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RHYTHMIC GYMNASTICS IMPROVES SOME COMPONENTS
OF THE COORDINATION ABILITY

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Abstract

Rhythmic gymnastics is a sports discipline practiced as both a high-performance sport and a mass sport. However, we also want it to become, in Romania, an adapted sport for people with various impairments, especially sensory ones (visual impairments). The purpose of this research is to develop some components of the coordination ability in visually impaired children through psychomotor actions performed with a series of apparatus (rope, hoop and ball) specific to rhythmic gymnastics. The following scientific research methods were used: documentation, case study, observation, statistical processing of the results and their graphical representation. The research included the following stages: stage 1 – performing an initial evaluation that consisted of a number of tests; stage 2 – applying some physical exercises with 3 of the 5 hand apparatus specific to rhythmic gymnastics (rope, hoop and ball); stage 3 – performing a final evaluation to assess the response of the coordination ability components (evolution/ involution/ stagnation) in the studied subjects; stage 4 – drawing conclusions. The evaluation of subjects was based on the hand-eye coordination test and the spatial-temporal orientation test. The findings demonstrate the progression of two components of the coordination ability after the visually impaired students have learned to handle the three apparatus included in the research.

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1. Introduction

Rhythmic gymnastics involves physical exercises performed with specific hand apparatus, which engage the components of the coordination ability. This sports discipline is mainly practiced by women, but lately, people of male gender have also shown a growing interest in this activity.

Worldwide, rhythmic gymnastics is practiced as a mass sport, performance sport and adapted sport. In some European countries, this sports discipline is included in the school curriculum and is successfully used to improve the psychomotricity of children with various disabilities (Macovei, 2007).

2. Problem Statement

Impairment is defined as “the loss of mental or physical function resulting from the disorder of an organ or a body segment, which hinders the functionality and development of the activity at a normal level” (Enăchescu, 2004, p. 31).

Impairments are systematised into three large categories: mental, sensory and motor ones (Cordun, 2009).

The category of sensory impairments includes visual and hearing impairments, as well as those associated to both of them (Teodorescu, Bota, & Stănescu, 2003).

The World Health Organization (WHO) states that the term “visual impairment” makes reference to either the decrease in visual acuity (amblyopia) or the loss of it (Smith, Frick, Holden, Fricke, & Naidoo, 2009).

It has been demonstrated that a decrease in the visual analyser function in visually impaired people is compensated for by other valid analysers. For example, the practice of rhythmic gymnastics requires complex multisensory (tactile-kinaesthetic, vestibular) information.

3. Research Questions

We believe that performing psychomotor actions with a number of rhythmic gymnastics apparatus (rope, hoop and ball) by children with amblyopia can contribute to the improvement of some coordination components (hand-eye coordination and spatial-temporal orientation) and that this sports discipline should be included into the physical education syllabus of special education units – for visual impairments.

4. Purpose of the Study

The purpose of this research is to develop some coordination components in children with visual impairments through psychomotor actions performed with rhythmic gymnastics apparatus.

4.1. Tasks of the research

- establishing the group on the basis of inclusion and exclusion criteria;
- designing the physical exercise programmes;
- dynamic evaluation of the investigated subjects;
- implementation of the physical exercise programmes;
- drawing conclusions.

4.2. Objectives of the research

- optimising some coordination components;
- developing the psychomotricity of children with visual impairments.

4.3. Hypothesis of the research

Physical exercises performed with the hand apparatus specific to rhythmic gymnastics can improve the hand-eye coordination and spatial-temporal ability of children with amblyopia.

5. Research Methods

The research methods used were the following:

- bibliographic documentation, consisting in the study of materials from the national and international literature on rhythmic gymnastics, visual impairments, coordination abilities, psychomotricity etc.;
- the case study, referring to the small number of subjects participating in the research (9 students);
- observation, which was carried out throughout the activity in order to adapt the proposed means to the momentary capabilities of the subjects;
- data processing, which was achieved using computer products (SPSS V20, Minitab V16, Microsoft Office 2010 – Word and Excel) and statistical tests (Wilcoxon test);
- graphical representation, which was used to highlight the response of the coordination ability components to the applied therapy (evolution/involution/stagnation).

