STUDIA UBB EDUCATIO ARTIS GYMN., LXVII, 4, 2022, pp. 113-123
(RECOMMENDED CITATION)
DOI:10.24193/subbeag.67(4).39

COGNITIVE DEVELOPMENT THROUGH MOVEMENT GAMES IN ELEMENTARY SCHOOL PUPILS

MACOVEI Raluca-Andreea[1,*], POPESCU Veronica[2]

Received 2022 October 08; Revised 2022 November 22; Accepted 2022 December 05; Available online 2023 March 10; Available print 2023 March 30.

ABSTRACT. Introduction. As one of the most fundamental activities of childhood, dynamic game can have a primary significance as a mean of recreation and gradually advance to a major pedagogical influence. Movement games are an ideal means of education, fulfilling the highest level of movement, motor and cognitive development, personality shaping and social integration, ensuring the formation of a strong profile of the primary cycle graduate. The way the student responds, applies and adapts to the rules imposed by the game directly influences memory, thinking, language, creativity, sensations and perceptions, thus, its implications hold a significant percentage in cognitive development. **Objectives.** 1) knowing of the implications of motion games in the cognitive development of primary-cycle pupils**;** 2) increasing the attractiveness of physical education lessons; 3) learn to spend free time as actively as possible. **Methods.** The knowledge test contains 10 items and was applied to 54 students in the 3rd and 4th grades in rural areas, divided into control group - 27 students and experimental group - 27 students, following the implementation of a dynamic game program applied to the experimental group during the school year 2021-2022. Knowledge testing verifies how they have understood the games and the ability to use, adapt or build them in a personalized way. **Results.** The knowledge test has a maximum score of 10 points, each question being scored differently. The average score for the experimental group is 9.11 points and for the control group is 6.27. The difference between the result obtained by the experiment group and the control group is 2.84 points, a difference that confirms the proposed objectives given the dynamic game program applied to the experiment group.

[1] *PhD Student, State University of Physical Education and Sport, Chișinău, Republic of Moldova*
[2] *Conf. Univ. Dr., Faculty of Physical Education and Sport, Alexandru Ioan Cuza University, Iași, Romania*
* *Corresponding author: raluca.macovei88@gmail.com*

Conclusion. Applied dynamic games aim to stimulate students' thinking, attention, memory and creativity in a fun way that does not provide the fear of rejecting their own ideas, rewarding and encouraging all attempts to build new dynamic games.

Key words: *cognitive development, movement games, elementary school.*

Introduction

Play, through the various forms it takes, is a method that never loses the curiosity of researchers and teachers, regardless of the discipline by which it is applied. Its usefulness starts by getting used to different rules, accumulating new information without the appearance of boredom, to awareness of involvement in activities, bearing defeat, developing courage and teamwork (Șchiopu & Verza, 1997). All the more, the contribution of the play represents a higher contribution, especially at the level of the primary classes, positively influencing the child in preparing for adult life.

It is known that the valences of physical education act on many levels, including cognitive development, improving thinking, attention, memory, creativity, and modeling a balanced, autonomous and prepared behavior to deal with the challenges of society. Physical education and sport classes have a positive influence on physical, cognitive and socio-emotional development and it can even be said that it is the only discipline that manages to have implications on all these educational components, contributing to the improvement of school performance (Corbin, Pangrazi & NASPE, 2004; McCluskey et.al, 2021; Yachmenev & Rubanovich, 2017). The dynamic play performed during the classes will provide a base for spending free time, succeeding through the learning process to ensure the optimal acquisition of the physical, socio-emotional and cognitive development: attention, memory, language, thinking, creativity or imagination, formation of sensations, perceptions and representations. (Wyver, 2019). Carson and Predy (2019) points out that regardless of the type of games or whether or not they are directed, children successfully participate in the learning process in a stimulating and enjoyable way.

