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CONTENT AND EFFICIENCY OF THE TECHNIQUE, AIMED AT FORMATION OF "WORKING" AND "DYNAMIC POSITION" OF LOWER ACROBATES, TAKING INTO ACCOUNT THE REQUIREMENTS OF THE CHOSEN SPECIALTY

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Abstract

The content of the methodology aimed at the formation of “working” and “dynamic posture” of bottom acrobats who train at the stage of preliminary basic training is discussed in the article presented. The methodology mentioned was developed with taking into account the requirements of the athletes’ chosen specialty, as well as on the basis of the kinematic structure of motor action which form the basis of functional duties of the bottom acrobat. It solved the following tasks: formation of a “working posture”, formation of “rational dynamic posture” of a bottom acrobat in the performance of functional duties; optimization of balancing technique and throwing actions of the bottom acrobats. The sequential implementation of the following stages created the algorithm of the methodology developed. It included formation of a “working posture” under simple conditions; formation of a “working posture” under the conditions of an increased load on the muscles that fix the “working posture”; formation of the “working posture” under the various spatio-temporal conditions; formation of a “rational dynamic posture” under simple conditions; formation of “rational dynamic posture” under conditions with a reduced support area; formation of “working posture” and “rational dynamic posture” under the conditions close to the performance of acrobatic exercises. AS a result of the experiment the Authors has shown that

the use of the technique developed contributes to the optimization of the balancing technique and technique of throwing actions of the bottom acrobats. So among main group acrobats the indicators of “working posture” and “dynamic posture” significantly differ ($p<0.05$) from those in control group and approach the model characteristics.

Key words: dynamic posture; specialty; acrobat; spine; physical; technical; special preparedness; training.

To successfully perform functional duties and reduce compression loads on the spine of the bottom acrobats when performing pair work, first, it is necessary to optimize the technique of balancing, as well as partner’s throws and catching by forming a certain motor stereotype, namely "working and dynamic posture”.

The analysis of scientific and methodical literature testifies to the importance of research of technique and training of exercises of sports kinds of gymnastics taking into account knowledge of a sportsman’s “working and dynamic posture”. V. T. Nazarov (1974) singled out "dynamic posture"; Yu. Haverdovsky, (2014) - "working positions", "working posture"; N. Suchilin (1989) - "borderline poses"; O. Reshetin (2009) - "rational starting position"; K. Danilov (1980) - "somersault-beginning", "figure", "somersault-end"; V. Boloban (2009) - "starting pose", "animation of poses", "final pose".

Sports acrobatics has characteristic for it positions, stances, poses, moves, movements. On their basis the elements are constructed, the "school of movements" is built. These characteristic positions, the body’s poses form its basis or a "working posture". In other words, the whole culture of movements in sports forms of gymnastics is actually embedded in the spine, in the position of the spine, hip and muscle tone [2, 3] state.

In sports practice, the "working posture" is often defined more specifically, it consists of the curvature of the natural curves of the spine; muscle tone of torso muscles; pelvic angle; angle and inversion of the thighs in the hip joint [2].

In sports acrobatics, the "working posture" of the bottom acrobat plays a primary role in the performance of restraints and balancing of the partner. Thus, during the balance work, the biolinks of the bottom partner must be located in such a way that the vector of gravity of the top acrobat passes strictly vertically, i.e. from the hands through the shoulder joint, then through the pelvis to the center of the feet. For this acrobat has rigidly fix the body parts with optimal extension in the shoulder joints, hip joints and increase the lumbosacral angle, optimally "smooth" the physiological curves of the spine.

The "dynamic posture" of the bottom acrobat when performing manipulations with the

top partner in the bent arms of the bottom is also characterized by the optimal configuration of the spine. Thoracic kyphosis is smoothed, the lumbar spine is slightly curved. This facilitates both balancing and retention of the upper partner by the bottom one in the seat and further his push [5].

Thus, O. Reshetin notes that to improve the technique in pair work it is necessary to optimize its parameters, which, first of all, "refers to the adoption of a rational starting position and the active actions of acrobats associated with changing posture during movement." (A. Reshetin, p. 66). Thus, in the initial position, a necessary condition for the optimality of the poses taken by the partners is to maintain balance. At the same time they face different tasks. Thus, the bottom partner's posture provides a strong support for the top partner, allows to accumulate potential energy and then effectively implement it.

The poses adopted by the partners in the initial position are characterized by angular relations, both between the individual levers of the kinematic chain (angle in the knee joint, angle in the hip joint), and between them and the vertical; for example, tilting the torso forward, as well as the location of the athletes' feet, which determines the size of the support area.

