



SPORTSKE NAUKE I ZDRAVLJE

SPORTS SCIENCE AND HEALTH

Volume 14

Issue

V

Naučno-stručni časopis iz oblasti sportskih i medicinsko-rehabilitacionih nauka
Scientific Journal in Sports and Medical-Rehabilitation Science

ISSN 2232-8211 (Print)
ISSN 2232-822X (Online)

Godina 14 • Broj V
Maj 2024.
Republika Srpska
Bosna i Hercegovina

Volume 14 • Issue V
May 2024
The Republic of Srpska
Bosnia and Herzegovina



UDC: 612
UDC: 613
UDC: 796



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SPORTSKE NAUKE I ZDRAVLJE

SPORTS SCIENCE AND HEALTH

Naučno-stručni časopis iz oblasti sportskih i medicinsko-rehabilitacionih nauka
Scientific Journal in Sports and Medical-Rehabilitation Science

Izdavač/Published by *Pan-evropski univerzitet "Apeiron" Banja Luka / Pan-European University "Apeiron" Banja Luka, Bosnia and Herzegovina*

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tel. +387 (0) 51 247 975,
fax +387 (0) 51 430 921
siz@siz-au.com
www.siz-au.com

Pan-European University "Apeiron"
Pere Krece 13, 78000 Banja Luka,
Bosnia and Herzegovina
tel. +387 (0) 51 247 975,
fax +387 (0) 51 430 921
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Sekretar i tehnička podrška/

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Sretko Bojić
Marko Milovanović
MARKOS, Banja Luka
Tiraž: 300 kom. /Printed in 300 copies/





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UDC 612
UDC 613
UDC 796

SPORTS SCIENCE AND HEALTH is registered with the Ministry of Science and Technology of the Republic of Srpska by serial registration code 07.030-053-85-2/11, date 08.02.2011., number 612.

SPORTS SCIENCE AND HEALTH (ISSN 2232-8211) is an international journal published two time a year.

SPORTSKE NAUKE I ZDRAVLJE

SPORTS SCIENCE AND HEALTH

Vol. 14 (2024) No. V (1-164)

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Dragi čitaoci,

Pred vama je prvo Specijalno izdanje Časopisa "Sportske nauke i zdravlje". Za ovaj izdanje smo se odlučili zbog velike zainteresovanosti autora i velikog broja kvalitetnih radova koji nam stižu. Samim tim nam je ovo još veći motiv da iz broja u broj podižemo Časopis "Sportske nauke i zdravlje" stepenicu više.

U ovom broju imamo 18 radova, autora iz Srbije, Sjeverne Makedonije, Indonezije, Indije, Kazahstana, Hrvatske, Ukrajine, Poljske, Španije, Alžira, Škotske, Njemačke, Italije i Bosne i Hercegovine. Tematika radova je raznovrsna i dosta zanimljiva: uticaj igre na finu motoriku u ranom djetinjstvu, odnos tekvando trenera prema trenerskom radu i pedagoškoj kompetenciji, analize igre u sprovođenju fine motorike u djetinjstvu, sprint i pretrčana distanca kod fudbalerki tokom utakmice, upotreba metode mikro kvadrata na mjerenje profesore fizičkog vaspitanja i sporta, uticaj sprovođenja badmintona na poboljšanje koncentracije u osnovnoj školi, razlike u određenim antropološkim pokazateljima učenica sedmog razreda osnovnih škola ruralne i urbane sredine, promjene nekih antropoloških dimenzija kod juniora u plesu pod uticajem eksperimentalnog programa, upravljanje jačanjem pismenosti kulture fizičkog vaspitanja u srednjim školama, korelacija povezanosti elemenata smisla za suradnju sa loptom i uspjehom iz predmeta matematika, interno okruženje kao razvojni potencijal fudokan karatea, integracija fizičkog i psihičkog treninga rvača kao priprema za elitni nivo, uticaj pilatesa u vremenu od 6 nedjelja na fizičke parametre i specifične vještine kod odbojkaških igrača, efekat programa fizičkog vaspitanja na motoričke sposobnosti adolescenata na Kosovu, efekat šestomjesečnog trenajnog procesa na antropološki status odbojkašica kadetskog uzrasta, razlike u opterećenjima dominantne i ne dominantne noge u košarkaša, razvoj osnovnih vještina za majgeri bazirano na CGFU – PM 515, biomarkeri oštećenja mišića i fizičke performanse poslije utakmice u ženskom fudbalu.

Uredništvo Časopisa kao i svaki put do sada želi da zahvali svim autorima, ali i recenzentima koji svojim učešćem unaprijeđuju i poboljšavaju kvalitet samog Časopisa. Pozivamo vas i dalje da na našu adresu www.siz-au.com šaljete svoje radove, kako bi što više doprinijeli razvoju kako Časopisa, tako i nauke uopšteno.

Kreativan čovjek motivisan je željom da postigne, a ne željom da pobjedi druge. (Ayn Rand)

UREDNIŠTVO ČASOPISA

Dear readers,

In front of you is the first special edition of the Journal "Sports Science and Health". We decided on this edition because of the great interest of the authors and the large number of quality works that we receive. With that, this is an even greater motivation for us to raise of the Journal "Sports Science and Health" a step higher from issue to issue.

In this issue, we have 18 works by authors from Serbia, North Macedonia, Indonesia, India, Kazakhstan, Croatia, Ukraine, Poland, Spain, Algeria, Scotland, Germany, Italy and Bosnia and Herzegovina. The topics of the papers are varied and quite interesting: the influence of the game on fine motor skills in early childhood, the attitude of taekwondo coaches towards coaching work and pedagogical competence, analysis of the game in the implementation of fine motor skills in childhood, sprint and running distance in soccer players during the match, the use of the micro square method on measurement of physical education and sports teachers, the impact of badminton on improving concentration in primary school, differences in certain anthropological indicators of seventh-grade female students in rural and urban primary schools, changes in some anthropological dimensions in juniors in dance under the influence of an experimental program, managing the strengthening of literacy in the culture of physical education education in secondary schools, the correlation between the elements of the sense of cooperation with the ball and success in the subject of mathematics, the internal environment as the development potential of fudokan karate, the integration of the physical and psychological training of wrestlers as preparation for the elite level, the influence of Pilates over a period of 6 weeks on physical parameters and specific skills in volleyball players, the effect of a physical education program on the motor skills of adolescents in Kosovo, the effect of a six-month training process on the anthropological status of female volleyball players of cadet age, differences in the loads of the dominant and non-dominant leg in basketball players, the development of basic skills for majors based on CGFU - PM 515, biomarkers of muscle damage and physical performance after a match in women's soccer.

The editorial board of the Journal, as always, would like to thank all the authors, as well as the reviewers, who, with their participation, improve and improve the quality of the Journal itself. We invite you to go to our address www.siz-au.com you send your papers, in order to contribute as much as possible to the development of both the Journal and science in general.

A creative person is motivated by the desire to achieve, not by the desire to defeat others. (Ayn Rand)

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BIOMARKERS OF MUSCLE DAMAGE AND PHYSICAL PERFORMANCE AFTER SOCCER MATCHES FOR WOMEN'S SOCCER TEAMS

MAHENDRA WAHYU DEWANGGA¹, AGUS WIDODO¹, WIJANTO¹, EKAN FAOZI², MUHAMMAD MUKHLIS CAHYADI¹, HENDI SAPUTRA¹, IFRAH YAUMIL FURQONY¹, ZULFIKAR YUCHA PUTRA¹, RIBKA VLORENTYNA WILGER¹, TRI NOVALIANO RECHTSI MEDISTIANTO¹, ANINDITA ANTYA CANDRIKA², ARI KURNIAWAN³, DEDE IRAWAN⁴, ANDY SIRADA⁵, ANNISA NURUL HIKMAH⁶, ADNAN FARIS NAUFAL¹, ARIF PRISTIANTO¹, FARID RAHMAN¹, UMI BUDI RAHAYU¹

¹Department of Physiotherapy, Faculty of Health Sciences, Universitas Muhammadiyah Surakarta, Indonesia

²Department of Nurse, Faculty of Health Sciences, Universitas Muhammadiyah Surakarta, Indonesia

³Sports Coaching Education Master's Program, Faculty of Health and Sports Sciences, Universitas Negeri Yogyakarta, Indonesia

⁴Sport Science Doctoral Program, Faculty of Health and Sports Sciences, Universitas Negeri Yogyakarta, Indonesia,

⁵Department of Physiotherapy, Faculty of Health Sciences, Universitas Pembangunan Nasional Veteran Jakarta, Indonesia

⁶Department of Health Analyst, Faculty of Nursing and Health Sciences, Universitas Muhammadiyah Semarang, Indonesia

Correspondence:

Mahendra Wahyu Dewangga, Department of Physiotherapy, Faculty of Health Sciences, Universitas Muhammadiyah Surakarta, Jawa Tengah, Indonesia, mwd171@ums.ac.id

Abstract: Soccer is the most famous sport in the world. Soccer is a sport with moderate to high intensity, which can cause physical and physiological fatigue in soccer athletes. Limited recovery time can also increase muscle tissue damage. Therefore, this study aimed to examine the time interval for performance recovery in female amateur soccer athletes as measured by checking physical performance and through biomarkers after a soccer match. Quantitative research is used. The type of experimental research is pre-experimental with a one-group pretest-posttest design. Sampling in this study used an accidental sampling technique. The respondents were 20 female soccer athletes who competed in the u17 women's soccer competition. The variables examined in the research included vertical jump, CPK, LDH, and IL-6. Examinations are carried out before the match, immediately after the match, 24 hours after, and 48 hours after. Next, the results were analyzed using the one-way ANOVA and post-hoc follow-up tests via the SPSS application. Doing soccer can reduce physical performance and increase CPK, LDH, and IL-6 levels due to fatigue. Fatigue peaks significantly after 24 hours after the match. However, 48 hours after the match, the fatigue gradually disappeared and decreased. Based on this research, female athletes' soccer matches must be accompanied by a sufficient recovery time of at least 48 hours to avoid muscle damage and an increased decline in muscle performance.

Keyword: Biomarkers, Muscle Damage, Muscle Performance, Women Soccer.

INTRODUCTION

The numerous soccer teams from different parts of Indonesia are proof of the country's high interest in soccer (Fuller, 2015). Both Indonesia's women's and men's soccer teams are highly intriguing. Indonesia has 1,300 female soccer players registered with FIFA, and the number of female soccer players in Asia reached 784 thousand in 2019 (Doewes et al., 2021). Only a small percentage of Indonesian female soccer players are registered with FIFA (Destrian et al., 2022).

The players' physical strength is required to withstand frequent changes in the direction of the ball, sprinting, and acceleration in the high-intensity soccer game (Hisdal et al., 2013). Soccer players will have a lot of matches to attend. These loads are composed of psychological, physiological, and physical loads (Hisdal et al., 2013). Soccer players also expect that they will win each game they play. This may have an impact on soccer players' decisions to give their all in each game (Pollard & Gómez, 2014). The physiological and physical reactions after this match might have an impact on physical performance in the following one. If it keeps happening, this can lead to an acute and persistent fatigue response (Montgomery et al., 2008).

A process that occurs in tandem with an increase in muscle temperature leads to high rates of reactive oxygen species (ROS) and an inflammatory response from the muscles mediated by neutrophil xanthin oxidase (Dewangga & Irianto, 2023). High-intensity exercise causes oxidative stress, which alters cell structure and disturbs intracellular homeostasis, allowing intracellular molecules like enzymes to migrate to extracellular regions and altering function (Dewangga et al., 2021).

Physical stressors that are severe and ongoing are the primary cause of fatigue (Poenaru et al., 2021). Damage to micromuscles can result from prolonged stress. Furthermore, a decrease in muscle glycogen stores is linked to the fatigue process following a soccer game (Krustrup et al., 2022). It has been demonstrated that there is a 48–72-hour recovery phase following competition that is responsible for restoring muscle glycogen and performance (Marqués-Jiménez et al., 2022). Both the extent of the inflammatory response and the degree of muscle damage affect how long recovery takes. When muscle damage happens, a number of biomarkers of muscle damage, including interleukin-6, creatine kinase, and lactate dehydrogenase, appear at the site of injury (Dewangga et al., 2022). As these molecules accumulate, cell necrosis, elevated body temperature, and delayed-onset muscle soreness (DOMS) result (dos Santos et al., 2020).

Giving athletes enough time to recuperate can help them in a number of ways. For example, it can accelerate metabolic processes like protein synthesis, ensuring that their bodies are balanced with protein when they return to the field (de Sousa et al., 2022). Athletes can compete with enjoyment if they have a good recovery, which can enhance sleep quality, decrease fatigue, and reduce DOMS (Rahman et al., 2022). The bulk of earlier research on the recovery aspects of soccer games only looked at male athletes' game responses; however, women could also be the subjects of this research to find out how changes in biomarkers of muscle damage and physical performance occur after soccer games (Pérez-Castillo et al., 2023). The fact that estrogen, for instance, has been demonstrated to have a protective effect on reactive oxygen species (ROS) is another reason for conducting this research. This suggests that gender differences may influence recovery patterns (Iorga et al., 2017).

Research on female players is also important, considering that the impact of the menstrual cycle on performance parameters in elite athletes is still inconclusive. However, recent literature suggests a possible influence of the menstrual cycle phase on the recovery process and health (Goulart et al., 2022). Therefore, it is still being determined whether applying information regarding male players' post-match recovery can accurately understand female players' responses, which is important for adequate training and recovery planning (Doeven et al., 2018). This study aimed to examine the time interval for performance recovery in female amateur soccer athletes as measured by checking physical performance and through biomarkers after a soccer match.

METHOD

The type of research used is quantitative research. The type of experimental research is pre-experimental with a one-group pretest-posttest design. Sampling in this study used an accidental sampling technique. Incidental sampling is a method of determining samples based on chance, meaning anyone who coincidentally or accidentally meets the researcher can be used as a sample. The total number of samples obtained in this research was 20. The research is carried out after the sample agrees to fill in the consent information.

Four women's soccer teams participated in a tournament between representatives of the West Java and Central Java Provinces. The women's soccer teams include the Persib Women's Soccer Team, the Princess Wijaya Subang Soccer Team, the Surakarta Women's Soccer Team, and the Semarang Ratanika Soccer Team. Female soccer players under the age of 17 (U-17) are competing in this tournament. This tournament, held for one week, requires one team to play three matches so that one team will compete every two days. From each team, 5 people will be randomly selected to be respondents for this research.

The Faculty of Medicine, Sultan Agung Islamic University, Semarang, Central Java, research ethics committee has approved this study No. 436/X/2023/Bioethics Committee. Before conducting the research, the respondents agreed and signed their consent to become research respondents after reading the experimental methods. Researchers conducted research in the city of Surakarta in November 2023.

The research data is a general examination, such as age, heart rate, and body mass index. Then, physical performance data was taken from vertical jump results. Muscle damage biomarker research data was examined using creatine kinase, lactate dehydrogenase, and interleukin-6 results. Physical performance data and muscle damage biomarkers were taken 2 hours before the first match, 24 hours after the match, and 48 hours after the first match. A general examination is carried out by asking for your name and age, then continuing by calculating your heart rate in one minute (BPM). The HR examination is manual: palpating the radial artery and counting for 1 minute. Then, the BMI examination was carried out by measuring the height and weight of the research respondents. Then, after the height and weight data is obtained, it is calculated using a formula. $BMI = \text{Body Weight (kg)} : [\text{Height (m)} \times \text{Body Height (m)}]$ (Syamsuryadin et al., 2022).

The athlete performs the vertical jump test by extending the hand that is closest to the wall while standing sideways to the wall. Keep feet flat on the ground, toe tips marked or noted. This is called the standing-to-reach height. The athlete then stands away from the wall and jumps vertically as high as possible, using both arms and legs to help protect the body upwards. The jumping technique may or may not use a counter-movement (see vertical jump technique). Try to touch the wall at the highest jumping point. The difference in distance between standing reach height and jumping height is called the score. Sampling was carried out in the brachial artery.

The blood sample was then put into a vacutainer tube and centrifuge machine. centrifuge at 3000 rpm for 30 minutes to obtain blood serum. Then, the blood sample is put into a microtube, placed, and stored in a cooler with a temperature of -20°C (Dewangga & Irianto, 2023). Then, blood samples were taken to be examined for the biomarkers creatine phosphokinase, lactic acid dehydrogenase, and interleukin-6 using basic biomedical research techniques with ELISA at the Clinical Pathology Laboratory of Dr. Hospital Sardjito Yogyakarta.

The process of examining creatine phosphokinase consists of several stages. First, prepare all the tools and muscle blood samples. Next, make solutions of monoreagents 1 and 2 by adding 2.5 ml of monoreagent 1 to the monoreagent. CPK activity was measured at 25°C. Next, 40 µL of homogenate was mixed with 1.0 mL of mono reagent Incubate for 3 minutes. Read the absorbance at 1, 2, and 3 minutes at a wavelength of 340 nm (Bernat-Adell et al., 2021).

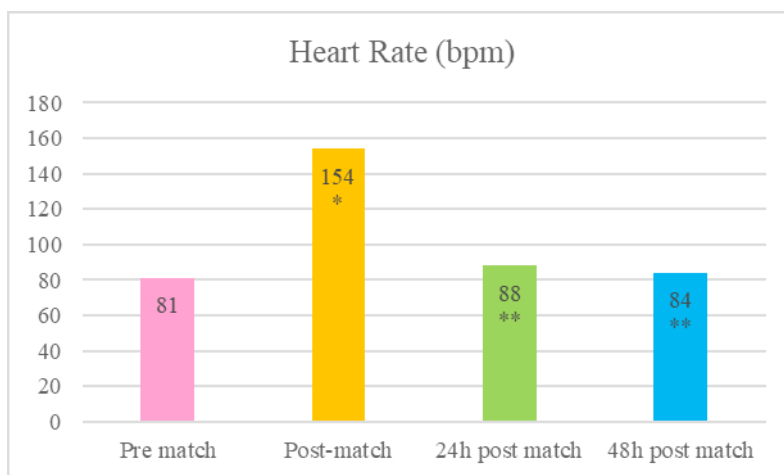
Examination of serum interleukin-6 levels was carried out using an ELISA tool (Human Interleukin 6 ELISA Kit Cat. No. E0090Hu and Elisa Reader PHO MO Autobio), which is an immunoserological examination tool at the Immunology Laboratory, Department of Medical Laboratory Technology, Muhammadiyah University, Semarang. The interleukin-6 examination procedure was carried out using the SOP Bioassay Technology Laboratory's Human Interleukin 6 ELISA kit, Cat. No. E0090Hu, with a sensitivity of 1.03 ng/L and a 96-well size. The principle of the examination is a microplate coated with IL-6 antibodies. Interleukin-6 contained in the sample will bind to antibodies coated on the microplate. When biotinylated IL-6 antibodies are added, they bind to the IL-6 in the sample. Biotin binds covalently to proteins, nucleic acids, or other molecules. Then streptavidin-HRP is added and binds to the biotinylated IL-6 antibody. After incubation, unbound Streptavidin-HRP was removed during a washing step. The substrate is then added, and the color changes proportionally to the IL-6 level. The reaction will end by adding a stop solution, and absorbance will be measured at a wavelength of 450 nm. The work procedure is as follows:

RESULTS

Variable	Mean (SD)	P-value
HR Pre-match (bpm)	81±9.06	0.000
HR Post-match(bpm)	120±7.94	
HR 24h after match (bpm)	88±9.4	
HR 48h after match (bpm)	84±4.4	
Vertical Jump Pre-match (cm)	44.7±5.88	0.000
Vertical Jump Post-match (cm)	38.2±6.01	
Vertical Jump 24h after match (cm)	43.4±4.82	
Vertical Jump 48h after match (cm)	44.3±3.38	
CK Pre-match (U/mL)	153.4±51.04	0.000
CK Post-match (U/mL)	165.5±57.48	
CK 24h after match (U/mL)	233.7±81.93	
CK 48h after match (U/mL)	173.2±48.1	
LDH Pre-match (mg/dL)	201.7±26.44	0.000
LDH Post-match (mg/dL)	207.05±16.11	
LDH 24h after match (mg/dL)	273.3±32.62	
LDH 48h after match (mg/dL)	228.8±22.41	
IL-6 Pre-match (pg/mL)	2.7±0.33	0.000
IL-6 Post-match (pg/mL)	3.5±0.52	
IL-6 24h after match (pg/mL)	5.4±0.71	
IL-6 48h after match (pg/mL)	3.7±0.55	

RATE (HR)

The normality test results using the Shapiro-Wilk test for measuring HR before the match, after the match, 24 hours after the match, and 48 hours after the match proved that all groups had a normal distribution. This is indicated by the results of the Shapiro-Wilk test, with a significance value of <math><0.05</math>. Then, the data was tested for influence using the one-way ANOVA test. The results of the one-way ANOVA test obtained a significance value of 0.00. This proves that there is a significant difference in influence between before the match, post-match, 24 hours after, and 48 hours after. In this study, the soccer match was held in the afternoon with a 2 x 45-minute playing time. The soccer match will certainly increase HR significantly ($p<0.05$), but after 24 hours and 48 hours, the heart rate will drop significantly and return to normal. Before the game, the average HR was 81 bpm. Then, after the match, the average HR increased to 154 bpm. 24 hours after the match, the average HR decreased to 88 bpm, and 48 hours after the match, the average heart rate decreased to 84 bpm. The difference in average HR can be seen in Graph 1.

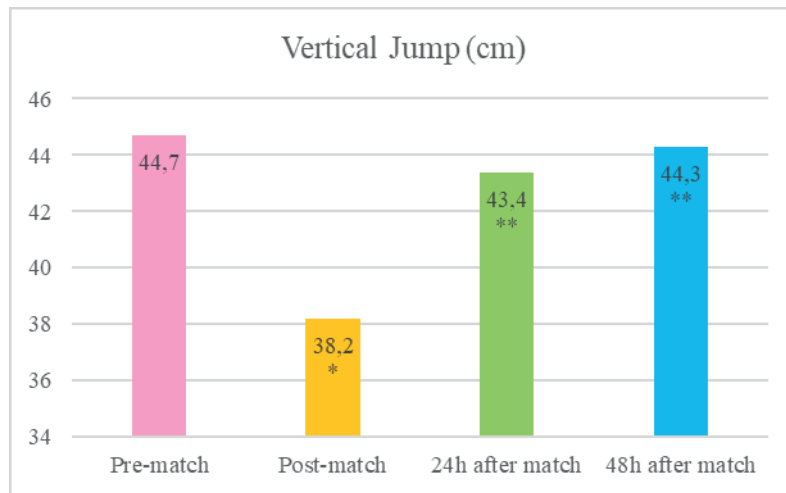


Graph 1. The difference in average HR

ANOVA followed by Post Hoc Analysis by SPSS 26. * $P < 0.05$ has significant diferent Il-6 levels with pre-match. ** $P < 0.05$ has significant diferent Il-6 with post-match. *** $p < 0.05$ has significant diferent Il-6 with 24h after match

Vertical Jump

The normality test results using the Shapiro-Wilk test for vertical jump measurements before, after, 24 hours after, and 48 hours after the match proved that all groups had a normal distribution. This is indicated by the results of the Shapiro-Wilk test, with a significance value of <math><0.05</math>. Then, the data was tested for influence using the one-way ANOVA test. The results of the one-way ANOVA test obtained a significance value of 0.00. This proves that there is a significant difference in influence between before, post-match, 24 hours after, and 48 hours after. In this study, soccer matches were held in the afternoon, with a playing time of 2 x 45 minutes. Soccer matches will certainly reduce the results of vertical jumps caused by fatigue significantly ($p<0.05$). Before the match, the average vertical jump result was 44.7 cm. Then, after the match, the average vertical jump result decreased to 38.2 cm. 24 hours after the match, the average vertical jump result increased to 43.4 cm, and 48 hours after the match, the average vertical jump result increased to 44.3cm. The difference in average vertical jump results can be seen in graph 2.

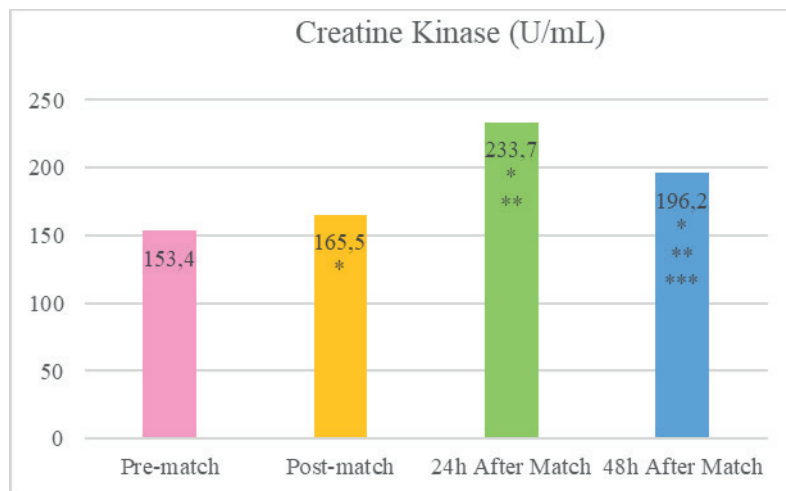


Graph 2. The difference in average vertical jump results

ANOVA followed by Post Hoc Analysis by SPSS 26. * $P < 0.05$ has significant diferent HR with pre-match. ** $P < 0.05$ has significant diferent HR with post-match.

Creatine Kinase (CK)

The normality test results using the Shapiro-Wilk test for measuring creatine kinase before the match, after the match, 24 hours after the match, and 48 hours after the match proved that all groups had a normal distribution. This is indicated by the results of the Shapiro-Wilk test, with a significance value of <0.05 . Then, the data was tested for influence using the one-way ANOVA test. The results of the one-way ANOVA test obtained a significance value of 0.00. This proves that there is a significant difference in influence between before the match, post-match, 24 hours after, and 48 hours after. In this study, soccer matches were held in the afternoon with a 2 x 45-minute game time. Soccer matches will certainly increase the results of creatine kinase, which is caused by damage to tired muscles, significantly ($p < 0.05$). Before the competition, the average creatine kinase result was 153.4 U/mL. Then, after the competition, the average creatine kinase result increased to 165.5 U/mL. 24 hours after the match, the average creatine kinase result increased to 233.7 U/mL 48 hours after the match, and the average creatine kinase result decreased to 196.2 U/mL. The average difference in creatine kinase results can be seen in graph 3.

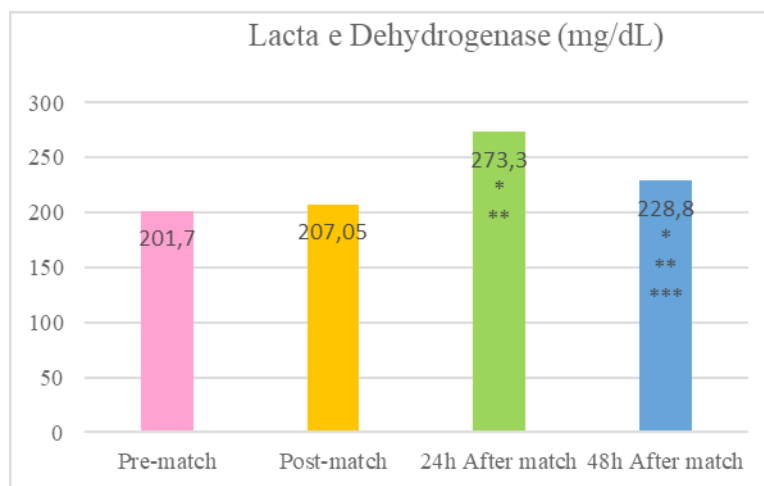


Graph 3. The average difference in creatine kinase results

ANOVA followed by Post Hoc Analysis by SPSS 26. * $P < 0.05$ has significant diferent CK levels with pre-match. ** $P < 0.05$ has significant diferent CK with post-match. *** $p < 0.05$ has significant diferent CK with 24h after match

Lactate Dehydrogenase (LDH)

The normality test results using the Shapiro-Wilk test for measuring lactate dehydrogenase before the match, after the match, 24 hours after the match, and 48 hours after the match proved that all groups had a normal distribution. This is indicated by the results of the Shapiro-Wilk test, with a significance value of <math><0.05</math>. Then, the data was tested for influence using the one-way ANOVA test. The results of the one-way ANOVA test obtained a significance value of 0.00. This proves that there is a significant difference in influence between before, post-match, 24 hours after, and 48 hours after. In this study, soccer matches were held in the afternoon, with 2 x 45 minutes of playing time. Soccer matches will certainly increase lactate dehydrogenase results, which are significantly caused by damage to tired muscles ($p<0.05$). Before the match, the average lactate dehydrogenase result was 201.7 mg/dL. Then, after the match, the average lactate dehydrogenase result increased to 207.05 mg/dL. 24 hours after the match, the average lactate dehydrogenase result increased to 273.3 mg/dL, and 48 hours after the match, the average lactate dehydrogenase result increased to 228.8 mg/dL. The difference in average lactate dehydrogenase results can be seen in graph 4.

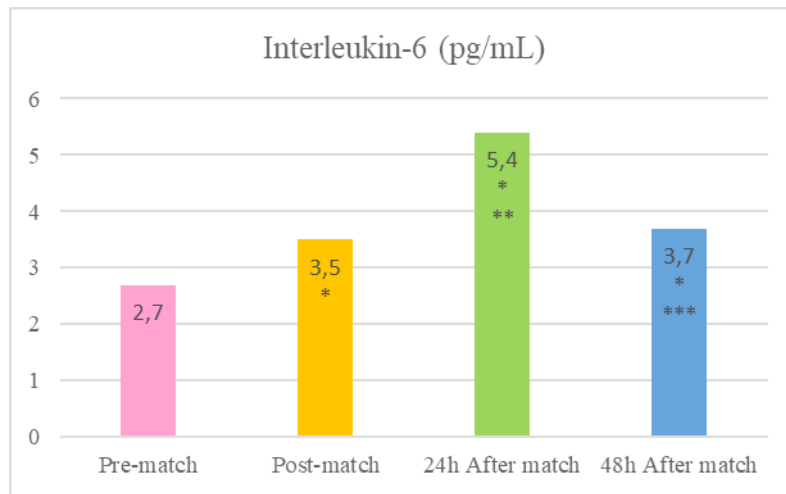


Graph 4. The difference in average lactate dehydrogenase results

ANOVA followed by Post Hoc Analysis by SPSS 26. * $P < 0.05$ has significant different LDH levels with pre-match. ** $P < 0.05$ has significant different LDH with post-match. *** $p < 0.05$ has significant different LDH with 24h after match

Interleukin-6 (IL-6)

The results of the normality test using the Shapiro-Wilk test for measuring interleukin-6 before the match, after the match, 24 hours after the match, and 48 hours after the match proved that all groups had a normal distribution. This is indicated by the results of the Shapiro-Wilk test, with a significance value of <math><0.05</math>. Then the data was tested for influence using the one-way ANOVA test. The results of the one-way ANOVA test obtained a significance value of 0.00. This proves that there is a significant difference in influence between before the match, post-match, 24 hours after the match, and 48 hours after the match. In this study, soccer matches were held in the afternoon with a playing time of 45x2. Soccer matches will certainly increase the results of interleukin-6, which is caused by damage to tired muscles, significantly ($p<0.05$). Before the match, the average interleukin-6 result was 2.7 pg/mL. Then, after the match, the average interleukin-6 result increased to 3.5 pg/mL. 24 hours after the match, the average interleukin-6 result increased to 5.4 pg/mL, and 48 hours after the match, the average interleukin-6 result increased to 3.7 pg/mL. The difference in average interleukin-6 results can be seen in graph 5.



Graph 5. The difference in average interleukin-6 results

ANOVA followed by Post Hoc Analysis by SPSS 26. * $P < 0.05$ has significant diferent Il-6 levels with pre-match. ** $P < 0.05$ has significant diferent Il-6 with post-match. *** $p < 0.05$ has significant diferent Il-6 with 24h after match

DISCUSSION

This study aimed to examine the time interval for performance recovery in female amateur soccer athletes as measured by checking physical performance and through biomarkers after a soccer match. More specifically, physical performance parameters were measured by a vertical jump, which was checked before the match, immediately after the match, 24 hours after the match, and 48 hours after the match. The muscle damage profile also shows an increased response, measured by checking CK, LDH, and IL-6 parameters. The parameters CK, LDH, and IL-6 increased significantly after the game after 24 hours. Then, during an examination 48 hours after the match, the results showed a significant decrease in CK, LDH, and IL-6 levels.

Our research shows that this recovery time is at least 48 hours. It should be noted that we intentionally limited the definition of training recovery to the ability to replicate or exceed baseline performance on our measures. To be clear, we are not saying that our subjects have fully recovered because we recognize that other disturbances to homeostasis, such as changes in muscle tissue, nerves, and hormonal status, may have occurred; however, we chose not to investigate this. Instead, we looked into what we consider a useful, performance-based recovery assessment that coaches and athletes can use. Additionally, because our performance measures are general and straightforward, coaches can easily evaluate performance recovery, and they also apply to other sports.

The average HR recorded before the match averaged around 81 bpm. After the match, the average HR increased to 154 bpm. 24 hours after the match, the average HR of the athletes returned to normal at 88 bpm, and 48 hours after the match, the average HR was still at a normal number of around 84 bpm. This is similar to Tesitore's study, which found that women's soccer post-match HR ranged between 120 and 140 bpm. Additionally, Capranica's research indicates that among teenage athletes, the HR of female soccer players will rise to about 170 bpm (Capranica et al., 2001). Women's soccer involves explosive actions, including sprinting, acceleration, or peak jump height. For example, at the elite level, competition demands include a total distance of between 9 and 11 km, with 1.5 km covered in high-speed running (>13 km/h) and around 4.7 km in sprinting (>22 km/hour) per player (Goulart et al., 2022). Competition-related acute fatigue will cause HR to rise to over 70% of HR max. This can also illustrate that soccer activities are carried out at low to moderate intensity; this sport is described as an "intermittent aerobic sport," with approximately 90% of total energy expenditure provided by aerobic energy sources or pathways. However, current data lack evidence to completely explain the recovery time of all physical performance actions on female soccer players. Different fatigue levels resulting from various skill sets, muscle mass recruitment, and intermuscular coordination between tests may cause the various recovery profiles for performance parameters (Alexandre et al., 2012).

