

The importance of coordination in the world of motion

ANCA IORGA¹

¹Faculty of Physical Education, Sports and Physical Therapy, Spiru Haret University

Published online: November 30, 2019

(Accepted for publication: November 15, 2019)

DOI:10.7752/jpes.2019.s6326

Abstract

Problem statement: We base our research on the idea that failing a good coordination, one cannot develop the specific motor skills and accurately perform them towards attaining performance. The research covers a group of rhythmic gymnasts aged 8 – 9 years who test for coordination. We intend to measure the subjects' capacity to learn how to coordinate the manipulation of the apparatuses with their body movements and to determine how fast they learn to reach the desired coordination level.

Purpose: We aim at determining the interindividual differences occurring in similar training conditions during a macrocycle training programme. If the testing reveals good coordinative capacities of the rhythmic gymnasts, then we appreciate that by regular and properly structured learning, they can improve the execution of the competition routine.

Methods: To measure their coordination level, subjects undergo testing, namely the execution of two apparatus difficulty elements consisting in series of 20 repetitions. We will consider the number of successful executions. After learning the required movements (test 1 which assesses the speed of the first execution of the element), the gymnasts are to repeat them, making the proper adjustments in order to produce precise movements towards mastery of execution. After acquiring the desired skills, the subjects undergo retesting.

Conclusions: Coordination may be subjected to a training programme so that rhythmic gymnasts improve their performance provided that there is no discontinuation of the transmission of the nerve impulse to the muscles. However, in order to attain performance, it is important that the athlete starts from a pre-existent above-average level. For rhythmic gymnasts, the ability to learn and perform specific motor skills is a higher step in which the coordinative capacities – including the three basic general capacities – hold a fundamental place. Training the coordinative capacity at the optimum time is a determining factor in terms of reaching performance in rhythmic gymnastics.

Keywords: coordinative capacity, motor performance, movement patterns

Introduction

Rhythmic gymnastics routines reveal the aesthetic and artistic side of the execution which materialises in unity and fluency, bodily elegance and harmonious coordination of body movements, and motor expressiveness. The relationship between body movement and handling of the apparatus is skilfully introduced to the viewer, the object the gymnast manipulates becoming an extension in space of her body segments and, at the same time, a means of motor expression (Macovei, 1999). The manipulation of the apparatus reveals the optimum neuromuscular control of gymnasts which help them achieve movements of great finesse.

We base our research on the idea that failing a good coordination, one cannot develop the specific motor skills and accurately perform them towards attaining performance (Nastase, 2011). The appropriate combination of the sensory and the motor elements results in correct and precise movements leading to an enhanced relationship with rhythmic gymnastics-specific objects and therefore to a better performance on the competition floor. This makes the topic on improving coordination in rhythmic gymnastics world an extremely important one.

Method

A good coordination is the result of practicing the motor skills in order to learn the movement technique in relation to the apparatus manipulation technique. At first, we notice muscle rigidity and a great mental effort in the subjects due to the fact that motor cortex excitation causes the areas not involved in the coordination of the movements of the body segments to be stimulated as well (Nenciu, 2002). This leads to a permanent voluntary control in executing the movements, which will result in permanent correction of the execution that in time will narrow the cortical area responsible for performing the movement. Movement repetition will lead to conditioned reflex reactions and therefore to a more precise movement coordination (Tudor, 2001).

Purpose

If the testing reveals good coordinative capacities of the rhythmic gymnasts, then we appreciate that by regular and properly structured learning, they can improve the execution of the competition routine.

We aim at determining the interindividual differences occurring in similar training conditions during a macrocycle training programme, namely in the January – June 2019 period.

Research subjects

The research covers a group of rhythmic gymnasts aged 8 – 9 years (children who pass from young age gymnasts to 4th category – juniors) who undergo two coordination tests.

The subjects are athletes trained to become competitive, but this is the first year they work with the hoop. At this age, coordinative capacity must be subjected to an intense development programme. This is the stage in which the subjects enhance their capacity to respond to external stimuli, produce gestures with high frequency, learn the correct differentiation of the space and develop coordinative capacity under time pressure.

