Components of the structure of technical training of acrobats

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Abstract

Purpose: Teaching methodology based on the motor structure of acrobatic exercises.

Methods: Study of the effectiveness of special technical training of young acrobats on the basis of biomechanical indicators of key elements of sports technique in basic acrobatic exercises. This is achieved through the implementation of targeted training programs.

The study involved 21 acrobats of the 2nd and 1st sports categories, specializing in acrobatic jumps on the track, aged from 11 to 13 years.

Results: At the initial stage, when basic technical skills are formed, the STP should be about 20% of the training material, which allows to lay the foundations of technique and awareness of basic movements. At the basic stage, characterized by deepening and automatization of technique, STP occupies the most significant volume - about 52%, which emphasizes its importance for the formation of stable skills and adaptation of athletes to increasing loads. At the stage of sports improvement, when acrobatic exercises are already performed at a high level and require support and improvement of existing skills, the share of STP decreases to 28%.

Conlcusion: The kinematics of dynamic joints of acrobatic exercises in bunches was investigated in order to analyze in detail the key biomechanical parameters that characterize their performance. As a result of the study, the parameters that allow to reveal the structural and functional links and interrelationships of the nodal elements of sports technique were identified. These parameters help to understand how the coordinated interaction of different phases of movements is realized, which in turn is an important factor for achieving the efficiency of "docking" elements in combined exercises.

Keywords: complex elements of acrobatics, materials of coaches' questionnaires, systematic technical training.

Introduction

Technical training of acrobats, especially in conditions of increasing complexity of competitive exercises and increased requirements to the quality of performance and stability of sports technique of acrobatic elements, requires a systematic approach, covering all stages of multi-year sports improvement. This approach involves not only the gradual complication of technical elements, but also the creation of a stable base of basic skills, which serves as a foundation for mastering complex acrobatic bunches and elements.

At each stage of multi-year training, the technical work of acrobats should include the purposeful development of specific physical and coordination skills necessary to achieve high quality performance of elements. At the initial stages, attention is paid to the formation of basic skills and general technique, which lays the foundation for accurate and stable performance of exercises in the future. As we move to a higher level of training, the emphasis shifts to the development of technique stability, dynamic accuracy and synchronization of movements, which allows athletes to successfully adapt to the increasing requirements of sports programs.

In addition, systematic technical training takes into account the importance of individualization of the training process. This involves the adaptation of training tasks and exercises to the physical and psychophysiological characteristics of each athlete, as well as his current level of training. This approach allows not only to increase the effectiveness of training, but also to minimize the risk of injury, providing reliable and safe mastering of complex elements of acrobatics. Ultimately, systematic technical training contributes to the achievement of a high level of skill necessary for stable performance of complex competitive combinations and successful performance at top-level competitions.

Methods

Analysis of scientific and methodical literature on acrobatics and other sports with high coordination complexity, study of classification, educational and training programs of acrobats training, as well as the content of free and final acrobatic exercises. The materials of coaches' questionnaires and the results of competition protocols are included.

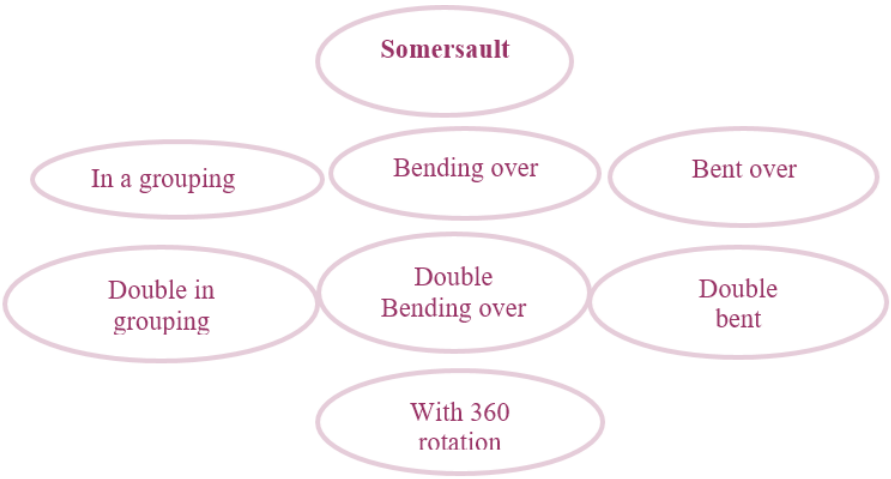
Results and discussion

As the athlete learns more and more complex acrobatic elements, both a wide range of choices and various, including complex, learning situations open up to the athlete. One of these

complexities is the transition between movements belonging to different types of structure. In the process of long-term improvement, the acrobat and his coach must act strategically and with farsighted planning.

One of the major families of acrobatic exercises, the somersault, is presented. This diagram roughly reflects the hierarchy of difficulty of exercises in this family and their interrelationships. Optimal sequences for mastering the exercises are shown by arrows. Analyzing this diagram can help the practitioner to form useful ideas for prospective planning of sports technical training (STT).

