SPECIFICITY AND DIVERSITY OF ATHLETIC ABILITY NEEDS AMONG PROFESSIONAL GYMNASTS

ESPECIFICIDADE E DIVERSIDADE DAS HABILIDADES ATLÉTICAS ENTRE GINASTAS PROFISSIONAIS

ESPECIFICIDAD Y DIVERSIDAD DE LAS CAPACIDADES ATLÉTICAS DE LOS GIMNASTAS PROFESIONALES

Original Article
Artigo Original
Artículo Original

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ABSTRACT

Introduction: Gymnastics sports require athletes to have exceptional physical fitness. Distinct specific training methods, when mastered, can elevate the functional capacity and athletic abilities of professionals. In this way, athletes can better perform their abilities in competition. Objective: Analyze the physical training methods of gymnasts. In parallel, this paper analyzes the impact of functional training methods on gymnasts' physical fitness and competition performance. Methods: This paper selects several gymnasts as research objects. The gymnasts were randomly divided into two groups (experimental and control groups). The experimental group used functional training. The control group used traditional training methods. This paper tests and records the athletes' fitness before and after training. The mathematical statistics method allows the collected data to be analyzed and discussed. Results: There was a big difference in the fitness index between the experimental and control groups (P<0.05). Conclusion: Functional training helps to improve the physical performance of gymnasts. Functional training programs can effectively enhance the response of the phasic muscles, positively influencing motor agility. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Physical fitness; Gymnastics; Athletes; Physical Conditioning, Human.

RESUMO

Introdução: A ginástica esportiva exige que os atletas tenham uma aptidão física excepcional. Distintos métodos de treinamento específicos, quando dominados, podem elevar a capacidade funcional e habilidades atléticas dos profissionais. Desta forma, os atletas podem desempenhar melhor suas capacidades na competição. Objetivo: Analisar os métodos de treinamento físico dos ginastas. Paralelamente, este trabalho analisa o impacto dos métodos de treinamento funcional na aptidão física e no desempenho de competição dos ginastas. Métodos: Este trabalho seleciona vários ginastas como objetos de pesquisa. Os ginastas foram divididos aleatoriamente em dois grupos (grupos experimentais e grupos de controle). O grupo experimental utilizou o treinamento funcional. O grupo de controle utilizou métodos tradicionais de treinamento. Este artigo testa e registra a aptidão física dos atletas antes e depois do treinamento. O método de estatística matemática permite analisar os dados coletados, posteriormente discutidos. Resultados: Houve uma grande diferença no índice de aptidão física entre os grupos experimental e controle (P<0,05). Conclusão: O treinamento funcional ajuda a melhorar o desempenho físico dos ginastas. Os programas de treinamento funcional podem efetivamente aprimorar a resposta da musculatura fásica, influenciando positivamente na agilidade motora. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

***Descritores*:** *Aptidão física; Ginástica; Atletas; Condicionamento Físico Humano.*

RESUMEN

Introducción: El deporte de la gimnasia requiere que los atletas tengan un estado físico excepcional. Los distintos métodos de entrenamiento específicos, cuando se dominan, pueden elevar la capacidad funcional y las habilidades atléticas de los profesionales. De este modo, los atletas pueden desarrollar mejor sus habilidades en la competición. Objetivo: Analizar los métodos de entrenamiento físico de los gimnastas. Paralelamente, este trabajo analiza el impacto de los métodos de entrenamiento funcional en la condición física y el rendimiento en competición de los gimnastas. Métodos: Este trabajo selecciona a varias gimnastas como objeto de investigación. Los gimnastas se dividieron aleatoriamente en dos grupos (grupo experimental y grupo de control). El grupo experimental utilizó el entrenamiento funcional. El grupo de control utilizó métodos de entrenamiento tradicionales. En este trabajo se comprueba y registra la aptitud física de los atletas antes y después del entrenamiento. El método de la estadística matemática permite analizar los datos recogidos, que se comentan más adelante. Resultados: Hubo una gran diferencia en el índice de aptitud física entre los grupos experimental y de control (P<0,05). Conclusión: El entrenamiento funcional ayuda a mejorar el rendimiento físico de los gimnastas. Los programas de entrenamiento funcional pueden mejorar eficazmente la respuesta de los músculos fásicos, influyendo positivamente en la agilidad motriz. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

***Descriptores*:** *Aptitud física; Gimnasia; Atletas; Acondicionamiento Físico Humano.*

DOI: http://dx.doi.org/10.1590/1517-8692202329012022_0275 Article received on 06/03/2022 accepted on 07/15/2022

INTRODUCTION

Gymnasts need to have excellent professional skills and absolute physical strength. In addition to making the trainer healthier, functional training can also effectively improve athletes' athletic ability. Academic research on physical fitness training in gymnastics mainly focuses on the core strength and balance ability.[1] There are few studies on the overall impact of physical fitness. Therefore, this paper analyzes the impact of functional physical fitness training methods on the specific quality of young gymnasts.