Research method

To measure their coordination level, subjects undergo testing, namely the execution of two apparatus difficulty elements consisting in series of 20 repetitions. We will consider the number of successful executions. Apparatus difficulty is a required element in the composition of a rhythmic gymnastics routine and is defined as a particularly technically difficult synchronisation between apparatus and body consisting of a minimum one base and minimum two criteria or two bases and one criterion. The two apparatus difficulty elements are part of the competition routines. The motor coordination test is conducted upon training resumption (after winter break) in January. The subjects repeat the test one week before leaving for the Rhythmic Gymnastics Junior National Championship. Therefore, the measurements are conducted solely for the period under research, we do not refer to a standard assessment scale.

We must mention that the subjects undergo appropriate physical training, therefore they possess the requisite strength to execute movements demanding speed and agility. The gymnasts must carefully control the execution speed in order to accurately perform the given task. They also prove good neuromuscular mobility to be able to carry out the required movements and to adapt to the adjustment demands, therefore performing corrections of great finesse. We must also consider that the set of commands constructed at the highest cortical levels may reach the lower centres responsible for executing the movement in an altered form, which may cause the movements to be produced with less precision.

First motor coordination test – small throw of the hoop with one hand and catch of the hoop by rotating it on three body segments (arm, back, arm), an element scored in the Rhythmic Gymnastics Code of Points with 0.30. We appreciate the ability of the subjects to throw the hoop with one hand and to catch it with one hand and the capacity to rotate the hoop on different body segments.

Second motor coordination test – large throw of the hoop with one hand and catch of hoop with the lower limbs, at one fixed spot, outside of visual control while on the floor, body weight is placed on the palms and balls of the feet, arms, legs and back outstretched, head and eyes facing ahead, an element scored in the Rhythmic Gymnastics Code of Points with 0.40. We appreciate the subjects' ability to throw the hoop with one hand and catch it with one hand, to catch the hoop with the lower limbs within visual control at one fixed spot (the knees).

After learning the required movements, namely the two apparatus difficulty elements making the object of the testing (tests 1 and 2) assessing the speed of first execution of the element, the subjects repeat them, making the necessary corrections in order to produce precise movements towards mastery of execution. After a time deemed sufficient for the subjects to develop the motor skills, they undergo retesting in order for us to measure the coordination level achieved (test 2 is conducted within 5 months from the performance of test 1).

Table 1. Test 1 – throwing the hoop with one hand and catching it by rotating it on three body segments

No.	Initials of the subject's surname and first name	January – first execution		June – completed element	
		No. of repetitions	No. of successful executions	No. of repetitions	No. of successful executions
1.	F.E.M.	20	14	20	20
2.	G.L.	20	6	20	15
3.	D.N.A.	20	0	20	5
4.	N.B.	20	16	20	15
5.	O.A.	20	2	20	5
6.	P.E.M.	20	0	20	4
7.	P.S.A.	20	10	20	18
8.	R.M.I.	20	3	20	6
9.	S.A.	20	5	20	19
10.	S.A.M.	20	7	20	17
11.	T.E.	20	14	20	20
12.	V.M.	20	2	20	13

Table 2. Test 2 – throwing the hoop with one hand and catching it with the lower limbs, outside of visual control, while on the floor, body weight is placed on the palms and balls of the feet, arms, legs and back outstretched, head and eyes facing ahead

No.	Initials of the subject's surname and first name	January – first execution		June – completed element	
		No. of repetitions	No. of successful executions	No. of repetitions	No. of successful executions
1.	F.E.M.	20	3	20	18
2.	G.L.	20	0	20	5
3.	D.N.A.	20	0	20	8
4.	N.B.	20	0	20	5
5.	O.A.	20	0	20	7
6.	P.E.M.	20	0	20	4
7.	P.S.A.	20	2	20	17
8.	R.M.I.	20	0	20	6
9.	S.A.	20	0	20	10
10.	S.A.M.	20	0	20	8
11.	T.E.	20	2	20	11
12.	V.M.	20	0	20	14

Results and discussions

We appreciate that gymnasts falling into the same age category as the tested subjects need to refine the accuracy and consistency of the motor skills in order to avoid inappropriate differentiation and deficient movement patterns. As expected, since the subjects selected belong to the competitive group (they possess rhythmic gymnastics skills), we notice a significant improvement of the executions. Obviously, the subjects score differently. Therefore, of the 12 tested children, only 5 participate in the Rhythmic Gymnastics Junior National Championship.

