 (±0,33)	49,6 (±1,17)	175 (±2,02)

7				3,34 (±0,07)	1,04 (±0,05)	3,23 (±0,05)	0,28 (±0,01)	0,11 (±0,03)	66,33 (±0,34)	49,7 (±1,26)	174 (±4,26)
8				3,34 (±0,07)	1,04 (±0,05)	3,23 (±0,05)	0,28 (±0,01)	0,11 (±0,01)	66,48 (±0,27)	48,8 (±1,22)	175 (±1,52)
9				3,30 (±0,09)	1,02 (±0,05)	3,23 (±0,05)	0,28 (±0,01)	0,11 (±0,02)	66,40 (±0,34)	48,7 (±1,57)	174 (±2,90)
Average results over a distance				3,32 (±0,15)	1,03 (±0,05)	3,23 (±0,05)	0,28 (±0,01)	0,11 (±0,02)	66,3 (±0,46)	0,28 (±0,01)	174,5 (±2,34)



*Drawing. Kinematogramma of race walking of the champion of Ukraine on 10 km distance Inna Kashina*

As can be seen from the table, the average speed to overcome all sections of distance ranges 3,19-3,35 m per second, indicating a small extent of some tactical training of athletes. Regarding basic competition rules, the biomechanical analysis showed in most cases observed athletes had a flight phase, but its duration was close to zero, in principle the judges are impossible to see it visually. The angle of the knee at the moment of setting foot on the ground averaged  $174,5^\circ$  ( $S = 2,34$ ), which is slightly less than that of the top competitors in the world -  $180^\circ$  ( $S = 3$ ). It is seen that the angle of the knee decreased during the race, due, of course, fatigue.

#### **Conclusions.**

As the studies there have been examined the bases of evaluation of the techniques speedwalkers of high qualification. There have been analyzed the biomechanical characteristics of the leading athletes in Ukraine specializing in race walking for 10 km. It has been found that for the level of results 50:14.15 ( $S = 1:03.0$ ), the average speed on the segments distance was 3.32 m per second ( $S = 0,15$ ). The average pitch length was 1.03 m ( $S = 0,05$ ), the frequency steps 3.23 steps per second ( $S = 0,05$ ). The duration of the stance phase 0.28 ( $S = 0,01$ ). The angle setting foot on the ground was  $66,3^\circ$  ( $S = 0,46$ ), the angle of repulsion -  $48,9^\circ$  ( $S = 1,7$ ).

An important direction of future research is to identify the most significant biomechanical indicators that best define the length and frequency of steps. This will improve the technology assessment of techniques of speedwalkers qualifications that, in turn, will create conditions to optimize the specific technical training.

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