

Movement Games as a Means of Enhancing Physical Fitness and Vestibular Stability in 8-9-Year-Old Pupils in the Mekong Delta, Vietnam: A Case Study

Dao Chanh Thuc^{1,2}, Do Tan Phong^{3,*}

¹Department of Physical Education, An Giang University, Vietnam

²Vietnam National University, Ho Chi Minh City, Vietnam

³Department of Physical Education, Banking University, Vietnam

Received January 19, 2024; Revised June 18, 2024; Accepted July 26, 2024

Cite This Paper in the Following Citation Styles

(a): [1] Dao Chanh Thuc, Do Tan Phong, "Movement Games as a Means of Enhancing Physical Fitness and Vestibular Stability in 8-9-Year-Old Pupils in the Mekong Delta, Vietnam: A Case Study," *International Journal of Human Movement and Sports Sciences*, Vol. 12, No. 4, pp. 738 - 746, 2024. DOI: 10.13189/saj.2024.120416.

(b): Dao Chanh Thuc, Do Tan Phong (2024). *Movement Games as a Means of Enhancing Physical Fitness and Vestibular Stability in 8-9-Year-Old Pupils in the Mekong Delta, Vietnam: A Case Study*. *International Journal of Human Movement and Sports Sciences*, 12(4), 738 - 746. DOI: 10.13189/saj.2024.120416.

Copyright©2024 by authors, all rights reserved. Authors agree that this article remains permanently open access under the terms of the Creative Commons Attribution License 4.0 International License

Abstract Objective: To assess the influence of movement games aimed at enhancing the physical fitness and vestibular stability of primary school students in the Mekong Delta, Vietnam, aged 8 to 9 years. The researchers conducted the study at a boarding primary school in the Mekong Delta, Vietnam. The study involved 125 students from the 3rd and 4th grades, and they were categorised into four groups: experimental group (EG) boys and girls, male and female control groups (CG). Results: The control group demonstrated noteworthy enhancements in the physical fitness and vestibular parameters of 8- to 9-year-old students both before and after engaging in physical games during physical education (PE) sessions. The experimental group exhibited superior physical fitness and vestibular stability indicators compared to the control group, along with a significant confidence level ($p < 0.05$). Therefore, the current study demonstrates that kinesthetic games that match students' characteristics, their interests, and how to organise them in practice are extremely important and practical. This study selected five new movement games for students aged 8 to 9 years old, using scientific research methods common in physical education. The purpose of these games is to help students stabilise their vestibules and develop physical fitness. Researchers conducted the study in two ways: outside of class and outside of physical education. The results showed that the exercise games selected for elementary school students

from 8 to 9 years old in the Mekong Delta, Vietnam, created vestibular stability and physical fitness development, as well as interest in physical education classes for 8- to 9-year-old students.

Keywords Primary School Students, Mekong Delta, Vietnam, Boarding Primary School, Student Interests, Physical Activity

1. Introduction

Sports and physical education are crucial for children's overall development, especially throughout their school years. Physical education in schools aims to promote the physical health and well-being of children [1], [2]. It helps in the overall development of students by providing movement activities and games that are essential for their growth [3], [4]. Physical education classes at school offer concentrated and structured physical training, which is necessary for students' comprehensive development. These classes provide the necessary physical activities and games that are crucial for students' growth [5], [6].

During physical education classes, teachers should create games that not only improve physical development but also create excitement among students. Movement

games serve as a means of physical education and conscious activities that aim to achieve specific goals and results under certain conditions. Sports games have two elements - entertainment and physical training - that contribute to the moral and physical development of students. These games help in forming and developing qualities, skills, and techniques necessary for life. Additionally, movement games provide pupils with thorough physical training that improves their strength, agility, and skills [7]. Children often employ fundamental natural movement abilities, including sprinting, leaping, throwing, climbing, crawling, and turning around while playing games. These games stimulate physical development by utilising these fundamental movement skills [7].

Physical education and sports games are essential for the overall development of students. They not only promote physical health but also contribute to the development of various skills and qualities necessary for life [8], [9].

The current physical education programmes in schools have certain shortcomings, such as the lack of incorporation of games during lessons and inadequate facilities or equipment [10]. This is especially relevant for primary school students, as entertainment through play activities plays a crucial role in their mental and physical development [11]. Unfortunately, the organisation of extracurricular physical training movements in primary schools is still lacking, leading to low learning outcomes in physical education and physical fitness among students in the Mekong Delta region of Vietnam. The limited facilities and weak physical education teacher support may contribute to this issue, as students may not feel comfortable engaging in physical activities that they enjoy [12], [13]. This is the motivation behind conducting this study.

