UDC [796.412:796.012.234+796.012.62/616.728.2]-053.5

ISSN (English ed. Online) 2311-6374

2021. Vol. 9. No. 4, pp. 66-79

DEVELOPMENT OF FLEXIBILITY IN THE HIP JOINTS IN CHILDREN 5-8 YEARS OF THE INITIAL GROUP OF SPECIAL PHYSICAL TRAINING IN RHYTHMIC GYMNASTICS

Katerina Somova

Tetiana Yemets

Yuliya Kalmykova

Serhii Kalmykov

Kharkiv State Academy of Physical Culture,

Kharkiv, Ukraine

Purpose: to evaluate the effectiveness of the proposed training technique for the development of flexibility in the hip joints in children 5-8 years, engaged in the initial group of special physical training in rhythmic gymnastics.

Material and methods: 16 gymnasts of the initial group of special physical training in rhythmic gymnastics at the age of 5-8 years, MG - 8 gymnasts who were engaged in the author's training method and CG - 8 gymnasts who were engaged in the standard training method took part in the research. Training in both groups was conducted three times a week for 1,5 hours. Assessment of the results of passive and active flexibility in the hip joints was used in both groups at the beginning of the examination and on day 22 of training, using tests "Performing twine from a gymnastic bench" and "Lifting the leg up lying on your back" by L.A. Karpenko, I.A. Wiener, V.A. Savitsky (2007).

Results: for the development of flexibility in the hip joints in children of the main group engaged in the initial group of special physical training in rhythmic gymnastics, the author's training technique was used, which includes exercises to develop passive and active flexibility, motivational part of the technique that

promotes positive emotions. increasing attention and interest in the result of training.

Conclusions: indicators of development of passive and active flexibility in the main group were significantly higher ($p<0,05$), compared with the control group, which indicates a positive effect of the use of the author's training methods. It helps to improve the indicators of active and passive flexibility in the hip joints by including combined exercises that develop all the components of mobility in the hip joints, dynamic exercises and strength exercises in combination with forced stretching.

Keywords: active and passive flexibility, children, hip joint, rhythmic gymnastics.

Introduction

Professional sports is a field of human activity that is characterized by an increased risk of injury. Observing the dynamics of sports injuries, it is possible to determine that the number of sports injuries is constantly increasing and is now becoming threatening. In different countries of the world, the number of injuries in sports ranges from 10-17% of all injuries. Sports injuries in the United States account for 16% of the total number of traumatic injuries, in Sweden - 10%. Until 40 years ago, sports injuries accounted for only 1,4% of all injuries. In 1970 this figure increased to 5-7%. By the end of the 80s - the beginning of the 90s, the number of sports injuries exceeded 10%, in the mid 90s it was 12-17%, and in the period 2001-2010 it reached 17-20%.

Gymnastics is a kind of historically established form of physical activity, which is a system of specially selected exercises and methods, which, in combination with games, tourism, swimming and other means, effectively affects the value of health and physical development, improvement of human motor abilities, and in sports activity - high achievements in many sports, especially in the art of body control [1].

The stages of sports training is a conditional division of the training process according to the age and the level of preparedness (skill), based on the patterns of age development of the motor analyzer, the motor system of a personality and her abilities in accordance with the requirements of gymnastics.

Stage I - initial sports training (from 5-6 years old to 8 years old). The conditions of sports training are determined at the early stages by the abilities of the gymnast and coach to overcome difficulties and the general desire to achieve the heights of sportsmanship in gymnastics.

In rhythmic gymnastics, the most often injured are the lower limbs (50-65%), the upper limbs (35-50%), the trunk and spine (15-20%). In addition, until recently, at the stage of initial training, they began to engage in gymnastics at the age of 7-9, but according to modern programs, it is allowed to involve children from 5-6 years old, and sometimes from 4 years old [4]. Therefore, today there is a problem of developing a modern approach to the development of flexibility of girls 5-8 years old, engaged in rhythmic gymnastics. It is important to modify the existing training methods, especially in the initial groups of special physical training to preserve the health of children, form the foundations of a healthy lifestyle and promote the popularization of sports among young people. [7; 10].

