

Factor structure of pre-competitive training of highly qualified speedwalkers

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Abstract

Objective of the study was to increase the competitive speed of walking at a distance of 20 km by adapting speedwalkers to specific loads in the aerobic, mixed and glycolytic zones.

Methods and structure of the study. The factor structure of pre-competitive training of athletes was assessed by examining the parameters of sports activity of 15 masters of sports in race walking for 20 km at the age of 28.5 ± 0.5 years. Based on the results of testing, a training model of functional development was developed, focused on the target indicators of the integral readiness of athletes for competitive starts.

Results and conclusions. The factors of special endurance and physical aerobic performance have the greatest correlation with the result of walkers of the master of sports level in the structure of special training. With the growth of qualification, the importance of speed increases and the contribution of special endurance of athletes decreases. This indicates the dynamism of the structure of the special precompetitive training of walkers.

Keywords: race walking, special training, efficiency factors.

Introduction. The management of the training process in sports involves the study of the factor structure of the special preparedness of athletes, depending on the characteristics of the main competitive exercise [2, 6, 7].

The study of the efficiency factors of special training in race walking for long and extra-long distances is the subject of studies by domestic and foreign authors who tested international-class runners for 20 and 35 km [4]. A rapid increase in the partial contribution of speed endurance to the structure of special readiness of walkers for 20 km has been established [3].

In studies of the training process of training walkers for 20 km, a special importance is noted for interval training for speed endurance at a speed of passing 1000 m in 4 min 05 s, which make up 33.3% of training volumes. The volume of training for special endurance in the mixed zone is 18.7% of the total training volume, the speed of passing each 1000 m is maintained at the level of 4 min 41 s. The volume of training for the gen-

eral endurance of walkers (the speed of movement of 1000 m faster than 5 min 40 s) is a segment of the training process of 13.5% [1].

Objective of the study was to increase the competitive speed of walking at a distance of 20 km by adapting speedwalkers to specific loads in the aerobic, mixed and glycolytic zones.

Methods and structure of the study. At the first stage of the work, the factor structure of the pre-competitive training of athletes was evaluated by examining the parameters of sports activity, characterizing anthropometric indicators, functional state, special physical fitness and psychomotor functions of 15 masters of sports in 20 km race walking at the age of 28.5 ± 0.5 years. Based on the results of testing, a training model of functional development was developed, focused on the target indicators of the integral readiness of athletes for competitive starts.

Focusing on the design result, the training model includes batteries of means for increasing special



speed endurance, which exceed the competitive mode in terms of speed or distance of the exercise. The load effect of the base series 10 × 400 m is repeated after 3 minutes of rest; 1 km + 2 km + 3 km after 4 min rest; competitive walking for 10 km in the arena; competitive road walking for 15 km and 30 km was used to increase energy performance in the aerobic, mixed and glycolytic zones [5].

At the second stage, the effectiveness of the developed training model was evaluated. The nature of the adaptive reactions of athletes was assessed by the PWC170 indicator according to the formula of V.L. Karpman.

Examination of functional parameters was recorded in terms of VC, heart rate at rest and under load in a 1000 m walk at a speed of 4.0 m/s at the finish and at the beginning of the 3rd minute of rest.

When evaluating technical readiness, the time of the unsupported phase of leg movement at a speed of 4.5 m/s, the critical walking speed, the critical length of steps, the critical step frequency were determined using an electronic device powered by electronic insoles with a sensor sensitivity threshold of 1.84 kg/cm².

The values of registration of changes in the articular angles in the ankle joint of the supporting leg, in the knee joint, the angular velocity of extension of the ankle joint were calculated using video filming with panning on a dark background and marking the characteristic points on the joint and foot with a colored tape.

Statistical processing included factor analysis algorithms of the Statistica 6.0 program.

Results of the study and their discussion. The results of the factor analysis revealed 12 growth parameters that make up three factors for increasing special speed endurance.