Given that every child is different and develops at a different rate, movement games are useful tools for working with kids [14], [15]. Rather than using completely new techniques, we suggest incorporating movement activities into the regular physical education curriculum for 8- and 9-year-olds in order to solve this problem. A preliminary survey of primary schools in the Mekong Delta region indicates that extracurricular sports activities are underdeveloped and the organisation of these activities is lacking, resulting in low learning outcomes in physical

education and physical fitness among primary school students, particularly 8–9-year-olds [10], [16]. Therefore, selecting appropriate physical conditions that align with the psychological and physiological characteristics of 8-9-year-olds for practical application is an important task to enhance physical strength and vestibular stability among these students. Moreover, it will play a role in enhancing the efficacy of physical education programmes in elementary schools within the Mekong Delta region of Vietnam.

2. Materials and Methods

The research methodology involves the application of diverse research methods, including the document search analysis method. Researchers perform data analysis utilising SPSS 20.0 software, facilitating the compilation of research outcomes [17]. The authors applied five new games and physical education subjects to the experimental group during the experimental phase. During the experimental phase, the experimental group actively participated in five new games: parkour, put-down games without getting caught, team play with a hula hoop, balance games, and rolling games (Figure 1). We divided the experimental subjects into two groups.

Statistical Analysis

Quantitative analysis: Microsoft Excel and SPSS version 20.0 statistical software were used to examine quantitative data in order to determine data normality and descriptive statistics (mean \pm standard deviation). The scores of vestibular stability and physical fitness in the experimental and control groups were compared before and after using paired-sample t-tests. 0.05 is the significance threshold that is used.

Physical fitness and vestibular stability testing: For fitness assessment tests, the authors used six tests according to the standards issued by the Ministry of Education and Training of Vietnam [18], and we also referred to other studies. For the test to evaluate the level of vestibular stability, we consulted experts and the studies of the authors [19] (Shown in Table 1a).



Figure 1. Five games experimented in the study

Table 1a. Physical Fitness and Vestibular Stability Tests

Tests	Content is evaluated
1. 5-minute run (m) 2. Handgrip test right, (kg) 3. Lifting the torso from the prone position, for 30s (times) 4. 30m Run, (s) 5. 4x9 m shuttle run (s) 6. Standing long jump (cm)	Physical fitness
7. Turns on the gym bench (times)	Vestibular stability

Table 1b. Program movement games

Training Unit Components	Activities	Duration
Warm-up	Prestretch and warm-up	5 min
Program movement games	a. Parkour b. Put-down games without getting caught c. Team play with a hulo hoop d. Balance games e. Rolling games Ten minutes are spent on a single-movement game.	50 min
Cool-down	Cardiorespiratory cool down and the poststretch.	5 min

The experimental group consists of 63 students (31 boys and 32 girls) who are 8–9 years old and come from two primary schools in the Mekong Delta region. The Ministry of Education and Training has established a standard physical education program that these students adhere to. They also take part in extracurricular physical education activities (particularly on Monday and Thursday afternoons each week, lasting 35 minutes) and movement games selected by the authors during class time (specifically, two hours each week) (Shown in Table 1b).

The control group consists of 62 students (31 boys and 31 girls) who are also 8–9 years old and come from the same two primary schools in the Mekong Delta as the experimental group. The Ministry of Education and Training established the regular physical education curriculum that these students follow. The experiment took place during extracurricular physical education hours, specifically in educational activities outside of class.

The author conducted testing and evaluation before and after the experiment. The author utilized five physical fitness tests to assess the students' performance. These tests include "30m Run (s), standing long jump (cm), lifting the torso from the prone position in 30 s (times), handgrip test right (kg), 4x9 m shuttle run (s), and 5-minute run (m)" [20], [21], [22], [23]. Furthermore, the researchers utilized a test to assess vestibular stability, specifically the "Turns on the gym bench (number of times)" test [24], [25].

The students had to perform exercises on a narrow surface and record the number of turns on the gym bench with an accuracy of 0.5 turns. If a student fell, they were instructed to continue the exercise. The test measures the number of repetitions completed in 20 seconds. Over a nine-month period, we conducted the experimental process with four periods per week. This included two periods of extracurricular educational activities and two periods of extracurricular activities in physical education. The pedagogical experimentation process took place from August 2022 to June 2023. Prior to the experiment, all students were in normal health and had obtained consent

from their parents. The experimental location for this research was the two primary schools located in the Mekong Delta region of Vietnam. The study involved a total of 125 elementary school students aged 8–9 years old.

