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Original article

STUDY ON THE USE OF DYNAMIC AND STATIC STRENGTH ELEMENTS AT THE AEROBIC GYMNASTICS WORLD CHAMPIONSHIPS

NICULESCU GEORGETA¹

Abstract

Purpose. Gymnastics, in general, and aerobic gymnastics, in particular, influence greatly the physical, mental, moral and aesthetical development and improvement of the individual. Therefore, for its developers, aerobic gymnastics becomes a life style based on the joy of effort, on its educative value and on the compliance with the universal fundamental ethical principles.

Methods. The paper shows a comparative analysis from a quantitative point of view on the use of static and dynamic strength elements at the 12 editions of the Aerobic Gymnastics World Championships. We mention that the Romanian aerobic gymnastics teams participated in all 12 editions of the World Championships starting with 1995 and recorded notable results, in 2006 being ranked first in the team competition.

Results. Group A elements (dynamic strength) and group B elements (static strength) are used almost equally in routines. The research method used is a video-based study. The results confirm the working hypothesis.

The conclusions certify that in all events, women's individual, men's individual, mixed pairs, trios and group, the static strength elements (group B) record a higher rate than the dynamic strength ones (group A).

Key words: competitive aerobic gymnastics, difficulty elements, static strength, dynamic strength

Introduction

Gymnastics, as a sports branch, has been experiencing an upward trend resulting in new exercises, while the continuous improvement of its content has led to diversified independent branches (Niculescu, 2008). Competitive aerobic gymnastics is the youngest branch of gymnastics. Highly spectacular, very appealing to the public, it combines elements of artistic, rhythmic, acrobatic gymnastics and dancesport. Competitive aerobic gymnastics means the ability to continuously perform to music complex, high-intensity movement patterns originating from traditional aerobics. Therefore, a complete routine must cover continuous movement, mobility, strength as well as the 7 basic steps and the difficulty elements, flawlessly executed (www.fig-gymnastics.com). There must be a balance between the basic steps, the arm movements and the difficulty elements ranging in four difficulty groups (Damian, 2005).

Competitive aerobic gymnastics covers four difficulty groups: Group A – Dynamic strength, Group B – Static strength, Group C – Jumps and leaps and Group D – Balance and flexibility. This diversity of elements offers various composition opportunities on harmony in movement and movement aesthetics, spectacular character, difficulty and exercise dynamics. A routine must cover a balanced representation of each group of movements according to the Code of Points. The static and dynamic strength elements offer great execution opportunities, their value carrying an important weight. The execution of each element reveals motor abilities as strength, mobility, balance capacity and coordination capacity.

Method

The A and B difficulty groups emphasise the gymnasts' muscle strength. Therefore, strength is the motor ability enabling an individual to overcome or fight resistance due to an intense muscular effort (Manno, quoted de Tudor, 1999)

The human body strength is the capacity to overcome or give way to an external or internal resistance by contracting one or several muscle groups (Dragnea, Mate-Teodorescu, 2002). The development of strength increases with age and it brings benefits to the physical performance and to the health of young people (Sabau, and colleagues, 2010).

Strength is considered to be the basic motor quality, since any movement involves a muscle contraction, closely related to the other motor qualities (Potop, 2008). For Pradet, 2000, strength is the ability to overcome an exterior resistance or to oppose to it with the help of the muscle contraction.

The difficulty level A category includes the elements of dynamic force that is achieved by isotonic contraction, which comes from a behavior of meeting a resistance (concentric) or giving way (eccentric) (Simion, Mihăilă, Stănculescu, 2011). The muscle shortens or lengthens and the dynamic force is the possibly highest force developed by the neurological and muscular system via a muscular contraction during a movement (Bota, 2000). Irrespective of the changes in the Code of Points, this level has always featured a large number of elements compared to level B.

The level B category includes the elements of static force, which manifests itself when the external

¹ Faculty of Physical Education and Sports – Spiru Haret University, Romania
CORRESPONDENCE AND REPRINT REQUESTS: Email: getanic52@yahoo.com

forces are higher than the ability of maximum force of the muscularity (Dragnea, Mate-Teodorescu, 2002). Upon examining this category, the smaller number of elements can be noticed, the elements are difficult to perform since the static strength (isometric) represents the tension voluntarily occurring in a muscle of a muscle group against a fixed resistance, in a given position (Bota, 2000). Hence, the gymnasts are required to have a special physical training. The

elements of static force that are featured in the routines are motor actions involving to maintain a certain posture on a low support surface, which means that the muscles in the entire body must be well prepared. In the Codes of Points, the elements are valued from 0.1 to 1. The coaches will introduce elements of a high value in the routines so that the gymnasts be awarded a high grade in the difficulty scale and a good ranking at the major championships.

