

SPRINTER'S PREPARATION TECHNOLOGY BY MEANS OF TRAINING STAND-MACHINES "INERTIAL TRACK"

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The perspective trend of the rationalization of the system of the sprinters preparation is use of the technical means for improvement of the sportsmen movement possibilities in the conditions created artificially by the special stand-machines. The conception of the controlling artificial environment, worked out by I.Ratov (1976) proceeds from creation of the conditions, in which a sportsman can execute the movement activity in the record regimes, what must to promote for the creation of the corresponding rhyme-rate structure of the future skill. Inculcation in practice the technical means for sprinter's preparation, allowing to realize the main thesis of the conception, causes a need to change the former views on the traditional method of the sport training, where the basic time is taking for the development of the physical qualities. The improvement of the sport motions is a process, which under it's unity includes a lot of contradictions, which are characteristic to the regulating developing systems, where the kinds of training are to be the organic correlation, forming the united dynamic system of the interaction of structures and functions (N.Bernchtein, 1947). There is a number of contradictions in the traditional training sprinter's process, which are developing into the problems later (rigid stabilization of motive practices, regular teaching a new, limited degree of realization of motive potential through the competitive technique etc.), to solve which at present is impossible, without use of means and methods corresponding to this standard of problems. It is necessary to make an elaboration and experimental ground of new and more effective methods of sprinter's preparation, which creates the technology, when the planned result is guaranteed. The task of the research was in elaboration of intensive technology for sprinter's preparation in the artificial conditions, creating by means of the training stand-machines "inertial-track" method.

The main method of scientific research was an experiment, in which the stand-machine's methods have been used for. Methods which are going into structure of "inertial track" and used in natural conditions such as (speedography, dynamography, myography, filming and others). It was analyzing the efficiency and economy of the races technique. There were studying and comparing parameters of the racing step to the space, temporary, space-temporary, dynamic and rhythical characteristics.

The research was carried out in three stages. The first stage was to reveal the destructive features of the race's technique, produced in the different conditions by stand-machine. It was analyzing the process of the sportsmen's adaptation to these exceptional artificial conditions. The second stage was to determine the efficiency of the operating factors (various means of the urgent information and motive task, external forces), improving the motive activities of the sprinter's in the established direction.

On the third stage the most effective operating factors created the special artificial conditions, in which the sprinter's preparation was realized according to the new technology by means of a complex of the technical means and methods elaborated on their basis.

There were 30 sportsmen under test of different qualifications (skill) (from 1st to 3rd), on short distance running. The researches held in the preparatory period of training and preceded to the competitive period.

Technical means. A training stand-machine "inertial track" was designed and constructed aimed at working out of the intensive technology of the sprinter's preparation. It represents itself moving by a sportsman the travelling buttoned up supporting (Fig. 1). the sprinter fixed by a waist-belt (1) and stiff traction (2) with the rigid support (3), set in motions the track and fly-wheel (5) of stand-machine in motion begin himself in place. The "inertial track" permits the sportsman to perform the running on the spot of any wished intensity, what gives him an opportunity to use wide range of the technical methods of the research and the urgent information on the selected parameters of the moving activity of a sportsman under test.

