

JLTM

Journal of Learning Theory and Methodology

Scientific journal

August 2024
Volume 5
Number 2



JLTm
LLC OVS

Journal of Learning Theory and Methodology
Журнал теорії та методології навчання
Abbreviated key-title: J. learn. theory methodol. (Online)

Scientific journal
Науковий журнал

Three issues per year. Established in 2020
Три випуски на рік. Заснований у 2020 році
<https://www.ltmjournal.com>. E-mail: editor-in-chief@ltmjournal.com

Editor-in-Chief

Olha Ivashchenko, Doctor of Pedagogy, Professor,
Kharkiv State Academy of Physical Culture, Ukraine

Editor Board

Roberto Araya, PhD, Professor,
University of Chile, Santiago, Chile

Oksana Blavt, Doctor of Pedagogy, Professor, Lviv Polytechnic
National University, Ukraine

Wojciech J. Cynarski, Prof. Dr hab., Full Professor,
University of Rzeszow, Poland

Francesca D'Elia, PhD in Methodology of Educational
Research, Associate Professor, University of Salerno, Italy

Karol Görner, Prof. PaedDr., PhD,
Matej Bel University in Banská Bystrica, Slovakia

Sergii Harkusha, Doctor of Pedagogy, Professor,
T. H. Shevchenko National University "Chernihiv Colehium",
Ukraine

Oleg Khudolii, Doctor of Sciences in Physical Education and
Sport, Professor, Kharkiv State Academy of Physical Culture,
Ukraine

Nur Ikhwan Mohamad, PhD, Professor, Sultan Idris Education
University, Malaysia

Kukuh Wahyudin Pratama, M.S.Sc., Institute of Advanced
Science, Engineering, and Education (IASEE), Malaysia

Valentina Voronova, PhD in Pedagogy, Professor, National
University of Ukraine on Physical Education and Sport,
Ukraine

Головний редактор

Ольга Іващенко, докторка педагогічних наук, професорка,
Харківська державна академія фізичної культури, Україна

Редакційна колегія

Роберто Арайя, доктор філософії, професор,
Університет Чилі, Сантьяго, Чилі

Оксана Блавт, докторка педагогічних наук, професор-
ка, Національний університет «Львівська політехніка»,
Україна

Валентина Воронова, кандидатка педагогічних наук,
професорка, Національний університет фізичного
виховання і спорту України, Україна

Сергій Гаркуша, доктор педагогічних наук, професор,
Національний університет «Чернігівський колегіум»
імені Т. Г. Шевченка, Україна

Кароль Гернер, доктор філософії, професор, Університет
Матея Бела в Банській Бистриці, Словаччина

Франческа Д'Елія, докторка філософії з методології освітніх
досліджень, доцентка, Університет Салерно, Італія

Войцех Кінарський, доктор наук, професор, Жешувський
університет, Польща

Нур Іхван Мохамад, доктор філософії, професор, Універси-
тет освіти Султана Ідріса, Малайзія

Кукух Вахюдін Пратама, M.S.Sc., Інститут передової науки,
техніки та освіти, Малайзія

Олег Худолій, доктор наук з фіз.вих і спорту, професор,
Харківська державна академія фізичної культури, Україна

Abstracting and Indexing:

CrossRef; ROAD (Directory of Open Access scholarly Resources); DOAJ (Directory of Open Access Journals); ICI Journals Master List / ICI World of Journals; Google Scholar; Open Ukrainian Citation Index (OUCI); Scilit (A database of scientific & scholarly literature); WorldCat

DOI: <https://doi.org/10.17309/jltm.2024.5.2>

Journal of Learning Theory and Methodology
Scientific journal
August 2024, Vol. 5, Num. 2

Contents

Original Scientific Article	47-80
Svitlana Marchenko, Artem Shapovalov and Oleksandr Korol	
Influence of Intensive Interval Training Programs on the Development of Endurance in 10-Year-Old Boys	47-53
Oksana Blavt and Tetyana Gurtova	
Physical Education in the Restoration of Damaged Functions in Students After Blast Tbi Complicated By Acuborotrauma	54-61
Sherial Shellen, Meirizal Usra, Destriani, Wahiu Indra Bayu and Fitri Agung Nanda	
Improving the Learning Outcomes of Volleyball Passing Through the Wall-Bounced	62-67
Afeez Jinadu	
Automated Control and Delivery System for Science Practical Instructions to Public Schools.....	68-73
Halyna Tsyhura and Serhii Harkusha	
Formation of the Cognitive Component of Future Physical Education and Sports Specialists' Readiness for Educational Activities in Sustainable Development	74-80
Reviewer Guidelines.....	81
Ethical Principles.....	82
Editorial Process.....	83

Журнал теорії та методології навчання
Науковий журнал
Серпень 2024, Том 5, Номер 2

Зміст

Оригінальні наукові статті.....	47-80
Світлана Марченко, Артем Шаповалов, Олександр Корол Вплив інтенсивних інтервальних програм а розвиток витривалості хлопців 10 років.....	47-53
Оксана Блавт, Тетяна Гуртова Фізичне виховання у відновленні ушкоджених функцій у здобувачів вищої освіти після вибухової черепно-мозкової травми, ускладненої акуборотравмою	54-61
Шеріал Шелен, Мейрізал Усра, Дестріані, Вахіу Індра Ваю, Фітрі Агунг Нанда Удосконалення результатів навчання волейбольного пасу з використанням відскоку м'яча від стіни.....	62-66
Афіз Джінаду Автоматизована система контролю та доставки наукових практичних інструкцій для державних шкіл	68-73
Галина Цигура, Сергій Гаркуша Формування когнітивного компонента готовності майбутніх фахівців фізичної культури і спорту до освітньої діяльності для сталого розвитку	74-80
Reviewer Guidelines.....	81
Ethical Principles.....	82
Editorial Process.....	83



Influence of Intensive Interval Training Programs on the Development of Endurance in 10-Year-Old Boys

Svitlana Marchenko^{1ABCD}, Artem Shapovalov^{1ABCD} and Oleksandr Korol^{2ABCD}

¹H. S. Skovoroda Kharkiv National Pedagogical University

²Lviv Polytechnic National University

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

DOI: 10.17309/jltm.2024.5.2.01

Abstract

Objectives. This study aimed to experimentally identify and evaluate the effectiveness of using intensive interval programs to develop endurance in the educational process of 10-year-old boys.

Materials and methods. The research involved twenty 10-year-old boys. Control (n = 10) and experimental (n = 10) groups were created. Children and their parents were informed of the features of the study and agreed to participate in the experiment. The study protocol was approved by the ethics committee of H.S. Skovoroda Kharkiv National Pedagogical University (Kharkiv, Ukraine). This study was conducted in accordance with the Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects (World Medical Association Declaration of Helsinki, 2013). The following research methods were used: scientific and methodological literature analysis, pedagogical testing, and mathematical statistics to process research results.

Results. According to the results of the complex control of boys' endurance abilities, statistically significant changes in all indicators in both experimental ($p < 0.001$) and control groups ($p < 0.05$) were established. The positive dynamics of the results favoured the experimental group.

The most statistically significant changes took place in the experimental group on indicators of tests "Push-ups in a lying position" by 35.2% ($p < 0.001$), "Jumping with a rope for 1 min" (20.8%; $p < 0.001$), "Squatting on two legs for 1 min" (18.8%; $p < 0.001$), "From a lying position rising in a saddle for 1 min" (17.4%; $p < 0.01$). The obtained results of the final testing in tests "Hanging on bent arms", "Burpee test in 1 min" and "300 m run" were somewhat lower and still demonstrated statistically significant changes (13.0%, 11.4%, 6.5%, respectively, at the level of significance $p < 0.001$). General endurance developed more slowly than other types of endurance. In "Hanging on bent arms" the change in data after the experiment in the control group was statistically insignificant ($p = 0.05$).

Conclusions. The intensive interval training method, which used specially selected exercises according to the "Tabata Protocol," promoted endurance development in 10-year-old boys.

Keywords: endurance, intensive interval training, Kyokushinkai karate, boys.

Introduction

In recent years, scientists (Akter & Bristy, 2022; Polevoy, 2023; Deng & Wang, 2024) have recorded a trend of increasing childhood and adolescent obesity. Overweight has become a global public health problem. The younger generation leads a sedentary lifestyle. Physical inactivity is considered a social disease. Younger students spend long periods of time sitting during school lessons (4 hours or more) and then spend the same amount of time doing homework, playing computer games, watching TV, etc. As a result of this lifestyle, cardiorespiratory performance, which is one of the most important indicators of physical health and is crucial

for maintaining overall health and quality of life, has significantly reduced (Le & Dinh, 2022; Marchenko, Ivashchenko & Khudolii, 2023).

To address this dangerous situation among children, the WHO (WHO, 2020) recommends that children and adolescents engage in moderate to vigorous physical activity for at least 60 minutes a day throughout the week, mostly aerobic. At the same time, the time spent by the child in a sitting or lying position should be limited, especially in front of a screen for entertainment purposes.

The development of endurance abilities in this age group within the framework of strictly regulated exercise methods can lead to decreased performance, fatigue, and distraction. It is difficult for primary school children to perform tradi-

tional aerobic physical exercises such as marathon running, swimming, cycling, and others for a long time (Unierzyski & Bogusławski, 2016; Marchenko & Handymov, 2021; Marchenko, Ivashchenko, Khudolii, & Lubchenkov, 2023).

There is a need to introduce new, more creative approaches and modern tools. Many authors recommend the use of high- and medium-intensity exercises (Martin-Smith, Cox, Buchan, 2020; Bauer, Sperlich, Holmberg, & Engel, 2022; Deng & Wang, 2024). They can be used in limited space and time during online learning.

Duncombe, Barker, Bond et al. (2022), Bauer, Sperlich, Holmberg et al. (2022), Wu, Yang, Yu et al. (2023), based on their own research, recommend integrating high-intensity interval training (HIIT) into physical education classes and adding aerobic and strength training to extracurricular activities. Litvin & Marchenko (2021), Marchenko, Khudolii, Ivashchenko & Musliumova (2023), Marchenko, Ivashchenko, Jagiello et al. (2023) have demonstrated that a high level of motor skill development affects the successful performance of motor actions. Scientists consider endurance to be a component of the learning process, and a sufficient level of endurance development can simplify motor skill formation.

Izumi Tabata used a system of high-intensity interval training (HIIT) to develop endurance. The exercises were performed until the subjects became fatigued during the 7th or 8th set of 20-s cycling cycles with a 10-s rest between sets (Tabata, 2019). Weston, Wisløff & Coombes (2014) defined HIIT as performed at an intensity >80% (often 85-95%) of the maximum heart rate.

The constant change of different exercises with short rest intervals for recovery stimulates children's motivation and interest in physical exercises aimed at developing endurance. Therefore, the chosen topic is relevant.

The purpose of this research was to experimentally identify and evaluate the effectiveness of using intensive interval programs for the development of endurance in the educational process of 10-year-old boys.

Materials and Methods

Participants of the Study

The study involved twenty 10-year-old boys. The control (n = 10) and experimental (n=10) groups were formed. Both children and their parents were informed about the study's features and agreed to participate in the experiment.

The study protocol was approved by the Ethics Committee of H.S. Skovoroda Kharkiv National Pedagogical University (Kharkiv, Ukraine). The study was conducted in accordance with the Declaration of Helsinki - Ethical Principles for Medical Research Involving Human Subjects (World Medical Association Declaration of Helsinki, 2013).

Design of the Study

The following research methods were used to address the tasks: analysis of scientific and methodological literature, pedagogical testing, and the method of mathematical statistics for processing research results.

The testing program included generally accepted tests: push-ups in a lying position, sit-ups in 1 min from the supine

position, bent arm hang, 300 m run, "Burpee" test in 1 min, jump rope in 1 min, and double leg squats in 1 min.

The study was conducted from September to May 2023-2024 at the sports club "Centaur" in Kharkiv. The study involved twenty 10-year-old karate athletes in their third year of training. Control (CG) and experimental (EG) groups were formed, with 10 participants in each group. The ratio of training sessions in both groups followed the recommendations of the standard Kyokushinkai karate program for children's and youth sports schools (Goncharenko, 2021). The formative experiment lasted 12 weeks.

In the classes of the EG, a set of exercises based on the "Tabata Protocol" was additionally used. Exercises were performed for 20 seconds, followed by a 10-second rest. This cycle was repeated 8 times consecutively, making the total time of one block 4 minutes (Tabata, 2019). The boys performed 3 blocks, totaling 12 minutes. Exercise complexes targeting different endurance components were performed at the end of each session. Both groups trained 3 times a week for 2 academic hours per session.

To determine training loads, we used the Tanaka formula to calculate the maximum heart rate.

$$HR_{max} = 208 - 0.7 \cdot \text{age}$$

The boys performed exercises at an intensity reaching 80-85% of their maximum heart rate. The physical exercises forming the basis of intensive interval training were performed according to the Tabata Protocol:

1. Run on the Spot: Perform at maximum speed.
2. Mae Hiza Geri: From the "Yoi dachi" stance with hands on the belt, perform knee strikes forward above the belt, alternating legs.
3. Kangaroo Exercise: Perform jumps on the spot, pulling knees to the chest during the jump.
4. Mountain Climber: From a lying position, pull knees to the chest, alternating legs.
5. Leg Change in Zenkutsu-dachi Stance: Start in a left-handed stance. When changing the position of the legs, comply with the requirements of the stance technique (Marchenko & Taranenko, 2020). Hands on the belt.
6. Heisoku Dachi to Kiba Dachi Transition: From a stance with legs together ("Heisoku dachi"), arms down, hands open, and palms pressed to the hips, transition with a jump to a wide stance with legs apart ("Kiba dachi"), arms through the sides up, performing a clap with palms above the head. Pay attention to the correctness of the Kiba dachi stance: the distance between the feet should be two shoulder widths. The feet are parallel and fully supported on the floor. The back is straight and perpendicular to the floor. The hips are slightly angled to the floor, parallel in a low stance. Keep knees to the sides. The body weight is evenly distributed on both legs (Litvin & Marchenko, 2021; Marchenko, Khudolii, Ivashchenko & Musliumova, 2023).
7. Mae Geri Kicks: From a kneeling position, alternate kicks with the right and left legs. Begin in a stance on the right knee. The thigh of the right leg is perpendicular to the floor, the left leg is bent and positioned forward, standing on the whole foot so that its shin is parallel to the thigh of the right leg. Maintain an upright torso during the exercise (Marchenko & Kovalenko, 2020; Marchenko, Ivashchenko, Jagiello et al., 2023).

8. Burpees: Perform in the following sequence: squat, lie down, push up once, squat, jump up, and clap palms above the head during the jump (Serhiienko, 2010).

Statistical Analysis

Data were collected and organized using the EXCEL program and analyzed using the IBM SPSS 26 statistical package. The following parameters were calculated: arithmetic mean (mean), standard deviation (SD), and standard error of the mean (SEM). Comparison of the arithmetic means was performed using Student's t-test for dependent samples and Student's t-test for independent samples. The hypothesis of normality of data distribution was determined using the Shapiro-Wilk test. The hypothesis of equality of variances among the compared groups was determined using Levene's test.

Results

The algorithm for processing the results was as follows: first, the study materials were processed in a consolidated group of children ($n=20$). The statistical analysis of endurance indicators among 10-year-old boys was carried out (Table 1). Indicators of the ability to display different types of endurance generally correspond to age norms. The sample was tested for normality of indicator distribution. Given that our sample was small ($n=20$), we used the nonparametric Shapiro-Wilk test to determine the normality of the data distribution (Table 2). The obtained values indicated that the significance level was $p > 0.05$ for all tests. Then, using the random numbers method, the sample was divided into an experimental group (EG) ($n = 10$) and a control group (CG) ($n = 10$) of students who participated in the developed research program.

The obtained p -level of Levene's test > 0.05 (p -value ranging from 0.271 to 0.744) indicates that the variances of

the compared distributions of values do not differ statistically significantly (Table 3). Therefore, it was decided to use the first type of Student's t-test (assuming equality of variances). The t-test results indicate that the difference between the samples of the experimental and control groups was not statistically significant (p -level > 0.05).

The data obtained during the formative experiment are presented in Table 4. The efficiency of using intensive interval exercises for developing endurance in 10-year-old boys was studied. According to the results of the comprehensive assessment of the boys' endurance abilities, statistically significant changes in all indicators were observed in both the experimental and control groups ($p < 0.05$). The positive dynamics of the results favored the experimental group.

The most statistically significant changes in the experimental group were observed in the following tests: "Flexion and extension of hands in a lying down support" (an increase of 35.2%; $p < 0.001$), "Jumping with a rope for 1 min" (20.8%; $p < 0.001$), "Squatting on two legs for 1 min" (18.8%; $p < 0.001$), and "From a position lying on the back, rising to a seated position for 1 min" (17.4%; $p < 0.01$).

The results of the final test in the "Bent arm hang," "Burpee test in 1 min," and "300 m run" showed somewhat lower but still statistically significant changes (13.0%, 11.4%, and 6.5%, respectively, at the significance level $p < 0.001$). General endurance developed more slowly compared to other types of endurance. In the "Bent arm hang," the change in data after the experiment in the control group was statistically insignificant ($p = 0.05$).

Discussion

The study hypothesized that the use of specially selected exercises based on the Tabata Protocol and the intensive interval training method would contribute to endurance development in 10-year-old boys. Previous studies by Ratel,

Table 1. Statistical description of endurance indicators among 10-year-old boys

Tests	Min	Max	Mean	SEM	SD	Skewness	SDS	Kurtosis	SEK
Push-ups in a lying position, times	8.0	21.0	13.90	0.864	3.865	0.261	0.512	-0.618	0.992
Sit-ups in 1 min from the supine position, times	20	32.0	26.05	0.890	3.980	-0.058	0.512	-1.346	0.992
Bent arm hang, s	8.0	26.0	16.00	1.254	5.610	0.463	0.512	-0.983	0.992
300 m run, s	63.0	85.0	74.80	1.428	6.387	-0.063	0.512	-0.855	0.992
"Burpee" test in 1 min (cycles)	11.0	24.0	17.80	0.936	4.188	-0.164	0.512	-1.204	0.992
Jump rope in 1 min, times	37.0	70.0	54.70	2.240	10.016	0.014	0.512	-1.006	0.992
Double leg squats in 1 min, times	28.0	43.0	36.90	0.794	3.553	-0.566	0.512	0.849	0.992

Table 2: Normality of data distribution according to the Shapiro-Wilk test

Tests	the Shapiro-Wilk test		
	Statistics	df	Mean
Push-ups in a lying position, times	0.959	20	0.516
Sit-ups in 1 min from the supine position, times	0.928	20	0.142
Bent arm hang, s	0.935	20	0.191
300 m run, s	0.972	20	0.792
"Burpee" test in 1 min (cycles)	0.941	20	0.247
Jump rope in 1 min, times	0.964	20	0.624
Double leg squats in 1 min, times	0.972	20	0.801

Table 3. Characteristics of endurance indices of the studied groups at the beginning of the experiment

Indicators studied	Levene's criterion for equality of variance		t-test for equality of means					
	F	Mean	t	Sig. (double-sided)	MD	MSED	95% confidence interval for the difference	
							Lower	Upper
Push-ups in a lying position, times	0.339	0.567	0.685	0.502	1.2	1.753	-2.483	4.883
Sit-ups in 1 min from the supine position, times	0.252	0.622	0.384	0.705	0.7	1.821	-3.126	4.526
Bent arm hang, s	0.305	0.587	0.708	0.488	1.8	2.543	-3.542	7.142
300 m run, s	0.864	0.365	-0.62	0.543	-1.8	2.904	-7.901	4.301
"Burpee" test in 1 min (cycles)	0.532	0.475	0.739	0.47	1.4	1.896	-2.583	5.383
Jump rope in 1 min, times	0.11	0.744	-0.174	0.864	-0.8	4.598	-10.461	8.861
Double leg squats in 1 min, times	1.289	0.271	0.369	0.716	0.6	1.626	-2.816	4.016
Assume equal variance levels								

Table 4. Characteristics of the influence of intensive interval exercises on endurance development in 10 year-old-boys

Indicators studied	Groups	Paired differences					t	Sig. (double-sided)	%
		Mean	SD	SME	95% confidence interval for the difference				
					Lower	Upper			
Push-ups in a lying position, times	EG	-5.10	1.595	0.504	-6.241	-3.959	-10.11	0.000	35.2
	CG	-1.70	1.337	0.423	-2.657	-0.743	-4.019	0.003	12.8
Sit-ups in 1 min from the supine position, times	EG	-4.60	2.836	0.897	-6.629	-2.571	-5.129	0.001	17.4
	CG	-2.50	0.707	0.224	-3.006	-1.994	-11.18	0.000	9.7
Bent arm hang, s	EG	-2.20	0.632	0.200	-2.652	-1.748	-11.00	0.000	13.0
	CG	-0.70	0.978	0.309	-1.399	-0.001	-2.264	0.050	4.6
300 m run, s	EG	4.80	2.044	0.646	3.338	6.262	7.426	0.000	6.5
	CG	1.50	1.650	0.522	0.320	2.680	2.875	0.018	2.0
“Burpee” test in 1 min (cycles)	EG	-2.10	0.876	0.277	-2.726	-1.474	-7.584	0.000	11.4
	CG	-1.00	0.667	0.211	-1.477	-0.523	-4.743	0.001	5.8
Jump rope in 1 min, times	EG	-11.30	6.255	1.978	-15.774	-6.826	-5.713	0.000	20.8
	CG	-3.30	2.214	0.700	-4.884	-1.716	-4.714	0.001	6.0
Double leg squats in 1 min, times	EG	-7.00	3.018	0.955	-9.159	-4.841	-7.334	0.000	18.8
	CG	-2.90	0.994	0.314	-3.611	-2.189	-9.222	0.000	7.9

Lazaar, Dore, et al. (2004), Costigan, Eather, Plotnikoff, et al. (2015), and Eddolls, McNarry, Stratton, et al. (2017) demonstrated the success of including intensive interval training in school schedules. We suggested incorporating these exercises into the educational and training programs for karate athletes at the initial stages, supplemented with simple karate elements. The final testing revealed that these complexes significantly influenced the level of endurance development in the experimental group (EG). The dynamics of the results for all exercises were statistically significant ($p < 0.001$).