Dynamic games are a main means of harmonious development of elementary school student, being performed to ensure physical development and motor skills. The use of motion games as an active system in the formation of general and specific competences of the discipline, has a favorable effect in the development of students, especially at the primary level, representing in the

same time one of the most important methods used for the elevate degree of fascination that has on the childhood period. When we talk about the movement game, it is mostly done outdoors, because it requires a more generous space to be able to achieve the proposed objectives. For example, from our experience in the department, if we propose to children in the primary class to carry out activities through motion games, outside, outdoors, they will unanimously agree to this way of performing the lesson. We mention that the game in the physical education lesson, in different forms, gives them the opportunity to manifest themselves freely and thus the main educational components are strengthened. The creativity of the physical education teacher makes the difference between a monotonous lesson and a lesson full of emulation and conscious participation on the part of students regarding the acquisition of multidisciplinary knowledge, also bringing into play elements from other disciplines that make up the national curriculum. This way of teaching has the effect of a strong consolidation of the accumulated knowledge palette, offering possibilities to select knowledge, to build strategies for solving requirements and to cooperate in solving problems. During the game, there is an assimilation of impressions and reactions that leads to the development through functionality, training and organization of a mental nature. Therefore, through play specific behaviors are manifested, practical and mental action schemes are developed that stimulate and fuel the development process. Outdoor motion games will involve children in leisure activities, managing to be more active and more cognitively and socio-emotionally responsive, with positive results on learning and forming the global personality.

From studies conducted (Carson & Predy, 2019; Wyver, 2019; Abdelkarim et al., 2017) as well as the opinion of several authors (Cârstea, 2000; Matveev & Novicov, 1980; Stănescu, Ciolcă & Urzeală, 2004) it is considered that movement games have a multitude of positive influences determined by the following characteristics:

- it's have been part of the physical activity of the individual since ancient times;
- it's an activity that produce self-stimulation, maintaining a high level of interest for knowledge and exploration;
- it's can be organized during lectures, recreations, in extracurricular activities or in their free time and have a broad creative initiative in choosing the means to achieve the intended goal;
- being based on the natural way of movement and manipulation of one's own body demonstrates native or acquired abilities, ingenuity, creativity, in other words a behavior appropriate to moral ideals;
- develops interpersonal relationships: collaboration, respect, critical spirit, self-criticism and observation, assuming responsibilities;

- it starts from the simple, reaching through repeated and methodical use, to the complex, ensuring the formation of competencies using the approach of several ways of solving for the proposed contents;
- it helps to develop their motor skills in a pleasant and accessible form;
- at the cognitive level they can positively influence executive functions like inhibitory control, working memory and cognitive flexibility, which are the basis of the general development of the child;
- it's increasing the memory productivity thus the game manages to impregnate it a categorical voluntary character from preschool age and with continuous imprint throughout the primary cycle on the rules fixation, recognition and reproduction;
- helps the development of oral or action language by actively participating in the communication process; The children's vocabulary is increased by describing their own actions or those of their teammates, which will bring positive results for verbal communication and the accumulation of new knowledge.
- through them, students experience the active environment, adapt to new situations, maintain optimal physical and mental health, stimulate their permanent need for movement and favor the use of physical activities as a way of spending free time;
- they can assess students' ability to apply the acquisition of knowledge and skills.
- they are more preferable to be made outdoors, to combine the factors of hardening of the body but also offering the opportunity to be allowed to unfold and express as close as possible to their natural behavior, also the relationship of movement game - outdoor activity is relevant knowing that the level of health and development can be achieved especially if it is achieved in places with maximum oxygen intake and rays of sun, cheerful and colorful nature;
- develops moral and willpower qualities as diligence, distributive attention, capacity for anticipation and courage;
- prepare the student for the introduction to the labor market: physical and psychological fortification, it creates skills and habits for group collaboration, for the application of their own actions, for the combination of joint effort in order to achieve a goal and for the joy of living - happy children will become active and optimist adults involved in the activities of the society.

Through play, as the acquired skills develop in accordance with the child's stage of development, the desire to apply them in informal activities increases. Through experimentation, the child will be able to invent many games in which to apply the skills obtained: games on the playground, cooperative games,

games with various themes or musical games. A program loaded with such games will give the child pleasure and the challenge of experiencing new things with maximum interest throughout his life.

Objectives

- knowledge of the implications of movement games in the cognitive development of primary school students;
- increasing the attractiveness of physical education lessons;
- enriching the baggage of knowledge for spending leisure time in the most active way possible.

Method

The knowledge test consisting of 10 items was applied to the control and experiment groups in 2022 may, following the completion of the implemented program. The test was attended by 24 third-graders and 30 fourth-graders pupils. During the implemented program, the students from the experimental group participated in various games that were explained, offering also various possibilities of adapting them according to the conditions existing in the area where they live in order to be performed in their free time, while the control group students followed the application of the curriculum in a classic way. Knowledge testing verifies how students in the experiment group understood the games and the ability to be able to use or build them in a personalized way compared to the baggage of knowledge accumulated by the students in the control group.

