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The study of types of speed through team games

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Abstract

Exploring movement during early childhood serves as a primary avenue for understanding the environment, achieved through interacting with objects and engaging with the world around them. Among various physical activities, engaging in games involving movement offers distinct benefits, fostering the concurrent development of motor skills, psychological processes, and aspects of personality.

These activities should be dynamic and captivating for children, fulfilling their inherent need for play and movement. A successful activity allows students to demonstrate their strength, dexterity, and problem-solving abilities. Given its numerous educational benefits, movement-based play is integrated into physical education across all age groups and subjects, highlighting its instructive value.

Keywords: motricity, games, speed, schoolchildren, psychic processes, competences

Introduction

Physical education in primary schools serves as an instructive and educational tool, employing physical activities to enhance students' abilities and physical skills. However, its impact extends beyond the realm of physicality, influencing intellectual, emotional, and moral development as well. As students engage in intellectual pursuits upon entering school, it becomes imperative to strike a balance between academic efforts and the need for movement and leisure.

Achieving this balance requires a well-rounded physical education program, with appropriate content and goals aimed at fostering the holistic development of students' personalities. This entails tailoring the curriculum to suit the local context and traditions while organizing the content in alignment with an educational model that progresses concentrically.

Each motor action encompasses various fundamental motor qualities, albeit with differing emphasis. For instance, dribbling a football while running requires skill, particularly when navigating obstacles, as well as speed due to the motion from running, strength for muscle engagement in movement, and endurance, especially during repeated dribbling in game scenarios. These motor qualities are interconnected, with skill and strength being noted for their broad interrelation with other motor abilities, according to experts (Tatu Al., 2007).

These qualities, also referred to as physical or psycho-motor qualities, are inherent attributes of the human body that develop from birth and continue evolving throughout life. Every individual possesses certain levels of motor qualities at birth, which develop over time until a certain age before gradually declining at varying rates, influenced by various factors (Leucea I.). Motor qualities can be classified into two categories:

- Basic motor qualities: encompassing speed, skill, strength, and endurance.

- Specific motor qualities: those tailored to particular sports or activities, often comprising combinations of the aforementioned qualities.

Speed, as a motor quality, refers to the ability of the human body to execute acts, actions, or motor tasks either with the entire body or specific body parts in a brief timeframe. Its development and expression can be significantly influenced with notable results observed between the ages of 10 and 18, with initiatives for improvement typically commencing around 4 to 5 years old. However, it's essential to acknowledge a less favorable period around 13 to 14 years due to pubertal changes (Tatu Al.).

According to Frey, rapidity is defined as the capacity to generate force or perform motor actions in the shortest possible duration, rooted in the mobilization of neuromuscular processes

and muscle capabilities (Firea E., 1984). Speed is further categorized into acyclic speed, referring to sequences of similar motor actions like running, and acyclic velocity, which pertains to isolated, often repetitive motor actions.

In pursuit of achieving maximum speed, Zaţ Iorski emphasizes the importance of ensuring that the action does not induce fatigue (Leucea I.).

The classification of speed often leads to diversity due to the potential confusion between its definition as a motor skill and its broader implication as a capacity linked to agility and swift movement, particularly evident in disciplines emphasizing accelerations. However, speed encompasses more than just rapid running; it's a fundamental aspect of timely response and reaction in acyclic performance scenarios. Gundalch highlights that speed is evident in cyclic movements, defined as the capability to initiate a powerful acceleration at the onset of motion and sustain it to achieve heightened maximum speed.

In the realm of theory and methodology, these components are integral to conditional skills (Steiner Adalbert, Steiner Ghe., 2004). Regarding running speed, Filin, Zat, and Iorski differentiate between:

- Quick motor reactions
- The capacity to attain maximum motion frequencies
- The capability to attain and uphold maximum speed within a defined space.

Physiologically, rapid movements are distinct from slower ones in that corrections during execution are impractical. Biochemically, limitations arise from ATP availability and its rapid breakdown within short timeframes. These processes are influenced by neuromuscular factors and the activation of enzymes like myozyme-ATP-ase and creatine phosphokinase, notably abundant in white fibers.

While athletes specializing in sprinting, a quintessential expression of speed, tend to have a prevalence of white fibers, pinpointing specific limiting factors in movement remains challenging.

Research indicates that individuals with faster nerve conduction speeds tend to exhibit swifter movement, a trait largely determined by genetic or constitutional factors. Besides, rapid force generation and joint mobility play crucial roles in speed development: the former enables the transition from a resting state, while the latter enhances movement efficiency.

