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MODELLING STRUCTURAL ELEMENTS OF COMPETITIVE ACTIVITY IN SPECIAL TRAINING OF QUALIFIED RACERS IN BMX

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Key words: competitive activity, BMX racers, start and starting build-up, finish, obstacle crossing, training process.

Annotation. Successfulness or unsuccessfulness of performing a competitive exercise by qualified BMX racers is due to the quality of performing separate elements of passing the BMX trails, the structure of which includes the start and the starting build-up until the first obstacle, passing through the middle segment of the distance, obstacle crossing, passing berms and the final segment of the distance. The special fitness level of racers needs to be evaluated according to the most important structural units of performing the competitive exercise, since it is due to the time of passing a special BMX trail. The purpose of this study is to substantiate approaches to model the elements of competitive activity in the training process of qualified BMX racers. Four options of the model were developed, suggested and proven, based on typical patterns of passing the elements of the competitive trail by BMX racers. Using the developed scheme of modelling elements of the competitive distance allowed working on weaknesses of the racer's special fitness, to individualize the training process at the expense of redistributing special means of training.

Introduction. Analysis of scientific literature on different aspects of the sports training process in BMX indicates a weak development of the issue of technical training in domestic and foreign references. Only some researchers in Russia are concerned with issues of different aspects of training BMX racers [1, 2, 3, 4, 5]. Issues of training BMX racers are analyzed more widely and for a longer period in the foreign literature. M. Mateo, M. Zabala et al. made the biggest contribution to the examination of issues of training young BMX racers, revealing the problems of technical training and biomedical support in this type of sports [6, 7]. However, issues of modelling the sports activity elements within the long-term training process of BMX racers at different stages are not fully covered.

The purpose of this study is to substantiate approaches to model the elements of competitive activity in the training process of qualified BMX racers.

Methods and organization. The study was carried out in the Department of Natural Sciences of the Siberian State University of Physical Culture and Sports. Sixteen male BMX racers with the Candidate Master of Sports qualification participated in the study. Following methods were used: pedagogical observation, pedagogical testing, modelling, pedagogical experiment, mathematical statistics methods.

Results and discussion. Results of the conducted analysis and pedagogical observation show that a combination of technical movements in BMX is diverse and is due to irregularity and high variability of competitive activity conditions. Main conditions include the situational nature of actions considering the racer's position when passing berms or obstacle crossing (due to the simultaneous start of 8 racers), constructive features of the competitive trail, which do not have any unifying standards. Therefore, requirements for versatility of the BMX racers' technique are increasing.

Successfulness or unsuccessfulness of performing a competitive exercise by qualified BMX racers is due to the quality of performing separate elements of passing the BMX trails, the structure of which includes the start and the starting build-up until the first obstacle, passing through the middle segment of the distance, obstacle crossing, passing berms and the final segment of the distance. The special fitness level of racers needs to be evaluated according to the most important structural units of performing the competitive exercise, since it is due to the time of passing a special BMX trail.

The analysis of performing structural elements of the competitive exercise was carried out in this study. Analysis of the technique of passing segments with different obstacles revealed a necessity to control biomechanical features (athlete's pose, angular features of body parts' articulation, support reaction force, moment of the support reaction force). The most preferred way to overcome obstacles (based on a degree of wheels' contact with a support) is the "on both wheels" way.

Analysis of the technique of passing the berm in BMX allowed pointing out following distinctive parameters of an effective technique. The trajectory of a bicycle when passing the berm through the middle road is faster than passing berms through the road on the outside. The speed of exiting berms is higher with this trajectory than the speed of passing berms through the road on the inside. Flexed arms significantly decrease the duration of passing berms in comparison with straightened arms. When exiting the berm, it is preferable to use the build-up technique with a positive angle between the vertical line and the straight line, which passes through the grip and the axis of shoulder joint, in the sagittal plane.

The conducted study show that most racers have weaknesses in technical training. As a rule, they are expressed by one, less often – by two structural elements

of the competitive exercise. The athlete has specific strengths, for example the starting position and passing berms or other combinations. However, every athlete has weaknesses expressed to different degrees: for example, a failed start or difficulties when crossing obstacles, which are needed to consider and correct in the training process. Only some racers do not have pronounced weaknesses in technical fitness. We suggested that modelling elements of competitive activity, considering the individual level of the racer's special fitness, their strengths and weaknesses would allow increasing the training process's effectiveness at this stage of sports training.