Soccer matches that take place at high intensity will result in muscle fatigue. Muscle fatigue usually occurs after high-intensity exercise or prolonged physical activity (Dambroz et al., 2022). Fatigue can be defined as a decrease in tension capacity or force output after repeated muscle contractions. This can result in a negative impact on an individual's overall performance. One way to check for leg fatigue is to check the power output during a jump height test (vertical jump) (Cooper et al., 2020). The vertical jump results in the pre-match showed it was 44.7cm. After the match, the vertical jump test results decreased to 38.2cm. 24 hours after the match, the vertical jump result increased to 43.4cm. The vertical jump test results 48 hours after the match were still in the same condition at 44.3cm. These findings corroborate Jesper Sjøkvist's research, which demonstrated a decrease in vertical jump height in women following soccer activities (Sjøkvist et al., 2011). Apart from that, there are also other studies, such as those conducted by Kreamer et al., who reported finding the effect of physical recovery after fatigue in the recovery period after 24 hours of a tennis match in female players (Girard et al., 2014).

According to Rodrigues research, moderate to high-intensity physical activity can cause significant muscle damage to muscle fibers. These findings explain the increase in CK levels, which lasts up to 24 hours after activity. Several studies report that soccer activities cause severe microdamage to muscle tissue at the cellular level, resulting in higher CK activity (Rodrigues et al., 2010). Another thing that deserves attention is that lower speeds, especially in the eccentric phase, increase muscle damage. CK is a good indicator to use in monitoring athlete recovery, and an increase in CK indicates a muscle damage response after a soccer game. Some studies show that CK concentrations can remain high for hours or even days after intense competition or prolonged training sessions (YAPALI & KÜRKLÜ, 2022). In this study, CK levels were checked several times. The first check is at pre-match, the second check is immediately after the soccer match, the third check is 24 hours later, and the fourth check is 48 hours later. When pre-matched, the average was 153.4 U/mL. The average CK level increased to 165.5 U/mL in the second examination after the match. On the third examination, 24 hours after the match, the average CK level had increased to 233.7 U/mL. On the fourth examination, 48 hours after the match, the average CK level had decreased to 228.8 U/mL.

Another important finding of this study concerns the LDH response. A significant increase in LDH can be experienced after exercise. Previous research by Kobayashi, demonstrated that primarily aerobic exercise can increase LDH activity for 12 to 24 hours (Kobayashi et al., 2005). Since both aerobic and resistance exercise are linked to stress-strain, it is thought that these changes in the immune system and hormones may be caused by increasing the amount and intensity of exercise (Walsh et al., 2011). This is, of course, in line with the research we conducted. The peak of LDH production occurs 24 hours after a soccer match. After that, LDH will decrease until it returns to normal. In this study, the LDH level was 201.7 mg/dL before the match. After the match, it increased to 207 mg/dL. 24 hours after the match, this is the peak of LDH production; the LDH levels examined had an average of 273.3 mg/dL. After 48 hours, LDH levels tended to decrease; the results showed that the average LDH level after 48 hours was 228.8 mg/dL.

This study showed a statistically significant difference between basal levels and levels 24 hours after the match in soccer players. This means a rapid homeostatic reorganization of the immune system, which lasts at least 24 hours in soccer players. However, contracting muscles are not the only source of IL-6 after exercise. For example, small discharges from the internal jugular vein suggest central nervous system (CNS) attribution in IL-6 secretion during exercise (Nybo et al., 2002). Under normal conditions, IL-6 levels are almost undetectable in the CNS. However, in pathological situations, such as trauma, hypoxia, or ischemia, IL-6 can be reduced by activated astrocytes (Van Wagoner et al., 1999). However, it can also be expressed in the form of the hypothalamus after acute and prolonged stress, such as intense and long-lasting exercise. Exercise-induced increases in athletes' serum IL-6 depend on the type, intensity, and duration of exercise. The initial view that IL-6 is a result of muscle damage that often accompanies some types of exercise has yet to be confirmed by current bibliographic data (Athanasios, 2014). Some research showed that IL-6 production was the same in athletes who performed isokinetic exercise, regardless of fitness level. In addition, IL-6 and creatine kinase, which are sensitive markers of muscle damage (Bouzigon et al., 2021).

CONCLUSION

Based on our research, soccer matches are light- to moderate-intensity sports played for 2 x 45 minutes. This makes the body feel tired, and performance decreases acutely, heart rate increases, and muscle tissue damage occurs, as indicated by the biomarkers CPK, LDH, and IL-6. Peak fatigue, characterized by increased biomarkers, will occur

in the first 24 hours. Then, 24 hours later (48 hours after the match), physical performance and muscle tissue damage return to normal. The slow recovery time experienced by an athlete is certainly not influenced by just one or two factors but by various complementary factors.

Acknowledgments

We would like to thank the Department of Physiotherapy, Faculty of Health Sciences, Muhammadiyah University of Surakarta. We also thank the Research and Innovation Institute, Muhammadiyah University of Surakarta, which has funded all of this research.

Conflict of Interest

The authors declare that there are no conflicts of interest.

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Primljen: 20. decembar 2023. / Received: December 20, 2023
Prihvaćen: 31. januar 2024. / Accepted: January 31, 2024



DEVELOPMENT OF BASIC SKILLS TEST INSTRUMENT FOR MAEGERI BASED ON CGFU-PM 515

WIDHA SRIANTO¹, SISWANTOYO¹, RUMPIS AGUS SUDARKO¹, FAUZI¹, DANANG WICAKSONO¹, SUSANTO SUSAN²

¹Sport Science Study Program, Faculty of Sport Science, Universitas Negeri Yogyakarta, Indonesia

²State Islamic University Tulungagung (UIN Sayyid Ali Rahmatullah) Tulungagung, Indonesia

Correspondence:

Widha Srianto, Faculty of Sports Science, Universitas Negeri Yogyakarta, Indonesia,
widhasrianto@uny.ac.id

Abstract: Play activities are necessary in training children in karate to change the image that karate is a tough sport. The concept of Coaching Game for Upgrading Performance Model 515 (CGFU PM-515) is very relevant for training children because with this concept children think that they are playing but actually the child is practicing karate techniques. The importance of conducting research to develop a CGFU-PM 515-based maegeri basic technique skill test instrument consisting of skill, soft skill, and performance assessment elements because there has been no previous research related to the preparation of these instruments. This research is development research, conducted with quantitative and qualitative approaches. This research was conducted in three stages, the first was by conducting a literature review, the second was by conducting validity and reliability tests, and the third was validity data analysis using the V-Aiken formulation and reliability testing with the intraclass correlation coefficient (ICC). Based on the results of the validity test and reliability test of the maegeri basic technical skill test instrument has a high level of validity and has a good level of reliability, the results of the validity test results using V-Aiken obtained the results of 0.99 and the reliability test using the intraclass correlation coefficient test showed a score of 0.801. Thus, the CGFU-PM 515-based maegeri basic technical skill test instrument which includes three aspects, namely soft skills, skills, and performance can be used.

Keywords: CGFU-PM 515, Test Instrument, Karate, Maegeri, Validity and Reliability.

INTRODUCTION

Karate sport consists of kata and kumite matches, a kata match is a match that shows a series of techniques or movements that are demonstrated, kumite is a fighting match between players using techniques that are allowed according to the rules of the World Karate Federation (WKF) (Danardono et al., 2022). Play activities are needed in training children when practicing karate, this is done to change the image that karate is a hard sport. The CGFU-PM 515 concept is very relevant for training children because with this concept children think that they are playing but actually the child is practicing karate techniques. The sport of karate is growing very rapidly, one indicator that the sport of karate is very developed is karate is in great demand and involvement is dominated by children (H. Chaabene et al., 2015) (N. Koropanovski et al., 2011). The concept of CGFU-PM 515 is needed because karate is a physical contact sport. The CGFU-PM 515 concept is expected to change the mindset of children that karate sports are fun activities and not coach oriented because the category of success rates with coach oriented is low 11.3%, training children become passive and less able to explore the potential that exists in themselves (W. Crossan, M. Bednar, and R. Quinn, 2021).

The CGFU-PM 515 concept is a training model with a play approach. Play is the main choice chosen by children because play is a fun activity. Play is a vital activity for children because it can provide a positive relationship for children, play is a bridge for the development of physical, mental aspects and a means of exploration to strengthen things to find new things (O.Johan, S. Rasmus, K. Ellen, and B. Hansen, 2021). Play is a comprehensively integrated activity that makes a person skillful, agile, and can improve physical components better. When playing a person uses basic motor skills such as running, jumping, throwing, climbing, crawling, turning, done regularly, thus stimulating physical development (C. T. Dao, 2021). CGFU PM -515 is a new concept in the field of sports coaching with creative, innovative, not boring, and futuristic training patterns by utilizing the development of information technology to lead to an educational model in the industrial era 4.0. The CGFU-PM 515 concept is a high order thinking skills (HOTS), namely remembering, understanding, applying, analyzing, evaluating, and creating. The concept of CGFU-PM 515 is based on the concept of teaching games for understanding (TGfU) which has developed in physical education (J. L.

Arias-Estero et al., 2020)(A. Gil-Arias, S et al., 2021)(S. Nopembri et al., 2022). The stages of the CGFU-PM 515 concept consist of four stages, namely innovation games, natural games action, coaching approach, and performance & skill assessment (N. B. S. Siswantoyo et al., 2020)(M. Z. Zaini and N. Salimin, 2020)(C. F. Sriwahyuniati, 2020) (W. Srianto et al., 2020).

This research will focus on developing a CGFU-PM 515-based maegeri basic technique skill test instrument. The maegeri basic technique skill test instrument is very important because the maegeri technique is a prefix technique that is trained to people who start karate (M. Błaszczyszyn et al., 2019). Knowledge and understanding of motion must be considered thoroughly so that children can improve the efficiency of technical motion patterns during training. Therefore, it is very important to conduct research to compile a CGFU-PM 515-based maegeri basic technique skill test instrument consisting of skill, soft skill, and performance assessment elements because there has been no previous research related to the preparation of these instruments.

MATERIALS AND METHODS

This research is a development research, conducted with quantitative and qualitative approaches in the hope of obtaining complete and valid data results (R. L. Harrison, T. M. Reilly, and J. W. Creswell, 2020). This validity and reliability uses three stages, the first is by conducting a literature review, namely collecting relevant research sources, and conducting a preliminary participatory observation study to develop tests through articles, journals, and textbooks related to instruments and maegeri techniques (A. Gör, A. Kabakulak, A. K., 2022)(R. Ferrari, 2015). The second stage is the validity test and reliability test carried out by expert judgment consisting of 4 academic expert judgment, namely karate sports lecturers and 5 practitioner expert judgment, namely 5 coaches who have a national coach license, then the expert judgment fills in the instrument with the delphi technique (A. Saud, 2019). The third stage is to analyze the data obtained in the form of quantitative and qualitative results, quantitative data is generated from the results of expert judgment assessments while qualitative data is generated from expert judgment input and suggestions on the instrument developed.

Data Analysis Technique

The validation of the instrument content is analyzed using the V-Aiken formulation, the range of V-Aiken values is 0 to 1, if the V value <0.6 in the low category, if the V value is between 0.6 - 0.8 in the medium category, if the V value > 0.8 in the high category (R. Arthur et al., 2019).

Table 1. V-Aiken Formula

$$V = \frac{\sum s}{n(c-1)}$$

$$s = r - lo$$

- V is the Aiken scale for which the value will be sought
- S is the result of reducing the validator’s score with the lowest score
- N is the number of validators
- C is the highest validity value
- Lo is the lowest validity value

The reliability of the instrument is analyzed using the Intraclass Correlation Coefficient (ICC), following the classification of the interpretation category of the analysis results (M. P. Portney, L. G., & Watkins. 2009).

Table 2. Classification of interpretation categories of ICC analysis results

ICC Value	Intepretation
0.00 – 0.50	Poor
0.51 – 0.75	Moderate
0.76 – 0.90	Good
0.91 – 1.00	Excellent

Data collection uses a Likert scale questionnaire with 4 answer options, namely strongly agree score 4, agree score 3, disagree score 2, and strongly disagree score 1 [21] [22], analysis data obtained from expert judgment and qualitative data in the form of input on the instrument developed.

RESULTS

The assessment results were then analyzed using V-Aiken to see the validity of the instrument developed, and using ICC analysis to see the reliability results.

Table 3. Results of instrument validation using V-Aiken

Grain	Assessment																		Σs	n(c-1)	V	Description
	Expert									s												
	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9				
1	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
2	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
3	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
5	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
6	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
7	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
8	4	4	3	4	4	4	4	4	4	3	3	2	3	3	3	3	3	3	26	27	0.96	Tall
9	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
10	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
11	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
12	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
13	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
14	4	4	4	3	4	3	4	4	4	3	3	3	2	3	2	3	3	3	25	27	0.93	Tall
15	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
16	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
17	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
18	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
19	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
20	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
21	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	27	27	1.00	Tall
22	4	3	3	3	4	4	4	4	4	3	2	2	2	3	3	3	3	3	24	27	0.89	Tall

Table 4. V-Aiken average results

V	Description
0.99	Tall

Based on this data, the average value of V count is 0.99, when using 9 raters with a scale of 1 to 4, the V table is 0.81. These results indicate that the content validity of the instrument developed is valid and can be used.

Table 5. Reliabilitas dengan intraclass correlation coefficient (ICC)

	Intraclass Correlation ^b	95% Confidence Interval		F Test with True Value 0			
		Lower Bound	Upper Bound	Value	df1	df2	Sig
Single Measures	.310a	.171	.514	5.099	21	168	.000
Average Measures	.801c	.650	.905	5.099	21	168	.000

The table shows that the results of the reliability test with ICC show the average measures point shows a score of 0.801. This score if interpreted in the interpretation of the value of the ICC test results is classified as good. Based on data collection and the results of expert judgment, the CGFU-PM 515-based maegeri basic technical skill test instrument is obtained in terms of three aspects of assessment, namely soft skills, skills, and performance.

Table 6. Aspects of soft skill assessment

Aspects assessed	Criteria Asseement
Communication	Verbal expressive Non-verbal expressive Actively responds Actively argues
Leadership	Be a role model Responsible Able to resolve conflicts or differences Able to cooperate
Cooperation	Social interaction Unselfish Helping each other Able to discuss

(Source: M. A. H. Hazman et al., 2020)

Table 7. Aspects of skill assessment

Assessment Aspects	Description
Good shape	A technique that has characteristics that match the effectiveness possible within the framework of traditional karate concepts.
Sportsmanship	A component of good form and refers to an attitude of no malice or vengeance, reflected through high concentration to produce high techniques
Strong spirit	Describes the power and speed of the technique and the desire to succeed.
Vigilance	Vigilance (zanshin) is a continuous state of commitment where the participant maintains total concentration, observation, and awareness of the opponent’s potential/possibility to counterattack.
Good timing	Executing a technique at the moment when it will be effective produces a large potential effect
Correct distance	Executing a technique at the right distance so as to produce maximum potency effect

(Source: W. K. Federation, 2020)

Table 8. Aspects of performance assessment

Assessment Aspect
Chudan-no-kamae (one hand is in front, and one hand protects the body area).
Lifting the knee to the front of the body
Pushing the hips and then pushing the legs forward
Pulling quickly to the Chudan-no-kamae position

(Source: M. Blaszczyzyn, et al., 2019)

DISCUSSION

The basic concept of developing CGFU-PM is based on the concept of Teaching Games for Understanding (TGfU) which has developed in the field of physical education (J. L. Arias-Estero, et al., 2020) (A. Gil-Arias, S et al., 2021). The results of the study between learning in the context of physical education and training in sports coaching there are fundamental differences in principle, namely in physical education learning the subject is the teacher, the object is the student, the goal is to improve ability, know how to implement, measurement by process assessment, and implemented in formal school education. Whereas in training the subject is the coach, the object is the athlete, aims to make the trainee more skillful, measurement through the process and achievement of results, and in a non-formal environment. There are six stages in doing activities with the TGfU concept, namely: playing games, game appreciation, tactical awareness, making appreciate decisions, skill executions, and performance. The results of the study found that the third stage, namely tactical awareness, is the starting point in the coaching process, and the sixth stage, namely performance, is the result of a process carried out. Thus it was agreed that starting from the tactical awareness stage to be explored and studied in depth with a coaching approach. CGFU-PM 515 is the concept of training stages consisting of four stages, namely innovation games, natural games action, coaching approach, and assessment of soft skills, skill performance. (N. B. S. Siswantoyo et al., 2020).



Picture: CGFU-PM515 (Siswantoyo,dkk, 2019)

Figure 1. Tahapan CGFU-PM 515 [10]

This research focuses on the soft skill assessment stage, skill performance, which is the stage of developing an instrument to assess basic maegeri techniques based on CGFU-PM 515 which consists of three aspects of soft skill, skill and performance assessment. This instrument is very important to be developed as the basis for assessing the basic maegeri technique skills test because the maegeri technique is a kicking technique that is trained to children at the beginning of training (M. Błaszczyszyn, et al., 2019). The three aspects were validated by 9 expert judgments consisting of 4 expert judgments in academics and 5 expert judgments in practitioners. After the data is assessed, instrument validation is carried out and intraclass correlation coefficient reliability is carried out so that the instrument developed has a high level of feasibility. The results of the validity test of the average V calculated value is 0.99, when using 9 raters with a scale of 1 to 4 obtained V table is 0.81 thus the validity of the instrument content is declared valid, while the results of the reliability test with intraclass correlation coefficient (ICC) average measures points show a score of 0.801, the score if interpreted is classified as good.

CONCLUSION

This study concluded that the validity test and reliability test of the basic maegeri technical skills test have a high level of validity and have a good level of reliability, the results of the validity test results using V-Aiken obtained the results of 0.99 and the reliability test using ICC showed a score of 0.801. The product is in the form of a CGFU-PM 515-based maegeri basic technical skill test instrument which includes three aspects, namely soft skills, skills, and performance.

Acknowledgments

On this occasion, the author would like to thank Prof. Dr. Sumaryanto, M.Kes. as Rector of Yogyakarta State University, Prof. Dr. Siswantoyo, M.Kes. as Promoter, Dr. Rumpis Agus Sudarko. as Co-Promoter in the research who has provided direction in writing research. Family who always provide support in writing research Trusti Aulia, Alesha Janitra Maheswari, Rajendra Argya Hamizan, and Rajendara Argya Atharrazka.

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Primljen: 01. decembar 2023. / Received: December 01, 2023
Prihvaćen: 22. februar 2024. / Accepted: February 26, 2024



DIFFERENCES IN THE EXERTION OF FORCE PRODUCED ON A SURFACE OF THE DOMINANT AND NON-DOMINANT LEG IN BASKETBALL PLAYERS OF DIFFERENT COMPETITION LEVELS

ADI PALIĆ¹, NIJAZ SKENDER², ADEMOVIĆ ADNAN¹, INER ALIĆ³

¹ Faculty of theaching University „Dzermal Bijedić“ Mostar, Bosnia and Herzegovina

² Faculty of Pedagogy University of Bihać, Bosnia and Herzegovina

³ Mixed High School Konjic, Bosnia and Herzegovina

Correspondence:

Adi Palić, Faculty of theaching University Dzermal Bijedić“ Mostar, Bosnia and Herzegovina

adi.palic@unmo.ba

Abstract: Basketball as a sports activity has evolved over its long history from an alternative game to a highly selective sport in which success is reserved exclusively for the most talented and capable individuals. The aim of the research was to examine the differences in the exertion of force produced on a surface for the dominant and non-dominant leg in basketball players of different levels of competition. The research was conducted on a sample of 33 subjects of senior age from three levels of basketball competition in the Federation of Bosnia and Herzegovina (FBiH). Exertion of the force exercised during the jump on a surface was obtained using the Gyko System and Opto Jump. The “Single leg jump” test procedure was used. It is concluded that 30-50% of the variables have a statistically significant difference, which partially indicates the existence of statistically significant differences in the exertion of force in the dominant and non-dominant leg. The biggest difference in the dominant and non-dominant leg was detected in subjects of the A1 League (3 out of 6 variables). The smallest difference was detected in the subjects of the A2 League (no statistically significant difference was detected in any variable). Subjects in the Premier League showed a difference in 2 of 6 variables (flight time and jump height). The results obtained indicate that regular practice with both legs, both in the game and in training, will help players become balanced and efficient in all aspects of the game. Based on these results, it is possible to construct test batteries that will provide quality information necessary for planning and programming in basketball.

Keywords: Basketball players, Single leg jump.

INTRODUCTION

The intensity of muscle activity in sports games depends on the duration and intensity of the game, the number of players, the dimensions of the playing field, and so on. The exertion, both physical and psychological, during the game affects the magnitude of the load on vegetative functions, which can be moderate or within the limits of sub-maximal or maximal load. (Skender, 2004, Skender, 2008).

CNS impact, muscle characteristics, flexibility, movement technique, and motivation are just some of the possible ways to increase speed, agility, and explosiveness. Connecting these abilities with the technical and tactical requirements of the soccer game is what is the goal of development and the final requirement for training these abilities. (Jazvin at all 2021,). According to the structure of movement, it is the most energetically demanding, and according to the frequency, it is the most common physical ability in sports games. (Karalic, Skender & Jelcic, 2022).

The strong expansion of the basketball game is present around the world. In our country, conditions have been created that encourage the development and improvement of the scientific methodical basis of the training process, as well as other factors that will influence the achievement of top sports results. Successful basketball players are characterized by a polyvalent technique, expressed in morphological characteristics, functional capacities, motor abilities and psycho-social personality traits (Sekeljic & Stamatovic, 2008). Speaking about the fitness training of basketball players Semenick (1985) says that basketball is “basically an anaerobic running sport in which speed, strength, and agility are of primary importance.” Any training stimulus observed in the long run must be managed according to biological and pedagogical principles, and based on this, motor skills can be developed gradually by increasing the load with the application of certain methods (Bjelica & Fratric, 2011). In order for a basketball player to effectively perform a starting acceleration of his body, he must have a good initial position and shift his body weight in the

desired direction of movement. Stopping quickly from motion is just as important as acceleration. As basketball becomes faster and faster, thanks to increasingly advanced fitness preparations that enable players to achieve maximum results and goals, players have less time for the timely execution of the technical-tactical element in order to score in the attack phase. Thus, the problem arises of how to stop the movement as effectively as possible after receiving the ball from a teammate and perform a jump shot as quickly as possible, in order to maintain an advantage over the opponent, i.e., the defender and prevent him from successfully defending the shot. So far, extensive research has been done on jump shots in basketball from the aspect of biomechanics. Rojas, Cepero, Ona, and Gutierrez (2000) investigated the adaptation in the jump shot technique of an offensive player against a defensive player. Okazaki and Rodacki (2000) analyzed the impact of increased distance on the basketball jump shot on the outcome and performance. Good biomechanics of a jump shot in basketball implies proper movement of the upper extremities, as well as a well-balanced and strong jump (Krause, seMeyer, D., & Meyer, J., 2008). Li-I Wang et. al. compared kinematics and kinetics during landing after a one- or double-contact jump and their potential impact on ACL injuries (Wang, Gu, Chen & Chang, 2010). Therefore, basketball belongs to sports that require great precision in performing movements (Erculj & Supej, 2006).

The aim of this paper is to present the differences in the exertion of force produced on the surface of the dominant and non-dominant leg in basketball players of different levels of competition.

METHOD

This research was conducted on a sample of 33 senior league respondents. The ability of basketball players from three basketball competition levels in FBiH was tested and assessed. Namely, K.K. "J&A" Sports Academy which participates in the A2 league (N - 12), K.K. "Konjic" which participates in the A1 league (N - 11), and H.K.K. "Zrinjski", which participates in the Premier League.

A sample of measuring instruments

- DurationConc(s) - Duration of concentric contraction expressed in seconds
- DurationEks(s) - Duration of eccentric contraction expressed in seconds
- FMax(N/kg) - Expressed force on the surface with respect to body weight
- Vmax (m/s) - Body speed expressed in meters per second
- Flighttime (s) - Flight time
- Hight (cm) - Jump height
- Pmax (wat/kg) – Maximum power with respect to body weight

The parameters of the force exerted during the jump on the surface were obtained using the Gyko System and Opto Jump during the execution of the "Single leg jump" test procedure.

In the paper, basic descriptive statistical indicators were calculated for all respondents (arithmetic mean, minimum, maximum, and standard deviation). After that, a T-test was performed for the samples within each group in order to determine the statistical significance of the difference in the height of the jump and the exertion of force on the surface during the jump. The obtained results are considered statistically significant at $p < 0.05$.

RESULTS

In order to show the differences in the exertion of force on the ground in the jump in the dominant and non-dominant leg of all subjects, Table 1 shows arithmetic means (SV) and standard deviations (SD). Table 2 shows T-test values (t), degrees of freedom (DF), and statistical significance (P).

The results of the T-test (Table 2) showed that at the univariate level there is a statistically significant difference in some of the jump parameters with which we measured the force exerted on the surface. In the case of Premier League players, there were differences in two out of six variables, in both cases in favor of the dominant leg. The variables are flight time (s) ($t = -2.28$) and ($\text{sig.} = 0.048$), and the variables jump height (cm) ($t = 2.26$) and ($\text{sig.} = 0.050$). Furthermore, the table presents an analysis of the differences between the arithmetic means of the A1 League respondents, and we can conclude that statistically significant differences were obtained in three out of six variables. Differences are evident in the variables flight time (s), jump height (cm), and eccentric contraction duration (s) at a high level of $\geq 98\%$. In two of the three variables in which there was a difference, there is an evident difference in favor of the dominant leg. For the variable flight time (s), the value is ($t = -2.89$) and ($\text{sig.} = 0.016$), the variable jump

height (cm) has values ($t = -2.90$) and ($\text{sig.} = 0.016$), while the variable eccentric contraction duration (s) has values ($t = 2.88$) and ($\text{sig.} = 0.016$), speaking in favor of the non-dominant leg. This result, showing the duration of the eccentric contraction in the non-dominant leg, is also in favor of the dominant leg. The third part of the table tells us about the analysis of the differences in the arithmetic means of the A2 League respondents, where we can conclude that none of the six variables used contributed to a statistically significant difference.

Based on the obtained results of the central and dispersion parameters, and the results of the T-test, where we determined statistically significant differences between the dominant and non-dominant legs when exerting force on the ground in basketball players of three different levels of competition, we come to the conclusion, as was expected, that there are statistically significant differences in some cases in favor of dominant legs.

Table 1. Descriptive indicators of force exerted by the non-dominant and dominant leg on the surface with all subjects

	Dominant leg			Non-dominant leg	
	N	A.S.	Std. Dev.	A.S.	Std. Dev.
Flight time (s)	33	.4740	.11368	.4229	.06517
Jump height (cm)	33	29.0758	13.44584	22.4515	6.35148
Duration of concentric contraction (s)	33	.2912	.09756	.3435	.27713
Duration of eccentric contraction duration (s)	33	.4110	.21257	.5252	.31172
Maximum force (N/kg)	33	32.4921	7.79913	32.4064	8.71306
Maximum speed in m/s	33	2.3639	.50961	2.1261	.27037
Maximum power in wat/kg	33	57.6082	21.86937	51.3888	13.29748
Valid N (listwise)	33				

Table 2. Analysis of the differences of A.S. when exerting force on the surface of the dominant and less dominant leg in the subjects

	Premier League			A1 League			A2 League		
	t	df	Sig.	t	df	Sig.	t	df	Sig.
Flight time (s)	-2.289	9	.048	-2.896	10	.016	-.948	11	.363
Jump height (cm)	-2.268	9	.050	-2.904	10	.016	-.985	11	.346
Duration of concentric contraction (s)	-2.145	9	.061	-.305	10	.766	1.665	11	.124
Duration of eccentric contraction duration (s)	.912	9	.386	2.888	10	.016	-.426	11	.679
Maximum force (N/kg)	1.168	9	.273	-.183	10	.859	-.640	11	.535
Maximum power in wat/kg	1.543	9	.157	-2.051	10	.067	-.925	11	.375

DISCUSSION

It is assumed that the results achieved by the A2 League basketball players – that is, without any statistically significant differences – can be attributed to the lower level of competition and reduced systematic monitoring and programming of training. In other words, more attention is paid to satisfaction in the game, where there are no exercises for the development of explosive exercises, which is not the case with basketball players of a higher level of competition.

It is important to mention that the results shown above are largely expected in the basketball game. Due to the large number of jumps represented in the game, the dominant leg is considered to be the leg from which the jump is performed, i.e., the leg opposite to the dominant side of the body. The results indicate that statistically significant differences are in favor of the dominant leg. These results favor the left leg in right-handed players and vice versa. The most evident difference was obtained in the subjects of the A1 League, while the smallest differences were observed in the subjects of the A2 League.

Abrams GD, Harris JD et al. (2014) tried to determine in their research the differences between plyometric training that is done in the frontal and sagittal plane, which can largely be the reason for the results of our research. In the mentioned research, it was concluded that plyometric training in the sagittal plane improves the performance of the vertical jump in the opposite direction more than plyometric training in the frontal plane, while plyometric training

in the frontal plane improved the performance of the lateral jump (left) and the lateral shuffle test (left) more from plyometric training in the sagittal plane. The standing long jump, lateral jump (right) and lateral shuffling (right) tests did not show a significant interaction effect. These results suggest that basketball players should include plyometric training in all planes to improve strength and speed of change of direction. Takashi Sugiyama, Masahiro Kageyama et al. (2014) aimed to show their research the asymmetry between the dominant and non-dominant legs in the jump in terms of the behavior of the lower extremities during running and single jumps. They came to the result, as we did in our research, that the height of the jump was significantly higher with the dominant leg. During the take-off phase, ankle and knee joint angles were significantly greater in the dominant leg. In addition, the contact time for the dominant leg was significantly shorter. Such results indicate that jump height asymmetry can be attributed to ankle joint kinematics during the take-off phase, which may be related to the ability to efficiently transfer take-off speed for the high jump. Work that deserves attention in this topic is Wang L.I. (2011) whose aim was to examine the kinematics in the ankle and knee joints and their risk for anterior cruciate ligament injuries that occur during jumping and landing. Higher maximum posterior and vertical ground reaction forces, and maximum anterior and lateral forces of the proximal tibia were observed during the landing phase of the one-legged jump. These results indicate that single-leg landings may have a higher risk of ACL injury than double-leg landings in jumping tasks that may be influenced by lower limb kinematics during the landing phase.

Basketball is eye-catching because of the speed of the game, acrobatic moves, tactical elements, and the possibility to score spectacular points. Basketball is a dynamic sport that involves different movements to achieve success on the court such as: running, dribbling, shooting, blocking, jumping, passing, defensive moves, and blocks. These movements make basketball a dynamic and exciting game that requires good coordination, agility, speed, strength, and tactical thinking. Wen, Dalbo et al. (2018) state in their research that many of the basic movements performed during basketball are based on basic strength-related attributes, including speed, change of direction, and jump. It was also pointed out that possible tests of basketball players should be based more on the specificity of movement appropriate for basketball players, which gives importance to the tests that were used for the purpose of this research. It is important to note that basketball training is adapted to different age groups, experience levels, and goals of the player or team. Professional players and teams often conduct an intensive and comprehensive training program, while amateur players and recreational teams may have less intensive training focused on improving basic skills and enjoying the game.

The non-dominant leg is the one that the player uses less often to make accurate shots or dribbles. In basketball, it is also important to develop and use the non-dominant leg to improve balance, agility, and flexibility, which can help the player in different situations on the court.

Here are some reasons why it is important to develop and use the non-dominant leg in basketball:

Better balance: Developing a non-dominant leg improves a player's balance and allows him to be more stable when dribbling, shooting or changing direction.

Less predictability: If a player is too dependent on one leg, he becomes predictable for the opposing player's defense. Using both legs makes it difficult for the defense to predict which leg the player will use to drop off or finish the action.

Flexibility: The development of a non-dominant leg allows the player more opportunities to pass and perform various moves.

Reduction of injuries: Equal use of both legs helps to reduce the asymmetry of the body and the risk of injuries caused by excessive load on one leg.

CONCLUSION

The research was conducted with the aim of determining the differences in force exertion on the surface between the dominant and non-dominant legs of basketball players at different levels of competition.

A slightly disrupted distribution was observed in the variable of the duration of concentric contraction of the right leg among all participants. Based on the results of central dispersion parameters and T-test results, which indicated a difference in the force load on the dominant and non-dominant leg surfaces, it can be concluded that 30-50% of the variable has a statistically significant difference, partially suggesting the existence of statistically significant differences in force manifestation in the dominant and non-dominant leg.

The largest difference between the dominant and non-dominant leg was found in the participants of the A1 league (3 out of 6 used variables). Differences were observed in the variables of flight time, jump height, and eccentric contraction duration. In Premier league subjects, a difference was found in 2 out of 6 used variables (flight time and jump height).

Coaches often work with players to develop and improve skills on both legs to make players more complete and versatile. Regular practice with both legs, both in-game and in training, will help players become balanced and efficient in all aspects of the game. From the obtained results, it will be possible to construct batteries of tests that will provide quality information necessary for planning and programming basketball training.

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Primljen: 01. februar 2024. / Received: February 01, 2024
Prihvaćen: 14. februar 2024. / Accepted: February 14, 2024



THE EFFECT OF A SIX-MONTH TRAINING PROCESS ON THE ANTHROPOLOGICAL STATUS OF THE FEMALE CADET VOLLEYBALL PLAYERS

EFEKAT ŠESTOMESEČNOG TRENAŽNOG PROCESA NA ANTROPOLOŠKI STATUS ODBOJKAŠICA KADETSKOG UZRASTA

DALIBORKA STANKOVIĆ, KONSTANTINOS STRATAKIS

Faculty of Medicine, University of Belgrade

Medicinski fakultet, Univerzitet u Beogradu, Srbija

Correspondence:

Daliborka Stanković

Faculty of Medicine, University of Belgrade
daliborka7.ds@gmail.com

Korespondencija:

Daliborka Stanković

Medicinski fakultet, Univerzitet u Beogradu, Srbija
daliborka7.ds@gmail.com

Abstract: The aim of this study was to determine any potential differences in the changes of individual anthropometric characteristics and motor skills of female volleyball players from the DIF volleyball school, aged between 12-15 years, who were tested before and after a continuous six-month training process. The sample consisted of 50 female volleyball players from the DIF volleyball school, aged 12-15 years, who trained four times a week for 90 minutes per session. All subjects were tested before and after the six-month continuous training process. Anthropometric characteristics, such as body height, body mass, body fat percentage, muscle percentage, body mass index, and arm span measurement, were determined for all subjects. Motor skills were also evaluated, including hand grip strength, flexibility of the muscles of the back of the thigh, flexibility of the shoulder girdle, explosiveness of the shoulder girdle muscles, explosiveness of the leg muscles (high jump), and agility. The results showed a statistically significant difference in body height, BMI, arm span, hand grip strength, overhead stick rotation, sit and reach, and medicine ball throwing. One of the limitations of this study was the insufficient sample size. However, despite this limitation, the results can be considered as a significant initial basis for examining the relationship between anthropometric parameters and motor skills, which can contribute to the existing knowledge in this area. It is important to note that only well-dosed and organized physical activity can lead to improvement in the results of young athletes.