Purpose of the study: to evaluate the effectiveness of the proposed training methodology for the development of flexibility in the hip joints in children 5-8 years old, engaged in the initial group of special physical training in rhythmic gymnastics.

Material and Methods of research

The research was carried out on the basis of KhDYuSSh № 1, Kharkov. The survey involved 16 gymnasts of the initial group of special physical training in rhythmic gymnastics at the age of 5-8 years, they were randomly divided into two groups: the main group (MG) - 8 gymnasts who were engaged in the author's training method, and the control group (CG) - 8 gymnasts who were engaged in a standard training method. Training in both groups was carried out three times a week for 1,5 hours.

The primary and repeated examination in the MG and CG of the female gymnasts was carried out on the 1st and 22nd days of training.

To determine passive and active flexibility in the hip joints in both groups, we used the test "Split from a gymnastic bench" and "Raising the leg up, lying on the back" by L. Karpenko, I.A. Viner, V.A. Savitsky (2007) [5].

Test 1. "Performing a split from a gymnastic bench" (assessment of passive flexibility in the hip joints). Testing: 1 - from the right leg, 2 - from the left leg, 3 - transverse split. Score: the maximum score of the test is 5 points. Points were awarded in accordance with Table 1.

Table 1

Assessment of passive flexibility in the hip joints according to the results of the test "Split from a gymnastic bench"

Evaluation criteria	Points	Performance level
Execution on the floor, the distance to the floor is 15 cm or more	1	low
Execution on the floor, the distance to the floor is from 15 cm to touching the floor	2	
Perfect execution on the floor	3	average
Firm touch of the floor with the thigh, the middle of the foot is on the bench	4	high
Thigh firm contact with the floor, heel is on the bench	5	

Test 2 "Raising the leg up, lying on the back" (assessment of active flexibility in the hip joints). Carrying out the test: starting position - lying on your back, raise your right (left) leg up, without lifting the pelvis from the floor. Within 3 seconds. Assessment: the distance from the back of the foot to the floor is measured (cm), the maximum test score is 5 points. Points were awarded in accordance with Table 2.

Table 2

Evaluation of active flexibility in the hip joints according to the results of the test "Raising the leg up, lying on the back"

Evaluation criteria (cm)	Points	Performance level
40 or more	1	low
35	2	
30	3	average
25	4	
from 20 to less	5	high

Results of the research

Flexibility is the ability to perform movements with greater amplitude. Distinguish between: active flexibility, achieved by the tension of one's own muscles, and passive, which is carried out due to external forces (body weight, partner efforts, the use of simulators, etc.).

Complex motor activity does not provide individual physical qualities in their pure, isolated form. A combination of various physical qualities is at work almost everywhere. At the stage of initial training for the performance of competitive compositions, it is necessary to master the elements that require the manifestation of various types of flexibility: passive and active [2; 9].

According to M.A. Godik, passive flexibility is determined by the very amplitude that can be achieved due to external force. Its value should be the same for all measurements, only in this case it is possible to obtain an objective assessment of passive flexibility [3]. The value of passive flexibility is determined at the moment when the action of an external force causes a painful sensation. Thus, the indicators of passive flexibility are heterogeneous and depend not so much on the state of the muscular and articular apparatus, but also on the athlete's ability to endure unpleasant sensations for a while. Therefore, it is important to motivate him so that he does not stop the test when the first signs of pain appear.

Much attention is paid to the development of active and passive flexibility in rhythmic gymnastics. Yu.V. Menchen, L.V. Volkov, V.M. Platonov, K.P. Sakhnovsky believe that the load when performing exercises with passive stretching is the same, in static positions it is greater than in swing positions. Therefore, different exercise dosages are needed. [6].