Results

For the analysis it was resorted to the calculation of the sum of the scores obtained by both groups as well as to the average of the scores obtained in total, by classes, groups and per item separately.

The maximum sum of the scores is 270 points, and according to Table 1, the experiment group managing to accumulate a total of 246 points out of which 104.25 points by third graders and 141.75 points by fourth graders, and the witness group managed to accumulate 169.5 points out of which 79 points by third graders and 90.5 points by fourth graders. Third graders were able to answer questions to almost the same extent as fourth-graders from both groups, with item scores even higher than the fourth graders on some questions.

Table 1. The points sum obtained by both groups

Involved students	Experimental group	Control group
3rd graders sum	104.25	79
4th graders sum	141.75	90.5
Total sum	246	169.5

Table 2. The average of the score obtained by both groups

Involved students	Experimental group	Control group
3rd graders avg	8.68	6.58
4th graders avg	9.45	6.03
Total avg	9.06	6.30

The knowledge test shows a maximum score of 10 points, each question being scored differently. The average of the score obtained on each group and class according to Table 2 shows that the third graders in the experiment group obtained an average of 8.68 points and the fourth graders an average of 9.45 points, while the students in the third graders control group obtained an average of 6.58 and the fourth graders obtained an average of 6.03 points. The average total score obtained by the experiment group is 9.06 points, and for the control group it is 6.30 points. The difference between the result obtained by the experiment group and the control group is 2.76 points, a fairly large difference that confirms the validity of the proposed hypothesis, given the diverse program of games applied to the experiment group. The experiment group also scored very close to the maximum, only 0.94 less than the maximum 10 points awarded.

For the interpretation of the knowledge test, it was taken into account the calculation of the average score obtained also on each question, comparing the results obtained by both groups with the maximum score granted for each item.

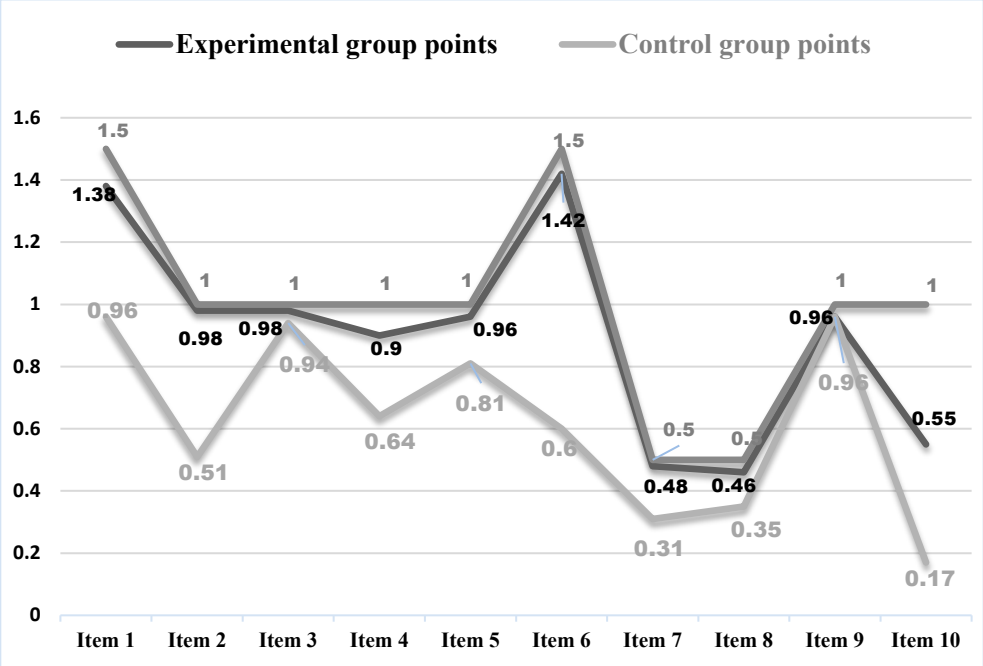

Figure 1. *Average of points distributed on each item for experimental and control group*

• Item 1 refers to the ticking of the boxes having games that have in their content the motor skill of running, the maximum score awarded being 1.5 points, 0.5 points for each box correctly ticked. The experiment group accumulated an average of 1.38 points and the control group an average of 0.96 points. The difference between the maximum score and the experiment group is 0.12 points, and between the maximum score and the control group is 0.54 points. The students in the experiment group averaged the score 0.42 higher than that of the students in the control group. Regarding the distribution of the average score by group and by class, for the experiment group the third graders obtained an average of 1.37 points and the fourth graders an average of 1.40 points, and for the control group the third graders obtained an average of 1.12 points and the fourth graders an average of 0.83 points. Although for the control group the students of the fourth grade are of a higher age, the students of the third grade recorded a higher average score on this question.