3. Results

Looking at Table 2, we see that the average values of EG and CG are similar, as are the physical fitness tests and the level of vestibular stability.

The vestibular stability index and physical fitness level of the two groups were comparable prior to the trial, according to test findings. The outcomes of the categorization are totally impartial. Following the experiment, the findings demonstrated that the experimental group's level of physical fitness was much higher than the control group's. This demonstrates how well the physical standards we chose and implemented for 8–9-year-old primary school pupils have worked to help them build their physical strength and vestibular stability for EG. To enhance the visualisation of variations in vestibular stability and physical fitness metrics between the EG and the CG, we initially computed the rate of growth in physical fitness levels for male and female students in both the CG and EG. Tables 3 and 4 show the findings.

Following the 5-movement game experiment, both the male and female EG showed a greater increase in physical fitness and vestibular stability compared to the CG, as shown by the results in Tables 3 and 4.

To be more specific, the experimental male group's vestibular stability index grew by 32.38%, exceeding the male CG by 12.15%, and its physical fitness test indices climbed from 7.83% to 41.90%, outpacing the male control group (1.60% to 21.43%). Physical fitness test indices rose from 7.42% to 26.73% in the experimental female group, exceeding the control female group (2.42% to 13.06%). By 35.43%, the experimental female vestibular stability index rose above the 16.77% female dominant CG.

Table 2. Mean of CG and EG groups before the experiment

TEST	Males		t	P	Females		t	P
	M_{CG}	M_{EG}			M_{CG}	M_{EG}		
1	755.31	752.13	0.33	>0.05	690.7	698.79	1.63	>0.05
2	13.04	12.98	1.45	>0.05	12.94	12.64	1.04	>0.05
3	13.65	13.85	1.73	>0.05	11.36	11.72	0.54	>0.05
4	6.31	6.37	1.06	>0.05	7.58	7.54	1.03	>0.05
5	12.97	13.02	1.52	>0.05	13.41	13.46	-1.08	>0.05
6	135.46	136.32	0.70	>0.05	131.73	130.89	1.51	>0.05
7	8.5	8.8	1.05	>0.05	7.1	7.2	2.08	>0.05

Notes: M_{EG} –Mean of the EG; M_{CG} –Mean of the CG; $P=0.05$, $t=0.05$; Six physical fitness tests: (1) 5-minute run, (2) handgrip test, (3) lifting the torso from the prone position, (4) 30m run, (5) 4x9m shuttle run, (6) standing long jump - and one (7) vestibular stability test - turns on the gym bench.

Table 3. Before and after the experiment, we compared the test results for male pupils aged 8 to 9 in terms of vestibular stability and physical fitness

TEST	CG (n=31)		W%	P	EG (n=31)		W%	P
	M_1	M_2			M_1	M_2		
1	755.31	776.21	2.73	>0.05	752.13	861.91	13.6	<0.05
2	13.04	16.17	21.43	<0.05	12.98	19.86	41.9	<0.05
3	13.65	15.51	12.76	<0.05	13.85	17.02	20.54	<0.05
4	6.31	6.21	-1.6	>0.05	6.37	5.89	-7.83	<0.05
5	12.97	12.03	-7.52	<0.05	13.02	10.85	-18.18	<0.05
6	135.46	149.37	9.77	<0.05	136.32	164.21	18.56	<0.05
7	8.5	9.6	12.15	<0.05	8.8	12.2	32.38	<0.05

Note: M_1 , Mean value before the experiment; M_2 , Mean value after the experiment; W% represents growth; P represents the statistical probability threshold.

Table 4. Before and after the experiment, we compared the test results for female pupils aged 8 to 9 in terms of vestibular stability and physical fitness

TEST	CG (n=31)		W%	P	EG (n=32)		W%	P
	M_1	M_2			M_1	M_2		
1	690.7	712.49	3.11	>0.05	698.79	752.65	7.42	<0.05
2	12.94	14.02	8.01	>0.05	12.64	16.54	26.73	<0.05
3	11.36	12.86	12.39	<0.05	11.72	14.86	23.63	<0.05
4	7.58	7.15	-5.84	>0.05	7.54	6.06	-21.76	<0.05
5	13.41	13.09	-2.42	>0.05	13.46	12.11	-10.56	<0.05
6	131.73	150.14	13.06	<0.05	130.89	155.77	17.36	<0.05
7	7.1	8.4	16.77	>0.05	7.2	10.3	35.43	<0.05

Note: M_1 , Mean value before the experiment; M_2 , Mean value after the experiment; W% represents growth; P represents the statistical probability threshold.

