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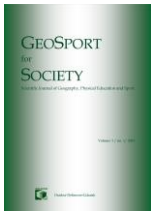

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Enhancing motor skills and coordination in middle schoolers through innovative physical education programs

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Abstract: New activities during physical education and sports classes attract children to the desire to exercise. This study, which involves two hours a week for a school year (8 months), in which children can experience new materials and learning tools during sports lessons, will improve their coordination and motor skills. The tests that the subjects of the experimental group will complete will bring coordination skills and the development of sensory perception. 3 of the tests used are for the development of kinesthetic sensitivity and 1 test will be for sensory-motor coordination. The results will show significant differences between the experimental and control groups after carrying out the program with the new work materials. In conclusion, the program carried out in the physical education and sports classes for two semesters led to significant improvements in terms of sensory-motor coordination and kinesthetic sensitivity of 10-14-year-old secondary school students.

Keywords: coordination, physical education, middle school, sensory-motor, motor skills

Introduction

Early childhood is considered an ideal age period for the development of fundamental movement skills (Karachle et al., 2017). Yasumitsu and Nogawa (2010) said that an exercise program intervention that incorporates rhythmic play could improve coordination skills in preschool children and even satisfy their needs in a way befitting early childhood development. Sabău et al (2023) indicates that, 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. Physical activity is one of the essential components of human existence which, together with intellectual activity, ensured the uniqueness of our species on the evolutionary path of the biosphere (Şandra et al., 2022). Szabo et al. (2020) support that the fundamental components of the agility skill are coordination and movement control.

Physical education is one of the most important subjects in the school curriculum because it directly targets the health and development of children (Papp et al., 2019; Erdely et al., 2020; Giurgiu et al., 2023). Also, adults are involved in this type of education precisely to improve work performance, general well-being, socializing with other practitioners, and the development of communities channeled towards the development of the movement (Ilieş & Caciora, 2020). The child's preoccupations will have to be oriented towards the functions of balance, static and dynamic, as well as general dynamic coordination, as a prelude to his socio-familial integration, as an immediate objective, and socio-productive, as a perspective objective (Albu et al., 2009). Boreham and Riddoch (2001) indicates that it is clear, despite their natural tendencies, children have become less physically active in recent decades. 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 (Domenico et al., 2022; Sabău et al., 2023).

Developing coordination during puberty is extremely necessary and effective due to the assimilation of knowledge by children at this age (Bulz et al., 2020). The fundamental role of proprioceptive training in children's sports is very important (Galea, 2014; Bondoc-Ionescu, 2017). This stage is a recommended stage for learning motor skills specific to some sports, as well as for developing coordination. In specialized literature, the term coordination is often used to refer to skill, precision, accuracy, balance, and mastery. These are closely related and represent an individual's adaptation to a new environment and his ability to perform harmonious movements and quickly combine new movements in the shortest possible time and with low energy consumption (Marcu & Matei, 2009; Şandra et al., 2023a and b).

In Manno (1992) conception, motor capacities represent a set of human predispositions or motor potentials on which learned motor skills are built. A sufficient or optimal level of motor capacity development allows for many sophisticated skills.

The most favourable period for the initiation of coordination is at the beginning of puberty, that is, up to 11-12 years, after which learning becomes motor of a spontaneous type, through imitation it gradually disappears, giving advantage to

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rational thinking through analysis, decision, creation, an idea not accepted by Tudor, V., in 2001, who considers the age of 15 years for boys and 13-14 years for girls is the age at which motor coordination can be best developed.

Chagas et al. (2016) said that it is recognized that children with a marked impairment in the development of motor coordination may show difficulty in gaining knowledge in schools. Breaz (2019) begun from the premise that performances in the field of coordinative capacities can be improved through operational models from the age of puberty. Another study from Iordăchescu and Orțănescu (2022), argues that the coordinative skills play a fundamental role in the child's physical development.

This study analysed the situation in Oradea's schools. We found that the development of coordination would be much more effective if we used current materials and means in physical education and sports classes. The objectives of this study are to educate the ability to coordinate, develop coordination, develop motor skills, and develop sensorial perception.

Materials and methods

Subjects

In this study, 101 students from 5th, 6th, 7th and 8th classes from Dacia High School in Oradea were involved. The experimental group consisted of 21 students (11 girls and 10 boys) from 5th grade, 33 students (16 girls and 17 boys) from 6th grade, 25 students (13 girls and 12 boys) and 22 students (7 boys and 15 girls from the 8th grade.