General fatigue during exercise reduces the range of motion, reduces the effectiveness of the exercise. If exercises are performed with weights, its weight should not significantly reduce the speed of swings or springy movements (encumbrances should not exceed 2-3% of the athlete's body weight). The conditions for performing movements are greatly facilitated by the use of a support.

The balance of work aimed at developing active versus passive flexibility within the annual cycle varies. In the early stages of the training year, the means of developing passive flexibility prevail, which is the basis for further work on the development of active flexibility. In the future, the volume of exercises that contribute to the development of active flexibility increases.

The use of exercises for the second stage of the development of flexibility is based on the same methods and the development of strength. The basic principle is the principle of repeated efforts with maximum stress in all operating modes: slow, fast and static. These exercises are much more stressful than passive exercises. Therefore, the number of repetitions and the number of approaches decreases, the duration of rest between sets increases and the content of rest changes.

The use of forced stretching has an undoubted advantage over other methods of developing passive mobility in the joints, however, in the development of an active form of flexibility in all directions, active and mixed training modes are much more effective [8]. At the same time, forced stretching, which provides the greatest (anatomically possible) mobility in the joints, carries both pain and an increased risk of injury.

V.M. Platonov, K.P. Sakhnovsky believe that in order to maintain mobility in the joints, you need to give them "work" every day. A set of exercises that develop active flexibility, as well as active-static strength exercises that require maximum flexibility, are used no more than 3 times a week, exercises that contribute to the development of passive flexibility can be performed daily [6].

Table 3

Results of the primary study of passive and active flexibility in the main and control groups

Test		Surveyed groups		t	p
		MG, n=8	CG, n=8		
Test 1. Assessment of passive flexibility in the hip joints	from the right leg	2,02±0,68	2,07±0,37	0,07	>0,05
	from the left leg	1,83±0,51	1,79±0,69	0,05	>0,05
	transverse twine	1,89±0,91	1,90±1,11	0,09	>0,05
Test 2. Assessment of active flexibility in the hip joints		1,85±0,38	1,89±0,27	0,86	>0,05

According to the results of the primary research, 62,5% of gymnasts had a low level of passive flexibility, 37,5% of gymnasts had an average level of passive flexibility, a low level of active flexibility - 100% of gymnasts (Table 3).

Such results are explained by the development of elasticity of the ligament and muscles in order to maintain themselves in a static position for a certain time, as well as the development of muscle strength in order to maintain the maximum possible range of motion in gymnasts. The psychoemotional sphere of girls aged 5-8 is also not yet able to withstand the load - it is quite difficult for young gymnasts to relax their muscles in order to increase the range of motion.

In order to develop the flexibility of the hip joints of children 5-8 years old, engaged in the initial group of special physical training in rhythmic gymnastics, we proposed an author's training methodology, which included exercises for the development of passive and active flexibility, the motivational part of the methodology, will contribute to the positive emotions of children, increasing attention and interest in the result of training.

Exercises to develop passive flexibility

1. Starting position (s.p.): sitting, legs apart with a tilt, arms up. As you exhale, lower the body to the floor. Return to starting position.

2. S.p.: lying on the left side. Swing with the right leg and left hand simultaneously in front of you: to the side - up to the girth of the lower leg with the hand. Hold positions for 20 s. Repeat on the right side.

3. Split right, left, longitudinal split

4. Splits with an increase in the angle of lifting the leg from the floor - using the first, second rail of the gymnastic wall (depending on the initial level of flexibility) - holding the position: arms up in the hanging for 2 minutes. (Start with 1 minute, gradually increase the exercise time depending on the development of quality).

Exercises to develop active flexibility

1. S.p.: sitting, legs apart, arms in second position. Turning the torso to the right with the right arm to the side, the left arm forward. Touch the floor with your left knee. Return to s.p. Repeat the exercise in the opposite direction.