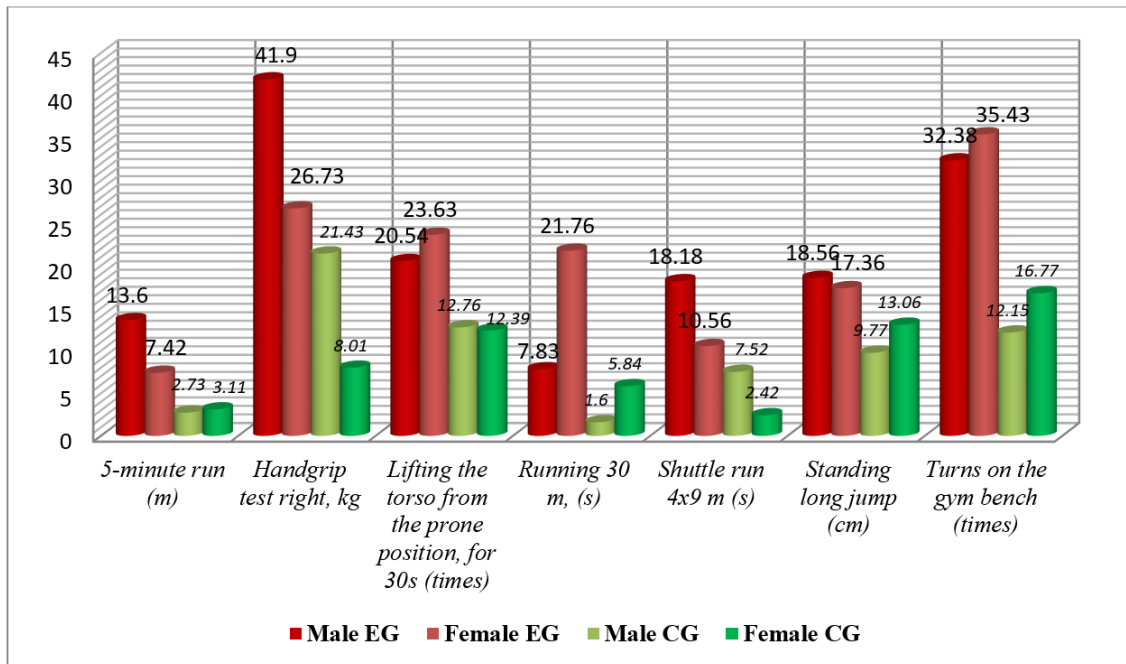


Figure 2. Levels of physical fitness index growth and vestibular stability of EG and CG

Figure 2 makes it easy to observe the degree of development that occurred after the experiment as well as the indications evaluating the two control and experimental groups' vestibular stability and level of physical fitness.

4. Discussion

A group of physical education instructors from two primary schools carried out the experimental investigation; they had received specialized training on the subject matter. All instructors (100%) demonstrated a solid understanding of how to implement problem-solving techniques during the extracurricular hours investigated for this research upon completing the training. As a result, instructors use the study's chosen reference standards to organize trials and assess efficacy in a reasonable and scientific manner. These are the fundamental requirements to guarantee the most precise, impartial, and successful evaluation of the efficacy of program implementation. Unfavourable environmental circumstances now in place have a significant detrimental effect pertaining to the maturation and progression of the human physique. Although a great deal of study has been done on healthy lifestyles, exercise's significance for an individual has to be discussed independently [26], [27]. Physical culture is a series of activities designed to enhance a person's adaptive skills and overall harmonious development as a means of preparing them for life [28], [29]. Students demonstrate significant physical education knowledge at school age. Each year, students are required to take physical education courses, and their participation outcomes are documented [5], [30]. The regular school physical education curriculum teaches students a number of crucial motions and exercises [10]. Certain writers

contend that other approaches or suitable workouts may entirely replace the usual regimen, negating the need for supplements [31]. We believe that this unconventional metric is not totally accurate. Primary school curricula simply need a few adjustments. For instance, studies have shown the beneficial effects of new exercise games on children's vestibular stability and physical development. Integrating physical games into primary school students' physical education curriculum has been shown to be useful. This game boosts the activity density of physical education lessons, boosting students' physical fitness [5]. The association previously shown [32], [33], [34] between physical talents and cognitive and mental processes is confirmed by this investigation. This research has shown the benefits of physical sports on schoolchildren's vestibular stability as well as the development of motor coordination skills. This requires us to consider how beneficial it is to use various strategies while dealing with kids. This method has a significant impact on pupils' personal growth. Previous investigations have verified the usefulness of this strategy [35]. Experimental findings have shown the effectiveness of correctly implementing physical education standards throughout physical education hours. The Mekong Delta's 8–9-year-old children have shown improvements in their physical development and vestibular stability as a consequence of the objectives that were met. The present study's findings support the usefulness of including games in physical education classes. According to the authors' comments [36], [37], [38], [39].