The participating subjects were 9 children in the 3rd grade, attending the courses of a special school named the “Middle School for Visually Impaired” of Bucharest. The research was conducted over a period of 4 months, from December 2014 to April 2015.

Subject selection was based on inclusion and exclusion criteria, as follows:

- Inclusion criteria: visually impaired students (unilateral or bilateral amblyopia; age of the subjects: between 9 and 12 years; regular participation in physical education classes within the education unit; motor and mental capability to perform the proposed activities.
- Exclusion criteria: students diagnosed with total bilateral visual blindness; older or younger age than that of the proposed range (9 to 12 years old); motor and/or mental incapacity to perform the proposed activities.

5.1. Stages of the research

- throughout the month of December, observations were made during the physical education classes in order to know how children with visual impairments used to work;
- at the beginning of January, an initial evaluation was performed through the hand-eye coordination test and the spatial-temporal orientation test;
- between January and April, implementation of the therapeutic programmes including means specific to rhythmic gymnastics through the alternative use of three apparatus (rope, hoop and ball);

- at the end of April, the final evaluation of the two coordination ability components (hand-eye coordination and spatial-temporal orientation) was performed.

After this period, the collected data were processed, analysed and interpreted to highlight the impact of physical exercise programmes performed with the three rhythmic gymnastics apparatus on some components of the coordination ability.

The lessons conducted in the aforesaid period consisted of 11 recovery sessions performed during the physical education classes included into the school timetable, their duration being 50 minutes.

5.2. Subject evaluation

To evaluate the coordination ability components, the following two tests were applied:

1. Hand-eye coordination test, which consisted in the successive throw of three rhythmic gymnastics balls into a space delimited on the ground by a hoop.

Required materials: 3 rhythmic gymnastics balls, a hoop, a stopwatch, a rope

With the rope, the throwing area was delimited. The hoop was placed about 3 meters away from the throwing area.

The subject performed the three throws to reach the target within 60 seconds.

The score was set based on the following scales:

7 points = the target is reached three times by the student (in 3 attempts) and the test time is not exceeded;

6 points = the student performs the 3 throws and all reach the target, but exceeds the 60 seconds;

5 points = the target is reached twice by the student (in 3 attempts) and the time allocated to the test is not exceeded;

4 points = the student performs the 3 throws, but only two reach the target, and exceeds the 60 seconds;

3 points = the target is reached once by the student (in 3 attempts) and the time allocated to the test is not exceeded;

2 points = the student performs the 3 throws, but only one reaches the target, and exceeds the 60 seconds;

1 point = the 3 attempts are unsuccessful (the student cannot reach the hoop placed on the ground), but they are performed within the test time;

0 points = the 3 attempts are unsuccessful (the student cannot reach the target) and exceeds the time limit.

2. Spatial-temporal orientation test

The subject is at point A and sits facing point B. The subject is initiated to cover the 2-m distance between points A and B, which are marked on the ground with coloured chalk.

The test is performed without sensory control (the child is blindfolded with a scarf) in order to obtain valid results.

Required materials: chalk to mark the two points, a scarf, metric tape to measure the distance between the two points

The score was set based on the following scales:

4 points = point B is reached (0 cm);

- 3 points = point B is exceeded or not reached with +/- 25 cm;
- 2 points = point B is exceeded or not reached with +/- 50 cm;
- 1 point = point B is exceeded or not reached with +/- 75 cm;
- 0 points = point B is exceeded or not reached with +/- 100 cm.

It should be noted that the test score scales were developed on the basis of subjects' extreme results (the best and the poorest ones).

6. Findings

The results achieved by three subjects in the hand-eye coordination test are showed below.