Our results align with the findings of Ratel, Lazaar, Dore, et al. (2004), Vasconcelos, Protzen, Galliano, et al. (2020), which showed that children recover faster from high-intensity exercise than adults. Exercises repeated at high speed and separated by short rest periods can improve aerobic and anaerobic performance. According to Duncombe, Barker, Bond, et al. (2022), Bauer, Sperlich, Holmberg, et al. (2022), and Wu, Yang, Yu, et al. (2023), high-intensity interval training (HIIT) improves muscular and aerobic fitness.

Our findings confirm those of Cao, Quan, and Zhuang (2019), Tottori, Morita, Ueta, et al. (2019), and Vasconcelos, Protzen, Galliano, et al. (2020) regarding high-intensity interval training as a promising, time-efficient method for endurance development. However, it should be noted that the physical fitness and health of modern Ukrainian pupils studying online call into question the use of high-intensity exercises. This condition requires a gradual increase in intensity with constant monitoring of external signs of fatigue and the cardiovascular system (HR) response to adjust the proposed load (Nurkholis, et al., 2023).

As practice and the results of previous studies (Masanovic, Gardasevic, Marques, et al., 2020; Marchenko, Ivashchenko, Khudolii, & Lubchenkov, 2023) have shown, primary school pupils find it very difficult to sustain physical activity for extended periods. They are not psychologically or physically prepared to overcome difficulties. The authors emphasize the importance of using both game- and competitive exercise methods in physical education and sports training,

especially when developing endurance. We used the competitive method and musical accompaniment to stimulate effort and increase interest during the experiment.

In terms of general endurance in the 300-m run test, boys showed a significant lag, which is consistent with the findings of Marchenko, Ivashchenko, Khudolii, & Lubchenkov (2023). Interval training improved muscular endurance during squats, consistent with the findings of Tottori, Morita, Ueta, et al. (2019).

Since the intensity of the work performed by the karate boys reached 80%-85% of their maximum heart rate, we agree with Tabata's opinion that training that uses other types of exercises, including running, jumping, burpee, and others, although performed similarly to the Tabata Protocol, are not high-intensity exercises. A real Tabata workout consists of 7-8 exhausting sets of high-intensity exercises. In his opinion, only motivated athletes can participate in such training (Tabata, 2019).

We agree with Gäbler, Prieske, and Hortobágyi (2018), as well as Hontarenko, Marchenko, and Korol (2022), that integrating endurance training with other motor skills (e.g., strength, coordination) has a more effective impact on physical fitness and sports performance in pupils than unidirectional training.

Conclusions

An analysis of global and Ukrainian scientific research, along with personal experience, indicates that martial arts are intermittent by nature, consisting of periods of high-intensity and low-intensity efforts with pauses during competition rounds. Most authors believe that intensive interval training is one of the best methods for improving cardiorespiratory fitness in healthy children and adolescents. Given its efficiency and effectiveness, it can be an effective approach for improving physical activity, health, and fitness, strengthening interest in exercise, and achieving high competition results.

Assessing the level of endurance in 10-year-old boys after classes incorporating intensive interval training supplemented with elements of karate demonstrated significant statistical changes in endurance indicators. Notably, there were improvements in exercises characterizing the development of local dynamic power endurance of different muscle groups (strength of arms, legs, and core muscles) and coordination endurance ($p < 0.001$).

Determining the effects of training according to the "Tabata Protocol" using exercises that imitate Kyokushinkai karate classes is valuable considering the specifics of training and its effects on sports performance. Further research can evaluate the impact of intensive interval training on Kyokushinkai karate competition results. Future research protocols should consider the number of strikes and technical skills used in combat.

Conflict of Interest

The authors declare no conflicts of interest.

References

- Akter, S., & Bristy, T.A. (2022). Lifestyle factors and risk of obesity among the school children in Khulna city. *Khulna Univ Stud.* 19(2), 235-44. <https://doi.org/10.53808/KUS.2022.19.02.2147-ss>
- Polevoy, G.G. (2023). The Development of Endurance Through Prolonged Running and Its Effect on the Attention of 9-10-Year-Olds. *Entomology and Applied Science Letters*, 10(1), 65-75. <https://doi.org/10.51847/2GXBecgNwL>
- Deng, Y., & Wang, X. (2024). Effect of high-intensity interval training on cardiorespiratory in children and adolescents with overweight or obesity: a meta-analysis of randomized controlled trials. *Frontiers in public health*, 12, 1269508. <https://doi.org/10.3389/fpubh.2024.1269508>
- Yulianti, A., Fitriana, F., & Falahiah, H. (2022). Impact of Physical Activity on the Balance and Fitness of Elementary School Children During the Covid-19 Pandemic. *Int Conf Med Health*, 372-6. <https://doi.org/10.18502/kme.v2i3.11887>
- Paulose, A., & Aluckal, E. (2022). Prevalence of Overweight and Obesity in School Children Aged 5-12 Years of Kottayam, India. *Int J Sci Healthcare Res.* 7(3), 410-5. <https://doi.org/10.52403/ijshr.20220760>
- Le, G.B., & Dinh, D.X. (2022). Prevalence and associated factors of overweight and obesity among primary school children: a cross-sectional study in Thanhhoa City, Vietnam. *BMJ open*, 12(4), e058504. <https://doi.org/10.1136/bmjopen-2021-058504>
- Marchenko, Svitlana, Ivashchenko, Olha, & Khudolii, Oleg. (2023). Discriminant analysis: motor skills in the structure of motor readiness of 8-year-old boys practicing karate. *Slobzhanskyi Herald of Science and Sport*, 27(4), 206-213. <https://doi.org/10.15391/sns.v.2023-4.005>
- World Health Organization. *Guidelines on physical activity and sedentary behaviour*. Geneva: World Health Organization; 2020. Available at: <https://www.who.int/news-room/fact-sheets/detail/physical-activity>
- Unierzyski, P., & Boguslawski, M. (2016). Endurance development for 10-12 & under tennis players. *ITF Coaching & Sport Science Review*, 24(69), 22-24. <https://doi.org/10.52383/itfcoaching.v24i69.191>
- Marchenko, S., & Handymov, B. (2021). Development of Strength Abilities Using Play Techniques with Elements of Martial Arts at the Sports and Recreational Stage in 10-Year-Old Girls. *Journal of Learning Theory and Methodology*, 2(2), 68-74. <https://doi.org/10.17309/jltm.2021.2.03>
- Marchenko, S., Ivashchenko, O., Khudolii, O., & Lubchenkov, R. (2023). Use of game tools in martial arts for endurance development. *Pedagogy of Physical Culture and Sports*, 27(6), 494-502. <https://doi.org/10.15561/26649837.2023.0608>
- Martin-Smith, R., Cox, A., Buchan, D.S., Baker, J.S., Grace, F., & Sculthorpe, N. (2020). High Intensity Interval Training (HIIT) Improves Cardiorespiratory Fitness (CRF) in Healthy, Overweight and Obese Adolescents: A Systematic Review and Meta-Analysis of Controlled Studies. *International journal of environmental research and public health*, 17(8), 2955. <https://doi.org/10.3390/ijerph17082955>
- Bauer, N., Sperlich, B., Holmberg, H.C., & Engel, F.A. (2022). Effects of High-Intensity Interval Training in School on the Physical Performance and Health of Children and Adolescents: A Systematic Review with Meta-Analysis. *Sports medicine - open*, 8(1), 50. <https://doi.org/10.1186/s40798-022-00437-8>

- Duncombe, S.L., Barker, A.R., Bond, B., Earle, R., Varley-Campbell, J., Vlachopoulos, D., Walker, J.L., Weston, K.L., & Stylianou, M. (2022). School-based high-intensity interval training programs in children and adolescents: A systematic review and meta-analysis. *PloS one*, 17(5), e0266427. <https://doi.org/10.1371/journal.pone.0266427>
- Wu, J., Yang, Y., Yu, H., Li, L., Chen, Y., & Sun, Y. (2023). Comparative effectiveness of school-based exercise interventions on physical fitness in children and adolescents: a systematic review and network meta-analysis. *Front Public Health*, 5(11), 1194779. <https://doi.org/10.3389/fpubh.2023.1194779>.
- Litvin, A., & Marchenko, S. (2021). Programming the Process of Teaching Boys Aged 10 Yoko Gery Kekomi (Side Kick). *Journal of Learning Theory and Methodology*, 2(3), 111-118. <https://doi.org/10.17309/jltm.2021.3.02>
- Svitlana Marchenko, Oleg Khudolii, Olha Ivashchenko, & Sabina Musliumova. (2023). Didactics: peculiarities of planning and managing the process of teaching the Mae hiza geri chudan technique in 8-year-old boys. *Slobozhanskyi Herald of Science and Sport*, 27(2), 92-98. <https://doi.org/10.15391/snsv.2023-2.005>
- Marchenko, S., Ivashchenko, O., Jagielło, W., Iermakov, S., Khudolii, O., & Bobrysheva, V. (2023). The efficiency of the process of forming the skill of performing kin geri kick. *ARCH BUDO*, 19, 51-59. <https://archbudo.com/view/abstract/id/16202>
- Tabata, I. (2019). Tabata training: one of the most energetically effective high-intensity intermittent training methods. *J Physiol Sci.*, 69, 559-572. <https://doi.org/10.1007/s12576-019-00676-7>
- Weston, K.S., Wisløff, U., & Coombes, J.S. (2014). High-intensity interval training in patients with lifestyle-induced cardiometabolic disease: a systematic review and meta-analysis. *British journal of sports medicine*, 48(16), 1227-1234. <https://doi.org/10.1136/bjsports-2013-092576>
- World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. *JAMA*, 2013;310:2191. <https://doi.org/10.1001/jama.2013.281053>
- Goncharenko, O.V. (2021). *Kyokushinkai karate. Training program for children's and youth sports schools*. Kyiv, 90. https://mms.gov.ua/storage/app/sites/16/Sport/Programy_navchalni/2021/programa-kiokushinkay-karate.pdf
- Marchenko, S., & Taranenko, O. (2020). Managing the Effectiveness of Teaching Boys Aged 10 Mawashi-Geri (Roundhouse Kick) Technique in Kyokushin Karate. *Physical Education Theory and Methodology*, 20(4), 262-268. <https://doi.org/10.17309/tmfv.2020.4.10>
- Marchenko, S., & Kovalenko, K. (2020). Optimization of Teaching Boys Aged 10 Mae-Geri (Front Kick) Technique in Kyokushin Karate. *Journal of Learning Theory and Methodology*, 1(1), 33-39. <https://doi.org/10.17309/jltm.2020.1.05>
- Serhiienko, L.P. (2010). *Sportyvna metrolohiia: teoriia i praktychni aspekty*. Kyiv, KNT, 776.
- Ratel, S., Lazaar, N., Dore, E., Baquet, G., Williams, C.A., Berthoin, S., Van Praagh, E., Bedu, M., & Duche, P. (2004). High-intensity intermittent activities at school: controversies and facts. *J Sports Med Phys Fitness.*, 44(3), 272-80. PMID: 15756166
- Costigan, S.A., Eather, N., Plotnikoff, R.C., Taaffe, D.R., Pollock, E., Kennedy, S.G., & Lubans, D.R. (2015). Preliminary efficacy and feasibility of embedding high intensity interval training into the school day: A pilot randomized controlled trial. *Preventive medicine reports*, 2, 973-979. <https://doi.org/10.1016/j.pmedr.2015.11.001>
- Eddolls, W.T.B., McNarry, M.A., Stratton, G., Winn, C.O.N., & Mackintosh, K.A. (2017). High-Intensity Interval Training Interventions in Children and Adolescents: A Systematic Review. *Sports medicine (Auckland, N.Z.)*, 47(11), 2363-2374. <https://doi.org/10.1007/s40279-017-0753-8>
- Vasconcelos, B.B., Protzen, G.V., Galliano, L.M., Kirk, C., & Del Vecchio, F.B. (2020). Effects of High-Intensity Interval Training in Combat Sports: A Systematic Review with Meta-Analysis. *Journal of strength and conditioning research*, 34(3), 888-900. <https://doi.org/10.1519/JSC.0000000000003255>
- Cao, M., Quan, M., & Zhuang, J. (2019). Effect of High-Intensity Interval Training versus Moderate-Intensity Continuous Training on Cardiorespiratory Fitness in Children and Adolescents: A Meta-Analysis. *International journal of environmental research and public health*, 16(9), 1533. <https://doi.org/10.3390/ijerph16091533>
- Tottori, N., Morita, N., Ueta, K., & Fujita, S. (2019). Effects of High Intensity Interval Training on Executive Function in Children Aged 8-12 Years. *International journal of environmental research and public health*, 16(21), 4127. <https://doi.org/10.3390/ijerph16214127>
- Nurkholis, Sifaq, A., Suyoko, A., Nirwansyah, W.T., Pramono, B.A., & Arisanti, R.R.S. (2023). Transforming Kempo Fitness: Enhancing Physiological Responses and Physical Performance in Adolescents via a Tabata-Based Method. *Physical Education Theory and Methodology*, 23(6), 868-876. <https://doi.org/10.17309/tmfv.2023.6.08>
- Masanovic, B., Gardasevic, J., Marques, A., Peralta, M., Demetriou, Y., Sturm, D.J., & Popovic, S. (2020). Trends in Physical Fitness Among School-Aged Children and Adolescents: A Systematic Review. *Front. Pediatr.*, 8, 627529. <https://doi.org/10.3389/fped.2020.627529>
- Gäbler, M., Prieske, O., Hortobágyi, T., & Granacher, U. (2018). The Effects of Concurrent Strength and Endurance Training on Physical Fitness and Athletic Performance in Youth: A Systematic Review and Meta-Analysis. *Frontiers in physiology*, 9, 1057. <https://doi.org/10.3389/fphys.2018.01057>
- Hontarenko, V., Marchenko, S., & Korol, O. (2022). Strength Abilities: Assessment and Specific Features of the Development of Elementary School-Aged Karate Boys. *Journal of Learning Theory and Methodology*, 3(3), 109-115. <https://doi.org/10.17309/jltm.2022.3.04>

Вплив інтенсивних інтервальних програм на розвиток витривалості хлопців 10 років

Світлана Марченко^{1ABCD}, Артем Шаповалов^{1ABCD}, Олександр Корол^{2ABCD}

¹Харківський національний педагогічний університет імені Г.С. Сковороди

²Національний університет «Львівський політехніка»

Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 7 с., 4 табл., 35 джерел.

Метою даного дослідження було експериментальне виявлення та оцінка ефективності використання інтенсивних інтервальних програм розвитку витривалості у навчальному процесі хлопчиків 10 років.

Матеріали і методи. У дослідженні взяли участь 20 хлопців 10 років. Були створені контрольна (n = 10) та експериментальна (n = 10) групи. Діти та їхні батьки були ознайомлені про всі особливості дослідження і дали згоду на участь в експерименті. Протокол дослідження схвалено Етичним комітетом Харківський національного педагогічного університету імені Г.С. Сковороди (Харків, Україна). Дослідження проведено відповідно до Гельсінської декларації – етичні принципи медичних досліджень за участю людей (World Medical Association Declaration of Helsinki, 2013). Були застосовані такі методи дослідження: аналіз науково-методичної літератури, педагогічне тестування та методи математичної статистики обробки результатів дослідження.

Результати. За результатами комплексного контролю здібностей хлопців до витривалості встановлені статистично достовірні зміни за всіма показниками як в експериментальній (p < 0,001), так і контрольній групах (p < 0,05). Позитивна динаміка результатів відбулася на користь експериментальної групи.

Більше за все статистично значимі зміни відбулися в експериментальній групі за показниками тестів «Згинання і розгинання рук в упорі лежачи» на 35,2% (p < 0,001), «Стрибки зі скакалкою за 1хв» (20,8%; p < 0,001), «Присідання на двох ногах за 1 хв» (18,8%; p < 0,001), «3 положення лежачи на спині піднімання в сід за 1хв» (17,4%; p < 0,01). Отримані результати підсумкового тестування у тестах «Вис на зігнутих руках», «Тест Берпі за 1 хв», «Біг 300 метрів» були дещо нижчі та все ж продемонстрували статистично значимі зрушення (13,0%, 11,4%, 6,5% відповідно, при рівні значимості p < 0,001). Загальна витривалість розвивалась повільніше по відношенню до інших видів даної здібності. У «Висі на зігнутих руках» зміна даних після експерименту в контрольній групі виявилась статистично не значимою (p = 0,05).

Висновки. Використання спеціально підібраних вправ за «Протоколом Табата» методом інтенсивного інтервального тренування сприяло розвитку витривалості у хлопців 10 років.

Ключові слова: витривалість, інтенсивне інтервальне тренування, кіокушинкай карате, хлопці.

Information about the authors:

Marchenko, Svitlana: sport-svet1968@ukr.net; <https://orcid.org/0000-0002-1013-9511>; Department of Theory, Methodology and Practice of Physical Education, H. S. Skovoroda Kharkiv National Pedagogical University, Alchevskykh St, 29, Kharkiv, 61002, Ukraine.

Artem Shapovalov: artemshapovalov30100@gmail.com; <https://orcid.org/0009-0007-5428-1740>; Department of Theory, Methodology and Practice of Physical Education, H. S. Skovoroda Kharkiv National Pedagogical University, Alchevskykh St, 29, Kharkiv, 61002, Ukraine.

Korol, Oleksandr: korolshihan@gmail.com; <https://orcid.org/0000-0001-7812-137X>; Department of Physical Education, Lviv Polytechnic National University, Bandera St, 12, Lviv, 79013, Ukraine.

Cite this article as: Marchenko, S., Shapovalov, A., & Korol, O. (2024). Influence of Intensive Interval Training Programs on The Development of Endurance In 10-Year-Old Boys. *Journal of Learning Theory and Methodology*, 5(2), 47-53. <https://doi.org/10.17309/jltm.2024.5.2.01>

Received: 20.07.2024. Accepted: 07.08.2024. Published: 30.08.2024

This work is licensed under a Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0>).



Physical Education in the Restoration of Damaged Functions in Students After Blast Tbi Complicated By Acuborotrauma

Oksana Blavt^{1ABCD} and Tetyana Gurtova^{2BCD}

¹Lviv Polytechnic National University

²Stepan Gzhyskyi National University of Veterinary Medicine and Biotechnologies of Lviv

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

DOI: 10.17309/jltm.2024.5.2.02

Abstract

Background. In the conditions of a long armed conflict, and, therefore, a permanent increase in the number of students affected by the war, there is a need to reorganize the content of physical education in higher schools, in accordance with modern requests and needs.

Objectives. The purpose of the article is to reveal the effectiveness of the implementation of a differentiated PE program in restoring gait and balance functions in students after blast TBI, complicated by acuborotrauma.

Materials and methods. The “10 Meter Walk Test” was used for the implementation of the experiment, the results of which were processed using the methods of mathematical statistics. The studied sample consisted of 20 students after blast TBI, complicated by acuborotrauma, in the first year of study at a higher education institution.

Results. In conclusion, according to the results of the final test cut, there is every reason to consider the implemented differential program effective in achieving the effectiveness of the correction of vestibular dysfunctions. This was reflected in the improvement of the results of the “10 Meter Walk Test” both in integral results and in intermediate sections, as well as in the results of tests used to control the level of balance development. The recorded positive dynamics within 9-19% of all students of the studied sample is evidence in favor of the implemented program.

Conclusions. Research-experimental verification of the effectiveness of the implementation of the developed differentiated physical education course program for students after blast TBI, complicated by acuborotrauma, proved the effectiveness of the proposed innovations. The established dynamics of the studied indicators and their analysis made it possible to answer questions about the effectiveness of the implemented differentiated program aimed at eliminating functional disorders in the body of students as a result of blast TBI, complicated by acuborotrauma. The effectiveness of the implementation of the program is proven on the basis of the established improvement of the test results of the students of the studied sample.

Keywords: physical education, student of higher education, blast TBI, acuborotrauma, program, effectiveness.

Introduction

Since the escalation of the war in Ukraine on February 24, 2022, the number of people affected by active hostilities has been increasing every day. As a result of constant shelling, serious injuries are suffered not only by the military but also by the civilian population.

The Russian-Ukrainian war is characterized by the use of the entire range of modern weapons (Misyura, 2023). It was studied (Sirko, Pilipenko, Romanukha, & Skrypnik, 2020) that this led to an increase in the number of victims with a brain injury from the action of a mine blast wave – blast traumatic brain injury (TBI). In recent military conflicts,

blast TBI has been recognized as the most common injury of military personnel (VA Research on Traumatic Brain Injury, 2019) – about 60% of BI cases, and 80% of them are mild.

Blast TBI, which is a separate traumatic effect on the brain, can include damage to the hearing organs and the vestibular apparatus – acubarotrauma (acoustic trauma and pressure trauma) (Plurad, 2011). Only according to 2017 data (Shvets, Kikh, & Lukianchuk, 2019), as a result of military operations in eastern Ukraine, blast TBI accounted for 30.8% of all mechanical combat injuries and injuries. At the same time, ear damage due to acubarotrauma among blast TBI was 22.8% (Galushka, Podolyan, Shvets, & Gorshkov, 2019).

According to extreme data (Blavt, Galamanzhuk, Huska, Iedynak, Pityn, Kachurak, Faidevych, & Turka, 2024), the full-scale invasion significantly increased the frequency of this

type of injury and made blast TBI a real challenge for the higher education system of Ukraine: every year, students after blast TBI in there are more and more institutions of higher education. So, like the rest of the spheres of the country's life, higher education has faced a certain range of problems and challenges (Blavt, Bodnar, Mykhalskyi, Gurtova, & Tsovk, 2023), seeking to organize such an educational process that is focused on strengthening the effective response to the primary and prospective needs of students, who suffered from the war.

In institutions of higher education, the function of health care is assigned to the discipline of "Physical education" (Kuntjoro, Soegiyanto, Setijono, & Suharto, 2022; Chernenko, Muszkieta, Dolynnyi, Oliynyk, & Honcharenko, 2022). In the conditions of a long armed conflict, and, therefore, a permanent increase in the number of students affected by the war, and the expectation of maintaining this trend in the future, there is a need to reorganize this process by modern requirements.

As researched (Bannikova, Kalinkin, & Magnushevskyi, 2018), the high specific weight of brain injury in terms of war injuries, a significant percentage of disability acquisition due to blast TBI (Teasell, Bayona, Marshall, & et al., 2007) disappointing forecasts of recovery of working capacity (Langlois, Rutland-Brown, & Wald, 2006) attribute this problem in Ukraine to several priorities. An analysis of the scientific output of research on this issue (Shvets, Kikh, Parkhomenko, & Lukianchuk, 2020; Ng, & Lee, 2019; Misyura, Ruban, & Mishin 2022; Perkins, Gracey, Kelly, & Jim, 2022) confirms that currently blast TBI, including complicated by acuborotrauma, is an actual interdisciplinary problem.