The content of the "special aerobic performance" factor (44.7% of the sample variance) includes 5 peak indicators of activation of the main and auxiliary functions that determine the effectiveness of adaptive developmental stimuli and long-term maintenance of a competitive walking speed for 20 km when a result of 5330.2 ± 142.6 s is achieved, which is most significantly associated with the result in walking for 30 km - 9002.8 ± 235.8 s (0.624).

Results in walking for 10 km (2596.7 ± 265.4 s) and 15 km (4009.7 ± 343.6) are significantly positively related to each other (0.682), reflect the level of special endurance of walkers and, to a lesser extent, are significantly positively related to speed endurance tests

(0.375). The internal commonality of work at walking distances exceeding 10 km forms the synergy of the impact on the accentuated development of the energy potential in the aerobic zone. Along with the increase in results at medium and long walking distances, a high level of PWC170 performance was recorded, 24.8 ± 5.2 kgm/min/kg, due to the concomitant development of energy capacity and mobilization of adaptive reserves (0.508).

The content of the "forming" factor (23.6% of the sample variance) is associated with productive improvements in the characteristics of walking technique and the functional state of athletes. The basic combinatorics of the factor generates several directions for improving technology in synchronization with the adaptive growth of the capabilities of functional systems. The amplitude-frequency modulation of space-time parameters of walking is focused on achieving rational criteria of technology in the configuration of critical values of step characteristics.

Parametric regulation of the critical walking speed up to 3.9 ± 0.4 m/s correlates with pulse indicators at the finish of 1 km with a walking speed of 245.5 ± 23.7 s (0.489); on the 3rd minute after walking 1 km at the level (0.534), the duration of holding the breath on inspiration was up to 82.6 ± 6.3 s (0.515). The improvement in the ratio of the critical step frequency up to 3.3 ± 0.2 steps/s to the critical step length up to 1.16 ± 0.05 m with a coefficient of 2.8 makes it possible to judge the rationalization of the athletes' walking technique.

Improvement of the relaxation tone of the gastrocnemius muscle to 68.9 ± 6.5 c.u. corresponds with the parameters of the angular velocity of leg extension reaching 3.5 ± 0.5 rad/s and the angular velocity of foot flexion of 8.4 rad/s, which indicates a decrease in muscle stiffness in combination with an improvement in the mobility of biomechanical links.

The operational functionality of the "threshold" factor (12.4% of the sample variance) is associated with the creation of conditions for increasing energy productivity in the mixed load zone. The functional impact of basic replications 10×400 m with a speed of passage of segments in 94.6 ± 7.6 s after 3 minutes of rest is focused on increasing the power of the mixed energy supply pattern with a partial triggering of glycolytic mechanisms. The consequent result of the systemic application of sprint series is a significant increase in the absolute walking speed per 100 m to 17.8 ± 0.7 m/s, which is due to an increase in the metabolizing



mass and explosive strength of the leg muscles (high jump from a place by $56.5 \pm 7,4$ cm).

Emphasizing peak loads in jumping exercises increases the selective development of the absolute walking speed per 100 m to 17.8 ± 0.6 s. The revealed increase in the speed potential is consistent with the achieved absolute values of the leg strength gradient of 446.8 ± 23.2 kg/s (0.465).

Basic training included tasks: 1 km + 2 km + 3 km with maintaining the speed of passing every 1000 m 245.7 ± 34.8 s after 4 min of rest. Intensification of training in the glycolytic zone of energy supply contributed to the improvement of the tonic parameters of muscle work. Due to the improvement in the relaxation tone of the anterior tibial muscle (101.6 ± 24.7 c.u.), which is of particular importance in race walking due to the performance of the main work and high fatigue, the walkers were able to maintain the average distance speed at a high level of individual results.

Conclusions. The factors of special endurance and physical aerobic performance have the greatest correlation with the result of walkers of the master of sports level in the structure of special training. With the growth of qualification, the importance of speed endurance increases and the contribution of special endurance of athletes decreases. This indicates the dynamism of the structure of the special precompetitive training of walkers.

The results obtained prove the effectiveness of the development of special and speed endurance of walkers based on the increase in special aerobic productivity, productive improvements in the technical characteristics of walking and the functional state of athletes.

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