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Study on the use of new trends, materials and exercises for the development of coordination in 5th grade students (10-11 years old)

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Abstract: From studying the bibliography and from experience we found that education issues regarding coordination abilities are addressed very vaguely and made by practical means scientifically unproven as effective. In today's sports branches, the importance of coordinative capacities is the starting point in the correct performance of motor skills but also in the ability to quickly adapt to different situations or working conditions. With the increase in the level of development of these motor capacities, in schools, through dedicated lessons, we could speak of a much better selection for certain sports branches but also for performance sports. Research presented at various scientific conferences and the published papers had a good impact on the specialists of Sport Science and Physical Education. We believe today that these studies are just the beginning to modernize the entire contents aimed at optimizing the motor capacities of the child. We know that today's young people, with problems of a motor nature, also have problems of an affective-social nature. This psychosocial imbalance is closely related to psychomotor development. In this sense, psychomotricity must be promoted as the main part of personality development.

Keywords: motor skills, coordination, optimization, physical education, middle school

Introduction

New trends in the means and methods of developing motor qualities and skills are constantly updated and modernized, and their use in physical education and sports classes bring value and an increased degree of attractiveness to secondary school students (Aubert and Alboret, 2001; Albu et al., 2006; Papp et al., 2019; Erdely et al., 2020). The importance of coordination is directly involved in the development of other motor skills and reaching the objectives of the physical education and sports school program in the 5th grade could be achieved much more easily (Boreham and Riddoch, 2001; Marcu and Petan, 2005; Ilies and Caciora, 2020; Sandra et al., 2022).

The introduction of materials such as bossu ball, swiss ball, agility ladder, wobble board (balance board), in sports lessons in the 5th grade, will have an effect of progress in terms of the development of coordination capacities in close connection with the other qualities and motor skills (Okely et al., 2004; Pullen et al., 2020; Dapp et al., 2021; Patti et al., 2022).

Over time, in specialized literature, coordination has been defined as the quality that allows us to coordinate complicated movements, ensures the rapid acquisition of skills and their improvement, as well as their use according to requirements and adaptation to various situations (Hirtz, 1977; Szabo et al., 2020).

Macovei (2010) states about 11-year-old children who practice acyclic sports (sports games, gymnastics etc), that they have a much more specific and varied than those who practice cyclic sports, and their motor development is equivalent to that of 15-16 year-old children who do not practice sports activities.

Materials and methods

Subjects

In this study, 40 students from two 5th classes from the Dacia Secondary School in Oradea were involved. The experimental group consisted of 21 students (11 girls and 10 boys) and the control group consisted of 19 students (11 girls and 8 boys). The proposed program was applied for 4 months, 2 times a week, after the schedule of physical education and sports classes of the experimental group, and the control group performed sports classes after the school curriculum normally.

Used materials

To achieve the proposed objectives, we used materials such as:

Wobble board – In physiotherapy a balance or wobble board is used for balance, athletic, postural, coordination and falls prevention training. It is a circular object with an uneven base, on which the user attempts to balance.

Swiss Ball - is the perfect equipment for improving core strength, balance, and flexibility. These versatile and durable exercise balls can be used for a variety of workouts.

Speed Ladder - is ideal for improving acceleration, agility and coordination.

Bossu ball - it is an excellent addition to aerobic and balance exercises, which contribute to the development of coordination of movements and to the activation and strengthening of the stabilizing muscle parts located in deeper layers, which are otherwise very difficult to develop.

We mention that all the exercises were done under the strict supervision of the teaching staff and with a dosage corresponding to the level of preparation of the class. In each lesson of physical education and sports, exercises accessible to the whole class of students were carried out and introduced as new work materials after an instruction in use.

