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HANDBALL-SPECIFIC EXERCISES FOR DEVELOPING COORDINATION IN PRIMARY SCHOOL

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Abstract: *This paper examines the impact of coordination skill development on motor performance. In physical education lessons, enhancing coordination improves the acquisition and stabilization of new motor skills and boosts the performance of previously learned acts. The study was conducted at "Nichifor Ludovic" Middle School in Niculițel, Tulcea County, during the 2022-2023 school year. Results show that students in the experimental class outperformed those in the control class. The conclusion emphasizes that coordination enables quick learning of new movements and adaptation to varying conditions.*

Key words: *coordination, development, primary.*

1. Introduction

Human movement is determined and influenced by various factors, one of which is motor coordination [1].

Although handball is a team sport, like any other, where performance is influenced by multiple factors, strength is one of the most significant external determinants due to its crucial role in fundamental movements such as throwing, jumping, changes in direction, and impact-related contacts [3].

Previous studies have shown that differences exist between elite and amateur handball players in terms of strength manifestations, such as maximal dynamic strength and muscle power development, as well as anthropometric characteristics [3].

Team handball is a complex sport that depends not only on the individual performance of each player but also on tactical components and team interactions [13].

Cornelia Bota defines coordination capacity as a "complex psychomotor quality, based on the correlation between the central nervous system and the skeletal muscles during the execution of movement" [4].

Over the past few decades, scientific and educational interest in investigating the potential relationships between

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physical activity, physical fitness, and physical education classes with cognitive and academic performance has increased [5].

Adrian Dragnea and Aura Bota describe coordination abilities as “a complex set of predominantly psychomotor qualities that involve the ability to quickly learn new movements, efficiently adapt to varied conditions specific to different types of activities and restructure the existing motor repertoire” [6].

Coordination is a complex motor skill. This skill plays an important role not only in acquiring and mastering new techniques and tactics but also in adapting them to unusual situations. Terms such as “skill” and “agility” are sometimes used in sports pedagogy to describe this concept [7].

Education offers a broad methodology for developing coordination qualities (including methods, motives, processes, and forms of organized exercise). While students and teachers have valuable experience in this field, the results have not yet reached their full potential in terms of developmental possibilities [14]. The tasks of this study were as follows:

- Identification of specialized literature and preparation of the bibliography.
- Formulation of working hypotheses and design of the activity plan.
- Preparation of planning documents based on the conditions existing in the school unit and the bio-psycho-motor capabilities of the subjects.
- Establishment of experimental and control groups.
- Development of the measurement and evaluation system for the experiment.
- Initial evaluation of the subjects.
- Implementation of the experimental program.
- Final testing of the subjects.

Childhood is a critical period for the development of these skills, which are considered the building blocks of more complex movements (8) and represent a key factor in promoting lifelong active lifestyles [9].

A widely accepted definition of agility among sports scientists describes it as “a rapid whole-body movement with modification of running direction in response to a stimulus” [16].

2. Hypotheses of This Study

1. If specific handball-based exercises are implemented at the primary education level to develop coordination, observable progress will be achieved.
2. The effectiveness of this intervention can be demonstrated through the specific coordination actuation systems used in lessons, and the results will be reflected in the performance of subjects in the control tests to which they are subjected.

Rizescu C. states that in primary education, the game of handball is introduced in a simplified form called Mini handball. In grades I, II, and III, the following fundamental techniques are practiced: catching the ball with two hands, passing the ball with two hands, passing the ball with one hand, simple stationary dribbling, and multiple dribbling while moving [10].

According to Cârstea, G. games, in general, are playful activities with significant implications for the development of an individual's personality from multiple perspectives, including their contribution to social integration. They are engaging, spontaneous, free, and natural activities with recreational and compensatory benefits [11].

Games (movement-based, preparatory, and sports-related), relays, exercises, and applied routes used in physical education lessons "contribute to the development of analytical perception, the deliberate direction of attention, observation skills, motor memory, imagination, cognitive flexibility, thinking, the ability to accurately perceive and anticipate evolving situations, and the overall level of anticipation and coordination" [12].

