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STUDY ON THE PHYSICAL TRAINING OF FEMALE GYMNASTS IN BEAM

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Abstract: *The purpose of the study was to identify the optimal physical training means and their influence on the power indicators of the female gymnasts. The study was conducted on a sample of 13 female athletes (32.97±5.72 kg and 140.8±9.2 cm) practicing artistic gymnastics, aged between 10 – 12 years (11.15±0.8 years), at performance level. The physical tests performed were as follows: standing long jump, stahl bar semi-squats, push-ups at the beam, pike position on the beam, extensions on the gym bench, and handstands. Following the analysis of the results, it has been concluded that the effects of the means proposed by us are statistically significant in case of all events (p=<0.0001).*

Key words: *practice, physical training, artistic gymnastics, beam, physical evaluation, monitoring*

1. Introduction

Female artistic gymnastics is a dynamic sport, habitually exposing young gymnasts to training programs higher in volume and intensity than other sports for children of similar age. Intensive training at a young age may entail complications for female gymnasts [3], [16].

Even under extreme condition, gymnastic training stimulates the development of balance and allows almost perfect stability [18], [20].

New scientifically based values of diagnosing physical fitness and determining its influence on the effectiveness of athletes' technical preparation improves the training process in gymnastics. For a create a prospective direction of development and improvement concerning the theory and methodology of training must working out a methodology and organisation of studies with a technology of testing, criteria of assessment of gymnasts' sports preparation, along with determining optimal groups of means and methods of interacting [7], [11].

Artistic gymnastics performance depends on the perfect balance between

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the physical fitness level and the complex technical skills required in case of each apparatus [9].

Gymnastics has advanced rapidly in the past few years, especially since new technical demands began to appear. Gymnasts, coaches and researchers have all sought to reach the perfection. Having a great insight into the development process of expansion involves a close analysis of the processes of adaptation who can be found in artistic gymnastics training [5].

Physical training is one of the most significant factors of sports training in order to reach high performance. The main objectives of physical training are to increase the physiological potential of the athlete and to develop the biomotor qualities at the highest level [2].

It is well-known that in order to train a gymnast capable participate in high level competitions, several things are mandatory: hard training for years, perseverance, tenacity, seriousness in training, material conditions and state-of-the-art equipment as well as highly-skilled experts [4].

Physical training determines the general exercise capacities of the body; it is meant to support the technical contents within the limits of the competition regulations; at the same time, it ensures the energetic background of performance, by stimulating the increase in the functional and morphological sports parameters [12].

Optimal health and level of physical fitness are essential for all gymnasts in order to be able to effectively and accurately perform varied elements and routines. The physical fitness assessment can provide information which allows us to track the impact of the sport on each gymnast's health. Artistic gymnastics improves all health-related components of physical fitness and positively influences children's physical development. Both female and male artistic gymnasts had better physical fitness in most parameters, in comparison to the international norms for their peers [8].

In every specialization, physical preparation (PP) is an inherent part of the development process of elite athletes. Considerable success in deepening the essence of PP as the basis for technical excellence sports and individual components of the training loads in sport has been achieved , in recent years [19].

The main purpose of sports training is to increase the exercise and performance capacity of athletes. Training is first and foremost a long-term systematic sports activity, progressively and individually staged [2].

The training process of the elite female gymnasts requires a long period of work starting from the initial selection until the achievement of the sports mastery. Physical training is one of the most important factors of the sports training for reaching the high performance. It is a process of education of the motor skills necessary for the correct learning of the elements, connections and combinations and of the whole exercises [17].

Training and sport in general – systematically developed and continually graduated pedagogical process of adaptation of the human body to intense physical and physical effort, in order to obtain high results in one of the competitive forms of the physical exercises [6].

Intensity of training, not time, is more relevant to the questions of interest, but criteria for intensive training are lacking. Estimated energy costs (METs) of

gymnastics for youth vary with level of effort: light, 3.0; moderate, 4.0; hard, 5.0 METs [10].

Volume is the training quantity (number of training hours, number of exercises, number of repetitions per exercise, distance travelled, etc.) and intensity is the training quality (speed, space, rest time – passive or active rest, amplitude of movements, etc.) [1].

Consists in the ability of the coach to organize adequate planning instruments, with the final goal to obtain good results in major competitions. The periodization is one of the most important concepts of planning and training. The term comes from the word "period", which is a slicing or splitting of time into smaller segments, easily controlled, called training stages [14].

2. Objectives

The objective had in view to design a system of means and to enforce them in the physical training of junior female gymnasts.