METHOD

General information

This article selects 20 amateur gymnasts. They are all gymnastics third-level players. Their age is 10 to 11 years old. The training time is three years or more.[2] In this experiment, subjects were randomly divided into an experimental group and a control group.

Research methods

The experimental and control groups were trained simultaneously and in different venues for 30 days and 2 hours a day.[3] The experimental group received 25% functional physical training + 25% traditional physical training + 50% special technical training+.[4] The control group received 50% traditional physical training + 50% special technical training.

Gymnastics posture control process of athletes

The system consists of 11 links $S_k\,(k=1,...,11)$. They are connected by ten connection points $O_k\,(k=2,...,11)$. The connection system originated from S_1.

$$h = \dot{h_1} + \sum_{2}^{n} h_k \tag{1}$$

$$\dot{h_1} = I_{ff}\omega_1 = I_{ff}\omega_{pf} + I_{ff}\omega_{fi} \tag{2}$$

$$\dot{h_k} = I_{uu}\omega_{ul} + m_u u_f \times \left(\omega_{ul} \times u_{ok}\right)(k = 2,\ldots,11) \tag{3}$$

It is independent of other angular velocities.[5]

Mathematical Statistics

In this study, SPSS 21.0 software was used for statistical processing and analysis of all data.[6] Measurement data were analyzed by t-test. In this study, $p < 0.05$ indicated that the difference was statistically significant.

There is no need for a code of ethics for this type of study.

RESULTS

The scores of flexibility quality before and after the intervention of the two groups of adolescent gymnasts

After training, the two groups of young gymnasts scored higher in the split right and left the split and total flexibility quality than before the intervention. After the intervention, the young gymnasts in the experimental group scored higher in the right split, left split, and total flexibility quality than the control group.[7] (Table 1).

The scores of static strength quality before and after the intervention of the two groups of young gymnasts

In the control group, the correct control score and the total score of static power quality of the adolescent gymnasts after training were higher than those before the intervention.[8-9] (Table 2).

The scores of quick strength quality before and after the intervention of two groups of young gymnasts

After training, the young gymnasts in the control group scored higher in the right front kick, left front kick, and total fast power quality than before the intervention.[10] The total scores of young gymnasts in the experimental group were higher than those before the intervention. The difference was statistically significant ($p < 0.05$). (Table 3)

Table 1. Comparison of flexibility quality scores between the two groups of adolescent gymnasts before and after intervention.

Flexibility index	Intervention period	Control group	Test group
Split right score	Before intervention	0.82±0.77	0.64±0.81
	After intervention	0.80±0.77	0.84±0.82
Split Left Score	Before intervention	0.27±0.47	0.22±0.41
	After intervention	0.34±0.68	0.42±0.83
Total flexibility score	Before intervention	1.07±1.26	0.88±1.11
	After intervention	1.24±1.28	1.37±1.47

Table 2. Comparison of static strength quality scores between the two groups of adolescent gymnasts before and after intervention.

Static Strength Quality Index	Intervention period	Control group	Test group
Right Front Control Score	Before intervention	4.03±3.80	3.88±3.03
	after intervention	4.51±3.55	5.1±4.11
Right control score	Before intervention	3.88±3.08	2.13±2.54
	after intervention	5.10±3.85	4.18±3.31
Right rear control score	Before intervention	5.88±3.48	8.59±3.19
	after intervention	5.11±3.24	8.85±1.98
Left front control score	Before intervention	2.44±3.83	1.83±2.93
	after intervention	2.58±3.88	3.55±3.50
Left control score	Before intervention	1.45±3.09	2.29±2.91
	after intervention	1.84±3.00	3.31±3.25
Left rear control score	Before intervention	8.18±3.84	8.85±2.03
	after intervention	5.95±4.08	9.54±1.00
The total score of static strength quality	Before intervention	24.85±14.58	25.39±11.93
	after intervention	28.19±15.55	35.43±12.81

Table 3. Comparison of fast strength scores between the two groups of adolescent gymnasts before and after intervention.