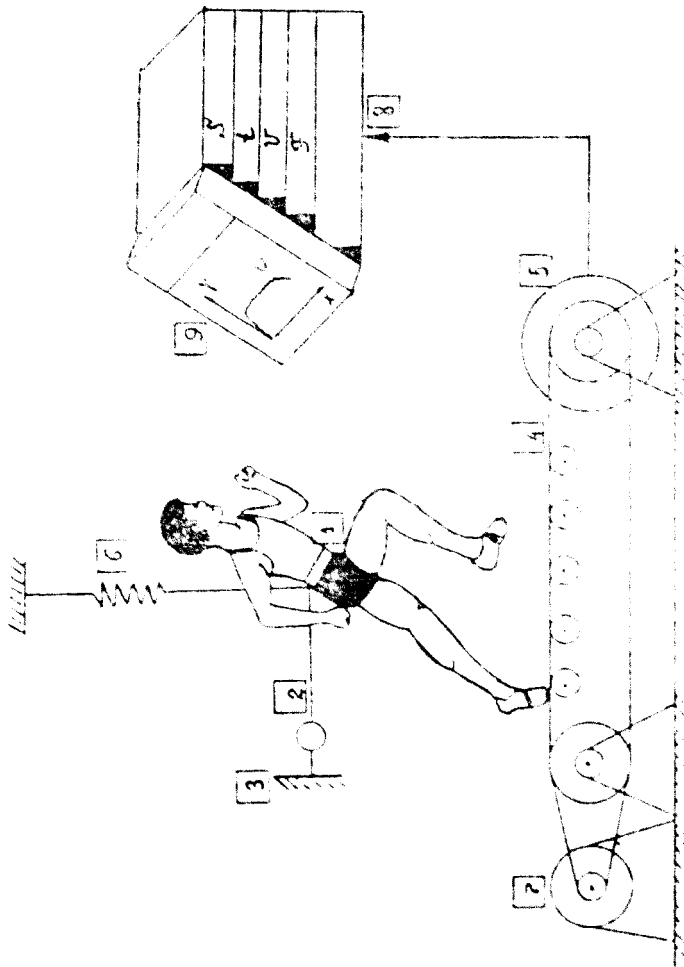


Figure 1: Stand-machines "inertial track"

Track-conveyor has a small weight and gabarits. It does not need the electricity to move it and sportsman can do the running of any intensity without an assistance of a trainer or an operator, therefore the stand-machine is handy and simple in operation and making. The design of the stand-machine includes: a) a mechanism of the vertical easing ("suspension bracket") (6), providing an application of the dosed effort to the sprinters body, directed against the vector of gravity: b) an additional mechanism rotational to the tape and fly-wheel of the track.

The stand-machine is equipped with the measuring complex (8), which permits to record the parameters of the running's technique (time of running, time of support and flight, duration of the amortization's phases and active repulsion, the length of step, the length of the surmounted distance, angular and velocity shifts of the feet groups, landing speed of a foot, speed and speeding up of run, vertical and longitudinal forces of the support's reaction, power of the running motions, electric activity of the muscles and other characteristics).

The necessary characteristics of the motive activity are giving to the runner on the information field in the general or in the graphic aspect for the autocontrol and the correction.

The arrangement of the stand-machine is equipped with the mechanisms of the dosed regulation of the force influence and the measuring apparatus, what is to use it as a training stand which permits: to estimate operatively the effectiveness of the different training factors and variants of the technique, to determine a level of the physical qualities, the motive resources of a sportsman present and potential.

THE RESULTS OF A RESEARCH. DISCUSSION.

Using the stand-machine "inertial track" as the research stand connected with the adaptation of the sportsmen under tests to the unusual (with respect to the natural) conditions of run performance. The novices pay more amount of energy during the running on a stand-machine, to do unnecessary motions and get tired sooner, and of that pervert the results of a research. To except the influence of the adaptation's process of the sportsmen to the stand-machine, it is necessary to determine the time, during which the facts cannot be collected. It's supposed, that if the adaptation to the stand-machine is a consequence of run performance on it, then the features and conformities of it to the natural run, with all sportsmen under test are to have the same character as for a number of kinematic and dynamic characteristics. The selection of the sportsmen of different skill under test was based on that thesis. Before the start of the trainings on the stand-machine there was the demonstration of run and exemplified the features of the technique. The first testing of a stand-machine began with the walking turning into the run of low intensity. It was the necessary insurance and the individual motive tasks were given. The sportsmen were rising the speed of run gradually, and reached their individual maximum in the end.