Along with that, the importance of the timely application of restorative physical therapy after injuries has been emphasized in numerous scientific investigations (Blavt, & Gurtova, 2023; Shvet, Kikh, & Parkhomenko, & Lukianchuk, 2020; Blavt, & Herasymenko, 2024). It has been studied (Denby, Murphy, Busuttill, Sakel, & Wilkinson, 2020; Shvets, Podolian, & Holinko, 2020; Sushchenko, Demchenko, & Bobrovnyk, 2024), the consequences of any BI, including blast TBI and complicated by acuborotrauma, can develop and manifest over the years.

The need for exercise after a stroke has been studied (Galleno, Pullano, Mourad, Galeoto, & Frontani, 2022; Bland, Zampieri, & Damiano, 2011; Vander Vegt, Hill-Pearson, Hershaw, Loftin, Bobula, & Souvignier, 2022). It has been proven (Carrick, McLellan, Brock, Randall, & Oggero, 2015; Bannikova, Kalinkin, & Magnushevskyi, 2018; Lorenz, Charette, O'Neil-Pirozzi, Doucett, & Fong, 2018) that physical activity contributes to the elimination of symptoms of connected with brain injury.

It is believed (Pellerin, Wilson, & Haegele, 2022; Canto, Chesire, Buckley, Andrews, & Roehrig, 2014; Blavt, 2023) that higher education has all the opportunities and potential for student health. Scientists (Grenier, Patey, & Grenier-Burtis, 2022; Blavt, Galamanzhuk, Huska, Iedynak, Pityn, Kachurak, Faidevych, & Turka, 2024; Jantz, P.B., Davies, & Bigler, 2014) point to the need to introduce innovations corresponding today's needs in the educational process of physical education of higher schools, which can ensure the effectiveness of this process.

Taking into account the situation of daily risks of terrorist tactics of waging war by Russia, studying the capabilities of

physical education to restore the working capacity of students to prevent late complications of acubotrauma after blast TBI is an urgent issue today.

The purpose of the article is to reveal the effectiveness of the implementation of a differentiated PE program in restoring gait and balance functions in students after blast TBI, complicated by acuborotrauma.

Material and Methods

Study Participants

20 students after blast TBI, complicated by acuborotrauma, in the 1st year of study aged from 18 to 23 years from Lviv Polytechnic National University and Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies of Lviv during the one-year course of PE were involved in the experimental study. Students for the study sample were selected based on a medical examination in the presence of mild blast TBI, but complicated by acuborotrauma. The absence of pronounced acute symptoms and the doctor's permission to participate in the testing were significant in the selection of students to participate in the study.

The selection of the contingent for the experimental study was guided by the data (Kim, Yun, Lee, Lee, Sung, Lee, Kim, Park, Choi, Song, Choi, Koo, & Kim, 2024) that age, gender, duration of the disease, species are not aggravations of vestibular disorders do not affect the result.

Students were invited to participate in the study based on anonymity and informed consent. The study was planned and carried out following the principles of bioethics set forth by the World Medical Association (WMA-2013) in the Helsinki Declaration «Ethical Principles of Medical Research Involving Humans» and UNESCO in the «General Declaration on Bioethics and Human Rights».

Methods

The experimental research was implemented at the theoretical and empirical levels. In the list of theoretical methods, there are analysis, synthesis, and generalization. A pedagogical experiment implemented by pedagogical testing was empirically applied, and mathematical statistics methods were used to process the results.

The choice of the testing method was guided by the recommendations (Unver, Baris, Yuksel, Cekmece, Kalkan, & Karatosun, 2017), which consider gait control to be an important indicator of the process of restoring damaged functions after injuries.

Considering the ease of use and evaluation of the results (de Baptista, Vicente, Souza, Cardoso, Ramalho, & Mattiello-Sverzut, 2020), the «10 Meter Walk Test» (10MWT) (Physiopedia), which is non-invasive and safe, was used to implement the experiment to monitor recovery after blast TBI (Hirsch, Williams, Norton, & Hammond, 2014)

Test procedure. Equipment Required: a clear pathway with a set distance (6, 8, or 10 meters in length depending on distance tested). The student must walk 10 meters unaided, with the intervening 6 meters timed to account for acceleration and deceleration (Fig. 1). The time is recorded (to the nearest second) and the walking speed is calculated.

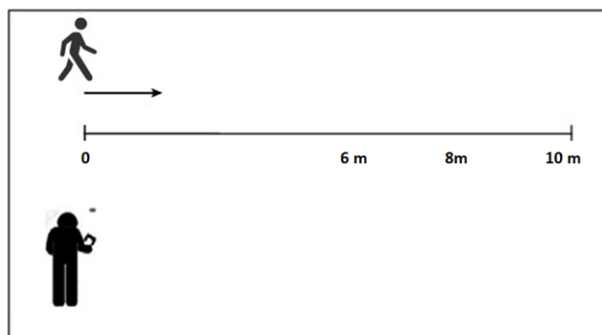


Fig. 1. Scheme of the 10MWT (Blavt, Galamanzhuk, Huska, Iedynak, Pityn, Kachurak, Faidevych, & Turka, 2024)

The student walks without assistance for 10 meters, with the time measured for the intermediate 6 meters to allow for acceleration and deceleration. Perform three trials and calculate the average of three trials. Scoring: The time (to the nearest second) is fixed. Walking speed (meters/second) can be calculated by dividing 10 meters by total time in seconds. 10MWT оцінили швидкість ходьби в метрах за секунду за короткий проміжок часу.

The basic Romberg test (Fruth, & Fawcett, 2019) was used to investigate and assess vertical stability (Fig. 2.). It proven (Kim, Kim, Kim, Kim, & Han, 2012), that be a sensitive and accurate means of measuring the degree of disequilibrium caused by head trauma.

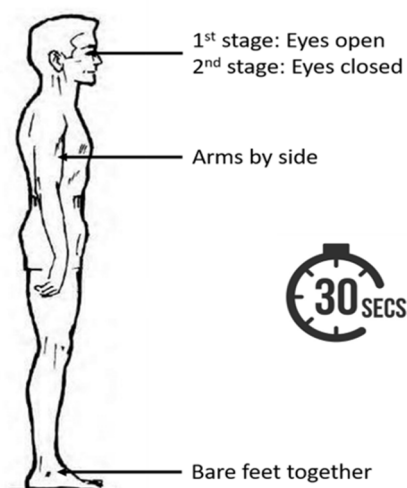


Fig. 2. Scheme of the Romberg test (Epomedicine)

Romberg's test is performed standing, arms extended forward, fingers slightly apart. The student first performs the test task with his eyes open, and then his stability is assessed in the absence of visual control (Fruth, & Fawcett, 2020).

Research Organization

A week after the beginning of the educational process, the students of the studied sample passed the initial test, the next one was scheduled three months later. Each student per-

formed three attempts, and the average value of the three attempts was used for analysis.

Before the start of the testing, a clear instruction was given regarding the procedure for the implementation of the test exercise and the evaluation of the results. If the student felt certain symptoms while performing the test, such as severe shortness of breath, chest pain, dizziness, pain in the legs, etc., the test was stopped.

The comparative experiment involved recording the test results before the start of the study and at the end of the academic semester during which the program was implemented. The result of the experiment was considered to be the dynamics of the studied parameters.

Statistical Analysis

All statistical analyses were performed using SPSS Version 24.0 (IBM Corporation). Рівень статистичної значущості встановлено на рівні 5%. Виміряні дані представлені як середнє трьох спроб $\pm$ стандартне відхилення.

Results

Our scientific search is based on the fact that concussion combined with acubarotrauma contributes to the prevalence of sensory (hearing, vision loss) and cognitive impairments (Shvets, Podolyan, & Golinko, 2020), accompanied by balance problems (Hillier, & McDonnell, 2015). This leads to a deterioration of functional independence against the background of vestibular disorders, in particular, chronic dizziness and loss of translational control (Rosen, Delpy, Pape, Kodosky, & Kruger, 2021).

It has been studied (Shvets, Kikh, Parkhomenko, & Lukianchuk, 2020; Shvets, Podolian, & Holinko, 2020) that one of the key aspects of acubarotrauma is that, along with damage to the hearing organs, damage to other parts of the central nervous system is observed. This is almost always accompanied by movement disorders (Overview of Traumatic Brain Injury) such as problems in maintaining body stability, which requires monitoring of such disorders during the recovery process (Galeno, Pullano, Mourad, Galeoto, & Frontani, 2022; Misyura, 2023).

Based on the information (Overview of Traumatic Brain Injury; Bland, Zampieri, & Damiano, 2011) that no two BIs are the same and based on the new generalization of accumulated experience, a differentiated physical education program was developed for students after blast TBI. The program was guided by evidence (Carrick, Mclellan, Brock, Randall, & Oggero, 2015) that vestibular complaints are the most common consequence of blast TBI, and vestibular function recovery is identified as the most important physical therapy method (Vander Vegt, Hill-Pearson, Hershaw, Loftin, Bobula, & Souvignier, 2022).

The implementation of a differentiated approach was to provide students with post-blast TBI complicated by trauma with physical education opportunities that are adapted to their abilities. The special tasks of the program were directed to the improvement of specific motor skills with a focus on the elimination of functional disorders of the gait function using a targeted influence on the state of the vestibular apparatus.

Table 1. Test control results

Statistical parameters		Test tasks and measurement results										effect,%
		at the beginning of the experiment					after of the experiment					
		X	S	As	Me	V	X	S	As	Me	V	
10MWT	2 M (c)	1.12	0.28	0.006	11.09	32.1	1.02	0.19	0.004	1.04	21.1	9.6
	6 M (c)	4.38	0.89	0.04	4.20	27.4	4.07	0.71	0.23	3.98	23.2	9.1
	8 M (c)	7.53	0.52	0.39	7.42	31.2	6.91	0.58	0.31	6.77	26.1	8.78
	10 M (c)	9.06	0.65	0.57	8.67	28.7	8.03	0.48	0.42	7.99	21.9	12.1
	V (m/s)	0.91	0.54	0.051	0.88	28.5	0.81	0.32	0.39	0.75	22.7	12.05
Romberg's test (points)	eyes open	12.77	1.93	0.06	12.01	33.2	16.02	2.12	0.87	15.99	24.1	18.17
	eyes closed	7.88	1.75	0.04	7.01	29.2	11.01	1.22	0.63	10.81	21.5	19.04

*The differences in the results at the beginning and after of the experiment are significant ($p < 0.05 - 0.001$)

Using recommendations (Yushkovska, 2016; Pérez-Rodríguez, García-Gómez, Coterón, García-Hernández, & Pérez-Tejero, 2021), the basis of the program is the use of various aerobic and gymnastic exercises that involve the afferent visual and proprioceptive systems and the vestibular apparatus.

Evaluation of program outcomes was conducted using information (Wellons, Duhe, MacDowell, Hodge, Oxborough, & Levitzky, 2022) that included outcome measures to quantify gait and balance development, as impairments are a common symptom following blast TBI complicated by acuborotrauma (Shvets, Kikh, Parkhomenko, & Lukianchuk, 2020). This was guided by the data (Morgan, Murphy, Opheim, & McGinley, 2016; van der Veen, Perera, Fino, Franke, Agyemang, Skop, Wilde, Sponheim, Stamenkovic, Thomas, & Walker, 2023) that information about equilibrium in the presence of various diseases is valuable for determining the level of functions, changes in functions and consequences for health.

So, in conclusion, according to the results of the final test section (Table 1), there is every reason to consider the implemented differential program effective in achieving the effectiveness of the correction of vestibular dysfunctions. This was reflected in the improvement of the 10MWT results both in the integral results and in the intermediate sections, as well as in the results of the tests used to control the level of balance development. The recorded increase in the speed of overcoming the 10MWT distance attracts attention.

Based on the results of calculating walking speed, which according to data (Graham, Ostir, Kuo, Fisher, & Ottenbacher, 2008), is a correlator of numerous indicators of physical condition and general health, we observe positive dynamics in the studied parameters. After comparing the distance covered in the first and last minutes by the students of the studied sample, conclusions were drawn about the development of fatigue and its effect on walking speed: after the end of the experiment, there was a decrease in the manifestations of fatigue in the performance of the exercise.

Discussion

The relevance of research into various aspects of the recovery process after blast TBI is proven by numerous scientific searches (Shvets, Kikh, & Lukianchuk, 2019; Plurad, 2011; Misyura, Ruban, & Mishin, 2022). The dominant factor in the effectiveness of this process is recognized (Blavt, Gala-

manzhuk, Huska, Iedynak, Pityn, Kachurak, Faidevych, & Turka, 2024) as the introduction of innovations and the formation of special educational programs (Pérez-Rodríguez, García-Gómez, Coterón, García-Hernández, & Pérez-Tejero, 2021; Chernenko, Muszkiet, Dolynniy, & Honcharenko, 2022; Blavt, & Herasymenko, 2024) in the process of physical education of students to meet today's challenges.

The scientific and applied problem of justifying the re-organization of the content of physical education in higher education is caused by the realities of martial law in Ukraine. The need for further investigation is supported by data (Galen, Pullano, Mourad, Galeoto, & Frontani, 2022; Ng, & Lee, 2019) regarding blast TBI symptoms that typically resolve within 7-10 days, but remain with dizziness and balance dysfunction that affect on quality of life (Shvets, Kikh, & Lukianchuk, 2019; Ogihara, Kamo, Tanaka, Azami, Kato, Endo, Tsunoda, & Fushiki, 2022; Wellons, Duhe, MacDowell, Oxborough, & Madhav, 2024).

Our results are consistent with the results of the study (Kim, Yun, Lee, Lee, Sung, Lee, Kim, Park, Choi, Song, Choi, Koo, & Kim, 2024; Ogihara, Kamo, Tanaka, Azami, Kato, Endo, Tsunoda, & Fushiki, 2022; Lorenz, Charrette, O'Neil-Pirozzi, Doucett, & Fong, 2018), which proved that the implementation of a differentiated approach in the correction of vestibular disorders after blast TBI contributes to the reduction of motor imbalances.

The conducted research is consistent with information (Wellons, Duhe, MacDowell, Hodge, Oxborough, Levitzky, 2022; Wellons, Duhe, MacDowell, Oxborough, & Madhav, 2024) regarding the feasibility of using gait assessment to monitor the recovery of vestibular disorders, in particular after blast TBI (Jain, 2016; Misyura, 2023). It has been argued (Thorman, Loyd, Clendaniel, Dibble, & Schubert, 2022; Hao, Pu, He, Remis, Yao, & Li, 2024) that gait speed is an indicator of both general functional health and the condition of the vestibular apparatus.

We agree with the authors on the effectiveness of aerobic activities (Yushkovska, 2016; Pérez-Rodríguez, García-Gómez, Coterón, García-Hernández, & Pérez-Tejero, 2021) in the recovery process after blast TBI. We support scientific ideas (Wise, Hoffman, Powell, Bombardier, & Bell, 2012; Mala, & Rasmussen, 2017; Marklund, Bellander, Godbolt, Levin, & McCrory, 2019) regarding the need for physical activity in TBI recovery.

The research results complement the works (Shvets, Kikh, Parkhomenko, & Lukianchuk, 2020; Denby, Mur-

phy, Busuttill, Sakel, & Wilkinson, 2020; Shvets, Podolian, & Holinko, 2020) that an important indicator of the rehabilitation of persons after blast TBI is the control of spatial stability. Instead, the relevance of the conducted research is confirmed by the data (Blavt, & Gurtova, 2023), according to which the violation of postural control is considered one of the main problems in the physical education of students who were injured as a result of the war.

Guided by the information (Brushko, Bannikova, & Kovelska, 2021) that the correct and justified choice of instrumental evaluation methods is a mandatory condition for the adequacy of the applied means, the gait parameters control test was chosen. Such tests are widely used to determine walking speed, health and functional status: in neurological diseases (Brushko, Bannikova, & Kovelska, 2021; Tyson, & Connell, 2009), orthopedic injuries (Master, Coleman, Dobson, Bennell, Hinman, Jakiela, & White, 2021), for children with cerebral palsy (Kolonyuk, 2023), after traumatic brain injury (Bland, Zampieri, & Damiano, 2011), in diseases of the cardiovascular, respiratory systems, and musculoskeletal system (Yushkovska, 2016), in Duchenne muscular dystrophy (Pizzato, Baptista, Martinez, Sobreira, & Mattiello, 2016).

For the first time, we used a test to evaluate gait parameters as an indicator of vestibular disorders in students after blast TBI, complicated by acubarotrauma, in the process of physical education. Given the data (Lam, T., Noonan, V., et al., 2007), that a change of 0.13 m/s in the results of the 10MWT is evidence of significant changes in the functioning of the vestibular apparatus, the experiment can be considered a success.

Conclusions

In the conditions of countering the challenges of martial law, domestic institutions of higher education continue to work and make every effort to maintain this trend in the future. The full-scale invasion significantly increased the number of students who suffered war injuries, including blast TBI, which posed a real challenge to the educational process, considering that in the current situation, it affects both military and civilians alike, given the threat of missile strikes.

Given the consequences of blast TBI, complicated by acubarotrauma, which are characterized by a long-term effect on work capacity and general well-being, it requires innovative ideas and provisions in the formation and implementation of the content of physical education as a factor in preserving the health of students after blast TBI, complicated by acubarotrauma. A proven differentiated program of physical education for students after blast TBI complicated by acubarotrauma is aimed at providing a targeted collective impact on the vestibular apparatus.

Research and experimental verification of the effectiveness of the implementation of the developed program proved the effectiveness of the proposed innovations in eliminating functional disorders in the body of students due to blast TBI, complicated by acupressure. The effectiveness of the implementation of the program has been proven based on the established improvement of the test results of the students of the studied sample within 9-19%.

In general, experimental data proved that the developed and implemented physical education course program for stu-

dents after blast TBI, complicated by acupressure, is effective and contributes to the elimination of vestibular disorders as a consequence of acupressure.

Conflicts of interest

No conflicts of interest exist.

References

- Misyura, V.B. (2023). State of balance, functional mobility and biomechanical parameters of walking of men aged 25–42 years with consequences of combat trauma. *Scientific journal of the NPU named after M.P. Drahomanova*, 2(160), 129–133. [https://doi.org/10.31392/NPU-nc.series15.2023.02\(160\).27](https://doi.org/10.31392/NPU-nc.series15.2023.02(160).27). [in Ukrainian]
- Sirko, A., Pilipenko, G., Romanukha, D., & Skrypnyk, A. (2020). Mortality and Functional Outcome Predictors in Combat-Related Penetrating Brain Injury Treatment in a Specialty Civilian Medical Facility. *Mil Med*, 185(5-6), e774–e780. <https://doi.org/10.1093/milmed/usz43>
- VA research on Traumatic Brain Injury (TBI). (2019). *DVBIC: Defense and Veterans Brain Injury Center*. <https://www.research.va.gov/topics/tbi.cfm>
- Plurad, D.S. (2011). Blast injury. *Mil Med*, 176(3), 276–282. <https://doi.org/10.7205/milmed-d-10-00147>
- Shvets, A., Kikh, A., & Lukianchuk, I. (2019). Features of postconcussion symptoms recovery after traumatic brain injury among military personnel. *Zaporozhye Medical Journal*, 1(1), 40–49. <https://doi.org/10.14739/2310-1210.2019.5.179424>. [in Ukrainian]
- Galushka, A., Podolyan, Y., Shvets, A., & Gorshkov, O. (2019). Peculiarities of military injury accompanying acubarotrauma in military services participating in military action. *Ukrainian Journal of Military Medicine*, 19(3), 56–66. <https://ujmm.org.ua/index.php/journal/article/view/54>. [in Ukrainian]
- Blavt, O., Galamanzhuk, L., Huska, M., Iedynak, G., Pityn, M., Kachurak, Y., Faidevych, V., & Turka, R. (2024). Using programmable device installations to control students with disabilities after blast traumatic brain injury in 10 Meter Walking Test. *Physical Education Theory and Methodology*, 24(3), 433–441. <https://doi.org/10.17309/tmfv.2024.3.12>
- Blavt, O., Bodnar, A., Mykhalskyi, A., Gurtova, T., & Tsovk, L. (2023). Application of electronic means in endurance coordination testing of students with disabilities who are war veterans. *Physical Education Theory and Methodology*, 23(3), 397–403. <https://doi.org/10.17309/tmfv.2023.3.12>
- Kuntjoro, B.F.T., Soegiyanto, S., Setijono, H., & Suharto, S. (2022). Inclusion of students with disability in physical education: analysis of trends and best practices. *AJPESH*, 2(2), 88–94.
- Chernenko, S., Muszkieta, R., Dolynnyi, Iu., Oliynyk, O., & Honcharenko, O. (2022). Impact of Physical Education on Peculiarities of Functional State of 18-22 Year Old Female Students' Cardiovascular and Respiratory Systems. *Journal of Learning Theory and Methodology*, 3(1), 41–45. <https://doi.org/10.17309/jltm.2022.1.06>
- Bannikova, R., Kalinkin, K., & Magnushevskyi, Yu. (2018). Problem issues of physical rehabilitation of persons with the consequences of traumatic brain injury. *Theory and*