3. Material and Methods

The research activity was conducted at the "*Nichifor Ludovic*" Gymnasium School in Niculițel commune, Tulcea county, during the 2023-2024 school year.

The following sports equipment was used:

- 15 handballs
- 20 goalposts
- A stopwatch
- A tape measure
- 10 medicine balls (2 kg. each)
- 10 oina balls
- Ropes
- Balls of various sizes (volleyball, basketball, football)
- 40 hoops

The teaching-learning-evaluation process was implemented in accordance with the annual thematic plan and semester calendar plans. Additionally, specially designed learning units were introduced to enhance coordinative abilities using specific elements from the game of handball.

4. Research Subjects

The subjects of this study were students from grade II A (experimental class) and grade II B (control class). The two groups did not have the same number of participants: grade II B consisted of 35 students (21 boys and 14 girls), while grade II C comprised 24 students (11 boys and 13 girls), including one boy who was medically exempt.

To ensure that the research results maintained a high degree of objectivity, I decided to randomly select several students from the experimental class that matched the control class in terms of gender distribution. Consequently, both groups were composed of 23 students each (10 boys and 13 girls).

At the time of the experimental study, the subjects were between 9 and 10 years old.

The teaching-learning-evaluation process was carried out according to the annual thematic plan and semester calendar plans, along with specially designed learning units aimed at developing coordination through the game of handball. The study was conducted in two phases:

- First semester: October 2 – November 17, 2023
- Second semester: May 7 – June 15, 2024.

5. Tests Applied for Research Validity:

- Somatic measurements
- Tests for assessing general coordination
- Tests for assessing coordination specific to the game of handball

Out of the six tests conducted with the children, I selected two for analysis because these were the ones that engaged the children the most—tests for assessing general coordination.

6. Tests for Assessing Coordination Specific to the Game of Handball

Dribbling with the Dominant Hand While Running and Changing Direction

(*Assessment of movement coordination ability*)

This test evaluates the player's ability to coordinate movements while dribbling and changing direction during running.

Test Setup:

- The test course is 10 meters long, marked by two boundary lines.
- Three markers are placed along the course.
- The distance from the starting line to the first marker, as well as from the last marker to the finish line, is 2.5 meters (*see Fig. no. 5*).

Procedure:

1. At the signal, the student starts dribbling the ball with their dominant hand while running.
2. The student must maneuver around each of the three markers while maintaining control of the ball.
3. The goal is to complete the course in the shortest possible time.
4. The recorded measurement is the total time taken from the starting signal to the moment the student crosses the finish line.

Test 1: Dribbling with the Skilled Hand While Running and Changing Direction

This test evaluates the ability to coordinate movements while dribbling and changing direction during running.

Test Setup:

- A 10-meter course is marked between two boundary lines.
- Three markers are positioned along the course.
- The distance from the starting line to the first marker and from the last marker to the finish line is 2.5 meters (*see Fig. no. 5*).

Procedure:

1. At the signal, the student starts dribbling the ball with their skilled hand while running.
2. The student must navigate around each of the three markers while maintaining control of the ball.
3. The goal is to complete the course in the shortest possible time.
4. The recorded measurement is the total time taken from the starting signal to the moment the student crosses the finish line.

Test 2: Dribbling with Both the Skilled and Non-Skilled Hand Between Markers

(*Assessment of bilateral coordination and movement control*)

Test Setup:

- Two parallel rows of 10 markers each are positioned 1 meter apart along a 10-meter course.
- The distance between the two rows of markers is 2 meters.

Procedure:

1. At the signal, the student begins dribbling the ball with their skilled hand, weaving between the 10 markers in the first row.
2. Upon reaching the end of the row, the student turns around and repeats the same dribbling pattern in the second row, but this time using their non-skilled hand.
3. The objective is to complete the entire course as quickly as possible while maintaining control of the ball.
4. The recorded measurement is the time taken from the start until the student passes the last marker in the second row.