The progression of speed is influenced by the physiological maturation of an individual. Similar to other skills, training stimulus alone may not suffice unless provided during the appropriate age range, typically between 7 and 12 years old.

However, speed is characterized by a relatively low coachability percentage. According to Filin, the potential for improvement does not exceed 20%, while other authors suggest it may be even lower. Analysis of speed development highlights distinct variations in different manifestations, such as reaction speed and maximum movement frequency.

Reaction speed undergoes a unique developmental trajectory, reaching its peak around the age of 20, whereas maximum movement frequency follows a typical progression of coordination skills. The ability to sprint evolves somewhere between conditional and coordination skills. Additionally, as noted by Carbonaro, maximum movement frequency serves as a general predisposing factor.

The significance of speed and its various expressions are influenced by numerous factors, some inherent in the genetic makeup of each individual and less amenable to improvement. Experimental findings suggest that muscles containing a higher proportion of white fibers are associated with greater speed development (Leucea-Ilica L). Key factors conditioning speed include:

- Mobility of cortical nervous processes: Facilitating rapid alternation between excitation and inhibition in motor areas of the cerebral cortex ensures synchronization of muscle contraction and relaxation.

- Speed of nerve impulse transmission: This encompasses the time taken for signal reception, receptor quality (e.g., vision, hearing, sense of balance), impulse transmission to the central nervous system, transmission to motor organs (muscles), and muscle activation.

- Development level of motor qualities: Speed is influenced by strength, with an inverse relationship between motion speed and external resistance. Increased strength facilitates overcoming resistance. (Ifrim M. Iliescu A.,1978)

- Resistance training for speed: Maintaining speed over extended durations necessitates specific endurance.

- Skill-based conditioning of speed: Technique proficiency significantly impacts the execution of motor actions. Enhanced technique leads to smoother movements. Additionally, skill plays a role in the speed of response within complex motor actions requiring anticipation, analysis, and adaptation (Stănescu M., Ciolcă C., Urzeală C., 2004).

Methods and Materials

In our study, we considered the morpho-functional characteristics of young school-aged children, as well as individual and gender-specific traits. The research spanned two semesters, allowing for activities both indoors and outdoors. The materials utilized included mattresses, balls, flags, badges, handkerchiefs, cubes, sticks, pebbles, and other items.

Subjects underwent initial measurements at the end of November 2022, before the commencement of initial tests, and in May 2023, before final tests were conducted. Measurement results were documented in tables and compared against prevailing standards.

Somatoscopic examination involves visually observing the child's body to assess physical development and identify any physical deficiencies. With the child undressed and in shorts, a general assessment of overall appearance was conducted followed by examination of specific regions.

Anthropometric examination entails measuring various aspects of the human body. By determining values such as length, width, thickness, volume, and mass of the body or its segments, individual or class averages can be compared against national norms.

Experimental Setup:

The study was conducted within the framework of the EUROFIT test, specifically Class IV. This observational-ameliorative experiment spanned the entire school year 2022-2023 and included the following phases:

- Initial testing at the beginning of the school year.
- Development of motor content.
- Final tests.

Test Battery:

1. Speed Running (A.Vt.) - 25m:
   - Initiated from a standing start with timed movement.
   - Two attempts were permitted with a 5-6 minute break between runs, recording the best performance.
   - Appropriate sports footwear and a smooth surface were utilized.
   - Results were recorded in seconds and tenths of a second.

2. Touch the Tiles (A.Pl.):

Factors: Speed of execution and coordination of upper limbs.

Test Description: Quickly touch two marked areas alternately with the skilled hand on a board.

3. Shuttle Race (A.N.A.) - 10 x 5m Round Trip:

Factors: Running speed, execution speed, coordination, skill.

Test Description: Full-speed shuttle run.

Regarding variables, they can be either continuous or discrete, denoted as X. Continuous variables span between two measured values with infinite intermediate values. The measurement of continuous variables is influenced by the technique and equipment used.

b) Data processing involves the following steps:

Ordering, grouping, and intuitive (graphic) representation of variables to highlight the distribution of the studied characteristic.

Calculation of typical values, indicators of central trend, and dispersion.

To calculate the arithmetic mean of a dataset ($\bar{x}$), the following formula is used:

$$\bar{x} = \frac{X1+X2+X3+\cdots+Xn}{n}$$

$$\bar{x} = \frac{\sum x}{n}$$

$\bar{x}$ = selection mean

Σ = addition operator (sum)

X = values of variable 1 to n.