- methods of physical education and sports*, 1, 23-29. [in Ukrainian]
- Teasell, R., Bayona, N., Marshall, S., & et al. (2007). A systematic review of the rehabilitation of moderate to severe acquired brain injuries. *Brain Inj*, 21(2), 107-112. <https://doi.org/10.1080/02699050701201524>
- Langlois, J.A., Rutland-Brown, W., & Wald, M.M. (2006). The epidemiology and impact of traumatic brain injury: a brief overview. *J Head Trauma Rehabil*, 21(5), 375-378.
- Shvets, A.V., Kikh, A.Y., Parkhomenko, Y.O., & Lukianchuk, I.A. (2020). Features of restoration of spatial stability disorders among servicemen with traumatic brain injury and acubarotrauma consequences. *Ukrainian Journal of Military Medicine*, 1(1), 40-49. [https://doi.org/10.46847/ujmm.2020.1\(1\)-040](https://doi.org/10.46847/ujmm.2020.1(1)-040)
- Ng, S.Y., & Lee, A.Y.W. (2019). Traumatic Brain Injuries: Pathophysiology and Potential Therapeutic Targets. *Front Cell Neurosci*, 27(13), 528. <https://doi.org/10.3389/fncel.2019.00528>.
- Misyura, V.B., Ruban, L.A., & Mishin M.V. (2022). Vestibular rehabilitation of amateur athletes after brain contusion. *Rehabilitation & recreation*, 12, 198-203. <https://doi.org/10.32782/2522-1795.2022.12.26> [in Ukrainian]
- Perkins, A., Gracey, F., Kelly, G., & Jim, J. (2022). A new model to guide identity-focused multidisciplinary rehabilitation for children and young people following acquired brain injury: I-FoRM. *Neuropsychological Rehabilitation*, 32(8), 1928-1969. <https://doi.org/10.1080/09602011.2022.2100794>
- Blavt, O., & Gurtova, T. (2023). Postural Control Development of Students with Disabilities in the Process of Inclusive Physical Education. *Journal of Learning Theory and Methodology*, 4(3), 88-94. <https://doi.org/10.17309/jltm.2023.3.03>
- Blavt, O., & Herasymenko, O. (2024). Inclusive Physical Education of Students with Disabilities Due to War Injuries: Restoration of the Functions of the Lower Extremities. *Journal of Learning Theory and Methodology*, 4(1), 5-12. <https://doi.org/10.17309/jltm.2024.5.1.01>
- Denby, E., Murphy, D., Busuttil, W., Sakel, M., & Wilkinson, D. (2020). Neuropsychiatric outcomes in UK military veterans with mild traumatic brain injury and vestibular dysfunction. *J. Head Trauma Rehabil*, 35, 57-65.
- Shvets, A.V., Podolian, Y.V., & Holinko, M.I. (2020). Features of functional state restoration among military personnel after traumatic brain injury combined with acubarotrauma. *Zaporozhye Medical Journal*, 22(3). Available from: <http://zmj.zsmu.edu.ua/article/view/20490>
- Sushchenko, L., Demchenko, M., & Bobrovnyk, L. (2024). Features of physical education and sports rehabilitation for combat veterans with traumatic brain injury. *Scientific Journal of National Pedagogical Dragomanov University Series 15 Scientific and pedagogical problems of physical culture (physical culture and sports)*, 3K(176).104, 470-473. <https://doi.org/10.31392/UDU-nc.series15.2024> [in Ukrainian]
- Galeno, E., Pullano, E., Mourad, F., Galeoto, G., & Frontani, F. (2022). Effectiveness of Vestibular Rehabilitation after Concussion: A Systematic Review of Randomised Controlled Trial. *Healthcare (Basel)*, 11(1), 90. <https://doi.org/10.3390/healthcare11010090>.
- Bland, D.C., Zampieri, C., & Damiano, D.L (2011). Effectiveness of physical therapy for improving gait and balance in individuals with traumatic brain injury: a systematic review. *Brain Inj*, 25(7-8), 664-79. <https://doi.org/10.3109/02699052.2011.576306>
- Vander Vegt, C.B., Hill-Pearson, C.A., Hershaw, J.N., Loftin, M.C., Bobula, S.A., & Souvignier, A.R. (2022). A Comparison of Generalized and Individualized Vestibular Rehabilitation Therapy in a Military TBI Sample. *J Head Trauma Rehabil*, 37(6), 380-389. <https://doi.org/10.1097/HTR.0000000000000777>.
- Carrick, F., Mclellan, K., Brock, J., Randall, C. & Oggero, E. (2015). Evaluation of the effectiveness of a novel brain and vestibular rehabilitation treatment modality in PTSD patients who have suffered combat-related traumatic brain injuries. *Frontiers in Public Health*, 3. <https://doi.org/10.3389/fpubh.2015.00015>.
- Lorenz, L.S., Charrette, A.L., O'Neil-Pirozzi, T.M., Doucett, J., & Fong, J. (2018) Healthy Body, Healthy Mind: A Mixed Methods Study of Outcomes, Barriers and Supports for Exercise by People Who Have Chronic Moderate-to-Severe Acquired Brain Injury. *Disabil. Health J*, 11, 70-78.
- Pellerin, S., Wilson, W. J., & Haegele, J. A. (2022). The experiences of students with disabilities in self-contained physical education. *Sport, Education and Society*, 27(1), 14-26. <https://doi.org/10.1080/13573322.2020.1817732>
- Canto, A.I., Chesire, D.J., Buckley, V.A., Andrews, T.W., & Roehrig, A.D. (2014). Barriers to meeting the needs of students with traumatic brain injury. *Educational Psychology in Practice*, 30(1), 88-103. <https://doi.org/10.1080/02667363.2014.883498>
- Blavt, O. (2023). Inclusive physical education of students with disabilities: accents in the modern dimension. *Mountain School of Ukrainian Carpaty*, 29, 80-84. <https://doi.org/10.15330/msuc.2023.29.80-84>
- Grenier, M., Patey, M.J., & Grenier-Burtis, M. (2022). Educating students with severe disabilities through an inclusive pedagogy in physical education. *Sport, Education and Society*, 28(8), 887-900. <https://doi.org/10.1080/13573322.2022.2084064>
- Jantz, P.B., Davies, S.C., & Bigler, E.D. (2014). *Working with Traumatic Brain Injury in Schools: Transition, Assessment, and Intervention* (1st ed.). Routledge. <https://doi.org/10.4324/9780203080849>
- Kim, S., Kim, M., Kim, N., Kim, S., & Han, G. (2012). Quantification and Validity of Modified Romberg Tests Using Three-Axis Accelerometers.Green and Smart Technology with Sensor Applications. *Communications in Computer and Information Science*, 338, 254-261. https://doi.org/10.1007/978-3-642-35251-5_35
- Unver, B., Baris, R.H., Yuksel, E., Cekmece, S., Kalkan, S., & Karatosun, V. (2017). Reliability of 4-meter and 10-meter walk tests after lower extremity surgery. *Disabil Rehabil*, 39(25), 2572-2576. <https://doi.org/10.1080/09638288.2016.1236153>
- de Baptista, C.R.J.A., Vicente, A.M., Souza, M.A., Cardoso, J., Ramalho, V.M., & Mattiello-Sverzut, A.C. (2020). Methods of 10-Meter Walk Test and Repercussions for Reliability Obtained in Typically Developing Children. *Rehabil Res Pract*, 20, 4209812. <https://doi.org/10.1155/2020/4209812>
- Physiopedia: 10 Metre Walk Test*. Available at: https://www.physio-pedia.com/10_Metre_Walk_Test
- Hirsch, M.A., Williams, K., Norton, H.J., & Hammond F. (2014). Reliability of the timed 10-metre walk test

- during inpatient rehabilitation in ambulatory adults with traumatic brain injury. *Brain Inj*, 28(8), 1115-20. <https://doi.org/10.3109/02699052.2014.910701>
- Fruth, S.J., & Fawcett, C. (2020). *Fundamentals of Tests and Measures for the Physical Therapist*. Jones & Bartlett Learning
- Romberg test [Internet]. Epomedicine. Available from: <https://epomedicine.com/clinical-medicine/romberg-test/>
- Hillier, S.L., & McDonnell, M. (2015). Vestibular rehabilitation for unilateral peripheral vestibular dysfunction. *Cochrane Database Syst Rev*, 16(2), CD005397. <https://doi.org/10.1002/14651858.CD005397>
- Rosen, K.B., Delpy, K.B., Pape, M.M., Kodosky, P.N., & Kruger, S.E. (2021) Examining the Relationship Between Conventional Outcomes and Immersive Balance Task Performance in Service Members With Mild Traumatic Brain Injury. *Mil Med*, 3, 186(5-6), 577-586. <https://doi.org/10.1093/milmed/usaa578>.
- Overview of Traumatic Brain Injury: https://www.physio-pedia.com/Overview_of_Traumatic_Brain_Injury
- Yushkovska, O. (2016) The role and place of therapeutic walking in the system of physical rehabilitation. *Sports medicine and physical rehabilitation*, 2, 42-46. [in Ukrainian]
- Pérez-Rodríguez, M., García-Gómez, S., Coterón, J., García-Hernández, J.J. & Pérez-Tejero, J. (2021). Physical Activity and Sport for Acquired Brain Injury (PASABI): A Non-Randomized Controlled Trial. *Medicina*, 57, 122. <https://doi.org/10.3390/medicina57020122>
- Wellons, R.D., Duhe, S.E., MacDowell, S.G., Hodge, A., Oxborough, S., & Levitzky, E.E. (2022). Estimating the minimal clinically important difference for balance and gait outcome measures in individuals with vestibular disorders. *J Vestib Res*, 32(3), 223-233. <https://doi.org/10.3233/VES-201630>
- Morgan, P., Murphy, A., Opheim, A., McGinley, J. (2016). Gait characteristics, balance performance and falls in ambulant adults with cerebral palsy: An observational study. *Gait & Posture*, 48, 243-248. <https://doi.org/10.1016/j.gaitpost.2016.06.015>
- van der Veen, S.M., Perera, R., Fino, P.C., Franke, L.M., Agyemang, A.A., Skop, K., Wilde, E.A., Sponheim, S.R., Stamenkovic, A., Thomas, J.S., Walker, W.C. (2023). Sensory functions and their relation to balance metrics: a secondary analysis of the LIMBIC-CENC multicenter cohort. *Front Neurol*, 14(14), 1241545. <https://doi.org/10.3389/fneur.2023.1241545>
- Graham, J.E., Ostir, G.V., Kuo, Y.F., Fisher, S.R., Ottenbacher, K.J. (2008). Relationship between test methodology and mean velocity in timed walk tests: a review. *Arch Phys Med Rehabil*, 89(5), 865-72. <https://doi.org/10.1016/j.apmr.2007.11.029>
- Ogihara, H., Kamo, T., Tanaka, R., Azami, M., Kato, T., Endo, M., Tsunoda, R., & Fushiki, H. (2022). Factors affecting the outcome of vestibular rehabilitation in patients with peripheral vestibular disorders. *Auris Nasus Larynx*, 49(6), 950-955. <https://doi.org/10.1016/j.anl.2022.03.004>
- Wellons, R.D., Duhe, S.E., MacDowell, S.G., Oxborough, S., & Madhav, K.C. (2024). Investigating health disparities in vestibular rehabilitation. *J Vestib Res*, 11. <https://doi.org/10.3233/VES-240002>
- Kim, M.K., Yun, S.Y., Lee, S., Lee, J.O., Sung, S.Y., Lee, J.Y., Kim, H.J., Park, H.Y., Choi, J.Y., Song, J.J., Choi, B.Y., Koo, J.W., & Kim, J.S. (2024) Efficacy of vestibular rehabilitation and its facilitating and hindering factors from real-world clinical data. *Front Neurol*, 29(15), 1329418. <https://doi.org/10.3389/fneur.2024.1329418>.
- Jain, A. (2016). Impact of static v/s dynamic start on results of 10 Metre Walk Test in patients with acute traumatic brain injury. *Indian J Physiother Occup Ther*, 10(1), 11-14
- Thorman, I., Loyd, B., Clendaniel, R., Dibble, L. & Schubert, M. (2022). The minimal clinically important difference for gait speed in unilateral vestibular hypofunction after vestibular rehabilitation. *Journal of Otology*, 18. <https://doi.org/10.1016/j.joto.2022.11.001>
- Hao, J, Pu, Y, He, Z, Remis, A, Yao, Z, & Li, Y. (2024). Measurement properties of the backward walk test in people with balance and mobility deficits: A systematic review. *Gait Posture*, 110, 1-9. <https://doi.org/10.1016/j.gaitpost.2024.02.018>
- Wise, E.K., Hoffman, J.M., Powell, J.M., Bombardier, C.H., & Bell, K.R. (2012). Benefits of Exercise Maintenance after Traumatic Brain Injury. *Arch. Phys. Med. Rehabil*, 93, 1319-1323.
- Mala, H., & Rasmussen, C.P. (2017). The Effect of Combined Therapies on Recovery after Acquired Brain Injury: Systematic Review of Preclinical Studies Combining Enriched Environment, Exercise, or Task-Specific Training with Other Therapies. *Restor. Neurol. Neurosci.*, 35, 25-64.
- Marklund, N., Bellander, B.-M., Godbolt, A.K., Levin, H., McCrory, P., & Thelin, E.P. (2019). Treatments and rehabilitation in the acute and chronic state of traumatic brain injury. *Journal of Internal Medicine*, 285(6), 608-623. <https://doi.org/10.1111/joim.12900>
- Brushko, V., Bannikova, R., & Kovelska, A. (2021). Analysis of available tools for assessing the impact of physical therapy on people with Parkinson's disease. *Sports medicine, physical therapy and occupational therapy*, 84-91. <https://doi.org/10.32652/spmed.2021.2.84-91> [in Ukrainian]
- Tyson, S., & Connell, L. (2009). The psychometric properties and clinical utility of measures of walking and mobility in neurological conditions: a systematic review. *Clin Rehabil*, 23(11), 1018-1033.
- Master, H., Coleman, G., Dobson, F., Bennell, K., Hinman, R.S., Jakiela, J.T., & White, D.K. (2021). A Narrative Review on Measurement Properties of Fixed-distance Walk Tests Up to 40 Meters for Adults With Knee Osteoarthritis. *J Rheumatol*, 48(5), 638-647. <https://doi.org/10.3899/jrheum.200771>.
- Kolonyuk, K. (2023). Review of modern gait assessment instruments in the examination of children with cerebral palsy. *Young scientist*, 1(113), 28-34. <https://doi.org/10.32839/2304-5809/2023-1-113-7>
- Pizzato, T.M., Baptista, C.R. de J.A. de, Martinez, E.Z., Sobreira, C.F. da R., & Mattiello Sverzut, A.C. (2016). Prediction of loss of gait in duchenne muscular dystrophy using the ten meter walking test rates. *Journal of Genetic Syndromes & Gene Therapy*, 7(4). <https://doi.org/10.4172/2157-7412.1000306>
- Lam, T., Noonan, V.K., Eng, J.J., SCIRE Research Team (2007). A systematic review of functional ambulation outcome measures in spinal cord injury. *Spinal Cord*, 46(4), 246-254.

Фізичне виховання у відновленні ушкоджених функцій у здобувачів вищої освіти після вибухової черепно-мозкової травми, ускладненої акуборотравмою

Оксана Блавт^{1ABCD}, Тетяна Гуртова^{2BCD}

¹Національний університет «Львівський політехніка»

²Львівський національний університет ветеринарної медицини та біотехнологій імені С. З. Гжицького

Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 8 с., 1 табл., 2 рис., 63 джерела.

Історія питання. В умовах тривалого збройного конфлікту, а, відтак перманентним збільшенням здобувачів вищої освіти, постраждалих від війни, виникає потреба у реорганізації змісту фізичного виховання вищої школи, відповідно до сучасних запитів та потреб.

Мета статті – виявити ефективність впровадження диференційованої програми ФВ у відновленні функцій ходи та рівноваги у здобувачів вищої освіти після вибухової черепно-мозкової травми, ускладненої акуборотравмою.

Матеріали та методи. Для реалізації експерименту використано «10 Metre Walk Test», результати якого опрацьовані методами математичної статистики. Досліджувану вибірку склали 20 здобувачів вищої освіти (чоловіки) після вибухової черепно-мозкової травми, ускладненої акуборотравмою, першого року навчання у закладі вищої освіти.

Результати. У підсумку, за результатами підсумкового тестового зрізу, є усі підстави вважати упроваджену диференційну програму ефективною у досягненні ефективності корекції вестибулярних дисфункцій. Зазначене знайшло своє відображення у покращенні результатів «10 Metre Walk Test» як у цілісних результатах, так і на проміжних ділянках, а також результатів тестів, використаних для контролю рівня розвитку рівноваги. Зафіксована позитивна динаміка у межах 9-19% в усіх здобувачів вищої освіти досліджуваної вибірки є свідченням на користь упровадженої програми.

Висновки. Дослідно-експериментальна перевірка ефективності впровадження розробленої диференційованої програми курсу фізичного виховання для здобувачів вищої освіти після вибухової черепно-мозкової травми, ускладненої акуборотравмою, засвідчила дієвість запропонованих новацій. Установлена динаміка досліджуваних показників та їхній аналіз дозволив дати відповідь на питання щодо ефективності упровадженої диференційованої програми, скерованої на усунення функціональних порушень в організмі здобувачів вищої освіти внаслідок вибухової черепно-мозкової травми, ускладненої акуборотравмою. Доведена результативність реалізації програми на основі установленого покращення результатів тестування здобувачів вищої освіти досліджуваної вибірки.

Ключові слова: фізичне виховання, здобувач вищої освіти, вибухова черепно-мозкова травма, акуборотравма, програма, ефективність.

Information about the authors:

Blavt Oksana: oksanablavt@ukr.net; <https://orcid.org/0000-0001-5526-9339>; Department of Physical Education, Lviv Polytechnic National University, Bandera St., 12, Lviv, 79013, Ukraine.

Gurtova Tetyana: hurtova@i.ua; <https://orcid.org/0000-0002-0943-8389>; Department of Physical Education, Sports and Health, Stepan Gzhytskyi National University of Veterinary Medicine and Biotechnologies of Lviv, Pekarska St., 50 Lviv, 79010, Ukraine.

Cite this article as: Blavt, O., & Gurtova, T. (2024). Physical Education in the Restoration of Damaged Functions in Students After Blast Tbi Complicated By Acuborotrauma. *Journal of Learning Theory and Methodology*, 5(2), 54-61. <https://doi.org/10.17309/jltm.2024.5.2.02>

Received: 20.07.2024. Accepted: 24.08.2024. Published: 30.08.2024

This work is licensed under a Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0>).



Improving the Learning Outcomes of Volleyball Passing Through the Wall-Bounced

Sherial Shellen^{1ABCD}, Meirizal Usra^{1ABD}, Destriani^{1ABD},
Wahiu Indra Bayu^{1BCD} and Fitri Agung Nanda^{1BD}

¹Universitas Sriwijaya

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

DOI: 10.17309/jltm.2024.5.2.03

Abstract

Objectives. The purpose of this research was to find out the improvement in learning to pass under volleyball through reflections on the wall in SMA Arinda Palembang students.

Materials and methods. This research method uses class action research methods. The sample used in this study amounted to 35 people. The research instrument is 1) passing skills test, 2) knowledge test, and 3) observation of learning activities.

Results. From the results and analysis of research data, it can be concluded that the learning outcomes of class XI students of SMA Arinda Palembang always increase in each cycle. The results of this study show that learning bottom pass-through reflections on the wall in volleyball games can improve the learning outcomes of bottom pass volleyball in class XI SMA Arinda Palembang.

Conclusions. The implication of this research is that passing exercises through reflections on the wall can be used as learning to improve learning to pass in volleyball games.

Keywords: volleyball, wall-bounced, learning outcome, physical education.

Introduction

Education is an effort to organise educational activities and develop the potential of students to acquire skills, both for themselves and for society. It includes education through physical activities given to students with the aim of improving cognitive, affective and psychomotor skills (Bayu & Andrianto, 2014). Physical education is a type of education that can help every student to grow and develop their talents. Every school offers physical education as one of the subjects to be taught to students (Bayu et al., 2013). Learning is one of the academic processes that takes place in the classroom or outside the classroom where there is a teacher and students (Pratama & Mulyati, 2020), and to understand and apply the principles and theories of learning that are key determinants of success in education and training (Firmansyah, 2016) through the process of design, implementation and evaluation, interpreted as the interaction of students with educators and learning resources in a learning environment (Suardi, 2022).

Physical education is a general subject. It emphasises the value of physical activity for pupils' physical, mental and social development (Iyakrus, 2019). The purpose of physical education is (1) to provide learners with educational movement experiences that harmonise their movement abilities with the process of growth and development and (2) to provide a platform for learners to achieve their full potential by the overall educational objectives, including their cognitive and affective aspects (Afrizal, 2020). In addition to learning the rules and regulations of sports training, physical education can help build the learner's mentality. Rather than seeing children as individuals with different physical and mental attributes, physical education looks at children as a whole and holistic person (Basuki et al., 2021). The teaching strategies used significantly impact how well students learn in the classroom. Educators need to identify teaching strategies that can assist in acquiring and mastering basic sports skills (Bhakti & Maryani, 2017). Learners will achieve good results if the right learning strategies are used. The problem is how to teach the subject simply and clearly to learners. As learners must understand the information being taught, teachers must be experienced in choosing approaches. Teaching strategies greatly influence the success of learning objectives.

© Shellen, S., Usra, M., Destriani, Bayu, W. I., & Nanda, F. A., 2024.

To achieve the desired learning objectives, PE teachers in schools need to be able to select relevant and appropriate teaching strategies (Fitria et al., 2019).

Volleyball is a team sport played by six people per team. The game works well if each player knows at least the basic volleyball techniques (Destriani et al., 2019). One of Indonesia's most popular team games is volleyball, played with six players and involves passing the ball into the opponent's territory (Dupri & Kamarudin, 2021). Volleyball is a team sport, so the players must work together and be compact (Destriani et al., 2022). To hit the ball into the opponent's court area, score points and win a volleyball game, the players have to pass the ball over the net during the match (Sonjaya, 2020). The object of volleyball is to hit the ball over the net so that it falls to the floor of the opponent's court and to prevent the opponent from doing the same (Destriana et al., 2021). One of the basic techniques that need to be emphasised by volleyball coaches is the basic technique of the low pass. The low pass is made with both arms parallel and linked, with the arm swing and the ball's contact under the arm (Widiyatmoko & Anggoro, 2019).

Materials and Methods

Study Participants

The subjects of this study were students of class XI IPA SMA Arinda Palembang, with a total of 35 students consisting of 17 males and 18 females.

Organization of the Study

This type of research is classroom action research (CAR). Research that observes a learning activity that begins with the provision of action with the aim of solving problems or improving the quality of learning. Classroom Action Research is an initiative to improve the quality of learning. This research procedure consists of several cycles, where each cycle consists of the stages of planning, implementation, observation and reflection. The data collection techniques in this study are skills assessment, knowledge assessment, and assessment of students' learning activities.

Statistical Analysis

The data analysis technique in this study is to analyse the data obtained for each activity in the cycle using percentage techniques.