The control group consisted of 98 students, 19 students (11 girls and 8 boys) from 5th grade, 30 students (14 girls and 16 boys) from 6th grade, 25 students (13 boys and 12 girls) from 7th grade and 24 students (13 boys and 11 girls), from the 8th grade.

This extensive study on the development of coordinative abilities in secondary school students included 199 children between the ages of 10 and 14.

The proposed program was applied for a scholar year (8 months), 2 times a week, after the experimental group's schedule of physical education and sports classes, and the control group performed sports classes after the school curriculum normally.

Tests used

Purdue Pegboard

The student must insert the chopsticks from the right side of the board with the right hand for 30 seconds. He will do the same thing on the left side with his left hand. In the 3rd part of this test, the student inserts the chopsticks simultaneously with both hands.

Movement precision test and eyes-hand coordination

The objective of the test is to accurately execute a two-hand takedown from the bottom after a pre-roll. Five repetitions are performed and the percentage efficiency is calculated. The subject is in the starting position behind the starting line (the bottom line of the volleyball court), performs a forward roll on the mat, a quick lift, a move to a ball offered by a partner from the opposing court and a two-handed catch

from the bottom to fixed point. The ball picked up by the subject must be directed towards a square with a side of 2.5 m located near the net in zone 2.

Hand dexterity test

The student has 1 minute to transfer as many of the given 150 cubes (side 2.5 cm) as possible from one side of a box to the other. The score is given by the number of cubes transferred. The student is given 15 seconds before the test to prepare.

Distance apreciation test

It is a test of distance appreciation, 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 to check the distance covered.

Materials and exercises proposed and used for the development of coordinative capacity

To achieve the proposed objectives, we used materials like:

Elastic cord (fixed in the wall), speed leather, swiss ball, bosu ball, balance plate, aplication courses, relays, diferent balls (handball, basketball etc), gimnastic bench, cones. Table 1 shows in detail all the materials used, together with the exercises developed through them, providing a clear and structured organized record of the related resources and activities

Tabel 1. Materials and exercise that we have done in this study

Materials used	Exercise
Agility leader	Raising left/right knee bent to chest Stepping 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 entryand exit from the square; Quick side steps to the left/right with both feet stepping in each square. 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 legs laterally in the form "in-in-out-out";
Elastic cord	The rope attached to the middle of the trunk in the harness, accelerated running as far as possible to stretch the rope and return; The rope attached to the middle of the trunk in the harness, running with the back until it allows the rope to stretch and return; Rope attached to mid-torso in harness, walk with added or crossed steps in basic; Basketball/handball position as far as possible to stretch rope and return; The rope caught by the hands, the imitation of throwing the handball ball;

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	The rope caught by the hands, imitating the throw to the basket; With the rope attached to the hands, throwing balls of different sizes and weights;
Swiss ball	Plank position from high support, outstretched legs supported in balance on the ball, hold 15 sec. Lying on your back, heels balanced on the ball, raising your pelvis off the ground, hold for 5 sec. return. Lying on your back on the fitness ball, knees bent, feet on the ground, arm extension and return; Lying on your back, the fitness ball between your ankles, rise to the square position, hold for 5 sec. and return; Lying face down on the fitness ball, contact with the ball in the thigh area, between the arm and forearm at a 90o angle, extension to the forearm on the arm and return; Lying on your back, arms outstretched with the ball caught between the palms, lifting into a square position and moving the ball between the ankles, the exercise is repeated; Sitting in balance on the ball, flexion and extension of the trunk with the arms at the side; Lying face down on the fitness ball, contact with the ball in the thigh area, trunk extension; Sitting in balance on the ball, flexion and extension of the trunk with the arms at the side.
Bossu Ball	Jumping on two feet on Bossu Ball; Jumps on the left/right leg; Ascending and descending alternately with the left/right foot on the Bossu ball; Jumps from the ground on the Bossu Ball and rebound; 90 degrees, 180 degrees, 360 degrees turn jumps on the ball with balance maintenance; Standing on the boss in one leg, the opposite arm up, maintaining the position 20 sec From support on the Bossu Ball with the flat side up, grabbing the edges, by jumping bringing the knees to the chest in squat support, and returning to the initial position; Throwing the handball/basketball with two hands from the chest into the Bossu Ball and catching it; Basketball hoop shot with Bossu Ball; Throw at the handball goal with a beat on Bossu Ball. Running with a step on Bossu ball placed longitudinally or zig-zag; From standing sideways to the ball, lateral jump from one leg to another alternately on the Bossu Ball;
Relays and applied courses	Running, walking in balance on the bench, jumping on two legs on the Bosu Ball, jumping on one leg on the Speed Ladder, bypassing the milestone and jumping on the other leg when returning; Running, running forward with both feet stepping squarely and stepping one foot out to the side in a "two-in-one-out" ladder, throwing at the target and returning with the same exercises;