2. S.p.: sitting, legs apart with a tilt, arms up. Accept the position. The emphasis is sitting down - put your hands on the floor at a distance of 15-20 cm from the socks, transfer your body weight evenly to your arms and legs, keep your head straight. Take the position: standing up, bent over - from the crouching position, tilt the torso forward as much as possible and bring it closer to the hips, legs straight, put your hands on the floor with your palms at the level of the toes, look at the toes. Return to starting position.

3. Perform the exercise in pairs: S.p: positions opposite the partner, sitting, legs apart, alternately leaning backward - tilt the partner forward with spring movements.

4. S.p.: standing at the gymnastic wall, hold on to it with your hand. Swing the leg forward, backward, sideways-up with maximum amplitude. When performing movements, return the foot outward, keep the body and head straight.

5. S.p.: standing at the gymnastic wall, hold on to it with your hand. Movement of the leg forward, backward, side-upward using weights.

6. S.p.: Lying on your back, arms up, lifting the torso, sitting position, legs apart with a tilt, return to s.p. breathing is arbitrary.

Activities aimed at increasing joint mobility should be done every day. To maintain flexibility at the level already achieved, you can reduce the number of sessions to 2-3 per week. At the same time, it is possible to reduce the volume of stretching exercises in each training session. It is advisable to perform all passive movements in 3-4 sets, each of 10-40 repetitions. Static positions are held for 6-10 s in 3-4 approaches. Relaxed hangs are performed for 30 seconds in 2-3 sets. The average pace when performing active exercises is one repetition per 1 s, when performing passive exercises - one repetition per 1-2 s, holding static positions - for 20-30 s. The duration of the lesson is from 20-30 to 45-60 minutes.

In order to increase interest in training in young gymnasts and the acquisition of the first competitive skills, it is advisable to use additional means and methods of training.

Motivational part of the methodology

– *Assessment of the quality of training.* The result of each gymnast's training is assessed by the trainer not by a grading system, but by issuing "stickers" that correspond to the degree of activity in the class: the one who showed himself better in the training session is given the opportunity to choose the sticker first, independently. For those who have shown themselves not obedient and diligent enough, the coach chooses the sticker. It is important to take into account that in the selected group, gymnasts have different levels of flexibility development, at the stage of initial training, technical skills are still poorly developed, therefore, first of all, obedience, efforts of the gymnast are assessed, regardless of the initial level of flexibility. In the group of gymnasts 7-8 years old, instead of stickers, you can include a grading system (1-5), include the first technical skills in the assessment.

– *Selected to demonstrate exercises to the most diligent athletes.* To show each subsequent exercise, the coach chooses a new gymnast, who performs the exercises very diligently, makes every effort. Gives the development of the first competitive skills, the desire of gymnasts to perform exercises with high quality.

– *Learning dance in a group.* To keep the gymnasts interested by the end of the workout (depending on the level of fatigue), the trainer chooses dance moves and music that the children will perform at the end of the lesson.

As a result of a three-week flexibility training, the indicators of active and passive flexibility of athletes of both groups improved significantly, it can be noted that some gymnasts achieved a high level of flexibility, according to the test results, due to the acquisition of the ability to achieve the greatest mobility and elasticity of the ligaments due to relaxation of the thigh muscles. The level of active flexibility increased only to the average level in almost all gymnasts, which is associated with the development of strength qualities. Thus, during the second

study, a statistically significant improvement in the indices of active and passive flexibility was observed in the main group, compared with the primary one. In the control group, we also observed an improvement in the studied parameters during the repeated study, compared with the results of the primary study (Table 4).