During the accumulation stage and the working stage, the bottom acrobat must strictly maintain the optimal location of the body parts, fixing the dynamic posture, which is determined by the relative position of the shoulder and hip joints, which must be in the same vertical plane.

Reshetin has revealed in his research that the tilt of the torso forward by the bottom acrobat, when performing dynamic exercises should not exceed 10°. In this regard, the common body mass centre (CBMC) of the top partner's body will be projected in the center of the support area and coincide with the projection of the CBMC of the bottom partner, which allows to perform an effective dynamic posture. It was also noted that the most rational location of the starting angles (angle of the thigh to the vertical) is 90 - 110°, and the angle of inclusion in the dynamic operation of subsequent chains (arms) is 130-140° of the thigh to the vertical. This, according to the author, promotes optimal muscle function and achievement of maximum speed and height of the top partner "fly out".

Hypothesis. We assumed that the formation of the skill of the "working and dynamic posture" fixing by the bottom acrobats will lead to the optimization of the balancing technique and throwing actions of the bottom acrobats.

The objective. To optimize the technique of balancing and throwing actions of the

bottom acrobats through the formation of "working posture" and "rational dynamic posture".

Research methods. Analysis of scientific and methodical literature, pedagogical experiment, pedagogical testing, biomechanical methods, methods of mathematical statistics.

The content of the technique aimed at the formation of "working" and rational "dynamic posture" of the bottom acrobats, taking into account the requirements of the chosen specialty.

Based on the above, we have developed a technique aimed at forming a "working posture" and "rational dynamic posture" of the bottom acrobats.

The methodology was developed taking into account the requirements of the chosen role of acrobats and solved the following tasks. 1. Formation of "working posture" of acrobats. 2. Formation of "rational dynamic posture" of bottom acrobats in the performance of their functional duties. 3. Optimization of balancing techniques, throws and catching of bottom acrobats due to the formation of "working posture" and "rational dynamic posture".

By "working posture" we mean rigid fixation of body parts with optimal extension in the shoulder joints, hips and lumbosacral angle increase by the bottom acrobat while supporting the partner in static positions and his movements during balance exercises.

In turn, "rational dynamic posture" is the adoption of the bottom acrobat of a certain starting position to throw a partner. "Rational dynamic posture" is also characterized by the optimal configuration of the spine. Thoracic kyphosis is smoothed, the lumbar spine is slightly curved, with the angle of the thigh to the vertical is 90 - 110°, and the inclination of the torso forward by the bottom acrobat should not exceed 10°.

To solve the tasks mentioned we followed the algorithm based on the experimentally confirmed "program of constructive transformation of motor stereotype" proposed by Yu. Maksimova, which was supplemented and modernized taking into account the requirements of the acrobat’s chosen specialty, namely the functional responsibilities of bottom partners [5, 6].

Algorithm for solving problems of the method aimed at the formation of "working posture" and "rational dynamic posture" of the lower acrobats includes:

1. The formation of "working posture" under the simplest conditions.

2. The formation of "working posture" under the conditions of increased load on the muscles that can fix the "working posture".

3. The formation of "working posture" under different spatio-temporal conditions.

4. The formation of "rational dynamic posture" under the simplest conditions.

5. The formation of "rational dynamic posture" under the conditions with reduced

support area.

6. The formation of "working posture" and "rational dynamic posture" under the conditions close to performing acrobatic exercises.

7. The formation of "working posture" and "rational dynamic posture" during acrobatic exercises.

Teaching aids are aimed at the strength endurance of the torso muscles increase, the development of optimal flexibility of the spine and mobility of the hip and shoulder joints, strengthening the arch of the foot, increase the functions of proprioceptive analyzers. Symmetrical corrective exercises are aimed at pre-stretching shortened muscles and relaxation of spasmodic, to stabilization of relaxed muscles. Imitating exercises are offered.

Underwater - simulating exercises: these exercises aimed at acquiring the skill of correct (parallel) legs setting; exercises aimed at acquiring the skill of rational arrangement of starting angles (angle of the thigh to the vertical) and the angle of inclusion in the dynamic work of the following chains (arms); exercises aimed at acquiring the skill of forming a "rational dynamic posture".