Results

Table 1. Frequency of Passing Skills of Pre-Cycle Learners

Interval	Frequency	Percentage	Category
85-100%	0	0	Very High
65-84%	1	2.8	High
45-64%	17	48.6	Moderate
20-44%	17	48.6	Low
≤20-	0	0	Very Low
Total	35	100	

Based on the results of the students' lower level skills test in the pre-cycle, it can be seen that the results of the students' lower level skills test in class XI of IPA SMA Arinda Palembang obtained the highest score of 65 and the lowest score of 25. The average score is 43.85%. 1 person got a high category with a percentage of 2.8%, 17 people got a middle category with a percentage of 48.6% and 17 people got a low category with a percentage of 48.6%. The results of the aptitude test in this pre-cycle are still relatively low, as they have not reached the predetermined indicator of 80%. Therefore, it is necessary to carry out action research in cycle I in order to reach the 80% indicator of the evaluation criteria.

Table 2. Frequency of Knowledge Score Results of Students at Pre-Cycle

Interval	Frequency	Percentage	Description
≥ 65-100	7	20	Completed
< 65	28	80	Not Completed
Total	35	100	

Based on the learning outcomes of students in the pre-cycle, it can be seen that the learning outcomes of students in class XI IPA SMA Arinda Palembang in the pre-cycle who obtained the highest score of 100 and the lowest score was 37.5. The average score is 56.78. There were seven students who were complete with a percentage of completeness of 20% and 28 students who were not complete with a percentage of incompleteness of 80%. The learning outcomes in this pre-cycle cannot be said to be complete because they have not reached the specified indicators, therefore it is necessary to carry out action research in cycle I in order to achieve a successful level of learning in the students.

Table 3. Distribution of student activity scores in the precycle

Interval	Frequency	Percentage	Category
81-100%	0	0	Very Active
61-80%	5	14.3	Active
41-60%	28	80	Fairly Active
21-40%	2	5.7	Poor Active
≤20%	0	0	Not Active
Total	35	100	

From the table above it can be seen that out of 35 students there were five participants who obtained the active category, 28 participants obtained the fairly active category and two participants obtained the less active category, with a percentage of 49.82%. So the activity level before the cycle is still quite active. Therefore, action research must be carried out in Cycle I in order to achieve success indicators ≥ 80%.

Table 4. Frequency of students' lower level skills in Cycle I

Interval	Frequency	Percentage	Category
85-100%	2	5.7	Very High
65-84%	10	28.6	High
45-64%	11	31.4	Moderate
20-44%	12	34.4	Low
≤20%	0	0	Very Low
Total	35	100	

Based on the results of the lower level skills test of students in cycle I, it can be seen that the results of the lower level skills test of students in class XI IPA SMA Arinda Palembang obtained the highest score of 85 and the lowest score of 25. The average score is 53.85%. Two people got a very high category with a percentage of 5.7%, 10 people got a high category with a percentage of 28.6%, 11 people got a medium category with a percentage of 31.4% and 12 people got a low score with a percentage of 34.3%. The results of passing the competency test in cycle I cannot yet be considered successful, as it has not yet reached the predetermined indicator of 80%. Therefore, it is necessary to improve the action in cycle II in order to reach the indicator of the evaluation criteria of 80%.

Table 5. Frequency of results of students' knowledge assessment in cycle I

Interval	Frequency	Percentage	Description
≥ 65-100	21	60	Completed
< 65	14	40	Not Completed
Total	35	100	

Based on the learning outcomes of students in Cycle I, it can be seen that the learning outcomes of students in Class XI IPA SMA Arinda Palembang in Cycle I who obtained the highest score was 100 and the lowest score was 25. The average score was 72.85%. There were 21 students who were complete with a percentage of 60% completeness and 14 students who were incomplete with a percentage of 40% incompleteness. The learning outcomes in Cycle I cannot be considered as successful because the indicators have not yet been achieved, therefore it is necessary to carry out actions to improve in Cycle II in order to achieve a successful level of learning among the students.

Table 6. Distribution of student activity scores in Cycle I

Interval	Frequency	Percentage	Category
81-100%	2	5.7	Very Active
61-80%	13	37.15	Active
41-60%	20	57.15	Fairly Active
21-40%	0	0	Poor Active
≤20%	0	0	Not Active
Total	35	100	

Based on the table above, it can be seen that out of 35 students there were two participants who obtained a very active category, 13 participants obtained an active category and six participants obtained a fairly active category and with a percentage of 58.57%. Thus the level of activity in cycle I is still quite active. So, cycle II action research must be carried out to achieve the success indicator ≥80%.

Table 7. Frequency of Results of Passing Skills of Cycle II Learners

Interval	Frequency	Percentage	Category
85-100%	15	42.85	Very High
65-84%	20	57.15	High
45-64%	0	0	Moderate
20-44%	0	0	Low
≤20%	0	0	Very Low
Total	35	100	

Based on the results of the lower pass skills test of students in cycle II, it can be seen that the results of the lower pass skills test of students in class XI IPA SMA Arinda Palembang obtained the highest score of 100 and the lowest score of 60. 15 people got a very high category with a percentage of 42.85%, and 20 people got a high category with a percentage of 57.15%.... The results of the passing skills test in cycle II can be said to be successful because it has met the value of the research success indicator which is ≥ 80%.

Table 8. Frequency of Students' Knowledge Score Results in Cycle II

Interval	Frequency	Percentage	Category
≥ 65-100	29	82.85	Completed
< 65	6	17.15	Not Completed
Total	35	100	

Based on the learning outcomes of students in cycle II, it can be seen that the learning outcomes of students in class XI IPA SMA Arinda Palembang in cycle II obtained the highest score of 100 and the lowest score of 50, with an average of 82.5. There were 29 students who were complete and six students who were not complete. The percentage of completeness of student learning outcomes has reached 82.85% with the category of complete success rate.

Table 9. Distribution of Learner Activity Values in Cycle II

Interval	Frequency	Percentage	Category
81-100	25	71.4	Very Active
61-80	10	28.3	Active
41-60	0	8.6	Fairly Active
21-40	0	0	Poor Active
≤ 20	0	0	Not Active
Total	35	100	

Based on the distribution table above, it can be seen that there are 25 students who get a very active category, and 10 students get an active category. Thus the level of learner activity in cycle II is already very active and has exceeded the research success indicator, namely from active to very active and has reached the assessment criteria indicator of ≥80%.

Discussion

The results of the study when combined with previous research or literature review have similarities regarding the training methods given in each cycle have increased the results of upper passing in volleyball games. Research result, (Rubiyanatno et al., 2021) said that if the upper pass through the training method using the wall with the provisions given was able to improve the playing ability of the students. Hasibuan and Imran Akhmad (2022) showed that the training method of bouncing the volleyball against the wall was able to improve the results of the top serve, this was due to the fact that training with bouncing against the wall increased the athlete's ability because the training method was not boring and monotonous. Training with the method of jumping against the wall is able to increase the development of speed, coordination of movements, accuracy. Consolidation and improvement of transfers from the top with two hands (Kurbanov et al., 2023).

Wall training can improve students' accuracy and control of upper and lower passes in volleyball (Saputra et al., 2022). Rahmat et al., (2023) Explains whether the exercise of bouncing the ball against the wall has an effect on the accuracy of the top pass in a volleyball game, because students need to be able to measure the volleyball perkanaan so that the bounce is given according to the desired range or desired direction. Wall volleyball is one of the exercises to improve the accuracy of the top pass in volleyball games. He continued, training by bouncing wall volleyball students are required to be able to control the movement of the fall of the ball and the contact of the ball when bouncing against the wall so that the results are good when done in the real game.

Kazem and Mazloom (2023) The number of times the ball touches the wall for the 30 seconds required for the test is counted, and any efforts that violate the above conditions are not counted, so in the demonstration the student must be able to train the imposition of the ball on the wall so that the bounce given when the ball returns to him is much better and affects later learning outcomes. Training with wall media is considered to be the easiest and can be done anywhere and will give maximum results in improving passing and smashing in volleyball games (Khalil, 2023). Malinda et al. (2024) teaching methods of upper passing with mixed procedures of passing on the wall and in pairs can improve the learning outcomes of upper passing in students carrying out the lower method of upper passing of volleyball games.

Misroodin and Dwicahya (2023) through the wall bounce training method is able to improve accuracy and impact in volleyball games, so that in real games volleyball players are able to control the direction of the initial attack when passing the game. Nishanbaevich (2024) tools, and theoretical knowledge of their contents for technical, physical, and psychological training for volleyball players end for use in the training of 15-17-year-old volleyball players for competitions intended. It can be used by masters of secondary schools, coaches of primary training groups of volleyball players of children's and youth schools, and fans of this sport. Keyword. Physical culture, physical quality, professional physical quality, volleyball. INTRODUCTION Modern volleyball places high demands on the motor skills and functional capabilities of an athlete. This requires the comprehensive development of physical qualities. The process of physical training of volleyball players is divided into general and special parts. The tasks of general physical training are: health promotion, general development of the player's body, formation of the correct figure. The development and improvement of basic motor skills and skills necessary for a volleyball player. Strengthening the body system of the volleyball player, which accounts for the main load during the game. The means of general physical training are general developmental exercises, exercises aimed at developing all qualities in the process of walking, running, jumping, throwing, as well as practicing various projectiles, exercises on simulators, and other sports [1-5]. The objectives of special physical training are: the development of physical qualities necessary for the game. The development of physical qualities and abilities necessary for mastering the techniques and tactics of the game. Remedy: preparatory exercises aimed at developing the speed and strength of muscle contraction. These muscles are involved in the performance of techniques, speed, dexterity, special dexterity, endurance (speed, jump,

strength, play Training methods in volleyball games that are felt to be able to improve the accuracy, precision and ability to control the ball can be done through the bounce training method to the wall. Through the bounce training method, it is able to improve eye coordination with the media in the opposite direction of the wall with the aim of being able to improve the results of the volleyball game (Satardi et al., 2023).

Conclusion

Based on the results obtained, it can be concluded that there is an increase in each cycle in the implementation of volleyball top passing using the bounce method of passing training. The results of the study are expected to be able to provide a reference for further research through the bounce passing training method in improving the learning outcomes of top passing in order to improve student learning outcomes. The results are also expected to be able to make a reference for further research on the upper passing training method, but can be created by adding other training methods so that it will be more optimal in application and learning outcomes obtained. The limitation of the research is that through the CAR method it focuses on only one school or sample cluster, so it is less diverse, so it is also hoped that the sample of further research from the research reference results will be more diverse.

Conflicts of interest

The authors declare no conflicts of interest.

Reference

- Bayu, W. I., & Andrianto, J. R. (2014). Profil Pendidikan Jasmani, Olahraga, Dan Kesehatan Pada Tingkat Satuan Pendidikan Sekolah Menengah Atas Se-Kabupaten Jombang Tahun 2016. *Bravos: Jurnal Program Studi Pendidikan Jasmani Dan Kesehatan*, 5(1), 18. <https://doi.org/10.32682/bravos.v5i1.442>
- Bayu, W. I., Suroto, & Maksum, A. (2013). Play-based learning to enhance critical thinking capabilities. *Anima, Indonesian Psychological Journal*, 28(2), 96-103. <https://www.researchgate.net/publication/303913388>
- Pratama, R. E., & Mulyati, S. (2020). Pembelajaran Daring dan Luring pada Masa Pandemi Covid-19. *Gagasan Pendidikan Indonesia*, 1(2), 49. <https://doi.org/10.30870/gpi.v1i2.9405>
- Firmansyah. (2016). Penerapan teori pembelajaran kognitif dalam pembelajaran pendidikan jasmani dan kesehatan. *Jurnal Pendidikan*, 5(2), 154-164. <https://doi.org/10.31571/JPO.V5I2.383>
- Suardi, M. (2022). Belajar Dan Pembelajaran Tujuan Belajar Dan Pembelajaran. *Uwais Inspirasi Indonesia*, 9(Issue March). Depdikbud. <https://www.coursehero.com/file/52663366/Belajar-dan-Pembelajaran1-convertedpdf/>
- Iyakrus, I. (2019). Pendidikan Jasmani, Olahraga Dan Prestasi. *Altius: Jurnal Ilmu Olahraga Dan Kesehatan*, 7(2). <https://doi.org/10.36706/altius.v7i2.8110>
- Afrizal, A. Z. N. (2020). Kinerja Guru Pendidikan Jasmani Olahraga dan Kesehatan. *Manajer Pendidikan*, 10(5), 507-511. <https://doi.org/10.30633/jkms.v11i1.859>
- Basuki, B., Rahman, T., Prakoso, B. B., & Bayu, W. I. (2021). Pemenuhan kebutuhan aktivitas fisik peserta didik selama

- pandemi Covid-19. *Jurnal Pendidikan Jasmani Indonesia*, 17(1), 48-56. <https://doi.org/10.21831/jpji.v17i1.42666>
- Bhakti, C. P., & Maryani, I. (2017). Peran LPTK dalam Pengembangan Kompetensi Pedagogik Calon Guru. *Jurnal Pendidikan (Teori Dan Praktik)*, 1(2), 98. <https://doi.org/10.26740/jp.v1n2.p98-106>
- Fitria, H., Kristiawan, M., & Rahmat, N. (2019). Upaya Meningkatkan Kompetensi Guru Melalui Pelatihan Penelitian Tindakan Kelas. *Abdimas Unwas*, 4(1). <https://doi.org/10.31942/abd.v4i1.2690>
- Destriani, D., Destriana, D., Switri, E., & Yusfi, H. (2019). The development of volleyball games learning for students. *Jurnal SPORTIF: Jurnal Penelitian Pembelajaran*, 5(1), 16. https://doi.org/10.29407/js_unpgri.v5i1.12605
- Dupri, & Kamarudin. (2021). *Teknik Dasar Bermain Bola Voli*. www.ahlimediapress.com
- Destriani, Ramdani, A., & Bayu, W. I. (2022). Efektivitas Penggunaan D'volleyball Learning Application Dalam Pembelajaran Pendidikan Jasmani. *Jendela Olahraga*, 7(2), 183-192. <https://doi.org/10.26877/jo.v7i2.11968>
- Sonjaya, S. (2020). Penerapan gaya mengajar resiprokal terhadap hasil pembelajaran passing bawah permainan bola voli pada siswa. *Cakrawala Pedagogik*, 4(1), 82-90. <https://doi.org/10.51499/cp.v4i1.143>
- Destriana, Destriani, & Herri Yusfi. (2021). Pembelajaran Smash Permainan Bola Voli. *Jurnal MensSana Jurnal Ilmiah Bidang Pendidikan Olahraga*, 6(2), 126-132.
- Widiyatmoko, F. A., & Anggoro, D. B. (2019). Model Permainan Game 3 On 3 dan Bola Pantul Meningkatkan Kemampuan Dasar Bola Voli. *Media Ilmu Keolahragaan Indonesia*, 9(2), 63-66. <https://doi.org/10.15294/miki.v9i2.23646>
- Rubiyatno, R., Rajidin, R., & Suganda, M. A. (2021). The Implementation Bounce Ball Games to Improve Students' Set Pass Ability. *Halaman Olahraga Nusantara (Jurnal Ilmu Keolahragaan)*, 4(2), 318. <https://doi.org/10.31851/hon.v4i2.5430>
- Hasibuan, Y., & Imran Akhmad. (2022). Development of Bounce Wall Training Aids To Practice Passing In Volleyball Athletes. *Jurnal Pendidikan Jasmani (JPJ)*, 3(1), 29-36. <https://doi.org/10.55081/jpji.v3i1.239>
- Kurbanov, G., Qurbanali, S., & O'tkir, R. (2023). VOLLEYBALL OUTDOOR GAMES Ghairat. *American Journal of Pedagogical and Educational Research*, 118-122.
- Saputra, E. D., Kamadi, L., & Haeruddin, S. (2022). Efforts To Improve Learning Outcomes for Passing Down Volleyball Games Through Wall Media. *Indonesian Journal of Research and Educational Review*, 1(3), 381-388. <https://doi.org/10.51574/ijrer.v1i2.302>
- Rahmat, A., Ridwan, M., Aryadi, D., & Arini, I. (2023). Penerapan Permainan Bola Spon untuk Meningkatkan Passing Bawah Bola Voli pada Siswa Sekolah Dasar. *Jurnal Pendidikan Kesehatan Rekreasi*, 9(1), 178-188.
- Kazem, M. M., & Mazloom, H. T. A. R. (2023). The effect of the inclusion method on learning and retaining some basic volleyball skills. *American Journal of Pedagogical and Educational Research*, 17, 118-122.
- Khalil, S. F. (2023). The effect of exercises with different times and resistances on the accuracy and performance of the blocking wall skill in volleyball for the players of the university of kufa. *Journal of Clinical Otorhinolaryngology, Head, and Neck Surgery*, 1, 1281-1289.
- Malinda, L., S, N. A., Helaprahara, D., Studi, P., Jasmani, P., & Sumenep, S. P. (2024). Peningkatan Hasil Belajar Passing Atas dalam Pembelajaran Permainan Bola Voli Melalui Metode Kedinding dan Berpasangan. *SPRINTER: Jurnal Ilmu Olahraga*, 5(1), 1-7.
- Syaifudin, R., Misrodin, & Dwicahya, N. (2023). Pengaruh Ketepatan Perkenaan Pasing Bawah Melalui Metode Modifikasi Bola Pantul Tim Bola Voli Bintang Muda Desa Tambah Subur. *Jurnal Review Pendidikan dan Pengajaran*, 6(2), 366-372. <http://journal.universitaspahlawan.ac.id/index.php/jrpp/article/download/18167/13421>
- Orifon Nishanbaevich, M. (2024). Methods of physical training of volleyball players. *European Journal of Pedagogical Initiatives and Educational Practices*, 2(1).
- Satardi, R. N., Kristina, P. C., & Handayani, W. (2023). The Influence of Training Methods and Eye-Hand Coordination Against the Results of Volleyball's Top Serve Skills. *Journal of Social Work and Science Education*, 4(3), 996-1010. <https://doi.org/10.52690/jswse.v4i3.645>

Удосконалення результатів навчання волейбольного пасу з використанням відскоку м'яча від стіни

Шеріал Шелен^{1ABCD}, Мейрізал Усра^{1ABD}, Дестріані^{1ABD},
Вахіу Індра Ваю^{1BCD}, Фітрі Агунг Нанда^{1BD}

¹Університет Срівіджая

Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 6 с., 9 табл., 27 джерел.

Метою даного дослідження було з'ясувати ефективність навчання волейбольних передач з використанням відскоку м'яча від стіни у студентів СМА Арінди Палембанг.

Матеріали і методи. У цьому методі дослідження використовуються методи дослідження групових дій. Вибірка, використана в цьому дослідженні, складала 35 осіб. Інструментом дослідження є 1) проходження перевірки навичок, 2) перевірка знань і 3) спостереження за навчальною діяльністю.

Результати. З результатів та аналізу даних дослідження можна зробити висновок, що результати навчання учнів XI класу SMA Arinda Palembang завжди зростають у кожному циклі. Результати цього дослідження показують, що навчання пасу з низу з відскоку від стіни під час волейбольних ігор може покращити результати навчання волейболу у XI класі SMA Arinda Palembang.

Висновки. Висновок цього дослідження полягає в тому, що навчання вправ через відскок від стіни може бути використано для покращення навчання пасу у волейбольних іграх.

Ключові слова: волейбол, відскок від стіни, результат навчання, фізичне виховання.

Information about the authors:

Shellen, Sherial: shelensherial1@gmail.com; Department Physical Education and Health, Universitas Sriwijaya, Jalan Palembang-Prabumulih, KM 32 Indralaya, Ogan Ilir, Sumater Selatan, 30662, Indonesia.

Usra, Meirizal: meirizalusra@fkip.unsri.ac.id; <https://orcid.org/0000-0003-0598-3416>; Department Sport Education, Universitas Sriwijaya, Jl. Srijaya Negara, Bukit Besar, Palembang, Sumatera Selatan, 30139, Indonesia.

Bayu, Wahyu Indra: wahyu.indra@fkip.unsri.ac.id; <https://orcid.org/0000-0002-0650-8783>; Department Sport Education, Universitas Sriwijaya, Jl. Srijaya Negara, Bukit Besar, Palembang, Sumatera Selatan, 30139, Indonesia.

Destriani: destriani@fkip.unsri.ac.id; <https://orcid.org/0000-0003-1407-664X>; Department Physical Education and Health, Universitas Sriwijaya, Jalan Palembang-Prabumulih, KM 32 Indralaya, Ogan Ilir, Sumater Selatan, 30662, Indonesia.

Nanda, Fitri Agung: fitriagungnanda16@fkip.unsri.ac.id; <https://orcid.org/0000-0002-3650-8135>; Department Physical Education and Health, Universitas Sriwijaya, Jalan Palembang-Prabumulih, KM 32 Indralaya, Ogan Ilir, Sumater Selatan, 30662, Indonesia.

Cite this article as: Shellen, S., Usra, M., Destriani, Bayu, W. I., & Nanda, F. A. (2024). Improving the Learning Outcomes of Volleyball Passing Through the Wall-Bounced. *Journal of Learning Theory and Methodology*, 5(2), 62-67. <https://doi.org/10.17309/jltm.2024.5.2.03>

Received: 05.07.2024. Accepted: 24.08.2024. Published: 30.08.2024

This work is licensed under a Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0>).



Automated Control and Delivery System for Science Practical Instructions to Public Schools

Afeez Jinadu^{1ABCD}

¹Centre for Educational Research and Management

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

DOI: 10.17309/jltm.2024.5.2.04

Abstract

Background. The dispatch of practical instructions to schools and supervisors before the actual conduct of the practical examination over the years has not received the same level of attention as given to the movements of people and goods and, therefore, is prone to challenges. However, the process could be automated using artificial intelligence. Previous studies have investigated the effects of automation on the control and delivery of goods in the transport management sector.

Objectives. This study assessed science teachers' challenges and readiness for automated practical instruction control and delivery systems.

Materials and methods. The study adopted an ex post facto design and recruited one hundred science teachers. Science Teacher Readiness for Automated Practical Instruction Control and Delivery ($r = 0.83$) was used to collect data, which were analysed descriptively.

Results. There are more male (73%) science teachers than female (27%). 84% of the respondents listed cost as one of the challenges, and 83% indicated resistance to change and technical difficulties, ethical issues (67%), and integration with the existing system (65%). The science teachers are moderately ready (64%). In comparison, 24% are lowly ready, and 12% are highly prepared to deploy an automated practical instruction control and delivery system.

Conclusion. Automation for delivering practical science instructions has more significant benefits than the manual method; however, science teachers are ready for its deployment despite its challenges. Therefore, efforts should be geared towards overcoming the inherent difficulties so that the benefits can be thoroughly enjoyed.

Keywords: automation, artificial intelligence, science teachers, practical instructions, readiness and delivery system.

