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## Development of speed, agility and strength in middle school students

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**Abstract:** Physical education is the discipline in the school curriculum that can help in different ways to educate and train children, young people and adults, contributing to personal and professional development but also the activity through which the subject, performing physical activities, becomes aware of his possibilities, in the conditions of success or failure, in the struggle with oneself or with others, learning at the same time to know oneself better and to know the world better. In the current conception, physical education and school sports constitute one of the most important links of physical education. Due to the fact that students in this educational cycle enter a stage of their lives characterized by profound morpho-functional, motor and psychic transformations, their interest in movement is very high during this period. The present study aims to develop speed, agility and strength, within the physical education lesson, aiming to maximize specific means. The experiment includes the two groups, control and experiment, thus following the interpretation of the results, the progress or regression of the experimental group will be more obvious and easy to analyze, thus the subsequent decisions regarding the content of the subsequent program being simpler, following the previous evaluation. The physical education of the last period suffers in terms of planning and organization of the proposed ones, and through the present paper we highlight the fact that through a correctly carried out activity, positive results appear.

**Keywords:** speed, agility, strength, high school students, physical education

## Introduction

Practicing physical education in school fulfills a particularly important role in the process of forming the student's personality, it ensures the formation of knowledge, the ability for social integration, but primarily, the students' body must acquire a series of physical qualities such as speed, skill, resistance, strength, but also the formation and development of volitional, character, moral and hygienic-sanitary traits (Demeter, 2005).

As an educational discipline, it has a predominantly formative character, aiming at the preparation of subjects for life and emphasizing harmonious physical development, the development of basic motor skills needed in everyday life, the ability to transfer the motor skills acquired in the lesson to everyday life, as well as the development of personality traits. However, the competitive nature of school physical education cannot be excluded (Papp et al. 2019; Romero-Blanco et al., 2020). This is illustrated both by the means used (sports, exercise games, competitions) and by the students' participation in school sports competitions (championships organized at school, sector, county, national level, cups, cross-country races (Dragnea, 2006).

The importance of physical education in the general process of preparation and training of students is also revealed by the fact that it presents the only object of the education plan which mainly has the role of acting in the field of development and physical training, to establish and achieve a proper balance between intellectual and physical effort, an element of great importance in the normal growth of youth (Erdelyi et al. 2020; Gea-García et al., 2020; Makhmudovich et al., 2022).

In physical education lessons with children of pubescent age, the main content of the activity must be oriented towards the use of various means, intended to achieve multilateral physical training. The use, in the training of children of this age, of as many physical exercises as possible, with a different structure of movements and a varied character of neuromuscular effort, will contribute to the development of dynamic stereotypes, which engage the most important systems of the body. (nervous, cardiovascular, respiratory system etc.). In these conditions, along with obtaining a rich motor baggage, the maximum mobilization and development of the body's functional capacity is achieved (Demeter, 2005).

In the secondary school cycle, due to the development of the body on multiple levels, especially due to the increase in the plasticity of the cortex and the mobility of the nervous processes of excitation and inhibition, the possibilities of improving all motor qualities and especially speed increase, especially at 12 years for girls and at 13 years in boys. At the age of 12, the speed of girls is higher than that of boys, and they will gradually increase their speed indices, gradually surpassing girls (Șandra et al. 2022; Sudak et al., 2022; Domenico et al., 2022).

As a result of the development of the locomotor apparatus, along with the speed, the skill obviously progresses, which is why puberty is called the age of skill. Mobility has the lowest values at 12-13 years for girls and 13-14 years for boys, which means that the movements are not performed with the appropriate amplitude, which requires special measures during the lessons (Suhaili et al., 2019; Șandra et al. 2023).

Resistance capacity is low, especially in the form of cardiovascular resistance, which requires a systematic action for its development. Preferably, the resistance will be acted upon in a strength or speed regime that engages large muscle groups (back, upper limbs, lower limbs) and allows the unhindered activity of the cardio-respiratory apparatus, without demanding it to its maximum possibilities (Ilies and Caciora 2020; Moore et al., 2022).

### ***Speed, agility and strength***

Speed, with its various forms of manifestation, is a particularly important motor quality in physical education and beyond, which is involved directly or in combination with other qualities, determining success in many cases. To develop speed in all its forms, it is recommended to use competition elements, which increase efficiency, but you can also use different games and relays with the content of running, different jumps and distance or precision throws (Epuran, 2001).

