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Development study determining motor qualities in rhythmic gymnastics. Mobility and coordination in gymnasts 10-12 years old

Anca Maria SABĂU¹, Bianca SĂVESCU^{2*}, Codruț BULZ¹, Mirela DAMIAN³,
Dragoș SĂVESCU¹

1. University of Oradea, Department of Physical Education, Sport and Physical Therapy, 1st University street, 410087, Oradea, Romania, e-mail: sabauancamaria@yahoo.com, bulz.codrut@gmail.com, savescudragos@yahoo.com
2. Winnie Academy Secondary School, 13 Primariei street, 410209, Oradea, Romania, e-mail: jurcabinca06@yahoo.com
3. Ovidius University of Constanta, Faculty of Physical Education and Sport, Department of Physical Education, Sport and Kinotherapy, 1st Universitatii Alley, 900470, Cosntanta, Romania, e-mail: mireladamian13@gmail.com

* *Corresponding author*

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Abstract: Rhythmic gymnastics is one of the sports that educates one of the basic components of physical beauty, also falling into the category of technical-combination sports. Achieving a high performance in rhythmic gymnastics is a complex process, which requires a comprehensive approach to the development of motor qualities and specific skills. In particular, two fundamental motor qualities, addressed in the paper, are essential for achieving success in this discipline: joint mobility and muscle elasticity, as well as coordination of body segments. Thus, through the appropriate introduction and implementation of specific exercises in the rhythmic gymnastics training of performance athletes, we highlighted the importance, the beneficial and essential effect in improving sports performance. The purpose of the research is to evaluate and analyze the impact of the means used in training on the development of mobility and coordination of gymnasts. The obtained results underline the positive influence of exercises on sportswomen's performances and through the planning and proper implementation of exercises in training, a holistic and sustainable development of athletes in their sports activities can be ensured.

Keywords: rhythmic gymnastics, mobility, coordination. physical training, motor skills

Introduction

Rhythmic Gymnastics (RG) is a form of gymnastics that developed as a sports discipline and took shape in the world competitive arena at a relatively recent date, namely in the second half of the 20th century. Thus, the success of RG over the years led to the transformation of a form of education for expression and rhythm, initially addressed exclusively to the female side, into an Olympic discipline with a well-defined status (Macovei, 2007). As an object of study in the field of motor activities, RG aims primarily at the development of coordinative capacities and suppleness. Everything appears as a dance accompanied by juggling in which the object becomes an extension in space of the body segments. In this context, the dominant factors from a motor point of view are motor control, coordination, suppleness, and expressiveness (Purenović-Ivanović et al., 2016; Sabau et al., 2022; Tincea and Balint, 2023).

The essence of rhythmic gymnastics lies in the ability of gymnasts to express themselves through elegant and graceful movements, turning technical elements into a true artistic performance. We can say that the key areas of development in rhythmic gymnastics are flexibility, grace, balance, strength, agility and coordination and progress is achieved through intensive, dedicated, and sustained training (Honchar et al., 2022). The gymnasts are guided by specialist coaches who guide and encourage them to develop their skills and artistic talent.

It can be considered that RG is an art in which the athlete has the opportunity to capture the public's interest by using her suppleness, coordination and strength in an original and creative way, because it offers the autonomy of movement of the locomotor apparatus, suppleness is one of the most important determining factors for the manifestation of the other motor qualities (Macovei, 2007; Cristea, 2017; Sampaio et al., 2023).

The young age of the gymnasts offers the best period for influencing coordination factors, being of maximum receptivity (Sandra et al., 2022; Savescu and Sandra, 2023; Bulz et al., 2023). At the same time, the influences of these factors being essential for learning technique, their development at this age will create the premises for future technical performances later on (Moraru, 2007). For competitive success and identifying potential talent in RG, the main motor capacities are flexibility, strength, coordination, rhythm, balance, agility and endurance (Laffranchi, 2001; Douda et al., 2008).

Most RG specialists see flexibility as a fundamental motor ability for this sport (Moraru, 2016). Bonaccorso (2001) defines coordination as the ability to plan, control and regulate our movement to achieve a goal. Motor games and activities in the form of games are an effective teaching method to increase psychomotor coordination (Thies and Travers, 2006; Popović et al., 2017).

An effective training program for children and adolescents must take into account the psycho-physical peculiarities of each age group, in order to focus on and exploit to the maximum the motor learning skills specific to the age (Ricotti, 2011; Papp et al., 2019; Erdely et al., 2020).