Introduction

Premium value have been put on practical works in the field of science; chemistry, physics, data processing, food and nutrition, animal husbandry, agricultural science, basic electronics, basic electricity and biology among others by education stakeholders. Many works have indicated importance of practicals to include development of laboratory competence and science knowledge, appreciating scientific concepts and theories (Schwichow, Zimmerman, Croker & Hartig, 2016; Fadzil & Saat, 2013). Students achieve a deeper level of understanding by finding things out for themselves and by experimenting with techniques and methods that have enabled the secrets of our bodies, our environment, and the whole universe – to be discovered. Practical help to promotion of students' positive attitudes and enhancement of motivation for effective learning in science (Okam & Zakari, 2017).

With a consequent effect, students' academic achievement can be influenced by positive attitude toward the importance of practical work (Hinne, 2017).

The goals of practical work are to improve students' understanding, develop their skills in solving problems and understanding the nature of science, by replicating the actions of scientists. Sotiriou, Bybee and Bogner (2017) state that: "While solving a scientific problem, students should act like a scientist and follow scientific processes." Practical work can motivate students, stimulate their interest in teaching and learning, enhance the learning of scientific knowledge, give them experience in using scientific knowledge and widen their way of thinking. Several reasons exist for taking practicals in science subjects in schools. For some it is to encourage accurate observations and descriptions, for others, it is to change theories into real-life application, to keep the interest of students in scientific studies and promote a logical and reasoning method of thought. In fact, practical work helps to improve students' scientific knowledge (Ajeyalemi, 2011).

The study of all scientific subjects (chemistry, physics, and biology) placed vital role on experiments in laboratories. However, Abrahams and Millers (2008) were of different views of teaching domiciled in the laboratories. Laboratory-based teaching is an inefficient teaching method and cannot represent scientific inquiry properly, were some of the demerits mentioned that direct lecturing should have been taught. Also, practical work create rote learning where students only adhere to teachers' instructions and they do not need to be creative or think to process the information.

Despite the importance of practical examinations and the preceding practical instruction delivery to schools, the control and delivery system is poor. This is made evident by late dispatch of the instruction forms, late or non-delivery of forms to the supervisor by staff at the custodial point, loss / non-delivery of forms to the schools by the supervisors and delivery of forms to unauthorized persons by the supervisors. Meanwhile, delivery of essential goods and services like practical instructions is vitally important for smooth conduct of respective practical examinations in those subjects. This presupposes that a novel control and delivery system be introduced to dispatch practical instructions to schools and supervisor. Observably, the use of portal (automated practical instructions control and delivery system) seems to be effective for control and service delivery. However, the readiness by the school science teacher is another area that needs exploration.

A portal (automated practical instructions control and delivery system) is a platform that could be accessed and interacted with by authorized users (school representatives, administrator user and staff agents). The portal will hold the instructions in electronic format securely until the preset time for access by the verified users. A prepared electronic message is dispatched to the school reps using their pre-registered information taken while registering on the portal once initially set timing conditions are triggered. The instructions can thereafter be downloaded by the school reps in time for adequate preparations for the examinations.

While Ubulom and Wokocha (2017) advanced the need for the introduction of CBT in Nigerian education system as necessary for the elimination of impersonation, special centres and cheating, the reality on ground is a far cry from what they advocated for. Faster dispatch demands by E-commerce clients are on the increase with attending service quality. These changes driven by e-commerce has brought business opportunities to the logistics service providers, especially couriers handling parcel and goods delivery to each customer's home quickly and reliably in small batches (Jinadu, Oyaremi and Rufai, 2021).

Changes in techniques and number of examination centres make it more challenging than ever to manage practical instructions in a fast, simple and secure way. This calls for introduction of a technology-based control mode into the delivery system of practical instructions to schools called automation or better put artificial intelligence AI. Artificial intelligence refers to the field of computer science that involves creating computer programs capable of imitating intelligent behavior and ideally enhancing human-like abilities (Naqvi, 2020). Artificial intelligence, a swiftly expanding discipline, encompasses the development of intelligent robots capable of emulating human thought processes and actions, finding utility in diverse areas such as medical diagnosis, self-driving cars, and educa-

tion where delivery of practical instructions to schools can be automated (Wardat, Tashtoush, AlAli & Jarrah, 2023).

Automation is the technology by which a process or procedure is accomplished without human assistance. It is implemented using a program of instructions combined with a control system that executes the instructions. To automate a process, power is required, both to drive the process itself and to operate the program and control system. Although automation can be applied in a wide variety of areas, it is can be applied to dispatch practical instruction manuals as it is proposed in this automated practical instruction development.

Automated practical instruction control and delivery system is a portal that could be accessed and interacted with by authorized users (school reps, admin user and staff agents). The portal will hold the instructions in electronic format securely until the preset time for access by the verified users. A prepared electronic message is dispatched to the school reps using their pre-registered information taken while registering on the portal once initially set timing conditions are triggered. The instructions can thereafter be downloaded by the school reps in time for adequate preparations for the examinations. The dates (timing) of the papers are set and the instructions are uploaded onto the portal by the staff agents. School Reps create their profiles with which they gain access to the portal to download the instructions exactly from date assigned (at least two weeks) to the conduct of the examination.

In an automated delivery system, the user can transmit instructions for the robot to go to two distinct workstations. At the first workstation, it retrieves an object, and at the second, the robot delivers this object. The user is given a simple program that asks for two workstation numbers. This information is then sent out through the PC's serial communications port, and through an IR transmitter, for the robot to detect. From the foregoing, it is logical to state that automated practical instruction control can affect delivery system of practical instructions because AI powered tools in educational assessment can be beneficial in various ways, including enhancing the assessment process's accuracy, speed, and efficiency such as assessment process involving practical instruction delivery to school. However, there seems to be a prominent challenge likely to be associated with using the said automation which is teachers' readiness.

The lack of stakeholder participation in developing AI tools for education can be a significant challenge in AI adoption. When AI tools are developed without input from educators, students, parents, and other stakeholders, the resulting tools may not be tailored to the specific needs of the education system. This can lead to a lack of relevance or adoption of AI tools in classrooms. According to Luckin and Cukurova (2019), developers of AI have limited knowledge about learning sciences and insufficient pedagogical understanding for the successful integration of AI into teaching. Consequently, AI developers frequently overlook the expectations of teachers, who are the end-users of AI in education (Cukurova & Luckin, 2018). Teachers are highly important in AI-based teaching (Seufert, Guggemos & Sailer, 2020; Jinadu & Balogun, 2020) therefore, it is essential to take their opinions, past experiences, and expectations into account to ensure the successful integration of AI in schools (Holmes, Bialik & Fadel, 2019).

The movement of practical instructions to schools and supervisor occurs in every examination period. However, such

movements have not received the same level of attention as that given to the movements of people, goods and freights. The cutting list (instruction to schools and supervisors) for such papers are packaged and dispatched to the various schools offering the respective subjects in most cases two (2) weeks before the scheduled time of the actual examination. This is to ensure the smooth conduct of the examination by affording the schools the opportunity to make available all items required for the various experiments to be carried out. These instructions are currently processed and dispatched to participating schools manually. The supposed movement of the practical instructions is hampered with a lot challenges in terms of late dispatch, late delivery, non-delivery or wrong delivery to unauthorised persons. Other disadvantages of the traditional delivery system such dispatch cost of the practical instruction papers borne by the examination bodies and allowances for custodians, coordinators, collators and other staff.

This process as described could be automated to maximize resources as well as cater for the inefficiencies that could arise from human errors. This is purely a case of artificial intelligence where computer is charged a task meant for human being. Previous software developments have investigated the effect of automation on control and delivery of goods in transport management sector. Others have investigated the automation of people and freight management in the western world. How the automation can be adapted to improve the delivery system of practical instructions to schools and supervisors needs to be investigated. It is imperative and believed that a portal designed for such transition can ease the delivery whereby it will be accessed and interacted with by authorized users such as school representatives, administrator user and staff agents. The portal will hold the instructions in electronic format securely until the preset time for access by the verified users. It is against this background that this study assessed science teachers' readiness for automated practical instructions control for delivery system.

The study will provide answers to the following questions:
What is the profile of science teachers in Oyo state?

What are the challenges inherent in the deployment of automated practical instruction control and delivery?

What is the level of readiness of science teachers for deployment of automated practical instruction control and delivery?

Materials and methods

Study Participants

The study used ex-post facto design. This design became necessary because it allowed the researchers to collected data as they are supplied. The target population for this study comprised all science teachers in public schools in Oyo state Nigeria. Multi-stage sampling procedure was adopted to select sample. Oyo state has ten educational zones. In the first stage, simple random sampling was used to select five zones out of the ten zones in the state. In the second stage, simple random sampling was used to select five schools each from the selected zones. In the third stage, simple random sampling was used to select four teachers each from each of the school chosen making one hundred teachers that participated in the study.

Study Organisation

Science Teacher Readiness for Automated Practical Instruction Control and Delivery (STRAPICS) was used to collect data. STRAPICS was developed by the researcher to measure science teachers' challenges and readiness for automated practical instruction control and delivery. It consists of two sections A, B and C. Section A sought participants' demographic information, Section B is on challenges of deploying automated practical instruction control and delivery and section C is on science teachers readiness for deploying automated practical instruction control and delivery. The initial scale thirty four items where participants were asked to select as it applies to them. These items were subjected to pilot testing using teachers who were not part of the final sample for the study.

Statistical Analysis

The content validity was established by given the draft to psychometricians and other test item developer experts. To determine the reliability of the instrument, the internal consistency of the scale was obtained using Chronbach's Alpha which yielded a value of 0.83. The researcher monitored the data collection exercise. Frequency count and percentage were used to analyse the data. The issue of ethical consideration was observed by ensuring that the participants were free to respond without cohesion. They were also free to withdraw from participation in the research exercise at any stage where they feel uncomfortable with the process. Their identities were protected from any unforeseen or potential danger in line with data protection and governance as entrenched by the Nigeria Communication Commission (NCC) of the Federal Ministry of Community and Digital Economy policy, as they were taken as anonymous by not requesting or recording their identities. And lastly, the data collected were treated with confidentiality and solely for research purpose only.

Results

Research Question 1: What is the profile of the science teachers in Oyo state?

Table 1. Profile of Science Teachers in Oyo State

Variable	Frequency	Percentage
Age		
Below 40 years	40	40.0
41-50 years	47	47.0
51-60 years	13	13.0
Total	100	100.0
Gender		
Male	73	73.0
Female	27	27.0
Total	100	100.0
Area of Specialisation		
Agricultural science	25	25.0
Biology	25	25.0
Chemistry	25	25.0
Physics	25	25.0
Total	100	100.0

Table 1 shows the descriptive statistics of the profile of the respondents (science teachers in Oyo state). The result revealed that 47 (47%) of the teachers in Oyo state are between 41-50 years of age, 40 (40.0%) are below 40 years of age and 13 (13%) are 51-60 years of age. Of these age brackets, 73 (73%) are male and 27 (27%) are female science teachers. 25 (25%) each of the respondents are teachers for the Agricultural science, Biology, Chemistry and Physics.

Research Question 2: What are the challenges inherent in the deployment of automated practical instruction control and delivery?

Table 2. Challenges of Deploying Automated Practical Instruction Control and Delivery

S/N	Challenges	Very sure	Sure	Not sure	Unsure
1	Cost	84 84%	-	16 16%	-
2	Resistant to change	83 83%	-	1 1%	16 16%
3	Technical difficulties	83 83%	-	16 16%	1 1%
4	Integration with existing system	65 65%	1 1%	16 16%	18 18%
5	Ethical issue	67 67%	16 16%	16 16%	1 1%

Table 2 presents the challenges inherent in the deployment of automated practical instruction control and delivery system. The table revealed that 84 (84%) of the respondent indicated that very sure cost is one of the challenges, and the remaining 16 (16%) indicated not sure to the statement to the same statement. 83 (83%) of the respondents indicated that very sure many science teachers are resistant to change and the remaining 17 (17%) indicated not sure to the statement. The table also shows that 83 (83%) responded that very sure technical difficulties is another challenge for deployment of automated practical instruction control and delivery system and 17 (17%) indicated not sure to the statement. 67 (67%) indicated very sure ethical issue is another challenge and 16 (16%) indicated not sure to the same statement. Also, 65 (65%) of the respondents indicated that very sure integration with existing system is yet another challenge as against 16 (16%) of the respondents who indicated not sure to the same statement.

Research Question 3: What is the level of readiness of science teachers for deployment of automated practical instruction control and delivery?

Table 3. Readiness of Science Teachers for Deploying Automated Practical Instruction Control and Delivery System

S/N	Level	Frequency	Percentage
1	Low	24	24.0
2	Moderate	64	64.0
3	High	12	12.0
4	Total	100	100.0

Table 3 shows the level of readiness of science teachers for deployment of automated practical instruction control

and delivery. The table revealed that 64 (64%) of the science teachers are moderately ready for the deployment of automated practical instruction control and delivery system while 24 (24%) are lowly ready and 12 (12%) are highly ready despite the prevailing challenges for the deployment.

Discussion

Result on the profile of the respondents (science teachers in Oyo state) revealed that 47 there more teachers who are between 41-50 years of age than below 40 years of age and 51-60 years of age. Of these age brackets, there more are male than female science teachers. The finding on the challenges inherent in the deployment of automated practical instruction control and delivery system revealed that many of the respondent indicated that very sure cost is one of the challenges, and the remaining indicated not sure to the statement to the same statement. The table also shows that more responded that very sure technical difficulties is another challenge for deployment of automated practical instruction control and delivery system and few indicated not sure to the statement. Many indicated very sure ethical issue is another challenge and few indicated not sure to the same statement. Also, many of the respondents indicated that very sure integration with existing system is yet another challenge as against few of the respondents who indicated not sure to the same statement.

The finding of this study is in tune with that of Luckin and Cukurova (2019) who reported that developers of AI have limited knowledge about learning sciences and insufficient pedagogical understanding for the successful integration of AI into teaching. Consequently, AI developers frequently overlook the expectations of teachers, who are the end-users of AI in education. These are sure challenges of implementing automation in school system.

The result on the level of readiness of science teachers for deployment of automated practical instruction control and delivery revealed that majority of the science teachers are moderately ready for the deployment of automated practical instruction control and delivery system while some are lowly ready and few are highly ready despite the prevailing challenges for the deployment. The result of this study corroborates that of Seufert, Guggemos & Sailer, (2020) who found out that teachers are highly important in AI-based teaching and learning process and therefore essential to take their readiness for advancement of artificial intelligence in schools to higher level. Therefore, their opinions, past experiences, and expectations must be taken into account to ensure the successful integration of AI in schools.

Conclusions

The use of automation in science practical instruction delivery and education, in general, has benefits over manual delivery, as seen by the science teachers in Oyo state battle ready for its deployment despite the challenges beset it as espoused in the discussion. This implies that whenever the public examination bodies are set to deploy automated practical science instruction to schools and supervisors, the science teachers are ready to adopt it. It is therefore recommended that efforts be geared towards overcoming the inherent

challenges like making automation less costly, creating more awareness of the benefit of AI, and securing data protection, among others, so that the benefits can be fully enjoyed. Also, science teachers who are highly ready for automation should be motivated. In contrast, moderately and lowly-ready others should be encouraged to avert the shortcomings of manual delivery and adopt the global best practices.

Conflict of interest

There are no conflicts of interest whatsoever.

References

- Schwichow, M., Zimmerman, C., Croker, S., & Hartig, H. (2016). What students learn from hands-on activities? *Journal of Research in Science Teaching. Advance online publication*. <https://doi.org/10.1002/tea.21320>
- Fadzil, H.M., & Saat, R.M. (2013). Phenomenographic study of students' manipulative skills during transition from primary to secondary school. *Sains Humanika*, 63(2), 71-75. <https://doi.org/10.11113/jt.v63.2013>
- Okam, C. C., & Zakari, I. I. (2017). Impact of Laboratory-Based Teaching Strategy on Students' Attitudes and Mastery of Chemistry in Katsina Metropolis, Katsina State, Nigeria. *International Journal of Innovative Research and Development*, 6(1), 112.
- Hinne, J.T. (2017). Attitude towards Practical Work and Students' Achievement in Biology: A Case of a Private Senior Secondary School in Gaborone, Botswana. *IOSR Journal of Mathematics (IOSR-JM)*, 13(4), 06-11.
- Sotiriou, S., Bybee, R.W., & Bogner, F.X. (2017). PATHWAYS—A Case of Large-Scale Implementation of Evidence-Based Practice in Scientific Inquiry-Based Science Education. *International Journal of Higher Education*, 6(2), 8-19. <https://doi.org/10.5430/ijhe.v6n2p8>
- Ajeyalemi, D. (2011). Practical work in school science: are the aims objectives being achieved? *Memorial lecture in 52nd Annual Conference of Science Teachers Association of Nigeria*, pp 3-15.
- Abrahams, I., & Millar, R. (2008). Does practical work really work? A study of the effectiveness of practical work as a teaching and learning method in school science. *International Journal of Science Education*, 30(14), 1945-1969. <https://doi.org/10.1080/09500690701749305>
- Ubulom, W. J. & Wokocha, K. (2017). Readiness and Acceptability of # Computer-Based Test (CBT) for Post-University Matriculation Examinations (PUME) among Urban and Rural Senior Secondary School Students in Rivers State. *International Journal of Innovative Social & Science Education Research*, 5(3), 51-60.
- Jinadu, A. T., Oyaremi, M. K. & Rufai, M. D. (2021). Assessment of the Oyo state teaching service commission interactive learning platforms during covid_19 lockdown period in Nigeria. *Interdisciplinary Journal of Educational Research*, 3(1) 37-44. <https://doi.org/10.51986/ijer-2021.vol3.01.04>
- Naqvi, A. (2020). *Artificial intelligence for audit, forensic accounting, and valuation: A strategic perspective*. John Wiley & Sons. <https://doi.org/10.1002/9781119601906>
- Wardat, Y., Tashtoush, M. A., AlAli, R., & Jarrah, A. M. (2023). ChatGPT: A revolutionary tool for teaching and learning mathematics. *EURASIA Journal of Mathematics, Science and Technology Education*, 19(7), em2286. <https://doi.org/10.29333/ejmste/13272>
- Luckin, R., & Cukurova, M. (2019). Designing educational technologies in the age of AI: A learning sciences-driven approach. *British Journal of Educational Technology*, 50(6), 2824-2838. <https://doi.org/10.1111/bjet.12861>
- Cukurova, M., & Luckin, R. (2018). *Measuring the impact of emerging technologies in education: A pragmatic approach*. Springer. https://doi.org/10.1007/978-3-319-53803-7_81-1
- Seufert, S., Guggemos, J., & Sailer, M. (2021). Technology-related knowledge, skills, and attitudes of pre-and in-service teachers: The current situation and emerging trends. *Computers in Human Behavior*, 115, 106552. <https://doi.org/10.1016/j.chb.2020.106552>
- Jinadu, A. T., & Balogun, R. T. (2020). Availability and Adoption of Online Learning Platforms during Covid-19 Lockdown in Nigeria. *Diverse Journal of Multidisciplinary Research*, 2(5), 8-12.
- Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign. <https://curriculumredesign.org/wp-content/uploads/AIED-Book-Excerpt-CCR.pdf>
- Luckin, R., & Cukurova, M. (2019). Designing educational technologies in the age of AI: A learning sciences-driven approach. *British Journal of Educational Technology*, 50(6), 2824-2838. <https://doi.org/10.1111/bjet.12861>

Автоматизована система контролю та доставки наукових практичних інструкцій для державних шкіл

Афіз Джінаду^{1ABCD}

¹Центр освітніх досліджень та менеджменту

Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 6 с., 3 таб., 17 джерел.

Історія питання. Розсилка практичних інструкцій школам і керівникам перед фактичним проведенням практичного іспиту протягом багатьох років не приділяла такого ж рівня уваги, як переміщенню людей і товарів, і, отже, схильна до про-

блем. Однак процес можна автоматизувати за допомогою штучного інтелекту. У попередніх дослідженнях вивчався вплив автоматизації на контроль і доставку вантажів у секторі управління транспортом.

Цілі. У цьому дослідженні оцінювалися проблеми та готовність учителів природничих наук до автоматизованих систем контролю та проведення практичних інструкцій.

Матеріали та методи. У дослідженні був прийнятий дизайн постфактум і залучено сто вчителів природничих наук. Готовність вчителя природничих наук до автоматизованого контролю та проведення практичних інструкцій ($r = 0,83$) використовувалася для збору даних, які аналізувалися описово.

Результати. Вчителів природничих наук чоловіків (73%) більше, ніж жінок (27%). 84% респондентів назвали вартість однією з проблем, а 83% вказали на опір змінам і технічні труднощі, етичні проблеми (67%) та інтеграцію з існуючою системою (65%). Вчителі природничих наук помірно готові (64%). Для порівняння, 24% мають низьку готовність, а 12% – високу готовність розгорнути автоматизовану систему контролю та надання практичних інструкцій.

Висновок. Автоматизація надання практичних наукових інструкцій має більш значні переваги, ніж ручний метод; однак вчителі природничих наук готові до його впровадження, незважаючи на труднощі. Таким чином, зусилля повинні бути спрямовані на подолання притаманних труднощів, щоб можна було повною мірою насолоджуватися перевагами.

Ключові слова: автоматизація, штучний інтелект, викладачі природничих наук, практичні інструкції, система готовності та доставки.

Information about the authors:

Jinadu, Afeez: afeezjinadu95@gmail.com; <https://orcid.org/0000-0002-8278-9329>; Centre for Educational Research and Management Ibadan Nigeria, Ibadan 200113, Oyo, Nigeria.

Cite this article as: Jinadu, A. (2024). Automated Control and Delivery System for Science Practical Instructions to Public Schools. *Journal of Learning Theory and Methodology*, 5(2), 68-73. <https://doi.org/10.17309/jltm.2024.5.2.04>

Received: 10.07.2024. Accepted: 26.08.2024. Published: 30.08.2024

This work is licensed under a Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0>).



Formation of the Cognitive Component of Future Physical Education and Sports Specialists' Readiness for Educational Activities in Sustainable Development

Halyna Tsyhura^{1ABCD} and Serhii Harkusha^{1AD}

¹T.H. Shevchenko National University "Chernihiv Colehium"

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

DOI: 10.17309/jltm.2024.5.2.05

Abstract

Objectives. To determine the effectiveness of the author's methodological system for training future specialists in physical culture and sports for educational activities related to sustainable development, focusing on the formation of the cognitive component of readiness.