Table 4

Results of the primary and repeated study of passive and active flexibility in the main and control groups

Tests		Research periods		t	p
		Primary study	Repeated study		
Main group, (n=8)					
Test 1	from the right leg	2,02±0,68	4,2±0,62	2,37	<0,05
	from the left leg	1,83±0,51	4,0±0,65	2,63	<0,05
	transverse twine	1,89±0,91	4,1±0,90	1,72	>0,05
Test 2	Assessment of active flexibility	1,85±0,38	3,7±0,50	2,95	<0,05
Control group, (n=8)					
Test 1	from the right leg	2,07±0,37	3,1±0,66	1,36	>0,05
	from the left leg	1,79±0,69	2,9±1,12	0,84	>0,05
	transverse twine	1,90±1,11	3,0±1,0	0,74	>0,05
Test 2	Assessment of passive flexibility	1,89±0,27	3,1±0,82	1,55	>0,05

When comparing repeated test results in the MG and CG, we observed statistically significant better results of the study of active and passive flexibility in the hip joints in the main group, compared with the control group, which indicates a more effective effect of the proposed training method on the development of active and passive flexibility ($p<0,05$) (Table 5).

Table 5

Results of a repeated study of passive and active flexibility in the main and control groups

Tests		Surveyed groups		t	p
		MG, n=8	CG, n=8		
Test 1. Assessment of passive flexibility in the hip joints	from the right leg	4,2±0,62	3,1±0,66	1,19	>0,05
	from the left leg	4,0±0,65	2,9±1,10	0,86	>0,05
	transverse twine	4,1±0,90	3,0±1,0	0,82	>0,05
Test 2. Assessment of active flexibility in the hip joints		3,7±0,50	3,1±0,82	0,63	>0,05

For the development of active flexibility, it is advisable to include in the training methodology combined exercises that develop all components of mobility in the hip joints, as well as exercises of a dynamic nature and strength exercises.

To achieve a high level of quality development, passive exercises are not very effective. A significantly greater effect is achieved when an active mode with weights is used in training, as well as a mixed mode of muscle work. The use of forced stretching has an undoubted advantage over other methods of developing passive mobility in the joints, however, in the development of an active form of flexibility in all directions, active and mixed training modes are much more effective. At the same time, a noticeable improvement occurs when, together with an active regimen, forced stretching is used, which provides the greatest (anatomically possible) mobility in the hip joints by relaxing the muscles and increasing the elasticity of the ligaments. [8].

Conclusions / Discussion

Analysis of literary sources showed that passive exercises are ineffective to achieve a high level of flexibility development. A significantly greater effect is achieved when an active mode with weights is used in training, as well as a mixed mode of muscle work.

For the development of active flexibility, it is advisable to include in the training methodology combined exercises that develop all the components of mobility in the hip joints, exercises of a dynamic nature and strength exercises. In training, it is advisable to use an active mode with weights, as well as a mixed mode of muscle work in combination with forced stretching, which provides the greatest (anatomically possible) mobility in the hip joints. A set of exercises that develop active flexibility, as well as active-static strength exercises that require maximum flexibility, are used no more than 3 times a week, exercises that contribute to the development of passive flexibility can be performed daily.

The motivational part of the methodology stimulates the gymnasts to receive positive feedback from the group, thereby arouses the desire to get the best result and allows to increase the effectiveness of training.

The introduction of the author's training methodology helped to improve the indicators of active and passive flexibility in the hip joints, due to the inclusion of combined exercises that develop all components of mobility in the hip joints, as

well as exercises of a dynamic nature and strength exercises in combination with forced stretching.

Prospects for further research. It is promising to develop preparatory exercises for gymnasts in order to prevent injuries while increasing the flexibility of the hip joint.

Conflict of interest. The authors note that no conflict of interest may be perceived to be detrimental to the impartiality of the article.

Sources of funding. This article didn't receive financial support from the state, public or commercial organizations

References

1. Aiunts, L. R. (2008), Gymnastics. Zhytomyr, 62 p. (in Ukr.).

2. Vlasova, O. P. (2011), The development of flexibility in teaching elements without a subject at the stage of initial training in rhythmic gymnastics: author. dis. Cand. ped. sciences. Omsk, 23 p. (in Russ.).

3. Godik, N. A. (1988), Sports metrology. Moscow, 191 p. (in Russ.).

4. Gumenyuk, S. V. (2020), Sports injury and its prevention. Ternopil, pp. 66-69. (in Ukr.).

5. Karpenko, L. A., Viner, I. A., & Sivitskiy, V. A. (2007), Methods for assessing and developing physical abilities among those who go in for rhythmic gymnastics. Moscow, pp. 19-20. (in Russ.).