In addition, it has made physical education a fascinating topic for pupils and raised their interest in physical education for primary school pupils. Considering the inclinations, demands, and preferences of students is one of the most crucial requirements for enhancing the efficacy of

sports facilities. The four components of the current investigation - the cognitive aspect, traits in personality development, physiological developmental processes, and language proficiency - have been the focus of the educational experimental outcomes. Moderate work assignments during practice will improve students' physical attributes in a "positive" way [40]. These easy, useful workouts cause the body to progressively become better. As a result, for the content of physical education in primary schools, the environment must maximize the fulfillment of the desire for motor activities and foster an adequate, adaptable, and pleasant psychological state [41].

The experimental investigation carried out by the physical education instructors revealed varied outcomes across different tests in the control group. While some tests showed significant improvement, others did not. This variability can be attributed to several factors, including the degree of adherence to reference standards and the quality of implementation among instructors [42]. The SPARK study demonstrated that physical education specialists were able to produce better outcomes in terms of quantity and quality of lessons compared to trained classroom teachers, who in turn outperformed their untrained peers [43]. This suggests that the instructors' level of training and expertise in physical education can significantly impact the consistency and effectiveness of the physical activities delivered [44], [45]. Furthermore, a study examining the influence of implementation quality on physical development found that specialist physical education teachers were more successful than generalist teachers in achieving greater improvement in children's physical fitness, though no differences were observed in physical development itself. This highlights the importance of both the instructors' knowledge and their ability to properly execute the curriculum.

Additionally, a longitudinal study on the long-term effects of a physical education program revealed that the withdrawal of specialist teachers led to a significant reduction in the quantity and quality of physical education lessons.

Evaluating the physical fitness levels and performance of students can be a complex endeavor, with numerous factors contributing to the observed outcomes. One key consideration is the students' baseline physical abilities [46]. Studies have shown that those with higher initial fitness levels may exhibit more substantial gains in certain areas, while those starting at a lower baseline might improve at a slower pace [47]. This suggests that inherent physical attributes could lead to disparities in the rate of improvement observed across a student population. Additionally, students' motivation, interest, and engagement in physical activities can significantly impact their performance [48]. Engaged and motivated students are more likely to see greater improvements compared to their less enthusiastic peers [46], [47], [48]. The availability and quality of physical education facilities and equipment at different schools can also affect the effectiveness of the

exercises and games, potentially leading to variations in test outcomes [47]. External factors such as weather conditions, available space, and time allocated for physical education could also play a role in the variability of results.

The specificity of the exercises and their alignment with the tests being used to evaluate physical fitness is another important consideration. Certain tests may be more closely aligned with the types of activities incorporated into the curriculum, resulting in more substantial improvements for students [49].

5. Conclusions

The recent findings have shown how important it is to use physical education standards correctly throughout physical education classes, as well as how beneficial it may be. In the Mekong Delta, Vietnam, primary school pupils aged 8 to 9 have shown improvements in their vestibular stability and physical fitness as a consequence of the targets that were met. Current schooling requires experimental studies on physical education and the use of movement games in physical education classrooms to increase students' physical fitness in Mekong Delta primary schools in Vietnam. Through a novel method of organization, this technique helps to solve the issues of how to arrange educational activities and how to carry out physical education assignments successfully. Experts highly regarded the feasibility, practicality, development, and appropriateness of the features of the study subjects, and the encouragement of physical fitness and vestibular stability of the 8–9-year-old pupils that we researched and selected. Experts highly regarded the selection of five exercise activities to promote physical fitness and vestibular stability for primary school pupils 8–9 years old in the Mekong Delta, Vietnam, through the study procedure. Findings were from experimental studies on actual sporting events and an assessment of their efficacy. The progression rate of the metrics indicated that physical activities proved highly effective in enhancing the physical strength and vestibular stability of 8–9-year-old elementary school students in the Mekong Delta, Vietnam. In contrast to the control group, the experimental group exhibited significantly higher levels of physical fitness.

Conflict of Interest

The authors declare that no conflicts of interest could be perceived as interfering with the publication of this study.