Continuing with the age between 10 and 15 years, through appropriate training, reaction speed indices equivalent to those of adults can be reached, and by increasing the capacity for anaerobic effort, it is possible to intervene on the development of movement speed, as well as the speed in force mode (Leon, 2010).

For the development of speed, all the movements that make up the content of the means of physical education can be used, performed at maximum speed in normal execution conditions, in easy conditions to increase the execution speed and in difficult conditions to increase the effort performed at maximum speed (Savescu and Șandra 2023). Both in school physical education and in performance sports, superior results cannot be obtained without proper training of all muscle groups. Most of the time, strength conditions the manifestation at a high level of the other qualities, as well as motor skills (Skitnevskiy et al., 2020; Bulz et al. 2023).

The set of factors that influence muscle strength is diverse and at the same time broad, which imposes in the development process a series of methodical measures, which favor the conditions created by their existence or diminish them. Strength development in children (especially during periods of intense growth) is achieved with some restrictions due to morpho-functional peculiarities (Körmendi et al. 2022).

In the process of developing this motor quality, the particularities of growth and development of the human body will be taken into account until around the age of 11-12 years, both in girls and in boys, a similar evolution of strength indices is recorded; this remains valid only until this age (puberty), because strength development is achieved due to neuromuscular coordination, not yet being influenced by the secretion of anabolic hormones, between 10 and 15 years old you can use exercises in which the load is your own body or weights of about 1-2 kg; up to the age of 14, the force-speed couple can be developed without restrictions (Sabău et al. 2023).

### **Materials and methods**

In the present experiment, we aimed to carry out a comparative study on the development of motor qualities - speed/agility/force (explosive) - in secondary school students, grades 7 and 8. In this idea we set out to design, apply and evaluate a program for their development.

The judicious application of the means and methods of developing explosive speed and strength in secondary school students (7<sup>th</sup> grade), during a 14-week training program, will significantly improve the manifestation indices of the two targeted motor qualities.

The students of the 7<sup>th</sup> grade A (experimental group) and 7<sup>th</sup> grade B (control group) participated in the study, consisting of 17 students (7 girls / 10 boys), respectively 20 (8 girls / 12 boys).

The experimental group with an average age of 13.2 years, and the control group 13.3 years.

### ***Tests used***

Standing long jump, performed to evaluate the horizontal explosive force of the lower limbs, anaerobic alactic power of the lower limbs.

The "T" test, monitoring the development of speed with a change of direction of the subject.

The "Zig-Zag" test, assessment of agility, ability to move with rapid changes of direction at different angles, balance, acceleration and deceleration. This test aims to monitor the development of the athlete's speed and agility.

Sprint 4×10 meters, with a standing start (Shuttle 4×10 m.), assessment of agility, ability to move with rapid changes of direction, combining muscular strength, explosive strength, starting strength, acceleration, and deceleration.

Throwing the medicine ball (3 kg) with two hands above the head, evaluation of the explosive force of the upper limbs and the trunk.

Physical education through its different forms of organization and due to its formative character, contributes to the harmonious development of the creative spirit, the desire for affirmation and overcoming or self-transcendence. Thus, our activity wants to develop the motor qualities targeted in the present experiment through and with the help of the activity within the physical education lesson.

The activity was carried out over a period of 3 months, in the present study the two 7<sup>th</sup> classes were included, with a total number of 37 students, of which the experimental group consists of 8 girls and 12 boys, and the group control 7 girls and 10 boys.

In the experimental group, intervention was carried out during the proposed program, during physical education classes, being equivalent to two weekly interventions of 20-30 minutes each, on Mondays and Wednesdays.

The methods used in the present study are the following: jumping on the gymnastic bench alternately, jumping over fences of different sizes, standing long jump, and squat long jump, these elements were used for the development of explosive force.

Exercises for speed development were performed at the beginning of the lesson, after the warm-up, and those for lower body strength at the end of the lesson.

For the development of agility, the means used were, various variants of moving in a ladder followed by accelerated running over different distances in zig-zag, slalom, lateral movement left/right, running with changing the direction of movement,

forwards and backwards, (4F+1B), left right and 180° turns with continued movement (left/right).