Based on results of the conducted study, four options of the training model were justified and suggested, taking weaknesses in performing the competitive exercise into account. Each option includes appropriate means and methods of training within the area of physical and technical training. Means of general and special physical training were used. Based on the first stage results, it was revealed that the first segment of passing the trail takes 3,5-4 seconds in average, the second one – 15-17 seconds, the third – 6-8 seconds. It takes 26-28 seconds to pass the whole trail. In order to account data in the winter preparatory period, following bicycle-friendly tests were used: 10, 30, 75 revolutions per minute. These tests are traditional in bicycle sports, their reliability and informational value were proven in a years-long practice. In total, three tests were conducted: at the beginning of the preparatory period, in the middle and at the end. When an athlete participated in the test of 75 revolutions, time of passing 10, 60, 75 revolutions was registered. Thus, we divided the test into several segments to see, at which moment the athlete passes the distance worse in comparison with others. These segments also identify a tendency of uneven performance. Moreover, results taken from the trail and the bicycle ergometer in most case are the same from the point of the technique of passing the segments by different riders. Taking it as a base, we selected exercises for general (Table 1) and special (Table 2) training for each athlete.

Then, taking into account the athlete's fitness level, strengths and weaknesses of the technical and special physical fitness of each athlete, we conducted modelling aimed to implement and improve so-called weaknesses of their fitness, readiness for the competitive exercise (passing the BMX trail).

In total, we have four options of the training model: 1 – is meant for athletes with a weak start; 2 – for athletes, who struggle with passing the middle segment; 3 – for racers with unstable obstacle crossing; 4 – for racers with a weak finish. During the annual cycle, we increased the amount of exercises by 15-20% for athletes, who did not have any problems on this segment and, in our opinion, solved issues of weaknesses in special fitness.

Table 1

Modelling means of the general physical training within the preparatory period within the annual cycle of qualified BMX racers

Start and build-up/types of means	Middle segment/ types of means	Obstacle crossing/ types of means	Finish/ types of means
Standing long jump Triple jump Tenfold jump Exercises with a stuffed ball Pull-ups Running in place with acceleration Bicycle ergometer, 10 revolutions Snatch "Start gate" training device	Climbing training Rope skipping Barbell lift Clean and jerk Bicycle ergometer, 60 revolutions	Coordination-based exercises Jumping over obstacles (bench, block) Jumping up Jumps with turning 180, 360^0 Imitating exercises	Climbing training 2-3 in free style, 3 to the max Jumping for 30 s (bench, rope, block) Bicycle ergometer, 75 revolutions, with an emphasis to the finish

The effectiveness of the implemented approach to model elements of the competitive activity was evaluated during the experiment (7 months) in compliance with indicators of special fitness of qualified BMX racers.

Table 2

Modelling means of the special physical training within the preparatory period within the annual cycle of qualified BMX racers

Start and build-up/types of means	Middle segment/ types of means	Obstacle crossing/ types of means	Finish/ types of means
Individually/in a group with a handicap	Individually/in a group with a handicap	Local obstacle crossing: Individually/in a group Crossing 2 obstacles: Individually/in a group	Passing the trail with an increasing finish: Individually/in a group

When analyzing results of each athlete, the following was revealed. The developed and used tested model of using separate elements of the competitive process among athletes improved indicators of special fitness (special endurance, speed- and power-based fitness, technical fitness) (Table 3). After applying the developed individual modeling scheme, the average group growth rates of the total distance passing time increased to 4,7% (the maximum individual increase was 6%), the start and build-up time to the first obstacle improved by an average of 3,5% (the maximum individual increased by 8.5%), the number of technical errors when crossing obstacles decreased.

We did not receive a significant improvement in passing the middle and the final segment. However, good results in the build-up allowed improving time of passing the whole trail. Athletes, who have an advantage in the build-up, felt confident during the competition, because it allowed them to come up with their race tactics.

Table 3

Indicators of special fitness of BMX racers after the pedagogical experiment

Distance segment	1 test $X \pm \sigma$	3 test $X \pm \sigma$	P – significance level
Start	3,75 ± 0,34	3,59 ± 0,30	0,003
Middle segment	16,19 ± 0,64	15,98 ± 0,58	0,01
Finish	7,23 ± 0,28	6,99 ± 0,28	0,002

Conclusion. Therefore, the conducted experiment allowed us to test the effectiveness of using the developed scheme of modelling the elements of the competitive exercise in BMX racers' training. Four options were developed, suggested and proven, based on type options of passing the elements of the competitive trail by BMX racers. Using the developed scheme also allowed us to improve weaknesses of the racer's special fitness, to individualize the training process at the expense of some redistribution of special means of training. This turned out to be convenient for organizing training sessions, since the athletes are divided into groups of 2-3 people, united by one task. The use of the developed scheme of modelling allowed optimizing, individualizing and correcting the training process, maintaining a higher level of competitive fitness at the expense of a selective target-oriented influence, which also allows saving the athlete and the coach's time and effort taken for the training process.

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