Driving the Swiss ball through the posts, dribbling with the Swiss Ball through the posts, sitting on the Wobble Board, turning 360o in sitting;
Running, going around a milestone 360 degrees, moving with the trunk bent, rolling forward from squat to squat, climbing the fixed ladder and returning with the same exercises.

The methodology and materials used in this study were carefully chosen to support the development of middle school students' coordination and motor skills through various exercises and innovative equipment. These activities included the use of a diverse set of materials such as bossu ball, swiss ball, bungee cords, balance boards, cones, gymnastic benches and balls of various types, all designed to provide a dynamic and attractive training environment for students. The proposed exercises have been adapted to age groups and abilities, emphasizing activities that develop balance, motor coordination, kinesthetic sensitivity and the ability to perform precise movements, from exercises on the agility scale to jumping on the bossu ball or transfer exercises of objects.

The program has been structured to be attractive and stimulate students' active involvement, encouraging them to develop both their physical strength and the cognitive abilities needed to control complex movements. The methodical approach was intended not only to improve the physical performance of the students, but also to provide them with a meaningful and diversified learning experience that meets the specific needs of their developmental age. Implementing these innovative materials and exercises in physical education classes thus provides a solid basis for the development of coordination, contributing to students' overall progress on a physical and motor level.

Results and discussions

In this sample, the test was done for the right hand, for the left hand and for both hands. On the right hand, the experimental group had an average of 16.4 chopsticks inserted in 30 seconds during the initial tests, and the control group an average of 16.8 chopsticks inserted. The left hand had an average of 15.7 chopsticks in the initial tests in the experimental group and 15.7 chopsticks in the control group. In the last test with both hands at once, the average in the initial tests was 11.6 chopsticks inserted in the experimental group and 11.6 chopsticks in the control group. We see that the values are very close, the subjects being at about the same level in the initial tests (Figure 1).

At the final tests, we noticed that the progress of the experimental group was much better than that of the control group. On the right hand, the average in the final tests was 22.3 chopsticks inserted in 30 seconds, an average of almost 5 chopsticks more than in the initial tests. The control group had an average of 19.8 chopsticks inserted in 30 seconds during the final tests. On the left hand, the experimental group recorded an average of 22 chopsticks, and the control group an average of 19 chopsticks. We also observe here an increase of approx. 6 chopsticks in the experimental group, compared to the initial tests. In the test of both hands, the average of the experimental group was 17.7 chopsticks at the final tests, and the

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control group had an average of 14.6 chopsticks. And in this test, the progress of the experimental group was approx. 6 sticks more than the initial tests.

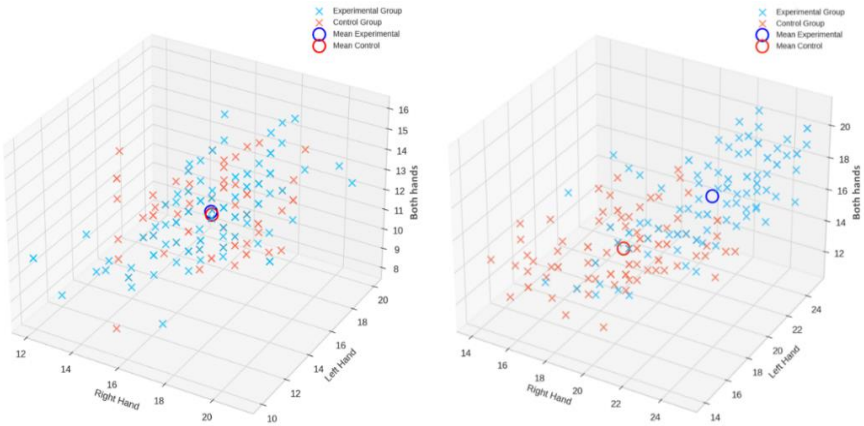

Figure 1. Purdue Pegboard initial test (left) and final test (right) on the experimental group and the control group

We mention the fact that the subjects of the experimental group from the 6th grade had the best progress in the right hand and the left hand, with an increase of 6.5 (right hand) more sticks and an increase of 6.5 (left hand) more sticks in the final tests than in the initial tests and in both hands, the most notable progress was made by the 5th grade subjects of the experimental group with an increase of 6.4 sticks more in the final tests.