For the development of the explosive force of the upper body, the means used were exercises with the elastic band, push-ups, but also throwing the soccer ball and throwing the medicine ball of different weights.

As in the case of the previous program within the lesson of each training cycle, for Wednesdays we used the same principle for the training program, at the beginning of the lesson the exercises aimed at developing agility were carried out, and the end of the lesson being reserved for the exercises that have in mind the development of the explosive strength of the upper body, through the means presented in the previous table.

### Results and discussions

In the first test in this work, namely the "T" Test according to the figure 1, we can see that following the application of the proposed program, a significant difference is observed between the averages of the initial and final tests for both girls and boys. If we compare the progress achieved by the girls' group, the average of the two tests in the experimental group shows a progress of 1.05 seconds, while the progress of the control group is 0.83 seconds, which is higher in the experimental group.

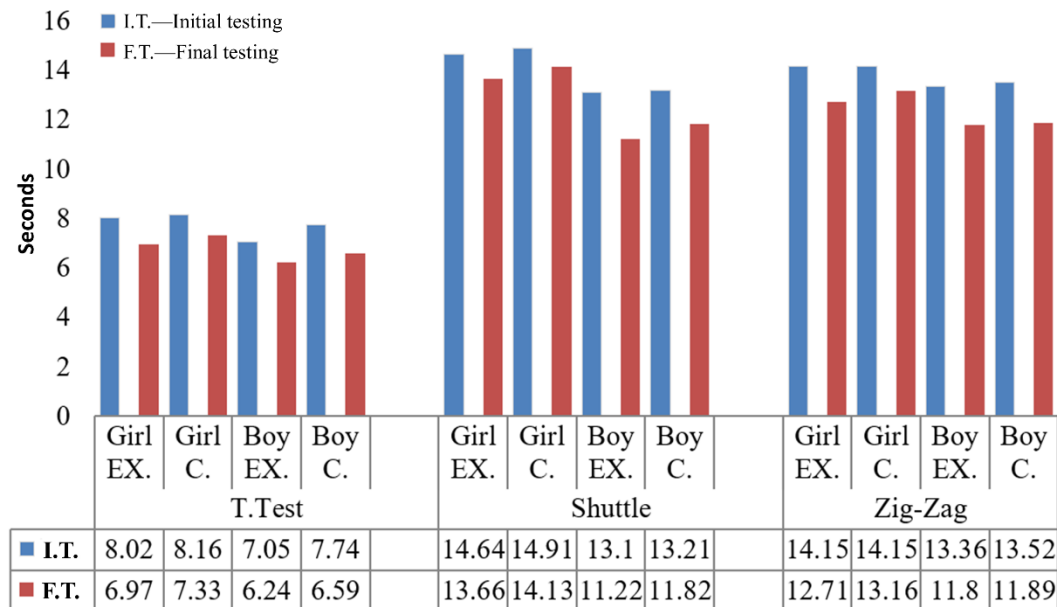
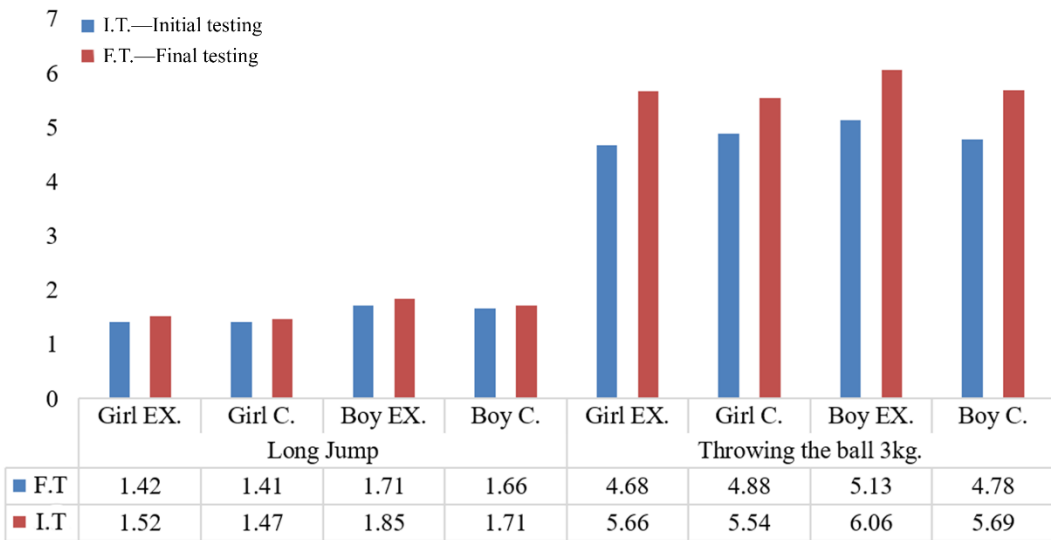


