THE PECULIARITIES OF STATODYNAMIC EQUILIBRIUM IN SPORTS EVENTS WITH COMPLEX COORDINATIONAL STRUCTURE

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The following task has been set - to study statodynamic equilibrium of the body and its systems in complex conditions of realisation of the program of athletic motions. A high volume of complex coordinational drills and special equilibrium tests performed by the athletes with different skills and specialisation (acrobats, gymnasts, figure skates) has been studied. The methods of tensometry (stabilography, dynamography, accelerography), camera-video registration of athlete's motions, statometry, the methods of mathematical statistics and qualimetry realised by means of computer programs have been used in the process of studies. All equipment is metrologically substantiated.

Human body equilibrium as characteristics of the balance for the body or its systems is determined by its abilities to actively balance disturbing forces (static equilibrium), stop beginning deviations and restore original positions (dynamic equilibrium). High statodynamic equilibrium of the body or its systems, and, as a consequence, high level of athletic skill can be achieved only with realisation of biomechanically expedient motions and postures depending on such parameters as amplitude, frequency and period of vibrations, equilibrium factor, time of equilibrium stabilization and balance conservation. As the athletic skill improves, in the process of fixation of control balances, the amplitude of body (body systems) vibrations and time of balance stabilisation decrease whereas the frequency of vibrations and time of balance conservation increase. Combination of small amplitude and frequency of vibrations at efficient equilibrium stabilisation with durable time of balance conservation is biomechanical characteristics of high level of regulation of athlete's posture. While performing balances on narrowed and motional supports (balance beam, skates) at high level with limited visual control, in orthograde and turned-over positions, the above features are maintained, being confirmed by experimental results and those ones of competitive activity.

Equilibrium of the athlete on support during his/her transition from dynamic part of exercise to static position (final stage of jumps and jumps off) depends on the number of motions being performed at ascending section of the flight trajectory: the more is the number of grades the athlete's body has turned to at ascending section of the trajectory, the more stable is the landing (correlation factor $r=0.860$, reliability $P>0.95$).

Postural reference-points of motion have been determined in sports events with complex coordinational structure. In preparatory actions, starting posture is separated - biomechanically advisable positions of body chains on support providing efficient interaction of athlete with support to completely realise motional program.

Starting posture during Axel Paulsen jump allows the figure skater to get efficiently into ascending part of the flight trajectory.

In major actions, dynamic carriage characterised by sequence of momentary fixed postures by the principle of multiplication is single out. Dynamic carriage of the figure skater is characterised by vertical position of body longitudinal axis providing performance of final actions.

In final actions, total posture characterised by stable body position on support providing to efficiently complete the exercise or create conditions for its continuation is single out.

Complex acrobatic element - triple salto twist, performed by limited number of athletes contains the most brightly expressed postural reference-points of motion. Frame 2 - starting posture allowing the athlete to get into ascending part of the flight trajectory efficiently; frames 7 - 20 - disclose content of the jump. multiplication of tusk position; frame 22 - final posture, stable landing.

High statodynamic equilibrium of the body system is based on synergies formed by motor compatibility of athletes-partners.

This equilibrium is characterised by the least motor interaction between the partners and depends on the features of visual afferentation, formed connection nodes of "wrists-wrists"type, support nodes and working postures.

Statodynamic equilibrium of acrobatic groups performing pyramid of column in fours type is provided by formed coordinational skills of vertical body position while standing by motor interactions of the partners and explained by conceptual models of posture regulation of the body system. This is confirmed by tensograms where individual motions of acrobats are registered. In upper acrobats, the elements of posture autonomous regulation are observed; second middle ones - co-performers of active actions of the upper and the first middle ones; the first middle perform the functions of leading balanceurs; the lower acrobats by means of hypercorrections and subtle motor search approach the system to the model of equilibrium by means of linear, bending and rotating vibrations. The important role in this process is played by tactics: frequent, dempheric and dissonance balancing; as well as dynamic blocks of equlibrium forming paired, group synergies of stabilisation.

Analysis has demonstrated that teaching in sports events with complex coordinational structure of statodynamic equilibrium is connected with solution of difficult pedagogical tasks. In our studies, we have elaborated and experimentally substantiated theoretical provisions and methodological recommendatiods of teaching exercise at high level of difficulty.

On the basis of our findings, the methods of teaching exercises with complex coordinational structure of statodynamic equilibrium have been developed. The above methods include both priority didactic principles: individualisation, conjugated influence, firmness and compatibility; methods of modelling, linear and ramified programming of educational material; purposeful preparational programs of following types: posture, orientation, rotations, choreography, balancing, interactions, jumps; elements of control and reglamentation; and other efficiency criteria: teaching quality, terms of educational material acquisition, stability of reproduction in competitive conditions. Statistically valid effect as the result of introduction of methods into educational and training process has been obtained.