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The elements of a new run-up-hurdle step training and improvement in springboard diving

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Abstract: Diving training and improvement, as any difficult for coordination action, is based on the main principles of training: mastering a motor action at the ability level, detailed learning, and then mastering and improving the action at the skill level [1]. The elements technique improvement happens during the repeated action or its parts reproduction, with directed changes in the movements. A number of phases performed correctly are repeated without significant changes and are gradually automated [1]. In diving the whole process of training and mastering is aimed at the elements of diving technique improvement, and in particular the run-up-hurdle step development. In recent years, the attention of specialists in diving has been focused on increasing the repulsion height in springboard diving, owing to increasing the use of the springboard oscillations during the run-up hurdle step. The works have been published [2,4,5,6,7,8] directed toward the resilient forces of the springboard study during the run-up hurdle step fulfillment from the springboard in diving. However, we didn't find the works connected with teaching a new run-up-hurdle step with "jumping-off" in the domestic literature and this situation conditions the novelty of the present research work. In this connection the article offers the exercises, directed toward a new run-up hurdle step teaching and development on the springboard. It can be used in practical work with the athletes. **Materials.** The article presents the author's exercises. They can be used in ground training of divers for this phase of the dive teaching and improvement. The effectiveness of the offered exercises is shown. **Research methods.** Information sources analysis, expert evaluation, methods of mathematical statistics. **Results.** On the basis of the run-up-hurdle step technique with "jumping-off" analysis we selected the exercises for the technique of run-up-hurdle step training and improvement in terms of ground training. The main result of the study is the following: the effectiveness of the used exercises in sports practice determination. **Conclusion.** We revealed the effectiveness of the created methodology of training during the pedagogical experiment. The athletes from the experimental group, who used developed by us exercises in training, significantly increased the quality of the main "jump-off" element fulfillment, increased the height of the take-off from the edge of a springboard and stability of hurdle step fulfillment.

Keywords: diving, springboard, run-up-hurdle step, steps, "jump-off", exercises.

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Introduction

Theory and methodology of teaching motor actions forms the base for springboard diving teaching and improvement. The whole process of springboard diving teaching and improvement presents the process of movements improvement in order to achieve an ideal in biomechanics and the form of fulfillment dives.

Almost all dives, fulfilled from the front stand on the springboard, are realized from a running start. It ends with the hurdle step on the edge of the springboard. Run-up-hurdle step seems to be an easy element, but in reality this element is

significant in diving. The whole dive depends on the quality of this element fulfillment. The technique of this element of the dive fulfillment during recent 10 years has changed greatly in order to achieve the maximum altitude of repulsion from the edge of the springboard.

During recent years most female athletes, who specialize in springboard diving, started to use a run-up-hurdle step with "jump-off". It should be noted that this element of the dive fulfillment is not stable, however, the altitude of repulsion in case of such variant of a run-up-hurdle step is higher, than in case of the traditional one.

There is no information concerning teaching this element of a dive in scientific-research sources and methodical literature. It makes the presented research work extremely urgent.

The aim of the research work is theoretical substantiation of the methodology of a new run-up-hurdle step teaching and improvement during springboard diving fulfillment.

The objectives of the research:

1. To define the main elements of kinematic chain of movements during a new run-up-hurdle step fulfillment.

2. To create the methodology of teaching and improvement the elements of a new run-up-hurdle step.

3. To check the effectiveness of the created methodology.

Materials and methods

The following research methods were used: scientific sources analysis, expert analysis, methods of mathematical statistics.

The research was held in laboratory environment using computer. We analyzed the technique of run-up-hurdle step fulfillment by the strongest athletes, the finalists of the World Championship and Europe Championship 2019 in springboard diving from 1 and 3 meters.

The technique of a new run-up-hurdle step analysis helped to reveal the main elements. They condition the effectiveness and stability of this element of a dive fulfillment [4].

Kinematic analysis of the technique of a run-up-hurdle step fulfillment by high-class athletes helped to reveal that the main elements of fulfillment technique were the following:

- 3-4 steps of run-up;
- "jump-off" fulfillment;
- hurdle step fulfillment on the edge of the springboard;
- repulsion fulfillment from the edge of the springboard.

The quality of teaching these elements conditions success of this phase of a dive fulfillment.

Teaching run-up-hurdle step, as teaching the most part of elements in diving, starts in sports acrobatic gym and only after the complete mastering of the elements they can be fulfilled on water.

We selected the exercises for teaching run-up-hurdle step both on land and on water.

Exercises in a gym can be divided the following way:

1. Exercises on the acrobatic track.
2. Exercises on special equipment.
3. Exercises on a trampoline.
4. Exercises on a "dry" trampoline.