Tests description

The Matorin test for general coordination - from a sitting position, a jump is performed with a turn around the longitudinal axis of the body (to the left and to the right). During the jump, the student must not lose his balance, he must land with his feet together, as in the initial position, and the turn should be as many degrees as possible. The teacher draws on the ground a circle with a diameter of 40 cm (graded) and a line for starting the jump. The student, in the standing position with his feet placed on either side of a line drawn on the ground, with his arms by his body, will perform a jump with a turn to the right, and then a jump with a turn to the left. After each jump with a turn, the student will remain in place in the landing position (which must be the same as the one at the start), and the teacher will measure the angle of the turn. The test is performed on flat ground. The teacher will draw a graduated circle with chalk and measure the turning angle for each jump with a ruler (Table 1).

Table 1 . Tests used

No.	Name of the test	Abreviation	Forms
1.	Matorin Test	Mat.	General Coordination
2.	Distance appreciation Test	Dist.Appr.	Sensory-Motor Coordination
3.	Denisiuk Test	Den.	General Coordination
4.	Ladder Test	Lad.	Agility

Distance appreciation test - it is a distance judgment test, the route is executed in two halves with a break. The subject must cover the distance on a straight line of 9 meters drawn on the ground with his eyes closed and stops when he considers that he has covered the 9 meters, waiting motionless. The go signal is

given after the subject has closed his eyes. During his movement, the subject is not allowed to use different reference points (number of steps, etc.) and must keep his eyes closed throughout. After stopping, he must wait motionless so that the distance covered can be checked.

Denisiuk Test - Consists of 5 m run, 360° round one flag, run, forward roll, run, 180 degree round the second flag, bent support run, forward roll, 360 degree round the flag and arrival where did he go from? The mattress is arranged in the middle of the distance between the two flags. The return route measures 30m and is timed.

The speed test (Ladder) – fast movement, timed from the moment one foot leaves the ground to the moment it stops on two feet, in the form of "2IN1OUT", over a ladder with 5 "eyes" measuring 40/40 centimetres.

Programs and exercises proposed and used for the development of coordinative capacities

The exercises used in the experiment are not considered to be the best, but with possibilities of application in all forms of sports manifestation. They were designed according to the particularities of the students in the experimental group. These exercises can be used as such or modified, they represent a point of support and at the same time a starting point for designing other exercises. They depend on the skill of the specialized staff, the goals pursued and the material conditions in which we want to apply them.

These exercises were carried out with a dosage corresponding to the level of preparation of the children and the place of the lesson in the didactic design, and these means are aimed entirely at the coordinative capacity.

In these exercises, the main components of coordinative ability that work are balance ability, kinesthetic ability and spatial-temporal orientation ability:

- standing while maintaining balance without touching the ground with the edges of the board;
- from standing: movements of the plate forward and backward without falling off the plate;
- from standing: movements of the board sideways left/right without falling off the board;
- from standing: toe-ups on the Wobble board;
- standing on one leg while maintaining balance without touching the ground with the edges of the board;
- from standing on one leg: board movements left/right and forward/backward without falling off the board;

- from standing on one leg: lifting on tiptoes while maintaining balance;
- from standing far away on the board, performing semi-squats while maintaining balance;
- from standing, twists of the trunk to the left and right while maintaining balance;
- left/right turns on the board while maintaining balance;
- from standing, throwing a ball vertically and retrieving it while maintaining balance;
- facial support with both hands on the board while maintaining balance;
- facial support with both hands on the board: bending the arms in the elbow joint and returning to the initial position;
- facial support with one hand on the board, the other hand behind the back while maintaining balance;
- from standing, dribbling with the right/left hand or alternatively with maintaining balance;
- from standing face to face on different boards passing the ball to pairs;
- from standing on the Wobble board, throwing a ball against the wall and catching it while maintaining balance;
- from sitting, alternate lifting of the legs with the passing of a ball from one hand to another under the leg;
- stepping through three Wobble plates placed longitudinally;
- passage by stepping on one leg of Wobble tiles placed in a zigzag pattern.