Results

Table 1.1. Dynamics of the elements in category A – dynamic strength

Year	Round	Individual women's	Individual men's	Mixed pairs	Trio	Group
1995	Paris	20,18%	25,80%	21,88%	28,76%	
1996	Haga	17,20%	23,40%	27,33%	25,77%	
1997	Perth	18,22%	26,43%	28,82%	27,30%	
1998	Catania	20,00%	25,60%	27,33%	22,13%	
1999	Hanovra	18,57%	23,60%	27,06%	22,82%	
2000	Riesa	18,14%	25,66%	26,12%	25,78%	
2002	Klaipeda	20,09%	25,01%	27,09%	24,44%	29,44%
2004	Sofia	25,36%	24,40%	24,70%	24,50%	24,71%
2006	Nanjin	23,43%	30,36%	30,23%	29,17%	28,87%
2008	Ulm	17,70%	21,87%	17,70%	29,83%	19,78%
2010	Rodez	17,50%	23,75%	21,87%	23,90%	19,79%
2012	Sofia	18,75%	26,25%	22,91%	23,95%	25,00%

The results in the category A – dynamic strength – are included in table 1.1.

Table 1.2. Dynamics of the elements in category B – static strength

Year	Round	Individual women's	Individual men's	Mixed pairs	Trio	Group
1995	Paris	16,34%	20,61%	25,80%	29,63%	
1996	Haga	18,97%	21,60%	29,01%	27,33%	
1997	Perth	18,31%	25,06%	30,12%	32,10%	
1998	Catania	18,32%	21,64%	30,07%	22,40%	
1999	Hanovra	17,33%	25,33%	28,66%	22,82%	
2000	Riesa	23,40%	23,91%	27,41%	30,58%	
2002	Klaipeda	18,45%	25,10%	26,66%	26,44%	27,33%
2004	Sofia	23,04%	25,20%	24,33%	24,50%	23,67%
2006	Nanjin	25,67%	28,81%	28,33%	29,18%	24,73%
2008	Ulm	13,53%	13,53%	17,70%	15,61%	14,57%
2010	Rodez	13,75%	12,50%	9,37%	12,49%	12,49%
2012	Sofia	11,25%	10,00%	10,41%	10,41%	11,11%

The results in the category B – static strength – can be seen in table 1.2.

Table 1.3. Women's Individual

Group	Family	Elements	Value	Frequency
A RODEZ	A Frame	A188 Explosive a-frame ½ turn to wenson	0,8	1x
	V & High V support	A239 High v- support reverse cut ½ turn to l split	0,9	6x
A SOFIA	A Frame	A188. Explosive a-frame ½ turn to wenson	0,8	1x
	V & High V support	A 239 High v- support reverse cut ½ turn to l split	0,9	7x
	Flair	A288 Flair to wenson or wenson to flair to wenson)	0,8	1x

B RODEZ	Straddle Support	B138 Straddle / 1 support 2/1 turn	0,8	5x
	V Support	B198 V-support 2/1 turn	0,8	1x
B SOFIA	Straddle Support	B138 Straddle / 1 support 2/1 turn	0,8	7x

Table 1.4. Men's individual

Group	Family	Elements	Value	Frequency
A RODEZ	A Frame	A188 Explosive a-frame ½ turn to wenson	0,8	3x
	Cut	A230 Straddle cut ½ twist to wenson	1.0	8x
		A 239 High v- support reverse cut ½ turn to l split	0,9	3x
	V & High V support	A250 1 Arm high v- support reverse cut ½ turn to l split	1.0	2x
		Flair	A300 1/1 Turn to wenson	1.0
A SOFIA	A Frame	A188. Explosive a-frame ½ turn to wenson	0,8	2x
		A229 straddle cut ½ twist to push up	0,9	1x
	Cut	A230 Straddle cut ½ twist to wenson	1.0	7x
		V & High V support	A239 High v- support reverse cut ½ turn to l split	0,9
	Flair	A291 Flair ½ to wenson	0,9	3x
A300 Flair 1/1 to wenson		1.0	3x	
B RODEZ	Straddle Support	B138 Straddle / 1 support 2/1 turn	0,8	2x
	Planche	B198 V-support 2/1 turn	0,8	1x
B SOFIA	Straddle Support	B270 Straddle planche to lifted wenson back to straddle planche	1.0	3x

