FUNCTIONAL STATE INDICES USE AS THE EVALUATION CRITERIA OF SWIMMERS’ TECHNICAL READINESS WITH THE HELP OF EXERCISES-MODIFIERS

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Keywords: swimming, 10-13 year-old teen-agers, technique development, pedagogical experiment.

Annotation. Different approaches analysis, directed at swimming technique development, proves the urgency of the problem. The article presents a conception of effectiveness increase during competitions, using “D&K-Test” express-diagnostics of a functional state and the spare capacities of an organism.

Research methods: scientific-methodical literature analysis and summarizing, pedagogical experiment, testing, statistical data manipulation.

Materials. The article is about the approach application of the motional skill development in a long-term swimmers training. The use of “D&K-Test” express-diagnostics of a functional state and the spare capacities of an organism gives an objective analysis of our methodology.

Results. Correctly formed motional skill provides the results improvement in a swimmer’s sports activity; “D&K-Test” express-diagnostics of the functional state use helps to see the increase of the functional state of an organism and also gives an opportunity to fulfill bioenergetics indices factor analysis, which demonstrate their genetic predetermination. Our methodology application gives an opportunity to change incorrectly formed skill at all stages of mastery. Swimming technique development with the help of the exercises, modifying the technique, helps to increase a swimmer’s ability to fulfill long-term loads and provides the increase of a sportsman’s aerobic and anaerobic indices. Owing to “D&K-Test” express-diagnostics there is a biological profile of a sportsman revelation and it gives an opportunity to form a technique, taking into account susceptibility.

Conclusion. The experimental results proved the effectiveness of the offered direction, the realization of which conditioned technical mastery improvement, the increase of functional state indices and other indices characterizing the increase of a swimmer’s sport results. “D&K-Test” express-diagnostics of an organism functional state gives a positive result in training 10-13 year-old swimmers and reveals genetic predisposition of a sportsman.

Introduction. According to modern notions, the base of a technical training, formed during the first year of going in for swimming, is the reason for a high level of technical mastery in the future and provides a planned sport result achievement. All long-term process of a swimming technique development is based on the laws of age-related development of motor activity, which condition the elements formation of swimming movements.

Most specialists are of the opinion, that one of the reasons for this situation is lack of attention given by the trainers-teachers to the technical training of young swimmers.

Many native authors and the authors abroad studied the question of a swimming technique development (A.P. Makarenko; V.B. Issurin; S.V. Kolmogorov; D.F. Mosunov; V.N. Platonov; R.E. Schleihauf; M. Rejman and others), however, most of the
works are devoted to highly qualified swimmers. Even in an active program for sport schools for children and teen-agers of the Olympic reserve only general descriptions of a motor skill formation and development methods are given and only some exercises for mistakes correction in a swimming technique are presented.

All mentioned above proves the necessity to hold a complex of special pedagogical recommendations and physical exercises influence, directed at swimmers’ technical training level development. The use of exercises, directed at technical training development and increase, together with the traditional means, helps to achieve high results among the sportmen-swimmers within shorter time periods of training.

The aim of the research work – to create and experimentally substantiate the structure and content of swimmers training, taking into consideration the use of a special complex of exercises, modifying the swimming technique.

In order to achieve the aim of the research work the following objectives were solved:

1. To create a methodology of swimmers training, which provides effectiveness increase of the swimming technique at an educational-training stage and increases the functional readiness among the swimmers by means of technique economization.

2. To check the effectiveness of the methodology during the pedagogical experiment.

In order to realize mentioned above objectives it is reasonable to use offered by us special complex of exercises, modifying the swimming technique. These exercises provide motional preconditions formation for effectiveness increase of the rowing movements in integral ways of swimming. It is necessary to use these exercises during the time devoted to technical training of the swimmers in the hall of dry swimming and on water.

The complex of exercises in the hall of dry swimming and on water is divided according to the stages of development.

Macrocycle was divided into 4 ways of swimming: dolphin, crawl on back, breast-stroke and crawl on breast – and included 4 months of training.

Mesocycle of development of one swimming style lasts 1 month.

Microcycle is divided into 4 stages of training and lasts 6 days:
- exercises for legs and breathing development;
- exercises for hands and breathing development;
- exercises for hands, legs and breathing co-ordination development;
- exercises for coordination of movements development.