The scattering amplitude (W) is determined by the difference between the highest and lowest values in the distribution:

$$W = x_{.max} - x_{Min}$$

W = amplitude

$x_{.max}$ = highest value

x_{Min} = lowest value

The coefficient of variability (Cv) is a measure of relative dispersion, in contrast to Am and S, which are absolute measures. It represents the percentage approximation of the quotient between the standard deviation and the arithmetic mean. The formula for calculating the coefficient of variability is:

$$CV = \frac{S}{\bar{x}} x100$$

Where:

CV= coefficient of variability

S = standard deviation

$\bar{X}$= arithmetic mean

The absolute measure of dispersion (S, Am) alone doesn't provide information about the extent of scatter in the data. However, expressing the ratio between S and x as a percentage allows for comparisons of variability across different datasets. A smaller coefficient of variability (CV) indicates a tighter grouping of data around the median, representing a more confident population.

A dataset is considered:

- Homogeneous (low variability) if CV is less than 10%.
- Relatively uniform (moderate variability) if CV falls between 10% and 20%.
- Inhomogeneous (high variability) when CV exceeds 20%.

In the pedagogical process, where variability tends to be high, the level of scattering can be interpreted as follows:

- Low scattering: between 0-15%
- Moderate scattering: between 15-25%
- High scattering: between 25-35%
- Excessive scattering: over 35%

c) Interpretation involves critically assessing empirical data to determine the possibility of generalizing the obtained information to the original population and formulating forecasts regarding future developments in a given experimental situation. The application phases of the statistical method are interdependent and collectively influence the validity of conclusions.

Results and discussion

After conducting anthropometric measurements on the student cohorts within the study group, we collected the following average height and body weight data for boys and girls in rural areas.

Table 1.

Data obtained after performing anthropometric measurements of the study group

	BOYS		GIRLS	
Age	Height	Weight	Height	Weight
4	97.9± 4.8	15.2± 1.9	97.1± 4.9	14.2± 1.8
5	104.3± 5.3	16.9±2.2	103.4± 5.2	16.4± 2.2
6	109.8± 5.5	18.5±3.4	109.3± 5.5	18.2± 2.5
7	115.7± 5.5	20.6± 2.6	114.7± 5.6	20.2±0.8
8	120.9± 5.6	22.7± 2.9	120.2± 5.8	22.1± 3.1
9	125.8± 5.8	24.8± 3.3	125.1± 5.8	24.3± 3.4
10	130.3± 6.1	27.1± 3.4	129.7± 6.1	26.9± 4.1
11	134.9± 6.3	29.8± 3.8	130.4± 6.7	29.4± 4.5

Table 2 .

Data obtained from measurements of the height of students in the study group

Item No.	**Name and surname**	**Height**	**d**
1	A. B.	136	-6
2	B. P.	133	-9
3	B. J.	135	-7
4	B. V.	166	23
5	D. J.	134	-6
6	I. M.	135	-9
7	I. R.	141	-2
8	J. B.	137	-3
9	S. M.	130	-11
10	M. C.	144	2
11	M. D.	149	7
12	P. P.	146	4
13	P. F.	145	5
14	P. G.	152	8

15	Ş. T.	148	6
16	T. A.	131	-10
17	T. M.	141	-3
18	T. N.	137	-3
19	T. R.	153	10
20	T. E.	147	5
Average		**142**	
Deviation			**6,96**
CV			**4,90**
In		**115**	
Max		**166**	
Min		**131**	

Table 3 .

Data obtained from measurements of the size of students in the study group

Item No.	Name and surname	Wingspan	d
1	A. B.	134	-5,5
2	B. P.	140	-1,5
3	B. J.	141	-0,5
4	B. V.	165	24,5
5	D. J.	130	-10,5
6	I. M.	135	-4,5
7	I. R.	140	0,5
8	J. B.	140	-1,5
9	S. M.	134	-5,5
10	M. C.	149	7,5
11	M. D.	144	4,5
12	P. P.	139	-2,5
13	P. F.	141	-0,5
14	P. G.	131	-10,5
15	Ş. T.	160	20,5
16	T. A.	154	14,5
17	T. M.	121	-20,5
18	T. N.	121	-9,5
19	T. R.	144	3,5

20	T. E.	147	7,5
Average		**140,5**	
Deviation			**7,9**
CV			**5,62**
In		**35**	
Max		**165**	
Min		**130**	

Table 4 .