The trainings on a stand-machine held every day and included in 10-s attempts in each, by duration of an attempt in 10 sec. and a relaxation in 5 min. among them. Every attempt held with the maximum individual speed. The parameters of the run technique in each attempt were analysed both in the natural conditions (run in 30m, with a rush, to be done till and after the trainings on stand-machine), and in the artificial conditions using the same methods of a research.

Comparison of the facts by attempts, which were performed in the natural conditions and on the "inertial track" showed, that already over five trainings the run on a stand-machine and the parameters of technique did not differ from the natural on: motive task; structure, rate and amplitude of the motions; typological features of the showed efforts; nature of the leading muscular groups; variability of all tested indices. However we found out the peculiar features of the run technique in different conditions, which were observed by the sportsmen under test after 5-10 trainings on a stand-machine. The greatest difference is in the absolute values of the racing steps, that is immaterial, as the amplitude shifts of the runner's feet are the same in fact. It is more time of the support period by running on a stand-machine, then in the natural conditions to 5, 6%, as the time of the flying period is to 6.5% less ($P = 0.01$). The constructive features of "inertial track" make a runner to reduce the vertical component of the supporting effort to 12.8% ($P = 0.01$) (by typological conformity of the tested dynamograms), as it's increase to come inevitably to the rise of friction in the rolling base of track, that is to impede the solution of the motive task. Therefore, to reduce the frictional forces the runners are seeking to set foot on a support in much cases "under themselves", that is characterized by the rise of angle of the foot's standing on a support to 7.18% ($P = 0.01$). The runner is forced pushing by more acute angle to horizontal to 3.4% ($P = 0.01$), then by natural run, in order to optimize efforts added towards the motion of the track.

As it turned out, that the higher is the runner's skill is higher, the faster and more qualitative he runs in the artificial conditions. Intercommunication of the run's speed, showed by the sportsman in these conditions, was changing from $r=0.65$ in the end of the first training on a stand machine, to $r=0.87$ after the fifth. Later on, (from 5-th to 10-th training) coefficient of correlation did not suffer the evident changes. The criteria of the effectiveness of the run's technique on a stand-machine (as total frequent) correspond to the natural sprinter's run, what permit to use a stand-machine "inertial track" (after preliminary training (to 5 trainings) as the research stand for run).

In the force aspect the run on "inertial track" is harder, then the usual sprinter run, as the increased period of support gives sportsman an opportunity to make such efforts, but the reduced duration of flight make sportsman to move faster in this period. It's supposed that the contrast between two considered trainings caused the marked training "effect afteraction". This effect is characterized by transfer of the features of the run parameters making in the artificial conditions. The runner is on a support less time now, set foot under himself mainly, make repulsion by the most acute angle to the horizontal. This attempt is forming the run with the better characteristics, which let sprinter to rise the common speed of run to 4.73% ($P = 0.01$) by means of increase of the step length to 3.66% ($P = 0.01$). There were examined two different regimes of the run easing, which were created by the test stand mechanisms, for the purpose of revealing the most conditions of the sportsman's interaction with the external forces. First easing in the direction of motion, second-easing along vertical line. It is supposed, that the diminution of the force content of run (in different directions) must create the best conditions for the motive resources of a runner. The method of the easing influence, which is created in the direction of the main motion showed, that parallel with increase of the motion rate to 2.5% ($P = 0.05$), the length of step to 3.07% ($P = 0.01$), speed to 5.7% ($P = 0.01$), factor of the run activity (FRA) to 7.97% ($P = 0.01$), other characteristics (in group upon the average) suffered the negative changes. So, the "frictional" longitudinal efforts increased to 21.24% ($P = 0.01$); and vertical efforts to 4.08% ($P = 0.05$), the sportsman's efforts in the direction of run diminished to 15.7% ($P = 0.01$). Duration of the amortization's phase grew to 10.42% , while the phase of the active repulsion reduced to 15.77% ($P = 0.01$) what cannot be called rational. There is no forming better rhyme-rate structure of run in these conditions, so is confirmed by the absence of "effect afteraction". Only the individuals exceeded the usual rate and speed of run in the natural conditions, after the run in the eased regime.

