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STUDY ON THE USE OF STATIC STRENGTH ELEMENTS IN THE PERFORMANCE AEROBIC GYMNASTICS

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Abstract: *The aim of this study is to analyze from the quantity point of vue the elements of static strength incorporated in the exercises of the final competitors in the five events of the last two Aerobic Gymnastic World Championships, held at Ulm (Germany), in 2008 and Rodez (France), in 2010. In the Aerobic Gymnastics, the Group of Static Strength Elements incorporates, according to the Code de pointage of the International Gymnastic Federation 6 Families with 52 elements. In the Performance Aerobic Gymnastics the elements are distributed in four difficulty groups, as follows: A Group - Dynamic strength, B Group – Static strength, C Group - Jumps and leaps and D Group – Balance and flexibility. The different modalities of show offer multiple solutions in the composition profile as concerns not only the motion harmony, aesthetics, spectator-appeal, difficulty, dynamism, inspired transmission of ideas through motion, but also its performances thanks to combined qualities.*

Key words: *performance aerobic gymnastics, difficulty elements, static strength.*

1. Introduction

The performance aerobic gymnastics is a new sport spectator-appeal discipline, using not only artistic, rhythmic and aerobic gymnastic elements but also sport dance elements and its exercises have to provide an equilibrium between aerobic movements (basic steps, arm motion) and the difficulty elements distributed in the four groups (Niculescu, G., 2008. p. 48). In the composition of aerobic exercises must be achieved an equilibrated distribution as well as an equal representation of each motion group or family while the group of static strength offers singular execution possibilities. The optimum parameters of each element execution render evident motive qualities like: supporting strength, mobility, equilibrium capacity, coordination.

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The images created by the elements of the static strength along an exercise are valuable thanks to the parameters required to keep the element, the design achieved by body segments and the changes imposed by it. Referring to this difficulty group, we can see it has not so much quantity of elements, but their execution is difficult as the static (isometric) strength represents a tension voluntarily developed by a muscle or a muscular group against a fix resistance, in a determined position (Bota, C., p. 324) and it requires an outstanding physical preparation.

The elements of static strength incorporated in the exercises are motive actions involving to maintain the position on a reduced supporting area and therefore must be developed all body musculature. So, we may consider the maximum static strength is expressed by the contraction of the entire muscular system in view to overcome an extraordinary resistance (Dragnea, A., Teodorescu-Mate, S., 2002, p.362).

2. Method

Referring to the content of the analyze, the study will evaluate, from the quantity point of vue all the elements belonging to the B group of difficulty, among the finalists of the World Championships at Ulm (Germany) in 2008 and Rodez (France) in 2010.

Analyzing the dynamics of this group of elements, in the final exercises, during the all 11 World Championships, we found out there are a lot of variations in the use of such elements due to changes operated in the Code de pointage. Here we have the dynamics of the static strength elements in all competition events in the up to now 11 World Championships.

Dynamics of B Group elements – World Aerobic Gymnastic Championships Table 1

Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2002**	**2004**	**2006**	**2008**	**2010**
Event	**Paris**	**Haga**	**Perth**	**Catania**	**Hannover**	**Riesa**	**Klaipeda**	**Sofia**	**Nanjing**	**Ulm**	**Rodez**
	%	%	%	%	%	%	%	%	%	%	%
Ind.W.	16,34	18,97	18,31	18,32%	17,33%	23,4	18,45	23,04	25,67	13,53	13,75
Ind. M	20,61	21,6	25,06	21,64	25,33	23,91	25,1	25,2	28,81	13,53	12,5
Mixed Pairs	25,8	29,09	30,12	30,07	28,66	27,41	26,66	24,335	28,335	17,70	9,37
Trio	29,63	27,33	32,1	22,4	22,825	30,585	26,44	24,5	29,18	15,61	12,49
Group							27,33	23,67	24,73%	14,57	12,48

The B Group of static strength elements contains 6 families of elements: G Straddle Support, L Support, V Support, Wenson Support, Lever Support, Planche (www.fig-gymnastics.com). All the 52 elements of this Group require the gymnasts to develop the equilibrium, the static strength in arms and legs, all body musculature, the mobility of coxofemoral and scapulohumeral joints and the coordination.