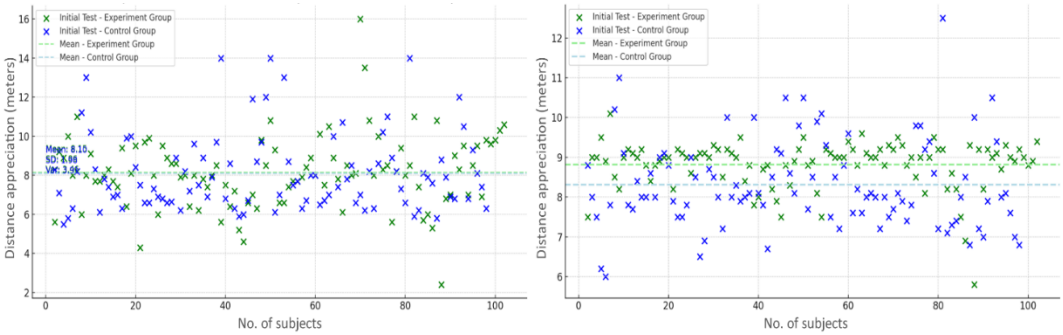

Figure 2. Movement precision test and eyes-hand, representing the initial test (left) and the final test (right) on the experimental group and the control group

In the movement precision and eye-hand coordination test, the following results were obtained: in the 5th grade, the experimental group achieved an average progress of 2.5 attempts between the initial and final testing. The differences between tests of the control group in the 5th grade was on average 1.5 trials between the initial testing and the final testing (Figure 2).

In 6th grade, the experimental group progressed an average of 2.4 trials between tests, and the control group progressed only 1.3 trials. In the 7th grade, progress was

evident in the experimental group compared to the control group. In the initial tests, the experimental group had an average of 2.3 attempts and in the final tests they reached an average of 4.6 attempts, the progress between the two tests being more than 2 attempts. The control group had an average of 2 attempts in the initial tests and of 3.8 in the final tests, between tests being a progress of 1.8 attempts. The 8th grade had an average of 2.2 attempts in the initial tests regarding the experimental group and an average of 2.1 attempts in the control group. At the final tests, the experimental group had a progress of 2.2 attempts, the average reaching 4.4 attempts. The control group reported an average of 3.7 attempts, the progress being 1.6 attempts more (Figure 2).

The average of the experimental group at the initial tests was 2.1 attempts and at the final tests the average was 4.4 attempts. The progress was +2.3 successful attempts. In the control group, the average in the initial tests was 2 attempts and in the final tests the progress was +1.7.

In the hand dexterity test, we notice that the control group recorded a better average in the initial tests, and in the right hand, with an average of 55.3 cubes, compared to 53.9 in the experimental group, and in the left hand where the group of control had an average of 54.5 cubes compared to 53.6 cubes achieved by the experimental group (Figure 3).

In the final tests, we notice that the experimental group made much greater progress and surpassed the control group, having an average of 61.2 cubes on the right hand compared to 57.9 cubes achieved by the control group. On the left hand, the average of the experimental group was 60.4 cubes and the average of the control group was 56.8 cubes. All classes registered a significant progress, the 6th grade having the greatest progress, having an average of 8.1 more cubes between the 2 tests on the right hand and an average of 7.8 more cubes on the left hand (Figure 3).