REFERENCES

- [1] Lelonek M., Przychodni A., "Level of physical activity during school recess within aspect of available dedicated

- playing space”, *Phys Activ Rev*, 8(2), pp. 30-37, 2020, <https://doi.org/10.16926/par.2020.08.19>
- [2] Nemček D, Pačesova P, Smela P, Ladecka L, Harcarikova T., “Health status differences in subjective well-being of male and female high school students preferring sedentary leisure activities”, *Phys Activ Rev*, 8(2), pp. 1-8, 2020, <https://doi.org/10.16926/par.2020.08.15>
- [3] Atkinson, Michael, "Physical Cultural Studies [Redux]," *Sociology of sport journal*, 28(1), pp. 135-144, 2011.
- [4] Gregor S, Janko S., “Influence of the quality implementation of a physical education curriculum on the physical development and physical fitness of children”, *BMC public health*, 12, 2012, <https://doi.org/10.1186/1471-2458-12-61>
- [5] Chen S, Kim Y, Gao Z., “The contributing role of physical education in youth’s daily physical activity and sedentary behavior”, *BMC Public Health*, 14, 2014, <https://doi.org/10.1186/1471-2458-14-110>
- [6] Wallhead T, Garn A, Vidoni C, “Sport Education and social goals in physical education: relationships with enjoyment, relatedness, and leisure-time physical activity,” *Physical Education and Sport Pedagogy*, 18(4), pp. 427-441, 2012, <https://doi.org/10.1080/17408989.2012.690377>
- [7] Tran D L., "100 Movement games for primary school students," *Pedagogical University Publishing House*, Hanoi, 1997. (In Vietnamese)
- [8] Dao C.T, Nguyen V.T, “Students’ Difficulties in the Practice of Volleyball in School Physical Education: An Analysis Based on Tactical Principles”, *International Journal of Human Movement and Sports Sciences*, 9(1), pp. 41-47, 2021. <https://doi.org/10.13189/saj.2021.090106>
- [9] Orofino, F., Sgro, F., Coppola, R., Crescimanno, C., & Lipoma, M., “Examining the influence of different physical activity training on the postural stability of university students”, *International Journal of Human Movement and Sports Sciences*, 3(3), 40-45, 2015. <https://doi.org/10.13189/saj.2015.030303>
- [10] Lyakh VI. *Physical culture. Grades 1-4: Textbook for general education institutions.* – Moscow: Education 2013;190 p.
- [11] Dao C.T, “Building The Model Of Recreational Sports Club For Students Of An Giang University, Vietnam”, *Innovative Journal of Medical and Health Sciences*, 9(4), pp. 384-394, 2019.
- [12] Breuer, Christoph, Kirstin Hallmann, and Pamela Wicker, "Determinants of sport participation in different sports," *Managing Leisure*, 16(4), pp. 269-286, 2011.
- [13] Barker, Dean, Mikael Quennerstedt, and Claes Annerstedt, "Learning through group work in physical education: a symbolic interactionist approach," *Sport, Education and Society*, 20(5), pp. 604-623, 2015. <https://doi.org/10.1080/13573322.2014.962493>
- [14] Chiodera P, Volta E, Gobbi G, Milioli MA, Mirandola P, Bonetti A, Delsignore R, Bernasconi S, Anedda A, Vitale M, “Specifically designed physical exercise programs improve children’s motor abilities. Scandinavian”, *Journal of Medicine and Science in Sports*, 18(2), pp. 179-187, 2008, <https://doi.org/10.1111/j.1600-0838.2007.00682.x>