Data obtained from measurements of the weight of students in the study group

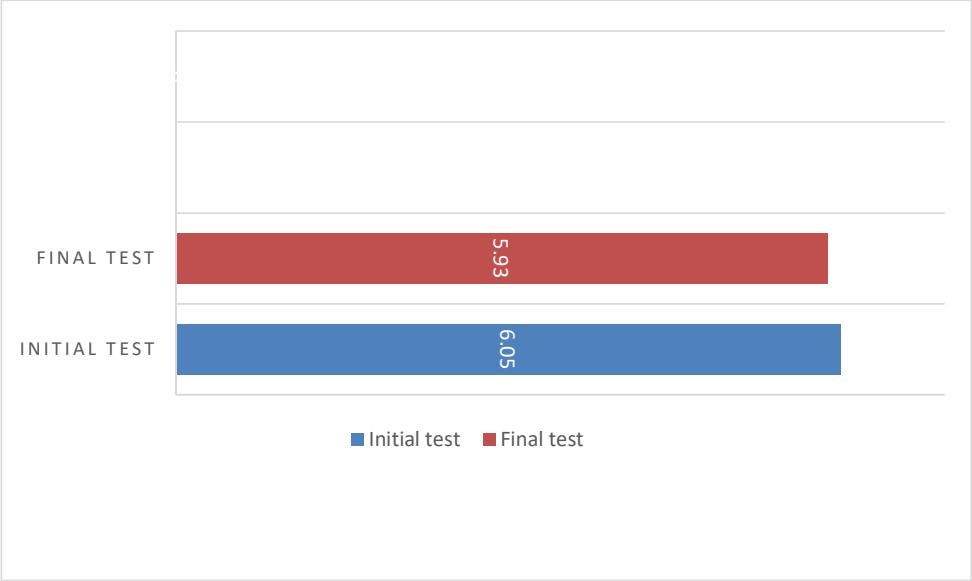
Item No.	Name and surname	Weight	d
1	A. B.	31	-5
2	B. P.	32	-6
3	B. J.	34	-4
4	B. V.	55	18
5	D. J.	30	-6
6	I. M.	32	-6
7	I. R.	31	-5
8	J. B.	42	4
9	S. M.	32	-4
10	M. C.	43	5
11	M. D.	41	5
12	P. P.	42	4
13	P. F.	37	1
14	P. G.	42	6
15	Ş. T.	52	14
16	T. A.	26	-11
17	T. M.	31	-5
18	T. N.	32	-4
19	T. R.	42	4
20	T. E.	35	-1
Average		**37**	

Deviation			**5,92**
CV			**16**
In		**29**	
Max		**55**	
Min		**26**	

After conducting the 25-meter speed tests, the following results were obtained and are illustrated in the figure below:

Fig. 1

Graphical representation of the speed at 25 m of the students in the study group

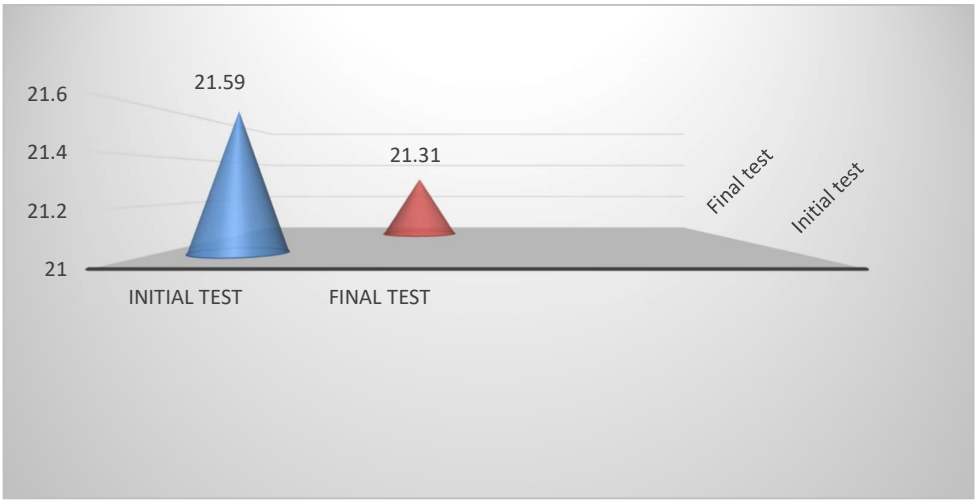


In the initial test, the average time recorded was 6.05 seconds, while in the final test, it improved to 5.96 seconds, indicating an increase in speed of 0.09 seconds over a 25-meter distance.