The number of failed and successful attempts, as well as the time (in seconds), were assessed in dynamics (initially and finally). Using the above scoring scale, the initial and final scores were calculated for each subject and the entire group (Table 01). The results were statistically processed (Tables 02 and 03).

Table 01. Hand-eye coordination test

Subject	Initial evaluation	Final evaluation
	Score	Score
1	1	3
2	1	1
3	1	3
4	0	1
5	3	5
6	1	1
7	0	1
8	1	1
9	1	3

Table 02. Statistical indicators of the hand-eye coordination test

Statistical indicators	Evaluation	
	Initial	Final
Mean	1.00	2.11
Mean difference (F-I)		1.11
Median	1	1
Standard deviation	0.87	1.45
Coefficient of variation	86.6%	68.8%
Minimum	0	1
Maximum	3	5
Range	3	4

In the final testing, the mean score in the hand-eye coordination test increased by 1.11, from 1.00 to 2.11, the progress achieved being 111.11%. The median had the value 1 in both tests.

The dispersion of the points obtained by the subjects is strongly non-homogeneous in both tests.

The points achieved vary between 0 and 3 in the initial testing and between 1 and 5 in the final testing. The range increased by 1 point in the final testing.

Table 03. Hand-eye coordination test – Wilcoxon test

Wilcoxon test	Results
Z	-2.271
P	0.023
Effect size	0.54

The significance test reveals a value of $p = 0.023 < 0.05$ for $z = -2.271$. The research hypothesis is accepted, the progress achieved being statistically significant. The effect size index (0.54) shows a large to very large difference between the two tests.

Statistical processing indicates that the use of means specific to rhythmic gymnastics by children with amblyopia leads to the improvement of their hand-eye ability. Thus, Figure 01 shows the progress recorded by the investigated subjects between the two evaluations, after applying the physical exercises performed with hand apparatus (rope, hoop and ball).

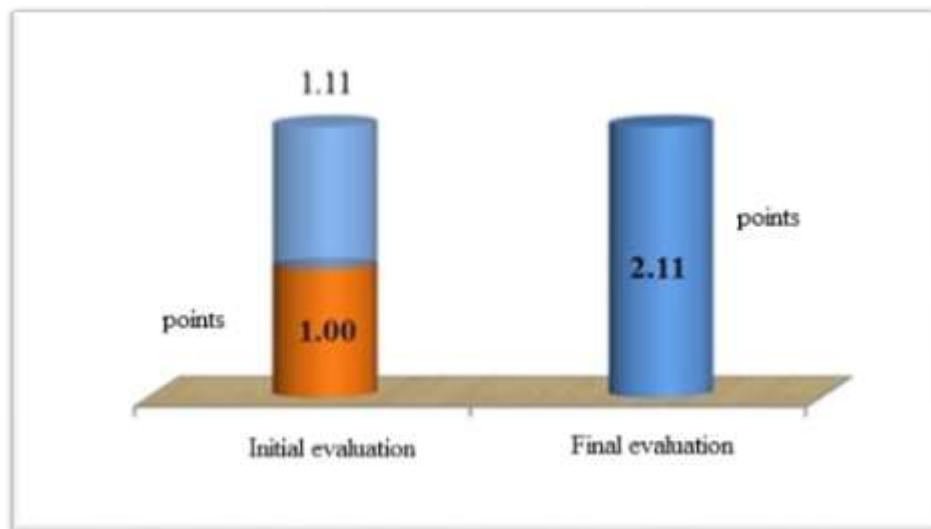


Figure 01. Hand-eye coordination test

The results of children with amblyopia in the spatial-temporal orientation test are showed below.

The distance covered to point B (in centimetres) was assessed in dynamics (initially and finally) (Table 04). The results were statistically processed (Tables 05 and 06).