Working with and at Bossu Ball is demanding and requires extra attention. With this device, it can be said that during the exercises, only one of the components of the coordination capacity acts, but all the components of this capacity act, being interconditioned between them:

- jumping on two legs on Bossu Ball;
- jumping on the left/right leg;
- ascending and descending alternately with the left/right foot on the Bossu ball;
- jumping from the ground on the Bossu Ball and returning;
- from standing on the Bossu Ball, jumps with twists of the trick to the left and right while maintaining balance;
- from standing, squats with arms forward and back;
- from standing, squats with jump on Bossu Ball;
- jumps with turning 90o, 180o, 360o on the ball while maintaining balance;

- from sitting on the ground, jumping on two feet on the Bossu Ball, bending the knees with the lowering of the center of gravity and jumping back to the ground;
- from standing sideways to the ball, lateral jump from one leg to another alternately on the Bossu Ball;
- running with knees up on the Bossu Ball;
- passing by stepping on Bossu balls placed longitudinally or zigzag;
- running with a step on Bossu balls placed longitudinally or zig-zag;
- maintaining a floating position on the Bossu Ball;
- from support on the Bossu Ball with the flat side up, grasping the edges, by jumping bringing the knees to the chest in squatting support, and returning to the initial position;
- from support on the Bossu Ball with the flat side up, grasping the edges, by jumping bringing the knees to the chest in a crouched support, high jump with the arms raised high, Bossu Ball held up, moving into a crouched support and returning to the initial position;
- throwing the handball/basketball with two hands from the chest into the Bossu Ball and catching it;
- throwing the handball/basketball with one hand into Bossu Ball and catching it;
- shooting at the basketball basket with a beat on Bossu Ball;
- throw at the handball goal with a beat on Bossu Ball;
- multiple dribbling with the handball/basketball on Bosu Ball;
- from standing sideways to the ball, lateral jump from one leg to another alternately on the Bossu Ball, catching and passing the basketball/handball ball with two hands from the chest or with one hand above the shoulder with a partner located in front of the performer.

Within this set of exercises, we find the relationship between the ability to combine movements, the ability to differentiate kinesthetic, the ability to orient spatiotemporally and the ability to transform movements. Of course, we also find the influence of the other components of the coordinative capacity, but in the first place we find the previously mentioned ones:

- semi-squats with jumping simultaneously with hitting the swiss ball on the ground;
- throwing the ball into the wall with two hands from the chest and catching it;
- passing the ball with the ground into the wall simultaneously with bending the knees and catching the ball;

- multiple dribbling while walking and running with Swiss Ball;
- from lying face down on the ball, rolling the ball forward until reaching face support with feet resting on the ball and coming back;
- from lying on the ball, twisting the trunk to the left/right;
- from lying on your back on the ball, rolling the ball back until you reach extension with your hands on the ground and return;
- rolling the ball on the narrow side of the bank;
- driving the ball between the posts;
- from standing face to face with a partner, each with a Swiss Ball, one passes with the ground and the other direct pass;
- from standing face to face with a partner, each with a swiss ball, a direct pass is simultaneously made by hitting the partner's ball in the air and retrieving one's own ball;
- mini handball with Swiss Ball.

Regarding the exercises with the Speed Ladder, it is stated that all the components of the coordinative capacity come into action here as well. In addition to coordinative capacities, through this device one educates and develops indices of strength, speed and endurance:

- raising the left/right knee bent to the chest with a step inside each square;
- swinging the left/right leg back with a step inside each square;
- hops on two feet in each square;
- hops on one leg in each square;
- jumping on two feet close inside the square and jumping with the feet apart outside the square;
- side jumps on two feet with entry and exit from the square;
- side jumps on two feet with entry and exit from forward squares;
- quick side steps to the left/right with both feet stepping in each square;
- different combinations of jumping and running;
- cross running with right/close foot touching each square with one foot;
- from standing sideways to the ladder, cross running with pelvic twist;
- from standing sideways to the ladder, touching each square with one foot in the form "in-in-out-out";
- from standing to the side of the ladder, perform forward and backward stepping movements in a square like "two in-two over-two out";
- from standing sideways to the ladder, step forward and backward in a square of the form "one in-two out";