Keywords: training, motor skills, anthropometric characteristics, continuous training process, physical activity.

Sažetak: Cilj ovog istraživanja je bio da se utvrdi da li postoji razlika u promeni individualnih antropometrijskih karakteristika i motoričkih sposobnosti odbojkašica škole odbojke DIF, uzrasta 12-15 godina, koje su testirane pre i posle kontinuiranog trenažnog procesa u trajanju od šest meseci. Uzorak je uključivao 50 ispitanika – odbojkašica škole odbojke DIF uzrasta 12-15 godina, koje su trenirale odbojku četiri puta nedeljno i svaki trening je trajao 90 minuta. Odbojkašice su testirane pre i nakon kontinuiranog trenažnog procesa u trajanju od 6 meseci. Svim ispitanicama su se određivale antropometrijske karakteristike - telesna visina, telesna masa, procenat telesnih masti, procenat mišića i indeks telesne mase, merenje raspona ruku. Zatim su procenjene motoričke sposobnosti: jačina stiska šake, fleksibilnost mišića zadnje lože buta, fleksibilnost ramenog pojasa, eksplozivnost mišića ramenog pojasa, eksplozivnost mišića nogu (skok uvis) i agilnost. Rezultati ukazuju na to da je postojala statistički značajna razlika u varijablama telesna visina, BMI, raspon ruku, jačina stiska šake, iskret palicom, pretklon u sedu i bacanje medicinke. Kao nedostatak ovog istraživanja, može da se navede nedovoljno veliki uzorak ispitanika. Uprkos ograničenjima ovog istraživanja, dobijeni rezultati mogu biti značajna inicijalna osnova za ispitivanje relacije antropometrijskih parametara i motoričkih znanja, što omogućava relevantan teorijski doprinos postojećim saznanjima u ovoj oblasti. Samo dobro dozirana i organizovana fizička aktivnost može dovesti do poboljšanja u rezultatima mladih sportista.

Cljučne reči: trening, motoričke sposobnosti, antropometrijske karakteristike, kontinuirani trenažni proces, fizička aktivnost.

INTRODUCTION

Each sport or sport branch has its unique set of factors that influence the outcome. Different types of

Uvod

Svaki sport, odnosno sportska grana ima svoju jedinstvenu strukturu faktora koji utiču na sportski rezultat. Sva-

sports demand specific skills, which are developed through training. The scope, intensity, and type of training play a crucial role in shaping the human body and the movements it can perform. Thus, different sports create different motor skill profiles for each of them (Feroli, Rampinini, Bosio, La Torre, Azzolini & Coutts, 2018). Volleyball is an engaging, interesting, complex, and dynamic sport. The game involves quick transfer of actions from one side of the court to the other, and teams strive to win by achieving a greater number of points through successful attacking or outsmarting the opponent. Volleyball demands a series of motor actions to be performed correctly and efficiently; therefore, training to improve those elements positively impacts the development of motor skills (Nešić, Sikimić, Ilić, & Stojanović, 2011). Volleyball training for children should not be a mini version of adult training. At the beginning, training should focus on the development of children's physical, cognitive, and social skills, not on volleyball game demands. Additionally, the training should follow a pedagogical approach towards children, as significant mistakes can occur otherwise (Janković & Marelić, 2003). Several scientific studies have recorded a significant number of similar studies demonstrating the influence of the training process on the anthropological status of female volleyball players. Nešić, Ilić, Majstorović, Grbić, & Osmankač (2013) examined quantitative changes in general and specific motor skills influenced by a three-month experimental treatment of volleyball training. The authors found that the experimental program contributed to a positive shift in all variables (standing long jump, block range, 20m run, Russell-Lange test - fingering, Russell - Lange's test - "bump," and Russell-Lange's test - serve) in a sample of 40 female volleyball players aged 13-14 years. In another study, Nešić, Majstorović, Osmankač, Milenkoski, and Uslu (2014) concluded that different ages of young volleyball players showed significant differences in motor skills such as agility, jumpiness, flexibility, and noticed anthropometric characteristics, a consequence of the positive effects of continuous training. Lehnert, Sigmund, Lipinska, Vařeková, Hroch, & Xaverová (2017) conducted a study where twelve young female volleyball players participated in an eight-week preseason training program. The results indicated numerous positive changes in physical performance and the risk of injury, despite the lack of body mass and its composition.

The aim of this study is to determine the potential difference in change of individual anthropometric char-

ka vrsta sporta, pred onoga ko se njome bavi, stavlja karakteristične zahteve u pogledu sposobnosti koje su potrebne za uspešno učestvovanje i takmičenje. Te sposobnosti se razvijaju i unapređuju kroz treninge koji svojim obimom, tipom i intenzitetom utiču na oblikovanje ljudskog tela i kretnji koje ono može da izvede, pa tako različite sportske grane kreiraju drugačije profile motoričkih sposobnosti kod svakog od njih (Feroli, Rampinini, Bosio, La Torre, Azzolini, Coutts, 2018). Odbojka je vrlo atraktivna, interesantna, kompleksna i dinamična sportska grana, sa brzim transferom akcija sa jedne strane terena na drugi, u kojoj timovi nastoje da dođu do pobede postignuvši veći broj poena, putem uspešnog napada ili nadmudrivanjem protivnika. S obzirom da osnovni odbojkaški elementi uključuju i čitav niz motoričkih radnji kako bi njihovo izvođenje bilo pravilno, ujedno i efikasno, razumljivo je i potpuno opravdano očekivati da će trenažni rad na poboljšanju tih elemenata uticati i na razvoj motoričkih sposobnosti (Nešić, Sikimić, Ilić i Stojanović, 2011). Trening odbojke za decu nije „mala“ verzija treninga za odrasle. U početku trening mora biti zasnovan na razvoju fizičkih, kognitivnih i socijalnih sposobnosti dece, a ne na zahtevima odbojkaške igre. Takođe, jako bitno je da se trening bazira na pedagoškom pristupu trenera u odnosu na dete, jer je moguće napraviti velike greške ukoliko se drugačije bude radilo (Janković i Marelić, 2003). Treneri mlađih kategorija moraju znati kada je optimalno vreme za početak bavljenja odbojkom, kada je vreme za specijalizaciju po igračkim funkcijama i u kojem uzrastu možemo očekivati vrhunske rezultate. Postoji nekoliko faza sportskog razvoja s obzirom na uzrast (Bompa, 2000): inicijacija (početna faza treninga za uzrast od 6 do 10 godina), oblikovanje sportiste (uzrast od 11 do 14 godina), specijalizacija (uzrast od 15 do 18 godina), vrhunski sport (uzrast od 19 godina i stariji). U dosadašnjim naučno-istraživačkim radovima, zabeležen je značajan broj sličnih studija koje su pokazale uticaj trenažnog procesa na antropološki status odbojkašica.

Nešić, Ilić, Mjstorović, Grbić i Osmankač (2013) ispitivali su kvantitativne promene u opštim i specifičnim motoričkim sposobnostima pod uticajem tromesečnog eksperimentalnog tretmana – trening odbojke. Na uzorku od 40 odbojkašica uzrasta 13-14 godina, autori su ustanovili da je eksperimentalni program doprineo pozitivnom pomaku u svim varijablama (skok u dalj iz stojećeg položaja, domet iz bloka, trčanje na 20 m, Rasel-Langeov test - prsti, Rasel – Langeov test – „čekić“ i Rasel-Langeov test – servis), što je slučaj i kod naših odbojkašica testiranih nakon programa treninga od šest meseci. U drugoj studiji, koju su sprovedi Nešić, Majstorović, Osmankač, Milenkoski i Uslu (2014) je zaključeno da među mladim odbojkašima različitog uzrasta postoje značajne razlike u motoričkim sposobnostima kao

acteristics and motor skills of female volleyball players from the "DIF" volleyball school, aged 12-15 years, who were tested before and after six months of continuous training.

METHOD

A prospective study was conducted to assess the motor skills and physical characteristics of 50 female volleyball players aged 12-15 years, who trained four times a week at the "DIF" volleyball school. The training sessions lasted 90 minutes and included technical elements of the spike, serve, fingering, and bump, as well as strength exercises. The focus was on the development and learning of the technique. The study included only those players who did not have any injury that could affect the results. Anthropometric characteristics such as body height, body mass, body fat percentage, muscle percentage, and body mass index were measured using appropriate instruments. Arm span was measured using a meter. Motor skills were assessed using various techniques such as hand grip strength using a dynamometer, hamstring flexibility using a box, shoulder girdle flexibility using a stick, shoulder girdle muscle explosiveness using a medicine ball, leg muscle explosiveness using high jump and vertical jump tests, and agility using the X test. The data obtained was analyzed using descriptive statistics, and all measurements were described by mean, standard deviation, minimum, maximum, coefficient of variation, and t-test for dependent samples. Excel and statistical programs were used for database preparation and processing. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1 displays the average body height of 161.5 cm at the initial measurement, while in Table 2, the final measurement shows an average height of 163 cm. The body mass did not show significant changes. The arm span was 162 cm in the first measurement and increased proportionally to 163 cm in the final measurement. As body height increases, there is a corresponding increase in arm span, which can sometimes exceed body height, as it did in the first measurement. The coefficient of variability for body height was the lowest at 5%, while for arm span, it was slightly higher at 7%.

As for the motor skills, Table 3 shows the smallest coefficient of variability was noticed in the test for assessing agility (X test), while the largest one appears in the flexibility test - sit and reach as well as in the leg muscle explosiveness test - squat jump.

što su agilnost, skočnost, gipkost, kao i u uočenim antropometrijskim karakteristikama, što je posledica pozitivnih efekta kontinuiranog trenažnog procesa.

Lehnert, Sigmund, Lipinska, Vařeková, Hroch I Xaverová (2017) sprovedeli su studiju u kojoj je dvanaest mladih odbojkašica učestvovalo u osmonedeljnom programu predsezonskog treninga. Rezultati studije ukazuju na brojne pozitivne promene u fizičkim performansama i riziku od povreda, uprkos nedostatku promena telesne mase i sastava.

Cilj ovog istraživanja je bio da se utvrdi da li postoji razlika u promeni individualnih antropometrijskih karakteristika i motoričkih sposobnosti odbojkašica škole odbojke „DIF“, uzrasta 12-15 godina, koje su testirane pre i posle kontinuiranog trenažnog procesa u trajanju od šest meseci.

METOD RADA

Istraživanje je sprovedeno po tipu prospektivne studije. U ovom istraživanju je uključeno 50 devojčica – odbojkašica škole odbojke „DIF“ uzrasta 12-15 godina, koje su trenirale odbojku četiri puta nedeljno i svaki trening je trajao 90 minuta. Na treningu su izvođeni tehnički elementi smeča, servisa, odigravanje prstima i čekićem, kao i elementi bloka, kombinovani sa vežbama snage. Takođe trening je bio usmeren na učenje i razvoj tehnike. Kriterijum za uključivanje u studiju bio je da ispitanici nemaju nikakve povrede koje bi mogle da utiču na rezultate studije. Odbojkašice su testirane pre i nakon kontinuiranog trenažnog procesa u trajanju od 6 meseci na Fakultetu sporta i fizičkog vaspitanja, Univerziteta u Beogradu. Svim ispitanicama su se određivale antropometrijske karakteristike (Macura, 2007) - pomoću Antropometra po Martinu mere na je telesna visina (TV), pomoću vage „tanita BC545n“ merene su telesna masa (TM), procenat telesnih masti (PM), procenat mišića (%M) i indeks telesne mase (BMI), pomoću metra izvršeno je merenje raspona ruku (RR). Zatim su procenjene motoričke sposobnosti: jačina stiska šake pomoću dinamometra (MS) (Zarić, Dopsaj i Marković, 2018), fleksibilnost mišića zadnje lože buta pomoću sanduka (PuS) (Ayán, Álvarez, González, & de Quel Martínez, 2018), fleksibilnost ramenog pojasa pomoću palice (IP), eksplozivnost mišića ramenog pojasa pomoću bacanja medicinke (BM) (Van den Tillaar i Marques, 2013), eksplozivnost mišića nogu (skok uvis, vertikalni skok) pomoću opto jump testa i Sardžent testa (SKOK i VS) (Heishman, Daub, Miller, Freitas, Frantz i Bembem, 2020) i agilnost pomoću X (iks) testa (X test) (Majstorović, Nešić, Grbić, Savić i Dopsaj, 2019)..

Analiza dobijenih podataka vršila se metodama deskriptivne statistike. Za pripremu baze podataka i statističku obradu je korišćen Excel i statistički program.

Table 1. Results of descriptive statistics of anthropometric characteristics - initial measurement

	BH/TV	AS/RR	BM/TM	BMI/BMI	FP/PM	%M/%M
N/N	50	50	50	50	50	50
M/SV	161.50	162.23	55.11	20.98	22.63	34.25
SD/SD	8.98	10.75	11.24	3.13	6.68	2.30
Min/Min	142.0	138.5	35	14.2	7.7	30.5
Max/Max	177.4	187.4	79	27.1	33.1	39.2
cV%(x100)	0.05	0.07	0.20	0.15	0.30	0.07

BH- body height; **AS** – arm span; **BM** – body mass; **BMI** – body mass index; **FP** – fat percentage; **%M** – muscle percentage; **N** – total number of subjects; **M** – mean; **SD** – standard deviation; **Min** – minimum; **Max** – maximum; **cV%** – variable coefficient

Table 2. Results of descriptive statistics of anthropometric characteristics - final measurement

	BH/TV	AS/RR	BM/TM	BMI/BMI	FP/PM	%M/%M
N/N	50	50	50	50	50	50
M/SV	163.16	163.44	55.42	20.56	22.69	34.29
SD/SD	8.61	10.70	11.37	3.07	6.22	2.21
Min/Min	145.00	142.00	31.00	13.61	10.70	30.06
Max/Max	179.00	189.00	77.00	28.19	33.80	38.90
cV%(x100)	0.05	0.06	0.20	0.15	0.27	0.06

BH- body height; **AS** – arm span; **BM** – body mass; **BMI** – body mass index; **FP** – fat percentage; **%M** – muscle percentage; **N** – total number of subjects; **M** – mean; **SD** – standard deviation; **Min** – minimum; **Max** – maximum; **cV%** – variable coefficient

Table 3. Results of descriptive statistics of motor skills - initial measurement

	R_MG/ D_MS	L_MG/ L_MS	JUMP/ SKOK	OSP/IP	SiR/ PuS	X_test/ X_test	MT/ BM
N/N	50	50	50	50	50	50	50
M/SV	234.34	216.78	27.76	74.56	21.49	9.08	5.82
SD/SD	72.00	72.89	10.53	15.32	5.84	1.34	1.30
Min/Min	96.00	98.00	9.8	25	7.0	1.60	3.00
Max/Max	392.00	389.00	56.3	101	32.0	11.70	8.00
cV% (x100)	0.31	0.34	0.38	0.20	0.27	0.15	0.22

MG – maximum hand grip; **JUMP** – squat jump; **OSP** – overhead stick rotation, **SiR** – sit and reach, **MT** – medicine ball throwing; **R** – right; **L** – left; **N** – total number of subjects; **M** – mean; **SD** – standard deviation; **Min** – minimum; **Max** – maximum; **cV%** – variable coefficient

Tabela 1. Rezultati deskriptivne statistike antropometrijskih karakteristika – inicijalno merenje

TV- telesna visina; **RR** – raspon ruku; **TM** – telesna masa; **BMI** – indeks telesne mase; **PM** – procenat masti; **%M** – procenat mišića; **N** – ukupan broj ispitanika; **SV** – srednja vrednost; **SD** – standardna devijacija; **Min** – minimum; **Max** – maksimum; **cV%** – koeficijent varijacije

Tabela 2. Rezultati deskriptivne statistike antropometrijskih karakteristika – finalno merenje

TV- telesna visina; **RR** – raspon ruku; **TM** – telesna masa; **BMI** – indeks telesne mase; **PM** – procenat masti; **%M** – procenat mišića; **N** – ukupan broj ispitanika; **SV** – srednja vrednost; **SD** – standardna devijacija; **Min** – minimum; **Max** – maksimum; **cV%** – koeficijent varijacije

Tabela 3. Rezultati deskriptivne statistike motoričkih sposobnosti – inicijalno merenje

TV- telesna visina; **RR** – raspon ruku; **TM** – telesna masa; **BMI** – indeks telesne mase; **PM** – procenat masti; **%M** – procenat mišića; **N** – ukupan broj ispitanika; **SV** – srednja vrednost; **SD** – standardna devijacija; **Min** – minimum; **Max** – maksimum; **cV%** – koeficijent varijacije

Sva merenja su opisana merama centralne tendencije, srednja vrednost (SV), standardna devijacija (SD), minimum (MIN), maksimum (MAX), koeficijent varijacije rezultata (%cV) i t test za zavisne uzorke (t test). Sve vrednosti p ispod 0.05 biće smatrane statistički značajnim.

Table 4. Results of descriptive statistics of motor skills - final measurement

	R_MG/ D_MS	L_MG/ L_MS	JUMP/ SKOK	OSP/IP	SiR/ PuS	X_test/ X_test	MT/ BM
N/N	50	50	50	50	50	50	50
M/SV	213.42	194.92	29.98	76.04	23.66	9.09	5.98
SD/SD	56.88	58.12	6.87	15.23	6.36	.86	1.33
Min/Min	100.00	79.00	14.00	28	7.00	7.17	3.00
Max/Max	373.00	329.00	45.00	105	34.00	11.70	8.55
cV% (x100)	0.27	0.30	0.23	0.20	0.27	0.09	0.22

MG – maximum hand grip; **VJ** – vertical jump; **OSP** – overhead stick rotation, **SiR** – sit and reach, **MT** – medicine ball throwing; **R** – right; **L** – left; **N** – total number of subjects; **M** – mean; **SD** – standard deviation; **Min** – minimum; **Max** – maximum; **cV%** - variable coefficient

Table 5. Results of statistical difference (statistical significance) of subjects tested – initial and final testing comparison, assessment and evaluation of morphological characteristics and motor skills (t-test for small dependent samples)

	T	df	P
BH – BH1 / TV – TV1	-8.32	49	.001
AS – AS1 / RR – RR1	-3.55	49	.001
BM – BM1 / TM – TM1	-0.65	49	.519
BMI – BMI1 / BMI – BMI1	2.10	49	.040
FP – FP1 / PM – PM1	-0.21	49	.834
%M – %M1 / %M – %M1	-0.46	49	.649
R_MG – R_MG1 / D_MS – D_MS1	3.62	49	.001
L_MG – L_MG1 / L_MS – L_MS1	3.48	49	.001
Jump – VJ / Skok – VS	-1.81	49	.077
OSP – OSP1 / IP – IP1	-3.71	49	.001
SiR – SiR1 / PuS – PuS1	-5.38	49	.000
X test – X test1 / X test – X test1	1.86	49	.069
MT – MT1 / BM – BM1	-0.02	49	.024

BH- body height; **AS** – arm span; **BM** – body mass; **BMI** – body mass index; **FP** – fat percentage; **%M** – muscle percentage; **MG** – maximum hand grip; **JUMP** – squat jump; **VJ** – vertical jump; **OSP** – overhead stick rotation, **SiR** – sit and reach; **MT** – medicine ball throwing; **R** – right; **L** – left; **t** – students' t-division; **df** – degree of freedom; **p** – possibility

Table 5 shows the obtained statistically significant change in variables: body height, arm span and BMI, while based on the mean values of motor skills between the first and second measurements, a statistically significant change was obtained in variables: maximum hand grip (maximum force), overhead stick rotation, sit and reach and medicine ball throwing.

Tabela 4. Rezultati deskriptivne statistike motoričkih sposobnosti – finalno merenje

MS - maksimalni stisak šake; **VS** – vertikalni skok; **IP** – iskret palicom, **PuS** – pretklon u sedu, **BM** – bacanje medicinke; **D** – desna; **L** – leva; **N** – ukupan broj ispitanika; **SV** – srednja vrednost; **SD** – standardna devijacija; **Min** – minimum; **Max** – maksimum; **cV%** - koeficijent varijacije

Tabela 5. Rezultati statističke razlike (statistička značajnost) testiranih ispitanika – poređenje početnog i krajnjeg testiranja, procena i evaluacija morfoloških i motoričkih karakteristika i veština (t-test za male zavisne uzorke)

TV- telesna visina; **RR** – raspon ruku; **TM** – telesna masa; **BMI** – indeks telesne mase; **PM** – procenat masti; **%M** – procenat mišića; **MS** - maksimalni stisak šake; **SKOK** – skok sa počučnjem; **VS** – vertikalni skok; **IP** – iskret palicom, **PuS** – pretklon u sedu, **BM** – bacanje medicinke; **D** – desna; **L** – leva; **t** – studentova t-raspedela; **df** – stepen slobode; **p** – verovatnoća

REZULTATI

U tabeli 1 vidimo da je prosečna telesna visina nakon inicijalnog merenja bila je 161.5cm dok je na finalnom merenju (tabela 2) prosečna visina 163cm, telesna masa se nije značajno promenila, raspon ruku je bio 162cm dok je na finalnom merenju bio 163cm (povećanjem telesne

DISCUSSION

In terms of anthropometric characteristics, this study found that there were no statistically significant differences in body mass, body fat percentage, and muscle after six months of continuous training. However, differences were observed in body height, BMI, and arm span. Body height results obtained were somewhat expected, because in this sport, selection, among other things, is carried out in relation to the body height required for certain playing positions. Body height is of great importance in volleyball (Banković, 2023). As the arm span is biologically directly related to body height, this is also the reason for the statistically significant difference (Rahmayani, Rumapea, Tarigan, Fadlyana, Dhamayanti & Rusmil 2023).

According to a study conducted by Nikolaidis in 2012, physical exercise during early childhood does not seem to have a significant impact on controlling body fat, as evidenced by our study on female volleyball players. In terms of the coefficient of variation, both tests revealed that the variables of body weight and fat percentage had the highest values. This is because adolescents are considered a risk group when it comes to lifestyle and nutrition, according to Salam, Das, Ahmed, Irfan, Sheikh & Bhutta (2019). In terms of motor skills, the hand grip estimation variable had the highest coefficient of variation, which indicates moderately homogeneous results. Additionally, a statistically significant difference was observed in measuring the strength of the hand grip, before and after continuous training. This suggests that technical elements of the spike and serve had an impact on improving the strength of the hand and wrist, which is an important factor in volleyball. The study conducted on female volleyball players showed no statistically significant change in agility test. However, a study conducted on 20 female volleyball players, with an average age of 10.5 ± 1.5 years, showed a statistically significant change in agility. Besides the aspect of motor skills, the morphological characteristics of the body, like body height, body mass, percentage of fat and muscles, etc., also affect agility. In our study, there was no statistically significant change in body mass, fat, and muscle percentage. Thus, this fact needs to be taken into account in terms of statistical significance of agility change. The results of the sit and reach test (SiR) and the test to assess the flexibility of the shoulder girdle (overhead stick rotation) showed a greater shift after the second measurement. This is because greater flexibility in volleyball is a result of larger amplitude movements. It's worth noting that stretching, particularly dynamic stretching as part of the warm-up

visine, proporcionalno dolazi i do povećanja raspona ruku, pa čak varijabla raspon ruku u nekim slučajevima i premašuje telesnu visinu, kao što je bio slučaj u prvom merenju). Najmanji koeficijent varijabilnosti je za varijablu telesna visina i iznosi 5%, dok je za raspon ruku nešto viši – 7%.

Kada su u pitanju motoričke sposobnosti, u tabeli 3 vidimo da se najmanji koeficijent varijabilnosti primećuje u testu za procenu agilnosti (X test), dok se veći pojavljuje u testu fleksibilnosti - pretklon u sedu kao i u testu eksplozivnosti mišića nogu – skok sa počučnjem.

U tabeli 5 prikazana je dobijena statistički značajna promena kod varijabli: telesna visina, raspon ruku i BMI, dok je na osnovu srednjih vrednosti motoričkih sposobnosti između prvog i drugog merenja, statistički značajna promena dobijena kod varijabli: maksimalni stisak šake (maksimalna sila), iskret palicom, pretklon u sedu i bacanje medicinke

DISKUSIJA

U ovom istraživanju je pokazano da za antropometrijske karakteristike statistički značajne razlike u telesnoj masi, procentu telesne masti i mišića ne postoje, dok su razlike uočene kod telesne visine, BMI i kod raspona ruku. Dobijeni rezultati telesne visine su donekle očekivani, jer se u ovom sportu selekcija, između ostalog, vrši u odnosu na telesnu visinu koja je potrebna za određene igračke pozicije. Telesna visina je od velikog značaja u odbojci (Banković, 2023). Kako je raspon ruku biološki direktno vezan za telesnu visinu, to je i razlog za statistički značajnu razliku (Rahmayani, Rumapea, Tarigan, Fadlyana, Dhamayanti i Rusmil 2023). Neka istraživanja (Nikolaidis, 2012) pokazuju da fizičko vežbanje u najranijem dobu, nema presudnu ulogu u kontroli telesne masti, što pokazuje i istraživanje na našim odbojkašicama. Kada je u pitanju koeficijent varijabilnosti, u oba testiranja je dobijeno da je najveći kod varijabli telesna masa i procenat masti, a razlog je što adolescenti predstavljaju rizičnu grupu kada je u pitanju stil života i ishrana (Salam, Das, Ahmed, Irfan, Sheikh i Bhutta, 2019).

Najveći koeficijent varijacije je zapažen kod varijable za procenu stiska šake i to ukazuje na umereno homogene rezultate. Takođe, uočena je statistički značajna razlika u merenju jačine stiska šake pre i nakon kontinuiranog treninga, što pokazuje da je izvođenje tehničkih elemenata smeča i servisa uticalo na poboljšanje jačine ruke i zgloba ručja koji predstavljaju bitan faktor u odbojkaškoj igri (Yulanda, Sepdanius, 2019).

U istraživanju na odbojkašicama nije došlo do statistički značajne promene u testu za procenu agilnosti, dok su u istraživanju (Elif i sar., 2010) sprovedenom na 20 odbojkašica prosečne starosti 10.5 ± 1.5 godina, došli do zaključka

for training, is slightly more prevalent in training technology. For girls in the youngest category, flexibility is already at a satisfactory level and in line with other abilities. The period of flexibility development aligns with the age of tested female volleyball players (12-15 years), after which this motor ability reaches its maximum. In the medicine ball throw test (MT), which evaluates the strength of the trunk and shoulder girdle, a small but statistically significant increase in the tested age category was observed. This highlights the fact that through learning and developing volleyball technique, the strength of these muscles is also increased.

CONCLUSION

The study results show that there was a significant increase in anthropometric characteristics and motor skills of female volleyball players after six months of continuous training. Out of the 12 variables examined, female volleyball players showed a significant increase in 8 of them. These findings could be useful for coaches of young girls in defining the goals and tasks for better training. They can also help identify strengths and weaknesses, and monitor the level of preparedness of female athletes based on their biological and developmental characteristics. The primary goal is to highlight areas that would make a significant impact on developing abilities in which athletes lag behind. However, to ensure the success of athletes, further studies should include a larger number of subjects and an expanded variety of tests that include determinants of simple performance on the field. Despite the limitations of this study, such as the small number of subjects and the heterogeneity of the sample in terms of the level of training, the results obtained provide a significant initial basis for examining the relationship between anthropometric parameters and motor skills. This contributes to the existing knowledge in this area.

ZAKLJUČAK

Iz dobijenih rezultata istraživanja može zaključiti statistički značajan porast antropometrijskih karakteristika i motoričkih sposobnosti odbojkašica. Odbojkašice su ostvarile statistički značajno povećanje u 8 od 12 ispitivanih varijabli. Dobijeni rezultati mogu biti od pomoći trenerima koji rade sa mladim devojčicama, kao smernica za bolje definisanje ciljeva i zadataka u treningu, identifikovanja prednosti i slabosti, odnosno praćenja nivoa pripremljenosti svojih sportistkinja, a sve na osnovu poznavanja bioloških i razvojnih karakteristika ovog uzrasta. Iskonski cilj se ogleda u akcentovanju onih sadržaja koji će bitno uticati na razvijanje upravo onih sposobnosti u kojima sportisti zaostaju. Međutim, dalja istraživanja bi trebalo da uključe veći broj ispitanika, kao i proširenu bateriju testova koja bi sadržala odrednice jednostavnog izvođenja u terenskim uslovima jer bi se na taj način obezbedio širi pristup koji je esencijalan za uspešnost sportista. Pored toga što imamo mali broj ispitanika, kao nedostatak može se navesti i heterogenost uzorka u pogledu nivoa treniranosti. Uprkos ograničenjima ovog istraživanja, dobijeni rezultati mogu biti značajna inicijalna osnova za ispitivanje relacije antropometrijskih parametara i motoričkih znanja, što omogućava relevantan teorijski doprinos postojećim saznanjima u ovoj oblasti.

da postoji statistički značajna promena u agilnosti. Kada je u pitanju agilnost, osim sa aspekta motoričkih sposobnosti, kao opravdanje za dobijene rezultate treba uzeti u obzir i morfološke karakteristike tela koje utiču na agilnost (telesnu visinu, telesnu masu, procenat masti i mišića, i dr.). U našem istraživanju nije došlo do statistički značajne promene u telesnoj masi, procentu masti i mišića, pa moramo uzeti u obzir i tu činjenicu kada pogledamo statističku značajnost promene agilnosti.

Rezultati testa pretklon u sedu (PuS) i testa za procenu fleksibilnosti ramenog pojasa (iskret palicom) pokazali su veći pomak nakon drugog merenja, što se može objasniti da je u odbojci veća fleksibilnost posledica pokreta većih amplituda. Takođe, u samoj trenajnoj tehnologiji malo je veća zastupljenost rastezanja (dinamičko rastezanje kao deo zagrevanja za trening). Kod devojaka je fleksibilnost u najmlađoj kategoriji već na zadovoljavajućem nivou i u skladu sa ostalim sposobnostima. Period razvoja gipkosti se poklapa sa uzrastom testiranih odbojkašica (12-15 godina), nakon čega ova motorička sposobnost dostiže svoj maksimum (Koprivica, 2009).

Prethodni autori su takođe posmatrali vertikalni skok kod odbojkašica i došli su do sličnih rezultata kao u ovoj studiji (Lidor, Côté i Hackfort, 2009; Lidor i Ziv, 2010; Schaal, Ransdell, Simonson i Gao, 2013; Mielgo-Ayuso, Calleja-González, Clemente-Suárez i Zourdos, 2015; Paz, Gabbett, Maia, Santana, Miranda i Lima, 2017), a to je da ne postoji statistički značajna razlika u promeni ove varijable. Ovo se može objasniti činjenicom da metodika učenja odbojkaške tehnike ne obuhvata mnogo vežbi koje zahtevaju maksimalno angažovanje vertikalne komponente brzine, snage i eksplozivnosti ekstenzora nogu.

Kada je u pitanju test bacanje medicinke (BM), kojim se procenjuje snaga trupa i ramenog pojasa, pokazao se mali ali statistički značajan prirast testirane uzrasne kategorije, što upućuje na činjenicu da kroz učenje i razvoj tehnike dolazi i do povećanja snage tih mišića.

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Primljen: 08. januar 2024. / Received: January 08, 2024

Izmjene primljene: 19. mart 2024. / Changes Received: March 19, 2024

Prihvaćen: 21. mart 2024. / Accepted: March 21, 2024



EFFECTS OF A SCHOOL PHYSICAL EDUCATION PROGRAM ON THE PHYSICAL AND MOTOR DEVELOPMENT WITH ADOLESCENTS FROM KOSOVO

VALON NIKQI¹, ZORICA STANKOVSKA², BAHRI GJINOVCI¹, SERJOZA GONTAREV³, ZARKO KOSTOVSKI³

¹ Faculty of Sports Sciences, University of Prishtina, Prishtina

² University Ss. Cyril and Methodius, Faculty of Pedagogy, St. Kliment Ohridski, Skopje, North Macedonia

³ Ss. Cyril and Methodius University, Faculty of Physical Education, Sports and Health, Skopje, North Macedonia

Correspondence:

Bahri Gjinovci, Faculty of Sports Sciences, University of Prishtina, Prishtina

bahri.gjinovcii@uni-pr.edu

Abstract: Because adolescents spend most of their time studying and doing schoolwork, they do not have enough time to engage in physical activity; this lack of physical activity is an important public health concern. Therefore, this study aimed to determine how the physical education curriculum and programs affect the physical and motor development of adolescents in the Kosovo. The research was carried out on a sample of 386 male students, who participated in physical education classes that lasted 72 hours (45 minutes after 2 hours per week). In order to realize the objectives of the research, 7 anthropometric measures and 14 motor (fitness) tests were applied. Research results showed changes in all anthropometric measures and motor fitness tests between initial and final measurements. The results of the research showed that physical education programs can have a positive effect on motor development among middle school aged adolescents in the Kosovo.

Keywords : adolescents, motor development, fitness, physical activity.

INTRODUCTION

The teaching of physical education in the world is distinguished by its diversity in terms of the elements it contains, their preparation and realization in practice. Despite the diversity of physical education teaching in different educational systems, it is characterized by one common goal. This goal can be identified in the development of the individual into a “physically educated man” (Hardman, 2009). Advocacy of this idea brought physical education as a teaching subject with an expanded role, and as such it has a certain kind of responsibility. That responsibility is reflected in the fact that the content of this subject covers many contemporary issues within the educational process, with features that are not offered by any other subject and teaching material (Hardman, 2009).