3. Material and Method

The sample of the research comprised 13 female gymnasts caged between 10 – 12 years old, practicing this sport at the School Sports Club of Bârlad. The evaluation involved the application of six tests to assess the force of the lower limbs, abdomen, arms, and back muscles.

We have conducted the following tests concerning the female gymnasts: standing long jump, stahl bar semi-squats, push-ups at the beam, pike position on the beam, extensions on the gym bench, and handstands.

The initial testing was carried out in the pre-competitive period, (i.e., in August 2020), while the final testing after 12 weeks of training.

We have used the following means throughout the experiment: assisted handstands on the beam; assisted handstand push-ups (on the low beam); plank positions on the beam; one-knee squats on the high beam; squat jumps on the beam; stand in relevé on the beam; one-leg standing on tiptoes; semi squat jumps on the beam; deep jump on the beam; successive jumps over the gym benches; pike position (apart and close) on the beam; from ventral decubitus, grabbing from underneath the beam, leg extensions; from ventral decubitus, grabbing from underneath the beam, raising with collarbone support and coming back to the initial position; pike position on the beam; from the transverse position on the beam, walk backwards in handstand: straight leg raises sagittally and horizontally.

4. Findings and Discussions

Table 1 and the subsequent Figures feature comparatively the results obtained at the two tests by the gymnasts included in our study. Tables show the differences in the values recorded between the initial testing and the final testing.

Results obtained at the tests applied Table 1

	Number of values	Minimum	Maximum	Mean	Std. Deviation	Coef-ficient of variation	t
Standing long jump_I (m)	13	1,56	1,92	1,762	0,1105	6,27%	6,47****
Standing long jump_F (m)	13	1,59	2	1,828	0,1175	6,43%	
Stahl bar semi-squats_I (rep)	13	10	21	17,38	3,228	18,57%	12,06****
Stahl bar semi-squats_F (rep)	13	16	26	22,77	2,743	12,05%	
Push-ups_I (rep)	13	13	30	21,23	6,03	28,40%	15,77****
Push-ups_F (rep)	13	19	36	26,77	5,718	21,36%	
Block_I (s)	13	21,72	130	71,1	34,44	48,44%	10,83****
Block_F(s)	13	30,12	149	89,78	35,49	39,53%	
Bench extensions_I (rep)	13	20	46	35,62	8,431	23,67%	6,61****
Bench extensions_F (rep)	13	25	52	41,46	8,705	20,99%	
Handstand_I (s)	13	2,11	20,21	7,762	5,483	70,64%	8,45****
Handstand_F (s)	13	5,63	23,05	12,12	5,309	43,82%	

The extensive power of the lower limbs has recorded a significant progress (t=6.47; p<0.0001), the athletes improving from 1.76±0.11 m to 1.82±0.11 m (Table 1 and Figure 1). At the same time, data homogeneity was preserved (variation was very low in terms of their dispersion).

Concerning the evaluation of abdominal muscle power, an important progress was noticed (t= 6.47; p<0.0001), the average increasing from 17.38±3.22 m to 22.77±2.74 m (Table 1 and Figure 2). We note a reduction of dispersion: group homogeneity decreased from 18.57% to 12.05%.

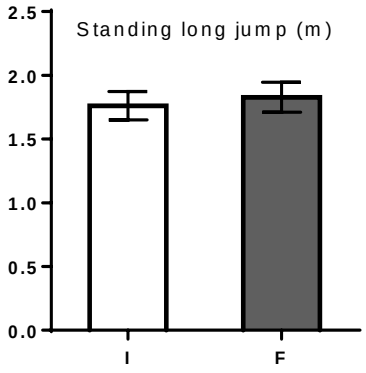

Fig. 1. *Results for "Standing long jump"*

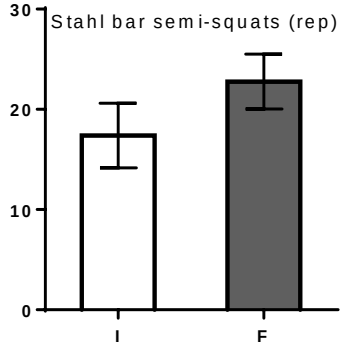

Fig. 2. *Results for "Stahl bar semi-squats"*

Regarding the arm muscle power, the progress is noteworthy, too (t=15,77; p<0.0001). Values increased from 21.23±6.03 m in the initial testing to 26.77±5.71 m in the final testing (Table 1 and Figure 3). Group homogeneity dropped from 28.40% to 21.