The motor qualities, joint mobility and coordination are a factor of progress in terms of the artistic performance offered by the gymnasts during the competition. In this context, the study aims to increase the level of physical training from the perspective of the two motor qualities: mobility and coordination, on the rhythmic gymnastics section for the age category 10-12 years, within the Bihorul Oradea High School with Sports Program.

Materials and methods

The subjects involved in this study were 10 performance gymnasts aged between 10-12 years, who actively participated in this research for a period of 3 months with a number of 5 trainings per week, and during the competitive period 6 trainings per week 4 hours of training/day. Exercises for the development of mobility were introduced in each training session after the specific warm-up and exercises for the development of coordination were introduced in two training days/week. The tests used were the coxo-femoral and spine mobility test, the general coordination test with specific objects and the Denisiuk test.

The coxo-femoral and vertebral column mobility test aims to evaluate coxo-femoral and vertebral column mobility. This being measured in the coxo-femoral joint by measuring in centimeters the distance between the pelvis and the ground in the lateral chord and the sagittal chord. In case of exceeding an angle of 180°, the distance between the ankle and the ground was measured. To find out the degree of mobility of the spine and shoulder girdle, the upper bridge was performed by measuring the distance between the heels and the palms, with the legs closed and extended.

The general coordination test, with specific objects consists of a skill circuit in a specific resistance mode (ribbon, rope, ball). On line 1, running is performed with the winding of the ribbon in a horizontal plane above the head. From line 2 to line 3, jumps are performed (right and left foot alternately) over the rope with the back and the rotation of the rope backwards. From line 3 to line 4, running is performed with a small release of the ball from one hand to the other. On line 4, run with the ricochet of the ball (2 ricochets with the right hand and 2 with the left hand). It is evaluated in grades from 1-10 TO, each escape of the object or each interruption during the test that can change the technique of the movements is penalized with one point, the number of lines covered in 1'30 is also noted, the lines

covered incompletely were expressed as follows: up to a quarter of a line 0.25, up to a half 0.5 and up to three quarters 0.75.

The Denisiuk test aims to assess general coordination. The test consists of running 5m, going around a flag 360 degrees, running, rolling forward, running, going around the second flag 180 degrees, running in bent support, rolling forward, going around the flag 360 degrees and arriving at the place where He left. The mattress is arranged in the middle of the distance between the two flags. The return route measures 30m and is timed.

Exercises used in training to develop mobility and coordination

During the research period, the specific warm-up also included elements for the development of coordination, which consisted of the introduction of exercises with tennis balls (Figure 1), such as:

- from standing, with a ball in each hand, alternately releasing the balls;
- from the stand, with the ball in hand, catching the ball under the thigh or under the hand;
- from the stand, with a ball in each hand, one ball is kept in balance, and with the other one successive hits are executed on the ground;
- from the stand, hitting the ground simultaneously with 2 tennis balls;
- running with catching balls vertically (juggling).



Figure 1. Exercises for the development of coordination

After finishing the specific warm-up, it was continued with the mobility development exercises that were introduced in each training during the research. The time allotted for this part of the lesson was 20-30 minutes.

Thus, for the development of mobility, exercises were performed on a fixed bar, exercises that consisted of leg swings forward-side-back, leg swings in Ponche, leg swings in the bridge, maintaining certain positions with a high degree of stress on joint mobility for one minute "Grand Ecart, Panche". Most of the exercises for the development of spinal mobility in particular were performed on a fixed scale (Figure 2), most of the exercises being based on trunk extension "Cambres".



Figure 2. Exercises for the development of mobility

Subjects performed exercises to develop joint mobility and muscle elasticity using a bench or chair (Figure 3). Holding the string position on the bench or chair was the most used exercise for developing coxo-femoral mobility. (the duration of holding the positions was a minimum of 2 minutes).



Figure 3. Exercises for the development of mobility

The training continued with coordination development exercises that mostly consisted of exercises with objects specific to this sport, such as: exercises with the simultaneous handling of 2 specific objects at the same time (Figure 4).



Figure 4. Exercises for the development of coordination

Examples:

- from standing, rotating the circle in the sagittal plane with the right hand, simultaneously with releasing the ball forward with the left hand;
- from standing, rotating the circle in the sagittal plane with the right hand, simultaneously making the ricochet of the ball on the ground with the left hand;
- from "Panche", rotating the circle on the paw of the left foot, simultaneously with the ricocheting of the ball on the ground with the right hand;
- from standing, right arm up, rotating the rope above the head, simultaneously with the ricocheting of the ball on the ground with the left hand;
- from standing, detaching a club with the right hand, simultaneously with the ricocheting of the ball on the ground with the left hand;
- from standing, launching a club in the sagittal plane with the right hand, simultaneously with the rotation of the circle in the sagittal plane with the left hand.