In the gymnasts' competition, the high difficulty elements are the most frequent. This is reasonable, as the men gymnasts have much more strength than the women. The 1-point value elements are found in the finalists' routines. The Cut family- 8 and 7 x includes the most such elements and the Planche family the least, only one.

The frequency of the elements in groups A (dynamic strength) and B value 0,8-1 point at the World Championships Rodez and Sofia – mixed pairs (table 1.5.)

Table 1.5. Mixed pairs

Group	Family	Elements	Value	Frequency
A RODEZ	A Frame	A188 Explosive a-frame ½ turn to wenson	0,8	2x
	V & High V support	A239 High v- support reverse cut ½ turn to l split	0,9	5x
		Flair	A288 Flair to wenson or wenson to flair to wenson	0,8
A SOFIA	A Frame	A188. Explosive a-frame ½ turn to wenson	0,8	6x
		V & High V support	A239 High v- support reverse cut ½ turn to l split	0,9
	Flair	A288 Flair to wenson or wenson to flair to wenson	0,8	3x
B RODEZ	Straddle Support	B 138 Straddle / L support 2/1 turn	0,8	3x
B SOFIA	Straddle Support	B138 Straddle / L support 2/1 turn	0,8	7x
	Planche	B268 Straddle planche to lifted wenson	0,8	1x

Table 1.6. Trio

Group	Family	Elements	Value	Frequency
A RODEZ	A Frame	A188 Explosive a-frame ½ turn to wenson	0,8	6x
		A229 straddle cut ½ twist to push up	0,9	1x
	Cut	A230 Straddle cut ½ twist to wenson	1.0	2x
		V & High V support	A239 High v- support reverse cut ½ turn to l split	0,9
	Flair	A250 1 Arm high v- support reverse cut ½ turn to l split	1.0	2x
		A291 Flair ½ to wenson	0,9	2x
		A300 Flair 1/1 to wenson	1.0	3x
A Frame	A188. Explosive a-frame ½ turn to wenson	0,8	8x	
	Cut	A230 Straddle cut ½ twist to wenson	1.0	5x

A SOFIA	V & High V support	A239 High v- support reverse cut ½ turn to l split	0,9	1x
	Flair	A291 Flair ½ to wenson A300 Flair 1/1 to wenson	0,9 1.0	3x 4x
B RODEZ	Straddle Support	B 138 Straddle / L support 2/1 turn	0,8	3x
	Planche	B270 Straddle planche to lifted wenson back to straddle planche	1.0	3x
B SOFIA	Straddle Support	B 138 Straddle / L support 2/1 turn	0,8	5x
	Planche	B270 Straddle planche to lifted wenson back to straddle planche	1.0	2x

Table 1.7.Grup

Group	Family	Elements	Value	Frequency
A RODEZ	A Frame	A188 Explosive a-frame ½ turn to wenson	0,8	6x
	Cut	A230 Straddle cut ½ twist to wenson	1.0	1x
	V & High V support	A239 High v- support reverse cut ½ turn to l split	0,9	1x
	Flair	A288 Flair to wenson or wenson to flair to wenson	0,8	4x
		A291 Flair ½ to wenson	0,9	1x
		A300 Flair 1/1 to wenson	1.0	1x
A SOFIA	A Frame	A188. Explosive a-frame ½ turn to wenson	0,8	5x
	Cut	A229 straddle cut ½ twist to push up	0.9	2 x
		A230 Straddle cut ½ twist to wenson	1.0	5 x
	V & High V support	A239 High v- support reverse cut ½ turn to l split	0,9	2x
	Flair	A288 Flair to wenson or wenson to flair to wenson	0,8	1x
		A291 Flair ½ to wenson	0,9	2x
A300 Flair 1/1 to wenson		1.0	1x	
B RODEZ	Straddle Support	B 138 Straddle / L support 2/1 turn	0,8	3x
	Planche	B268 Straddle planche to lifted wenson	0,8	1x
		B270 Straddle planche to lifted wenson back to straddle planche	1.0	1x
B SOFIA	Straddle Support	B 138 Straddle / L support 2/1 turn	0,8	4x
	Planche	B270 Straddle planche to lifted wenson back to straddle planche	1.0	1x