- [15] Dobbins M, Husson H, DeCorby K, LaRocca R.L, “School-based physical activity programs for promoting physical activity & fitness in children and adolescents aged 6 to 18”, *Cochrane Database of Systematic Reviews*, vol. 2, 2013, <https://doi.org/10.1002/14651858.CD007651.pub2>
- [16] Dao, Chanh Thuc, "Using movement games in physical education class to improve physical fitness and stabilize vestibule for children aged 6 to 7 years." *International Journal of Human Movement and Sports Sciences*, 9(6), pp. 1396-1402, 2021, <https://doi.org/10.13189/saj.2021.090636>
- [17] Dao C.T, “Measurement in sports”. LAP LAMBERT Academic Publishing, ISBN 978-613-9-90198-2.2018
- [18] Ministry of Education and Training, "Promulgating Regulations on organization of extracurricular sports activities for pupils and students", Hanoi, Vietnam, 2008. (In Vietnamese)
- [19] Polevoy GG., “Use of Exercise Classics in Physical Education Classes for the Development of Vestibular Stability of Schoolchildren”, *International Journal of Human Movement and Sports Sciences*, 9(2), pp. 180-184, 2021, <https://doi.org/10.13189/saj.2021.090203>
- [20] Natal'ya M, Mikhail K, Elena R, Evgenii T, Sergey U, Evgeny T, Andrey G, Elena K, Anton V, Dulamjav P., “Pilates program use for high school girls' additional physical education”. *Journal of Physical Education and Sport*, 20(6), pp. 3485-3490, 2020, <https://doi.org/10.7752/jpes.2020.06470>
- [21] Ramírez-Vélez, Robinson, et al., "Normative reference of standing long jump for colombian schoolchildren aged 9–17.9 years: The FUPRECOL Study," *The Journal of Strength & Conditioning Research*, 31(8), pp. 2083-2090, 2017, <https://doi.org/10.1519/JSC.0000000000001633>
- [22] Gontarev, Seryozha, et al., "First normative reference of standing long jump indicates gender difference in lower muscular strength of Macedonian school children," *Health*, 2014, <https://doi.org/10.4236/health.2014.61016>
- [23] Dao CT., Huynh TK, “The Influence of Recreational Sports Clubs on the Physical Health and Confidence- Social Health Development of Participants: A Study of Recreational Sport Clubs a University”, *Innovative Journal of Medical and Health Science*, vol.9, no.6, pp.468-74, 2019. <https://doi.org/10.15520/ijmhs.v9i6.2606>.
- [24] Dallolio L, Ceciliani A, Sanna T, Garulli A., “Proposal for an Enhanced Physical Education Program in the Primary School: Evaluation of Feasibility and Effectiveness in Improving Physical Skills and Fitness”, *Journal of Physical Activity & Health*, 13(10), pp. 1024-1034, 2016. <https://doi.org/10.1123/jpah.2015-0694>
- [25] Boichuk, Roman, et al., "Use of exercises with increased coordination complexity in the training process of young female volleyball players aged 13-14 years," 2023, [erpub.chnpu.edu.ua:8080/jspui/handle/123456789/9325](https://doi.org/10.8080/jspui/handle/123456789/9325)
- [26] Mischenko, N. Y., Romanova, E., Kolokoltsev, M., Kraynik, V., & Botagariyev, T., “Young cyclists' vestibular stability and balance development at an initial training stage”, *Journal of Physical Education and Sport*, 20(4), pp. 1896-1902, 2020. <https://doi.org/10.7752/jpes.2020.04256>
- [27] Sheehan, D. P., & Katz, L., “The effects of a daily, 6-week