This responsibility is fully summarized in the Decision on the role of sport in education, which the European Parliament adopted in November 2007 (Hardman, 2009). In the preamble of the Decision, it is specially emphasized that physical education is the only teaching subject in which children are prepared for a healthy life, that it is aimed at their overall physical and mental development, that important social values are transmitted through it, such as: honesty, self-discipline, solidarity, tolerance, team spirit and fair play and together with sports is considered one of the most important tools for social integration (Hardman, 2009).

Unfortunately, in recent years, physical education teachers have become increasingly concerned about low levels of physical activity, which contributes to a decrease in physical fitness and motor performance among students (Greier, 2013). Sedentary habits, such as watching TV and playing computer games, are becoming more and more popular and replacing usual physical activity (Kaiser-Jovy, Scheu, & Greier, 2017; Owen, Healy, Matthews, & Dunstan, 2010; Mathers et al., 2009). Accordingly, the majority of children and adolescents do not achieve the recommendations of at least 60 minutes of moderate to vigorous physical activity per day (Reilly et al., 2004; WHO, 2016). In light of these developments, a large number of scientific studies confirm the negative aspects of reducing physical activity and increasing a sedentary lifestyle (Janssen & Leblanc, 2010; Houston et al., 2013; Dutra, Kaufmann, Pretto, & Albernaz, 2015; Burtscher, 2015; Greier et al., 2018). Insufficient physical activity and an increased sedentary lifestyle can lead to a number of negative health effects such as poor posture, obesity, metabolic disorders, diabetes and diseases of the cardiovascular system (Ferrari et al., 2015; Dutra et al., 2015). In addition to negative health effects,

low levels of physical activity are also associated with reduced physical fitness and motor performance (Tomkinson, Léger, Olds, & Cazorla, 2003; Tomkinson & Olds, 2007; Albon, Hamlin, & Ross, 2010; Hardy, Barnett, Espinel, & Okely, 2013; Muellerova et al., 2015; Ruedl, Greier, Kirschner, & Kopp, 2016; Greier & Drenowatz, 2018; Greier, Riechelmann, Ruedl, & Drenowatz, 2019). Although there is a close relationship between physical activity, physical fitness and motor competence, all three components are important in modifying and promoting health among young people. (Myers, Prakash, Froelicher, Partington, & Atwood, 2002; Bauman, 2004; Ortega, Ruiz, Castillo, & Sjöstrom, 2008; Vandorpe et al., 2012; Erfle & Gamble 2015; Ruedl et al., 2016; Greier & Drenowatz, 2018).

This concerns all the more because motor performance, regardless of its genetic determination, can be strongly influenced by the degree of acquisition of fundamental motor skills (Chiodera et al., 2008; Förster, 2005; Logan et al., 2012; Riethmüller et al., 2009). The need to nurture motor development further emphasizes the need to start promoting it from a young age. The elementary school years are considered a critical stage for the development of motor competence and physical fitness (Augste & Künzell, 2015). Therefore, special attention should be paid to increasing sports participation during school hours, including opportunities for physical activity in free time. According to the current Curriculum and Program in the Republic of Kosovo, the subject of physical education is represented with 2 hours per week for a duration of 45 minutes or a total of 72 hours per year. The small number of teaching hours in the subject of physical education is a limiting factor and cannot compensate for the lack of physical activity of today's students (Osterroth, Spang, & Gießing, 2012). However, in the Republic of Kosovo, there are limited data and one can only speculate about the influence of physical education teaching on the physical and motor development of primary school children. Therefore, the purpose of this study was to determine how the physical education curriculum and programs affect the physical and motor development of adolescents from elementary schools in the city of Pristina.

METHODS

The research is a quasi-experimental longitudinal type and was conducted in a school environment, on a sample of students of secondary school age, within the regular teaching of physical education. A pretest-posttest was used research draft. The respondents worked according to the existing one's curricula and programs approved by the Ministry of Education (Education Development Institute) of the Republic of Kosovo. The program lasted the whole school year, with two hours a week. The initial measurements were carried out in September and the final in May.

Sample of respondents

The research includes a sample of 386 male students from the following three elementary schools in Pristina: OU Nazim Gafuri 142 students, OU Elena Gjika 158 students and OU Zelena Shkola with 88 students. The average age of the respondents was 13.56 ± 0.94 years. The study included all students whose parents gave consent to participate in the research, who were psychophysically healthy and who regularly attended physical and health education classes. Subjects were treated in accordance with the Declaration of Helsinki (Edinburgh 2013 revision).

Measurements

In order to achieve the objectives of the research, the following anthropometric measures were measured: height, weight, waist circumference, skinfold on the upper arm and skinfold on the back. The following motor tests were also measured: hand tapping, foot tapping, deep forward bend on a bench, kick with a bat, forward bend - twist - touch (mechanism for synergistic regulation and tone regulation), long jump from a place, high jump from a place, throwing a medical ball lying down, running for 20 m, (mechanism for regulation of excitation intensity), raising the trunk for 30 sec, push-ups from the knees, sheltering the trunk from lying down (mechanism for regulation of excitation duration), side steps, running in rectangle (mechanism for structuring the movements). Also, based on the height and weight of each child, the body mass index - BMI (kg/m^2) and the percentage of fat tissue based on sum of triceps and subscapular skinfolds - Slaughter equation (Slaughter et al., 1988).

Motor abilities were measured according to the methodology of: Metikoš, D., Prot, F., Hoffman, E., Pintar, J. & Oreb G. (1989) and Kurelić, N., Momirović, K., Stojanović, M., Šturm, J., Radojević, F. & Viskić-Stalec, N. (1975). Anthropometric measures measured according to: International Biological Program (IBP).

The measurement was carried out in the sports halls in which the students regularly perform physical education classes. The halls were adequately lit, with a normal temperature for work. Tests were measured during classes,

always at the same time with all examinees, and in the same order depending on the possibility and difficulty of the tests themselves. All tests were distributed according to working measurement points, so they were always measured by the same gauges. The instruments used during the research were standardized and calibrated before the beginning of the measurement of each group of 30 to 40 students. All respondents were in sports clothes.

Statistical analysis

The normal distribution of the variables was determined by the Kolmogorov - Smirnov test. Basic descriptive statistical parameters (arithmetic mean and standard deviation) were calculated for all variables. The differences in anthropometric measures and motor (fitness) tests between the initial and final measurements were determined by paired t-test. The statistical significance level was set at 0.05. For the statistical analysis, SPSS software (version 26.0, IBM Corp., Armonk, NY, USA) was used.

RESULTS

From the overview of the table 1, it can be seen that between the initial and final measurement, statistically significant differences were determined in the anthropometric measures: Body height (ATLVIS), Body weight (ATLMAS), Body mass index (BMI), Abdominal circumference (AOBTRB), Upper arm skinfold (ANABNA), Back skinfold (ANABLE) and body fat percentage (MAST) ($p < 0.001$). Based on the calculated percentage increase in the values of the arithmetic mean between the initial and the final measurement, it can be said that after 9 months from the start of the exercise program, the subjects increased the value of body height by 2.43%, body weight by 7.08 %, body mass index by 2.24%, abdominal circumference by 3.90%, upper arm skinfold by 4.55%, back skinfold by 9.84 and the percentage of fat tissue by 6.76%.

Table 1. Significance of differences of arithmetic measures between initial and final measurement

Variables	INITIAL		FINAL		%	R	T-test	Sig
	Mean	SD	Mean	SD				
ATLVIS	162.92	9.22	166.88	8.96	2.43	0.97	-35.35	0.000
ATLMAS	55.06	13.38	58.96	13.84	7.08	0.96	-20.51	0.000
BMI	20.56	3.87	21.02	3.98	2.24	0.94	-6.69	0.000
AOBTRB	73.02	10.47	75,87	11.56	3.90	0.93	-13.31	0.000
ANABNA	11.42	5.35	11.94	6.75	4.55	0.91	-3.42	0.000
ENABLE	9.35	5.59	10,27	7.05	9.84	0.90	-5.60	0.000
MAST	17.01	8.87	18,16	11.02	6.76	0.93	-5.29	0.000

Table 2. Significance of differences of arithmetic means in the motor (fitness) tests between the initial and final measurement

Variables	INITIAL		FINAL		%	R	T-test	Sig
	Mean	SD	Mean	SD				
MTAR	29.75	4.06	32.07	3.74	7.80	0.63	-13.53	0.000
MTAN	17,22	2.39	19,29	1.98	12.02	0.40	-16.91	0.000
MDPK	29.88	7.76	31.72	8.35	6,16	0.76	-6.40	0.000
MISP	64,66	13,11	58,57	11.94	9.42	0.62	10.98	0.000
MBFPZD	15.76	2.48	17.70	2.44	12.31	0.41	-14.29	0.000
MSDM	1.54	0.26	1.66	0.27	7.79	0.84	-14.97	0.000
MSVM	34,21	7.43	36,32	7.45	6,17	0.74	-7.79	0.000
MFML	4.92	1.24	5.54	1.28	12.60	0.83	-16.91	0.000
MFE20V	3.91	0.39	3.78	0.40	3.32	0.68	8.06	0.000
MDTR	20.85	4.65	21,27	4.70	2.01	0.68	-2.24	0.026
MSKL	15.30	4.45	16.62	4.05	8.63	0.65	-7.24	0.000
MRCZTL	13.47	1.99	14.43	2.15	7.13	0.56	-9.65	0.000
MCVS	11.80	1.36	11,20	1.22	5.08	0.64	10.79	0.000
MTVP	28.51	2.70	27.98	2.39	1.86	0.76	5.85	0.000

Table 2 shows the differences between the initial and final measurements in the motor (fitness) tests among adolescents of middle school age. From the review of the table, it can be seen that between the initial and final measurement, statistically significant differences have been determined in all motor (fitness) tests. Based on the calculated percentage increase in the values of the arithmetic means between the initial and the final measurement, it can be said that after 9 months from the beginning of the exercise program, adolescents of middle school age increased the value of the motor (fitness) tests: hand tapping (MTAR) for , 7.80%, foot tapping (MTAN) by 12.02%, deep bench press (MDPK) by 6.16%, bat spin (MISP) by 9.42%, forward press - twist - touch (MBFPZD) by 12.31%, Standing Long Jump (MSDM) by 7.79%, Standing High Jump (MSVM) by 6.17% Lying Medley Throw (MFML) by 12.60%, Running 20m (MFE20V) by 3.32 % , 30sec trunk deadlift (MDTR) by 2.01%, knee push-ups (MSKL) by 8.63%, trunk tilt from lying down (MRCZTL) by 7.13%, side steps (MCVS) by 5.08% , running in a rectangle (MTVP) by 1.86% ($p > 0.05$) .

DISCUSSION

This study aimed to investigate how a regular physical education program affects the physical and motor development of urban adolescents in the Republic of Kosovo. The results of the research showed that there was a statistical improvement in all motor (fitness) tests. Also, between the initial and final measurement, statistically significant differences were determined in all anthropometric measures. Changes in height and weight are most likely the result of natural biological processes of growth and development that are particularly pronounced in this phase of adolescence. On the other hand, the fact that the increase in body weight and the body mass index is not the result of an increase in muscle mass is worrying, but rather the result of an increase in the fat component. Namely, in the final measurement there was an increase in the volume of the abdomen by 3.90%, the skinfold on the upper arm by 4.55%, the skinfold on the back by 9.84 and the percentage of fat tissue by 6.76%. The results are consistent with the results of Harris et al. (2009) who determined through a meta-analysis that the intervention carried out in a school environment caused positive changes in other health factors, but not in the body mass index and other measures for assessing body composition. Harris et al. as a possible reason they highlight the insufficient level (duration, intensity and frequency) of physical activity, necessary to make changes. Another possible reason is that physical activity has a smaller influence on body composition, compared to the combined influence of physical activity and dietary factors. Similarly, Dobbins et al. (2013), Guerra et al. (2013), and Kelishadi et al. (2014) reported that a school-based physical activity intervention had no significant effect on BMI. Against these results, in a certain number of studies it has been established that the intervention carried out in the school environment (Carrel et al., 2005; Kain, Uauy, Vio, Cerda, & Leyton, 2004; Kriemler et al., 2010) led to a positive impact on body composition.

Regular physical activity and / or programmed physical exercise are the most important factors that maintain and improve motor skills (fitness). Schools can and should provide conditions for youth to engage in physical activity, improve health-related physical fitness, and can play a very important role in motivating youth to remain physically active (Burgeson et al., 2001). They represent suitable places for promoting and adopting positive health habits. Taking into account the trends, such as the dramatic increase in the prevalence of obesity among children and adolescents, the increased time spent watching TV or playing on the computer, and the decrease in physical activity, the conclusion that schools should take the leading role in involving young people in the appropriate forms of physical activities every working day , with the aim of improving physical fitness related to health and acquiring sports literacy (Pate et al., 2006).

A number of studies point out that it is necessary to implement physical activity programs in schools to increase opportunities for adolescents to participate in physical activities [Kelly et al. 2019; Demetriou et al. 2019; Silva et al. 2020]. Kelly et al. (2019) reported that health promotion interventions in schools can increase students' access to physical activity opportunities. Demetriou et al. (2019) reported that in order to increase and maintain the level of physical activity among adolescents, it is necessary to raise and maintain motivation, and the promotion of physical activities in school environments is effective in strengthening this motivation. Silva et al. (2020) indicates that physical activities during physical education classes have the potential to improve students' health and academic performance, while creating opportunities for adolescents to engage in school activities. Several studies have reported that physical education programs are effective in increasing the time spent in physical activities by adolescents and improving physical health (Isensee et al. 2018; Andrade et al. 2014). For example, Isensee et al. (2018) showed

that German adolescents who received interventions at school showed an increase in time spent in physical activities compared to students who did not undergo such an intervention. Andrade et al. (2014) reported that physical education programs can improve the physical health of Ecuadorian adolescents and minimize the decrease in their level of physical activity. And some other previous studies (Kelishadi wet al., 2014; Giannaki et al., 2015; Martin-Smith et al. 2019) supported the findings observed in this study, reporting that a school-based physical education program had a positive effect on changes in health-related physical fitness.

Based on the conclusions of the National Association for Sport and Physical Education (NASPE), it should prepare children and adolescents for a physically active and healthy life, encourage them to engage in activities and develop habits for regular lifelong exercise (The Cooper Institute, 2010). Creating or selecting the best curricula and programs in physical education and their implementation by the highest quality teaching staff is a critical step in ensuring efficiency in the development of physically educated individuals who will choose to participate in physical activities throughout their lives (CDC, 1998).

This study has certain limitations. First, there was no control group and only the differences between the initial and final measurements were analyzed. In future studies, well-designed randomized controlled trials are recommended. Second, this study was conducted only in a few middle schools in urban Pristina and, therefore, the sample did not represent the entire population of the Republic of Kosovo, which makes it difficult to generalize the results of this study. In future research, it is necessary to increase the sample size from all regions of the Republic of Kosovo. Third, although it is important to investigate the influence of gender, age, and maturation on intervention effects, we did not investigate these aspects in this study. Finally, other factors that are known to influence the level of physical activity, physical fitness, such as parental support, nutritional intake and psychological status of the adolescents participating in this study, were not analyzed (Sharma et al. 2018).

CONCLUSIONS

In summary, the results of this study confirmed that school-based physical activity programs can have a positive impact on motor (fitness) abilities in adolescents. These results are expected to help health and educational professionals to plan or make decisions about strategies that can promote physical activities in schools. In future research, the effects of school programs for physical activity among adolescents should be taken into account not only on anthropometric measures and motor skills, but also on learning performance, mental health, lifestyle and behavior.

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Prilijen: 02. decembar 2023. / Received: December 02, 2023
Prihvaćen: 21. decembar 2023. / Accepted: December 26, 2023



EFFICACY OF 6 WEEKS PILATES TRAINING ON PHYSICAL PARAMETERS AND SPORTS-SPECIFIC SKILLS OF VOLLEYBALL PLAYERS: A RANDOMIZED CONTROLLED TRIAL

USHA PANIHAR, PARUL SAGWAL, SHABNAM JOSHI

Department of Physiotherapy, Guru Jambheshwar University of Science & Technology, Hisar, Haryana, India

Correspondence:

Usha Panihar, Department of Physiotherapy, Guru Jambheshwar University of Science & Technology, Hisar, Haryana, India, ushasportsphysio@gmail.com

Abstract: Volleyball is a game of high aerobic capacity, power, speed, agility, strength, flexibility, and jumping. Pilates exercise helps in improving muscle strength and flexibility thus providing a player with skills of jumping, high aerobic capacity, and better offense and defense capabilities. The study aimed to evaluate the effect of Pilates exercises on various fitness parameters and volleyball sports-specific skills in volleyball players. University-level male volleyball players ($n=30$) aging between 18-25 years were included and randomly allocated into two groups i.e. control group ($n=15$) who performed only regular volleyball training, and the experimental group ($n=15$) who were given Pilates training in addition to their regular volleyball training 3 times per week for 6 weeks. The outcome measures: balance, upper and lower abdominal strength, agility, explosive power, and volleyball-specific skill tests, assessed at baseline and post-intervention. The results showed significant improvement within the control group for balance (In posterior reach and medial reach) and volleyball-specific skills (Brady's test), but other parameters did not revealed any statistical significance difference. Whereas, in the experimental group, significant improvement was found for all tested parameters except balance in lateral, anterior, posterior, anterolateral, anteromedial, and posterolateral directions. Also, there existed a statistically significant difference between both the groups for all tested parameters ($p \leq 0.05$). The study concluded that Pilates training helps in improving physical parameters such as agility, explosive power, balance, upper and lower abdominal strength, and sports-specific skills of volleyball players.

Keywords: Mat exercise, agility, balance, strength, explosive power.

INTRODUCTION

Volleyball is considered as the game of high aerobic capacity, power, speed, agility, strength, flexibility and jumping activities like blocking and spiking while maintaining a higher level of performance. Volleyball games have 12 players and can be categorized as setters, hitters, middle blockers and liberos, where all play their significant and specific role (Paz et al., 2017). The players require a variety of dynamic movements and techniques while playing volleyball game. For optimal performance during the game, the players must be in excellent physical and mental condition because volleyball games have no predetermined time limit and, if the teams are evenly matched, might go for many hours (Yapici, 2019). To maintain ball contact from a maximum height during jumping activities, athletes must use the extreme explosive power of legs to jump vertically (Kumar, Goswami & Kumar, 2016). Power is a crucial component in volleyball since it allows players to jump while spiking or blocking throughout the game (Taware, Bhutkar & Surdi, 2013). Furthermore, strength (upper and lower body muscular strength) and speed are also necessary during different sprinting, jumping and high intensity movements which repeatedly occur during the play (Gabbett, Georgieff, Anderson, Cotton, Savovic & Nicholson, 2006), whereas agility is needed during the game in a way like quick and precise change in the movement of the entire body, in response to stimuli or to stop quickly (Sajjan, 2019). Additionally, the ability of the body to accurately land after jumping activity on the playing surface makes balance an important necessary component of this game. The balance control demands the integration of a flexible movement pattern design as well as the integration of sensory input (Genc, 2020). All these physical parameters such as balance, power, strength, agility, and speed contribute to the skillful play of volleyball players. There have been different sports-specific skill tests developed for the volleyball game, such as Brady's volleyball skill test, North Carolina State University volleyball skills test, AAHPER volleyball skill test, SAI volleyball skill test, Russell-

Lange volleyball skill test, and Brumbach volleyball test to evaluate the various skills that are important in volleyball, such as volleying, passing, serving, spiking or killing, and returning over the net. Brady's volleyball skill is designed to evaluate the overall playing ability of volleyball players. The Brady's test is used to measure the real number of volleys in one minute which examines the attacking ability of a player (Kansal, 2021).

Several training protocols have been developed and explored for improvement in physical fitness parameters and game specific skills thereby enhancing the performance in different sports players. The Pilates training is a highly practiced approach among players and other population which enhances the muscle strength and flexibility, thereby improving the physical fitness of sports person and it also alleviates the risk of injury risk (Manshour, Rahnama & Khorzoghi, 2014; Greco et al., 2019). Pilates is referred to as a modern exercise method with sport specific training (Greco et al., 2019). These exercises can be performed on mat or by using different equipments like spine corrector, wunda chair, trapeze table, cadillac, reform and barrel (Owsley, 2005; Greco, Patti, Cataldi & Lovane, 2019). Pilates works on the six principles which involve concentration, control, centering, precision, proper breathing, and flow. The exercises are meant to increase the strength and flexibility by focusing on repeated movements which further causes coordinated motion in between muscle group and body organs (Panchal, Panchal, Panihar, Joshi & Pawalia, 2022). Pilates consists of various forms of stretching and strengthening exercises (Shah, 2013). It has been found to increase the muscle strength and flexibility thus providing a player with skills of jumping, improvement and enhancement in aerobic capacity, enhanced offense, and defense skills (El-Sayed, Mohammed & Abdullah, 2010). Pilates training have been found to enhance the abdominal muscle strength, neuromuscular coordination, agility, and dynamic balance in badminton players (Yeole, Kad & Singhamoney, 2018). Similarly, in cricket players it improved core muscle strength, agility, power, hamstring muscle flexibility, and speed (Panchal et al., 2022). However, the previous research on volleyball players only evaluated effect of Pilates on hamstring flexibility and serving ability and suggested strong evidence of enhanced flexibility and improved serving ability after Pilates training (Manshour et al., 2014; Greco et al., 2019). There is paucity of studies on efficacy of Pilates on abdominal strength, agility, power, balance, and volleyball specific skills. Hence, this study aimed to determine its effects on various other physical parameters such as abdominal strength, agility, explosive power, balance, and sports-specific skills in volleyball players.

METHODS

Study Design

It was a randomized, parallel group, controlled and single blinded (participants blinded) clinical trial conducted on university level volleyball players at University Sports Complex, Hisar. The ethical approval was obtained from the Departmental Ethical Committee (vide letter no. PTY/2022/155). The study was also registered under Clinical Trial Registry-India (CTRI) with the registration no. CTRI/2022/06/043132. The study was conducted from June 2022 to August 2022.

Participants

The study included total 30 male volleyball players with age group of 18-25 years, those practicing volleyball at least 3 days in a week and experience of no less than two years. The exclusion criteria consisted of any history of neurological, metabolic disease, cardiovascular, and musculoskeletal disorder as well as any existing surgery, players not practicing volleyball, involved in other sports along with volleyball, practicing Pilates presently and who are not willing to participate. Beside this, the players who had a history of drug abuse and alcohol consumption were also excluded.

Procedure

A total of 41 players were screened in accordance with the study's inclusion and exclusion criteria. Out of 41 subjects, only 30 students who satisfied the selection criteria were considered for inclusion in the study (Figure 1). All the included players were given a full explanation of the trial's procedures, and each player gave their informed consent. The players were divided randomly into two groups, i.e. control group (CG) and experimental group (EG) using lottery method with 15 players in each group. The total duration for protocol was six weeks.

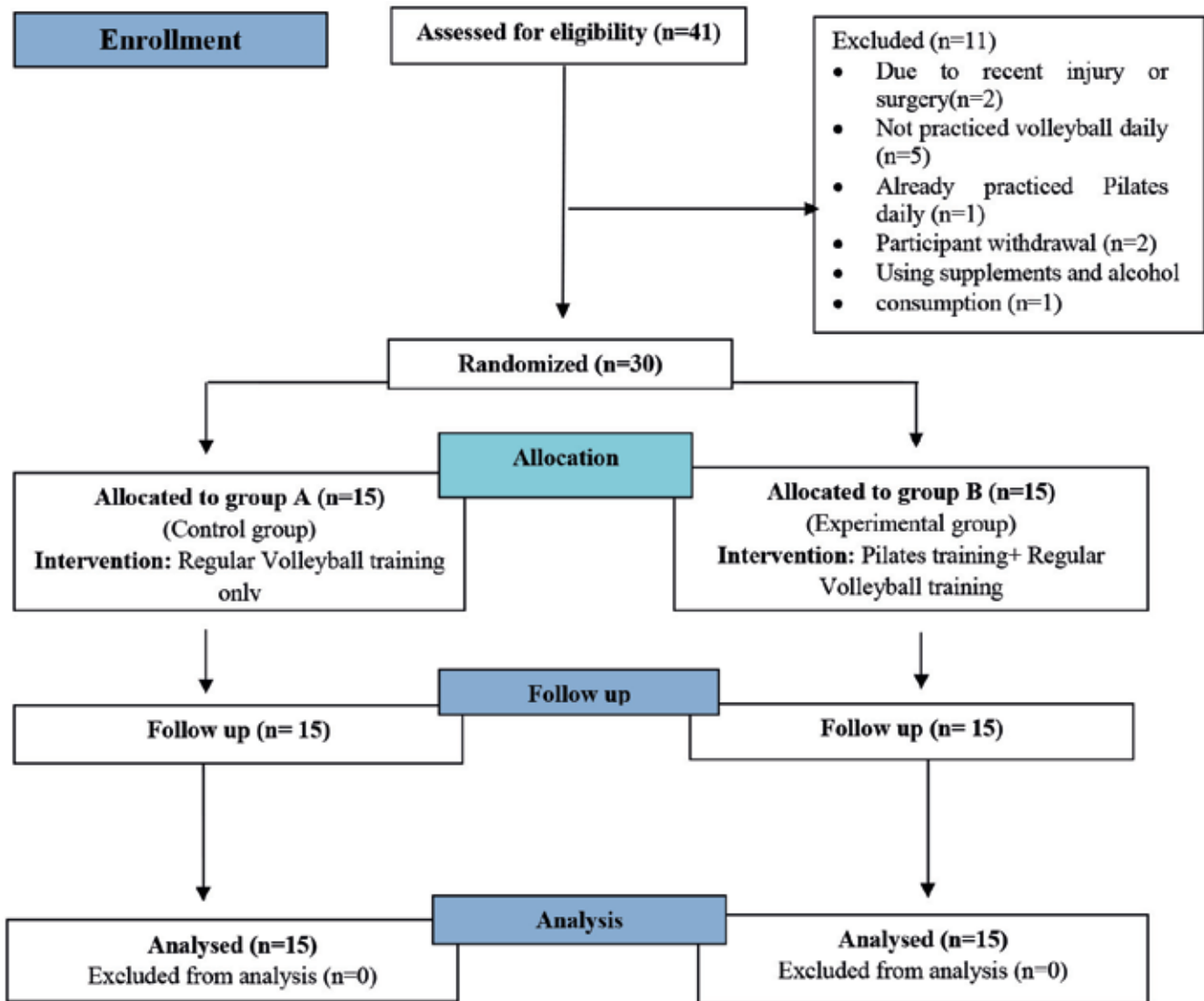


Figure 1: Consort Flow Diagram.

Intervention

The participants in the control group (Group-A) followed the standard volleyball training programme, but those in the experimental group (Group-B) also engaged in pilates exercises. Standard volleyball-specific exercises were included in both groups’ regular training regimens, which were given to the players by coaches. For a period of six weeks, these were carried out five days a week.

The players in both groups performed regular volleyball training under the supervision of their concerned coaches which included standard volleyball game practice on routine basis such as jogging, running, general stretching exercises and volleyball matches.

Pilates exercises, such as leg circle, scissors, sidekicks, the saw, spine stretch, single leg stretch, heel squeeze, roll over, pushup, side stretch and leg pull fronts exercises (Lindsay, 2001; Segal, Hein & Basford, 2004), were performed by the participants for three days a week for six weeks. The players in the experimental group (Pilates group) completed 10 minutes warm-up before intervention, including breathing exercise, hip rotation, head movement, shoulder stretch, shoulder elevation, thoracic muscle stretch, leg stretching and cat stretch exercises, and cool down for 10 minutes at the end of training session. The protocol for Pilates training was structured in 3 phases, where each phase was followed for 2 weeks. The session length was initially 30 minutes, but by the end of week 6, it had been gradually extended to 45 to 55 minutes.

The Pilates training protocol included several exercises and progression was made from week I to week VI in terms of no. of repetitions and sets (Table 1). In Ist and IInd week, 2 sets of exercises with 10 repetitions were performed

where rest period was provided in between each exercise (i.e. 30 sec) and between the different set of exercises (i.e. 60 sec) from phase I to phase VI during 6-week Pilates training. After the second week of training, the repetitions for each exercise were raised from 10 to 15, and roll-over exercise was added from IIIrd week. After the fourth week, the number of sets was raised to three, with each exercise being performed ten times. Pushups and shoulder bridge exercises were introduced to the training regime early in the fifth week (Manshoury et al., 2014; Greco et al., 2019).

Table 1. Pilates training protocol during Phase-1 to Phase-3 (Ist to VIth week).

Exercises	Ist & IInd week	IIIrd & IVth week	Vth & VIth week
Leg circle	2x10	2x15	3x10
Scissors	2x10	2x15	3x10
Sidekicks	2x10	2x15	3x10
The saw	2x10	2x15	3x10
Spine stretch	2x10	2x15	3x10
Single leg stretch	2x10	2x15	3x10
Heel squeeze	2x10	2x15	3x10
Roll over		2x15	3x10
Shoulder bridge			3x10
Push ups			3x10

Outcome measures

Upper and lower abdominal strength, balance, explosive power, agility, and a volleyball-specific skill test are among the outcome variables in the study. Both at the beginning and conclusion of the six-week period, measurements were obtained. When measuring lower abdominal strength, the double leg lowering test (DLLT) was used (Kamatchi, Arun, Tharani, Yuvarani, Vaishnavi & Kaviraja, 2020), whereas the curl-up test was used to assess upper abdominal strength (Ahearn et al., 2018). Star excursion balance test (SEBT) was used to evaluate balance (Bressel, Yonker, Kras & Heath, 2007). The Illinois Agility Test (IAT) was used to measure agility (Kutlu, Yapici & Yilmaz, 2017). Vertical jump height (VJH) was used to determine the explosive power (Dave, Sharma, Patel, Prajapati & Varma, 2019). Brady’s volleyball skill test (1945) was used to assess a volleyball-specific skill test. The double leg lowering test and curl up, star excursion balance test, Illinois agility test, vertical jump test and Brady’s volleyball skill test, all have been rated as good to excellent on reliability test (ICC= 0.93 to 0.98, 0.995, 0.35 to 0.93, 0.98, 0.995, 0.92) (Plisky, Gorman, Butler, Kiesel, Underwood & Elkins, 2009; Kutlu et al., 2017; Rosell, Marquez, Custodio & Garcia, 2017; Ahearn, Greene & Lasner, 2018; Kansal, 2021; Rathod, Vyas & Sorani, 2021). All participants were given instructions to warm up their body before each test while the outcome measures were being assessed. The players completed three trials for each test, with the best outcome from those three being considered for the analysis.

Statistical analysis

To conduct the statistical analysis for all of the outcome measures, the paired t-test and the independent t-test were used, respectively, for the comparisons within and between groups. The criterion for statistical significance was set at $p \leq 0.05$.

RESULTS

The characteristics of all the players such as age (years), weight (kg), height (cm), and body mass index (kg/m²) and all outcome variable before intervention were recorded and checked for any statistical significance to look for baseline similarity between the groups. The results indicated that there was baseline similarity among the participants for majority of outcome variable except SEBT in anterior direction (Table 2).

Table 2. Comparison of control group and experimental group before intervention.

Characteristics	Control group (CG)	Experimental group (EG)	t-value	p-value
	Mean±SD	Mean±SD		
Age (years)	19.67±1.11	20.33±1.63	-1.3	0.202
Weight (kgs)	57.53±6.59	69.20±11.43	-0.91	0.002
Height (cm)	169.0±6.59	171.27±6.98	-3.42	0.368
BMI (kg/m ²)	20.10±1.72	23.51±3.09	-3.72	0.001
Hours of training (hours)	2.37±.87	2.40±.60	-0.12	0.904
Practicing year (years)	2.30±.92	2.63±.81	-1.05	0.302
Curl up (counts)	4.33±.97	4.40±.73	-0.21	0.83
DLLT (degree)	21.00±26.26	21.33±18.56	-0.04	0.96
Illinois agility test (sec)	14.87±.83	14.80±1.20	0.17	0.86
Vertical jump test (cm)	40.40±5.39	49.27±9.41	-3.16	0.04
Brady's test (numbers)	9.00±2.13	8.80±1.61	0.28	0.77
SEBT Anterior (cm)	73.53±5.93	83.60±7.45	-4.09	0.000
SEBT Posterior (cm)	77.07±5.21	82.00±9.04	-1.83	0.078
SEBT Medial (cm)	76.60±5.86	79.27±9.26	-0.94	0.35
SEBT lateral (cm)	77.53±6.30	82.47±10.676	-1.54	0.13
SEBT Anteromedial (cm)	77.73±7.77	75.07±7.713	-0.94	0.35
SEBT Anterolateral (cm)	79.13±5.48	81.27±5.470	-1.06	0.29
SEBT Posteromedial (cm)	79.33±6.44	83.47±11.03	-1.25	0.22
SEBT Posterolateral (cm)	81.93±7.73	83.27±10.59	-0.39	0.69

DLLT- Double leg lowering test, SEBT- star excursion balance test. The critical value of *t* test was 2.048. The results were statistically significant at $p < 0.05$ and non-significant at $p > 0.05$.

The findings for the volleyball skill test (Brady's test) and SEBT (in posterior reach, medial reach, and lateral reach) in the control group showed statistically significant improvement. However, Curl up ($p=0.164$), DLLT ($p=0.082$), VJT ($p=0.499$), IAT ($p=0.433$), and SEBT in other directions (anterior ($p=0.486$), antero-lateral ($p=0.546$), antero-medial ($p=0.189$), and postero-lateral ($p=0.334$)) did not demonstrate any statistically significant change ($p > 0.05$) after a period of 6 weeks from baseline. Brady's test, the DLLT, the VJT, the IAT, and the SEBT (in the medial, posterior-medial direction) all showed statistically significant improvements in the Pilates group, but SEBT in the anterior ($p=0.228$), posterior ($p=0.094$), lateral ($p=0.878$), anterolateral ($p=0.076$), anteromedial ($p=0.232$), and posterolateral ($p=0.641$) directions did not. These results signify that all outcome variables considerably improved in the experimental group but failed to do the same in the control group.