Fig 1. Acrobatic exercises the somersault.



"Elementary school" of movements - represents the initial level of technical training, where athletes master basic movements and coordination.

"Basic blocks" - structural and technical fragments of an exercise that include individual elements and sequences that form the basis for more complex combinations.

"Integral basic blocks" - more complex sets of movements that form the basis of exercises and include combinations of elements that require a high degree of coordination and skill.

These components of training material are sequentially related to each other, functionally complement each other and solve the tasks set in the framework of sports training.

The first component of the TP structure - "initial school" of movements - continues to be improved taking into account the trend of development of sport acrobatics, as well as other factors. There is a rich experience of forming a "school" of movements in young athletes in sports that are difficult to coordinate (3,4). It is connected with correctly formed goals of the "school" of movements:

1. To develop coordination abilities in young athletes, including balance, spatial and temporal

Fig 2. Components of the training program

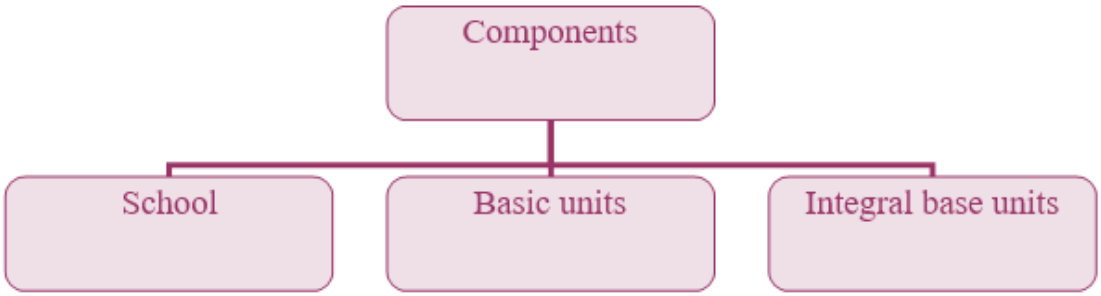


Table. Judges' penalties (in points) for errors made by young athletes in the performance of acrobatic somersault exercise of experimental (n = 12) and control (n = 12) groups in the pedagogical experiment

Elements of the som-	Experimental group				Control group			
	before the exper-iment	V%	after experi-ment	V%	before the ex-perime nt	V%	after experi-ment	V%
Preparatory phase of action	0,27 0 ,07	25,9	0,12 0,09	33,3	0,28 0,08	28,5	0,25 0,07	28,0
Adopting a position in the air	0,32 0,09	28,1	0,17 0,05	29,4	0,35 0,08	22,8	0,27 0,07	25,9
Finalization phase	0,34 0,1	29,4	0,15 0	33,3	0,3 0,07	23,3	0,28 0,8	28,6
Appraisal	**8,3 0,14**	**1,7**	**9,2 0,11**	**1,22**	**8,35 0,28**	**3,35**	**8,65 0,22**	**11,56**

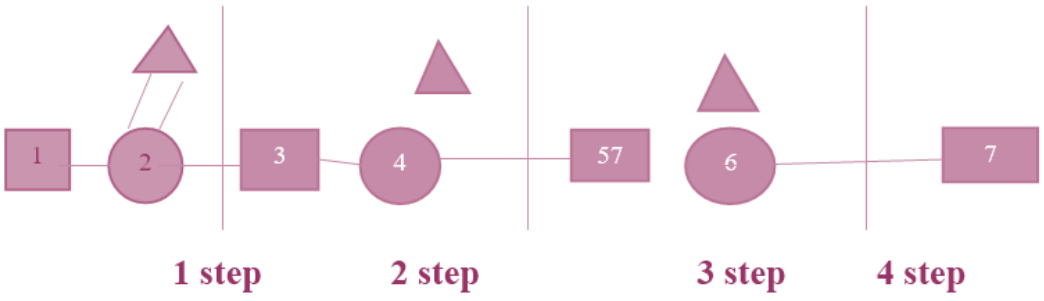
analysis of movements, differentiation of muscular efforts, stability and sensitivity of vestibular reactions, symmetry and asymmetry of movements, as well as the ability to evaluate poses, body position, tempo and rhythm of movements.

To teach children to perform a wide range of simple exercises, thus creating a movement base that will "specialize" the body's sensory systems for successful performance of increasingly complex exercises in training and competition. The process utilizes elements of general gymnastics, music, games, dance, choreography, basic acrobatics, trampolining, thematic exercise sets and technical aids.

To form in young athletes gymnastic style, which includes: beautiful posture, correct body lines, straight legs, extended toes, accuracy of poses and positions, dynamism of movements, choreography and artistry.

The next stage of the TP training process - special technical training (STP) as a direction of work of the coach and athlete - is revealed in the works of specialists in sports gymnastics (1,2,3,5). Thus, there should be a special subject of STP, which is not only competitive exer-

Fig 3. Composing the construction of a backflip training program.