Diving exercises with reduced weight: exercises aimed at acquiring the skill of correct (parallel) posture of legs. Loads are in the form of weights on the legs weighing 0.3 - 0.5 kg, a stuffed ball up to 3-5 kg in weight, a barbell weighing 50% of the partner's weight; exercises aimed at acquiring the skill of correct placement of the hands. Exercises mentioned are performed with acrobatic "cubes", "acrobatic stands", gymnastic mat and the partner with the support of a coach or near the support on which the top acrobat rests to reduce the support on the hands of the bottom partner; exercises aimed at acquiring the skill of rational location of the starting angles (angle of the thigh to the vertical) and the angle of inclusion in the dynamic work of the following chains (arms). This exercise should performed with a gymnastic mat and a partner with the support of a coach or near the support on which the top acrobat rests to reduce support on the hands of the lower partner; exercises aimed at acquiring the skill of forming a "rational dynamic posture". They also performed with a gymnastic mat and a partner with the support of a coach or near a support on which the top acrobat rests to reduce the **resistance** on the hands of the lower partner.

Under-water and basic exercises performed jointly by partners. The purpose of these exercises is to optimize the technique of balancing, throwing and catching of bottom acrobats by using the skill of fixing the "working posture" and "rational starting position".

Ideomotor training. It is used at the stage when acrobats have a clear motor idea of performing the basic exercise, namely its objective and subjective components. Objective

components are, in essence, the biomechanical structure of movements, which is assimilated by the acrobat at the stage of storytelling and demonstration of exercises. At this stage, he is clearly aware of the movement of biolinks, kinematic characteristics of motor action, change of posture and temporal parameters of movement. At this stage, the acrobats were given the following tasks: speaking and imagining (mentally) of the exercise phase (studies by some authors have shown that the effect of imaginary representations increases significantly if they are given in exact verbal formulations); graphic image of the exercise phase.

But for the use of ideomotor training this is not enough, it is necessary to have formed efferent and sensory-perceptual perceptions, each of which is associated with any important for the acrobat way of sensory assessment of movement. This, in turn, is kinesthetic sensitivity, i.e. the ability to assess one's own musculoskeletal actions, to determine posture, as well as visual, tactile, vestibular sensation. These and other feelings consist of subjective components of motor perception, which is already a characteristic of perception and are formed only during the practical implementation of imitative, subdued, preparatory exercises [4, 5].

Ideomotor training consisted of reproducing (mentally and sometimes out loud) the exercise before each performance. At the same time, the coach set a clear goal setting, in which he explained the sequence of actions and their technical implementation. Practice has shown that the repetition of imaginary and oral reproduction of the exercise more than 6 times is ineffective, because with a given number of repetitions there is fatigue, inability to concentrate. Also at this stage, the acrobats had to develop absolutely accurate sensory representations (tension of the muscular system, opening in the joints, tactile sensations of support, tempo-rhythm of the exercise, etc.), i.e. to identify the main points of reference. Also before the practical implementation of the exercise and during rest (at home) they mentally reproduced the exercise, but first in slow motion, then in accelerated and then at a pace close to the actual performance. When learning the technique of the exercise, according to many authors, it is necessary to imagine its implementation in slow motion, as seen in the demonstration of video shot by the rapid method. Slow comprehension of the technique will allow to present more accurately all the details of the exercise being studied and to eliminate errors in time [3, 4, 5, 9].

The result of training is the skill of fixing the "rational dynamic posture" by acrobats when performing simulation and diving exercises.

To identify the effectiveness of the methodology developed, we conducted pedagogical testing. Assessment of the readiness of the bottom acrobats, taking into account

the requirements of the chosen role, was performed according to the tests proposed by A. Reshetin.

Table 1 presents the structural components of the exercises performed by acrobats during testing.

Table 1

Structural components of exercises

Statistical indicators	Angle in a shoulder joint, °		Angle of a hip joint to vertical,°		Angle of a torso to a vertical, °		Angle of a hip to a vertical at inclusion in work of hands, °	
	MG	**CG**	**MG**	**CG**	**MG**	**CG**	**MG**	**CG**
Structural components of the exercise "squats with a barbell in straight arms"								
$\bar{x}$	176.9	171.7	95.9	79.3	10.6	16.9	-	-
p	p>0.05		p<0.05		p<0.05		-	
Structural components of the exercise "throwing a barbell with subsequent catching"								
$\bar{x}$	-	-	102.1	78.5	10.6	16.9	129.3	127.6
p	-		p<0.05		p<0.05		p>0.05	
Structural components of the exercise "stand with one's feet in the hands of the bottom, fixing the working position to the throw, 20 s"								
$\bar{x}$	-	-	100.8	74.7	10.9	17.2		
p	-		p<0.05		p<0.05			
Structural components of the exercise "Standing with his feet in the hands of the bottom, joint squat"								
$\bar{x}$	-	-	102.1	78.5	10.6	16.9	-	-
p	-		p<0.05		p<0.05		-	