However, after completion of training i.e. after six weeks, comparisons across groups showed significant differences in all of the tested parameters, including upper (Curl up, $p=0.043^*$) and lower (DLLT, $p=0.01^*$) abdominal strength, lower limb explosive power (VJT, $p=0.000^*$), agility (IAT, $p=0.000^*$), volleyball-specific-skill test (Brady's test, $p=0.000^*$), and balance i.e. SEBT in all directions (Table 3). These results demonstrated that Pilates training is an effective means to improve volleyball players' performance since the experimental (Pilates) group showed better improvement than the control group.

Table 3. Outcome variables comparison within the groups (paired t test) and between groups (independent t test).

Outcome Variables	Groups	Pre-intervention	Post intervention	(Within group) t-value	Pre-post difference	(Between group) t-value
		Mean±SD	Mean±SD	(p-value)	Mean±SD	(p-value)
Curl up (counts)	Control group	4.33±.97	4.47±.83	-1.46 (0.164)	-0.13±0.35	2.12 (0.043*)
	Experimental group	4.40±.73	4.93±.258	-3.22 (0.006*)	-0.53±0.64	
DLLT (degree)	Control group	21.00±26.26	17.00±19.53	1.87 (0.082)	4.00±8.28	-2.76 (0.01*)
	Experimental group	21.33±18.56	6.00±7.60	4.38 (0.001*)	15.33±13.55	
Illinois agility test (sec)	Control group	14.86±.83	14.73±.96	0.8 (0.433)	0.13±0.64	-12.42 (0.000*)
	Experimental group	14.80±1.20	11.86±1.24	19.13 (0.000*)	2.93±0.594	
Vertical jump test (cm)	Control group	40.40±5.39	40.26±5.37	0.69 (0.499)	0.13±0.74	10.6 (0.000*)
	Experimental group	49.26±9.41	52.66±9.02	-12.47 (0.000*)	-3.40±1.05	
Brady's test (numbers)	Control group	9.00±2.13	10.00±2.00	-3.09 (0.008*)	-1.00±1.25	4.32 (0.000*)
	Experimental group	8.80±1.61	11.60±2.13	-10.69 (0.000*)	-2.80±1.01	
SEBT Anterior (cm)	Control group	73.53±5.93	73.33±6.19	0.71 (0.486)	0.20±1.08	10.08 (0.000*)
	Experimental group	83.60±7.45	82.00±9.04	1.26 (0.228)	3.87±1.12	
SEBT Posterior (cm)	Control group	77.07±5.21	76.60±5.24	3.5 (0.004*)	0.47±.516	10.58 (0.000*)
	Experimental group	79.27±9.26	82.47±10.67	-1.79 (0.094)	3.87±1.47	
SEBT Medial (cm)	Control group	76.60±5.86	76.00±5.79	3.64 (0.003*)	0.60±0.63	13.62 (0.000*)
	Experimental group	75.07±7.71	81.27±5.470	-4.74 (0.000*)	3.53±0.99	
SEBT lateral (cm)	Control group	77.53±6.30	77.00±10.64	2.25 (0.041*)	0.53±0.91	10.37 (0.000*)
	Experimental group	83.47±11.03	83.27±10.59	0.15 (0.878)	3.60±1.24	
SEBT Anteromedial (cm)	Control group	77.73±7.77	77.53±7.87	1.38 (0.189)	0.20±0.561	11.48 (0.000*)
	Experimental group	87.47±7.511	85.80±9.44	1.25 (0.232)	4.20±1.37	
SEBT Anterolateral (cm)	Control group	79.13±5.48	78.86±5.95	0.61 (0.546)	0.27±1.66	8.38 (0.000*)
	Experimental group	82.80±9.38	86.06±10.18	-1.91 (0.076)	3.67±0.72	
SEBT Posteromedial (cm)	Control group	79.33±6.44	78.80±6.28	2.08 (0.056)	0.53±0.99	12.08 (0.000*)
	Experimental group	79.26±6.92	84.93±5.58	-5.24 (0.000*)	3.93±1.03	
SEBT Posterolateral (cm)	Control group	81.93±7.73	81.73±7.90	1 (0.334)	0.20±0.77	11.5 (0.000*)
	Experimental group	87.40±10.61	86.80±10.32	0.47 (0.641)	3.53±0.99	

DLLT- Double leg lowering test, SEBT- star excursion balance test. The critical value of t test for within group was 2.14 and between groups was 2.048. * Significant at $p \leq 0.05$.

DISCUSSION

The outcomes of this study indicated that individuals in the control group significantly improved their balance (posterior and medial direction) and volleyball sports specific skills. However, in participants of experimental group, upper and lower abdominal strength, explosive power of lower limb, agility, balance (medial and posterior direction) and volleyball specific skills improved significantly at the end of 6-weeks of Pilates training. Moreover, all the

outcome variables have improved considerably in the Pilates group compared to the control group. These findings indicated that regular Pilates exercises combined with volleyball training would benefit volleyball players' different physical attributes and sport-specific skills.

The improvement of these physical characteristics with Pilates training may be attributable to the improved capacity of the neuromuscular system to accomplish various dynamic, eccentric, and isometric stabilization contractions to counteract gravity and motion. Adequate core stability facilitates enhanced inter-body movement, sustained contraction of the deep spinal stabilizer muscles, and stability for the movement of distal segments. Additionally, it improves motor unit coordination and lessens neutral inhibitory reflexes which further lead to improvement of various physical parameters (Panchal et al., 2022).

The results of our study coincide with those of a study conducted by El-Sayed et al. (2010), which concluded that the addition of Pilates mat-work training to specialized volleyball training had a substantial impact on vertical jump performance in young volleyball players. The development of trunk muscular strength, which improves limb motor coordination, motor function, and the amount of oxygen delivered to the lungs, was found to benefit from Pilate's training. Therefore, the Pilates training regimen is beneficial for improving biological efficiency, lower limb strength, and jump performance.

Similar results were found in badminton players by Yeole et al., (2018), who found that a 4-week Pilate's exercise program significantly increased abdominal muscle strength, neuromuscular coordination, agility, and dynamic balance. Likewise, research by Panchal et al., on cricket players in 2022 found that 6 weeks of Pilates training had a positive impact on several physical traits, including core muscle strength, agility, power, hamstring muscle flexibility, and speed. Additionally, the findings of the present study are consistent with those of a study conducted by Johnson, Larsen, Ozawa, Wilson & Kenedy (2007) on healthy adults, which found that implementing a 5-week Pilate's exercise program improved kinesthetic awareness, core stability, and reduced inappropriate movement patterns, which in turn improved motor control in study participants.

The findings of our study are also consistent with findings from a study on badminton players, which found that five weeks of Pilates exercises significantly improved participants' agility, lower-limb explosive power, and dynamic balance compared to the control group (Preeti, Kalra, Yadav & Pawaria, 2019). Furthermore, according to Yadav et al. (2019), five weeks of Pilates training proved beneficial for improving the badminton players' agility and coordination.

Pilates exercises contribute to improved neuromuscular coordination and enhanced control of trunk movement. The findings of our study and other studies clearly demonstrate that Pilates exercises are beneficial for improving numerous physical parameters and sports-specific skills in volleyball players. However, the study had several limitations including small sample size, inclusion of only male university volleyball players and lack of follow up. Future studies can assess the impact of Pilates training on female volleyball players and competitive volleyball players, and they might also include follow-up.

CONCLUSION

This clinical trial concluded that Pilates training is an efficient kind of exercise that enhanced the physical parameters such as agility, balance, upper and lower abdominal strength, explosive power of lower limb and sports specific skill of volleyball players. The research has provided an insight into the significance of Pilates for volleyball players, indicating that sports physiotherapists may guide the coaches and players about beneficial effects of Pilates exercises in sports players so that it can be included in their routine practice. The results of the study may be applied to general practice of players in a way that these exercises if given in combination with the regular volleyball training to the players may reduce injuries and improve overall performance of the players with improvement in their physical parameters and volleyball sports specific skills.

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Primljen: 07. februar 2024. / Received: February 07, 2024

Izmjene primljene: 22. februar 2024. / Changes Received: February 22, 2024

Prihvaćen: 16. mart 2024. / Accepted: March 16, 2024



INTEGRATION OF PHYSICAL AND PSYCHOLOGICAL TRAINING OF WRESTLERS AT THE STAGE OF PREPARATION FOR THE ELITE LEVEL

ASSAN ZHOLDASBAY

Department of Physical Culture and Sports, Abai Kazakh National Pedagogical University, Almaty, Republic of Kazakhstan

Correspondence:

Assan Zholdasbay, Abai Kazakh National Pedagogical University, Almaty, Republic of Kazakhstan,

zholdasbay_a@hotmail.com

Abstract: The purpose of the study is to substantiate the need to introduce a system of methodological tools for the development of sambo athletes' readiness to integrate physical and psychological training during professional growth as a guarantee of their ability to receive high awards. The study was conducted in two stages: theoretical (analysis, comparison, and systematisation of normative documents on the research problem, classification, generalisation of theoretical data) and practical (pedagogical observations; control exercises; psychological tests). During the study, the content of the concepts "training process of sambo athletes" and "integration of physical and psychological training" was determined; their signs and features were revealed; a methodology for the preparation of sambo athletes to integrate physical and psychological training at an elite level was developed and implemented. During the experimental study among sambo athletes who attended the sports school "Satpayev Kali" (Shamalgan), a methodological toolkit was developed to improve the readiness of sambo athletes to integrate physical and psychological training at an elite level, namely: the implementation of components and criteria of readiness with selected methods of their development. According to the results of the conducted research, promising areas for improving the methodology of the development of sambo athletes' readiness for integration of physical and psychological training at an elite level by developing components and criteria of outlined readiness. The practical value of the study is the development of a methodological system for improving the training of sambo athletes at an elite level in Kazakhstan.

Keywords: health-saving technologies, sports education, readiness components, methodical system, sports classes.

INTRODUCTION

In the era of informatisation and digitalisation of society, which leads to an increase in mental and informational loads on a person, the search for ways of optimisation, harmonisation, and adaptation in the socio-ecological environment, subject to constant updating, becomes relevant. In Kazakhstan, sambo wrestling is recognised as a national and priority sport, which has a high importance in the education of young people and the development of the personality of a citizen and patriot of Kazakhstan society. The state policy of Kazakhstan is aimed at the introduction of health-saving technologies in the process of training wrestlers at the stage of preparation for high-level sports. The relevance of the identified issues is conditioned by the existing problem of physical and psychological training of wrestlers for their qualitative preparation for high-level sports (The Strategy for..., 1997). The problem of the study is the theoretical and practical substantiation of the methodology of integration of physical and psychological training of sambo athletes at an elite level in Kazakhstan.

Akkari, Seidikenova, Bakitov, & Minazheva (2023) have proved that with the development of targeted national social programmes in Kazakhstan and based on an in-depth analysis of the current state of the educational environment, the issue of ensuring the level of public health becomes relevant. Ensuring an educated and healthy generation of future specialists is one of the most important tasks of the educational system of Kazakhstan. Physical culture and sports play a significant role in the development of a healthy and athletic Kazakh society, occupying a leading place in the development of universal culture. Maintaining a sporty lifestyle, according to scientists, is designed to provide the younger generation of Kazakhstan with the necessary amount of physical activity, develops physical qualities, and hardens. Participation in martial arts is designed to form the moral and volitional qualities of future specialists.

Hacıhasanoğlu, Yıldırım, Karakurt & Sağlam (2011) suggest that the insufficiency of the methodological developments aimed at revealing an integrative approach to the implementation of physical and psychological training of sambo wrestlers, which provides for the development of physical qualities and mental functions in athletes, blocks

the process of preparing a sports reserve. Many researchers have proved the need for such integration, since the manifestation of the maximum physical qualities of a wrestler is associated with psychological preparedness. Lyell, Simmonds & Deane (2016), in papers related to the specifics of sambo training in sports classes and clubs, prove the existing insufficient level of psychological methods of training such athletes due to the lack of a powerful methodological base. The researchers actively explore the psychology of sports as an applied science aimed at ensuring the effectiveness of the educational and training process and the high quality of athletes' preparation for competitions. It is proved that very important components in the process of training sambo athletes at the stage of preparation for an elite level are the realisation of the personality traits of the athlete; stable psychological adjustment when performing physical exercises. Therefore, the main goal of physical culture and sports is to achieve unity of physical and spiritual qualities of a person, increase physical and mental health along with the improvement of sports skills.

In the collection of materials of the international round table on the topic: "Training of professional in the context of digitalisation of education – Problems and prospects" (2022), researchers mention that the existing methodological tools aimed at training sambo athletes need to be gradually improved on the principle of primary competition and secondary training. Due to the implementation of significant changes in the content of the competitive sambo duel, the rules of the competition, training methods, tactical and technical techniques, reducing the duration of the duel, the wrestling process has become dynamic, continuous attacking actions are encouraged. All this requires sambo athletes to quickly solve tactical and technical problems and use certain attacking combination actions. However, the existing methodology of technical and tactical training does not sufficiently consider the requirements of modern freestyle wrestling.

The purpose of the study is to develop and implement a methodological system for training sambo athletes on the way to achieving the elite level in sports. During the conducted research, the following tasks are highlighted:

1. Analysis of the experience of physical and psychological training of sambo athletes and analysis of the possibilities of its integration into the training process of sports schools and classes.
2. Development and experimental verification of the methodology of integration of physical and psychological training of sambo athletes at the stage of preparation for an elite level in sports schools of Kazakhstan.
3. Determination of the nature of the influence of the developed integrated methodology on the development of physical and psychological qualities, increasing the functional capabilities of sambo athletes.
4. Testing the influence of an integrative approach to the training of sambo athletes at the stage of preparation for an elite level.

The solution to the outlined problems will contribute to the effective development of a complex of professional competencies of sambo athletes, the development of professionally significant qualities for competitiveness in the labour market, and the solution of urgent tasks and problems of socio-economic development of the country.

MATERIALS AND METHODS

The presented research was conducted in two stages: theoretical (analysis, comparison and systematisation of literature, normative documents on the research problem, classification, generalisation of theoretical data to assess the level of research and determine the importance of the studied issues) and practical (pedagogical observations; control exercises; psychological tests; analysis of plans and diaries of athletes, acquired experience innovative activity among coaches and highly qualified sambo athletes; conversations and interviews with athletes; questionnaires; psychophysiological methods; expert evaluation; competition method; pedagogical experiment; methods of mathematical statistics, evaluation of results using methods of mathematical statistics to verify the relevance of this author's methodology). The main methods in the process of experimental research were aimed at investigating the problems of the preparation of sambo athletes to integrate physical and psychological training at an elite level in Kazakhstan. Theoretically, the study of the problems of the application of methodological tools for the development of the readiness has been carried out. These methods were used to identify the input level of readiness of sambo athletes to integrate physical and psychological training.

The practical stage consisted of an experimental study conducted in the city of Shamalghan among sambo athletes who attended the "Satpayev Kali" sports school and engaged in wrestling for 10-15 years. In order to ensure the representativeness and reliability of the sample, the features of the development of experimental groups of respondents are determined. The establishment of the research array was carried out by pairwise selection. The condition

was considered that at the end of the selection, the number of the experimental group met the requirements of representativeness. 36 sambo athletes were involved in the experiment. The control group included 16 respondents, and the experimental group included 20 participants. The experimental and control groups had no differences in height, weight, and dynamometric measurement results. The experiment was conducted during 2022-2023. Diagnostics of the effectiveness of the system of methodological means of preparing sambo athletes for the integration of physical and psychological training at an elite level, who were trained according to the methods of the honoured coach of the Republic of Kazakhstan in sambo Asan Zholdasbai, was carried out.

During the ascertaining experiment, the following components and criteria of readiness were identified, namely motivational (motivational and value criterion), psychological (emotional), physical (strength) and performance (reflexive). The levels of readiness of sambo athletes for the integration of physical and psychological training at an elite level in Kazakhstan have been determined and evaluated at medium and low levels. At the formative stage of the experiment, the selected components of the readiness of sambo athletes to integrate physical and psychological training at an elite level in Kazakhstan were tested. In the course of the research, the following principles were implemented: individualisation, accessibility, systematicity, visibility, gradual increase in workload, and strengthening of initiative. To increase the level of readiness of sambo athletes to integrate physical and psychological training at an elite level, a system of methodological tools has been developed, which include exercises aimed at the implementation of: mental self-regulation, concentration of attention, development of attention switching, noise immunity, imagination, muscle tension control abilities, development of relaxation skills.

The following methods were used to fulfil these conditions: development of positive motivation for psychological and physical training (questionnaires, conversations, analysis of the performances of advanced wrestlers), systematic analysis of performance during training and fights (individual training of causal schemes); development of individual performance in actions (conversations); development of wrestlers' self-esteem and goal planning ("personality training"); optimisation of the ratio of training motivation during a duel (training sessions, conversations and beliefs); development of motivational achievements in wrestlers (using stories based on pictures of the Thematic Apperceptive Test (TAT), development of mental self-regulation in wrestlers (psychoregulatory training of Sambo athletes). After the end of the experiment, the analysis of the results obtained and their generalisation was carried out, conclusions were drawn, and prospects for further research on this topic were substantiated.

RESULTS

An important aspect of the development of the social culture of the individual in Kazakhstan society is sport, which provides physical improvement, spiritual and moral development, the ability to social adaptation, value and motivational determination, achievement of a high level of skill and professionalism in the field of sports, namely Sambo wrestling. The implementation of the training of a high-level wrestler depends on a qualitatively selected methodological system, which includes tactical and technical actions that should tend to improve (Borysiuk, 2001; Melnyk, 2023). Nowadays, the requirements for the training of sambo athletes, in particular, at the stage of preparation for elite-level sports, constantly tend to increase. Since sports activities are carried out in extreme conditions, significant physical and neuropsychological stresses are required from athletes (Melnyk, Cherkasova, Khimenes & Zahura, 2023). Based on the relevance of the identified issues on the implementation of the integration of physical and psychological training of wrestlers at an elite level, an experimental study was conducted. The methodology of the honoured coach of the Republic of Kazakhstan in sambo Asan Zholdasbai was taken as a basis on which athletes were engaged.

In the process of forming an experimental study at the ascertaining stage of the experiment, to determine the real state of readiness of wrestlers for the integration of physical and psychological training, an analysis of competitive duels and the training process of athletes of different qualifications was carried out. Based on the analysis, it was found out that at the stage of preparation for an elite level, the wrestler must have the tactics of active struggle, consolidate the advantage through active manoeuvre, restrain the opponent with grips of various types, have the ability to actively use technical and tactical actions with reliable protection and counterattacking actions from capturing legs, make throws with a large amplitude, master the technique of pinning down the opponent in a dangerous position. It was found that the specificity of sambo wrestling is conditioned by the high and diverse motor activity of the wrestler associated with the manifestation of physical qualities (strength, speed, endurance, dexterity, flexibility) and psycho-

logical (concentration, steadfastness, attention switching), intellectual (resolution of situations), volitional (perseverance, determination, self-control, independence). Physical properties develop in the process of sambo wrestling, but special physical training is needed for a high level of their development.

To determine the actual readiness of wrestlers to integrate physical and psychological training, testing was conducted in both groups, which determines the level of physical fitness (motor qualities), physiological characteristics and psychological indicators, and the tolerance of physical activity. The purpose of testing is to identify the level of awareness of Sambo athletes of professional skills at the stage of preparation for an elite level. 36 sambo wrestlers who attended sports clubs in Almaty and engaged in wrestling for 10-15 years were involved in the survey. The control group included 16 respondents, and the experimental group included 20 participants. There were no significant differences in height, weight, and dynamometric measurement results between the experimental and control groups. The establishment groups – experimental and control – was carried out by analogy with one another for all the studied signs, which allowed for comparative observation. The results of experimental studies were evaluated at high, medium, and low levels. The experiment was conducted during 2022-2023.

At the stage of the ascertaining experiment, a theoretical analysis of the literature base on the problem of research, the acquired experience of innovative activity among coaches and highly qualified sambo wrestlers, who have repeatedly passed high victories, was carried out. Based on the data obtained, a methodology for integrating the physical and psychological training of wrestlers and assessing its impact on their level of preparedness at the stage of preparation for an elite level has been developed. According to the experimental programme in the control group, training was carried out during the year according to the traditional programme for wrestlers at the stage of preparation for an elite level. The experimental group was offered classes developed based on experimental methods of training wrestlers. After completing the training according to the experimental method, repeated testing was carried out in both groups, according to which the reliability of the change in the test results for the year and the difference in the gradation of the experimental data results between the experimental and control groups were evaluated. The integral indicator of the effectiveness of the training process is considered by the results of the performance of athletes at competitions. For this purpose, the participation of athletes of the experimental and control groups in competitions of different levels was considered. The performance was evaluated by points according to the developed scale. The points received individually by each athlete were added, after which the average values for the groups were calculated.

The method of integration of physical and psychological training of wrestlers is based on the relationship of physical qualities and mental functions. The implementation of psychological training of sambo athletes should be integrated into the process of physical training. The statement of spiritual and educational principles among wrestlers lays the foundation of personality and creates a platform for the development of physical properties. Mastery of techniques allows a wrestler to defeat an opponent and cultivate high spiritual qualities and self-control. Thus, the methodology is based on the implementation of physical indicators, moral principles, universal values, and the ability to concentrate, which is transformed into a concentration of energy and strength. The training of the concentration process is one of the mandatory sections of the psychological training of sambo athletes. The process of teaching concentration of attention is proposed to be carried out both by traditional methods of martial arts, and through psychotechnical training with elements of yoga, chi-gong, meditative practices. The indicated methodology of integration of physical and psychological training of wrestlers is proposed to be implemented by observing the following conditions:

- integration of mental and physical forces;
- knowledge of own strengths and capabilities by the wrestler;
- motivation to achieve success;
- confidence in achieving the set goal;
- ability to concentrate on performing a certain movement;
- ability to resist internal and external psychological factors;
- state of readiness of the wrestler at the time of performing the movements;
- development of volitional qualities (determination, fortitude, self-control).

The content of the methodological system of integration of physical and psychological training of wrestlers at the stage of preparation for an elite level is implemented in the following conditions:

1. Development of positive motivation for psychological and physical training. Verification of the condition is carried out through questionnaires, conversations, and analysis of the fights of advanced wrestlers.

2. Systematic analysis of performance during training and duels. To check the effectiveness of this condition, the study suggests the use of individual training of causal schemes, which is proposed to be carried out after each training session and duel, aimed at studying the actualisation of emotional states.
3. Development of individual effectiveness in actions. It consists in using conversations aimed at developing performance through strengthening sports motivation.
4. Development of wrestlers' self-esteem and goal planning. To implement this task, "personality training" was used. The training contributes to the development of adequate self-esteem among wrestlers.
5. Optimisation of the ratio of training motivation during the match. It is proposed to implement the task by using training sessions after the competition, while using conversation and persuasion.
6. Development of motivational achievements among wrestlers. The indicated condition consists of two aspects, namely: the motivation to achieve success and the motivation to avoid failure. The study suggests teaching athletes how to create stories based on TAT images, in the process of which wrestlers are invited to view photos of sports fights, where they should make a brief description of the emotions depicted in the photo.
7. The development of mental self-regulation in wrestlers. To implement the indicated condition, a psychoregulatory training of sambo wrestlers is proposed, during which the following functions are realised: concentration, stability, distribution and switching of attention, development of imagination.

In order to implement the methodology of integration of psychological and physical training of sambo athletes at the stage of preparation for an elite level, the components and criteria of its organisation are identified, namely: motivational (motivational and value criterion), psychological (emotional), physical (strength), and performance (reflexive). Based on indicators of the athletes' readiness to integrate psychological and physical training at an elite level during the ascertaining stage of the experiment, data processing was carried out in the control group. The obtained data at the stage of the ascertaining experiment are presented in Figure 1.

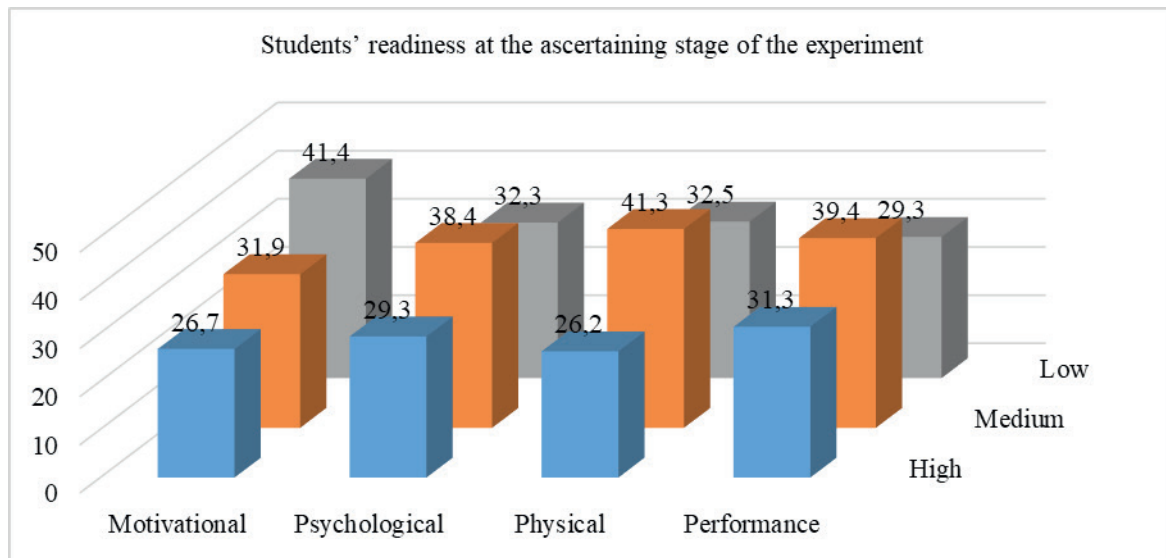


Figure 1. The results of diagnostics of the level of development of the components of the wrestlers' readiness for the integration of psychological and physical training at the stage of preparation for an elite level in the control group

Source: compiled by the author.

At the formative stage of the experiment, the following principles are proposed for implementation: individualisation, accessibility, systematicity, visibility, gradual increase in loads, strengthening of initiative:

1. The implementation of mental self-regulation in the study is proposed to be developed through a set of exercises: "Fingers", "Butterflies", "Attention", "Focusing", "Rhythmic contemplation", "Fly".
2. In order to concentrate attention to the use of exercises are offered: "Thermometer", "Pulse", "Geometric figures", "Breathing", "Searchlight".

3. For the development of attention switching: “Red-black table”, “Numerical order”, “Pump”.
4. It is proposed to develop noise immunity through a series of exercises: “Obstacles” and “Number arrangement”.
5. For the development of imagination: “Thinking training”, “Word”, “Mental visualisation”, “Geometric figures”, “Mental reproduction”, “Motor skills training”.
6. To develop the ability to control muscle tension: “Dynamometer”, “Conductor”, “Infrared rays”.
7. To develop relaxation skills, exercises are used: “Contrast”, “Slow motion”, “Pump”, “Bell”, “Partial relaxation”.

In the process of training wrestlers for elite-level sports, it is proposed to educate the following qualities in sambo athletes:

1. Strength development (through repeated interval exercises). Before performing exercises for the development of strength, the following is carried out: psychological adjustment to previous activities to create mobilisation readiness for the manifestation of strength; creation of a mental image of “I am strong”. To do this, athletes used psychoregulatory training (individual options) and ideomotor training. The exercises were carried out due to perseverance and determination.
2. Development of speed. The development of two types of speed was applied: quickness of reaction and rapid movements with the manifestation of great strength. The development of speed was carried out by gradually increasing the load (running for short distances, exercises with dumbbells, and exercises in pairs with elements of imitation of real sambo wrestling).
3. Development of endurance. It is proposed to run 1,000 meters using the methods of repeated and interval exercises.

The results of the study at the formative stage of the experiment are elaborated and presented in Figure 2.

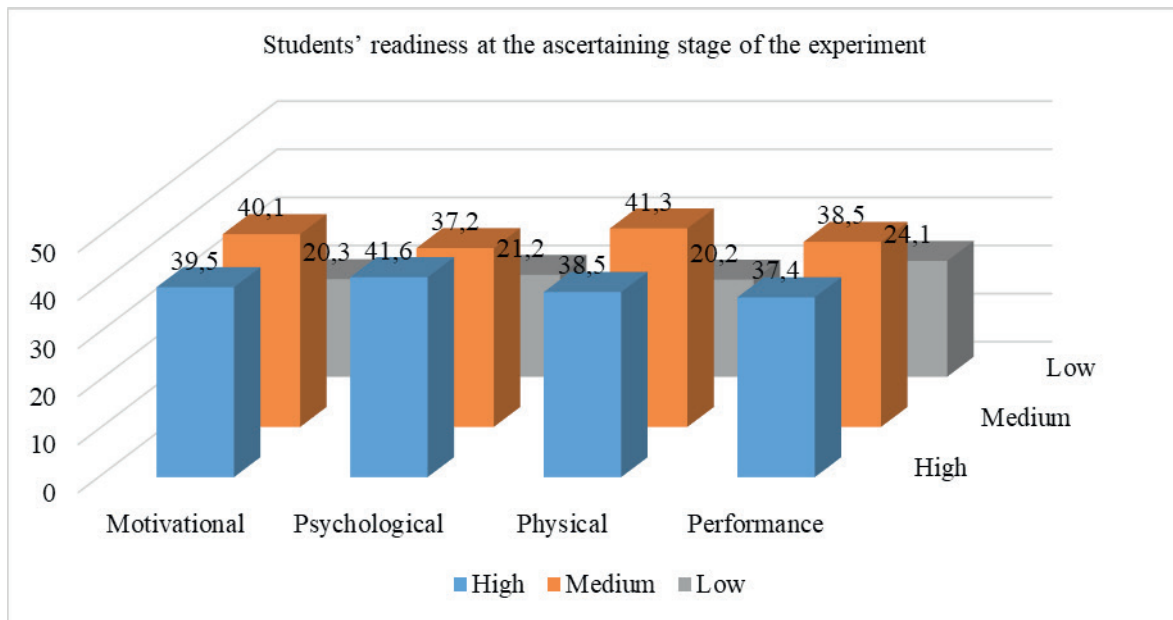


Figure 2. The results of diagnostics of the level of development of the components of the wrestlers' readiness for the integration of psychological and physical training at an elite level in the experimental group

Source: compiled by the author.

Thus, the author's integrated methodology of psychological and physical training of sambo wrestlers is aimed at the development of athletes' physical qualities and mental functions that determine their manifestation in competitive conditions. The methodical system is aimed at accelerating the acquisition of control skills, optimising the training process, improving the quality of training and the results of competitions of sambo athletes. In this methodology, the priority is given to the psychological training of wrestlers as a guarantee of creating a psychological base for the

successful development and manifestation of physical qualities, namely: strength, speed, and performance. However, it is necessary to prioritise psychological training, as a guarantee of creating a psychological base for the successful development and manifestation of physical qualities – strength, speed, endurance.

The proposed methods, within the framework of a certain methodology for integrating physical and psychological training of sambo athletes in the preparation for elite-level sports, direct coaches to actively introduce psychological training to athletes. The use of modern methods of integrating psychological and physical training of wrestlers at an elite level requires athletes and their coaches not only to be active and able to find new solutions, but also to form the skills to independently set and perform new professional and social tasks of adaptation and work in changing conditions, confidence, and responsibility.

DISCUSSION

Today in Kazakhstan the improvement of the system of athletes' training, the search for effective methods of assessing and improving the physical fitness of wrestlers and their psychological readiness at the stage of preparation for high-level sports, in particular in judo wrestling, is becoming promising. The solution of this issue should be carried out by improving existing and developing new training programmes for judoists, updating the system of comprehensive control of the development of physical and psychological fitness (Rueda Flores, Mon-López, Gil-Ares & Coterón, 2023). The integration of physical and psychological training of wrestlers an elite level is a complex and multifaceted process. In the study, the components of integration include:

- subject (integration of knowledge);
- cognitive or epistemological (integration of cognition methods);
- active (integration of activity methods);
- organisational (integration of forms of implementation of activities);
- personal (integration of human manifestations within the framework of integrated knowledge);
- didactic (integration of teaching methods).

Integration is a process of movement and development of the system, where the number of its constituent elements and the intensity of their interaction are growing. The growing need for coaches to develop competencies aimed at knowing the specifics of content and technology in the context of the pedagogical process of training sambo athletes and the insufficient development of methodological tools for working in the training system of the sports reserve is becoming important (Соболенко & Мартинов, 2017; Beighton, Grahame, Bird, Beighton, Grahame & Bird, 1999). Based on the opinion expressed by researchers, sambo wrestling refers to a sport where the final result directly depends on both the physical qualities of athletes and their psychological adjustment to conducting active competitive activity. The implementation of modern sambo wrestling in Kazakhstan is based on the requirements of the parties of sports preparedness, which allows for the selection of relevant, reasonable, and adequate means and methods of training. Contrary to the opinion of researchers, the implementation of the integration of physical and psychological training of wrestlers requires not only sports classes that contribute to the full physical development of wrestlers at the preparation for an elite level and emotional unloading, but also work on improving their individual physical and psychological data.

The stage of preparation of sambo athletes for an elite level provides for the achievement of maximum results in sambo wrestling, there is a sharp increase in special training in the total amount of training work and the growth of competitive practice. The main task at this stage is the ability of sambo athletes to use means aimed at rapid adaptation. The goal of the stage is to maximise the total values of the volume and intensity of training work, a wide plan of classes with heavy loads (Fagard, 2001). Hacıhasanoğlu et al. (2011) argued that sambo is a fairly young sport in Kazakhstan. According to researchers, today there are not enough developed training programmes and approaches for conducting training sessions of wrestlers at the stage of preparation for an elite level. Since the preparation of wrestlers for an elite level is based on the deepening of the physical qualities of athletes and the maximum realisation of individual capabilities, ensuring high sporting results in competitive conditions involves improving the technical skills of training sambo athletes on a permanent basis. According to honoured sambo coach of the Republic of Kazakhstan, Asan Zholdasbai, psychological training of sambo athletes precedes and accompanies physical training. The coach formulated the essence of the main problem of modern sports, which consists in a harmonious and complex combination of the main components of success: psychological, physical, functional, and tactical training of athletes (Dvoryatkina, Melnikov & Shcherbatykh, 2022).

