

METHODOLOGY FOR DISCOVER AND CREATING NEW ELEMENTS IN ARTISTIC GYMNASTICS

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The background and objectives of the project are to develop an inventive process of searching and creating new elements in Artistic Gymnastics, founded on a scientific basis. The methodology for discover and creating new elements is developed on the basis of a coordinate system „athlete-parallel bars“ separated in 24 3D sectors which has been analysed for presence of gymnastics elements.

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The progress of humankind and its existence at all would not be possible without creativity in every single activity of everyday life. Furthermore creativity happens to be one of the basic active states and manifestations of freedom. In its substance it is closely related to a game, what the sports also are. We could say that creativity is the product of a game that human spirits play. The ability to create, which is mainly the result of reflexive thinking, is what separates humans from nature and allows them to change it according to their needs.

Creativity in sports is not always associated with extraordinary achievements - jumping higher, running faster, and scoring more goals. Names as those of Michael Jordan, Dick Fosbury, Stoyan Deltchev, etc. will remain in the history not only for being great athletes, but also for giving something new to their sports, they have created a new „language“, new conceptions, new movements or new methods.

Artistic gymnastics gives specialists, coaches and even athletes a great opportunity to unravel their creativity. However by going through the different articles we hardly find any active development of those new and without any doubt original elements on parallel bars [1, 4, 12-17]. It is more as if they are accomplished by transfer of similar already mastered elements (from the high bar for instance), non-standard combinations of separate elements and of course by an increasing number of rotary motions around the body axes.

In fact there is no qualified classification of the methods, used to invent new gymnastic elements. That is what inspired us to create such a classification.

We spotted four main methods: *transference, increasing of quantity parameters, modification and combination.*

The method of transference – the transference of elements can be made from other sports and arts (dancing, ballet, figure skating and etc.); from other gymnastics sports

(rhythmic gymnastics, acrobatics, trampoline); from one to another apparatus (high bar to parallel and uneven bars, and rings). Some of the elements are transferred without amendments, others are adapted to the specific construction of the apparatus.

The method of increasing of quantity parameters – this method is related to the rotation around the 3 main virtual body axes – longitudinal, anteroposterior, transverse and in combination. The result is increasing the level of difficulty of the elements, but according to Gavardovski [7: 72-87] it has at least two limits – athletic and technical. They are related with energy movements providing and an accessible effectivity of movement control.

The method of modification – works in several directions: with body position changing (straight, pipe and tuck); with changing the start, final or both positions of the element; execution the element on the different part of the apparatus and combinations.

The method of combination – combined different positions, movements and elements in one new element. It also leads to increasing the level of difficulty.

We didn't find also a detailed methodology which tell us how and where to search and find the new elements, what kind of scientific tools to use? When we already know the name of a new element and we would like to develop it in practice – the methodology is quite clear. Čuk and Iztok [3: 413-415] offer a detailed model in 7 phases starting with an idea of a new element, definition of the hypothetical biomechanics model of the new element, checking the consistency of the new element with the Code of points, designing of the methodics of the new element, training of the new element until it successful execution, collecting and analysing of the biomechanics data of the new element and the last phase is definition of the optimal biomechanics model of the new element

and saving the data into the gymnastics data base.

The model begins with an idea of a new element and the above mentioned authors define this phase as “essential and usually of random nature“. A product of imagination, experience and logical thinking of gymnasts, their coaches and scientists. The ways – to combine different body positions, different movements, to change the start or final position or the direction of the movements, to add a rotations or a flight phase and related with it new contact with the apparatus. Too many options...

But what to do if we have not such a bright idea and in spite of all efforts we can not design a new element? Wait... May be the most specialists have been exactly in this position in recent years. Otherwise our research concerning the number of new elements invented on parallel bars for the time period 1980-2008 didn't show an extremely negative tendency (fig.1). Can we exclude the random and make the process foreseeable with a practical sequence? Obviously the lack of methodology for discover and creating new elements is an obstacle for the development of the parallel bars in future.

But how to start the methodology? May be like Darwin, before to invent his theory of evolution of the species, he made the journey to collect the data [5]. In our case we have to collect the different elements on parallel bars and look how modern gymnasts use them to create their routines. So we need to have detailed classification of a maximum number of the elements existed on this apparatus. We did an example by biomechanical indication with more than 1000 elements. If we make parallel with the FIG Code of Points (2009) [6], the elements are 190.