6. Menkhin, Yu. V., & Volkov, A. V. (1980), Beginning of gymnastics. Kiev, pp. 58-62. (in Russ.).

7. Platonov, V. N.,& Sakhnovskiy, K. P. (1985), Training of a young athlete. Kiev, pp. 173-190. (in Russ.).

8. Puhach, N. V. (2017), Theory and methods of development of physical qualities in choreography. Lviv, pp. 3-13. (in Ukr.).

9. Bilokopytova, Zh. A., Nesterova, T. V., Deriuhina, A. M., & Bezsonova, V. A. (1999), Rhythmic gymnastics: Curriculum for CYSS, SDYUSHOR, SHVSM,

RNMK, State Committee of Ukraine for Physical Culture and Sports. Kyiv, 48 p. (in Ukr.).
10. Development of flexibility at the initial stage of training in rhythmic gymnastics (2015), URL: https://cyberleninka.ru/article/n/razvitie-gibkosti-na-etape-nachalnogo-obucheniya-v-hudozhestvennoy-gimnastike. (in Russ.).
11. Ávila-Carvalho L., Klentrou P., Palomero M. d. L., Lebre E. (2014), "Body composition profile of elite group rhythmic gymnastics", Science of Gymnastics Journal, Vol. 4, No. 1, pp. 21-32. (in Eng.).
12. Carvalho L. A., Klentrou P., Lebre E. (2012), "Handling, throws, catches and collaborations in elite group rhythmic gymnastics", Science of Gymnastics Journal, Vol. 4, No. 3, pp. 37-47. (in Eng.).
13. Fortios M., Miltiadis P., Eirini A., Andromahi S. (2012), "Dynamic Balance in Girls Practicing Recreational Rhythmic Gymnastics and Greek Traditional Dances", Science of Gymnastics Journal, Vol. 5, No. 1, pp. 61-70. (in Eng.).
14. Gallahue D. L., Ozmun J. C. (2006), Understanding Motor Development (Infants, Children, Adolescents, and Adults). New York: McGraw-Hill, 125 p. (in Eng.).
15. Kosmidau E., Giannitspoulou E., Proios M. (2015), "Perceived locus of control in rhythmic gymnastics by coaches and judges", Sport Science Review, Vol. XXIV, No. 1-2, pp. 89-102. (in Eng.).
16. Wang Z. (2016), "Proprioception influence on rhythmic gymnastics sport skill formation based on physiology theory", Journal of Chemical and Pharmaceutical Research, Vol. 1, pp. 57-61. (in Eng.).

Received: 04.08.2021.
Published: 31.08.2021.

Information about the Authors

Katerina Somova: PhD (Medicine); Kharkiv State Academy of Physical Culture: Klochkovskaya str. 99, Kharkiv, 61058, Ukraine.

ORCID: http://orcid.org/0000-0002-7174-2373

E-mail: kvsomova@gmail.com

Tetiana Yemets: Kharkiv State Academy of Physical Culture: Klochkovskaya str. 99, Kharkiv, 61058, Ukraine.

ORCID: http://orcid.org/0000-0002-7796-2318

E-mail: tany59034@gmail.com

Yuliya Kalmykova: PhD (Physical Therapy), Associate Professor; Kharkiv State Academy of Physical Culture: Klochkovskaya str. 99, Kharkiv, 61058, Ukraine.

ORCID: http://orcid.org/0000-0002-6227-8046

E-mail: yamamaha13@gmail.com

Serhii Kalmykov: PhD (Medicine), Associate Professor; Kharkiv State Academy of Physical Culture: Klochkovskaya str. 99, Kharkiv, 61058, Ukraine.

ORCID: http://orcid.org/0000-0002-6837-2826

E-mail: srgkalmykov@gmail.com