The methods by Asan Zholdasbai for the integration of physical and psychological training of wrestlers have found active application among the following types of martial arts: judo, Kazakh wrestling, and freestyle wrestling. The coach of the Almaty region on combat sambo Kuanzhan Kulpeisov considers sambo wrestling one of the unique types of martial arts that is inherent in the culture of each nation. Sambo combines elements of judo, freestyle and Greco-Roman wrestling, Kazakh wrestling, sumo, and fist fight. That is why, according to the coach, the training of sambo athletes at the stage of preparation for an elite level requires the development of a special methodological system. Cabrera, Vega, Sarmiento, Paz-Susana & Tierra (2022) investigating the development of sambo located one of its founders in Almaty along with other outstanding coaches, namely, Kerey Koishibek.

An equally important person among the elite sambo athletes is the practitioner Asana Adambayuly, who learned the basics of wrestling under the guidance of a prominent specialist, the honoured coach of Turkmenistan Bayram Mammadov. In 2006, Asan Zholdasbai became the director of Youth Sports School No. 15 in Almaty (Cabrera et al., 2022). In the study, sambo wrestling is interpreted as a fight in two positions, namely: in a stand – the task of which is the ability to throw the opponent on the carpet, and on the ground – from a prone position to carry out a painful reception that will force the opponent to surrender. Asan Zholdasbai, within the framework of his methodology, tended to a wide arsenal of techniques for wrestlers to implement which they must have certain physical qualities, namely: strength, speed, endurance, and willpower. According to the coach, the wrestler is required to demonstrate strength and speed at the maximum level, which depends on the psychological readiness of the athlete. Mental training is recommended to increase the functionality of the athlete and the reliability of the competition.

Knight (2008), Fleischman & Mumford (1989) proved in scientific developments that in order to integrate the physical and psychological components, before performing exercises concerning the development of strength and psychological adjustment to competitive activity, the development of the image of “I am strong” should be used. The expressed opinion is considered correct and is reflected in the need to use psychoregulatory and ideomotor training. However, different arguments were made in the study, since the indicated exercises should be applied along with volitional efforts (stubbornness, determination). The development of strength, agility, flexibility, coordination can be carried out through game training, consisting in a combination of a standard approach to training and specially selected sports games, for example, wrestling rugby – basketball with elements of rugby, during which speed, functionality, cardio and general physical training develop.

Thus, the integration of physical and psychological training of wrestlers is proposed to be carried out using a methodological system based on a game technique aimed at the contextual development of physical qualities and mental functions during competitions. When athletes work in extreme conditions, significant changes and activation of pre-pathological processes occur in their psyche. Therefore, the complex and harmonious development of sambo athletes requires a renewed attitude to sports activities. Such integration is aimed at accelerating the development of process management skills at the subconscious level, optimising the training process, and improving the quality of training and competitive activities of wrestlers at the stage of preparation for an elite level.

CONCLUSIONS

The study concluded that high-quality professional training of sambo athletes for the integration of physical and psychological training at an elite level in Kazakhstan should be based on a system of methodological tools for the implementation of which it is necessary to predict the effective component of the content. The application of integration of physical and psychological training of sambo athletes at an elite level requires careful preparation from both the coach and the athlete, which allows the wrestler to adapt to the updated training methodology. The study confirms that knowledge of the theoretical and practical foundations of the integration of physical and psychological training of sambo athletes at the stage of preparation for an elite level will contribute to the further expansion of the professional competencies of high-level athletes. The results of the experiment indicate significant positive changes in the levels of development of wrestlers' readiness for the integration of physical and psychological training, which proves the effectiveness of the developed system of methodological tools.

Promising areas for improving the development of readiness for the integration of physical and psychological training at an elite level have been formed. During the experiment, it was found that the readiness under study is at low and medium levels. It is determined that such a trend requires the creation of the necessary methodological tools, which will contribute to improving the level of training of specialists. The data obtained from the results of

the experiment after applying the proposed methodology allow drawing conclusions about the effectiveness of the implementation of methodological tools. In this regard, the policy of training sambo athletes in Kazakhstan should be aimed at updating the methodology of training future champions in the field of freestyle wrestling.

Prospects for further research are aimed at developing a wider range of methodological tools to form the process of preparing wrestlers to integrate physical and psychological training at an elite level. The obtained primary results require the expansion and deepening of the problem under study, therefore, the development of a broader set of scientific and methodological support will contribute to the development of systemic knowledge about the conduct of free-style wrestling tactics, and the development of skills and abilities to use them in practice. The data obtained can be considered as a tool to increase the readiness of sambo athletes to integrate physical and psychological training.

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Primljen: 25. decembar 2023. / Received: December 25, 2023
Prihvaćen: 15. februar 2024. / Accepted: February 15, 2024



INTERNAL DOMAIN AS A DEVELOPMENTAL POTENTIAL OF THE FUDOKAN KARATE | INTERNO OKRUŽENJE KAO RAZVOJNI POTENCIJAL FUDOKAN KARATEA

JOVICA DIMIĆ, MILAN NEŠIĆ, ZLATKO AHMETOVIĆ

Faculty of Sport and Psychology, Novi Sad, Serbia

Fakultet za sport i psihologiju, Novi Sad, Srbija

Correspondence:

Jovica Dimić

Faculty of Sport and Psychology, Novi Sad, Serbia
jocad68@hotmail.com

Korespondencija:

Jovica Dimić

Fakultet za sport i psihologiju, Novi Sad, Srbija
jocad68@hotmail.com

Abstract: In the sports domain karate gains popularity of enormous proportions. Judging by the massiveness criterion, it is ranked immediately behind football. However, this ranking is not in accordance with the appropriate organizational concept, that would have visible integrative feature. The problem of organizational and stylistic dissociation is transferred onto the national level, which causes the presence of a variety of competitive disciplines, the way of organization, an appropriate training approach, various interpretations of the basic karate principles etc. Although such situation may create, to some extent, an illusion of positive sides (the possibility of training selection, larger number of stylistic varieties for training relatively "different" forms of karate etc.) which is reflected on the massiveness, in organizational and conceptual context (basically of one skill) makes the problems in creating an effective concept of karate management. In this respect, various concepts of karate organization can be noticed, based on stylistic determinations. One of the autonomous organizational karate forms is The World Fudokan Federation - WFF, with its national federations as integral and constituent parts. Its basic concept is oriented towards the fostering of the traditional approach to karate (traditional karate do), i.e. fostering the traditional karate principles, established by the founder of the modern karate Gichin Funakoshi. As the organization, which, conditionally speaking, is an ideological antipode to the so-called sports karate, it endeavors to affirm and preserve the basic karate values and adjust them to modern sports and social tendencies. In this respect, it faces numerous organizational, sports-political, conceptual and other problems, induced by the external environment, but may be overcome by the activities and tendencies generated within the internal domain of Fudokan Karate organization. Empirical research, carried out in the form of transversal study, was aimed at the identification of some facts of internal organizational domain of Fudokan, which may have positive impact on its development in the upcoming five-year-period, and are perceived by the main Fudokan karate holders (instructors and trainers). The respondent sample comprised 73 instructors/trainers as the main activity holders in the clubs. The research was in the form of a survey and the

Apstrakt: U sportskom okruženju karate ostvaruje popularnost izuzetnih razmera. Po masovnosti ga svrstavaju odmah iza fudbala, međutim, ovakvu pozicioniranost ne prati odgovarajući koncept organizacije koji bi imao vidljiv integrativni karakter. Problem organizacijske i stilske razdušenosti prenosi se i na nacionalne nivoe, što uslovljava postojanje više takmičarskih disciplina, načina organizacije, pristupa treningu, različitog tumačenja izvornih principa karatea, itd. Mada ovakva situacija, donekle, može da stvori privid i dobrih strana (mogućnost izbora vežbanja, veći broj stilskih varijeteta za vežbanje relativno "različitih" oblika karatea, itd.) što se reflektuje na masovnost, u organizacionom i konceptualnom kontekstu (suštinski jedne veštine) stvara probleme u kreiranju efikasnog koncepta upravljanja karateom. U tom pogledu mogu se zapaziti različiti koncepti organizacije karatea u čijoj su osnovi stilska opredeljenja. Jedan od autonomnih organizacijskih oblika u karateu je i Svetska Fudokan federacija (World Fudokan Federation-WFF), sa svojim nacionalnim federacijama kao integrativnim i konstitutivnim delovima. Koncipirana je kroz orijentaciju na negovanje tradicionalnog pristupa karateu (Traditional karate do), odnosno, negovanje izvornih karate principa utemeljenih od strane osnivača modernog karatea Gičin Funakošija. Kao organizacija koja je, uslovno, ideološki antipod tzv. sportskom karateu, nastoji da afirmiše i očuva izvorne vrednosti karatea i uskladi ih sa savremenim sportskim i društvenim tendencijama. U tom pogledu suočava se sa brojnim organizacijskim, sportsko-političkim, koncepcijskim i drugim problemima koji su indukovani od strane eksternog okruženja, ali se mogu prevazilaziti dominantno aktivnostima i opredeljenjima koja se generišu u okviru internog okruženja Fudokan karate organizacije. Empirijsko istraživanje koje je sprovedeno u formi transversalne studije imalo je za cilj identifikaciju nekih činilaca internog organizacijskog okruženja Fudokana koji mogu imati pozitivan uticaj na njegov razvoj u narednom petogodišnjem periodu, a koji su percipirani od strane ključnih aktera Fudokan karatea (instruktora i trenera). Uzorak ispitanika je sačinjavalo 73 instruktora/trenera koji su glavni nosioci aktivnosti u klubovima. Istraživanje je bilo aknketnog tipa, a kao

key research instrument was a questionnaire devised as an estimation scale. The results have proved that the greatest potential for Fudokan development in the future belongs to the factors of Internal domain – Organizational structure, Organizational culture and Organizational resources, with the high level of possible impact.

Keywords: *Fudokan, domain, development.*

INTRODUCTION

Contemplation about various aspects of modern context of contemporary karate, regardless of the emphasis of its features as a modern sport, would not be complete without the continuity of understanding its roots. They are found in the Martial Arts of the Far East. The Sport activity features in the 20th century, especially its second half, gave the dominant sport dimension to the Martial Arts of the Far East, therefore, they spread in such light all over the world. Having been in touch with different cultures, they had inevitably undergone a transformation towards the sport physiognomy. One of the reasons can be found in its popularity, which resulted in its massiveness. In this respect, it is essential karate to be contemplated, whose transformation, (from the Art of the spiritual self-development as a Martial Art), was directed towards the constitution of the modern competitive sport (Nešić, Nešić & Dimić, 2023.) By introducing the sport emblems and the sports rules, karate evolved from a utilitarian skill into a modern sports discipline.

For this reshaping, the most creditable figure may be considered Gichin Funakoshi (he is considered the founder of the modern karate) and the Japanese instructor Masutatsu Nakayama (Dimić, 2020.)

In the period from 1916. to 1939., the foundation of karate as a sport was laid, the training programs were defined and accepted, the competition rules were implemented, making the dominant feature of the West European Martial Arts. Respecting the tradition of karate skill and regarding the possibilities of its development as a sports discipline (particularly within the University, where the students are eagerly doing sports), Funakoshi made an ecclesiastic system based on moral principles, which, not only keep a dignity of both partners fighting, but put aside traditional winning result (inability to continue the fight, an injury, etc), thus putting an emphasis on the sports approach (evaluating skill, speed, coordination, good psychological preparation of the contestants, etc.) (Jorga & Jorga, 2017). The principle of non-contact (non-contact; strikes without an injury and inflicting pain) became a grounding karate is based on, thus becoming a mass sport (Mabuni, 2009.) . The merits of fur-

osnovni istraživački instrument korišten je upitnik konstruisan kao skala procene. Rezultati su pokazali da se kao najveći potencijali za razvoj Fudokana u budućnosti percipiraju faktori internog okruženja – organizaciona struktura, organizaciona kultura i organizacijski resursi, sa visokim nivoom mogućeg uticaja.

Ključne reči: *Fudokan, okruženje, razvoj.*

Uvod

Razmatranje različitih aspekata aktuelnog konteksta današnjeg karatea, bez obzira na intenzivno potenciranje njegovih osobnosti kao savremenog sporta, ne bi bilo celovito bez kontinuiteta shvatanja njegovih korena. A oni se nalaze u drevnim borilačkim veštinama Dalekog istoka. *Osobnosti sportskih pojava u dvadestom veku, posebno u njegovoj drugoj polovini, borilačkim veštinama Dalekog istoka dale su dominantnu sportsku dimenziju, te se u takvom kontekstu proširile po celom svetu.* U dodiru sa različitim kulturama neminovno su doživele osobenu transformaciju ka sportskoj fizionomiji. Jedan od razloga treba tražiti u njihovoj popularnosti, što je rezultiralo i velikom masovnošću. U tom kontekstu je, svakako, potrebno posmatrati i karate, čija je transformacija (od umetnosti duhovnog samorazvića kao borilačke veštine) išla u pravcu konstituisanja modernog takmičarskog sporta (Nešić, Nešić & Dimić, 2023). Uvođenjem sportskih obeležja i takmičarskih pravila karate je od utilitarne veštine postao savremena sportska disciplina.

Za ovakvo preoblikovanje najzaslužnijim se mogu smatrati Funakoši Gičin (smatra se tvorcem modernog karatea) i japanski instruktor Masutatsu Nakajama (Dimić, 2020). U periodu od 1916. do 1939. postavljeni su temelji karatea kao sporta, na način da su definisani i usvojeni programi obuke, kao i implementirana pravila takmičenja koja čine dominantno obeležje zapadno-evropskih borilačkih sportova. Poštujući tradiciju karate veštine i sagledavajući mogućnosti njenog razvoja kao sportske discipline (naročito u okviru univerziteta gde se studentska omladina rado bavila sportom) Funakoši je načinio jedan eklekistički sistem baziran na moralnim pravilima. Koja ne samo što čuvaju dostojanstvo oba partnera u borbi, već stavljaju u drugi plan tradicionalne ishode pobeđe (nesposobnost za nastavak borbe ili povredu) uz dominaciju sportskog pristupa (procenjuje se veština, brzina, koordinacija, bolja psihička pripremljenost takmičara, itd.) (Jorga & Jorga, 2017). Princip beskontaktnosti (non-contact; udarci bez povrede i nanošenja bola) postao je osnova na kojoj je karate postao masovan sport (Mabuni, 2009). Zasluge za dalju evoluciju karatea kao sporta pripadaju i jednom broju kasnijih majstora/učite-

ther evolution of karate as a sport, can be attributed to a certain number of masters/instructors (Sensei – Sugiyama Shojiro, Hidetaka Nishiyama, Taiji Kase, Ilija and Vladimir Jorga, etc.). Some innovations are reflected through specific competition disciplines, such as enbu, fukugo and kogo (Swanson, 2017.)

During its evolution on a wider world scale and under the influence of differently-oriented karate instructors, karate started to obtain the characteristics of a discipline, which does not evaluate traditional values, such as form, stance, the way of breathing, movement etc, but just direct effect evoked by fast technique (Lawrence & Wilder, 2005.) . Such tendency completely split karate into two separate disciplines, therefore, today there are two types of karate:

1. Traditional (based on karate skill and Budo philosophy)
2. Sports (primary aim is a sport result)

Further process of sports karate innovations in recent years is accentuated again, which is notable through various modifications (particularly in aspect of sub-discipline competition program), which opened the notable tendency of sports karate complements overuse (hyperproduction of competitions, results, champions, etc). In this respect, there is a notable tendency at a growing number of karate instructors that they are gradually getting back to its traditional values (claiming that karate is, above all, Budo skill of self-progress and personal characteristic development) (Dimić, 2020.)

Fudokan, in its wider context, should be considered as a modern Martial Art, based on the principles of Bushido Codex of the ancient warriors of the Far East. It got its physiognomy at the beginning of the 80's of the 20th century, when, through its founders' 1 innovative approach for the first time in karate recent history, the skill was based on the unity of scientific theory of sports-philosophical aspect of karate, karate sports practice of that time and the authentic sport spirit of its protagonists. Nowadays, Fudokan karate makes the dominant school of traditional karate in the East-European countries and the central Asian countries. In the context of the global sports, Fudokan tends to be affirmed as an autonomous sports branch, not as one discipline (style) more within the karate sport. In this way, Fudokan is organisationally constituted as a hierarchical structured system with subordinate functional principle and the dominating divisional organisational form. At the top of the Fudokan Karate Organisation pyramid is World Fudokan Federation (WFF).

Regarding the issue of functioning and development of Fudokan organisation, it is vital to have in mind

Ilija (*Sensei* - Sugiyama Shojiro, Hidetaka Nišijama, Taiđi Kaze, Ilija i Vladimir Jorga, itd.). Neke od inovacija ogledaju se i kroz specifične takmičarske discipline kao što su enbu, fukugo i kogo (Swanson, 2017).

Tokom svoje evolucije na široj svetskoj sceni i pod uticajima različito orijentisanih instruktora karate je sve više dobijao obeležja discipline u kojoj se ne vrednuju tradicionalne vrednosti - forma, stavovi, način disanja, kretanje, itd., već samo neposredan efekat izazvan brzom tehnikom (Lawrence & Wilder, 2005). Ovakva tendencija je u potpunosti razdvojila karate na dve posebne discipline, tako da se danas se može govoriti o dve vrste karatea:

1. tradicionalnom (zasniva se na karate veštini i Budo filozofiji) i
2. sportskom (primarno obeležje je sportski rezultat).

Dalji proces inovacija sportskog karatea poslednjih godina je ponovo aktuelizovan, što je uočljivo kroz različite modifikacije (posebno u delu više subdisciplina takmičarskog programa), što je otvorilo prostor za primetnu tendenciju zasićenosti sportskim komplementima karatea (hiperprodukcija takmičenja, rezultata, šampiona, itd.). U tom smislu je primetna tendencija kod sve većeg broja karate učitelja da se polako vraćaju njegovim tradicionalnim vrednostima (nalažu da je karate iznad svega Budo veština samousavršavanja i izgradnje karakternih osobina) (Dimić, 2020).

Fudokan u najširem smislu treba posmatrati kao savremenu borilačku veštinu koja svoje utemeljenje zasniva na načelima Bušido kodeksa drevnih ratnika Dalekog istoka. Svoju fizionomiju dobija početkom osamdesetih godina XX veka kada se kroz inovativan pristup njegovih osnivača¹, po prvi put u novijoj istoriji karatea, utemeljenje jedne veštine kreiralo kroz jedinstvo naučne teorije sportsko-filozofskog obuhvata, dotadašnje sportske prakse karatea i izvornog sportskog duha njegovih neposrednih protagonista. Danas Fudokan karate čini dominantnu školu tradicionalnog karatea u istočnoevropskim i srednjoazijskim državama. U kontekstu globalnog sportskog pokreta Fudokan nastoji da se afirmiše kao potpuno samostalna sportska grana, a ne kao još jedna od disciplina (stil) u okviru karate sporta. U tom smislu Fudokan je organizacijski konstituisan po sistemu hijerarhijske strukture i subordinativnog principa funkcionisanja, uz dominirajući divizionu organizacionu formu. Na vrhu piramide Fudokan karate organizacije je Svetska Fudokan federacija (World Fudokan Federation – WFF).

¹ osnivač i idejni tvorac Fudokana je dr Ilija Jorga, uz aktivnu podršku dr Vladimira Jorge i *Sensei* Taiji Kazea.

that its functionality is based on an appropriate internal dynamics and activities. Regarding this, it is essential to respect the concept of strategic management (in sport) and the existence of Fudokan Karate organisation environment, which is determined through:

- a) Internal domain (internal organisational dynamics - clubs, federation)
- b) External domain (environment), determiners of closer and wider social context.

Internal domain is characteristic for its organisational dynamics based on mutual functional interaction of resources and actual program activities. Dual sub-system organisational model (sports and business-like sub-system block) may be recognized in the largest number of Fudokan karate organisations. The process of internal functioning (first of all clubs as the basic activity holders and Fudokan „life“ itself) relies on three tightly connected, interactive factors: a) structure, b) functions and c) processes (Nešić, 2008.)

In this context, certain models of functioning, which are bound to the general system theories and the universal functioning of the organizational domain, may applicably refer to Fudokan karate organization environment. (Radoš, 2019.)

METHOD

The research, carried out in the form of the transversal empirical non-experimental study, was aimed at the identification of some factors of the Fudokan Internal organizational domain, which may have positive impact on its development in the upcoming five- year-period, and which were perceived by a certain number of the key Fudokan karate instructors.

The study sample comprised 73 instructors/trainers, as the main activity holders in the clubs. The research was of a survey type and the basic research instrument was the questionnaire similar to the instruments already used in some previous studies (Vojnović, 2012.), Vukajlović 2014., Radoš, 2019.), which was for the occasion adjusted by the appropriate re-designed item suitable for the research area. The questionnaire comprised 19 item-indicators, that constitute the content structure of three dominant factors of the Internal Organisational Domain:

A) ORGANISATIONAL STRUCTURE (Fudokan karate clubs; club managing structures; Management of the Fudokan organization as a whole),

B) ORGANISATIONAL CULTURE (Fudokan organization creativity; work innovation of the Fudokan organization; inter-personal relations within Fudokan organization; mutual vision of the Fudokan organization

Kod razmatranja problematike funkcionisanja i razvoja Fudokan organizacije neophodno je imati u vidu činjenicu da ona svoju funkcionalnost zasniva na odgovarajućoj unutrašnjoj dinamici i aktivnostima. U tom pogledu je neophodno uvažavanje koncepta strategijskog upravljanja (u sportu) i egzistencije okruženja Fudokan karate organizacije koje je determinisano kroz:

- (a) interno okruženje (unutrašnja organizacijska dinamika – klubovi, savez) i
- (b) eksterno okruženje (determinante užeg i šireg društvenog ambijenta).

Unutrašnje okruženje je karakteristično po svojoj organizacijskoj dinamici zasnovanoj na međusobnoj funkcionalnoj interakciji resursa i konkretnih programskih aktivnosti. Kako se u najvećem broju organizacija Fudokan karatea može prepoznati dualni podsistemski organizacioni model (sportski i poslovni podsistem/blok), unutrašnje funkcionisanje (pre svega klubova kao osnovnih nosilaca aktivnosti i “života” fudokana) oslanja se na tri međusobno povezana interaktivna činioca: (a) strukturi, (b) funkcijama i (c) procesima (Nešić, 2008). U ovom kontekstu se određeni modeli funkcionisanja, koji su vezani za opšte teorije sistema i univerzalnog funkcionisanja organizacijskog okruženja, mogu aplikativno odnositi i na okruženje Fudokan karate organizacija (Radoš, 2019).

METOD

Istraživanje koje je sprovedeno u formi transverzalne empirijske neeksperimentalne studije imalo je za cilj identifikaciju nekih činilaca internog organizacijskog okruženja Fudokana koji mogu imati pozitivan uticaj na njegov razvoj u narednom petogodišnjem periodu, a koji su percipirani od strane jednog broja ključnih aktera Fudokan karatea.

Uzorak ispitanika je sačinjavalo 73 instruktora/trenera koji su glavni nosioci aktivnosti u klubovima. Istraživanje je bilo aknetnog tipa, a kao osnovni istraživački instrument korišten je upitnik čiji se konstrukt oslanjao na slične instrumente primenjene u nekim ranijim studijama (Vojnović, 2012; Vukajlović, 2014; Radoš, 2019) i koji je za ovu priliku prilagođen odgovarajućim redizajnom ajtema usklađenih sa prostorom istraživanja. Upitnikom su bila obuhvaćena ukupno 19 ajtem-indikatora koji sačinjavaju sadržinski konstrukt tri dominantna faktora internog organizacijskog okruženja:

A) ORGANIZACIONA STRUKTURA (klubovi Fudokan karatea; upravljačke strukture u klubovima; menadžment Fudokan organizacije kao celine),

B) ORGANIZACIONA KULTURA (kreativnost Fudokan organizacije; inovativnost u radu Fudokan organizacije; međuljudski odnosi unutar Fudokan organi-

members; fostering basic values Fudokan organization is based on; permanent education and quality improvement of the Fudokan organization members; decision-making system within the Fudokan organization; decision implementation of the Fudokan organization managing structures;

C) ORGANISATIONAL RESOURCES (professional staff of the Fudokan karate organization; sports facilities used by the Fudokan members; condition of equipment and props used in the training process; state of keeping the Fudokan members informed; financing of the Fudokan organization and its members; programs implemented within the Fudokan organization; expertise and competence of the Fudokan members; Fudokan organization Management).

Survey respondents supplied their evaluation of each impact factor on the five-point Likert type scale, where number (1) signified the perception of the lowest impact level, while number (5) signified the highest level.

Empirical construction is performed based on the appropriate statistical procedures.

As the variables were arranged in the form of the ordinal scale, central tendency parameters were calculated (frequency distribution, standard deviation and scalar average value – Mean), while for comparing scalar values in the context of the mutual connection and impact on the subject determination, the procedure of Spirman correlation calculation procedure was applied (Spirman ro).

1 the Fudokan originator and its Mastermind is dr Ilija Jorga, supported by dr Vladimir Jorga and Sensei Taiji Kase.

For scale validity determination, the procedure of its internal compliance calculation procedure is applied and is based on Crombach Alpha. The collected data were processed by the application program SPSS.21, while statistical conclusions were done on the significance level 0,05 ($p < 0,05$).

RESULTS

To check the questionnaire validity, 19 item-indicators of the evaluation scale were subjected to analysis of its internal compliance. The results show that the scale overall has good internal compliance, and that is illustrated by value Crombach's Alpha = 0,897, which is significantly higher than theoretical recommended value 0,7 (De Vellis, 2003. Table 1). In this respect, good instrument metrical characteristics are supplied, and adequate analysis of empirical data is enabled.

zacije; zajednička vizija članova Fudokan organizacije; negovanje osnovnih vrednosti na kojima se zasniva Fudokan organizacija; permanentno usavršavanje i edukacija članova Fudokan organizacije; sistem odlučivanja unutar Fudokan organizacije; realizacija odluka upravljačkih struktura Fudokan organizacije) i

C) ORGANIZACIJSKI RESURSI (stručni kadrovi koji rade u Fudokan karateu; sportski objekti koje koriste članovi Fudokan organizacije; stanje opreme i rekvizita koji se koriste u trenažnom procesu; informisanost članova Fudokan organizacije; finansiranje Fudokan organizacije i njenih članica; programi koje se sprovode unutar Fudokan organizacije; znanje i kompetencije članova Fudokan organizacije; menadžment Fudokan organizacije).

Ispitanci su svoju procenu uticaja svakog od faktora davali na petostepenoj skali Likertovog tipa, gde je vrednost jedan (1) označavala percepciju najnižeg nivoa uticaja, a vrednost pet (5) najviši nivo.

Empirijska građa je obrađena odgovarajućim statističkim procedurama.

Kako su varijable bile uređene u obliku ordinalne skale izračunati su parametri centralne tendencije (distribucija frekvencija, standardna devijacija i skalarni prosek - Mean), a za kompariranje skalarnih vrednosti u kontekstu međusobne povezanosti i uticaja na predmetnu određenost primenjena je procedura izračunavanja Spirmanove korelacije ranga (Spirman ro).

Za utvrđivanje validnosti skale primenjena je procedura izračunavanja njene unutrašnje saglasnosti bazirane na Kronbahovom alfa koeficijentu (Crombach Alpha). Prikupljeni podaci obrađeni su pomoću aplikacionog programa SPSS.21, a statistička zaključivanja izvedena su sa nivoom značajnosti 0,05 ($p < 0,05$).

REZULTATI

U cilju provere validnost upitnika 19 ajtem-indikatora skale procene podvrgnuto je analizi njene unutrašnje saglasnosti. Dobijeni rezultati pokazuju da skala u celini ima dobru unutrašnju saglasnost, na šta ukazuje Kronbahov koeficijent alfa (Cronbach's Alpha = 0,897) koji je značajno veći od preporučene teorijske vrednosti 0,7 (De Vellis, 2003) (Tabela 1). U tom pogledu su obezbeđene dobre metrijske karakteristike instrumenta i omogućena adekvatna analiza empirijskih podataka.

Table 1: Elements of Internal compliance of the Internal factor's evaluation scale of Fudokan karate development

Tabela 1: Elementi unutrašnje saglasnosti skale procene internih faktora razvoja Fudokan karatea

<i>Item Indicators/Ajtem indikatori</i>	<i>Scalar average/ Skalarni prosek</i>	<i>Item elimination impact on Alpha/ Uticaj uklanjanja stavke na alfa koeficijent</i>
1. Fudokan karate clubs/ Karate klubovi Fudokan karatea	4.30	.894
2. Fudokan karate club managing structures/ Upravljačke strukture u karate klubovima Fudokan karatea	4.22	.891
3. Management of the Fudokan organization as a whole/ Menadžment Fudokan organizacije kao celine	4.32	.893
4. Fudokan organization creativity/ Kreativnost Fudokan organizacije	4.04	.890
5. Work innovation of the Fudokan organization/ Inovativnost u radu Fudokan organizacije	3.96	.890
6. Inter-personal relations within the Fudokan/ Međuljudski odnosi unutar Fudokan organizacije	4.01	.893
7. Mutual vision of the Fudokan organization members/ Zajednička vizija članova Fudokan organizacije	4.04	.889
8. Fostering basic values, the Fudokan is based on/ Negovanje osnovnih vrednosti na kojima se zasniva Fudokan organizacija	4.12	.886
9. Permanent education and quality improvement of the Fudokan organization members/ Permanentno usavršavanje i edukacija članova Fudokan organizacije	4.03	.889
10. Decision-making within the Fudokan organization/ Sistem odlučivanja unutar Fudokan organizacije	4.25	.894
11. Decision implementation of the Fudokan Managing structures/ Realizacija odluka upravljačkih struktura Fudokan organizacije	3.79	.884
12. Professional staff of the Fudokan organization/ Stručni kadrovi koji rade u Fudokan karateu	3.99	.892
13. Sport facilities used by the Fudokan members/ Sportski objekti koje koriste članovi Fudokan organizacije	4.00	.897
14. Condition of equipment and props used in the Training process/ Stanje opreme i rekvizita koji se koriste u trenažnom procesu	3.95	.895
15. State of Fudokan members being informed/ Informisanost članova Fudokan organizacije	4.08	.896
16. Financing the Fudokan and its members/ Finansiranje Fudokan organizacije i njenih članica	3.88	.894
17. Programs implemented within the Fudokan/ Programi koje se sprovode unutar Fudokan organizacije	3.96	.890
18. Expertise and competence of Fudokan members/ Znanje i kompetencije članova Fudokan organizacije	4.21	.891
19. Fudokan organization Management/ Menadžment Fudokan organizacije	4.04	.891
<i>Total / Ukupno:</i>	4.11	.897

Empirical results data indicate positive scale orientation of high intensity in all three factors. Estimating their possible impact intensity on the future development of Fudokan karate. the respondents perceive the internal domain factors as very significant. the fact proved by the average scalar value of their grading (4.11). In the process of Internal domain factors evaluation of the Fudokan karate. the most important are the elements of the Or-

Rezultati empirijskih podataka ukazuju na pozitivnu skalnu orijentaciju visokog intenziteta u sva tri faktora. Procenjujući mogući intenzitet njihovog uticaja na budući razvoj Fudokan karatea ispitanici percipiraju faktore internog okruženja kao veoma značajne, o čemu govori prosečan skalarni prosek njihovh ocena (4,11). U vrednovanju faktora internog okruženja Fudokan karatea najznačajnije mesto pridaju elementima Organizacione

ganisational structure (4.28) then Organisational Culture (4.03) and finally factors of Organisational Resources (4.01) (Table 2).

Table 2: Intensity evaluation of the Internal Domain Factor Impact on the Fudokan karate development in the future

strukture (4,28), zatim Organizacione kulture (4,03) i na kraju, ali ne manje važnim, faktorima Organizacijskih resursa (4,01) (Tabela 2).

Tabela 2: Procena intenziteta uticaja faktora internog okruženja na razvoj Fudokan karatea u budućnosti

Factor/Faktor	Item-Indicators/ Ajtem indikatori	SV	Average value rank/ Vrednosni rang	
Structure/ Struktura	1) Fudokan karate clubs/ Karate klubovi Fudokan karatea	4.30	1	
	2) Fudokan karate club managing structures Upravljačke strukture u karate klubovima Fudokan karatea	4.22		
	3) Management of the Fudokan organization as a whole Menadžment Fudokan organizacije kao celine	4.32		
	<i>Scalar average (S)/ Skalarni prosek (S):</i>			4.28
Organisational structure/ Organizaciona kultura	4) Fudokan organization creativity/ Kreativnost Fudokan organizacije	4.04	2	
	5) Work innovation of the Fudokan organization/ Inovativnost u radu Fudokan organizacije	3.96		
	6) Inter-personal relations within the Fudokan organization/ Međuljudski odnosi unutar Fudokan organizacije	4.01		
	7) Mutual vision of the Fudokan organization members/ Zajednička vizija članova Fudokan organizacije	4.04		
	8) Fostering basic values the Fudokan organisation is based on/ Negovanje osnovnih vrednosti na kojima se zasniva Fudokan organizacija	4.12		
	9) Permanent education and quality improvement of the Fudokan organization members/ Permanently usavršavanje i edukacija članova Fudokan organizacije	4.03		
	10) Decision-making within the Fudokan organization/ Sistem odlučivanja unutar Fudokan organizacije	4.25		
	11) Decision implementation of the Fudokan Managing structures/ Realizacija odluka upravljačkih struktura Fudokan organizacije	3.79		
	<i>Scalar average (OK)/ Skalarni prosek (OK):</i>			4.03
	Resources/ Resursi	12) Professional staff of the Fudokan organization/ Stručni kadrovi koji rade u Fudokan karateu		3.99
13) Sport facilities used by the Fudokan members/ Sportski objekti koje koriste članovi Fudokan organizacije		4.00		
14) Condition of equipment and props used in the Training process/ Stanje opreme i rekvizita koji se krose u trenažnom procesu		3.95		
15) State of Fudokan members being informed/ Informisanost članova Fudokan organizacije		4.08		
16) Financing the Fudokan and its members/ Finansiranje Fudokan organizacije i njenih članica		3.88		
17) Programs implemented within the Fudokan organization/ Programi koje se sprovede unutar Fudokan organizacije		3.96		
18) Expertise and competence of the Fudokan members/ Znanje i kompetencije članova Fudokan organizacije		4.21		
19) Fudokan organization Management/ Menadžment Fudokan organizacije		4.04		
<i>Scalar average (R)/ Skalarni prosek (R):</i>		4.01		
Total Scalar value/ Ukupno SV:		4.11		

Regarding the evaluation of item-indicators (which constitute the factors of the Internal domain), the hierarchical distribution evaluation of their impact can be conditionally discussed. It is noticeable that larger number of Item-indicators appear as the most significant factor particles, evaluated by the respondents in scalar grade higher than four. Therefore, the following indicators are placed on the highest position: (1) Management of the Fudokan organization (4.32). (2) Fudokan karate clubs (4.30). (3) Decision-making system within the Fudokan organization (4.25). (4) Fudokan Karate club managing structures (4.22). (5) Expertise and competence of Fudokan members (4.21). (6) Fostering basic values Fudokan organization is based on (4.12). (7) State of Fudokan members being informed (4.08). (8) Fudokan organization creativity (4.04). (9) Mutual vision of Fudokan organization members (4.04). (10) Fudokan organization Management (4.04). (11) Permanent education and quality improvement of the Fudokan organization members (4.03). (12) Inter-personal relations within the Fudokan organization (4.01). (13) Sport facilities used by the Fudokan members (4.00).