• In item 2, the students had to list two movement games that can be made with the handball, respectively the football one, being able to obtain a maximum score of 1 point, 0.5 points for each game listed. The students in the experiment group did very well, obtaining an average of 0.98 points, and the

students in the control group obtained an average of 0.51 points. The students of the 4th grade in the experiment group obtained the maximum score compared to those from the 3rd grade who obtained an average of 0.95 points. For the control group, the third graders recorded a better score average than the fourth graders students, respectively 0.66 points compared to 0.4 points. The difference between the experiment group and the control group is 0.47 points.

- The maximum score on item 3 is 1 point and was obtained by correctly ticking the box that names the game that follows the development of breathing. Both groups involved in the test scored very well, close to the maximum: 0.98 experiment group points and 0.94 control group points. The third grades from each group recorded a maximum score, and the fourth grades obtained an average score of 0.96 points for the experiment group and 0.90 points for the control group.
- Item 4 gave a maximum score of 1 point and was awarded for listing two things that the student can use to be able to make a ball that would have the shape and size of a tennis ball. They showed creativity, especially in those within the experiment group who scored 0.9 points, 0.26 more than the control group that scored 0.64 points. The students of the experiment group of the third grade obtained the average of 0.83 points and those of the fourth grade averaged 0.96 points, and the students of the control group of the third grade averaged 0.83 points and those of the fourth grade 0.5 points. Among the most options listed by the students are paper and clothing items.
- Item 5 also has the maximum score of 1 point, awarded for listing two material resources used instead of bowling pins, for making the game Pins. Both groups obtained an average score close to the maximum, the experiment group having the average score of 0.96 points and the control group an average score of 0.81 points. The 4th grade from the experiment group obtained the maximum score and the 3rd grade of the same group 0.91 points, while from the control group, the 4th grade scored 0.76 points and the 3rd grade scored 0.85 points. The students' most ingenious solutions were bottles, glasses, milestones and even wood cut to about the same size and arranged like pins.
- The sixth requirement consists of 3 sub-tasks, each corresponding to the ticking of a single correct answer for which 0.5 points are obtained, with a total score of 1.5 points. The first item has as a requirement to tick the correct answer for the main muscle group developed through the game The Fight of the Roosters, the second item the choice of the main resource used to make the game Transport with Rolling, and the third item requires the choice of the number of balls necessary to perform the game Countries. The experiment group accumulated a score average of 1.42 points, of which those in 3rd grade obtained an average of 1.33 points and those in 4th grade obtained an average

of 1.5 points. The control group obtained an average of 0.6 points, of which those from 3rd grade obtained an average of 0.5 points and those from 4th grade an average of 0.68 points. The difference between the average of score of the experiment group and that of the control group is 0.82 points.

- Item 7 is an open question where students must name a game that takes place on music, accumulating for a correct answer a maximum score of 0.5 points. The experiment group accumulated a score average by 0.17 points higher than the control group, respectively 0.48 points and the control group averaging 0.31 points. The score obtained by class is as follows: the experiment group – the 3rd graders an average of 0.5, the 4th graders an average of 0.46, and the control group – the 3rd graders an average of 0.33, the 4th graders an average of 0.3 points. In both groups, the students from the 3rd grade obtained an average score higher than the ones from 4th grade. Among the most famous games performed on a musical background are the Musical Chairs, the Ice Cream and The Bear is Sleeping.
- The requirement of item 8 is to name a game that develops attention. From the maximum score of 0.5 points, the experiment group obtained an average of the score of 0.46 and the control group an average of the score of 0.35. Depending on the average per grades and group, in the experiment group, the 3rd graders scored 0.41 points, the 4th graders scored the maximum of 0.5 points, and in the control group, the 3rd graders scored 0.29 points and the 4th graders 0.4 points. The most listed games are: Remember the number, Reverse Command, Clockwork, The Hide and Seek and The Ducks and Hunters.
- In item 9, the students must draw lines from the column with images to the column containing the corresponding word, each correctly drawn line being awarded 0.25 points, and the maximum score obtained is 1 point. The images depict body positions specific to athletics, gymnastics, football and handball, which are approached through playful activities during the school year. This requirement is the only one in which the students of both groups recorded the same average of the scores of 0.96, being also very close, at a difference of 0.04 points, to the maximum score granted.
- The last requirement verifies the memory and creativity of students as a result of the games implemented in the planning during the 2021-2022 school year. They must build a relay or game that has in its content resources such as balls, milestones and ropes, in order to obtain a maximum score of 1 point. It is the question on which the students recorded the lowest score: the experiment group with the average score of 0.55 points and the control group the average score of 0.17 points. Students who described a relay or a game were able to describe their own ones without listing those performed during the physical education class, and some of them were made in class to encourage students to have a desire to practice their own activities in their free time as well.