Fast Strength Index	Intervention period	Control group	Test group
+D46:D63 points for lifting the rope at both ends while lying on your back	Before intervention	8.77±1.20	7.77±1.07
	after intervention	8.77±1.20	9.22±1.07
Scoring on the ropes on both sides	Before intervention	7.75±1.00	7.58±1.42
	after intervention	7.82±1.95	9.15±1.11
Right forward kick	Before intervention	8.82±0.78	9.15±0.77
	after intervention	9.47±0.58	9.11±0.19
Right kick	Before intervention	9.19±0.54	9.22±0.71
	after intervention	9.22±0.54	9.91±0.19
Right-back kick	Before intervention	9.91±0.19	9.97±0.14
	after intervention	10.00±0.00	10.00±0.00
left front kick	Before intervention	8.97±0.54	9.15±0.58
	after intervention	9.47±0.50	10.00±0.00
left kick	Before intervention	9.22±0.44	9.47±0.50
	after intervention	9.22±0.54	9.82±0.29
Left-back kick	Before intervention	10.00±0.00	10.00±0.00
	after intervention	10.00±0.00	10.00±0.00
Total Quick Strength Quality Score	Before intervention	71.75±2.70	71.71±1.85
	after intervention	72.08±2.71	79.17±4.07

Endurance quality scores of the two groups of young gymnasts before and after intervention

After training, the scores of the double-shake jump, 1500m running, and total endurance quality of young gymnasts in the two groups were higher than those before the intervention.[11] There was no significant difference in the scores of double-shake jumping, 1500m running, and total endurance quality of the adolescent gymnasts in the experimental group after the intervention (p>0.05). (Table 4)

The total score of the unique qualities of the two groups of young gymnasts before and after the intervention

There was a statistically significant difference in the total exceptional quality score among the two groups of adolescent gymnasts after exercise than before the intervention (p < 0.01). 05). (Table 5)

DISCUSSION

Gymnastics special physical training is an integral part of athlete training. The content, methods, and means of physical training must be strictly obeyed in selecting its exceptional characteristics and the need for notable sports ability improvement. Physical training that does not meet specific requirements is meaningless.[12] Physical training can only play a positive role when closely integrated with special sciences. Gymnastics technique and physical fitness are not two distinct, independent factors.[13] There is a close connection between the two. Technical projects require physical support. Sometimes the relatively weak side will become a critical factor in determining the quality of the athletic level. The key to winning when the game time is relatively fixed mainly focuses on the ability to maintain technology and tactics. In this process, the functional level of the athlete will inevitably affect the performance of special skills. The mutual influence and effect between physical fitness and technique always run throughout the gymnastics competition.[14] The development of special physical fitness training for gymnasts can improve the level of gymnastics.

Table 4. Comparison of endurance quality scores between the two groups of adolescent gymnasts before and after intervention.

Endurance quality index	Intervention period	Control group	Test group
Double shake to score	Before intervention	7.98±1.53	7.79±1.12
	after intervention	8.23±1.31	8.13±1.21
1500m run score	Before intervention	6.63±1.32	5.93±1.78
	after intervention	6.76±1.33	6.73±1.68
Total endurance score	Before intervention	13.61±1.69	13.73±1.69
	after intervention	13.78±1.55	13.66±1.31

Table 5. Comparison of the total scores of the unique qualities of the two groups of young gymnasts before and after the intervention.

	Intervention period	Control group	Test group
Special quality total score	Before intervention	112.18±17.95	113.81±14.11
	after intervention	116.31±19.66	131.59±13.57

Strength is the foundation of gymnasts' movements. Flexibility is the key to their movement. Coordination is an ability that cannot be ignored. Gymnastics pays more attention to the relative strength of athletes. Athletes in this project need to overcome their gravity to complete basic technical movements of the body. In this study's design of the training program, the strength training of the lower body is mainly based on dynamic exercises. We need to follow the muscle development law of the trunk muscles first and the limb muscles later. Core strength training movements take a combination of dynamic and static methods. Studies have shown that core strength training mainly develops the ability of the athlete's nervous system to integrate and precisely regulate the motor muscle system. Gymnastics requires not only multi-faceted flexibility for the flexibility of the hip joint but also require superior control of the surrounding muscles. The primary requirement of joint training is joint flexibility and stability, which complement each other. The improvement of the ability of nerves to recruit muscle fibers can fully exert the flexibility of athletes. The improvement of flexibility quality also promotes strength quality and movement speed.

In this study, the athletes showed a significant improvement in their flexibility and fitness levels after training. Lower body strength was also significantly improved, and the functional training regimen in this study could effectively improve the ability of nerves to recruit muscle fibers. It can improve the ability of fast muscle contraction.[15] The growth rate of reasonable leg control of functionally trained athletes is significantly higher than that of the traditional training groups. The reason is that the increase of hip muscle contraction force leads to the development of muscle endurance. Unique qualities and abilities are interlinked.[16] We can improve muscle contraction ability through dynamic exercises to improve muscle endurance. The level of physical function of elite athletes in China is low. This will affect the exercise intensity and volume of physical training. This restricts the improvement of sports level and the exertion of sports ability. Increasing the amount of exercise or high-intensity physical training reflects that the human body's metabolic level and functional ability have increased. Although the rise was not significant, the athlete felt fatigued. This suggests that the athlete may be tired. They are not back to the optimal functioning state they should be.