This group of elements is not numerous and it does not involve all the range of difficulties. These families are:

- Straddle Support with difficulties from 0.2 to 0.8
- L Support with difficulties from 0.2 to 0.7
- V Support with difficulties from 0.3 to 0.8
- Wenson Support with only one difficulty of 0.2
- Lever Support with difficulties from 0.2 to 0.7
- Planche with difficulties from 0.6 to 1.

All the elements of this analyzed group require the following execution criteria (www.fig-gymnastics.com):

- to demonstrate isometric strength and to be kept at least 2 seconds;
- in the case of the rotation elements, the two second maintain can be done before, during or after the rotation;
- the boy is supported only by the arms (hands in contact with the ground);
- the lower legs and/or hips cannot touch the ground during all element;
- during all elements execution full palms must be on the ground (not only the fingers).

Any departure from the general execution requirements leads to a deduction.

3. Results and interpretation

According to the Code de pointage, the gymnasts' execution during the competitions must show an equilibrium between the difficulty elements made in air, at the ground level and on the floor and should have not more than 12 elements for mixed pairs, trio and group families and not more than 10 elements for individual women and individual men. The elements of the ground level will be maximum 5 for individual women and individual men and 6 for mixed pairs, trio and group. The exercise has to contain at least one element from each group and combinations of two elements, from 12 or 10, must be chosen from all groups, but from different families and they have to be combined directly, without stops or hesitation. The score for difficulty is the result of adding 12 or respectively 10 elements and then divided by two. The difficulty level is graduated from 0.1 to 1 point.

In the table No. 2 is the frequency of the B Group elements in the Individual Women events, in the 2008 World Championships, at Ulm, and in the table No. 3, in the 2010 World Championships, at Rodez.

Individual Women – WCh., Ulm, 2008 Table 2

FAMILY	ELEMENTS	Value	Frequency
STRADDLE SUPPORT	B 106: STRADDLE SUPPORT 2/1 TURN OR MORE	0.6	3x
	B 138: STRADDLE / L SUPPORT 2/1 TURN	0,8	3x
L SUPPORT	B 146: L-SUPPORT 2/1 TURN OR MORE	0,6	5x
V SUPPORT	B 198: V-SUPPORT 2/1 TURN	0,8	1x
WENSON SUPPORT			
LEVER SUPPORT			
PLANCHE	B 269: STRADDLE PLANCHE TO LIFTED WENSON HINGE PUSH UP	0.9	1x

Individual Women – WCh., Rodez, 2010 Table 3

FAMILY	ELEMENTS	Value	Frequency
STRADDLE SUPPORT	B 106: STRADDLE SUPPORT 2/1 TURN OR MORE	0.6	1x
	B 138: STRADDLE / L SUPPORT 2/1 TURN	0,8	5x
L SUPPORT	B 146: L-SUPPORT 2/1 TURN OR MORE	0,6	4x
V SUPPORT	B 198: V-SUPPORT 2/1 TURN	0.8	1x
WENSON SUPPORT			
LEVER SUPPORT			
PLANCHE			

The analysis of the exercises shows: in both World Championships there were 6 elements of STRADDLE SUPPORT Family in the exercises. From the L SUPPORT Family there were 5 at Ulm and 4 at Rodez, one element of V SUPPORT Family in both World Championships and 1 element from the PLANCHE Family at Ulm. They did not use any element from the WENSON SUPPORT or LEVER SUPPORT Families in both World Championships and from the PLANCHE Family at Rodez.

In the table No. 4 there is the frequency of B Group elements in Individual men during the 2008 World Championships at Ulm and in the table No. 5, in 2010 World Championships, at Rodez.

Individual Men – WCh., Ulm, 2008 Table 4

FAMILY	ELEMENTS	Value	Frequency
STRADDLE SUPPORT	B 138: STRADDLE / L SUPPORT 2/1 TURN	0,8	6x
L SUPPORT	B 146: L-SUPPORT 2/1 TURN OR MORE	0,6	2x
V SUPPORT			
WENSON SUPPORT			
LEVER SUPPORT			
PLANCHE	B 269: STRADDLE PLANCHE TO LIFTED WENSON HINGE PUSH UP	0.9	1x
	B 270: STRADDLE PLANCHE TO LIFTED WENSON BACK TO STRADDLE PLANCHE	1	4x

