A GENERAL MODEL OF DEVELOPMENT OF A NEW GYMNASTICS ELEMENT

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With a new gymnastics element a gymnast wants to impress judges and to get an advantage over the other gymnasts, specially if the new element is very difficult and if it is executed with high amplitude and elegance. Slovenian gymnasts were in the last decade very original and they developed some new elements. As the development of a new element is a general problem in gymnastics we tried to define this phenomena theoretically.

Our investigation shows that we can define a general model of how to develop a new gymnastics element. The model consists of seven consecutive phases:

1. idea of a new gymnastics element,
2. definition of the hypothetical biomechanics model of the new element,
3. consistency of the new element with the present Code of points,
4. designing of the methodics,
5. training until successful execution,
6. collecting and analysing the biomechanics data,
7. definition of the optimal biomechanics model of the new element and saving the data into the data base.

The first phase is essential, and is usually of a random nature. In many cases a new element is the product of experience and logical thinking of the gymnast and his trainer. Also often a new element is developed by scientists.

The Code of points includes all elements ever performed by somebody at the competitions and wich are ranked at least as an A part (the easiest element) by the FIG technical committes.

An element is always described with four basic data:

- apparatus on which the element is performed,
- position of the gymnast in regard to the apparatus
- contact of the gymnast with the apparatus
- description of the movement or position

If we change any of the mentioned parameters we can get a slight deviation of the known element or a new element. When the changes are very important we consider such an element a new one and often we give a new name to the element.

APPARATUS ON WHICH THE ELEMENT IS PERFORMED

At the first step we can transpose an element from one apparatus to another one. For instance in male gymnastics: giant swings were first performed on the high bar, later on rings and last on parallel bars. Also we can transpose elements from men's apparatus to the women's apparatus and vice versa. The already mentioned giant swings were in late seventies performed on uneven bars.

Not only transfer from apparatus to apparatus but also improvement of the apparatus mechanical characteristics can enable new elements. With the revolutionary new springboard for vault, Tsukahara from Japan (at the Worldchampionship in

Ljubljana, Slovenia, 1970) performed a new super vault, which has become after 25 years a basic skill for gymnasts.

FIG which writes Code of points, together with the equipement manufacturers, support development of new elements. Trainers, gymnasts and scientists are active new-elements designers and FIG with equipement manufacturers are pasive new-elements designers.

Unfortunately all competitive apparatus has internationally recognised tehnical norms. This is the reason why we are more directed into changing other parameters.

POSITION OF THE GYMNAST IN REGARD TO THE APPARATUS

This variable determines the gymnasts potential energy and his balance. According to this gymnasts can:

1. stand, sit , kneel or lie:
   - on the apparatus
   - in front of the apparatus
   - behind the apparatus
2. hang
   - frontways
   - rearways
3. support
   - upper arm support
   - support
   - handstand

All the positions can be also in a side or cross position.

CONTACT OF THE GYMNAST WITH THE APPARATUS

If the position of the gymnast is 'hang' or 'support' he can be in different contacts with the apparatus. With the contact we usually change the gymnast's balance position, moment of inertia or the gymnast's arms are in a such an anatomical position, where some muscels groups. cannot be partly or completely used.

DESCRIPTION OF THE MOVEMENT OR THE POSITION

Movement is described first by it's starting position, then action and finally with it's ending position. It is much easier to describe a static position is as we need less parameters. The starting position of the movement is usually similar to the position of the gymnast in regard to the apparatus. During the movement the gymnast changes his total energy according to the changes of potential energy, translational kinetic energy and rotational kinetic energy. When we are searching for a new element we try to simulate known element with:

- changed direction of the movement (forward, backward, sideward and mixed direction),
- added rotation forward or backward or/and to left or right or/and around the longitudinal, transversal or sagital axis or combined rotation,
- changed body position (tucked, piked, stretched, straddled, with legs together etc),
- added flight phase.

When we add a flight phase and the new element is not dismount we have to design a new contact with the apparatus which can be similar to the contact before release.

And last by we have to design the ending position of the element, which can be similar to that in the starting position.

With the second phase we design a biomechanical model of the new element, we have to determine theoretically trajectories, velocities, forces etc. for the new element.

The third phase gives the answer if the new element is consistent with the present Code of points and if the benefits of the new element are such that it is worth to start to learn it.

If the third phase gave us a positive answer we go to **the fourth phase** where we have to determine the methodics. Methodics is formded on the theories of motor learning and on the biomechanical model of the element. In the first step we have to choose a gymnast who will be able to perform the new element. Criteria for the gymnast are: previous technical knowledge, adequate level of motoric abilities, appropriate level of morfological characteristics and adequate psychological readiness. At the next stage we have to describe the new element to the gymnast.The next step is defining a learning method (e.g. syntetic, analytic) and defining a complex of exercises the gymnast will have to do. At the next step we have to determine a way of correcting mistakes and the modes of assistance during the execution of the element.

The fifth phase is training the new element up to the minimal criterium of a good technical execution of the element. Minimum technical criterium means execution of the element without a major mistake (from the Code of points - penalisation for the error is less than 0.4 points).

The sixth phase means collection and analysis of the data related to the execution of the element.

The seventh phase is definition of the optimal biomechanical model of the element and saving all the data into the data base.

The general model can be applied in men's and women's artistic gymnastics and can be also used in some other polystructural conventional sports.

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