

# STATODYNAMIC STABILITY OF ATHLETE'S BODY AND BODY SYSTEM

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## ACTUALITY

The major content of competitive programs in sports acrobatics (paired events: male pairs - MP, female pairs - FP, mixed pairs - MxP) and figure skating (sports pairs -SP) are the exercises performed individually and pairs, at physical contact of partners. Paired exercises dominate in compositions of athletes. Forming body system, the athletes perform different in complexity acrobatic exercises and figure-skating elements of static and dynamic character: equilibriums, supports, stands, throws, individual and paired motions in the structure of motor interaction.

It is proved by studies [4,5] that statodynamic stability (SDS) of athlete's body and body system is provided by body poses and positions technically accurately fixed, motor interaction skills efficiently formed in connective junctions of "wrists-wrists", support junctions of "support-feet", "ice-skate" types, etc; the high level of physical fitness; visual and vestibular sensory systems developed in athlete's body, etc. However, analysis of athlete's performances at competitions demonstrates that a significant number of mistakes made during acrobatic exercises and figure-skating elements is due to disturbed equilibrium of the body and body system. In view of increasing complexity in competitive programs, demands increased for performance mastery of sports pairs, and technique of the elements performed, actuality of the problem of examination of SDS structure and functions for athlete's body and body system under complex conditions of equilibrium maintenance becomes evident.

## PURPOSE

The studies are aimed at obtaining the new knowledge on SDS biomechanics of elite athlete's body and body system.

## TASKS

1. Measurement and estimation of SDS for athlete's body and body system during individual and paired acrobatic exercises and paired figure-skating elements.
2. Definition of relations between the indices of SDS for athlete's body and that for body system.

## METHODOLOGY

In the studies, 10 elite acrobatic and sports pairs ( 5 - MP, 2 - FP, 3 - SP) participated. To measure SDS, sport-specific tests with complex coordinational structure, published in [3,4] were used. During studies, stabilography, accelerography, video-cine registration, expert estimation, mathematical statistics were used.

## RESULTS

Individual indices of SDS for athlete's body during tests were analyzed. In upper athletes (in acrobatic pairs - in males and females, and in females in figure-

skating pairs), in statistic and dynamic equilibriums, prolonged pose fixation and small oscillation amplitudes were registered. The above facts corresponded to the tasks solved by the upper athletes: technically precise fixation of body poses and positions, according to motor actions of the lower athletes. In the lower athletes, high oscillation frequency and short-term stabilization were registered which could be reliably explained by specifics of them - they performed as the leading balancers during paired exercises.

During analysis of SDS individual indices with the account for specifics in acrobatic and figure-skating events, one should mention high oscillation frequency in the upper acrobats of MP and the partners of figure-skating sports pairs. It was determined that SDS of body system depended on high individual indices in body equilibrium maintenance and functional relations between the indices for upper and lower athletes in the system of body interaction.

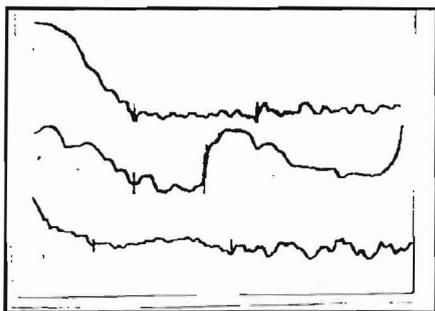


Fig.1. Oscillation of body during one-hand stand by the upper athletes in MP

Fig. 1. illustrates performance results of one-hand stand by the upper athletes in MP. These stabilograms are rather individual. Upper and lower demonstrate precision of one-hand equilibrium maintained by athlete (1) and athlete (3). At the same time, the upper high-performance athlete (2-medium stabilogram), performs one-hand stand with high oscillation amplitude.

High oscillation amplitudes were observed during individual performance of one-hand stand by Vic. T. (the upper athlete) and pole balancing on the forehead by Vi. T. (the lower athlete) were observed. However, in the pair, during performance of one-hand stand by the upper acrobat on the head of the lower one, efficient co-ordination of the athletes defining high statodynamic stability (lower stabilogram in Fig.2.) was registered.

It should be mentioned that male acrobatic pair (Vi. T. and Vic. T.) are monozygotic twins. It looks like, in the process of motor interaction within the pair, functional co-ordination between the partners is the most important.

## CONCLUSIONS

Dynamic stability of the upper and the lower athletes during individual and joint sports exercises is satiated with deep functional content of control systems. SDS of body system depends on high individual indices of stability and is determined by functional synergias formed by motor and genetic compatibility of athlete-partners.

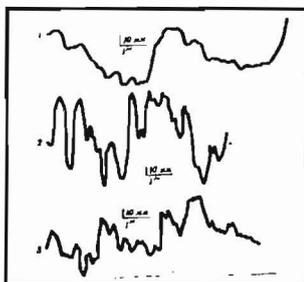


Fig.2. Oscillations of body and body system in MP ( Vic.T. and VI.T):

- 1 -pressing and fixation of the one-hand stand by means of strength by the upper acrobat;
- 2 -balancing the pole on the forehead by the lower acrobat;
- 3 -performance of one-hand stand by means of strength on the head of the lower acrobat by the upper one.

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