Within the scalar average range from 3.50 to 4.00 (which may be regarded high evaluation context as well), the ranking of the remaining Internal domain indicators would be as follows: (14) Professional staff of the Fudokan organization (3.99). (15) Programs implemented within the organization (3.96). (16) Work innovation of the Fudokan organization (3.96). (17) Condition of the equipment and props used in the training process (3.95). (18) Financing the Fudokan organization and its members (3.88) and (19) Decision-implementation of the Fudokan Managing structures (3.79) (Table 2.)

The result support of the quantitative analysis of scalar values given by the activity holders in Fudokan karate, supplies the information of the correlation among the Internal domain factors. The values of the Spearman correlation among the very factors themselves, as well as in relation to the values of the Internal domain scalar average of the whole, indicate their intense mutual dependence. At all three factors of the Internal domain, high levels of positive correlation were noted, above 0.50, which, according to the Cohen criterium (Cohen, 1988) presents a strong bond among the variables. The noted statistical significance was on the level of 0.01 (Table 3).

U kontekstu procene pojedinačnih ajtem-indikatora (koji konstituišu faktore internog okruženja) može se, uslovno, govoriti o hijerarhijskoj distribuciji procene njihovog uticaja. Vidljivo je da se kao najznačajnije faktorske čestice pojavljuje veći broj ajtem-indikatora koji su od strane ispitanika vrednovani skalarnom ocenom većom od četiri. Tako da najvišu vrednosnu poziciju zauzimaju indikatori: (1) menadžment Fudokan organizacije kao celine (4,32), (2) klubovi Fudokan karatea (4,30), (3) sistem odlučivanja unutar Fudokan organizacije (4,25), (4) upravljačke strukture u karate klubovima Fudokan karatea (4,22), (5) znanje i kompetencije članova Fudokan organizacije (4,21), (5) negovanje osnovnih vrednosti na kojima se zasniva Fudokan organizacija (4,12), (7) informisanost članova Fudokan organizacije (4,08), (8) kreativnost Fudokan organizacije (4,04), (9) zajednička vizija članova Fudokan organizacije (4,04), (10) menadžment Fudokan organizacije (4,04), (11) permanentno usavršavanje i edukacija članova Fudokan organizacije (4,03), (12) međuljudski odnosi unutar Fudokan organizacije (4,01), (13) sportski objekti koje koriste članovi Fudokan organizacije (4,00).

U opsegu skalarnog proseka od 3,50 do 4,00 (koji se može smatrati kontekstom, takođe, visokog vrednovanja) rangiranja preostalih indikatora internog okruženja bi bilo sledeće: (14) stručni kadrovi koji rade u Fudokan karateu (3,99), (15) programi koje se sprovode unutar Fudokan organizacije (3,96), (16) inovativnost u radu Fudokan organizacije (3,96), (17) stanje opreme i rekvizita koji se koriste u trenažnom procesu (3,95), (18) finansiranje Fudokan organizacije i njenih članica (3,88) i (19) realizacija odluka upravljačkih struktura Fudokan organizacije (3,79) (Tabela 2).

Potpore rezultatima kvantitativne analize skalarnih proseka ocena koje su davali glavni nosioci aktivnosti u Fudokan karateu daju i informacije o korelativnom odnosu činilaca internog okruženja. Vrednosti Spirmanovog koeficijenta korelacije, kako između samih faktora, tako i u odnosu na vrednosti skalarnog proseka celine internog okruženja, govore o njihovoj intenzivnoj međuzavisnosti. Kod sva tri faktora internog okruženja zabeleženi su visoki nivoi pozitivne korelacije, iznad 0,50 što je prema Koenovom kriterijumu (Cohen, 1988) velika jačina veze između varijabli. Zabeležena statistička značajnost je bila na nivou od 0,01 (Tabela 3).

Table 3. Factor correlation that may have an impact on Fudokan karate development

Tabela 3: Korelacija faktora koji mogu imati uticaj na razvoj Fudokan karatea

Factors/Faktori		Structure/ Struktura	Organis. culture/ Organizaciona kultura	Resources/ Resursi	Internal domain/ Interno okruženje
Structure/ Struktura	Corr. Coef.	1,000	,533**	,514**	,792**
	Sig.	.	,000	,000	,000
Organis. culture/ Organizaciona kultura	Corr. Coef.	,533**	1,000	,710**	,878**
	Sig.	,000	.	,000	,000
Resources/ Resursi	Corr. Coef.	,514**	,710**	1,000	,842**
	Sig.	,000	,000	.	,000
Internal domain/ Interno okruženje	Corr. Coef.	,792**	,878**	,842**	1,000
	Sig.	,000	,000	,000	.

** Correlation significant at level 0.010 – Spearman’s rho

** Korelacija značajna na nivou 0.010 - Spearman’s rho

DISCUSSION

Results of the empirical part of the research should be observed and interpreted bearing in mind that the Fudokan karate and its position in the environment is specific. First of all, from the aspect of internal orientation, the Fudokan organization fosters some specific features and values that make them different in comparison to the other karate concepts and karate organisations. The basis of the Fudokan karate is a training process. Although it may seem that the training system of the Fudokan karate is based on the principles like some other forms of the modern karate, i.e. sport principles (learning and practising the techniques applied in the sport fight and learning and practising techniques for karate kata), its characteristics are entirely exposed through three different segments (Jorga, 1998): a) Kihon (the principles of technique practising), which comprise two basic aspects that direct the learning, training and Fudokan karate technique improvement: 1) The Basic principle – Maximum strength application, interpreted as a physical force that is a product of the mechanism of muscles contraction and de-contraction, but dominantly under mental control of the player, i.e. in the training process, segmentally directed towards the development of karate player maximum strength, it is necessary to accomplish complete mental control in three aspects – control of emotions, control of mental tension and control over mental energy (Jorga, 2020); 2) Kata Fudokan style – through training approach in which it is essential to know: a) biomechanical basis of Kata and b) the idea of Kata itself (as the fight simulation with an imaginary opponent). Kata selection which is learnt and trained in the Fudokan karate is based on Shotokan Kata, but on twelve authentic Fudokan

DISKUSIJA

Rezultate empirijskog dela istraživanja treba posmatrati i tumačiti u svetlu specifičnosti Fudokan karatea i njegove pozicije u okruženju. Pre svega u unutrašnjoj opredeljenosti Fudokan organizacije da neguje karakteristične osobenosti koje ih na određeni način diferenciraju od drugih karate koncepata i karate organizacija. Osnovu Fudokan karatea čini trenažni (vežbovni) proces. Mada se, na prvi pogled, može činiti da se sistem treninga Fudokan karatea zasniva na osnovama kao i u drugim oblicima savremenog karatea, pre svega sportskog (učenje i uvežbanje tehnika tehnika koje se primenjuju u sportskoj borbi i učenje i uvežbanje tehnika za izvođenje kata), njegove osobenosti dolaze do izražaja kroz tri specifična segmenta (Jorga, 1998): (a) Kihon (principi vežbanja tehnika) koji obuhvataju dva bazična područja koji usmeravaju učenje, obuke i usavršavanje tehnika Fudokan karatea: (1) Osnovni princip - primena maksimalne snage, shvaćen u kontekstu fizičke sile koja proizilazi iz mehanizma kontrakcije i dekontrakcije mišića, ali dominantno pod kontrolom psihičke sfere vežbača, što podrazumeva da je u procesu treninga koji se segmentarno usmerava na razvoj maksimalne snage karatiste neophodno postići potpunu psihičku kontrolu kroz tri prostora - kontrolisanje osećanja, kontrolu mentalne napetosti i kontrolu nad mentalnom energijom (Āopra, 2020); (2) Kate Fudokan stila – kroz trenažni pristup u kojem se insistira na poznavanju: (a) biomehaničke osnove kate i (b) ideje same kate (kao simbolizacija borbe sa zamišljenim protivnikom). Repertoar kata koje se izučavaju i vežbaju u Fudokanu zasnovan je, u principu, na Šotokan katama, ali i dvana-

karate Kata as well; 3) Educational rules for children-players of Fudokan karate imply the idea of traditional concept of education affirmation of the ancient Japan. adjusted to the contemporary way of life of the area where the players live. The creators of the Fudokan are naturally aware that. in modern world of “personalized freedom” proclaimed by the western world (concept of life and work. therefore. upbringing and education. is directed to an individual; the emphasis is put on individualization. while the idea of collectivization remains a relict of the past). the idea of re-affirmation of “Samurai breeding” may be interpreted in a wrong way. In creating the concept of the educational principles of the Fudokan. the starting point is the postulation of the ethical rules and principles which can influence the personality formation of young people based on traditional values (which would not be an antipode to “modern trends”) (Jorga, 2019).

The next important characteristic is a subordinate system of the inner organization at all levels. with the emphasis on leader hierarchy and authority impact. The membership in the World Fudokan Organisation at whose top is the World Fudokan Federation. is. as in all sports associations. voluntary.

The Federation and its members function together as a unique system of Fudokan karate. while the membership system is constituted by the sports organisations and associations which foster sportsmanship of Fudokan karate. professional associations of Fudokan karate. as well as the individual sportsmen that practise the Fudokan Martial Art. However. what is a specificum of the internal dynamics of the Fudokan organization is the Institution of the Supreme Master (Sensei) and the executive authority called The Council of Guardians of Style. Sensei presents spiritus movens of the Fudokan and it is the main holder of the Fudokan idea and life. He is President for life of the Council of Guardians of Style and at the same time the Honorary Head of the Federation. The Council of the Guardians of Style is the supreme authority. which takes care of the preservation and independence of the Fudokan style. and is made of internationally most eminent. distinguished and accredited masters of the Fudokan Martial Art, Although the Fudokan organization formally has all “common” managing structures as well as other similar organisations of sport association type. (Assembly, Executive board. President. Secretary General. Executive Secretary...etc.). the above stated organizational concept specifics emphasize special internal organization dynamics which highlights the significance of Internal domain.

The significance of Internal domain in this research is determined through three interactive areas. Organisational structure. which. in its widest sense reflects mixed organiza-

est autentičnih kata Fudokan karatea; (3) Vaspitna pravila za decu vežbače Fudokan karatea koja impliciraju nastojanja da se afirmišu vrednosti tradicionalnog koncepta vaspitanja drevnog Japana, usaglašeni sa savremenim načinom života i podneblja u kojem vežbači žive. Tvorci Fudokana su, naravno, svesni da u današnjem svetu “personalizovane slobode” koju propagira zapadni svet (koncept života i rada, pa time i vaspitanja, koji je okrenut ka pojedincu; naglasak je na individualizaciji, dok se kolektivizacija smatra reliktom prošlosti) ideja reafirmacije “samurajskog vaspitanja” može biti pogrešno protumačena. U koncipiranju vaspitnih principa Fudokana polazi se od postulata univerzalnih etičkih pravila i moralnih načela kojima se može uticati na formiranje mladih osoba u duhu tradicionalnih vrednosti (koje ne bi bile antipod “savremenim trendovima”) (Jorga, 2019).

Sledeća značajna osobenost jeste subordinativni sistem unutrašnje organizacije na svim niovima, uz naglašenu lidersku hijerarhiju i uticaj autoriteta. Članstvo u svetskoj Fudokan organizaciji, na čijem je vrhu Svetska Fudokan federacija (WFF) je, kao i kod svih sportskih asocijacija, dobrovoljno. Federacija i njeni članovi funkcionišu kao jedinstven sistem Fudokan karatea, a sistem članstva konstituišu sportske organizacije i asocijacije koje neguju Fudokan karate, stručna udruženja iz područja Fudokana, kao i samostalni sportisti koji upražnjavaju Fudokan borilačku veštinu. Međutim, ono što jeste specifikum unutrašnje dinamike Fudokan organizacije jeste postojanje institucije Vrhovnog učitelja (Sensei) i tela koje nosi naziv Veće čuvara stila. Sensei predstavlja spiritus movens Fudokana i glavni je nosilac ideje i života Fudokana. Po funkcije je doživotni predsednik Veća čuvara stila i počasni predsednik federacije. Veće čuvara stila je najviše telo koje brine o očuvanju i samosvojnosti Fudokan stila, a sačinjavaju ga međunarodno priznati vrhunski i akreditovani majstori Fudokan borilačke veštine. Mada Fudokan organizacija formalno ima sve “uobičajene” upravne strukture kao i druge slične organizacije tipa sportskih udruženja (skupština, izvršni odbor, predsednik, generalni sekretar, izvršni sekretar, itd.), upravo navedene specifičnosti organizacijskog koncepta u prvi plan ističu osobenu unutrašnju organizacijsku dinamiku koja apostrofira značaj internog okruženja.

Značaj internog okruženja u ovom istraživanju je determinisan kroz tri interaktivna prostora. Organizaciona struktura koja, u najširem pogledu, odslikava mešoviti organizacijski model (na bazičnom nivou - klubovi dominantna je neformalna organizaciona struktura, dok su nacionalni savezi mahom uređeni kroz funkcionalni organizacioni model; krovni savez (WFF) poseduje

tional model (at its basic level – clubs) is a dominant informal organizational structure. While national federations are mostly arranged through functional organizational model; World Fudokan Federation (WFF) has the coordinates of divisional organizational model. Having this in mind structure as an Internal domain factor according to the respondents, is considered a significant indicator for further Fudokan development. This is in accordance with some general managing approaches of organization structuring, defining it as a formal work division within the company (Lazarević-Moravčević, Paunović & Mosurović-Ružičić, 2023.). Thus, managing, executive and administrative structure of the organization is created, with the determined level of responsibility, hierarchical relations and communication connections (Dess, Lumpkin & Eisner, 2007). In this respect, one of the significant determinants of the organizational structure is ORGANISATIONAL CULTURE (Micić, 2012), as interdependent complements (Dragnić, Lazić & Cvijanović, 2003) (particular type of the organizational culture may have an impact on the selection and existence of the organizational structure model, as well as some accidental alteration of the structure model may cause adjustment and re-defining of the postulated organizational culture (Janićijević, 2012). In this research, Fudokan karate organizational structure is perceived as a significant factor of its further development. One of the relevant characteristics of the sports management is resource limitation (Nešić, 2008). As almost all processes within and outside of the Fudokan karate are occurring in constantly changeable environment (internal and external), special focus of the managing bodies should be directed to a rational usage and utilization of limited (very often scarce) resources (Nešić, Srdić & Fratrić, 2013.) That is why one of very important managing postulates should be cherished and developed, and that is the approach of pro-active management of the Fudokan organization. Resource basis of each organization presents, primarily, internal domain issue (as a segment of the Internal domain), but is directly connected with the dynamics on the external scale. Fudokan karate status, at the local, but at the same time at some wider sports scale, in comparison to the other karate organizations, does not present the factor of competitive advantage. Current sports karate status domination poses problems in the domain of public resources approach, existing at local community level, but at state level as well (Nešić, Dačić & Srdić, 2014) This problem is the most prominent in aspect of public (budget) financing of karate program in the Republic of Serbia, where the financial means, approved at the national level, are exclusively approved for the karate organizations that belong to sports karate within World Karate Federation (WKF).

koordinatno divizionog organizacionog modela). U tom smislu se strukturno kao faktor internog okruženja, prema oceni ispitanika, doživljava kao značajna odrednica za dalji razvoj Fudokana. Što je u skladu sa nekim opštim menadžmentskim pristupima strukturiranja organizacija koji definišu da je to obuhvat formalne podele poslova unutar kompanije (Lazarević-Moravčević, Paunović & Mosurović-Ružičić, 2023). Na taj način se kreira upravljačko, izvršno i administrativno ustrojstvo organizacije, uspostavlja nivo i relacije odgovornosti, hijerarhijskih odnosa i komunikacijskih veza (Dess, Lumpkin & Eisner, 2007). U tom pogledu jedan od značajnih odrednica organizacione strukture jeste i organizaciona kultura (Micić, 2012), kao međuzavisni komplementi (Dragnić, Lazić & Cvijanović, 2003) (određeni tip organizacione kulture može imati uticaja na izbor i egzistenciju modela organizacione strukture, kao i što eventualna promena modela strukture može usloviti prilagođavanje ili redefinisavanje postavljene organizacione kulture) (Janićijević, 2012). U ovom istraživanju se organizaciona kultura Fudokan karatea percipirala kao značajan faktor njegovog daljeg razvoja. Jedna od bitnih karakteristika sportskog menadžmenta jeste ograničenost resursa (Nešić, 2008). Kako se gotovo svi procesi u i oko Fudokan karatea odvijaju u kontinuirano promenljivom okruženju (internom i eksternom) posebna pažnja upravljačkih tela se mora posvetiti racionalnoj upotrebi i korišćenju ograničenih (često i oskudnih) resursa (Nešić, Srdić & Fratrić, 2013). Stoga se kao jedan od važnih upravljačkih postupaka mora negovati i razvijati pristup proaktivnog upravljanja Fudokan organizacijom. Posebno što resursna baza svake organizacije predstavlja, prvenstvo, unutrašnje pitanje (segment je internog okruženja), ali je direktno povezano sa dinamikom eksternog okruženja. Status Fudokan karatea, u lokalnom, ali i širem sportskom okruženju, u odnosu na druge karate organizacije ne predstavlja faktor konkurentne prednosti. Trenutna statusna dominacija sportskog karatea stvara probleme u pristupu javnim resursima, kako na nivou lokalnih zajednica, tako i na nivou države (Nešić, Dačić & Srdić, 2014). Ovaj problem je najvidljiviji u prostoru javnog (budžetskog) finansiranja programa karatea u Republici Srbiji, gde se sredstva na nacionalnom nivou odobravaju isključivo za karate organizacije koje pripadaju sportskom karateu u okviru WKF-a. Sa druge strane, ekonomska moć Fudokan karate klubova, kao i pojedinaca koji su nosioci njegovog razvoja, nije tolika da bi se moglo investirati u izgradnju sopstvenih trenaznih i drugih neophodnih resursa sportske infrastrukture. Ono što se u Fudokan zajednici smatra resursnom snagom jesu kadrovi i edukativni programi.

On the other hand, the economic power of Fudokan karate clubs, as well as the individuals taken separately as holders of its development, is not so high to enable the investment into their own training facilities and other necessary resources of sports infrastructure. What is regarded the resource power in Fudokan community are personnel and educational programs. The Fudokan organization has clear and specific concept of its personnel educational program, which differs in comparison to programs of most other karate organizations. Beside its basic thematic orientation directed towards the improvement of technical and tactical level of the trainees. Fudokan educational programs are dominantly directed to health condition preservation (based on multi-decade medical-physiological research of karate moves impact). Thus, authentic sports-medical approach towards Fudokan personnel education is created. Beside the aspects mentioned so far, one more segment in educational process is clearly and highly ranked, and that is Fudokan philosophical-ethical codex.

CONCLUSION

Theory and practice of modern sports management, which both rely on inter-disciplinary scientific and professional research, ranked and defined the sports organizations as complex organizational systems, based on explicitly determined and law-grounded form. The Fudokan karate organizations clubs and federation are legally speaking sports associations (citizen association and non-profitable sports organization) which primarily implies that the system functions on the principles of neat and precise structure co-ordination and proper management of all constituent parts of the structure (functions processes and internal interpersonal relations). This creates the conditions for managing definition and actualization of organizational goals. Thus, consideration of various aspects of the Fudokan improvement and development implies systematic approach in shaping its managing and executive activities. Well designed managing system is the most significant segment of successful management of every karate organization. It determines stable and solid organization, capable of getting into grips with all challenges that come from constantly changeable environment.

The sphere of the Fudokan karate organization is surrounded by complex occurrences and factors that both externally and internally may, directly and/or indirectly, influence its entire activity and existence. As in most organizational systems, it is about inner (internal) and outer (external) domain.

As non-profitable organizational system, Fudokan, with all its basic, constituent parts – karate clubs, is charac-

Fudokan organizacija ima jasan i specifičan koncept edukacije svojih kadrova, koji se razlikuje od većine drugih karate organizacija. Pored osnovnih tematskih usmerenja ka usvršavanju tehničkog i taktičkog nivoa polaznika, dominantna usmerenost edukativnih programa Fudokana jeste uticaj vežbanja karatea na zdravlje (utemeljenih na višedecenijskom medicinsko-fiziološkom proučavanju uticaja karate pokreta). Tako da je kreiran autentičan sportsko-medicinski pristup edukaciji kadrova Fudokana. Pored ovih aspekata, još jedan segment u edukaciji je veoma jasno visoko pozicioniran, a to je filozofsko-etički kodeks Fudokana.

ZAKLJUČAK

Teorija i praksa savremenog sportskog menadžmenta, koja se sve više oslanja na interdisciplinarna naučna i stručna istraživanja, pozicionirala je sportske organizacije kao kompleksne organizacijske sisteme, utemeljene na jasno određenoj i pravno uobličenoj formi. Organizacije Fudokan karatea (klubovi i savezi) su u pogledu formalno-pravnog statusa sportska udruženja (udruženja građana i neprofitne sportske organizacije) što primarno podrazumeva da sistem funkcioniše na osnovama egzistencije pravilne uređenosti, koordinacije i vođenja svih delova organizacijske strukture (funkcije, procesi i unutrašnji interpersonalni odnosi). Što stvara preduslove za upravljačko definisanje i realizaciju organizacijskih ciljeva. Stoga razmatranje različitih aspekata unapređenja i razvoja Fudokan karatea podrazumeva sistemski pristup u oblikovanju njegovih upravljačkih i realizatorskih aktivnosti. Dobro projektovan sistem upravljanja predstavlja najvažniji segment uspešnog menadžmenta svake karate organizacije. A to determiniše stabilnu organizaciju sposobnu da se nosi sa svim izazovima koji dolaze iz konstantno promenljivog okruženja.

Okruženje Fudokan karate organizacija obuhvaćeno je kompleksnim pojavama i faktorima koji spolja i iznutra mogu direktno i/ili indirektno da ostvaruju uticaj na njihovu ukupnu aktivnost i egzistenciju. Kao i u većini organizacijskih sistema i ovde je reč o unutrašnjem (internom) i spoljašnjem (eksternom) okruženju. Kao neprofitan organizacijski sistem Fudokan, sa svojim osnovnim konstitutivnim česticama – karate klubovima, karakterističan je po dinamičnoj otvorenosti (stalnoj interakciji sa realnim okruženjem), što implicira da je podložan uticajima iz nesporednog, ali i šireg društvenog okruženja. Uloga dobrog upravljanja, koja podrazumeva permanentu pažnju na razvojne aspekte organizacije, suštinski je fokusirana ka elementima uticaja okruženja na funkcionisanje Fudokan organizacije kao celovitog siste-

teristic for its dynamic openness (constant interaction with real environment). which implies that it is influence- prone from direct or even wider social environment. The role of a good

management. which implies the constant focus on developmental aspects of the organization. is basically directed to elements of environment impact on the Fudokan organization functioning as a complete system. That is why the significance of the Internal domain gets a special dimension. having in mind that all responses upon changes in the environment are initiated and materialized through it.

The results of the research which was carried out among the key holders of the Fudokan karate (trainers and instructors. as Fudokan dominant human resource). with the purpose to identify the key factors of Fudokan Internal domain which can have positive impact on its development in the upcoming five-year-period. indicate that the Internal domain is perceived as extremely significant for further development of this karate concept. The most dominant impact is expected within the factors of the Organizational structure. where the emphasis is recognized in karate clubs (the basic holders of Fudokan development). as well as the managing structures (in clubs and Fudokan organization as hierarchically ordered system). Two more factors are recognized. connected to the previous one. i.e. Organizational culture and Organizational Resources. which are interactively related to the Organizational structure. making a complete system of Fudokan Internal Domain. With its constituent parts. which were marked in this research through nineteen Item Indicators. they make a stable system of high potential for Fudokan development principles and concepts in the future.

The results of this study. as well as the applied methodology. may serve as a starting point for similar or further studies within the area of Fudokan karate. or some other sports organization within the domain of Martial Arts.

ma. U tom pogledu značaj internog okruženja dobija posebnu dimenziju, obzirom da se svi odgovori na promene u okruženju iniciraju i realizuju upravo iz njega.

Rezultati istraživanja koje je sprovedeno među ključnim akterima Fudokan karatea (treneri i instruktori kao dominantan ljudski resurs Fudokana), sa ciljem identifikacije ključnih činilaca internog okruženja Fudokana koji mogu imati pozitivan uticaj na njegov razvoj u narednom petogodišnjem periodu, pokazuju da se interno okruženje percipira kao izuzetno značajno za dalji razvoj ovog karate koncepta. U tom pogledu najdominantniji uticaj se očekuje u okviru faktora organizacione strukture, gde je akcenat prepoznat na karate klubovima (kao osnovnim nosiocima razvoja Fudokana), kao i upravljačkim strukturama (u klubovima i Fudokan organizaciji kao hijerarhijski uređenom sistemu). Povezano sa ovim faktorom su preoznata i druga dva činioca – organizaciona kultura i organizacijski resursi, koji u interaktivnom odnosu sa organizacijskom strukturom čine jedinstven sistem internog okruženja Fudokana. Sa svojim konstitutivnim elementima, koji su u ovom istraživanju bili evidentirani kroz devetnaest ajetm indikatora, čine stabilan sistem koji ima visok potencijal za razvojne koncepte Fudokana u budućnosti.

Rezultati ove studije, kao i primenjena metodologija, mogu poslužiti kao polazna osnova za dalja slična istraživanja u području Fudokan karatea, ali i drugih sportskih organizacija u prostoru borilačkih sportova i veština.

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Primljen: 18. septembar 2023. / Received: September 18, 2023
Prihvaćen: 12. decembar 2023. / Accepted: December 12, 2023



KORELACIJA POVEZANOSTI ELEMENATA SMISLA ZA SURADNJU S LOPTOM I USPJEHOM IZ PREDMETA MATEMATIKA: STUDIJA SLUČAJA UTAKMICE HNK ZADAR

MIOČIĆ JOSIP¹, ERLIĆ ZORAN², ANDROJA LUKA¹

¹Visoka škola za menadžment i dizajn „Aspira“, Split, Hrvatska

²Hrvatski nogometni klub Zadar, Zadar, Hrvatska

Correspondence:

Miočić Josip, Visoka škola za menadžment i dizajn „Aspira“, Split, Hrvatska,

josip.miocic@szgz.hr

Sažetak: Ovim istraživanjem ispituje se je li proces donošenja odluka vezanih uz smisao za suradnju s loptom u nogometu u korelaciji sa školskim uspjehom, u predmetu matematika kroz trenerske i učiteljske procjene ispitanikovih sposobnosti. Istraživanje je provedeno na uzorku od 18 nogometaša Hrvatskog nogometnog kluba Zadar, selekcija 2007. i 2008. godišta. Cilj istraživanja je uvidjeti kolika je korelacija ocjena iz nastavnog predmeta matematike i uspješnost donesenih odluka vezanih uz smisao za suradnju s loptom za vrijeme predmetnih utakmica. Navodi u istraživanju su analizirani i vrednovani u kontekstu stručnih kinezioloških preporuka i preporuka u području nogometa. Kako je cilj ovog istraživanja, utvrđivanje odnosa među varijablama, odnosno utvrđivanje statističke ovisnosti i pokazatelja jakosti takve ovisnosti, korištena je regresijska analiza, kojom se analitički izražava odnos među pojavama.

Cljučne riječi: nogomet, donošenje odluka, smisao za suradnju, korelacija, matematika.

Uvod

Suvremeni nogomet ima obilježja acikličke aktivnosti. Ukoliko se nogomet klasificira u određenu skupinu sportskih aktivnosti onda se može reći da pripada skupini kompleksnih sportskih aktivnosti, točnije ekipnim sportskim igrama (Dujmović, 2006). Kada je riječ o sportskim igrama, Gabrijević, (1964) navodi „Sportske igre svestrano angažiraju tjelesne pokrete, kao i psihofizičke osobine: brzinu, okretnost, snagu i izdržljivost (Milanović, 2013). Pored toga, igre postavljaju naročite zahtjeve na psihi igrača. One iziskuju sposobnost kombiniranja vremenskih i prostornih odnosa u kretanju vlastitih igrača (jedan i više igrača) s kretanjem lopte i protivnika (Nemčić, Fiorentini i Sporiš, 2013). Igre iziskuju donošenje brzih i ispravnih odluka u datoj situaciji, koje baziraju na prethodnoj akciji, a ujedno usmjeravaju i daljnji tok akcije, te se igrač mora opredijeliti za najbolje moguće rješenje“. Nogomet pripada dinamičnoj grupi sportova u kojem se dvije ekipe s po 11 igrača natječu jedna protiv druge, uspostavljaju protok lopte i pokušavaju postići pogodak u igri. Fiziološki je to aerobno – anaerobni sport s fazama visokog opterećenja i niskog opterećenja koje se izmjenjuju te zavisno od načina aktiviranja organskog sustava uvijek dominira jedna, a usko je vezana s pozicijom nogometaša u momčadi (Željaskov, 2003; Milanović, Jukić i Šimek, 2003). U nogometnoj igri je apsolutno nemoguće predvidjeti razvoj događaja na terenu, ne samo zbog broja složenih i nepredvidljivih situacija nego i zbog činjenice da se u igri istovremeno nalaze 22 igrača (Castellano, Blanco – Villasenor i Alvarez, 2011). No, usprkos činjenici da se ne može sa sigurnošću predvidjeti razvoj događanja, definitivno nogometnim treningom može se utjecati na sposobnost predviđanja situacija u igri i pojavi taktičkog mišljenja igrača, a veliku ulogu u pojavi istog ima i vrsta treninga i stručna nadogradnja koja se provodi (Željaskov, 2003; Milanović, Jukić & Šimek, 2003). Konkretno u ovom slučaju se radi o obradi te analizi dvije nogometne utakmice mlađih dobnih selekcija, 2007. i 2008. godišta Hrvatskog nogometnog kluba Zadar, koje su najbolji reprezentant – igre i donošenje odluka od strane navedenih igrača u situacijama gdje se susreću sa prvoligaškim ekipama (HNK Hajduk i NK Osijek). Upravo time se ovaj znanstveni rad bavi, definiranju i razumijevanju pojma „taktičkog mišljenja“ nogometaša – donošenje odluka vezanih uz smisao za suradnju s loptom te primjenom u nogometnoj utakmici. Kao korelaciju za uspješnost za potrebu ovog rada navode se prediktori ocjena u školskom obrazovanju navedenih 18 nogometaša (11 na terenu i 7 na kluپی za rezervne igrače) iz matematike. Istraživanje je potaknuto projektom „Uloga emocija u strateškom odlučivanju“ iz 2019-2022. godine (Božac i Kostelić, 2023), koje se bavilo sličnom problematikom u širem smislu u drugom polju.

Istraživanja u hrvatskom nogometu do sada nisu dovoljno obrađivali predmetnu problematiku, istraživanja koja su proveli Erceg, Sporiš (2018), Rađa (2016) bave se širom tematikom od one koje se bave autori u ovom radu. Kako bi se utvrdila uloga donošenja odluka uz smisao za suradnju s loptom u procesu nogometne igre i korelacije uspješnosti u matematici, provedeno je empirijsko istraživanje koje je omogućilo identifikaciju i kvantifikaciju te utvrđivanje poveznica uspješnosti iz matematike s elementima u procesu donošenja odluka vezanih uz smisao za suradnju s loptom u nogometnoj utakmici. Odlučivanje je proces, te kao svaki proces ima svoje faze. Donošenje odluka dijeli se u četiri faze na koje se nadovezuju postupak odlučivanja i donošenje odluka: 1. svijest o potrebi za odlukom, 2. priprema odluke, 3. donošenje odluke, 4. provedba odluke. U skladu s tim postupak odlučivanja i donošenja odluka ima sljedeće faze: identifikacija problema, definiranje ciljeva, donošenje preliminarne odluke, generiranje liste mogućih rješenja, evaluacija mogućih rješenja, odabir rješenja, provođenje odluke u praksi, praćenje izvršenja odluke. Za kvalitetno donošenje odluke ne bi se smjelo preskočiti ni jednu navedenu fazu. Rezultati istraživanja omogućili su kreiranje preporuka teorijskog, ali i praktičnog značaja.

ANALIZA NOGOMETNE IGRE

Analizom sportske aktivnosti dobivaju se korisne informacije za programiranje procesa učenja i vježbanja i stupnja usvojenosti tehničko-taktičkih znanja čime se pomaže u određivanju kriterija uspješne izvedbe u određenom sportu čime postaju osnova za definiranje sadržaja, opterećenja i vrsta rada, u svrhu poboljšanja izvedbe i uspješnosti u sportskoj aktivnosti, a u ovom slučaju nogometa Milanoviću (2013). Poznavanje strukture nogometa znači razumijevanje svih faza i podfaza tijekom igre i pozicija pojedinih igrača, što nam pomaže da prepoznamo određene situacije u igri (Castelano i sur., 2011). Kod prijelaza iz jedne faze u drugu osnovno je da igrači razumiju i donose pravovremene odluke u igri koristeći odgovarajuće tehničko-taktičke programe (Barešić, 2007). Sa stajališta strukturne analize u nogometu, postoje tri područja igre: faza napada, faza obrane i tranzicija, a u svakoj od navedene tri faze postoje određene podfaze i tipične situacije (Miočić, 2018).