In case of the fourth exercise, the differences found between the initial testing and the final testing, namely from 71.1±34.44 m to 89.78±35.49 m (Table 1 and Figure 4) have a high level in terms of statistical significance (t=10.83; p<0.0001). Data homogeneity decreased from 48.44% to 39.53%.

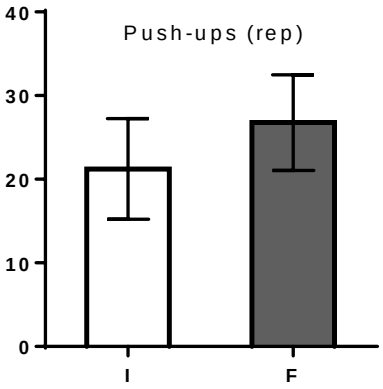

Fig. 3. *Results for "Push-ups"*

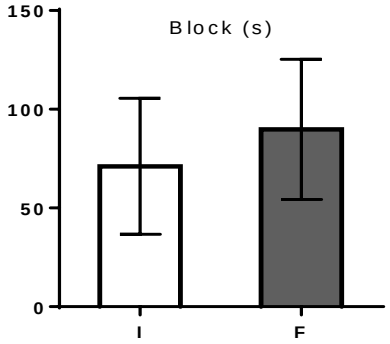

Fig. 4. *Results for "Block"*

The statistical analysis (Table 1, Figure 5) conducted has enabled the identification of a progress between the initial and the final testing (t=6.61; p<0.0001), data increased their values from 35.62±8.43 m to 41.4±8.70 m. Data homogeneity decreased from 39.53% to 20.99%.

The values obtained at the last exercise (t=8.45; p<0.0001) demonstrate the existence of a statistically significant progress (Table 1 and Figure 6). We have found differences between the data obtained concerning the gymnasts, namely from 77.62±5.48 to 12.12±54.30 m. Data homogeneity dropped from 70.64% to 43.82%.

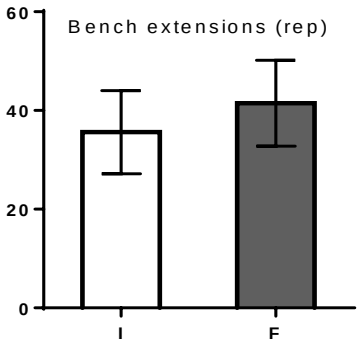

Fig. 5. *Results for "Bench extensions"*

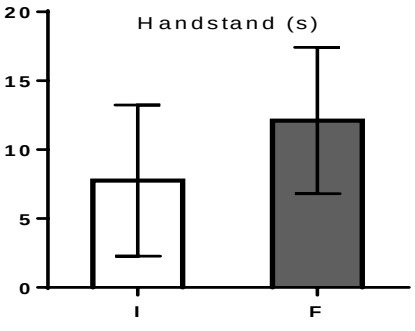

Fig. 6 *Results for "Handstand position"*

Scientific literature includes various research studies focusing on the assessment of muscle power of junior female gymnasts using various means. For instance, in the test for evaluating the abdominal muscle force of 12-year-old gymnasts, the values obtained ranged between 19.28±0.35 m initially and 19.9±0.31 m finally, with t=5.67 and p<0.0001. Upon assessing back muscle power, literature mentions data values between 33.57±0.39 and 34.5±0.29 (t=4.76; p<0.0001). In the case of evaluating lower limb muscle power, results varied between 187±2.47 and 189.8±2.41, with t=8.68; p<0.0001 [15].

It is worth noting that the values obtained by Potop et al. are very similar (nearly identical) to those obtained.

Concerning the Push-ups, Block, Handstands, we have not found any studies concerning the assessment of arm or abdomen muscle power, for female gymnasts aged 10-12 years old.

Considering the low number of studies regarding the physical training of junior female gymnasts on the beam, we have not been able to make any more comparisons regarding the data obtained.

5. Conclusions

The findings of the research have enabled us to draw the following conclusions:

1. Statistically significant differences were found concerning the values of physical tests between the initial and the final testing, for al, six tests applied, namely: the force of the lower limbs, abdomen, arms, and back muscles. The comparisons were made by using the Student test.
2. The means used in developing the force of the lower limbs, abdomen, arms, and back muscles were effective and they contributed to the optimisation of power indicators. This stands to confirm the purpose of our research.
3. In this research, we have obtained similar values to others studies carried out within the same age range and for related sports branches.

6. Other specifications

All the authors had equal contributions to this research.