But how many different elements from all possible are using from the gymnasts today in their routines? Answer of this question gives the research on 33 routines on parallel bars from 3 prestige tournaments:

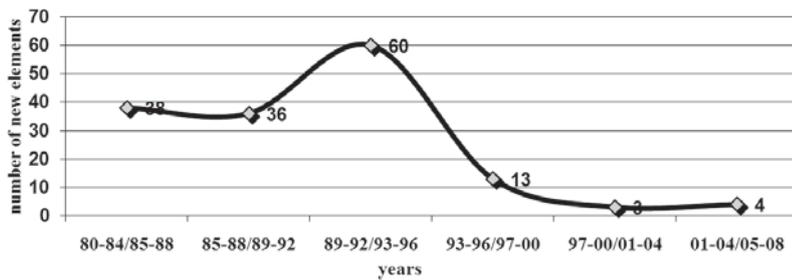


Fig. 1. Dynamic of creation of new elements on parallel bars for the period 1980 - 2008

WC Tianjin (China) 1999, OG Sidney 2000 and WC Anaheim (USA) 2003.

After collecting the quantity data concerning the elements on parallel bars we should give an answer to one important question. What are the basic limits which influenced over the gymnast's performance and are they responsible for the negative tendency of creating new elements? The answer is no so difficult. It is enough to watch a big tournament of artistic gymnastics to see how huge the level of difficulty is. The gymnasts are no robots. They are well trained human beings, but they can not jump over the lows of the nature.

The main motive engine force in Artistic gymnastic - the process of increasing the difficulty of elements and routines seems to be slowing down. According to Bruggemann G. P.[2: 15-24] that process is in a conflict with the human possibilities and is becoming from a positive - a negative factor. The increased number of failures, traumata and injuries during training sessions and competitions is a proof of his statement. Even authors from Russia – one of the leading force in Artistic gymnastics, claim that exactly the traumatism, reaching the sacrifice of athletes, is the reason why Russia has lost its popularity in the international sport forums [9, 10]. Sadly it is Artistic gymnastic that holds the record for sport traumata [11]. The more and more complicated elements are an enormous challenge for the athlete's body, that is pushed to its boundaries and cannot adequately react to the pressure. The phase of preparation, which is when the athlete accumulates energy for the upcoming element, has already been critically shortened which leads to failures in the neuro-motorical control.

In order to verify the effectivity of those methods we carried out a research, spanned over the period from 1980 to 2008. We established the number of new

elements for parallel bars, registered by the International Code of Points[6] and classified them according to the four methods of creation.

It turned out that in the examined period 154 elements in different levels of difficulty had been invented. Most of them 67 in difficulty group D, because specialists are always looking for more attractive, more difficult routines for their athletes. Disturbing however was the fact that in the last years of the period of our research there had been only four new elements. (fig.1)

The most of the new elements were created by method II – 53 (fig. 2), e.g. increasing of quantity of parameters, and with only 2 less or 51 elements follows the method III – modification of already existing elements. It is interesting to mark that from method I – are transferred elements to parallel bars mostly from high bar and

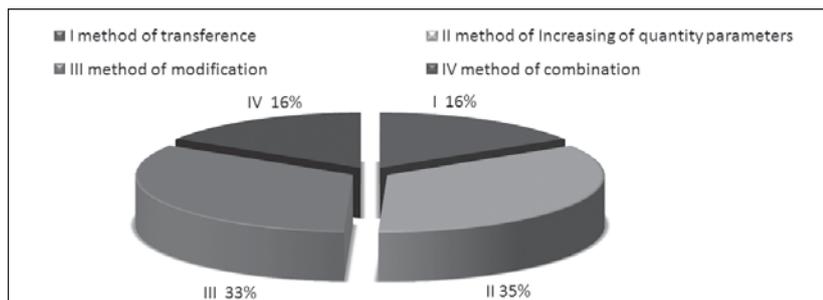


Fig. 2 New elements correlation according their methods of creation

pommel horse. Along with it the less usable method is the last one – combination of movements and elements.