This research aims at determining how fast the subjects learn to coordinate apparatus handling with their body movements. For an accurate assessment, two aspects are considered:

- The development level of the coordinative capacities of the 8–9-year-old, whose brain has the ability to reorganise itself, to adapt to various situations, thus enabling the relatively high development of the coordinative skills. Differentiated inhibition is not adequately developed yet which leads to the predominance of the excitation processes over the inhibition processes. Kinesthetic discrimination is insufficiently developed, that is why precision in execution in terms of space and time orientation is slightly altered.

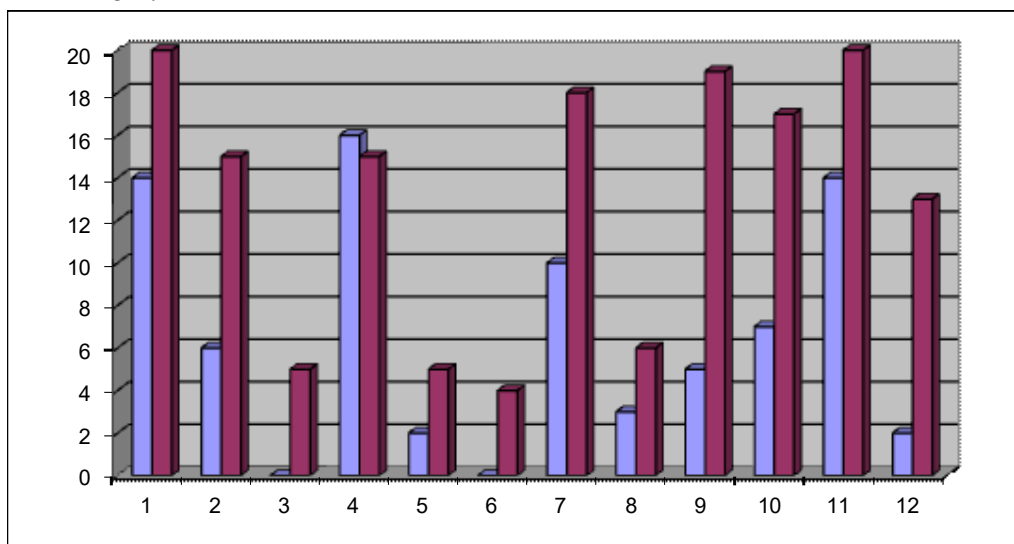


Chart 1. Scores obtained in test 1 – throwing the hoop with one hand and catching it by rotating it on three body segments

- Training assessment. Assessment started at the second half of the school year, upon the beginning of the mesocycle training programme, when the children go from learning the technical elements to practising them. Hoop exercises are 90% completed, the only elements left to be introduced are apparatus difficulty and required risk (throwing the apparatus, performing two movements while apparatus is in the air, with a change of level, and catching the apparatus). The subjects train to participate in the Rhythmic Gymnastics Junior National Championship.