Individual Men – WCh., Rodez, 2010 Table 5

FAMILY	ELEMENTS	Value	Frequency
STRADDLE SUPPORT	B 106: STRADDLE SUPPORT 2/1 TURN OR MORE	0.6	1x
	B 138: STRADDLE / L SUPPORT 2/1 TURN	0,8	2x
L SUPPORT	B 146: L-SUPPORT 2/1 TURN OR MORE	0,6	4x
V SUPPORT			
WENSON SUPPORT			
LEVER SUPPORT			
PLANCHE	B 270: STRADDLE PLANCHE TO LIFTED WENSON BACK TO STRADDLE PLANCHE	1	3x

The analysis of the exercises allows us to say: There were 6 elements from the STRADDLE SUPPORT Family at Ulm and 3 at Rodez; from L SUPPORT 2 at Ulm and 4 at Rodez and from the PLANCHE Family, 5 at Ulm and 3 at Rodez. No elements from V SUPPORT, WENSON SUPPORT and LEVER SUPPORT Families in both World Championships.

In the table No. 6 is the frequency of B Group elements for Mixed pairs, at Ulm in 2008 and in the table No. 7 at Rodez, in 2010.

Mixed Pairs – WCh, Ulm, 2008 Table 6

FAMILY	ELEMENTS	Value	Frcquency
STRADDLE SUPPORT	B 106: STRADDLE SUPPORT 2/1 TURN OR MORE	0.6	2x
	B 138: STRADDLE / L SUPPORT 2/1 TURN	0,8	2x
L SUPPORT	B 146: L-SUPPORT 2/1 TURN OR MORE	0,6	3x
	B 157: 1 ARM L-SUPPORT 1/1 TURN	0,7	2x
V SUPPORT			
WENSON SUPPORT			
LEVER SUPPORT			
PLANCHE	B 268: STRADDLE PLANCHE TO LIFTED WENSON	0,8	1x
	B 269: STRADDLE PLANCHE TO LIFTED WENSON HINGE PUSH UP	0.9	1x
	B 270: STRADDLE PLANCHE TO LIFTED WENSON BACK TO STRADDLE PLANCHE	1	6x

Mixed Pairs – WCh., Rodez, 2010 Table 7

FAMILY	ELEMENTS	Value	Frequency
STRADDLE SUPPORT	B 138: STRADDLE / L SUPPORT 2/1 TURN	0,8	3x
L SUPPORT	B 146: L-SUPPORT 2/1 TURN OR MORE	0,6	6x
V SUPPORT			
WENSON SUPPORT			
LEVER SUPPORT			
PLANCHE			

From the analysis of the exercises we may notice: At Ulm were 4 elements from the STRADDLE SUPPORT Family and 3 at Rodez. From the L SUPPORT Family, 5 at Ulm and 6 at Rodez and from the PLANCHE Family, 8 at Ulm. No one element from V SUPPORT, WENSON SUPPORT and LEVER SUPPORT Families at both World Championships or from the PLANCHE Family at Rodez.

In the table No.8 there is the frequency of B Group elements for Trio, in the 2008 World Championship at Ulm and in the table No. 9 at Rodez, in 2010.

Trio – WCh., Ulm, 2008 Table 8

FAMILY	ELEMENTS	Value	Frequency
STRADDLE SUPPORT	B 106: STRADDLE SUPPORT 2/1 TURN OR MORE	0.6	1x
	B 117: 1 ARM 1/1 TURN STRADDLE SUPPORT	0,7	1x
	B 138: STRADDLE / L SUPPORT 2/1 TURN	0,8	2x
L SUPPORT	B 146: L-SUPPORT 2/1 TURN OR MORE	0,6	3x
V SUPPORT			
WENSON SUPPORT			
LEVER SUPPORT			
PLANCHE	B 270: STRADDLE PLANCHE TO LIFTED WENSON BACK TO STRADDLE PLANCHE	1	8x

Trio – WCh., Rodez, 2010 Table 9

FAMILY	ELEMENTS	Value	Frequency
STRADDLE SUPPORT	B 106: STRADDLE SUPPORT 2/1 TURN OR MORE	0.6	2x
	B 138: STRADDLE / L SUPPORT 2/1 TURN	0,8	3x
L SUPPORT	B 146: L-SUPPORT 2/1 TURN OR MORE	0,6	4x
V SUPPORT			
WENSON SUPPORT			
LEVER SUPPORT			
PLANCHE	B 270: STRADDLE PLANCHE TO LIFTED WENSON BACK TO STRADDLE PLANCHE	1	3x

The analysis of elements shows: there were 4 elements from the STRADDLE SUPPORT Family in the World Championship at Ulm and 5 at Rodez. From the L SUPPORT Family, 3 at Ulm and 4 at Rodez and from the PLANCHE Family 8 at Ulm and 3 at Rodez. No one element from V SUPPORT, WENSON SUPPORT and LEVER SUPPORT Families in both World Championships.