Exercises used for teaching "new" run-up-hurdle step on an acrobatic track

1. Heel and toe walking, it is necessary to fulfill no less than 30 steps along the track. Instruction notes: the exercise is necessary to fulfill along the direct line, with high toe rise in the end of each step.

2. Rising on toes with one's eyes open and closed. It should be fulfilled no less than 30 times. During the exercise fulfillment heels should touch one another, belly pulled in, posterior tense, knees straight.

3. Upward cat leap, 30 jumps on each leg. Swing-up leg is bent 90 degrees in "hurdle step" position.

4. Jumps from one leg landing on another leg, jumping out up-forward. Fulfill 10 times on each leg. During repulsion knee is straight, toe is tense. Leg is bent in "hurdle step" position.

5. Jumps from two legs landing on one leg. Fulfill 10/15 times landing both on take-off and swing-up leg.

6. Jumps from two legs landing on take-off leg, with the swing-up leg raised and 90 degrees bent. 10/15 times each.

7. From the initial position standing on one leg, the other leg is bent in a convenient position, hurdle step-jump from this position landing on two legs.

8. During upward repulsion swing-up leg is put down and landing happens on two legs. During landing legs should be put together. The exercise should be fulfilled with both legs 10/15 times each.

Static exercises for the sense of balance development

1. Initial position – standing on one leg, the other leg is 90 degrees bent in "hurdle step" position, hands down. The exercise should be fulfilled first on one leg, then on the other leg. An athlete should try not to fall down and not to change the initial position.

2. While mastering this exercise it should be fulfilled first on one leg, than on the other leg with different hands position, trying not to fall down.

After mastering all mentioned above exercises it is necessary to fulfill them in connection. As we divided run-up-hurdle step into the parts, it is necessary to learn how to connect its separate elements into one whole. It should be done within 4 stages with consequent change of hands position from simple one (hands down) to difficult one (hands movements in hurdle step):

1. The 1st stage. We should connect "jump-off" from two legs with landing on take-off leg, at the same time the other leg is bent behind, the knee is down. While mastering the exercise an athlete fulfills it with the leg swing till 90 degrees ("hurdle step" position).

2. The second stage. To add the push from one leg to two legs. Fulfilling this exercise it is necessary to make the mark on the floor in order to outline

the edges of the springboard. Then it would be easier for an athlete to fulfill this exercise on a “dry” springboard in a gym and on water.

3. The third stage. To the first two exercises we add one more push with two legs. It is “jump down into water”, but during the first attempts it is difficult for an athlete to understand that he haven’t jumped “into water” yet. In order to fulfill this exercise it is necessary to make “the edge of the springboard” and “water” marks.

4. The 4th stage. Run-up-hurdle step “assembly”. An athlete should add necessary amount of usual steps with heel and toe walking.

Exercises using special equipment

As special equipment we used the following: “hemisphere” ball, Swedish wall, gymnastic bar. Exercises with special equipment help to master the elements of the technique and improve them.

While mastering the exercise it is necessary to change the initial position of hands - (hands down, up, hands movement upward). All exercises should be fulfilled pushing off both with the right and the left leg.

Exercises on a “hemisphere” ball

(soft side of the ball is turned upward)

1. The initial position standing on one knee, one leg on the floor, the other leg is on the ball – get onto the ball in “hurdle step” position. Fulfill 10 times with each leg.

2. The initial position standing on one knee – “hurdle step” on the ball with two legs. Shoulders should be even, don’t bend forward, swing-up leg rises till 90 degrees.

3. The initial position – standing two legs on the ball, hands down. Take “hurdle step” position and return to the initial position. During the exercises fulfillment it is necessary to keep the balance, working only with legs, shoulders and head don’t move.

While mastering the exercises change the initial position – hands down- hands, arms behind neck- hands work bottom-up. At the same time legs position is not changed.

Exercises on two “hemisphere” balls

(soft side of the ball is turned upward)

1. The initial position – left leg is put forward on the 1st “hemisphere”, the right leg is back on the 2nd “hemisphere”, hands are put forward. Pushing off upward we change the legs, hands are put back. Only legs work, hands help. Shoulders stay still.

While mastering the exercise from “hands down” position a person should fulfill the exercise from the initial position hands forward, up and with hands movement in hurdle step. Legs position is not changed.

Exercises on the flat side of a “hemisphere”

1. The initial position – standing two legs on a flat side of a ball, hands down. Take “hurdle step”

position and return to the initial position. The same is fulfilled with the other leg. It is necessary to hold the balance and not to fall down. Only legs work, shoulders and head are still.

2. The initial position – legs are slightly bent, during “hurdle step” position taking the stationary foot becomes straight, swing-up leg rises till 90 degrees angle. The exercise ends in “hurdle step” position, hands down.