"Zig-Zag in Pairs"

Players form teams of four, arranged in a zig-zag pattern. Each pair in the team has a ball. At the signal, they begin passing the ball in pairs. The team that completes the most passes within a given time wins.

"Three Passes in Pairs in a Circle"

Players form teams of 4 to 8 participants. At the signal, the game begins with two players making three consecutive passes between them. Then, the player with the ball turns around and makes three passes with another teammate. When the ball returns to the player who initially started the sequence, the game stops. The team that completes the sequence first wins.

"Two-Way Passing Game with Competition"

Players form pairs at a distance of 3 to 5 meters from each other. At the signal, they begin passing the ball back and forth. The team that completes a predetermined number of passes first, or the team that makes the most passes within a given time, wins.

"The Ball is Hot"

Players form circles with an equal number of participants, all facing outward. One player in each circle starts with a ball. At the leader's signal, the ball is passed in a single direction. If another signal is given, the player holding the ball must pass it immediately. If they fail to do so, they are eliminated from the game. If the next player is not paying attention and fails to receive the ball properly, they are also eliminated. The game then resumes in the opposite direction. The last four remaining players win the game.

To avoid eliminating players, an alternative rule can be applied: those who make mistakes receive penalty points instead. After a certain period, the players with the fewest penalties are declared the winners.

7. Research results

Table 1

Results of statistical and mathematical calculations after dribbling the ball with the skillful hand with a change of direction

Class		**Class a II-a A (exp.)**				**Class a II-a B (control)**			
Sex		**Boys**		**Girl**		**Boys**		**Girl**	
Testing		**T.I.**	**T.F.**	**T.I.**	**T.F.**	**T.I.**	**T.F.**	**T.I.**	**T.F.**
Statistical indicators	**Σ**	233,45	223,37	365,37	340,7	240,7	224,9	374,7	343,2
	$\bar{x}$	23,34	22,33	28,10	26,21	24,07	22,49	28,82	26,40
	W	5,64	6,34	11,89	10,27	5,47	5,76	12,64	10,26
	A^m	1,35	1,48	2,80	2,92	1,55	1,81	3,19	3,18
	±S	±1,74	±1,90	±3,57	±3,50	±1,87	±2,17	±3,91	±3,78
	C_v	7,46	8,53	12,70	13,35	7,79	9,67	13,57	14,34
	„t"	7,18		8,08		10,04		9,48	
	p	> 0,01		> 0,01		> 0,01		> 0,01	

Dribbling with the Dominant Hand While Running and Changing Direction

Arithmetic Means:

Boys:

- Experimental class: 23.34s (T.I.) → 22.33s (T.F.)
- Control class: 24.07s (T.I.) → 22.49s (T.F.)

Girls:

- Experimental class: 28.10s (T.I.) → 26.21s (T.F.)
- Control class: 28.82s (T.I.) → 26.40s (T.F.)

Statistical Analysis:

The amplitudes of the series indicate a narrow range of results. The average deviation shows that, on average, individual values do not significantly deviate from the central value of each series, indicating relatively small dispersions. Additionally, the standard deviation evolved with low values, further confirming the consistency of the data.

The coefficient of variability is below 10%, indicating high homogeneity in the results.

Significance Testing (t-Test Results):

The values of *t* indicate:

Significance Testing (t-Test Results):

- **Experimental class:**
- Boys: $t = 7.18 > 3.250$ (Fisher's Table, at the 0.01 threshold) → The differences are statistically significant with a 99% confidence level and a 1% risk.
- Girls: $t = 8.08 > 3.055$ (Fisher's Table, at the 0.01 threshold) → The differences are statistically significant with a 99% confidence level and a 1% risk.
- **Control class:**
  - Boys: $t = 10.04 > 3.250$ (Fisher's Table, at the 0.01 threshold) → The differences are statistically significant with a 99% confidence level and a 1% risk.
  - Girls: $t = 9.48 > 3.055$ (Fisher's Table, at the 0.01 threshold) → The differences are statistically significant with a 99% confidence level and a 1% risk.