Materials and methods. The study involved 390 students from the faculties of physical education at T.H. Shevchenko National University "Chernihiv Colehium", the National University of Life and Environmental Sciences of Ukraine, Sumy State University, and Sumy State Pedagogical University named after A.S. Makarenko – future specialists in physical culture and sports. The participants, who were from various courses and were of both sexes, were divided into control and experimental groups. The methods used included surveys, testing, pedagogical experiments, analysis, synthesis, and generalization of information, and mathematical statistics methods.

Results. At the beginning of the study, 93.33% of the students in the control group and 86.67% of the students in the experimental group had low levels of cognitive readiness for educational activities related to sustainable development. The final test revealed a significant improvement in this indicator within the experimental group: 32.22% of the students had a low level of cognitive readiness, 48.89% had a satisfactory level, 17.78% had an average level, and 1.11% had a high level. Relevant improvements were observed across all criteria (content components) of readiness, including: knowledge of the history of the new paradigm of human development and international documents on sustainable development; understanding the essence of sustainable development; comprehension of ecological laws governing human existence; and knowledge and understanding of the ecological, economic, and social components of sustainable development, as well as the role of physical culture and sport in promoting sustainable development.

In the control group, no significant changes were observed in the levels of cognitive readiness for educational activities related to sustainable development by the end of the experiment.

Conclusions. The results of the pedagogical experiment confirm the positive impact of the developed methodological system on the formation of the cognitive component of future specialists' readiness in physical culture and sports for educational activities related to sustainable development.

Keywords: sustainable development, education, physical education, sports, physical education teacher, sports coach.

Introduction

Education is a priority for any country striving to develop (Kremen, 2001). After the signing of the EU-Ukraine Agreement (Uriadovyi portal, 2014), Ukraine's education sector began to adopt the experience of developed European countries. A new wave of reforms has started, incorporating best international practices, and resulted in another phase of standardization in Ukraine's education system, impacting all levels of education (Hlushko, 2017; Bakhrushyn, 2020;

Standartyzatsiia profesiinoi osvity, 2018). Higher education standards are being developed and approved. For instance, in 2019, the Ministry of Education and Science of Ukraine approved the higher education standard for the specialty 017 'Physical Culture and Sports' at the first (bachelor's) level of higher education. This standard includes the development of the following general competency in graduates: "The ability to exercise their rights and responsibilities as a member of society, to understand the values of a civil (democratic) society, and the need for its sustainable development, as well as the rule of law, and human and civil rights and freedoms in Ukraine" (Ministerstvo osvity i nauky Ukrainy, 2019).

This is reflected in the educational and professional programs for training specialists in physical culture and sports at the first (bachelor's) level of higher education in the specialties 017 Physical Culture and Sports (Osvitno-profesiina prohrama «Fizychna kultura i sport», 2020) and 014 Secondary Education (Physical Culture) (Osvitno-profesiina prohrama Serednia osvita (Fizychna kultura), 2020). In accordance with these educational and professional programs, the development of this competency is integrated into the study of courses such as: "History of Ukraine", "Ukrainian Language", "Philosophy and Cultural Studies", "Jurisprudence", and "Tourism Work". A similar approach is used to develop this competency in other higher education institutions in Ukraine that offer bachelor's degrees in Physical Education and Sports and Secondary Education (Physical Education) (Tsyhura & Harkusha, 2020). It is worth noting that the competency of "awareness of the need for sustainable development of society" forms the foundation for future professionals in physical education and sports to cultivate key competencies in students, such as competence in natural sciences and technologies, social and civic competence, environmental literacy, and healthy living. Furthermore, each curriculum includes the following content areas: "Environmental Safety and Sustainable Development", "Civic Responsibility", and "Health and Safety" (Navchalna prohrama z fizychnoi kultury, 2022). Therefore, it is evident that the aforementioned general competency – "awareness of the need for sustainable development of society" – comprises the following components: understanding the essence of the new paradigm of human development and knowledge of the reasons for its emergence; understanding the ultimate goal that global society is striving towards; and knowledge of methods to achieve sustainable development and the application of this knowledge in both professional and personal contexts. However, courses offered in the educational programs alone cannot fully develop "awareness of the need for sustainable development of society", as confirmed by previous studies (Tsyhura, 2021).

Scientists abroad are much more concerned with the transition to sustainable education (UNESCO, 2014; Laurie et al., 2016; Sengers et al., 2019) than those in Ukraine (Osvita dlia staloho rozvytku, 2007; Pometun, 2015; Koreneva, 2018). In their studies, they also highlighted the challenges of incorporating sustainable development into physical education. In particular, they emphasized the lack of knowledge and guidance for physical education teachers on how to implement such activities, as well as the limited time and resources available in school physical education for education related to sustainable development. However, physical education itself is positively regarded for its potential to foster attitudes and values necessary for sustainable development (Baena-Morales et al., 2022; Merma-Molina, 2023). Therefore, they argued that researchers should focus on exploring and deepening the ways in which the field of physical education and sports can contribute to the achievement of sustainable development goals (Baena-Morales & Ferriz-Valero, 2023).

The purpose of the study is to determine the effectiveness of the author's methodological system for training future physical education and sports specialists in educational activities related to sustainable development, specifically focusing on the formation of the cognitive component of readiness.

Materials and methods

Study participant

The study involved 390 students from physical education faculties – future specialists in physical culture and sports – who were divided into control and experimental groups. The control group consisted of students from T.H. Shevchenko National University "Chernihiv Colehium". The experimental group included students from T.H. Shevchenko National University "Chernihiv Colehium", the National University of Life and Environmental Sciences, Sumy State University, and Sumy State Pedagogical University named after A.S. Makarenko. Only students in physical education departments participated in the study. Both sexes and differ academic years were represented among the participants.

At the initial stage of the experiment, both the control and experimental groups comprised 90 students each. The control group consisted of 52 boys (57.78%) and 38 girls (42.22%), while the experimental group consisted of 55 boys (61.11%) and 35 girls (38.89%). At the formative stage of the experiment, the control group had 83 students, including 44 boys (53%) and 39 girls (47%), while the experimental group had 90 students, consisting of 49 boys (54.44%) and 41 girls (45.56%).

Study organization

The pedagogical experiment was conducted from 2019 to 2024, following relevant recommendations (Sysoieva & Krystopchuk, 2013). The study was carried out in stages. At the ascertaining stage, future physical education and sports professionals were tested to determine their initial readiness level for sustainable development. During the formative stage, participants in the experimental group were introduced to a methodological system developed for training students at the Faculty of Physical Education in these activities. At the control stage, the participants' levels of readiness for educational activities related to sustainable development was assessed.

The methods used in the study included: a pedagogical experiment, surveys, testing, analysis, synthesis, and of information, as well as mathematical and statistical methods.

To evaluate the formation of the cognitive component of future physical education and sports specialists' readiness for educational activities related to sustainable development, thematic tests were used. These tests were created using Google Forms. The test questions were based on the material provided to the students during their study of the author's course "Sustainable Development in Physical Culture and Sports" and were aligned with the indicators of cognitive readiness. The tests covered the following knowledge areas: historical origins and formation of sustainable development; problems of civilisation and ways to address them; fundamental ecological laws of life on the planet; the essence of sustainable development; the environmental, economic and social components of sustainable development and their interdependence; the role of the education and sports sectors in promoting sustainable development; and the role of physical education and sports specialists in fostering sustainable development. In addition, the tests assessed the impact of human activities on the environment.

Accordingly, the indicators of the cognitive criterion of readiness were as follows:

- Knowledge of the formation history of a new paradigm of human development and international documents related to the implementation of sustainable development;
- Knowledge and understanding of the essence of sustainable development;
- Understanding the ecological laws of human existence;
- Knowledge and understanding of the environmental components of sustainable development;
- Knowledge and understanding of the economic component of sustainable development;
- Knowledge and understanding of the social components of sustainable development;
- Knowledge and understanding of the role and involvement of physical culture and sports in the sustainable development of society;
- Systematic thinking on sustainable development issues.

Formation of the cognitive component of readiness for future specialists in physical culture and sports for educational activities related to sustainable development was assessed by converting the scores obtained by students into the ECTS scale used for evaluating the quality of educational achievements in higher education institutions: 0-59 points – low level; 60-74 points – satisfactory level; 75-89 points – average level; 90-100 points – high level. The same scale was used to assess each indicator (content component) of the cognitive component.

The tests, created using Google Forms, were distributed through Google Classroom, which also contained all the educational and methodological information for the course “Sustainable Development in Physical Culture and Sports.”

Statistical analysis

The systematization of the materials and mathematical processing were performed using Microsoft® Excel 2010. The non-parametric Pearson's χ^2 criterion was applied to compare the results of the study at a significance level of $p < 0.05$ (Herych, Syniavska, 2021).

Results

Here, we present results related to the cognitive component of physical education for future physical education and sports specialists' readiness for educational activities that promote sustainable development.

At the ascertaining stage of the pedagogical experiment, the level of formation of the cognitive component in both the control and experimental groups was not significantly different and was predominantly low (Fig. 1). This comparison is supported by the calculation of Pearson's criterion: $\chi^2_{\text{empirical}} < \chi^2_{\text{critical}}$ ($2.22 < 3.84$, $p < 0.05$). Specifically, 93.33% of students (84 individuals) in the control group and 86.67% of students (78 individuals) in the experimental group had a low level of readiness; 5.56% (5 individuals) and 12.22% (11 individuals) of students in the control and experimental groups, respectively, had a satisfactory level; and 1.11% of respondents (1 individual) in each group exhibited an average level of cognitive readiness for educational activities related to sustainable development.

Upon analyzing the data from the final test, we observed a significant improvement in the formation of this component in the experimental group. Pearson's criterion calculation after the formative stage of the experiment revealed a notable difference between the control and experimental groups: $\chi^2_{\text{empirical}} < \chi^2_{\text{critical}}$ ($65.97 > 5.99$, $p < 0.05$). In the control group, 91.57% of students (76 individuals) remained at a low level, 7.23% (6 individuals) achieved a satisfactory level, and 1.2% (1 individual) demonstrated an average level of this component (Fig. 1). In contrast, in the experimental group, the percentage of students with a low level of cognitive readiness decreased by 2.7 times compared with the initial data, resulting in a decrease of 32.22% (29 individuals). Meanwhile, the number of students with a satisfactory level increased to 48.89% (44 individuals); 17.78% (16 individuals) achieved an average level, and 1.11% (1 individual) reached a high level of cognitive readiness for educational activities related to sustainable development (Fig. 1).

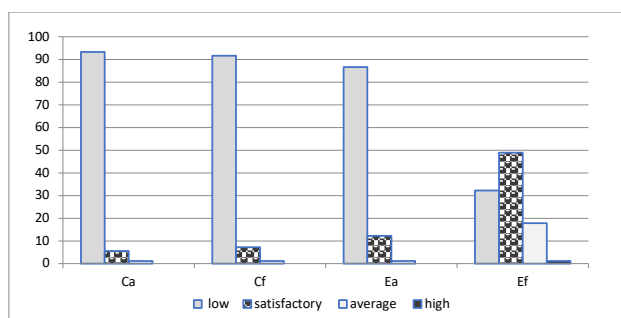


Fig. 1. Diagram showing the levels of cognitive readiness for sustainable development among future physical education and sports specialists (% of students): Ca – Control group, ascertaining stage of the experiment, Cf – Control group in the formative stage of the experiment, Ea – Experimental group, ascertaining stage of the experiment, Ef – Experimental group, formative stage of the experiment

Similar designations are used in the other diagrams.

The cognitive component of physical culture and sports specialists' readiness for sustainable development has specific content. Therefore, it is important not only to observe changes in the levels of this component among different student groups but also to analyze how well the student groups' specific content elements correspond to the indicators of the cognitive criterion.

As shown in Figures 2, 3, and 4, at the beginning of the experiment, over 80% of students in both groups exhibited a low level of knowledge across most content components. However, the distribution of knowledge levels before the experiment varied across indicators, such as “knowledge and understanding of the economic components of sustainable development” (Fig. 4). At the outset, the control and experimental groups performed relatively better in this area: 26.67% and 14.44% of students, respectively, had a satisfactory level of knowledge; 14.44% and 20.0% had an average level; and 5.56% and 20% demonstrated a high level of knowledge. By the end of the study, this indicator improved significantly in the experimental group: the number of students with medium and high levels of knowledge increased by 1.4 and 2 times, respectively, while the number of students with low levels decreased by nearly three times. Positive changes were also observed in the control group (Fig. 4).

At the conclusion of the pedagogical experiment, students in the experimental group showed the greatest improvement in understanding the “essence of sustainable development” and its “environmental component.” For these indicators, the number of students with low levels of knowledge decreased by 3.8 and 2.7 times, respectively (Figs. 2 and 3). Additionally, 37.78% and 44.45% of students reached a satisfactory level of knowledge, 33.33% and 10.00% achieved an average level, and 14.44% and 2.22% demonstrated a high level of knowledge about sustainable development and its environmental components, respectively.

Regarding the indicator “knowledge of the history of the formation of a new paradigm of human development and international documents on sustainable development” (Fig. 2), the results were somewhat different: approximately one-fifth of the students in the experimental group attained high, medium, and satisfactory levels of knowledge. The most challenging indicator to master was “knowledge and understanding of the ecological laws of human existence,” with 61.12% of respondents still exhibiting a low level of knowledge by the end of the study (Fig. 3).

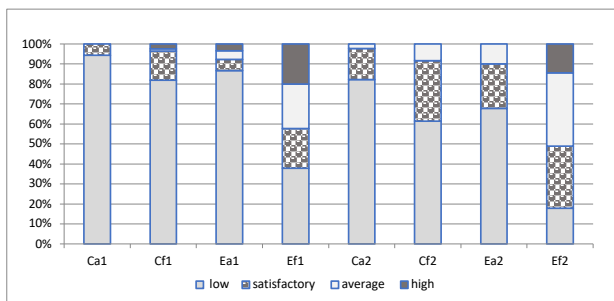


Fig. 2. Diagram showing the levels of formation of content components 1 and 2 of the cognitive component of future physical education and sport specialists' readiness for sustainable development (% of students): 1 – knowledge of the history of the formation of a new paradigm of human development and international documents on the implementation of sustainable development; 2 – knowledge and understanding of the essence of sustainable development

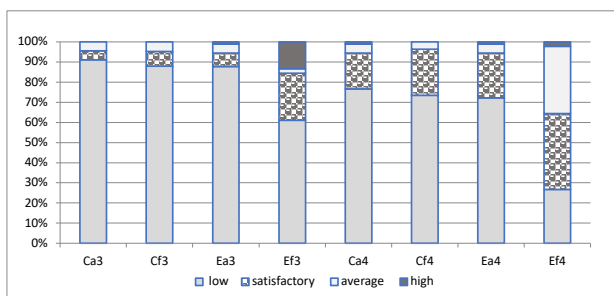


Fig. 3. Diagram showing the levels of formation of content components 3 and 4 of the cognitive component of future physical education and sport specialists' readiness for sustainable development (% of students): 3 – understanding of the ecological laws of human existence; 4 – knowledge and understanding of the environmental components of sustainable development

In terms of content components such as “knowledge and understanding of the social component of sustainable development” (Fig. 4) and “knowledge and understanding of the role and involvement of physical culture and sport in the

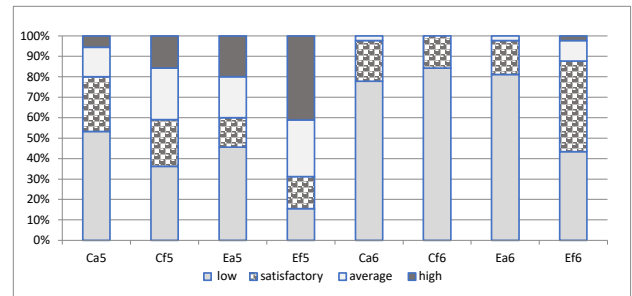


Fig. 4. Diagram of the levels of formation of content components 5 and 6 of the cognitive component of future physical education and sports professionals' readiness for sustainable development (% of students): 5 – knowledge and understanding of the economic components of sustainable development; 6 – knowledge and understanding of the social components of sustainable development

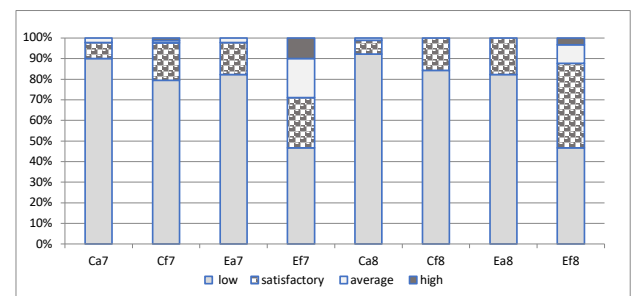


Fig. 5. Diagram of the levels of formation of content components 7 and 8 of the cognitive component of future physical education and sport specialists' readiness for sustainable development (% of students): 7 – knowledge and understanding of the role and involvement of physical culture and sport in sustainable development; 8 – systemic thinking

sustainable development of society” (Fig. 5), the number of students with a low level of knowledge at the end of the experiment decreased by 1.8 times, amounting to 43.33% and 46.67%, respectively. Meanwhile, 44.45% and 24.44% of students reached a satisfactory level; 10.0% and 18.89% achieved an average level, and 2.22% and 10.0% reached a high level of knowledge, respectively.

All these changes were reflected in the indicator “systemic thinking on sustainable development issues,” which also significantly improved among the students in the experimental group by the end of the experiment. The decrease in the number of students with a low level of “systemic thinking” corresponded with an increase in the number of students at the satisfactory level, reaching 37.78% (up from 22.22% at the baseline stage of the study). Additionally, 33.33% of students achieved an average grade level, and 2.22% reached a high grade level.

In the control group, no significant changes were observed in the components identified for physical education and sports specialists' readiness for educational activities related to sustainable development. However, there was a positive trend towards improvement.

Discussion

The study hypothesized that students in physical education faculties – future specialists in physical culture and sports – have a low level of cognitive readiness for sustain-

able development. It was found that at the beginning of the pedagogical experiment, on average, 92.45% of students had a low level of this readiness. Analyzing knowledge levels on content components of cognitive readiness for sustainable development provided further insights and revealed key features of its formation.

It was unexpected but understandable that at the beginning of the experiment, only 49.45% of participants had a low level of knowledge about the “economic component of sustainable development.” This result is plausible given that many modern Ukrainian students live in contexts in which managing finances is a pressing issue for almost every family (Statystychnyi shchorichnyk Ukrainy, 2022). In contrast, a higher percentage of students had a low level of knowledge in other content areas, ranging from 67.78% to 94.44%. Specifically, the high percentage of students with low knowledge in areas such as “knowledge and understanding of the environmental component of sustainable development” and “knowledge and understanding of the social component of sustainable development” was surprising, with 74.45% and 79.45% of students, respectively. This is particularly unexpected given that environmental and social issues are prominent in the education sector of most developed countries (Safranov et al., 2022). At the current stage of Ukraine’s development, social and environmental issues are extremely relevant due to the negative impact of the ongoing conflict with the Russian Federation on various aspects of life, including environmental quality and public health (Ekolohichni naslidky viiny, 2022; Nevydymy naslidky viiny, 2023; Sotsialno-ekonomichni ta humanitarni naslidky rosiiskoi ahresii, 2022). Therefore, we anticipated higher levels of student knowledge and understanding of the environmental and social components of sustainable development at the start of the experiment.

The results from the beginning of the experiment underscore the necessity of preparing future physical education and sports specialists for educational activities related to sustainable development. They also align with the findings of international research, which highlighted the challenges of integrating sustainable development into physical education and sought ways to engage the field of physical culture and sports in achieving sustainable development goals (Merma-Molina et al., 2022; Baena-Morales, 2023). Our research addressed this gap by developing the course “Sustainable Development in Physical Culture and Sports” and a methodological system for training future specialists in physical culture and sports for educational activities related to sustainable development.

By the end of the experiment, students engaged in sustainability-related work in their professional fields showed significant improvements across all content components of cognitive readiness for sustainable development, as reflected in the overall indicator. The most notable improvements were observed in the following components: the history of the formation of a new paradigm of human development and knowledge of international documents on sustainable development; knowledge and understanding of the essence of sustainable development; and knowledge and understanding of the environmental component of sustainable development. The number of students with a low level of these components decreased by 2.3 to 3.8 times (i.e., by 45.56% to 50%), whereas the number of students at satisfactory, medium, and high levels increased accordingly. The smallest changes were

observed in the component of understanding the ecological laws of human existence, which can be attributed to the fact that grasping these laws requires strong systemic thinking.

The decrease by the end of the experiment of only 35.55% in the number of students with a low level of “knowledge and understanding of the role and involvement of physical culture and sport in the sustainable development of society” can be attributed to several factors. The primary reason is the lack of Ukrainian-language resources on this topic that allow students to independently study under the current conditions of education in Ukraine (since 2019, distance or online learning has become predominant in Ukrainian higher education institutions). Information on the involvement of physical culture and sports in sustainable development is scarcely reported in Ukrainian-language sources – it is not available in the media, on the internet, or in teaching materials. As we have previously noted (Tsyhura, 2023), even the Ukrainian-language website of the International Olympic Committee lacks information on sport’s role in sustainable development. In contrast, the English-language website features a dedicated “Sustainability” page with extensive information and guidelines for athletes and sports organizations on sustainable development activities (IOC, 2024).

In the control group, no significant changes were observed in the indicators of cognitive readiness for educational activities related to sustainable development at the end of the pedagogical experiment. However, there was a positive trend in some content components, which can be attributed to the availability of environmental and social sector material in the Ukrainian information space, the high level of attention paid to the sustainability of the country’s economic sector and business structures, and the involvement of international partners in Ukraine’s recovery from the consequences of the Russian war (Suspilne.media, 2024).

Conclusions

The results of the pedagogical experiment confirm the positive impact of the developed methodological system on the formation of the cognitive component of future physical education and sports specialists’ readiness for educational activities related to sustainable development. At the beginning of the experiment, 86.67% of respondents had a low cognitive readiness level, 12.22% had a satisfactory level, and 1.11% had an average cognitive readiness level for educational activities related to sustainable development. By the end of the experiment, the number of students with low levels decreased by 2.7 times (to 32.22%), and the number of students with satisfactory and average level increased to 48.89% and 17.78%, respectively.

Conflict of interest

The authors declare that there is no conflict of interest.