The research of the easing along vertical showed, that in these conditions the rate of the steps increased to 2.58% ($P = 0.01$), while the length remained (the same) invariable, speed grew to 2.12% ($P = 0.05$). The time of the supporting period reduced to 7.33% ($P = 0.01$), the period of flight did not change. Duration of support reduced owing to reduction of the phase of amortization to 13.85% ($P = 0.01$). The horizontal component of the support's reaction reduced to 14.64% ($P = 0.01$) and the vertical component to 12.57% ($P = 0.01$). At the whole of the run parameters in the conditions of the partial "suspension" became lower, but it did not result in sinking of the speed motion - which is the main criterion of the effectiveness of the sprinter's run technique. The sprinters improved the time of run in the natural conditions to 30% with a rush, as to the initial time, to 0.16 ($P = 0.01$), after the attempts on a stand-machine (in the eased regime along vertical). The findings are showing, that it is forming the more perfect technique of the fast run in the conditions eased along vertical. A number of the tests on a stand-machine "inertial track" was carried out, where the information on the selected parameters was given to the running sportsman on the figure screen, vector oscilloscope or on a graph plotter. These tests were held with the purpose of determining the most effective programs, based on getting the motive tasks and the instant information by a sportsman.

The implement of the controlling influence which is based on use the instant information on speed of motion of the stand-machine's track with task on it's rise, came to increase the very controlled characteristic which is giving for autocontrol to the runner, to 3.02% ($P = 0.01$). The rate of motion grew to 2.02% ($P = 0.05$), length of the steps increased insignificantly. The increase of rate is conditioned by the time reduce of the support to 2.46% ($P = 0.05$), which took place due to reduced amortization phase to 11.27% ($P = 0.01$). The efforts of a runner in a phase of an active repulsion have grown to 8.71% ($P = 0.01$), by the simultaneous reduction of the "frictional" efforts in a phase of amortization to 8.78% ($P = 0.01$). It is showed up during the experiment that each sportsman seeking to choose such individual variant of the running technique, which is optimum at the moment. Use of that method come to the rational reorganizations of the running technique and make it more intensive, reveals non used the motive potential of a sprinter in the fast run.

Use of the instant information on the motive characteristics which are giving to a sportsman in the moment of run is expedient when a sportsman has a corresponding motive task and knows a way of it's realization. In this case, the realization of the given parameters came with more probability (99.8% , by $P = 0.01$) and the

motions corresponded to the model of a skilled runner.

It is evident that increase of the effectiveness of the easing's methods in the longitudinal and vertical directions is linked much with the simultaneous use the means of the urgent information and the motive tasks. By the solution of task to increase the rate of the run steps (the conservative parameter of the sprinter run) use of the controlling influences make sportsmen to go to the new speed level to 4.6% ($P = 0.01$). The complex of the urgent information's means, motive tasks, external force additions stimulates display of the potential motive resources. In such attempts the time of retention the maximum speed of the runners less to 8.6% ($P = 0.01$), while the power in the longitudinal direction is higher to 7.3% ($P = 0.01$), then in the attempts when the rise of the run steps's rate not to be marked. The artificial controlling influences must make sprinter to the level which exceeds the competitive. Therefore the creation of new technic is linked with the sportsmen's results.

The process of the run motions formation with known characteristics is more effective by use of "creative" technologies, when the reached planned parameters on a stand-machine transfer in the natural competitive exercises after stabilization in the artificial conditions.

CONCLUSION

1. Use of the technical means in the sprinter's preparation has the specific characteristics with respect to the traditional process and permits to realize better the didactic principles, that create the intensive technology of the planned parameters of the competitive exercise.
2. It elaborated highly effective means and methods influencing the sprinter's activity.
3. It determined the ways of using the "creative" and "destroying" technologies which perfect the sprinter's run, and based on use of eased and hampered artificial external conditions, created by training stand "inertial track".

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