Results

As for the content under study, this paper aims to evaluate, comparatively, from a quantity perspective, the entire content of the elements in the A and B categories for the finalists in all the 12 World Championships so far organized. Similarly, we will present the frequency of the value elements of 0.8, 0.9 and 1 during the latest two world championships for the five rounds. While examining the dynamics of the elements in this category in the routines during the finals, at all 12 World Championships, a high variability in the percentage has been noticed in using the elements in this difficulty category for the routines, due to the changes in the Codes of Points. Thus, the highest percentage of the elements in A has been scored by the men's individual round (30.36%), mixed pairs (30.23%) and trio (29.83%) at the 2006 World Championships in Nanjin, while the lowest was registered by the women's individual (17.20%) in Hague, Rodez and Ulm. For the B group, the highest

percentages were recorded in the trio at World Championship in Riesa, mixed pairs in Perth and Catania, and the lowest in Sofia (2012) during all rounds. The frequency of the elements in the categories A (dynamic strength) and B (static strength), of 0.8 – 1 in value at the World Championships in Rodes and Sofia – women's individual (table 1.3.) Upon examining the two groups, the participants at both World Championships used elements in the V & High V support and Straddle Support families with the highest frequency of 7x, and the low frequency of the elements in the A Frame and V Support family – only once. There are no elements of 1 point in this round. The frequency of the elements in group A (dynamic strength) and B (static strength) value 0.8-1 point at the World Championships Rodez and Sofia – men's individual (table 1.4.) There was no maximum value element in the mixed pairs competition, as the women gymnasts do not risk the execution of such elements. The highest frequency is found within the V



& High V support -5x and Straddle Support - 7x. We have only one element in the Flair and Planche families. The frequency of the elements in groups A (dynamic strength) and B (static strength) value 0,8-1 point at the World Championships Rodez and Sofia – trio (table 1.6.) The Cut and Flair families' elements are the most frequent at both World Championships, and the V & High V support family was the least frequent in Sofia. At both World Championships, the frequency of the maximum value elements (1 point) was of 21x, the 0,9 - 8x, and the 0,8 - 22x.

The frequency of the elements in groups A (dynamic strength) and B (static strength), value 0,8-1 point at the World Championships Rodez and Sofia – group (table 1.7.) In the group competition, the most exciting one, the 1 point elements were introduced in routines with a frequency of 10x, the 0,9 elements - 8x, and the elements with 0,8 value - 18x. The highest frequency is found at the A Frame and Cut families- 5x.

Conclusions

Synthesising the options of the athletes during the studied period, we notice that they used dynamic strength elements in group A, in a percentage of 25%, slightly different according to category. The mixed pairs and the groups had the most numerous dynamic strength exercises in their routines. A smaller percentage of these strength elements are found in the competitions' structures at the last three editions. Regarding the static strength exercises in group B, we note that the same categories, mixed pairs and group, preferred these elements, although the percentage was smaller than in the case of the dynamic strength elements. The same tendency to lower the use of the static strength elements has been observed at the last three editions of the World Championships. The more obvious use of the strength elements may be justified in the two cases. The specific of the routines require a high strength level, taking into consideration the support and pressure features needed in the movements between partners. In women's individual, we notice a balance between the dynamic and static strength elements, regarding both weight and value, at the two championship editions. The high value elements are dominant (dynamic strength - V & High V support 0.9) in the exercises structures for women's individual competition. The high value static strength elements (0.8 - Straddle Support) are preferred in the women's routines at the 2010 and 2012 World Championships.

In the men's individual competition, the maximum value elements (1.0) are dominant, as the gymnasts have high execution strength. Maximum value elements have not been included in the content of the mixed pairs routines. The 0,8 value elements in the A Frame and Straddle Support families are the most common. The most spectacular competitions are: the world trio and the group competitions, first introduced at the World Championships in 2002, as the 0,9 and 1.0 point elements are dominant.

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