3. The initial position – standing on a slightly bent leg, the other leg is driven back, hands are slightly driven back. Straightening the stationary foot, take “hurdle step” position and then stand up.

During standing up shoulders are not bent forward, swing-up leg goes up quickly till 90 degrees, then it goes down also very quickly. Landing happens on two linked together legs. It is necessary to keep one’s balance and not to fall down. The exercises should be fulfilled ten times.

Exercises on wall-bars and a fixed bar

1. The initial position – hang on the wall. Legs together, hands at shoulder length. Lift swing-up leg till 90 degrees and put it down into the initial position. Take-off leg is pressed to the wall and swing-up leg shouldn’t be raised for a long time. Fulfill no less than 10 times. The exercise should be fulfilled both with the right and left leg.

2. The initial position – standing two steps before facing the fixed bar. Fulfilling “jump-off” a person should jump on the bar into hanging on the bar. Fulfill no less than 10 times. During jumping on it is necessary to lift quickly the swing-up leg till 90 degrees and put it down also very quickly, when an athlete is hanging on the bar, legs should be together.

3. The initial position – hanging on the bar. Raise swing-up leg till 90 degrees and put it down into the initial position. During the hang the head is straight, hands grasp is at shoulder length.

Exercises on the trampoline

1. From the initial position “bent leg squat” fulfill two not high hops in the initial position, during the third hop push off maximally upward and take “hurdle step” position while flying, then land on two legs.

2. Tempo hops, while flying take “hurdle step” position with landing on two legs. No less than 10 times. Head is always straight, legs are straight, stretched. Landing on the trampoline is always on two legs.

After all mentioned above exercises mastering it is necessary to fulfill then in combination. As we divided run-up-hurdle step into the parts, it is necessary to learn how to connect its separate elements. It should be done in within four stages with successive hands position change, from simple (hands down) to difficult one (hands movements in a hurdle step): The first stage. We connect “jump-

off” from two legs with landing on take-off leg. The other leg is bent, the knee is down. While mastering the exercise an athlete fulfills it with a leg swing till 90 degrees (“hurdle step” position).

The second stage. Add the push off from one leg to two legs. For this exercise fulfillment it is necessary to make a mark on the floor, indicating “the edges of the trampoline”, in order to understand its size. Further it would be easier for an athlete to fulfill this exercise on a “dry” trampoline in the gym or on water.

The third stage. We add one more push off with two legs to the first two exercises – “Jump down into the water”. In order to fulfill this exercise it is necessary to make the marks “the edge of the trampoline” and “water”.

The fourth stage. Run-up-hurdle step “assembly”. At this stage an athlete should add necessary amount of usual steps with heel and toe walking.

Results and discussion

The effectiveness of the created methodology of run-up-hurdle step teaching was checked during the pedagogical experiment.

In order to check the effectiveness of the created methodology we organized run-up-hurdle step and a push off fulfillment technique testing among the athletes of the control (n=10 people) and experimental (n=10 people) groups. Testing was held at the beginning and in the end of the experiment.

In order to estimate the technique of run-up fulfillment and the height of pushing off from the trampoline we formed the group of experts (5 people). All the experts were the masters of sport in springboard diving, 2 of them were honored coaches of Lithuania, one was internationally certified judge, 2 people – masters of sport. The experts estimated the technique of run-up-hurdle step fulfillment according to the following scheme:

- the first steps;
- sizes of steps;
- take-off leg stating;
- height of repulsion with the take-off leg;
- holding hands up during the moment of leg lowering;
- accuracy of coming on the edge of the trampoline with two legs;
- height of repulsion from the edge of the trampoline with two legs.

Maximal mark for each element – 5 points. All in all a person can get 35 points for the whole run-up-hurdle step.

The results of table 1 prove that the technique estimation of run-up-hurdle step with “jump-off” fulfillment at the beginning of the experiment in the control and experimental groups didn't have valid differences. In the end of the experiment the fulfillment technique estimation of this phase of jump increased significantly in the experimental group.