The complex of exercises in the hall of dry swimming included 3 exercises after warming-up; the limit of general time was 17 minutes; for each exercise there were 5 repetitions 45 seconds each; rest after a set – 15 seconds, between the exercises – 1 minute.

The complex of exercises on water also was fulfilled right after warming-up and the limit of general time was 15 minutes. One exercise at the initial stage of education was dosed to 4 minutes (200 meters distance swimming, rest between the distances – 1 minute), and included exercise explanation and demonstration. During the time limit for each exercise sportmen were to swim 600 meters.

At the stage of advanced development these exercises could be fulfilled with small shovels or flippers, also the regime of distance swimming was given:
- 5*50 exercise № 1 within 1 minute rate, pulse 26-28 beats per 10 seconds;
- 5*50 exercise № 2 within 1 minute rate, pulse 26-28 beats per 10 seconds;
- 5*50 exercise № 3 within 1 minute rate, pulse 26-28 beats per 10 seconds.

General volume of swimming was 750 meters.
**Research methods:**

1. Scientific-methodical literature analysis and summarizing.
2. Swimmers’ functional readiness testing.

Anaerobic metabolic capacity (ANAMC) is estimated according to electrocardiogram of rest with the help of percentage ratio sum \((R\times100%)/(R+S)\) in abductions V3R, V1 V2 \((V3R\%+V1\%+V2\% = AHAME)\). This index defines the ability to fulfill the load in an anaerobic rate of power.

The capacity of anaerobic utilization (anaerobic genotype) (ANAMC %) is estimated according to anaerobic metabolic capacity divided by the index of general metabolic capacity and helps to characterize an anaerobic metabolic susceptibility of an organism in percentage.

Aerobic metabolic capacity (AMC) is estimated according to \(\Delta\) electrocardiogram of rest with the help of percentage ratio sum \((R\times100%)/(R+S)\) in abductions V4, V5, V6 \((V4\%+V5\%+V6\% = AMC)\). This index characterizes the ability of an organism to fulfill the load in an aerobic regime of power.

The capacity of aerobic utilization (aerobic genotype) (AMC %) is estimated according to aerobic utilization capacity divided by the index of general metabolic capacity and characterizes an aerobic metabolic susceptibility of an organism in percentage.

General metabolic capacity (GMC) is estimated according to \(\Delta\) electrocardiogram of rest with the help of percentage ratio sum \((R\times100%)/(R+S)\) in abductions V3R, V1, V2, V4, V5, V6 \((V3R\%+V1\%+V2\%+V4\%+V5\%+V6\% = GMC)\) and is characterized by the ability to fulfill a great volume of work.

The power of kreatinephosphate source of energy-supply (PKP) is estimated according to \(\Delta\) electrocardiogram of rest with the help of percentage ratio sum \((dV3R\times100%)/(dV3R+dV3S)\). This index characterizes power abilities and the ability to fulfill the load in a lactate, maximum intensity zone of power.

The power of glycolytic source of energy-supply (PGL) is estimated according to \(\Delta\)EKG of rest with the help of percentage ratio sum \((dV2R\times100%)/(dV2R+dV2S)\). This index characterizes the speed endurance of an organism, i.e. the ability to accumulate maximum concentrations of a lactate in blood.

The power of aerobic source of energy-supply (PASES) is estimated according to \(\Delta\)EKG of rest with the help of percentage ratio sum \((dV6R\times100%)/(dV6R+dV6S)\). This index determines the ability of maximum oxygen consumption by an organism.

According to the results of “D&K-Test” express-diagnostics 4 bioenergetic profiles of swimmers were chosen.

4. The methods of statistical data manipulation (Student t-test, Mann-Whitney U test).

In order to check the effectiveness of created by us methodology a pedagogical experiment was held. 30 qualified (the 3rd-2nd category) swimmers (10-13 year-old) took part in the experiment. The control group (CG) and the experimental group (EG) were formed, each included 15 people. The experiment was held on the basis of sport swimming department of a municipal autonomous educational establishment of additional education of children sports school for children and teen-agers “Dolphin” in Naberezhnye Chelny.

The research results and their discussion. The received during the experiment results show the tendency.