Figure 1. Representation of the values obtained in the initial and final tests at the speed and agility tests

Also in the speed trial, at the shuttle 4×10m. The averages of the initial and final tests are presented in figure 1, where the mean value of boys shows values above those of girls. However, the progress of the experimental groups, girls and boys

respectively, is above that of the control groups, 0.98 seconds experimental girls with 0.78 seconds control, and experiment boys 1.88 seconds with 1.39 seconds.

Looking at the progress in the "Zig-Zag" test from the averages of the two tests, we observe the following aspects: the girl group experienced a progress of 1.44 seconds, while the control group 0.99 seconds. And in the case of boys, even if both values from the two tests show better values compared to those of the control group, the progress of the control group is 0.07 seconds better, a statistically insignificant value.



**Figure 2.** Representation of the values obtained in the initial and final tests at the strength tests

For the first sample aimed at evaluating the strength of the lower limbs, we notice after the analysis of the averages obtained during the tests that: the groups of boys, experiment, but also control exceed the values of girls, where in both cases the experimental groups present results above the control ones.

When throwing the 3 kg medicine ball. The averages obtained after performing statistical-mathematical calculations show us a greater progress of the experimental groups, thus for girls 0.98 meters compared to 0.66 meters the control group, and for boys the results are somewhat closer regarding the progress, experiment 0.93 meters, control 0.91 meters (Figure 2).

The values represented in figure 3 represent the standardized difference between the averages and highlight whether this difference is statistically significant.

This is a method by which the level of efficiency achieved after the training period can be found. For the difference to be considered small, this value must be less than or equal to 0.2, for an average group efficiency this value must be between 0.2-0.8 and for a statistically high efficiency this value must be greater than or equal to 0.8.