Note: *1 step - pushing off with legs, arms swing . 2 step - flight phase. 3 step - final phase. 4 step-improvement. - part of the element, - learning, - errors.*

cises (constituting the goal of training), but also specially selected and systematized training exercises, which constitute the necessary base for mastering the planned for the future competitive exercises.

The importance of STP is extremely great - it is the cornerstone of training a high-class acrobat. The purpose of STP is to form in athletes special motor skills to perform the nodal elements of sports technique of basic acrobatic exercises and their dynamic connections in bundles and combinations; on this basis to prepare athletes to perform profiling exercises using actual pedagogical technologies (2,3,4,5).
Biomechanical analysis of acrobatic exercises, including backflip in grouping, allowed us to identify three key elements of sports technique: starting pose (SP), grouping pose and its continuation (PG), final pose (FP). The study of the backflip in grouping showed that the starting pose is a kinematically optimal position of body parts on the support in the preparatory phase, necessary for an effective push up. In high-level athletes performing a backflip in a grouping, the starting posture in the coordinate system is located in the push-off sector limited by the angles 7-5° to the vertical and 5° behind it. In this case, athletes take an elastic, rigid position on the support, standing on their toes, with arms extended forward and upward.

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Despite the diversity and multidirectionality of the resulting velocities of the movements of various parts of the body, the analysis of the data allows us to identify cause-and-effect relationships in the work of key elements of sports technique when performing a backflip in a grouping. Rational elastic-rigid position of body parts on the support in the toestand in the specified sector of push-off contributes to the slowing down of the body backward movement, creates conditions for the coordination of the resulting velocities of the center of mass of the body and individual links. This allows the acrobat to perform a greater number of rotations on the ascending part of the trajectory, effectively “twisting” the body upwards and raising the center of mass to a height of 150 cm. This probably explains the possibility of further complication of acrobatic jumps of this type (2, 3, 4 rotations).

In the course of acrobatic technique research, key nodal elements were identified, which complement the existing phase structure of exercise execution (Fig. 3) and allow to emphasize attention on STP (special technical training). These elements, being an important part of the technique of acrobatic exercises, create opportunities for purposeful work on STP, aimed at optimizing movements and improving coordination in the performance of ligaments.

The results of the questionnaire and pedagogical experiment emphasized the importance of further development of STP as an integral component of the structure of technical and preparatory (TP) activities. The survey conducted among coaches showed that 100% of respondents consider it necessary to include STP at all stages of multi-year sports improvement of acrobats. The importance of STP is explained by the fact that it not only improves technique, but also forms the basis for more complex elements, reducing the risk of injury and improving the stability and quality of performance.
According to the opinion of coaches, the amount of training material on STP should vary depending on the stage of training of the athlete. This approach allows to maintain the level of technique and at the same time gives the opportunity to focus on more complex elements of the program, ensuring the development of acrobats' skills at each stage of training.

Experimental (n = 12) and control (n = 12) groups of young acrobats of the 2nd sport category underwent acrobatic training according to the generally accepted methodology. Additionally, in the experimental group the training was based on the formation of motor skills of performance of nodal elements of sports technique of basic acrobatic exercises, for which purpose the target programs of STP were developed, named as: “Preparatory phase”, ‘Program of position in the air’, ‘Landing program’.

We conducted a pedagogical experiment to evaluate the effectiveness of the specialized

training program (STP) in the educational and training process in acrobatics. The analysis of the results obtained on the example of performing somersaults confirms the reliability of improvements at the significance level of $p<0.05$. This allows us to conclude that the use of STP, based on biomechanical indicators of the performance of key elements of acrobatic exercises, as well as the use of other basic exercises and specialized training programs, contributes to improving the effectiveness of the training process for young acrobats.

The kinematic parameters of dynamic bundles of acrobatic exercises were studied in the course of the research. The obtained biomechanical data reveal structural and functional connections between the nodal elements of sports technique, which allow us to successfully solve the problems of "docking" exercises in combinations. These data can be useful for optimizing training and creating programs focused on more accurate movement control and construction of ligaments in acrobatics.

Conclusion

The phase structure of acrobatic exercise is supplemented with nodal elements of technique and their biomechanical characteristics. In the preparatory phase - starting pose - the most rational position of the body for subsequent movements is provided. In the main phase there is a change of poses, including combined poses, which determines the composition of the exercise. The final phase includes the final pose that forms the landing and transition. Special technical training is important at all stages of the athlete's long-term improvement: at the initial stage it is given 20% of the training material, at the basic phase - 52%, and at the stage of sportsmanship - 28%.

The obtained data can serve as a basis for the creation of methods aimed at improving the technique of performing ligaments, increasing stability and smoothness of transitions between elements. Comparative analysis of biomechanical characteristics in different phases of acrobatic movements helps to identify the most rational ways of their performance, taking into account the individual characteristics of athletes and specific requirements of the program. This approach allows not only to increase the amplitude and dynamics of acrobatic elements, but also to reduce the risk of injury due to accurate load control and distribution of forces in key points of movement.

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