One of the components of the exercise "squats with a barbell in straight arms" is the angle in the shoulder joint of the bottom acrobats, the value of which depends, firstly on the flexibility in this joint, secondly on the level of static strength of arm muscles, upper extremities and torso, third from the ability to maintain a "working and dynamic posture." In the bottom acrobats of the main group, these indicators are close to the model parameters of movement and range from 170.2° to 182.6°. In athletes of the control group, the angle in the shoulder joint was - 167.8° -182.2°. It should be noted that the three acrobats of the control group received discounts for performing this exercise, as the angle in the studied joint exceeded 10° from the vertical. Also, two acrobats of the control group could not perform the exercise more than eight times due to loss of dynamic posture. However, the difference in the shoulder joint angle between the groups is not significant.

Indicators of "working posture" in acrobats of the main group significantly ($p < 0.05$) differ from the control and approach the model characteristics of the exercise.

In the control group, 100% of the acrobats tilted their torso more than 10° during the test task, which led to loss of balance and lowering of the barbell in two athletes.

With regard to the last structural component of the exercise, it should be noted that the exercise "squats with a barbell in straight arms" was strictly regulated. Before performing this exercise, all athletes were instructed on its biomechanical parameters. So the depth of squatting should be in the range of 90°-100°.

The table shows that five of the eight acrobats in the control group are unable to hold the angle. Under the weight of the barbell neck, they performed a deep squat from the third run, but due to insufficient strength of the leg muscles when getting up, posture and balance were disturbed.

Acrobats of the main group showed significantly better results ($p < 0.05$). The depth of the squat corresponded to the model characteristics of seven acrobats. One athlete had slight deviations from the model - 86.4°. But it should be noted that the scatter of values in this acrobat was in the range - 84° -90°, which indicates the absence of so-called "leg failure".

When performing the exercise "throwing a barbell with subsequent catching" acrobats of the main group had significantly better ($p < 0.05$) results for the two structural components of the exercise.

As for the third component of the exercise, namely the angles of the thigh to the vertical when the hands included in the work, we can note the following. Acrobats of both the main and control groups started throwing with their hands too early, which did not allow to reveal all the potential strength of the legs. Thus, the push begins with the extension of the legs and with increasing speed of extension of the legs increases the speed of the shoulder girdle. Thus, according to A. Reshetin, “at a squat depth of up to 130-140°, it reaches maximum. It is at this point in the dynamic work should be included the next link in the biokinematic chain - the hands. Their active actions at this moment give an additional increase in the total speed of the top acrobat or tool "(A. Reshetin, p.72.).

When performing the exercise "stand with one’s feet in the hands of the bottom, fixing the working position to the throw" the situation is similar to that in previous exercises.

The acrobats of the control group due to insufficiently developed static force had a so-called "failure of the legs", which was reflected in a deep squat. A. Reshetin found that "the speed of movement of the shoulder joint at the beginning of the movement from a deep squat increases for some time, and when reaching an angle (thigh to vertical) 90°, it decreases to minimum values, as the load moment increases" (A. Reshetin, p. 71.). Therefore, according to

the author, the most rational option to perform the push and accumulation of kinetic energy is the location of the starting angles in the range from 90 to 110°, which contributes to optimal muscle function and achieving maximum speed and height of the top partner.

In the main group acrobats, the indicators of the angle of the thigh to the vertical are significantly better ($p < 0.05$) than that in the control group, and range 86.3° - 110.9° with the average for the group 100.8°, which corresponds to the model characteristics of motor task.

When performing the exercise "stand with one's feet in the hands of the bottom, joint squat" indicators of dynamic posture are similar to these indicators that were obtained during the previous exercises. Thus, the main group acrobats have a significantly higher degree of "dynamic posture" ($p < 0.05$) than in control.

Based on the above, we can conclude that the use of techniques aimed at forming a "working" and rational "dynamic posture" of the bottom acrobats, taking into account the requirements of the chosen specialty helps to optimize the technique of balancing and throwing actions of bottom acrobats.

Conclusions. It was found that the main group acrobats indicators of "working posture" significantly ($p < 0.05$) differ from the control and approach the model characteristics of the exercise.

It was revealed that in the main group bottom acrobats the angle indicators in the shoulder joint are close to the model parameters of movement and range 170.2°-182.6°.

It is shown that the depth of squat in acrobats of the main group significantly ($p < 0.05$) differs from that in control group and approaches the model characteristics of the exercise.

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