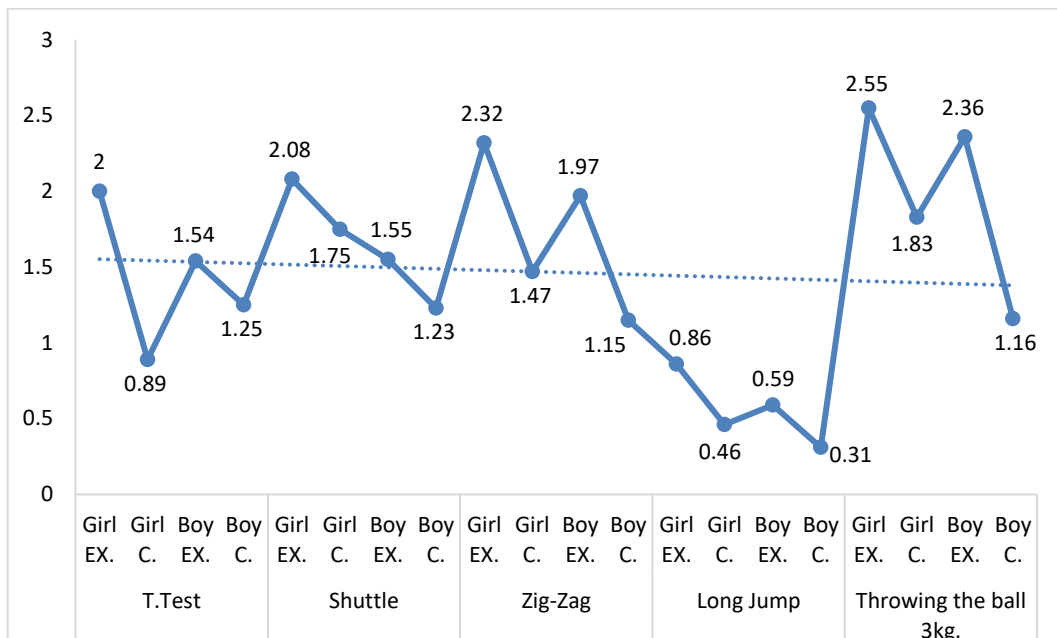


Figure 3. Effect size values for each group at the five tests

In the case of the experimental groups at each control sample, the effect size in the case of girls was between 0.86 and 2.55, and in the case of boys 0.59 and 2.36. In the control group, only in four of the five control samples, the effect size was large, above 0.8, in boys between 1.15 and 1.23, in girls between 0.89 and 1.83 and in two samples of control the effect size was medium, boys registering values between 0.31 and 0.51 and girls between 0.46 and 0.48.

Through all that has been mentioned in the previous lines, we can state that the effect size is large, which justifies us to say that we are dealing with a significant difference between the means of initial and final testing.

### Conclusions

Physical development, respectively the development of motor skills in the physical education lesson must be a main and priority objective of young people's training, so that it becomes a solid basis for their activity in everyday life or later sports.

In the speed/agility tests there was a progress between 0.81-1.88 seconds in the three tests, in the case of the experimental group, the progress being between 0.78-1.39 seconds, we observe a better progress of the experimental group. The data we collected, and the results obtained in this study demonstrate that the training process was effective in developing the targeted motor qualities, so as can be seen in the tables above for all the tests performed, a significant progress was made for the experimental group, by the value between the averages and by the percentage difference calculated for each sample.

Another conclusion that emerges from the values recorded for both the experimental and control groups confirms that our activity was effective, thus the

effect size largely presents values greater than 0.8, the percentage being higher in the group experiment, which confirms that the difference between the averages recorded in the two tests, initial and final, is significant from a statistical point of view.

After all the work done, but also through the lens of the interpretation of the results previously presented in the present study, the group that participated in the proposed program achieved a progress over that of the control group, a fact highlighted by the calculation of the size of the effect highlighted in figure 3, but also in the figures 1 and two where in each sample of the final test the experimental group obtained results above those of the control group.

## References

- Bulz, A.M., Sandra, M., Ille, M., Stance, L., Sabau, A., Sturzu, B., Savescu, D., & Bulz, G.C. (2023). Study on the use of new trends, materials and exercises for the development of coordination in 5th grade students (10-11 years old). *Geosport for Society*, 18(1), 30-40. <https://doi.org/10.30892/gss.1803-094>
- Demeter, A. (2005). *Fiziologia educației fizice și sportului [Physiology of physical education and sport]*, Editura Stadion, Bucharest, Romania.
- Domenico, F.D., Altavilla, G., & Raiola, G. (2022). Relationship between rapid strength, reactive and strength and agility in university sports students. *The South African Journal of Child Health*, 10(1), 98–103. <https://doi.org/10.13189/saj.2022.100114>
- Dragnea, A. (2006). *Educație Fizică și Sport – Teorie și Didactică [Physical Education and Sports – Theory and Didactics]*, Editura FEST, Bucharest, Romania.
- Epuran, M. (2001). *Metodologia cercetării activității corporale [Methodology of physical activity research]*. Academia de Educație Fizică și Sport, Bucharest, Romania.
- Erdely, S., Caciora, T., Serbescu, C., Papp, B.M., Tamas, F.A., Bujorean, E.; Baidog, A., Furdui, S., Ile, M., & Herman, G.V. (2020). Trends in the lifestyle of students. Case study of a high school in Oradea, Romania. *Geosport for Society*, 12(1), 1–12. <https://doi.org/10.30892/gss.1201-052>.
- Gea-García, G.M., González-Gálvez, N., Espeso-García, A., Marcos-Pardo, P.J., González-Fernández, F.T., & Martínez-Aranda, L.M. (2020). Relationship Between the Practice of Physical Activity and Physical Fitness in Physical Education Students: The Integrated Regulation As a Mediating Variable. *Frontiers in Psychology*, 11, 1910. <https://doi.org/10.3389/fpsyg.2020.01910>
- Ilies, A., & Caciora, T. (2020). Mapping the Scottish university football competitions. A dual performance model: organized sports and professional training. *Geosport for Society*, 12(1), 72–90. <https://doi.org/10.30892/gss.1208-061>
- Körmendi, G., Lucaciu, S., & Lucaciu, G. (2022). Aspects of aerobic endurance in middle school students. *Geosport for Society*, 17(2), 69-74. <https://doi.org/10.30892/gss.1701-084>
- Leon, V., (2010). *Dezvoltarea calitatilor motrice cu ajutorul metodelor moderne si a mijloacelor specifice jocului de fotbal, in invatamantul liceal [The development of motor skills with the help of modern methods and means specific to the football game, in high school education]*, Editura Sfântul Ierarh Nicolae, Galati, Romania.
- Makhmudovich, G.A., Anvarovich, I.S., & O'rmonovich, I.F. (2022). Development of physical activity of students based on physical education and sports classes. *International Journal of Social Science & Interdisciplinary*, 11(11), 135–141.
- Moore, J.H., Smith, K.S., Chen, D., Lamb, D.A., Smith, M.A., Osburn, S.C., Ruple, B.A., Morrow, C.D., Huggins, K.W., McDonald, J.R., Brown, M.D., Young, K.C., Roberts, M.D., & Frugé, A.D. (2022). Exploring the Effects of Six Weeks of Resistance Training on the Fecal Microbiome of Older Adult Males: Secondary Analysis of a Peanut Protein Supplemented Randomized Controlled Trial. *Sports*, 10(5), 65. <https://doi.org/10.3390/sports10050065>
- Papp, B.M., Șerbescu, C., Caciora, T., Baidog, A., Varodi, M.O. (2019). The Effects of a Physical Activity Program on Body Composition and Physical Condition in the Overweight Adult. *Analele Universității din Oradea. Fascicula Educație Fizică și Sport*, 29(1), 1-9.