CONCLUSION

The functional training program designed in this study can effectively improve the rapid muscle contraction ability. Flexibility has a significant influence on the rapid strength development of the lower limbs of adolescent gymnasts. At the same time, the ability of rapid muscle contraction is more decisive. Functional training can promote the effective and coordinated application of all aspects and muscles of the body by young gymnasts. We can develop the contractility of the athlete's muscles through dynamic exercises. This training can gradually affect the static control ability of young gymnasts.

The author declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: Each author made significant individual contributions to this manuscript. MX: writing and data analysis.

REFERENCES

1. Qin YK, Li P, Hu SQ. The Effect of Functional Physical Training on Special Quality of Youngster Rhythmic Gymnasts. Journal of Southwest China Normal University (Natural Science Edition). 2020;45(4):90-6.
2. Vargas PI, dos Reis FDG, Leite N, Capraro AM. The Sporting Trajectory of Elite Athletes In Artistic Gymnastics: A Systematic Review. Sci Gymnast J. 2021;13(3):337-441.
3. Bartholomew J, Gilligan C, Spence A. Contemporary Variables that Impact Sleep and Development in Female Adolescent Swimmers and Gymnasts. Sports Med-Open. 2021;7(1):1-11.
4. Forminte VN, Micu R, Potop V, Grosu EF. The relationship between the indicators of physical preparation and the scores attained in competitions by the junior female gymnasts. J Phys Educ Sport. 2021;21(3):1607-12.
5. Todorova V, Bodrenkova I, Moshenska T. Simulation of The Yearlong Cycle of Training Of Athletes In Aerobic Gymnastics At The Stage Of Specialized Basic Training. Slobozhanskyi Her Sci Sport. 2021;9(3):51-62.
6. Gram MCD, Bø K. High level rhythmic gymnasts and urinary incontinence: Prevalence, risk factors, and influence on performance. Scand J Med Sci Sports. 2020;30(1):159-65.

7. Campos-Pérez J, Páscoa RN, Lopes JA, Cámara-Martos F. Relationship Between Gymnastic Rhythmic Practice and Body Composition, Physical Performance, and Trace Element Status in Young Girls. Biol Trace Elem Res. 2022;200(1):84-95.
8. Deineko A. Features of methodology of flexibility development of female athletes of 8-9 years old, engaged in artistic gymnastics. Slobozhanskyi Her Sci Sport. 2020;8(5): 45-55.
9. Temürçi İ, Bayraktar I, Nalbant Ö. The early specialization requiring sport of gymnastics and long-term athlete development programs. The Online Journal of Recreation and Sports. 2020;9(4):8-18.
10. Somova K, Yemets T, Kalmykova Y, Kalmykov S. Development of Flexibility in The Hip Joints in Children 5-8 Years of The Initial Group of Special Physical Training in Rhythmic Gymnastics. Slobozhanskyi Her Sci Sport. 2021;9(4):66-79.
11. Akhmedova JA. Structure and distribution of training facilities in the micro and pre-competition mesocycle of young gymnasts-«artists». Eurasian J Educ Res. 2021;1(2):86-91.
12. Genc H, Cigerci AE. The effect of gymnastics training on anthropometric, somatotype and some performance characteristics in pre-school girls. Prog Nutr. 2020;22(2):547-54.
13. Opala-Berdzik A, Głowacka M, Juras G. Postural sway in young female artistic and acrobatic gymnasts according to training experience and anthropometric characteristics. BMC Sports Sci Med Rehabilitation. 2021;13(1):1-11.
14. Weber J. Demands Profile in Wheel Gymnastics: Differences Between Athletes at Different Performance Levels, Between Genders and In Different Disciplines. Sci. Gymnast J. 2022;14(1):119-38.
15. Nassib SH, Mkaouer B, Riahi SH, Wali SM, Nassib S. Prediction of gymnastics physical profile through an international program evaluation in women artistic gymnastics. J Strength Cond Res. 2020;34(2):577-86.
16. Váňa P, Juříková J, Bernaciková M, Ševčík R, Žákovská A, Hedbávný P. Might salivary lysozyme be an indicator of prolonged intense training load in athletes? A preliminary study in adolescent male gymnasts. Stud Sport. 2020;14(1):33-9.