Table 1

The results of run-up-hurdle step elements fulfillment by the athletes from the experimental and control groups at the beginning and in the end of the experiment

Elements of estimation	Experimental group		Control group	
	At the beginning of the experiment	In the end of the experiment	At the beginning of the experiment	In the end of the experiment
	$X \pm \sigma$	$X \pm \sigma$	$X \pm \sigma$	$X \pm \sigma$
the first steps	4,4± 0,2	4,5± 0,2	4,3± 0,08,	4,5±0,2
sizes of steps	4,5± 0,3	5±0,2	4,4±0,09	3,5±0,2
take-off leg stating	3,8± 0,2	4±0,2	4±0,07	4,2±0,4
height of repulsion in	3,5± 0,6	4,5±0,3	3,5±0.0,6	3,2±0,0,2
hurdle step				
holding hands up	3,8±0,8	4,8±0,4	3,7± 0,8	3,8±0,5
Точность прихода на край	4±0,8	4,7±0,6	4±0,8	3,5±0,5

accuracy of repulsion from the edge of the trampoline	3,5 ± 0,5	5±0,6	3,6±0,7	3,9±,45
Average score	27,5	32,5	27,5	26,6
X±σ	3,5 ± 0,4	4,5 ±0,27	3,97 ± 0,6	3,8± 6,2

However, the comparison of these indices in the end of the experiment proves more qualitative fulfillment of a run-up-hurdle step by the athletes from the experimental group. The most significant differences were in the absence of the stop before “jump-off” and in estimating the height of repulsion with the take-off leg from the edge of the trampoline. It should be noted that a run-up-hurdle step is the element for the height of repulsion and the duration of the flight time increase. It is known that the height of the jump increase for 50 cm increases time of flight for 50,6% from 1 meter trampoline and for 30,8% from 3 meters trampoline [1]. High altitude of the take-off, increasing the duration of the flight, provides the opportunity to fulfill the figure of the jump over the water. It is reflected in the mark of the experts for the jump in general.

Thus, as a result of the pedagogical experiment we proved the effectiveness of the created methodology of teaching a new run-up-hurdle step.

Conclusion

1. We created the exercises for the main elements of a run-up-hurdle step improvement. They provide the effectiveness of its fulfillment: run-up steps and a hurdle step; an additional hop (rolling of the trampoline), fulfilled with two almost put together legs; jumping on (“hurdle step”) on the take-off leg. It happens 20 cm before the edge of the trampoline; repulsion from the take-off leg into a hurdle step; coming to the edge of the trampoline on two legs for repulsion into the jump.

2. It was revealed that teaching a new run-up-hurdle step should be realized during land lessons. It improves physical training of athletes with simultaneous technique improvement of run-up-hurdle step elements with “jump-off” no less than 3 times a week.

3. Teaching exercises should be realized with the help of the split method. It provides both correct structure of movements formation and coordination, sense of space and movements coordination with the vibrations of the trampoline development.

4. We defined the effectiveness of the created methodology of teaching during the pedagogical experiment. The athletes from the experimental group, who used created by us exercises in training, differed significantly from the athletes of the control group in the quality of the run-up elements fulfillment, the height of repulsion from the edge of the trampoline and stability of the main

element fulfillment – “jump-off”, during hurdle step fulfillment.

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Methodology of planning the training process of young 7-8-year-old boys hockey players taking into account the system of muscle activity energy-supply

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Abstract: The article considers the process of physical training and describes the experimental methodology of planning the training process of young 7-8-year-old boys hockey players on the basis of taking into account the system of muscle activity energy-supply. The effectiveness of the created methodology was estimated according to the comparison of physical fitness indices of the boys from the experimental and control groups and according to the changes in the indices of the functional and reserve capacities of an organism in the experimental group in the end of the experiment. **Material.** Creation and experimental effectiveness substantiation of the methodology of planning the training process of young 7-8 year-old hockey players on the basis of the system of muscle activity energy-supply. **Research methods:** information sources analysis and summarizing, general physical fitness testing, method of express-diagnostics of the functional state and reserve capacities of an organism "D&K-Test", pedagogical experiment, methods of mathematical statistics. Results. The results of the pedagogical experiment analysis showed that all considered indices of organism functional and reserve capacities improved among the hockey players from the experimental group and all compared values have statistically valid differences. **Conclusion.** We can claim that the experimental methodology of the training process planning among young 7-8 year-old hockey players taking into account the system of muscle activity energy-supply is more effective in comparison with the standard program of the federal standard.

Keywords: young hockey players, multifactorial express-diagnostics «D&K-Test», systems of energy-supply, physical training.

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Urgency

The training process organization among young hockey players is regulated in accordance with the federal standard of sports training in "Hockey" [7]. Some authors describe the issue of planning training loads during young hockey players training [7,10]. We also found the works connected with the training process planning on the basis of muscle activity energy supply systems. For example, Mironov A.Yu. [1] in his work considers the problem of educational-training process individualization on

the basis of bioenergetic types. Kapralova A.M. [3] in her work studies the necessity to take into account the mechanism of muscle activity energy-supply during the training process organization with the qualified karatekas. Tikhonov Yu.V. [8] reveals the factors, which define the necessity to organize the training of marathon runners taking into account the peculiarities of muscle activity energy-supply mechanism. There are works not connected with educational-training process, but which take into consideration bioenergetic types, for example, the