- Romero-Blanco, C., Rodríguez-Almagro, J., Onieva-Zafra, M.D., Parra-Fernández, M.L., Prado-Laguna, M. D.C., & Hernández-Martínez, A. (2020). Physical Activity and Sedentary Lifestyle in University Students: Changes during Confinement Due to the COVID-19 Pandemic. *International Journal of Environmental Research and Public Health*, 17(18), 6567. <https://doi.org/10.3390/ijerph17186567>
- Sabău, A.M., Săvescu, B., Bulz, C., & Săvescu, D. (2023). Development study determining motor qualities in rhythmic gymnastics. Mobility and coordination in gymnasts 10-12 years old. *Geosport for Society*, 19(2), 65-75. <https://doi.org/10.30892/gss.1903-097>
- Şandra, M., Bulz, G.C., & Marinău, M.A. (2022). The development of speed, agility and coordination in young football players of the U12 category. *Geosport for Society*, 17(2), 75-88. <https://doi.org/10.30892/gss.1702-085>
- Şandra, M., Săvescu, D.V., Bulz, G.C., & Marinău, M.A. (2023). Development of speed and strength in young football players aged 10-12 years. *Analele Universităţii din Oradea. Facicula Educaţie Fizică şi Sport*, 33(1), 3-12.
- Săvescu, D.V., & Sandra, M. (2021). Aspects regarding the development of basic motor skills in 10-12 year old children in football. Perspectives of the coach. *Geosport for Society*, 18(1), 1-8. <https://doi.org/10.30892/gss.1801-092>
- Skitnevskiy, V.L., Balashova, V.F., Grigoryeva, E.L., Kozlov, V.I., Sedov, I.A., Krasilnikova, Y.S., & Smirnov, S.A. (2020). Development of speed endurance of children of 13 to 14 years of age attending football classes. *EurAsian Journal of BioSciences*, 14(2), 3401–3407.
- Subak, E., Kaya, K., Viga, Ş.O., Ocak, M.H., Ağaoğlu, C., & Bekiroğlu, A. (2022). Association between body composition, physical activity level and Illinois agility test performance in young males and females. *Physical Education of Students*, 26(4), 180–187.
- Suhaili, I., Harun, D., Kadar, M., Hanif Farhan, M.R., Nur Sakinah, B., & Evelyn Jong, T.H. (2019). Motor performance and functional mobility in children with specific learning disabilities. *The Medical Journal of Malaysia*, 74(1), 34–39.