Results and discussions

During the three months in which the two specific training programs for the development of mobility and the development of coordination were implemented in

the gymnasts' training, two tests were also performed (final test, initial test), and after them we obtained the following results.

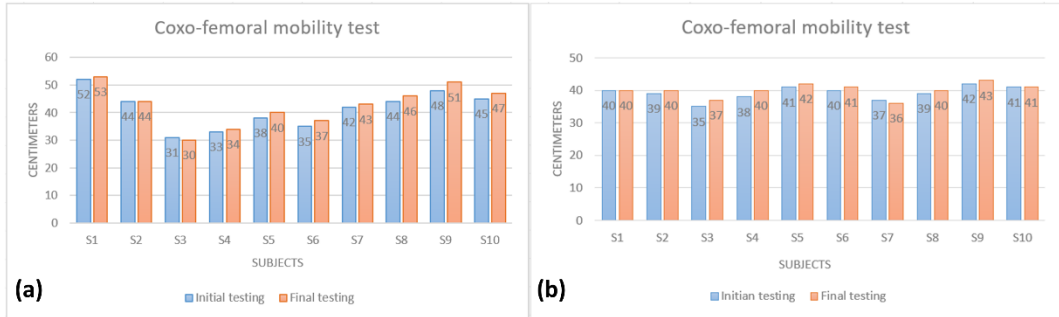


Figure 5. The results obtained by the gymnasts at the initial testing and the final testing at the coxo-femoral mobility test (*a* – right foot; *b* – left foot)

In the coxo-femoral mobility test, measurements were made on both the right and left leg (Figure 5), because it is important for the gymnast to have mobility on both the right and left sides due to the large and complex number of exercises that require unilateral mobility. In these tests, the gymnasts received the qualification of "very good" with the expectation of only one gymnast who received the qualification "good". The best result obtained on the right leg was 53 cm, and the one on the weak one was 30 cm. On the left leg, the best result was 43 cm, and the worst 36 cm.

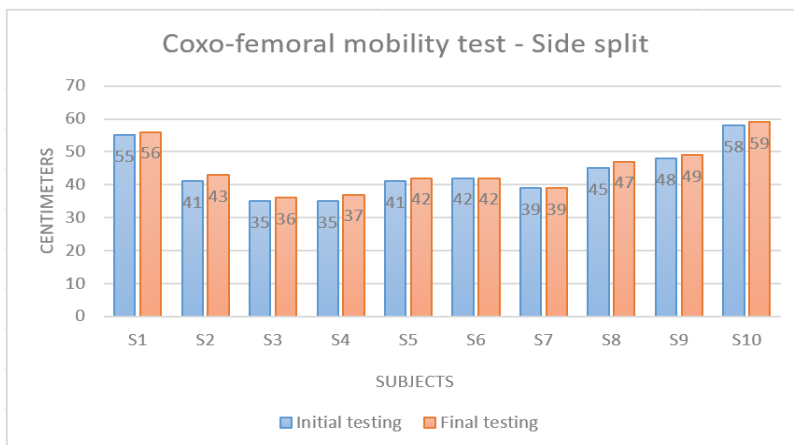


Figure 6. The results obtained by the gymnasts at the initial and final testing of the coxo-femoral (lateral) mobility test

In the lateral cord coxo-femoral mobility test, the best result recorded was 59 cm, and the worst 36 cm, these results being obtained at the final test (Figure 6).

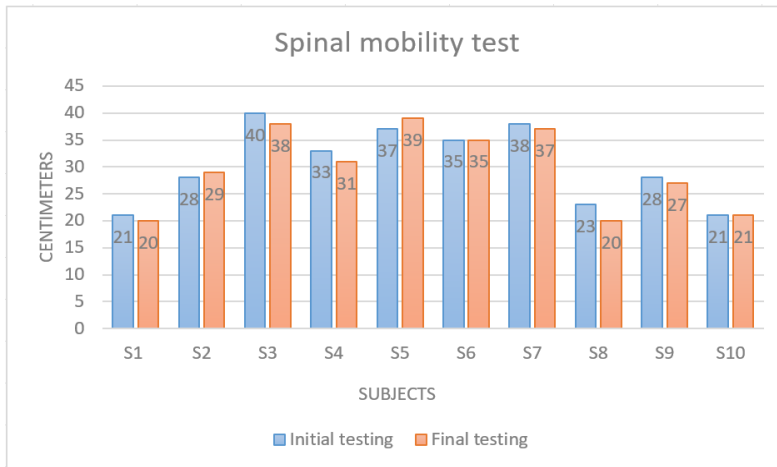


Figure 7. The results obtained by the gymnasts at the initial testing and the final testing at the spine mobility test

In rhythmic gymnastics, this type of mobility is often found in high-amplitude exercises, due to the spectacularization that this motor quality offers. During the performance tests, it was found that some of the gymnasts did not achieve the best results, 5 of them obtained the qualification of "good", and the rest of the gymnasts obtained the qualification of "very good". The best result recorded was 20 cm, and the worst was 39 cm, these results being obtained at the final test (Figure 7).