Table 04. Spatial-temporal orientation test

Subject	Initial evaluation	Final evaluation
	Score	Score
1	3	3
2	2	3
3	0	2
4	3	4
5	2	2
6	0	2
7	2	4
8	2	3
9	2	3

Table 05. Statistical indicators of the spatial-temporal orientation test

Statistical indicators	Evaluation	
	Initial	Final
Mean	1.78	2.89
Mean difference (F-I)		1.11
Median	2	3
Standard deviation	1.09	0.78
Coefficient of variation	61.5%	27.1%
Minimum	0	2
Maximum	3	4
Range	3	2

In the final testing, the mean score in the spatial-temporal orientation test increased by 1.11, from 1.78 to 2.89, the progress achieved being 62.50%. The median increased by 1 point in the final testing.

The dispersion of the points around the mean is strongly non-homogeneous in the initial testing and relatively homogeneous in the final testing. In the initial testing, the median value 2 better represents the central tendency.

The points achieved vary between 0 and 3 in the initial testing and between 2 and 4 in the final testing. The range decreased by 1 point in the final testing.

Table 06. Spatial-temporal orientation test – Wilcoxon test

Wilcoxon test	Results
Z	-2.428
P	0.015
Effect size	0.57

According to the Wilcoxon test, the significance threshold p is equal to $0.015 < 0.05$ for $z = -2.428$.

The research hypothesis is accepted, the progress achieved being statistically significant. The effect size index (0.57) shows a large to very large difference between the two tests.

Statistical processing indicates that the spatial-temporal orientation of children with amblyopia is better after applying the therapy programme performed with the three rhythmic gymnastics apparatus. Thus, Figure 02 emphasises the progress recorded by the investigated subjects between the two evaluations.

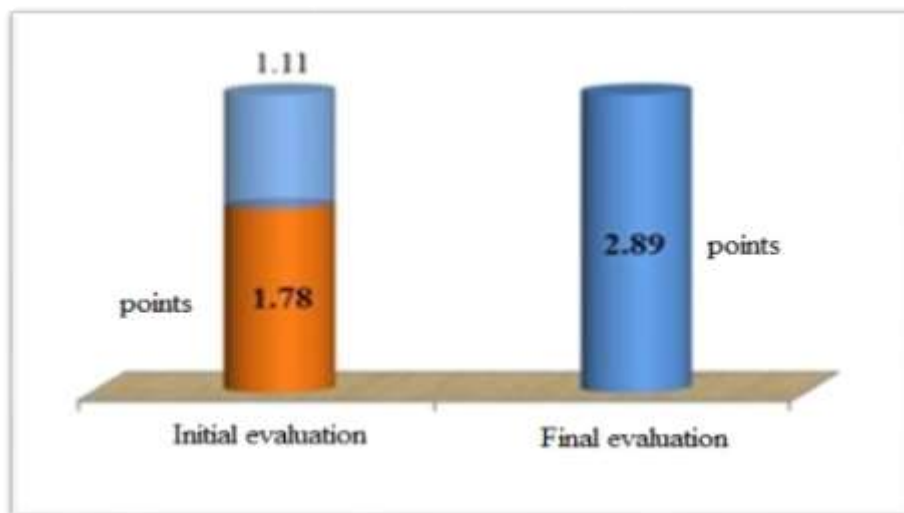


Figure 02. Spatial-temporal orientation test

7. Conclusion

The analysis and interpretation of the obtained data show that the means applied to students with visual impairments can improve their coordination ability, which has been demonstrated by the confirmation of the research hypothesis, according to which physical exercises with the hand apparatus specific to rhythmic gymnastics can improve the hand-eye coordination and spatial-temporal ability of children with amblyopia.

The progress of the coordination ability components that have been studied in this research highlights that the means specific to rhythmic gymnastics can be successfully used during the physical education classes within the special education units.

The effectiveness of the means used is supported by the achievement of the proposed goal after applying the physical exercises performed with three of the five hand apparatus specific to rhythmic gymnastics (rope, hoop and ball).

We think that this sports discipline can be included into the physical education syllabus of special education units – for visual impairments, because it has direct consequences on the psychomotricity of visually impaired children.

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