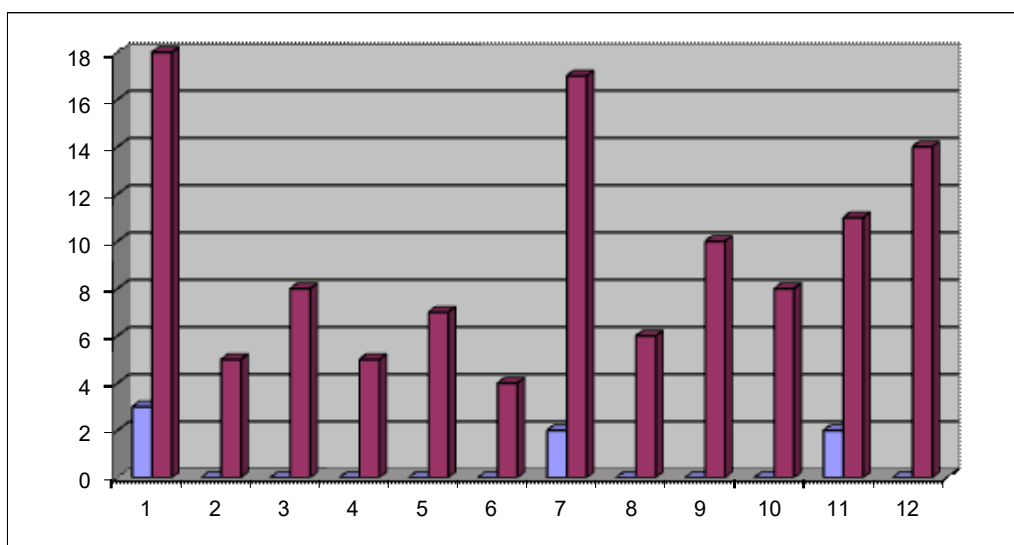


Chart 2. Scores obtained in test 2 – throwing the hoop with one hand and catching it with the lower limbs, outside visual control, while on the floor, body weight is placed on the palms and balls of the feet, arms, legs and back outstretched, head and eyes facing ahead

The scores reveal the following:

- Although the gymnasts undergo the same training, the testing reveals clear differences between them.
- The more complex the apparatus difficulty element, the longer the period necessary to achieve precision in execution and to learn the motor skills, even when the child has learnt additional elements or sequences of movements specific to the respective apparatus difficulty.

Conclusions

Coordinative capacities, often referred to as skilfulness or dexterity, are the result of the mental processes responsible for adjusting and guiding the movements and, essentially, they ensure the coordination of both stereotyped and unpredictable motor actions in an accurate manner and with an economy of effort (Tudor, 1999). Coordination enables the correlation between the central nervous system and the skeletal muscles during movement execution (Netter, 2012). This research addresses the special coordinative capacities in rhythmic gymnasts, for this sport demands a very complex coordination (coordination of the body segments, coordination between body and apparatus, coordination between body and apparatus, on the one hand, and the background music, on the other, and coordination between gymnasts, for group routines) (Macovei, 1999).

In rhythmic gymnastics, it is essential that the athlete executes the movements with the least expenditure of energy. The achievement of this prerequisite depends on the precision of the set of commands conveyed by the brain to the muscles. It is important that the movements, even if not executed identically on each repetition, fall within a limited range of execution. Since the performance is accompanied by music, the movements must be executed with great precision, at high speed, which requires the minimisation of energy expenditure. To sum up, we can state that coordination may be subjected to a training programme so that rhythmic gymnasts improve their performance provided that there is no discontinuation of the transmission of the nerve impulse to the muscles. However, in order to attain performance, it is important that the athlete starts from a pre-existent above-average level. For rhythmic gymnastics athletes, motor learning capacity is a higher step in which the coordinative capacities – including the three basic general capacities (guiding capacity, capacity to adapt and readapt to movement and learning capacity) – hold a fundamental place. Training the coordinative capacity at the optimum time is a determining factor in terms of reaching performance in rhythmic gymnastics, as in fact in all sports.

References

- Macovei, S. (1999). *Gimnastica ritmică de performanță*, Editura: A.N.E.F.S., București.
- Macovei, S. (1999). *Suplețea*, Editura: A.N.E.F.S., București.
- Năstase, V. D. (2011). *Metodologia performanței*. Pitești: Editura Paralela 45.
- Nenciu, G. (2002). *Fiziologia sistemului neuromuscular cu aplicații în sport*. București: Editura Fundatiei Romania de Maina
- Netter, F. H. (2012). *Atlas de anatomie a omului, ediția a V-a*. București: Editura Medicală Callisto
- Tudor, V. (1999). *Capacitățile condiționale, coordinative și intermediare – componente ale capacității motrice*, Editura: RAI, București.
- Tudor, V. (2001). *Evaluarea în educația fizică școlară*, Editura: Printech, București.