References

- Kremen, V. (2001). Modernizatsiia osvity – vazhlyvyi chynnyk sotsialnoho, ekonomichnoho i politychnoho rozvytku Ukrainy. *Visnyk Natsionalnoi akademii nauk Ukrainy*, (3), 22–25. (in Ukrainian).

- Uriadovyi portal (2014). *Uhoda pro asotsiatsiiu*. <https://www.kmu.gov.ua/diyalnist/evropejska-integraciya/ugoda-pro-asociacyu> (in Ukrainian).
- Hlushko, O. Z. (2017). Yevropeyskyi vektor osvity reform v Ukraini. *Ukrainskyi pedahohichnyi zhurnal*, (4), 5-11. (in Ukrainian).
- Bakhrushyn, V. Ye. (2020). Standartyzatsiia vymoh do vyshchoi osvity, yak instrument zabezpechennia yakosti vyshchoi osvity: rivni vyshchoi osvity ta predmetni oblasti. *Osvitnia analityka Ukrainy*, 2(9), 50-66. (in Ukrainian).
- Standartyzatsiia profesiinoi osvity: teoriia i praktyka: monohrafiia (2018). A. A. Kalenskyi, P. H. Luzan, N. M. Vanina, T. M. Pashchenko, S. H. Kravets, T. V. Piatnychuk. Za nauk. red. A. A. Kalenskoho. Zhytomyr: "Polissia". (in Ukrainian).
- Ministerstvo osvity i nauky Ukrainy (2019). Nakaz "Pro zatverdzhennia standartu vyshchoi osvity za spetsialnistiu 017 "Fizychna kultura i sport" dlia pershoho (bakalavrskoho) rivnia vyshchoi osvity". 24.09.2019. №567. <https://mon.gov.ua/storage/app/media/vishcha-osvita/zatverdzeni%20standartu/2021/07/28/017-Fizykultura.sport-bakalavr.28.07.pdf> (in Ukrainian).
- Synihovets, I. V. et al. (2020). *Osvitno-profesiina prohrama "Fizychna kultura i sport", pershyi (bakalavrskiy) riven vyshchoi osvity, spetsialnist 017 Fizychna kultura i sport, haluz znan 01 Osvita / Pedahohika, kvalifikatsiia: bakalavr fizychnoi kultury i sportu, trener-vyklyadach z vydu sportu*. Natsionalnyi universytet "Chernihivskiy kolehium" imeni T.H.Shevchenka. <http://chnpu.edu.ua/faculties/physical-faculty/123-fakultet-fizichnogo-vikhovannya/382-osvitni-programi> (in Ukrainian).
- Lysenko, L. L. et al. (2020). *Osvitno-profesiina prohrama Serechnia osvita (Fizychna kultura), pershyi (bakalavrskiy) riven vyshchoi osvity, spetsialnist 014 Serechnia osvita, spetsializatsiia 014.11 Fizychna kultura, haluz znan 01 Osvita / Pedahohika, kvalifikatsiia: bakalavr serechnoi osvity (Fizychna kultura), vchytel fizychnoi kultury*. Natsionalnyi universytet "Chernihivskiy kolehium" imeni T.H.Shevchenka. <http://chnpu.edu.ua/faculties/physical-faculty/123-fakultet-fizichnogo-vikhovannya/382-osvitni-programi> (in Ukrainian).
- Tsyhura, H. O., & Harkusha, S. V. (2020). *Haluz fizychnoi kultury i sportu yak perspektyva dlia osvity v interesakh staloho rozvytku. Pidhotovka fakhivtsiv fizychnoi kultury i sportu: profesiino-pedahohichni, nauково-poshukovi, tekhnolohichni aspekty: monohrafiia / za nauk. red. M. O. Noska; hol.red. N. O. Terentieva*. Cherkasy: Vydavets Chabanenko Yu. A., 402 s: 172-213. (in Ukrainian).
- Boliak, A. et al. (2022). *Navchalna prohrama z fizychnoi kultury dlia 6-9 klasiv zakladiv zahalnoi serechnoi osvity*. <https://mon.gov.ua/storage/app/media/zagalna%20serechnya/programy-5-9-klas/2022/08/15/navchalna.programa-2022.fizychna-kultura-6-9.pdf> (in Ukrainian).
- Tsyhura, H. (2021). Potreba studentiv fakultetu fizychnoho vykhovannia v obiznanosti z pytan staloho rozvytku. Pedahohichni nauky: teoriia, istoriia, innovatsiini tekhnolohii. *Naukovyi zhurnal. SumDPU imeni A. S. Makarenka*, 3(107), 294-307. <https://doi.org/10.24139/2312-5993/2021.03/294-307> (in Ukrainian).
- UNESCO (2014.) *Shaping the Future We Want - UN Decade of Education for Sustainable Development (Final report)*. <https://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=1682&menu=35>
- Laurie, R., Nonoyama-Tarumi, Y., Mckeown, R., & Hopkins, C. (2016). Contributions of Education for Sustainable Development (ESD) to Quality Education: A Synthesis of Research. *Journal of Education for Sustainable Development*, 10(2), 226-242. <https://doi.org/10.1177/0973408216661442>
- Sengers F., Wiczorek A. J., & Raven R. (2019). Experimenting for sustainability transitions: A systematic literature review. *Technological Forecasting and Social Change*, (145), 153-164. <https://doi.org/10.1016/j.techfore.2016.08.031>
- Osvita dlia staloho rozvytku: Natsionalna dopovid. / Uklad.: K. M. Levkivskiy, S. M. Stepanenko ta in.; Za zah. red. S. M. Nikolaiienka. (2007). K.: Znnania. (in Ukrainian).
- Pometun, O. I. (2015). Pedahohichni zasady osvity dlia staloho rozvytku v ukrainiskii shkoli. *Ukrainskyi pedahohichnyi zhurnal*, (1), 171-182. <https://uej.undip.org.ua/index.php/journal/article/view/53/30> (in Ukrainian).
- Koreneva, I. M. (2018). Osvita dlia staloho rozvytku: realii Ukrainy. *Visnyk Hlukhivskoho natsionalnoho pedahohichnoho universytetu imeni Oleksandra Dovzhenka. Seriia: Pedahohichni nauky*, (1), 17-25. http://nbuv.gov.ua/UJRN/vgnpu_2018_1_4 (in Ukrainian).
- Baena-Morales, S., Prieto-Ayuso, A., Merma-Molina, G., & González-Villora, S. (2022). Exploring physical education teachers' perceptions of sustainable development goals and education for sustainable development. *Sport, Education and Society*, 29(2), 162-179. <https://doi.org/10.1080/13573322.2022.2121275>
- Merma-Molina, G., Urrea-Solano, M., González-Villora, S., & Baena-Morales, S. (2023). Future physical education teachers' perceptions of sustainability. *Teaching and Teacher Education*, (132), 104254. <https://doi.org/10.1016/j.tate.2023.104254>
- Baena-Morales, S., & Ferriz-Valero, A. (2023). What about physical education and Sustainable Development Goals? A scoping review. *Physical Education and Sport Pedagogy*, 1-18. <https://doi.org/10.1080/17408989.2023.2214572>
- Sysoieva, S. O., & Krystopchuk, T. Ye. (2013). *Metodolohiia naukovy-pedahohichnykh doslidzhen: Pidruchnyk*. Rivne: Volynski oberehy. (in Ukrainian).
- Herych, M. S., & Syniavska, O. O. (2021). *Matematychna statystyka: navch.posib*. Uzhhorod: DVNZ UZhNU. (in Ukrainian).
- Statystychnyi shchorichnyk Ukrainy. Derzhavna sluzhba statystyky Ukrainy. Za redaktsiieiu I. Ye. Verner. (2022). Vidpovidalnyi za vypusk O. A. Vyshnevsk. <https://stat.gov.ua/sites/default/files/2024-02/Zbirnyk%20Statystychnyi%20shchorichnyk%20Ukrainy%202022%20rik.pdf> (in Ukrainian).
- Safranov, T. A., Chuha, A. V., & Ilina, V. H. (2022). *Problemy ekolohichnoi osvity Ukrainy: navchalnyi posibnyk*. Odesa: ODEKU. (in Ukrainian).
- Ekolohichni naslidky viiny. *Ekotsyd Ukrainy: bibliohr. spysok* [uklad. : V. Vovk ; red. N. Linkevych (2022).]; Derzh. b-ka Ukrainy dlia yunatstva. Kyiv. <https://bibliogr-front.4uth.gov.ua/dovkillia-i-viina/ekolohichni-naslidky-viiny-ekotsyd-ukrainy> (in Ukrainian).
- Nevydymi naslidky viiny. *Yak rozpoznavaty? Yak spilkuvatys? Yak dopomohty podolaty? Dovidnyk dlia shirokoho kola fakhivtsiv*. Zahalna redaktsiia: K. Voznitsyna, L. Lytvynenko. (2023). Druhe vydannia, dopovnene. Kyiv. <https://legal100.org.ua/wp-content/uploads/2020/09/Nevidimi-naslidki-viiny-2023-1.pdf> (in Ukrainian).

Pyshchulina, O., Yurchyshyn, V., Markevych, K., Mishchenko, M., & Dobrovolskyi, D. (2022). *Sotsialno-ekonomichni ta humanitarni naslidky rosiiskoi ahresii dlia ukrainskoho suspilstva*. Kyiv. https://razumkov.org.ua/uploads/article/2022_Gum.pdf (in Ukrainian).

Tsyhura, H. (2023). Internet-resursy yak dzherelo rekomendatsii dlia stalykh podii u sporti. *Zdorovia, fizychnе vykhovannia i sport: perspektyvy ta krashchi praktyky: materialy IV Mizhnarodnoi naukovy-praktychnoi*

onlain-konferentsii. 16-17 travnia, 2023 r., Kyiv / Kyiv. un-t imeni Borysa Hrinchenka; za zah. red. O. V. Yarmoliuk. K.: Kyiv. (in Ukrainian).

IOC. *Sustainability* (2024). <https://olympics.com/ioc/sustainability>

Suspilne.media. *Suspilne Novyny* (2024). <https://suspilne.media/507675-ukrainci-ta-biznes-nazvali-golovni-problemi-ukraini-opituvanna/> (in Ukrainian).

Формування когнітивного компонента готовності майбутніх фахівців фізичної культури і спорту до освітньої діяльності для сталого розвитку

Галина Цигура^{1ABCD}, Сергій Гаркуша^{1AD}

¹Національний університет «Чернігівський колегіум» імені Т. Г. Шевченка

Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

Реферат. Стаття: 7 с., 5 рис., 30 джерел.

Мета дослідження – виявити ефективність авторської методичної системи підготовки майбутніх фахівців фізичної культури і спорту до освітньої діяльності для сталого розвитку на формування когнітивного компонента готовності.

Матеріали та методи. У дослідженні брали участь 390 студентів факультетів фізичного виховання Національного університету «Чернігівський колегіум» імені Т.Г.Шевченка, Національного університету біоресурсів і природокористування України, Сумського державного університету та Сумського державного педагогічного університету імені А. С. Макаренка – майбутні фахівці фізичної культури і спорту. Учасники дослідження представлені обома статтями різних курсів, з яких було сформовано контрольну та експериментальну групи. Використані методи опитування, тестування, педагогічний експеримент, аналізу, синтезу та узагальнення інформації, методи математичної статистики.

Результати. На початку дослідження 93,33 % студентів контрольної групи та 86,67% студентів експериментальної групи мали низький рівень когнітивного компонента готовності до освітньої діяльності для сталого розвитку. Завершальне тестування показало істотне покращення досліджуваного показника в експериментальній групі: студентів з низьким рівнем когнітивного компонента досліджуваної готовності було 32,22%, із задовільним рівнем – 48,89%, із середнім рівнем – 17,78%, з високим – 1,11%. Відповідні зміни простежуються за усіма критеріями (змістовними складниками) готовності: знання історії становлення нової парадигми розвитку людства та міжнародних документів щодо реалізації сталого розвитку; знання і розуміння сутності сталого розвитку; розуміння екологічних законів існування людства; знання і розуміння екологічної складової сталого розвитку; знання і розуміння економічної складової сталого розвитку; знання і розуміння соціальної складової сталого розвитку; знання і розуміння ролі та причетності фізичної культури і спорту для сталого розвитку суспільства; системне мислення.

У контрольній групі на завершення експерименту достовірних змін щодо рівнів когнітивного компонента готовності майбутніх фахівців фізичної культури і спорту до освітньої діяльності для сталого розвитку не виявлено.

Висновок. Результати педагогічного експерименту підтверджують позитивний вплив розробленої методичної системи на формування когнітивного компонента готовності майбутніх фахівців фізичної культури і спорту до освітньої діяльності для сталого розвитку.

Ключові слова: сталий розвиток, освіта, фізичне виховання, спорт, вчитель фізичного виховання, спортивний тренер.

Information about the authors:

Tsyhura Halyna: zygura.g@ukr.net; <https://orcid.org/0000-0002-2998-7537>; Department of Biological basis of physical education, health and sports, T. H. Shevchenko National University "Chernihiv Colehium", Hetmana Polubotka Str. 53, Chernihiv, 14013, Ukraine.

Harkusha Serhii: biomex@ukr.net; <https://orcid.org/0000-0002-7120-1446>; Department of pedagogy, psychology and physical education methods, T. H. Shevchenko National University "Chernihiv Colehium", Hetmana Polubotka Str. 53, Chernihiv, 14013, Ukraine.

Cite this article as: Tsyhura, H., & Harkusha, S. (2024). Formation of the Cognitive Component of Future Physical Education and Sports Specialists' Readiness for Educational Activities in Sustainable Development. *Journal of Learning Theory and Methodology*, 5(2), 74-80. <https://doi.org/10.17309/jltm.2024.5.2.05>

Received: 10.07.2024. Accepted: 27.08.2024. Published: 30.08.2024

This work is licensed under a Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0>).

Reviewer Guidelines

This journal is peer-reviewed. Original research articles, research notes and review articles are sent for consideration to one of the reviewers. This journal uses double-blind review. Articles are accepted for publication after positive evaluation. The editorial staff reserves the right to make changes to the text to meet the journal and language standards.

How to prepare a review

Preview

Before accepting or declining the review request, please consider the following issues:

- Does the article match your area of expertise? Accept an invitation if you are sure that you can provide a high quality review.
- Do you have a competing interest? Answer this question.
- Can you complete your review in time? Reviewing may take a lot of time – before accepting an invitation make sure that you can complete the review by the suggested deadline.

Reply to the invitation at your earliest convenience. Delay in response slows down the process of reviewing the material. If you decline the invitation, provide suggestions for alternative reviewers, if possible.

If you accept an invitation, then you should consider the materials as confidential documents. This means that you cannot share them with anyone without the prior permission of the editor. As the expert review is confidential, you must not provide information about the review to anyone without the permission of the editors and authors.

First, read the article and then take a break. Consider the article from your own perspective. Make sure that you know the criteria for evaluating the article offered by the journal.

Review

Your review will help the editor decide whether to publish the article or not. Giving your overall opinion and general conclusions about the article are essential. Your comments should be courteous and constructive, and should not contain any personal remarks or personal data, including your name.

Providing insight into any deficiencies is important. You need to explain your judgment so that both editors and au-

thors will be able to fully understand the reasoning behind your comments.

Checklist

Please evaluate the following aspects of the article: (If the answer is “No”, please make your improvements in the field “Information for authors”, if applicable)

- Does the title accurately reflect the content of the text?
- Is the aim of the review clearly stated?
- Does this article make a significant contribution to the development of this problem?
- Is the article sufficiently complete and up-to-date?
- Is the article clearly written (concise, clear and well organised)?
- Is the essence of the article covered in the abstract? Is the abstract informative and concise?
- Are the author’s conclusions adequately supported by references?

Please provide specific comments and suggestions, particularly on the layout, title, description, introduction, hypothesis and/or subject of study, materials and methods, statistical processing of materials, results, discussions, conclusions, language and references.

If you see the manifestations of academic dishonesty, discuss your suspicions with the editor, providing as much detail as possible.

Your Recommendation

When making a recommendation you select one of the categories that are used to classify the article:

- Accept Submission
- Revisions Required
- Resubmit for Review
- Resubmit Elsewhere
- Decline Submission

Final Decision

The editor-in-chief decides whether to accept or reject the article. The editor, before making a decision, will weigh all the views and may call for a third opinion or ask the author to revise the document. The editorial system provides users with a notification of the final decision.

Ethical Principles

Ethical Principles

The principles of professional ethics governing the editor's and publisher's work are:

- when deciding to publish an article, the editor of the journal proceeds from its scientific significance and accuracy of the presented data;
- the editor assesses the manuscript content irrespective of the nationality or ethnicity, gender, political views, institutional affiliation of its author(s);
- the unpublished data contained in the manuscript shall not be given to third parties without the author's written consent, except for the purpose of peer reviewing;
- the editor will not allow publication of the article in the instance of having reasonable grounds to conclude that the article contains plagiarized content or ideas;
- the editor is responsible for resolving conflicts and doing whatever is necessary to prevent infringements of the author's rights.

- ensure proper formatting of quotations;
- clearly indicate and credit the contribution of other scientists to the matter under study;
- not submit the manuscript sent to, under consideration in or already published by another journal.
- if a clinical research or experimental study involves human subjects, the study must conform to the directive of the Helsinki Declaration, and the study must have the ethical approval of the relevant institution with signatures from the ethics committee. For experiments conducted within the field of Physical Education and Sport, the author(s) must have the approval of the institution to publish the experimental data. The participants must be anonymous, both in pictures and in the text.

The texts of the articles, tables, graphics, formulae are protected by the law on copyright.

The author of the article bears full responsibility for the accuracy of the facts, quotations, proper names, geographical names, names of organizations and institutions, and other information.

Reviewer's Ethical Principles

The reviewer provides unbiased professional review of the article submitted for consideration based on the following principles:

- the reviewer will respect the authors' intellectual property and treat the manuscript received for review as confidential and such that cannot be given for consideration or discussion to third parties that are not authorized to do so by the Editorial Board;
- the reviewer will offer objective assessment of the research results presented in the manuscript; personal criticism of the author is unacceptable;
- the editor will be informed immediately of any conflict of interests between the reviewer and the author and requested to have this reviewer excluded from the article reviewing process.

Author-Guiding Principles

The responsibility for the novelty and accuracy of the research results rests on the author who will:

- provide reliable research results that contain no erroneous or falsified data;
- guarantee the originality of the research results;
- provide adequate references to the data, facts, evidence used in the text of the article with the original sources listed;

Plagiarism Policy

The Editorial Board of the journal considers plagiarism in articles unacceptable (publication in a written or electronic form of the research results obtained and published by other persons as the author's own contribution, or reprint of the published texts authored by other persons without proper reference thereto).

The articles must not contain:

- copied or published work executed by other scholars and presented as the author's own findings.
- word-for-word copying of fragments of any text (from a single phrase to several sentences) without proper quotation formatting;
- slightly modified copied material (re-phrased sentences, changes in the word order, etc.) without proper quotation/reference formatting;
- other people's thoughts, ideas or texts rendered in the author's own words without providing proper references to the sources.

The author must provide references to his or her own previously published works.

The Editorial Board reserves the right to reject any manuscript containing borrowings from previous publications without proper references thereto and can cancel any publication pursuant to a plagiarism complaint.

The Editorial Board use Unicheck.

Editorial Process

Preliminary consideration of the submission (up to 2 weeks)

- appointment of an editor;
- checking the manuscript for consistency with the thematic scope of the journal;
- technical check (volume of the manuscript, volume of the abstract, assessment of the submission in terms of the stylistic and bibliographic requirements set forth in the Guidelines for authors);
- determining the relevance, novelty and originality of the paper;
- verifying the presence of a pedagogical experiment, its compliance with the research methods which can be repeated (representativeness of the sample, homogeneity of the sample in terms of age, motor fitness, level of sports fitness, training experience, etc.);
- if the manuscript is a review paper, the use of the PRISMA protocol, which covers systematic reviews and meta-analyses, is checked. Authors are recommended to complete the checklist and the flow diagram and include them in the submission;
- plagiarism check.

If the manuscript received a favorable assessment, it is sent for review, otherwise it is rejected.

Peer Review

Selection and invitation of reviewers, waiting for a response to the request (up to 2 weeks). The typical period of time allowed for reviews is four weeks.

All articles in this journal undergo peer review.

The editor-in-chief of the journal sends the paper for peer review to experts whose scientific speciality is the closest to the topic of the paper.

Peer reviewing takes place under a double-blind scheme.

In each paper, the peer review process always considers:

- ethical aspects;
- originality of the paper;
- the importance of information;
- clarity and comprehensibility of the text;
- expediency of using the research methods;
- interpretation of results;
- validity of conclusions.

Making a decision on publication (up to 2 weeks)

- discussion of reviews: request for a new version, acceptance or rejection of the submission;
- if a decision is made to request a corrected version of the manuscript, the author is given 2 weeks to prepare the manuscript;
- if a decision is made to accept the manuscript, it is sent to the step of preparation for publication.

Preparation for publication (4 weeks)

- literary editing;
- desktop publishing;
- familiarization of the authors with the layout;
- correction of printing and formatting errors;
- preparation and upload of the electronic version of the journal.

Publication – Early Access

Publication (on schedule)

ISSN 2708-7581 (Online)
ISSN-L 2708-7573



Journal of Learning Theory and Methodology

Scientific journal

August 2024

Volume 5

Number 2

Відповідальний за випуск	О. М. Худолій
Комп'ютерна верстка	М. О. Худолій
Коректор	Є. Б. Бланк

Зареєстровано в Національній раді України з питань телебачення і мовлення:
рішення No 1751 від 23.05.2024 р., протокол No 16, оприлюднено 23 травня 2024 р., ідентифікатор медіа – R40-04690
<https://webportal.nrada.gov.ua/wp-content/uploads/2024/05/R-2024-01751.pdf>

Засновник і видавець — ТОВ «ОВС».
Адреса редакції: <https://www.ltmjournal.com>. Тел.: (067) 578-40-08. E-mail: editor-in-chief@ltmjournal.com
Підписано до друку 28.08.2024. Формат 60×84 1/8. Електронне видання. Гарнітура Таймс. PDF формат.
Ум. друк. арк. 6,989. Обл.-вид. арк. 7,25. Вид. № 01-2024. Зам. № 56. Тираж 300 прим. Ціна договірна.

ТОВ «ОВС» Україна, 61003 Харків, пл. Конституції, 18, к. 11.
Свідоцтво Держкомінформу України Серія ДК № 331 від 08.02.2001 р.