- running with a step forward in a square and exit with the separation of the feet laterally in the form "in-in-out-out";
- running with a step backward in the square and exit with the separation of the feet laterally in the form "in-in-out-out";
- running forward and backward with both feet squared and one foot out to the side in a "two-in-one-out" fashion;
- from lateral facial support to the stepladder, advancing with the right/left hand into the square followed by the left/right hand and exiting the square in the same order of the form "forward in-in - back out-out";
- from face support facing the ladder, entering the square with both hands simultaneously and exiting to the side simultaneously with both hands simultaneously;
- the exercises mentioned above, combined with handling the basketball/handball around the torso.

Results and discussion

Regarding the value of the body mass index of the students who form the control group and the experimental group, it falls within the normal limits according to the results presented in the specialized literature (Table 2 and 3).

Table 2. Results of the control group in terms of body mass index value

Control Group	Height (m)	Weight (kg)	Wingspan (m)	BMI
5 th grade	1.54	44.89	1.51	18.91

Table 3. Results of the experimental group regarding the body mass index value

Experimental Group	Height (m)	Weight (kg)	Wingspan (m)	BMI
5 th grade	1.57	45.52	1.54	18.45

The graphic representations above show us that in the "Matorin" test, the values at the final tests are visibly improved in the experimental group compared to the initial ones, both in the test with turning to the right and the one with turning to the left. We can conclude that in this sample, the balance of the body in relation to its coordination were improved, the subjects of the experimental group managing to obtain better results. Therefore, the exercises performed during the lessons to develop coordinative capacities were beneficial for obtaining better results in this test (Figure 1).

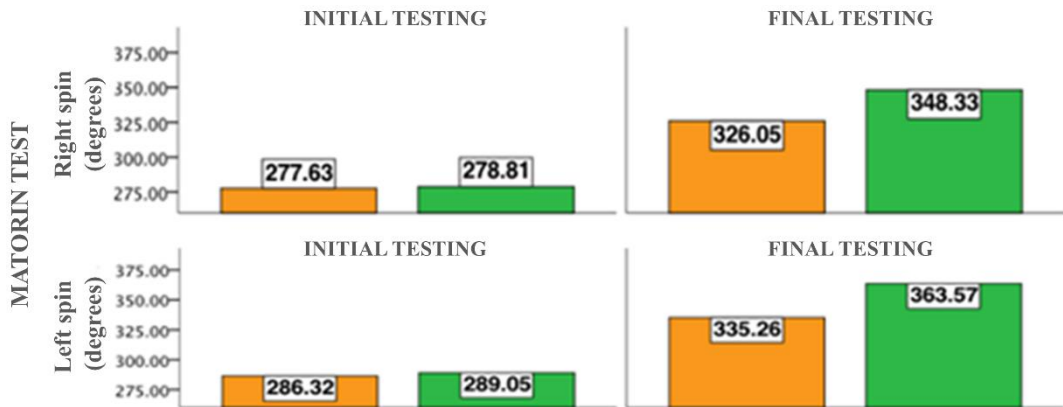


Figure 1. Representing the left-right Matorin test values at the initial and final tests in the control group and the control group

Distance appreciation was a test that in the final tests had significant differences compared to the initial tests, namely a difference of more than 1 meter better than the initial tests (Figure 2).