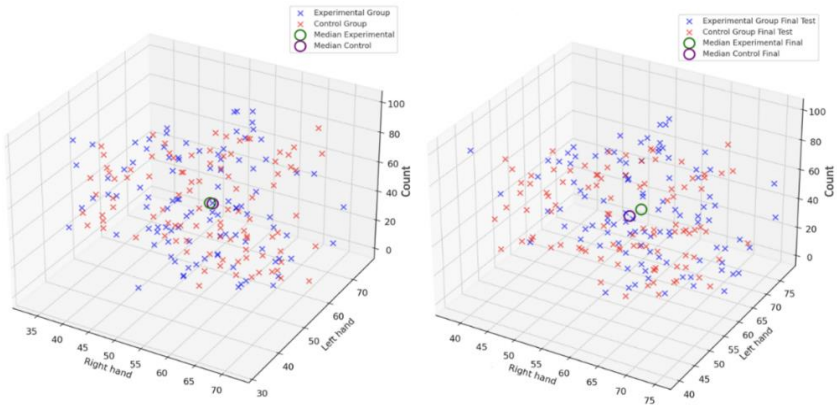

Figure 3. Hand dexterity test, representing the initial test (left) and the final test (right) on the experimental group and the control group

Even if in the initial tests the control group recorded better results, the final tests bring a much better progress of the experimental group compared to the control

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group, the averages obtained reflecting the clear difference of approx. 4 extra cubes for each hand in the final tests.

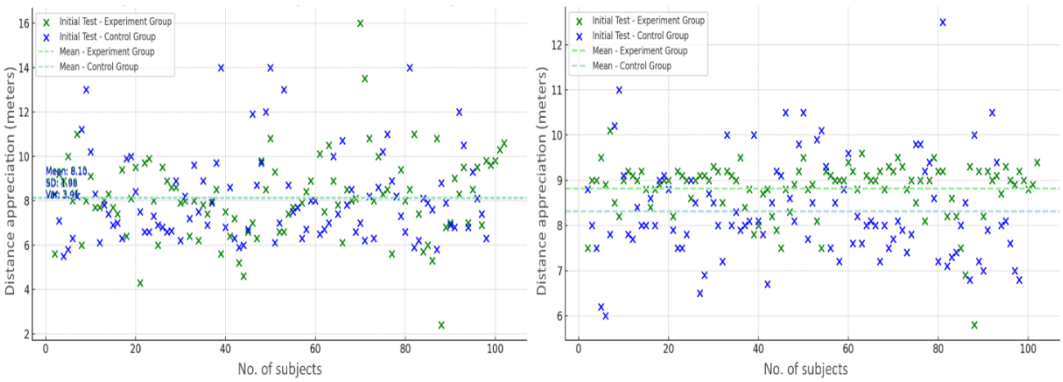

Figure 4. Distance appreciation test, representing the initial test (left) and the final test (right) on the experimental group and the control group

In this sample, the initial tests' average was 8.1 meters in the experimental group and 7.9 meters in the control group. We note the 6th grade, with an average of 8.7 meters in the experimental group and 8.3 meters in the control group. At the opposite pole was the 5th grade, with an average of 7.1 meters in the experimental group and 7.8 meters in the control group.

At the final tests, the average of the experimental group increased to 8.8 meters and the average of the control group was 8.2 meters. In this test, the experimental group of the 5th grade made the greatest progress, whose average increased from 7.1 in the initial tests to 8.6 in the final tests, a progress of 1.5 meters. We see better progress in the experimental group, whose average increased from 8.1 in the initial tests to 8.8 in the final tests. The control group registered insignificant progress, from 7.9 meters in the initial tests to 8.2 in the final tests (Figure 4).

Progress was observed in more than 80% of subjects in the experimental group and only 35% of the control group progressed.

Following the application of the "t" test, the results recorded in this test are significant. A highly statistically significant difference was found in the means of the experimental group compared to the control group. As can be seen in the graph, at the final test the experimental group came very close to the 9-meter threshold that had to be covered according to the test description, which proves that the sensory-motor coordination of the subjects in the experimental group improved.

Conclusions

By introducing new materials and means to the physical education and sports classes at the gymnasium, we observed a significant improvement in the general coordination, kinesthetic sense and cognitive abilities of the students in this study. Introducing the lesson exercises with Swiss ball, Bosu ball, agility ladder, elastic rope, etc., we obtained considerably improved final test results. The control group that did the physical education lessons after the school curriculum and did not use the means

and materials used in the experimental group had insignificant progress.

The use of bossu ball and swiss ball in lessons led to an improvement in balance and motor skills in over 78% of the tested subjects. Also, the use of the agility ladder and the elastic rope attached to the wall considerably improved general coordination, resistance to short-term intense efforts, but also a clear cognitive development in more than 70% of the participants in this study. In the test for movement precision and hand-eye coordination, the progress was also with 2 more successful executions than the control group. The balance exercises on the bossu ball and walking in balance on the benches during the applicative courses helped to considerably improve the results of this test.