- exergaming curriculum on balance in fourth grade children," *Journal of Sport and Health Science*, 2(3), pp. 131-137, 2013. <https://doi.org/10.1016/j.jshs.2013.02.002>
- [28] Shtsterova, L. Y., Riadova, L. I. L. I. A. N. A., Yefremenko, A., Masliak, I., Kryvoruchko, N. A. T. A. L. I. A., Bala, T. E. T. I. A. N. A., ... & Zhuk, V., "Influence of specifically aimed exercises and active games on indicators of the functional state of the vestibular sensory system in 10–16-year-old children with visual impairments", *Journal of Physical Education and Sport*, 19(3), pp. 1599-1605, 2019, <https://doi.org/10.7752/jpes.2019.03232>
- [29] Sousa, C. V., Hwang, J., Cabrera-Perez, R., Fernandez, A., Misawa, A., Newhook, K., & Lu, A. S., "Active video games in fully immersive virtual reality elicit moderate-to-vigorous physical activity and improve cognitive performance in sedentary college students," *Journal of Sport and Health Science*, 11(2), pp. 164-171, 2022, <https://doi.org/10.1016/j.jshs.2021.05.002>
- [30] Carpenter, P. J., and K. Morgan, "Motivational climate, personal goal perspectives, and cognitive and affective responses in physical education classes," *European Journal of Physical Education*, 4(1), pp. 31-44, 1999, <https://doi.org/10.1080/1740898990040103>.
- [31] Dufková, K., "Movement games and their evaluation in physical education of 1st grade", 2022, https://theses.cz/id/x8w291/Bakala_r_ka-Dufkova_.pdf
- [32] Chaddock-Heyman, L., et al., "III. The importance of physical activity and aerobic fitness for cognitive control and memory in children," *Monographs of the Society for Research in Child Development*, 79(4), pp. 25-50, 2014, <https://doi.org/10.1111/mono.12129>
- [33] Chang EC-H, Chu C-H, Karageorghis CI, Wang CC, Tsai JH-C, Wang Y-S, Chang Y-K, "Relationship between mode of sport training and general cognitive performance", *Journal of Sport and Health Science*, 6(1), pp. 89-95, 2017, <https://doi.org/10.1016/j.jshs.2015.07.007>
- [34] Pietsch, S, Böttcher, C, Jansen P, "Cognitive Motor Coordination Training Improves Mental Rotation Performance in Primary School-Aged Children. Mind", *Brain, and Education*, 11(4), pp. 176-180, 2017, <https://doi.org/10.1111/mbe.12154>
- [35] Kühnhausen J, Dirk J, Schmiedek F, "Individual classification of elementary school children's physical activity: A time-efficient, group-based approach to reference measurements," *Behaviour Research Methods*, 49(2), pp. 685-697, 2016, <https://doi.org/10.3758/s13428-016-0724-2>
- [36] Dimiyati, Akhmad, et al., "Does Movement Games Impact on Increasing Sports Participation, Fundamental Movement Skill and Life Satisfaction of Students Disabilities?," *Revista iberoamericana de psicología del ejercicio y el deporte*, 18(1), pp. 93-98, 2023, <https://dialnet.unirioja.es/servlet/articulo?codigo=8877180>
- [37] Dimiyati, Akhmad, et al., "The Effect Of Movement Games On The Level Of Physical Fitness And Mental Health Of Students With Disabilities: Mixed Method," *Physical Education Theory and Methodology*, 22(4), pp. 466-472, 2022, <https://doi.org/10.17309/tmfv.2022.4.02>
- [38] Polevoy, Georgy G. "The Development of the Vestibular Stability in Children Who are Engaged in Football Taking into Account their Nervous System." *EXECUTIVE EDITOR*, 10(2), pp. 306-311, 2019. <https://doi.org/10.5958/0976-5506.2019.00306.1>
- [39] MARINĂU, Marius Alin, et al., "THE DEVELOPMENT OF SPEED AND EXPLOSIVE FORCE OF THE LOWER LIMBS IN PRIMARY SCHOOL STUDENTS THROUGH DYNAMIC GAMES," *EDUCAȚIE FIZICĂ ȘI SPORT*, 40, 2022.
- [40] Tzanetakos, Nikolaos, et al., "Utilizing physically interactive videogames for the balance training of adolescents with deafness within a physical education course," *Journal of Physical Education and Sport*, 17(2), pp. 614-623, 2017, <https://doi.org/10.7752/jpes.2017.02093>
- [41] Kushnir Y, "The State Of Development And Relations Of Coordination Abilities Of Primary School Pupils Who Belong To Special Medical Group," *Journal of Education, Health and Sport*, 5(11), pp. 441-452, 2015.
- [42] Ferriz-Valero, A., Østerlie, O., Martínez, S G., & García-Jaén M, "Gamification in Physical Education: Evaluation of Impact on Motivation and Academic Performance within Higher Education," *Multidisciplinary Digital Publishing Institute*, 17(12), pp. 4465-4465, 2020, <https://doi.org/10.3390/ijerph17124465>
- [43] McKenzie, T L., Sallis, J F., Kolody, B., & Faucette, F.N, "Long-Term Effects of a Physical Education Curriculum and Staff Development Program": SPARK. *Taylor & Francis*, 68(4), pp. 280-291, 1997. <https://doi.org/10.1080/02701367.1997.10608009>
- [44] Starc, G., & Strel. J, "Influence of the quality implementation of a physical education curriculum on the physical development and physical fitness of children," *BioMed Central*, 12(1), 2012. <https://doi.org/10.1186/1471-2458-12-61>
- [45] Constantinides, P., Montalvo, R., & Silverman. S, "Teaching processes in elementary physical education classes taught by specialists and nonspecialists". *Elsevier BV*, 36, pp. 68-76, 2013. <https://doi.org/10.1016/j.tate.2013.07.004>
- [46] Physical Activity, Fitness, and Physical Education: Effects on Academic Performance, 2013, <https://www.ncbi.nlm.nih.gov/books/NBK201501/>
- [47] Guan, Y. "Research on the Collaborative Path of Integrating Ideological and Political Content into College" *Physical Education Teaching.*, 6(10), 2023, <https://doi.org/10.23977/curtm.2023.061020>
- [48] Dusen, D P V., Kelder, S H., Kohl, H W., Ranjit, N., & Perry, C.L, "Associations of Physical Fitness and Academic Performance Among Schoolchildren*", *Wiley-Blackwell*, 81(12), pp. 733-740, 2011. <https://doi.org/10.1111/j.1746-1561.2011.00652.x>
- [49] Castelli, D M., Hillman, C H., Buck, S., & Erwin, H, "Physical Fitness and Academic Achievement in Third- and Fifth-Grade Students," *Human Kinetics*, 29(2), pp. 239-252, 2007, <https://doi.org/10.1123/jsep.29.2.239>