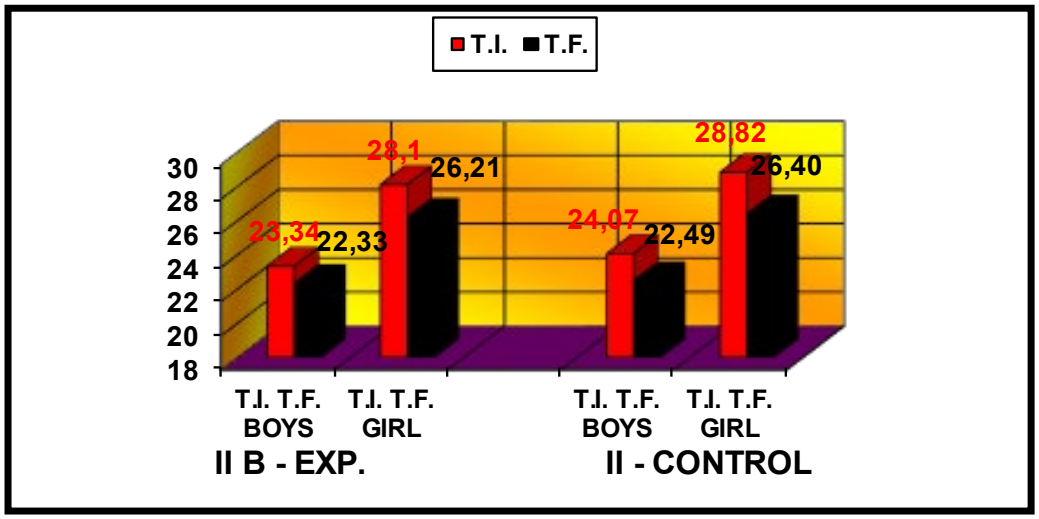

Fig. 1. *Dynamics of average values when driving the ball with the dexterous hand while running with a change of direction*

8. Conclusions

1. Our research has demonstrated that when effective methods and techniques—such as those specific to handball—are employed to develop motor skills, they contribute positively to enhancing the teaching approach.
2. The study also revealed that using handball-specific techniques to develop coordination (i.e., in the experimental group) significantly increases students' engagement and enthusiasm in physical education classes. Moreover, these methods foster organizational and self-organization skills, as well as social integration, by encouraging interpersonal interactions required by the game.
3. The observed progress confirms that coordination training through these methods is accessible to second-grade students. Additionally, the effectiveness of these exercises is enhanced by the ability to adjust effort levels and introduce variations that align with students' age, developmental stage, and training level.
4. The research objectives were successfully met through comprehensive documentation, selection of appropriate samples and control tests, and implementation of relevant methods. All aspects of the study were completed, and the collected data was analyzed using statistical and mathematical interpretation. The findings were further illustrated through graphical representations to enhance clarity and comprehension.
5. Considerations for Effective Coordination Development

To achieve optimal results in developing coordination, it is essential to have a comprehensive understanding of the group being studied, including their health status, physical abilities, and technical skills. Continuous monitoring of how students adapt and respond to training requirements is necessary. This process must be conducted systematically through ongoing observation and by maintaining a strict record of results obtained in intermediate assessments.

Current findings suggest that during the competitive season, 10 weeks of Coordination and Reaction Training (CRT), with only two training sessions per week, led to significant improvements in various measures of athletic performance among handball students enrolled in physical education programs. Such conditioning should be strongly recommended as an integral part of the annual training program for handball players [2].

During the research, it was concluded that the movement education program focused on coordination was applied to the experimental group within lessons involving movement and play activities. This program was integrated into the preschool curriculum for 12 weeks, consisting of two days per week with four hours of classes per week. (15)

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