Swiss ball provides a variety of challenging exercises, not just for the core, but for the upper and lower body as well and this fact helped to concentrate more and better on tests that require fine coordination. Maintaining positions on bossu ball and swiss ball, which require both core and upper body strength, helped to develop general strength and body balance in over 80% of the participants in the experimental group.

The use of these helpful materials during physical education and sports lessons and finding the right exercises according to the potential and age characteristics of the classes led to significant improvements in all tests. More than 80% of the students who were part of the experimental group recorded remarkable progress, which gives us perspectives for the future.

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References

Albu, C., Albu, A., Vlad, T.L., & Iacob, I. (2006). *Psihomotricitatea [Psychomotricity]*. Editura Institutul European, Iasi, Romania.

Bondoc-Ionescu, D. (2017). *Antrenamentul proprioceptiv individualizat pe baza informațiilor analizatorilor în activitatea motrică specifică sportului [Individual proprioceptive training based on the information of the analyzers in the motor activity specific to the sport].* Editura Universitatii Transilvania din Braşov, Brasov, Romania.

Boreham, C., & Riddoch, C. (2001). The physical activity, fitness and health of children. *Journal of Sports Sciences, 19*(12), 915-929. https://doi.org/10.1080/026404101317108426

Breaz, P.C. (2019). Study on the development of coordinating capacities in gymnasium education students. *Bulletin of the Transilvania University of Braşov, Series IX: Sciences of Human Kinetics*, 12(2), 87. https://doi.org/10.31926/but.shk.2019.12.61.2.43

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

Chagas, D.V., Leporace, G., & Batista, L. A. (2016). Relationships between motor coordination and academic achievement in middle school children. *International Journal of Exercise Science, 9*(5), 616-624.

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

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.

Galea, I. (2014). *Evaluarea motrică și somatofuncțională [Motor and Somatofunctional Assessment].* Editura Universitatii Aurel Vlaicu, Arad, Romania

Giurgiu, L. R., Damian, C., Sabău, A. M., Caciora, T., & Călin, F. M. (2023). Depression related to COVID-19, coping, and hopelessness in sports students. *Brain Sciences, 14*(6), 563. https://doi.org/10.3390/brainsci14060563

Ilieș, 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

Iordăchescu, E.M., & Orțănescu, D. (2022). Improving coordinative skills in 4th grade students through additional programs taught online. *Gymnasium Scientific Journal of Education, Sports, and Health, 23*(1), Article 06. https://doi.org/10.29081/gsjesh.2022.23.1.06

Karachle, N., Dania, A., & Venetsanou, F. (2017). Effects of a recreational gymnastics program on the motor proficiency of young children. *Science of Gymnastics Journal, 9*(1), 17-25.

Manno, R. (1992). *Les bases de lenrtainement sportif [The basics of sports training]*, Edition Revue E.P.S., Paris, France.

Marcu, V. & Matei, C. (2009). *Echilibrul corporal [Body Balance].* Editura Universității din Oradea, Oradea, Romania

Papp, B.M., Șerbescu, C., Caciora, T., Baidog, A., & Olău, V.M. (2019). The effects of a physical activity program on body composition and physical condition in overweight adults. *Analele Universității din Oradea. Fascicula Educație Fizică și Sport, 29*(1), 1-9.

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

Șandra, M., Abodi, C. N., Bulz, G.C., Caciora, T., & Marinău, M.A. (2023a). Development of speed, agility, and strength in middle school students. *Geosport for Society, 19*(2), 111-119.

Sandra, M., Bulz, G.C., & Marinau, 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

Șandra, M., Savescu, D.V., Bulz, G.C., & Marinau, M.A. (2023b). Development of speed and strength in young football players aged 10-12 years. *Analele Universității din Oradea. Facicula Educație Fizică și Sport*, 33(1), 3-12.

Szabo, D.A., Neagu, N., & Sopa, I.S. (2020). Research regarding the development and evaluation of agility (balance, coordination and speed) in children aged 9-10 years. *Health, Sports & Rehabilitation Medicine*, 21(1), 33–40. https://doi.org/10.26659/pm3.2020.21.1.33

Yasumitsu, T., & Nogawa, H. (2010). Effectiveness of a coordination exercise program during school recess of elementary school - Focusing on agility. *Research Society of Sports Performance*, 2, 233-245.