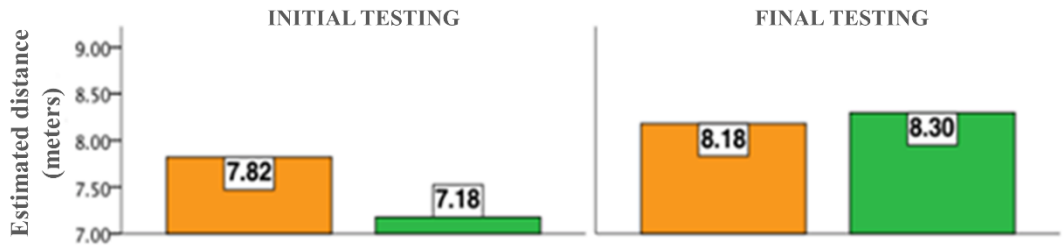


Figure 2. Representing the values of the distance appreciation test at the initial and final tests, the control group and the experimental group

The Denisiuk test is a test in which the results of the experimental group exceeded the results of the control group, initially the two groups recorded approximately the same values. Due to better overall coordination, better coordination speed, subjects in the experimental group were able to make better progress than those in the control group (Figure 3).

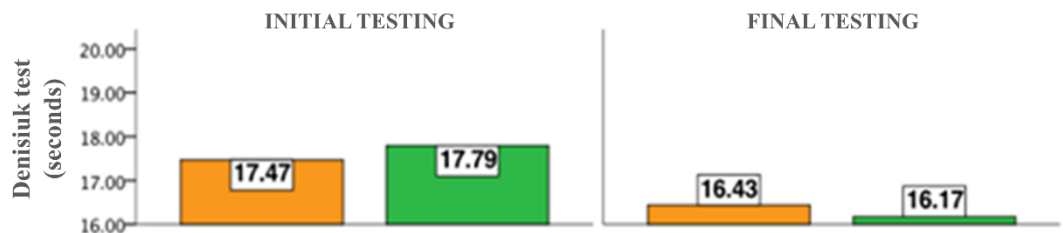


Figure 3. Representing the values of the Denisiuk test, at the initial and final tests, the control group and the experimental group

Regarding the Ladder test, a test that measures the agility level of the subjects, the difference between the initial and final testing in the control group was 0.59 seconds less, and in the experimental group the difference was 0, 86 seconds less or rather, faster. We can conclude that the agility exercises of the lower limbs, the speed in coordination mode, the multitude of applied courses performed during the lessons, helped the experimental group to register a higher progress than the control group (Figure 4).

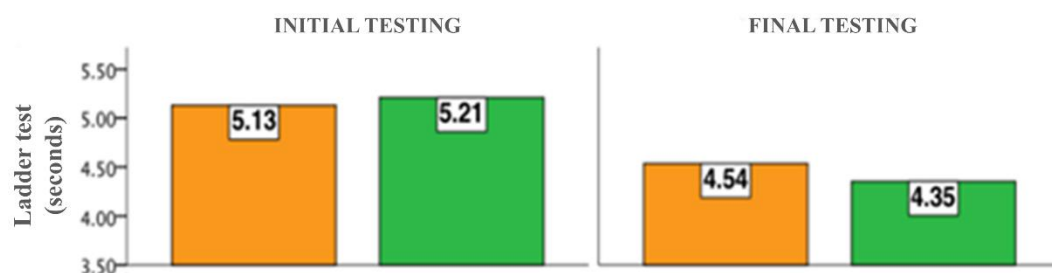


Figure 4. representing the results of the Ladder test, the initial and final tests, the control group and the experimental group

Conclusions

By introducing these modern means and materials in the physical education lesson, it was noticed that the interest of the students in participating in the lesson increased, the number of exempt students decreased and we noticed an improvement in the state of health and in general all the capabilities of the body through a walk nice, a proper run, proper breathing and even an improvement in the learning situation in the other subjects. The teaching situation is not part of the research, but it was observed by the educational counselors of the classes improvements in the children's behavior in the lessons.

The students in the experimental group became more interested in participating in the training lessons of the school team in different sports branches. This interest in participating in the additional training of the handball, basketball, cheerleading team of the school, we can say that it became interesting for the students with the increase in the level of development of these coordination capacities, and we could even talk about a better selection for performance sports.

The results obtained after the final testing prove the effectiveness of modern means, methods and materials, which aim not only at the development of motor coordinative capacities but also at motor skills and the stimulation of motor potential.

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