Looking at the results we see that the new elements used to be developed mainly by the methods of increasing the quantity of different parameters (35%) and modification of existing ones (33%). In our point of view the first method is about to run out, because of reaching the boundaries of human abilities. For instance, taking the present construction of the parallel bars and an

objective environment a triple or quadruple back off tucked seems impossible. The second method is tightly connected to the first one e.g. only something that is already existing can be modified. The method of transference (mainly from high bar) is also limited. Therefore there is just one method with unlimited possibilities left - the one of combining different elements, movements and positions.

According to the Russian specialist Gaverdovskiy[8: 47-53] Gymnastics cannot develop in the known way anymore - from a double flip into a triple, quadruple, etc. He also believes that there is a lot of hidden potential in the original combination of elements and movements, which comes back to the creativity of coaches and specialists.

In order to reach some progress and turn the negative tendency of developing new exercises back into a positive one, the performance at parallel bars has to be looked upon in the dynamic interaction between the human body and the apparatus, comparably to a coordinate system. Then analysing it one could look for „empty spaces“, that could make it possible to create new movements and exercises. That means that one will use a systematic approach that has been proven extremely useful in almost all spheres. Furthermore one could set limiting factors for each „empty space“, which hinder the development and

the performance of new elements. Analysing their negative affect, it would be possible to minimize it, which might lead to new possibilities to create new elements, that don't contradict with the biomechanics of the human body.

For defining the coordinate system „athlete-parallel bars“ we took the two main positions of the athlete to the apparatus - cross and side. Furthermore we considered the main positions, from which the athlete performs an exercise

Table 1.

Sector's saturation with elements on parallel bars

Working Positions to PB	CROSS POSITION			SIDE POSITION		
	forward	backward	sideward	forward	backward	sideward
Basic positions						
Hang	1	2	3	4	5	6
Upper arm hang	7	8	9	10	11	12
Support (rear support)	13	14	15	16	17	18
Handstand	19	20	21	22	23	24

Legend: PB – Parallel Bars, white sectors – presence of elements, shaded sectors –

- hang, upper armhang, support, and handstand - as well as the possible directions of their performance - forward, backward or sideward. We figured that there are 24 combinations - let's call them sectors. We analysed these sectors and filled them up with already existing elements (tab. 1).

It turned out that 14 sectors, coloured white at the chart, make it possible. For the other 10 sectors - 3, 6, 9-12, 15, 18, 21 and 24 there are no elements or connections to fill them completely. From now on we can point out a common feature, connecting almost all problem sectors - the movement direction is always sideward.

The main limiting factors caused lack of elements in the 10 „problem sectors“ are the construction of the apparatus, some of the specific positions of the gymnast, as well as the limited possibilities for accumulating of energy.

However, analysing the 10 sectors, it turns out that at least in 4 of them - 3, 6, 11, 12 it might be possible to perform elements, which will fill their capacity. This could be accomplished by overcoming the limited possibilities for creating and accumulating energy by improving the coordinating abilities, the motional asymmetry and the power potential of the muscular system, as well as trying to perform the exercise from a higher starting position.

The group of elements with counter swing is also to be further developed. There are at least 6 possible new elements that can be created on the basis of the exercise with backward counter swingsalto.

In conclusion we can say that all research done shows that we can present a methodology for creating new elements in gymnastics that follows several steps. We hope that it may help specialist to boost their creativity. Thanks to it they will have an instrument that will set practical boundaries so that they don't have to rely only

on their experience, fantasy, bright ideas or sudden strokes.

Step №1 developing a detailed classification of the elements on an examined apparatus by a biomechanical indication.

Step №2 looking up all the elements used by the athletes at the moment and arranging them according to the methods used to develop them and to their structural groups.

Step №3 constructing of a coordinate system “gymnast-apparatus” for analysing and splitting it into available 3D sectors.

Step №4 analysing the coordinate system and its sectors aiming to figure out its „saturation level“ with existing elements.

Step №5 localizing the empty quadrants - those without or with a limited number of elements.

Step №6 analysing the limiting factors, which hinder the development of new elements.

Step №7 creating new elements in the empty quadrants by combining movements indifferent directions which meet the possibilities of the examined apparatus.

Step №8 the new elements have to undergo a theoretical analysis whether they correspond to the biomechanical advisability and creation of biomechanical prognosis models.

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