Functional state indices and the spare capacities of an organism were estimated twice – before and after the pedagogical experiment.
There was the increase of anaerobic metabolic capacity (ANAMC) (anaerobic abilities) to 48.45% (this index characterizes the ability improvement of physical load fulfillment in the 3rd and the 5th zones of intensity). The 3rd zone of intensity is characterized by the duration of physical load with the average intensity, where the lactate concentration is 2.5-3.5 millimole, max heart rate – almost 160-170 bpm. The 5th zone includes intensive interval training, where high intensity and the lactate concentration is 6-12 millimole and 90-95% from max heart rate, almost 180-190 bpm. The index of anaerobic utilization capacity (anaerobic genotype) (ANAMC %) increased to 30.29%.

The index of aerobic metabolic capacity (AMC), characterizing the ability to fulfill physical loads in the 1st, the 2nd and partially in the 3rd zones of intensity, among the swimmers from the EG increased to 16.40%.

The capacity of aerobic utilization (aerobic genotype) (AMC%) increased to 6.78%.

General metabolic capacity (GMC) is presented as the index, which characterizes the level of working capacity of an organism. The ability to fulfill a planned volume of physical loads among the swimmers increased to 7.82%.

The power of kreatinephosphate source of energy-supply (PKP) determines allactate part of speed abilities of an organism and the power of kreatinephosphate source of energy-supply of sportsmen’s muscular activity. The power of kreatinephosphate source of energy-supply among the swimmers from the EG changed to 8.54%.

The power of glycolytic source of energy-supply (PGL) i has the tendency to increase during the experiment was 17.75%.

The power of aerobic source of energy-supply of a muscular activity (PASES) is presented as a qualified index of physical load fulfillment till the level of the limit of an anaerobic metabolism: among the swimmers from the EG it was 12.56%.

The effectiveness index of aerobic source of energy-supply of muscular activity (W lanm), which determines the direction of the training in the structural cycles of a yearly cycle of training, shows the effectiveness of energetic substances, characterizes coordinating abilities, during the experiment changed to 8.25%.

In the CG there were also changes of the studied indices, but these changes were insignificant: ANAMC - 6.88%; ANAMC% - 6.09%; AMC - 1.30; AMC% -1.41%; GMC - 2.93; PKP – 0.77%; PGL – 6.35%; PASES – 5.44%; W lanm – 1.64%.

<table>
<thead>
<tr>
<th>Group</th>
<th>ANAMC</th>
<th>ANAMC %</th>
<th>AMC</th>
<th>AMC %</th>
<th>GMC</th>
<th>PKP</th>
<th>PGL</th>
<th>PASES</th>
<th>W lanm</th>
</tr>
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<tbody>
<tr>
<td>CG</td>
<td>before</td>
<td>66.35± 7.08</td>
<td>23.61± 2.03</td>
<td>210.89± 11.66</td>
<td>72.91± 1.9</td>
<td>259.0± 9.15</td>
<td>30.97± 1.33</td>
<td>29.76± 0.70</td>
<td>58.78± 2.93</td>
</tr>
<tr>
<td></td>
<td>after</td>
<td>70.92± 7.22</td>
<td>25.05± 1.87</td>
<td>213.64± 10.78</td>
<td>73.94± 1.97</td>
<td>266.7± 12.47</td>
<td>31.21± 1.00</td>
<td>31.65± 1.46</td>
<td>61.98± 3.33</td>
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<tr>
<td>EG</td>
<td>validity after the</td>
<td>P &gt; 0.05</td>
<td>P &gt; 0.05</td>
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**Table 1**

*Functional readiness indices of the control and experimental groups before and after the experiment*
The diagram of indices of a functional state and spare capacities of an organism increase “D&K – Test”

Conclusions:
1. The effectiveness of the methodology improving the swimming technique at educational-training stage and increasing the functional readiness of swimmers by means of economization, is stated.

2. The valid values of Student t-test correlation have the aerobic metabolic capacity (AMC), the capacity of aerobic utilization (aerobic genotype) (AMC%). General metabolic capacity (GMC), the power of aerobic source of energy-supply of a muscular activity (PASES) and the effectiveness index of aerobic source of energy-supply of a muscular activity use (W lanm).

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