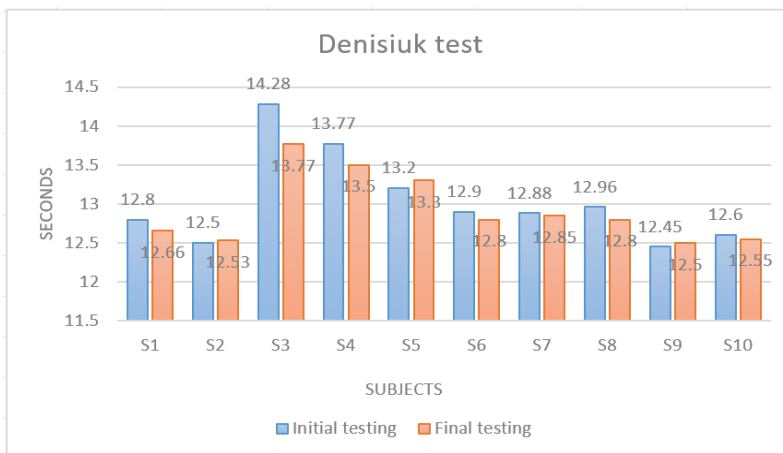


Figure 8. The results obtained by the gymnasts at the initial testing and the final testing at the Denisiuk test

The Denisiuk test assesses general coordination ability. In rhythmic gymnastics, the movements that make up this test are found quite often, especially during the throwing of objects. Together with the gymnasts' trainer, we noticed that

the results could be more satisfactory, due to the lightness with which they perform the rolls, but nevertheless the results were satisfactory (Figure 8). The best result was 12.50 sec, and the worst was 13.77 sec, these results being obtained in the final testing.

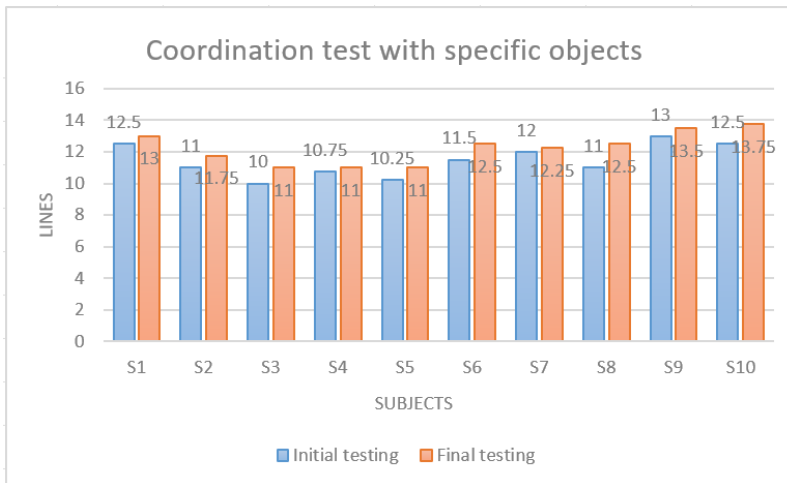


Figure 9. The results obtained by the gymnasts at the initial testing and the final testing at the coordination test with specific objects

The coordination test with specific objects evaluates the gymnast's coordination with the object, being considered one of the basic components of this sport. TO was also noted, because most of the gymnasts, out of a desire to achieve as many lines as possible, no longer focused on handling the objects, which was a negative transfer in the progress we wanted to achieve. In this test, most of the gymnasts did very well, due to this fact the best result was 13.75 lines, and the worst result was 11 lines (Figure 9).

Conclusions

The aim of this study was to evaluate and analyze the effect of 12 weeks of training in performance gymnasts on mobility and coordination by introducing specific exercises into the training. The main findings were that the training evoked an increase in the coxo-femoral mobility value and the spine as well as an improvement in the coordination of the gymnasts. Following the implementation of the proposed program for the development of motor skills, mobility, and coordination, and following the results obtained, we can affirm the fact that the approach to the training of gymnasts in this age category is correct.

In conclusion, the research highlights the fact that the hypothesis according to which the effectiveness of the means used in children aged between 10-12 years,

leads to the development of coordination capacities and mobility has been confirmed.

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