Conclusion

The contribution of the use of movement games is founded in the efficiency of the physical education lesson, in the determination of students to participate in activities with pleasure and enthusiasm, in the formation of motor skills that will make him aware of his possibilities.

The involvement of students in performing movement games during physical education lessons is an important basis of knowledge on how to spend their free time, offering desire to stay outside, make new friendships and have a healthier lifestyle. The time spent through the game stimulates the student to observe, to be attentive and creative, to think and forces him unconsciously to seek and find solutions to solve the requirements by collaborating with others.

Applied dynamic games aim to stimulate students thinking, attention, memory and creativity in a fun way that does not provide the fear of rejecting their own ideas, rewarding and encouraging all attempts to build new dynamic games. The students learned that there are no ideas or misconceptions, but only things that can be improved, of course with the help of the teacher.

We consider the game as a method that combines the traditional with the modern, managing to guide the student in going through the most attractive and interactive cycles of education, offering a stable and strong foundation to successfully face the challenges of adult life.

REFERENCES

Abdelkarim, O., Ammar, A., Chtourou, H., Wagner, M., Knisel, E., Hökelmann, A., & Bös, K. (2017). Relationships between motor and cognitive learning abilities among primary school-aged children. *Alexandria Journal of Medicine,* 53(4), 325-331. DOI: 10.1016/j.ajme.2016.12.004.

Carson, V., & Predy, M. (2019, May). Active Outdoor Play. *Enclyclopedia on Early Childhood Development*, 1-7. Retrived from https://www.child-encyclopedia.com/pdf/expert/outdoor-play/according-experts/active-outdoor-play

Cârstea, G. (2000). *Teoria şi metodica educaţiei fizice şi sportului.* Bucureşti: Editura AN-DA.

Corbin, C. B., Pangrazi, R. P., & National Association for Sport and Physical Education. (2004). Physical activity for children: A statement of guidelines for children ages 5-12. *National Association for Sport and Physical,* 2, 1-28.

Matveev, L. P., & Novicov, A. D., (1980). *Teoria şi metodica educaţiei fizice*, Bucureşti: Editura Sport-Turism.

McCluskey, M., Al-shallawi, A.N., Penk, D., Bridges, J., Gilson, N., Hermens, H., Buurke, J., & Pandyan, A. (2021). Evaluating Associations between Physical Activity and Growth, Academic Attainment, and Socioeconomic Factors in Primary School Children - A Prospective Cohort Study. *Journal of Physical Activity Research,* 6(2), 112-121. DOI: 10.12691/jpar-6-2-8.

Stănescu, M., Ciolcă C., & Urzeală, C. (2004). *Jocul de mişcare- Metodă şi mijloc de instruire în educaţie fizică şi sport*, Bucureşti: Editura Cartea Universitară.

Şchiopu, U., & Verza, E. (1997). *Psihologia vârstelor.* Ediţia a III-a revizuită. Bucureşti: Editura Didactică şi Pedagogică.

Wyver, S. (2019 May). The influence of outdoor play on social and cognitive developement. *Encyclopedia on early childhood developement,* 1-7. Retrived from https://www.child-encyclopedia.com/pdf/expert/outdoor-play/according-experts/influence-outdoor-play-social-and-cognitive-development

Yachmenev, N., & Rubanovich, V., (2017). Dynamics of morphofunctional state of schoolchildren of 6–7 classes in the academic year, depending on the organization of physical education. *Novosibirsk State Pedagogical University Bulletin*, 7(1), 191-202. DOI: 10.15293/2226-3365.1701.13