References

1. Batista, A., Gomez, T.N., Garganta, R., et al.: *Training intensity of group in rhythmic gymnastics*. In: Science, Movement and Health, Vol. 18, 2018, pp. 17 – 24.
2. Bompa, T.: *Teoria și metodologia antrenamentului – periodizarea (Theory and methodology of training - periodization)*. București, Editura Tana, 2001, p. 4.
3. Burt, L.A., Naughton, G.A., Higham, D.G. et al.: *Training load in pre-pubertal female artistic gymnastics*. In: Science of Gymnastics Journal, Vol. 2, 2010, pp. 5 – 14.
4. Corlaci, I.: *Efficiency in the Artistic Training of the Beginners' Group in the Men's Artistic Gymnastics*. In: Procedia – Social and Behavioral Sciences, Vol. 117, 2014, pp. 408 – 413.

5. Damian, M., Popescu, R., Olteanu, A., et al.: *Plyometric exercises to improve explosive power in artistic gymnastics*. In: Science, Movement and Health, Vol. 14, 2014, pp. 381–386.
6. Grosu, E.F., Iurian, C., Szabo, P., et al.: *Optimizarea antrenamentului sportiv (Optimizing sports training)*. Cluj-Napoca, Editura GMI, 2008, p. 20.
7. Kochanowicz, A., Kochanowicz, K., Sawczyn, S.: *Special Fitness and yhe Effectiveness of Technical Preparation in Gymnastic Vault Event in Athletes at the Directed Stage*. In: Baltic Journal of health and physical activity, Vol. 1, 2009, p. 70–80.
8. Kiuchukov, I., Yanev, I., Petrov, L., et al.: *Impact of Gymnastics Training on the Health-Related Physical Fitness Young Female and Male Artistic Gymnasts*. In: Science of Gymnastics Journal, Vol.11, 2019, p. 157–187.
9. Makaouer, B., Hammoudi-Nassib, S., Amara, S., Chaabène, H.: *Evaluating the physical and basic gymnastics skills assessment for talent identification in men's artistic gymnastics proposed by the International Gymnastics Federation*. In: Biol Sport, Vol. 35, p. 383–392.
10. Malina, R.B., Baxter-Jones, D.G., Armstrong, N.: *Role of Intensive Training in the Growth and Maturation of Artistic Gymnasts*. In: Sport Med, Vol. 43, p. 783–802. DOI 10.1007/s40279-013-0058-5.
11. Marković, K., Čavar, I., Sporiš, G.: *Changes in gymnasts motor abilities during the nine month training process of female gymnasts 5-6 years of age.* In: Science of Gymnastic s Journal, Vol. 4 (2), 2012, p. 45-54.
12. Moraru, C.: *Pregătirea fizică în gimnastica ritmică (Physical training in rhythmic gymnastics)*. Iași, Editura CERMI, 2010, p. 13.
13. Potop, V.: *Assessment of Physical and Technical Training Level in Basic Specialization Stage in Women's Artistic Gymnastics.* In: Journal of Physical Education and Sport, Vol. 13, pp. 119 – 119.
14. Potop, V., Cîmpeanu, M.: *Periodization of training effort in junior female gymnasts' preparation*. In: Ovidius University Annals, Vol. 11, 2011, pp. 407-414.
15. Potop, V., Moraru, C.: *Analysis of the influence of specific physical training on sports performance in female artistic gymnastics.* In: Scientific Journal of Education, Sports, and Health, Vol. 15, 2014, pp. 109 – 116.
16. Potop, V., Creţu, M., Buftea, V., et al.: *Analysis of the Specific Physical Training Influence on the Technical Execution of Double Salto Backward on the Floor*. In: Journal of Physical Education and Sport, Vol. 18, 2018, p. 2186-2192.
17. Potop, V., Grigore, V., Cîmpeanu, M., Buftea, V., Jurat, V.: *Relationship of the Level of Physical and Technical Training in 9- Year Old Junior Gymnast*. In: Scientific Journal of Education, Sport, and Health, Vol.20, 2019, p. 23-35.
18. Russo, L., Palermi, S., Dhahbi, W., et al.: *Selected components pf physical fitness in rhythmic and artistic youth gymnast.* In: Sport Sciences for Health, 17, 2020, p. 415-421.

19. Sawczyn, S., Zasada, M., Kochanoowicz, et al.: *The effect of specific strength training on the quality of the gymnastic elements executions in young gymnasts.* In: Baltic Journal of Health and Physical Activity, Vol. 8(4), 2016, p. 79–91.
20. Veljković, V.A., Madić, D., Veličković, S., et al.: *Balance in young gymnasts: age-group difference*. In: Facta Universitatis, Vol. 12, 2014, p. 289–296.