In the table No.10 appears the frequency of the B Group elements for Group at Ulm in 2008 and in the table No. 11 at Rodez, in 2010.

Group – WCh., Ulm, 2008 Table 10

FAMILY	ELEMENTS	Value	Frequency
STRADDLE SUPPORT	B 106: STRADDLE SUPPORT 2/1 TURN OR MORE	0.6	1x
	B 138: STRADDLE / L SUPPORT 2/1 TURN	0,8	1x
L SUPPORT	B 146: L-SUPPORT 2/1 TURN OR MORE	0,6	5x
V SUPPORT			
WENSON SUPPORT			
LEVER SUPPORT			
PLANCHE	B 269: STRADDLE PLANCHE TO LIFTED WENSON HINGE PUSH UP	0.9	1x
	B 270: STRADDLE PLANCHE TO LIFTED WENSON BACK TO STRADDLE PLANCHE	1	6x

Group – WCh., Rodez, 2010 Table 11

FAMILIA	ELEMENTE	Value	Frequency
STRADDLE SUPPORT	B 106: STRADDLE SUPPORT 2/1 TURN OR MORE	0.6	1x
	B 138: STRADDLE / L SUPPORT 2/1 TURN	0,8	3x
L SUPPORT	B 146: L-SUPPORT 2/1 TURN OR MORE	0,6	6x
V SUPPORT			
WENSON SUPPORT			
LEVER SUPPORT			
PLANCHE	B 268: STRADDLE PLANCHE TO LIFTED WENSON	0.8	1x
	B 270: STRADDLE PLANCHE TO LIFTED WENSON BACK TO STRADDLE PLANCHE	1	1x

Analyzing the exercises, we may notice: There were 2 elements of STRADDLE SUPPORT Family in the exercises during the World Championships at Ulm and 4 at Rodez, 5 from L SUPPORT Family at Ulm and 6 at Rodez and from the PLANCHE Family 7 at Ulm and 2 at Rodez. No one elements from V SUPPORT, WENSON SUPPORT and LEVER SUPPORT Families at both World Championships.

Centralizing all elements by their families in the two World Championships, we found a high frequency in the exercises with elements from Straddle support (43), L support (44) and Planche (41) Families.

Frecquency of elements Table 12

		WCh. – ULM, 2008					WCh. – RODEZ, 2010					
No.	**Family of elements**	**IW**	**IM**	**MP**	**TR**	**GR**	**IW**	**IM**	**MP**	**TR**	**GR**	**T**
1	STRADDLE SUPPORT	**6**	**6**	**4**	**4**	**2**	**6**	**3**	**3**	**5**	**4**	**43**
2	L SUPPORT	**5**	**2**	**5**	**3**	**5**	**4**	**4**	**6**	**4**	**6**	**44**
3	V SUPPORT	**1**					**1**					**2**
4	WENSON SUPPORT											
5	LEVER SUPPORT											
6	PLANCHE	**1**	**5**	**8**	**8**	**7**	**1**	**3**	**3**	**3**	**2**	**41**

4. Conclusions

- to perform the technical elements of this group, gymnasts must have: equilibrium, static strength at arm and leg levels, mobility of coxofemural and scapulohumeral joints as well as coordination;
- in all exercises there are elements from the STRADDLE SUPPORT, L SUPPORT

and PLANCHE Families as they have the strongest spectator-appeal and they have a high position in the difficulty grid;
- the elements of other families are not inserted in the exercises as they have a small value;
- the gymnasts did not insert in their exercises any element from Wenson support and Lever support Families;
- such kind of groups has a small incidence as its elements are performed only at the ground level and the Code de pointage incorporates a limited number of elements realized at such level;
- the competition rules specify the compulsory insertion of only one element from the 4 groups of difficulties and this group of elements is less inserted as the difficulty grid has lower values and there is a small number of elements.

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