Following the shuttle race tests involving a 10x5 meter round trip, the results obtained are depicted in the figure below:

Fig. 2

Graphic representation of the 10x5 m round trip shuttle race of the students in the study group

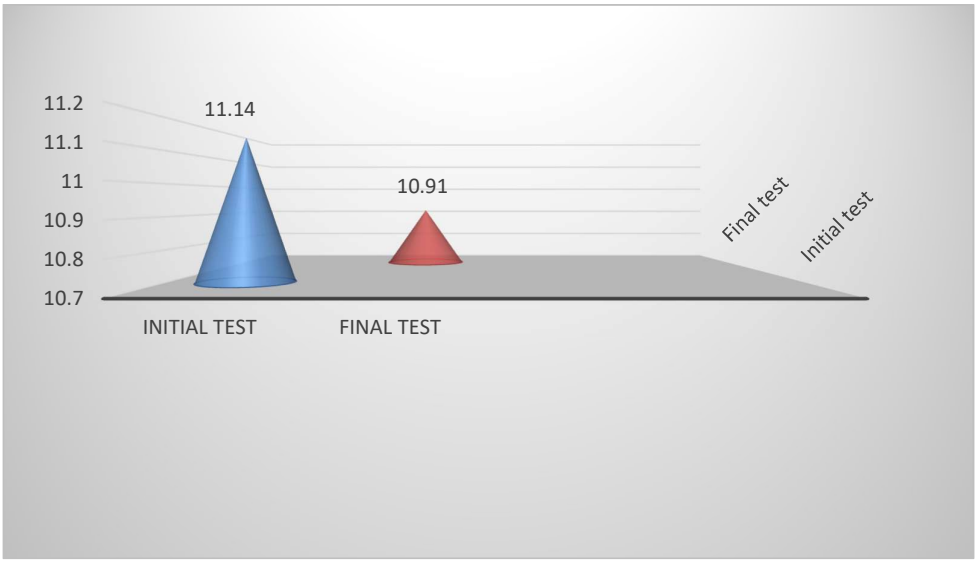


In the initial test, the average time recorded was 21.59 seconds, while in the final test, it improved to 21.31 seconds, indicating an increase in speed of 0.28 seconds during the test.

Following the tests on the touch-plates 25x2, the results obtained are illustrated in the figure below:

Fig. 3

Representation of graphics to touch -plates 25x2 of the students in the study group



"After conducting the tests and analyzing the data, we noted an improvement in motor quality (speed) in the experimental class compared to the control class. In Test 1, "Speed Running" (25 meters), there was a speed increase of 0.09 seconds in the control class compared to the experimental class. In Test 2, "Touch the Plates," there was a slight improvement in execution speed of 0.02 seconds. Finally, in Test 3, the "Shuttle Race" (10x5 meters round trip), the experimental class showed a speed increase of 0.11 seconds."

Conclusions

The analysis of anthropometric data revealed a slight increase, with measurements aligning closely with average height and weight standards for both boys and girls. Considering the rapid alternation of game phases at present, I believe that reaction speed development can be facilitated through certain procedures. This development relies on complex psychological processes, which are inherently linked to the speed at which these processes occur.

It is crucial to fully utilize this stage of childhood to foster the comprehensive development of necessary qualities, taking into account the current possibilities. The progress observed was influenced by the content of movement games employed, tailored to the interests, enjoyment, and focus of the participants, particularly when introducing elements of competition.

Therefore, when utilizing games, it's essential to maintain sustained attention for executing procedures at a steady pace – emphasizing speed – while ensuring that this pace remains within the realm of full mastery of the respective procedures. Exceeding this threshold risks ingraining incorrect executions that diminish efficiency, making later corrections very challenging or even impossible.

The games were introduced gradually, transitioning from easy to challenging, from familiar to unfamiliar, and from simple to complex, taking into account the class team's readiness for the game and their interest levels. Through these movement games, besides developing motor quality (speed), I aimed to cultivate in students the spirit of solidarity and teamwork, acclimatizing them to collaborative work.

Simultaneously, I seized the opportunity to gain a deeper understanding of students in all aspects, fostering skills that will prove beneficial to them in the future. It's worth noting that although some schools may lack adequate materials, many of the proposed games can still be conducted even in winter.

Play enriches and enriches life, serving as an essential biological function for individuals and as a cultural expression for society. It is indispensable both as a means of expression and as a cultural function.

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