Funkcionalna analiza nogometne igre

Funkcionalna analiza nam pruža informacije o intenzitetu, trajanju i vrsti radnog opterećenja u sportskoj aktivnosti, prema čemu se zaključuje o strukturi i dominaciji energetske procesa kojima se osigurava energija za rad u natjecateljskoj aktivnosti (Milanović, 2013). U nogometnoj utakmici nogometaši izvedu velik broj različitih aktivnosti i kretnji s loptom ili bez nje za čiju izvedbu je bitno donošenje odluka. Pri tome se neplanirano (i nepredviđeno) izmjenjuju intervali rada visokog i niskog intenziteta, kao i njihovo trajanja, koji otežavaju donošenje odluka (Milanović, M., Milanović, L. i Lukenda, 2010). Tijekom jedne utakmice vrhunski nogometaši u prosjeku izvedu 1200 do 1400 različitih promjena aktivnosti, mijenjajući ih svakih 4-6 sekundi, stoga njihova psihofizička sprema mora adekvatno podržavati donošenje odluka (Marković i Bradić, 2008). Budući da je u radu naglasak na korelaciju uspješnosti donošenja pravovremenih, odgovarajućih odluka analiza nam predstavlja metodološki okvir istraživanja, sukladno ocjenama iz nastavnog predmeta matematike (Weineck, 2000).

Taktika nogometne igre

Kada je riječ o sportskoj taktici, sportska taktika predstavlja način djelovanja jednog sportaša ili skupine sportaša tijekom natjecanja u odnosu na djelovanje suprotstavljene strane – protivnika u namjeri da ga se nadvlada, nadmudri, nadigra, tj. da ga se onemogući u njegovim taktičkim nastojanjima tako što će se uspješno provesti vlastite taktičke aktivnosti (Milanović (2013). Prema (Castelano i sur., 2011) taktika u nogometnoj igri podrazumijeva uzajamno svrsishodno djelovanje suigrača, odnosno pojedinaca u okviru momčadi. Tako se postiže uspješno formiranje i igranje napada i obrane te tranzicije iz napada u obranu i obrnuto. Preduvjet za postizanje navedenog su posjedovanje taktičkih znanja koja podrazumijevaju sposobnost percipiranja i mišljenja ovisno o prostorno – vremenskim odnosima, položaju suigrača i protivničkih igrača, a također i pronalaženje odgovarajućih situacijskih rješenja radi provedbe željenog plana igre u fazi napada, tranziciji i fazi obrane. Kako bi nogometaši ostvarili svoje taktičke ideje u nogometnoj igri, moraju se služiti određenim sredstvima te donositi odluke (Gabrijelić, 1977). Tako se igrači služe taktičkim sredstvima, tu se ubrajaju svi tehnički elemente koji se primjenjuju u situacijskim uvjetima radi rješavanja taktičkih zadataka tijekom igre, za koje su obučeni trenažnim procesom.

Taktičko mišljenje nogometaša i donošenje odluka u nogometnoj igri

Zbog važnosti i posljedica odluka, većina se istraživanja u znanosti usmjerava na optimizaciju, sustavnost i racionalnost pri donošenju takvih odluka. U svijetu novija istraživanja uzimaju u obzir i ljudski faktor te osobne čimbenike koji utječu na proces donošenja odluka (Sekulić, 2019). Jedan od pristupa odnosi se na iskustveno-intuitivni pristup pri odlučivanju u nogometnoj igri. U procesu odlučivanja u kojem nogometaš donosi odluke na temelju iskustva i intuicije, brojni osobni čimbenici mogu utjecati na proces donošenja odluke. Jedan od osobnih čimbenika koji utječe na proces donošenja odluke su emocije i stres, koji još uvijek predstavljaju nepoznanicu (Rašić, 2021). Takav pristup odstupa od racionalnog modela procesa donošenja odluka u nogometnoj igri, pa se očekuje da će i rezultati tog procesa odstupati od optimuma i neće biti dovoljno u korelaciji sa uspješnosti iz matematike s čime se bavi istraživanje. Staneković navodi, kako bi se nogometaše dovelo do razine da tehničkom i tjelesnom izvedbom mogu pratiti zahtjeve nogometne utakmice, potreban je dugogodišnji proces rada s igračima od najmlađe dobi. Osim što je taj proces dugotrajan, on je i sadržajno vrlo kompleksan jer mora obuhvatiti niz različitih sastavnica. Prije svega, on uključuje poduku, stabilizaciju i automatizaciju izvedbe osnovnih tehničkih i taktičkih elemenata nogometa. Pritom valja u kontinuitetu raditi na razvoju motoričkih i funkcionalnih sposobnosti te psiholoških karakteristika nogometaša kako bi oni svojom tjelesnom spremnošću mogli iznijeti teret natjecanja u odrasloj dobi (Akyildiz i sur., 2022). S današnjeg stajališta takav pristup modernoj poduci 21. stoljeća nije utemeljen, već se djecu što prije želi uključiti u nogometni trening kako ostvarili što učinkovitiju prilagodbu na loptu (Erceg, Rađa i Sporiš, 2018). Šindik (2012) navodi, kako su psihološke karakteristike bitne za učenje, adaptaciju i socijalizaciju igrača unutar svog tima. Prema osobinama ličnosti nogomet može pridonijeti tome da djeca i odrasliji pojedinci koji su kroz igranje nogometa navikli na trening, natjecanje i borbu za svoju poziciju imaju više samopouzdanja i da budu otporniji na stresne situacije (Šindik i Brnčić, 2012). Od trenutka uključivanja u poduku i trening mladi igrači pomoću svojih vidnih i slušnih receptora memoriraju i misaono obrađuju informacije te ih pohranjuju i koriste za vrijeme igre. Informacije dobivaju od trenera i drugih sportskih pedagoga. Iskustveno djeca za vrijeme treninga drugačije reagiraju na smjernice i zadatke koje im trener zadaje, što ovisi o svakom djetetu ponaosob. Stoga je iznimno važno svakom djetetu pristupiti i strategija individualno obzirom na njegove psihosocijalne karakteristike kako bi ostvarili maksimalan učinak u vidu usvajanja novih znanja i sposobnosti. Iz ranije navedenog čini se da je nogomet kompleksna aktivnost te da, osim brzine živčano mišićnih sposobnosti, brzina mentalne obrade podataka također razlikuje igrače po njihovoj kvaliteti odnosno rangu natjecanja. Kognitivne sposobnosti su mentalni kapaciteti sportaša koji omogućavaju prijem obradu, pohranu i korištenje motoričkih informacija. Prema Milanoviću (2013) strukturu ličnosti odnosno konativne dimenzije predstavljaju emocionalne i motivacijske aspekte psihičkih procesa. Izgradnja intelektualnih sposobnosti i konativnih obilježja izravno ovisi o intenzitetu opterećenja za vrijeme sportske aktivnosti, ali i o urednom psihološkom stanju igrača, koje ovisi o nizu faktora kao što su odmor, regeneracija, stil života, prijateljsko okruženje i druge koje rezultiraju izgradnjom igračevih crta ličnosti i karaktera.

Šindik i Brnčić (2012), navode kako iz svega navedenog evidentno je da proces razvoja mladih igrača od najniže dobi do seniora zahtijeva iznimno mnogo različitih postupaka i strategija. Iako se taj proces provodi longitudinalno on je vrlo osjetljiv jer u njemu djeca prolaze fazu rasta i razvoja, tjelesnog i intelektualnog. Utoliko je njegovo planiranje složenije i kompleksnije i za najiskusnije sportske pedagoge i trenere. Obzirom na razlike u stručnosti, sportskoj pozadini, iskustvu među akterima koji provode planiranje i operacionalizaciju treninga, u praksi su prisutne i razlike u radu. Ipak, pretpostavlja se da klubovi, škole i druga sportska društva, koja provode poduku i trening nogometa s djecom, iste provode prema unaprijed pripremljenim planovima. Stoga, smisao i sposobnost za taktičko mišljenje je jedan od prvih preduvjeta za ostvarenje korisne i smislene nogometne igre.

Karakteriziraju ga osnovne značajke, a to su prema (Čolakhodžić, Rađa i Alić, 2016):

- uloga opažanja i predodžbe u misaonim procesima nogometaša – igrač pronalazi rješenja, koristi kombinacije i elemente u skladu s trenutnom putanjom lopte u igri, rasporedom suigrača i protivničkih igrača koje u tom trenutku opaža (najveću ulogu ima vizualno opažanje igrača, tj. predodžba situacije koju onu u datom trenutku vidi),
- efikasan karakter taktičkog mišljenja nogometaša – kako bi riješio taktičke zadatke tijekom igre nogometaš odabire konkretne akcije koje mora izvesti brzo i efikasno, realizirajući samim time donesene odluke. Izvedena akcija može poslužiti kao početni trenutak taktičke zamisli ili novog rješenja,
- brzina procesa mišljenja – ključno je da svaki igrač veoma brzo procjenjuje situaciju na terenu i pronalazi prava rješenja te ih brzo realizira. Mišljenje nogometaša treba odlikovati maksimalna brzina protjecanja

- misaonog procesa, jer jedino u tom slučaju igrač može donijeti i izmijeniti odluku u kratkom vremenskom periodu. To je odlika vrhunskih nogometaša, a brzina procesa mišljenja ovisi o raznovrsnosti tehničkih elemenata, postojanja taktičkih znanja, umijeća i navika, provjerenih i učvršćenih tijekom trenažnog procesa,
- povezanost mišljenja nogometaša s emocionalno-voljnim manifestacijama – tijekom igre mišljenje nogometaša je povezano s njegovim emocionalnim stanjem. Ukoliko nogometaš vrlo lako doživljava emocionalna uzbuđenja to negativno utječe na taktičko mišljenje, jer u takvom stanju nije u mogućnosti jasno shvatiti i riješiti situacije u igri i dolazi do taktičkih grešaka.

Tijekom igre ugodne i neugodne emocije su direktno povezane s produktivnošću mišljenja nogometaša, dok je dizanje emocija u pravilu povezano sa samopouzdanjem, stvaralački karakter taktičkog mišljenja nogometaša – kako se nogometaš ne bi „gubio“ u novonastalim nepredviđenim situacijama u igri od njega se zahtijeva da vlada velikom gipkošću i pokretljivošću misaonih procesa, elastičnosti i inicijative odnosno stvaralačkom aktivnošću, kolektivni karakter mišljenja nogometaša tijekom igre – budući da je nogomet ekipna sportska igra, taktička zamisao pojedinca ne vrijedi ništa bez suradnje.

Iz prethodno navedenih značajki za uspješno taktičko mišljenje nogometaša može se primijetiti kako se spominju pojmovi koji su povezani sa kognitivnim sposobnostima nogometaša. Kada je riječ o kognitivnim sposobnostima. Kognitivni ili spoznajni procesi su: percepcija, pažnja, predočavanje, mišljenje i pamćenje“. Kognitivne sposobnosti odnose se na vještinu stjecanja i prepoznavanja informacija iz okoline u svrhu integriranja istih s postojećim, odnosno stečenim znanjem (Marteniuk, 1976). Ukoliko nogometaš ima visoko razvijene kognitivne sposobnosti one će mu omogućiti da odabere i izvrši prikladno rješenje (odluku) u datoj situaciji (Friedman i sur., 2006). Vrlo zanimljiva podgrupa tih sposobnosti su izvršne funkcije, a u stranoj literaturi poznata kao „executive functions“. Izvršne funkcije su opisane kognitivnim procesima koji kontroliraju misli i radnje pogotovo u situacijama koje nisu uobičajene. Prema Diamondu (2013) izvršne funkcije se mogu podijeliti na: temeljne izvršne funkcije – radna memorija, kognitivna elastičnost i inhibicijska kontrola, više izvršne funkcije – rasuđivanje, rješavanje problema i planiranje.

Budući da izvršne funkcije ovise o različitim strukturama u čeonom režnju ljudskog mozga, može se zaključiti kako iste nisu jednako razvijene tijekom karijere nogometaša.

Matematika u sustavu obrazovanja i sporta

Prema općem shvaćanju matematika je najbolja igra na svijetu. Zaraznija je od šaha, napetija od pokera i traje duže od Monopola, besplatna je. Može se igrati bilo gdje – Arhimed se, na primjer, igrao u kadi (Milinković, 2009). Matematika je nastavni predmet koji učenici slušaju čitavu osnovnu i srednju školu. U nacionalnom kurikulumu školska je matematika pragmatično opisana kao jedan od čimbenika tehnološkog napretka društva utemeljenog na informatizaciji i tehnologiji, a time i važan element preživljavanja i poboljšanja kvalitete života pojedinca (Mardešić, Baras, Šitin, 2017). Matematika i društvene igre pa tako i nogomet imaju mnogo zajedničkog, zar ne? U matematici je najvažnije logički misliti, tj. “raditi glavom”, a tako je i u nogometu. Da bi se postigao uspjeh u matematici, potrebno je nešto sposobnosti te puno više rada i vježbanja, a tako je i u nogometu. S obzirom da djeca uče igrati nogomet, to bi ih moglo odvratiti od toga da naprave nešto što bi ih stajalo slobode ili života, što je onda za mene podjednako važno kao i osvajanje titule prvaka svijeta. Neki raniji sportski svjetski prvaci bili su i poznati matematičari: dr. Emanuel Lasker, dr. Max Euwe, dr. Mihail Botvink, dok su neki matematičari prema sportu pokazivali određeni znanstveni interes: Johann Carl Friedrich, Leonhard Paul Euler (Ivanović, 2004). Načela trenažnog procesa u nogometu i obrazovnom procesu (matematika) koja se primjenjuju su: načelo primjerenosti, načelo zornosti i apstraktnosti, načelo sistematičnosti i postupnosti, načelo individualizacije, načelo problemnosti, načelo znanstvenosti, načelo trajnosti znanja, vještina i navika, načelo interesa, svjesnosti i vlastite aktivnosti (Ivanović, 2004). Ovaj rad nema ambiciju diskutirati o ovako važnim temama i problematici pristupa “ odozdo”, sa strane na kojoj se nalaze znanstvenici, nastavnici, učenici i njihovi roditelji već će pokušati pronaći poveznice između nogometa i matematike kako bi se potaknula diskusija koja bi pridonijela povećanju kvalitete trenažnog procesa, te čvršćim vezama među čimbenicima koji utječu na uspješnost u matematici, i na svim razinama donošenja odluka u nogometnoj igri.

Predmet i cilj istraživanja na primjeru nogometnih utakmica Hrvatskog nogometnog kluba Zadar

Predmet istraživanja jest ukazati na korelaciju između procesa donošenja odluka vezanih uz smisao za suradnju s loptom na nogometnim utakmicama i školskim uspjehom u matematici, promatrane populacije nogometaša.

Cilj je ovog rada sustavnim istraživanjem i sistematizacijom dostupne literature odnosno putem analiza utakmica Hrvatskog nogometnog kluba Zadar te brojčane ocjene iz matematike u školskom obrazovanju ispitanika utvrditi korelaciju značajnosti. Prema tome cilj istraživanja je bio uvidjeti kolika je korelacija ocjena iz nastavnog predmeta matematike i uspješnosti donesenih odluka vezanih uz smisao za suradnju s loptom za vrijeme nogometnih utakmica. Te iste navode, analizirati i vrednovati u kontekstu stručnih kinezioloških preporuka i trenažnih preporuka u području nogometa.

METODE RADA, ODREĐIVANJE VRSTE I VELIČINE UZORKA I TIJEKA ISTRAŽIVANJA

U svrhu rada provedeno je istraživanje i analiza nogometnih utakmica Hrvatskog nogometnog kluba Zadar, selekcija 2007. i 2008. godišta sa: Nogometnim klubom „Osijek“ i Hrvatskim nogometnim klubom „Hajduk“, na ukupnom uzorku od 18 ispitanika/nogometaša navedene kategorije. U istraživanju je analiziran odnos nogometaša i donošenje vezanih odluka uz smisao za suradnju s loptom za vrijeme navedenih utakmica te njihova uspješnost u matematici. Valja napomenuti da je uvaženo iz koje škole dolaze nogometaši te koliko su participirali u nogometnoj utakmici. Populacija, iz koje je odabran uzorak od 18 ispitanika, definiran je kao uzorak nogometaša iz Hrvatskog nogometnog kluba Zadar, rođenih 2007. i 2008. godine.

Ovaj uzorak nogometaša, je po prirodi selektivnog procesa pozitivno selekcioniran po većini antropoloških dimenzija koje se koriste u selektivnom procesu Hrvatskog nogometnog saveza, karakterizira ih određena razina znanja igranja nogometa. Uzorak predstavljaju nogometaši koji su postizali dobre nogometne rezultate u svojim kriterijskim natjecanjima iz nogometa na nižim razinama natjecateljskih nogometnih liga (2 HNL-središte Jug) te utakmica sa prvoligaškim ekipama te selektivnim utakmicama za selekcije Hrvatskog nogometnog saveza. Istraživanje je provedeno metodom analize sadržaja i regresijske analize.

Kriteriji ocjenjivanja

U skladu s problemom i ciljem rada odabrano je 12 pod kriterija za utvrđivanje smisla za suradnju s loptom koje su uzete u razmatranje i analiziranje, s pretpostavkom da će nam njihova detaljna obrada pružiti bolji uvid u izradi planova i programa škola nogometa, a sve za dobrobit razvoja trenažnog procesa mladih nogometaša. Uzorak kriterija i pod kriterija je uzet u skladu sa tematikom rada i iskustvenog statusa istraživača. Pod kriteriji su: veličina terena / prostora (VPT), broj igrača na terenu (BIT), intenzitet pritiska protivničkog igrača na loptu (IPPI), odabir najboljeg rješenja (ONR), (BDO), tajming donošenja odluka (TDO), realizacija donošenja odluka (RDO), vertikalnost odabranog rješenja (VOR), horizontalnost odabranog rješenja (HOR), vraćanje lopte unatrag (VLU), novo započinjanje suradnje (ZNS) i sporost donošenja odluka (SDO). Podaci o ocjenjivanju uspješnosti u igri nogometaša a ovdje su navedeni općenito. Nije interpretiran dio objektivne pouzdanosti ocjena, zbog dva razloga: prvo, do sad ne postoje identična istraživanja, te drugo, procjene ocjena su subjektivne..

Ocjenjivanje ispitanika/nogometaša obavila su dva ocjenjivača, kompetentnih nogometnih stručnjaka. Ispitanici su u svakoj od navedenih kriterijskih varijabli ocjenjivani ocjenama od 1 do 5, identično ocjenjivanju predmet matematike u obrazovnoj ustanovi. Kriteriji za brojčanu ocjenu od 1 do 5 za smisao za suradnju u trenutku posjeda lopte (Tablica 1.)

Tablica 1. Kriteriji brojčane ocjene

Ocjena	Kriteriji
Odličan (5)	mali prostor, veći broj igrača, veliki pritisak na loptu, najbolje moguće rješenje, brzina donošenja odluke, pravovremenost, vertikalnost (progresivnost).
Vrlo dobar (4)	mali prostor, manji broj igrača, veliki pritisak na loptu, najbolje moguće rješenje, brzina, donošenja odluke, nepravovremenost, vertikalnost.
Dobar (3)	srednji prostor, manji broj igrača, manji pritisak na loptu, najbolja rješenja, sporo donošenje, odluka, nepravovremenost, horizontalnost.
Dovoljan (2)	veliki prostor, manji broj igrača, mali pritisak na loptu, odabir slabijih rješenja, sporo, donošenje odluka, nepravovremenost, horizontalnost i regresivnost.
Nedovoljan (1)	veliki prostor, manji broj igrača, nema pritiska na loptu, ne prepoznaje nikakvu suradnju. regresivnost.

Tablica 2. Ocjene nogometaša promatrane populacije nogometaša HNK Zada iz matematike.

R.b	Popis igrača	Brojčana ocjena iz matematike
1	Igrač br.1	2
2	Igrač br.2	2
3	Igrač br.3	2
4	Igrač br.4	2
5	Igrač br.5	3
6	Igrač br.6	2
7	Igrač br.7	3
8	Igrač br.8	2
9	Igrač br.9	4
10	Igrač br.10	3
11	Igrač br.11	4
12	Igrač br.12	3
13	Igrač br.13	2
14	Igrač br.14	5
15	Igrač br.15	4
16	Igrač br.16	5
17	Igrač br.17	3
18	Igrač br.18	4

Da bi standardizirali kriterije i pod kriterije koji utječu na kriterije ocjenjivanja, istraživači su dobili pismene upute o elementima ocjenjivanja koji su na dvije utakmice bili ujednačeni. Svaki ispitanik bio je ocjenjivan na obje utakmice utakmice. Valja napomenuti da su ispitanici označeni zvjezdicom (*) na utakmici participirali kao rezerve, odnosno sa manjom minutažom stoga su njihove ocjene manje relevantne. Utakmice su se održavale u skladu sa pravilima nogometne igre te natjecanja te su ih sudili kvalificirani nogometni suci Hrvatskog nogometnog saveza.

Obrada podataka i prikazivanje rezultata

Unos podataka bitnih za obradu svake pojedine pod kriterije, koje su navedene u Tablicama 2 i 3 autori su samostalno obradili. Prvotno su radovi uneseni u Excel tablicu na način da su ekstrahirani iz odabranih nalazaka sive literature, prevedeni te potom sistematizirani u odgovarajuće odjeljke tablica. Prosječna ocjena svih ispitanika iz predmeta matematika je iznosila 3.1, dok je prosječna ocjena iz elementa kriterija za ocjenjivanje smisla za suradnju s loptom za ispitanike iznosila 3,06. Nakon toga pristupilo se obradi ekstrahiranih podataka iz tablica na način da su podaci sažeti i strukturirani radi daljnje obrade i analize za potrebe rada.

Tablica 3. Brojčane ocjene iz promatranih pod kriterija za vrijeme utakmica

R.b	Popis igrača	Brojčana ocjena smisla za suradnju s loptom
1	Igrač br.1	3,38
2	Igrač br.2	3,12
3	Igrač br.3	3,57*
4	Igrač br.4	2,64
5	Igrač br.5	2,8
6	Igrač br.6	3,25
7	Igrač br.7	3
8	Igrač br.8	3,42
9	Igrač br.9	3,26
10	Igrač br.10	2,85
11	Igrač br.11	2,76
12	Igrač br.12	3,2*
13	Igrač br.13	3*
14	Igrač br.14	3,71
15	Igrač br.15	2,6*
16	Igrač br.16	3,6*
17	Igrač br.17	3*
18	Igrač br.18	2*

Regresijska analiza

Za potrebe rada regresijska analiza provedena je s ciljem utvrđivanja utjecaja pojedinih elemenata kao prediktora ukupnog utjecaja na donošenje odluka vezanih za smisao za suradnju s loptom u nogometnoj utakmici. Prema tome, regresijska analiza opisuje se kao statistički postupak za procjenu odnosa među pod kriterijima. Kako je cilj ovog rada, utvrđivanje odnosa među pod kriterijima, odnosno utvrditi statističku ovisnost i pokazatelje jakosti takve ovisnosti. Osnovu regresijske analize predstavlja regresijski model kojim se analitički izražava odnos među pojavama, metoda je kao takva korištena. Cilj rada je utvrditi odnos među pod kriterijima koje se smatraju važnim za donošenje odluka vezanih za smisao za suradnju s loptom i korelaciju sa uspjehom u matematici promatrane populacije.

Rezultati istraživanja pokazuju kako navedeni kriteriji vrednovanja značajnosti donošenja odluka u nogometnoj utakmici objašnjavaju 48,7% varijacija ukupne razumljivosti značajnosti ($R^2 = 0,487$, $F(89) = 29,156$, $p=0,000$). Nadalje, pokazuje se da veličina prostora ($\beta = 0,369$, $p = 0,000$) i suradnja po dubini ($\beta = 0,405$, $p = 0,000$) predstavljaju značajne pozitivne prediktore ukupne značajnosti dok suradnja po širini ne pokazuje značajan doprinos ($\beta = 0,078$, $p = 0,370$) (Tablica 4).

Tablica 4. Regresijska analiza utjecaja pojedinih elemenata kao prediktora značajnosti donošenja odluka u nogometnoj utakmici

	B	Beta	T	Sig.
Veličina prostora	,382	,369	3,912	,000
Suradnja po dubini	,384	,405	4,587	,000
Suradnja pod pritiskom				
Suradnja po širini				
Brzina protoka lopte	,094	,078	,901	,370
Točnost dodavanja				

Za potrebe istraživanja, slično tomu, regresijska analiza provedena na elementima korelacije kriterija uspješnosti u matematici i donošenje odluka u nogometnoj utakmici koji pokazuje da navedeni kriteriji objašnjavaju 56,4% varijacija ($R^2 = 0,564$, $F(85) = 16,706$, $p=0,000$), pri čemu se „ocjena odličan“ ($\beta = 0,256$, $p = 0,002$), „ocjena vrlo dobar“ ($\beta = 0,360$, $p = 0,000$) i „ocjena dobar“ ($\beta = 0,311$, $p = 0,001$) pokazuju kao značajni prediktori, dok „ocjena dovoljan i nedovoljan“ ne pokazuju značajan utjecaj na ukupnu korelaciju (Tablica 5).

Tablica 5. Regresijska analiza utjecaja pojedinih elemenata kao prediktora korelacija uspjeha u matematici i odluka u nogometu

	B	Beta	T	Sig.
Ocjena odličan	,149	,256	3,200	,002
Ocjena vrlo dobar	,184	,360	3,836	,000
Ocjena dobar	,292	-,134	-1,255	,213
Ocjena dovoljan	-,132	,119	1,105	,273
Ocjena nedovoljan	,112	,012	,113	,910

Rasprava

Rezultati provedenog istraživanja kod promatrane populacije nogometaša HNK Zadar, ukazuju prije svega da je prosječna ocjena iz matematike 3,1. Za potrebe ovog rada valja naglasiti da promatrana populacija ne dolaze ih jedne škole već iz više njih iz grada Zadra i Zadarske županije. Stoga kriteriji i zahtjevi kojima su dobivene navedene ocjene nogometaša na žalost ne podliježu istim zahtjevima u svakoj školi odnosno kod pojedinog nastavnika iz matematike. Ocjenu 5 ima samo dvoje nogometaša, od kojih je jedan ispitanik nastupao i na državnim završnicama iz matematike stoga udovoljava nacionalnim kriterijima izvrsnosti, ocjenu 4 ima pet ispitanika, dok ocjenu 3 ima također pet ispitanika, ocjenu 2 ima sedam ispitanika dok ocjenu 1 nema nitko od ispitanika. Analizirajući ocjene ispitanika, te uzevši u obzir njihov svakodnevni društveni i sportski život, proizlazi da ispitanici nemaju dovoljan interes za predmet matematika, te da kontinuirano ne ulažu vrijeme i trud u proces usvajanja znanja.

Autori su analizirajući 12 pod kriterija koji su uzeti za razmatranje u istraživanju za ocjenjivanje uspješnosti u igri nogometaša, ovdje su navedeni općenito. Nije interpretiran dio objektivne pouzdanosti ocjena, zbog dva razloga: prvo, do sad ne postoje identična istraživanja, te drugo, procjene ocjena su subjektivne.

Tablica 6. Rezultati istraživanja

Kriterij	Rezultati istraživanja
Veličina prostora (VPT)	Dobio se uvid u veličinu prostora i broj igrača koji aktivno sudjeluje u igri te snalaženje.
Intenzitet pritiska protivničkog igrača na loptu“ (IPPI)	Ukazuju na situacijsku efikasnost ispitanika pod pritiskom igrača (igrači prvoligaškog kluba) gdje se uvidjelo da jedan veći broj igrača HNK Zadar ima probleme kod donošenja odluka kod pritiska većeg intenziteta od strane protivničkog igrača. Pojedinci koji su kroz igranje nogometa navikli na pritisak suparničkog igrača, natjecanje i borbu za svoju poziciju imaju više samopouzdanja, otporniji su na stresne situacije
Broj igrača na terenu (BIT)	Ukazuju na prisutnost igrača obiju momčadi u aktivnom koridoru za igru, te potrebu uvažavanja ispitanikovog snalaženja i donošenja odluka kod prisustva većeg broja igrača. Istraživanjem je utvrđena problematika kod donošenja odluka u fazi napada u prostoru aktivne igre.
Odabir najboljeg rješenja (ONR),	Također ukazuju da dio ispitanika ima problem kod odabira odgovarajućeg rješenja ukoliko se nalazi pod pritiskom protivničkog suigrača. Analizom je utvrđeno da ipak igrači HNK Zadar tijekom protekle tri sezone iz objektivnih razloga imaju nedostatak utakmica najviše razine, dok protivnički igrači tijekom sezone imaju podražaj u svakoj utakmici na najvišoj razini (1 HNL).

Sposobnost brzog donošenja odluka (BDO)	Ukazali su da kod igrača HHK Zadar postoji potencijal za igranje utakmica na najvišoj razini, te da dio igrača postiže zapažene rezultate, što ukazuje i na kvalitetu trenažnog procesa i kvalitetni potencijal pojedinca.
Tajming donošenja odluka (TDO)	Istraživanjem je utvrđeno da tijekom utakmice negativne emocije su direktno povezane s produktivnošću mišljenja i donošenja odluka nogometaša, gdje se u novonastalim nepredviđenim situacijama u igri od ispitanika se zahtijeva da vlada stvaralačkom aktivnošću.
Realizacija donošenja odluka (RDO)	Rezultati ipak su dijelom ukazali postoji problem kod realizacije odluke, pogotovo uzevši u obzir specifikume specijalizacije u nogometnoj igri. Naravno uzevši u obzir kvalitetu igrača iz suparničke momčadi.
Vertikalnost odabranog rješenja (VOR)	Rezultati istraživanja za pod kriterije: vertikalnost odabranog rješenja (VOR), horizontalnost odabranog rješenja (HOR) ukazuju da ispitanici teže odlukama koje su sigurne stoga je analizom utvrđeno da u promatranim utakmicama dominiraju odluke koje su usmjerene horizontalnim rješenjima. S tim da valja naglasiti u obzir specifičnosti pozicije igrača i njegovu ulogu u ekipi i zahtjeve u igri koji proizlaze iz navedenog.
Horizontalnost odabranog rješenja (HOR)	Ukazuju da ispitanici teže odlukama koje su sigurne stoga je analizom utvrđeno da u promatranim utakmicama dominiraju odluke koje su usmjerene horizontalnim rješenjima. S tim da valja naglasiti u obzir specifičnosti pozicije igrača i njegovu ulogu u ekipi i zahtjeve u igri koji proizlaze iz navedenog.
Sporost donošenja odluka (SDO)	Ukazali su da postoji korelacija kod brzine donošenja odluka sa još nizom vanjskih faktora povezanih sa igračima iz suparničke ekipe ili ipak po sudu istraživača nogometne kvalitete ispitanika
Vraćanje lopte unatrag (VLU)	Ukazali su na zahtjeve koji su postavljeni od strane trenera prema ispitanicima i donošenje odluka koje doprinose navedenim zahtjevima kako bi se ostvario postavljeni cilj.
Novo započinjanje suradnje (ZNS)	Također, ukazuju da na zahtjeve koji su postavljeni od strane trenera prema ispitanicima i donošenje odluka koje doprinose navedenim zahtjevima kako bi se ostvario postavljeni cilj.

Regresijskom analizom utvrđeno je da navedeni kriteriji vrednovanja značajnosti donošenja odluka u nogometnoj utakmici objašnjavaju 48,7% varijacija ukupne razumljivosti značajnosti ($R^2 = 0,487$, $F(89) = 29,156$, $p=0,000$). Ukazuje se da veličina prostora ($\beta = 0,369$, $p = 0,000$) i suradnja po dubini ($\beta = 0,405$, $p = 0,000$) predstavljaju značajne pozitivne prediktore ukupne značajnosti dok suradnja po širini ne pokazuje značajan doprinos ($\beta = 0,078$, $p = 0,370$). Slično tomu, regresijska analiza provedena na elementima korelacije kriterija uspješnosti u matematici i donošenju odluka u nogometnoj utakmici koji pokazuje da navedeni kriteriji objašnjavaju 56,4% varijacija ($R^2 = 0,564$, $F(85) = 16,706$, $p=0,000$), pri čemu se „ocjena odličan“ ($\beta = 0,256$, $p = 0,002$), „ocjena vrlo dobar“ ($\beta = 0,360$, $p = 0,000$) i „ocjena dobar“ ($\beta = 0,311$, $p = 0,001$) pokazuju kao značajni prediktori, dok „ocjena dovoljan i nedovoljan“ ne pokazuju značajan utjecaj na ukupnu korelaciju.

ZAKLJUČNA RAZMATRANJA

Uzimajući u obzir sve komponente koje su potrebne za uspjeh u nogometu, današnji nogomet zahtijeva od igrača da su univerzalnog karaktera, odnosno s osobinama polivalentnosti. Ono što karakterizira suvremeni nogomet je visoka brzina kretanja igrača, a pritom i visoka razina kontrole lopte, automatizirana individualna, grupna i kolektivna taktička djelovanja, visoka razina motivacije i borbenosti, te brza i kvalitetna razina donošenja odluka. Kada se govori o kolektivnom i grupnom taktičkom djelovanju tu se misli na grupno oduzimanje lopte, vršenje pritiska na protivničku ekipu dok je u posjedu lopte, stvaranje brojčane nadmoći, povećanje prostora za igru na bitnim dijelovima igrališta i sl. Karakteristika navedenoga je što se na taj način želi smanjiti manevarski prostor protivniku. Smanje prostora za igru posljedično je dovelo do smanjenja vremena za prepoznavanje situacija i donošenja odluka, a samim time povećalo važnost taktičkog mišljenja (donošenje odluka) koje je ključno za uspješno taktičko djelovanje. Današnji nogometaš mora biti u stanju prepoznati i predvidjeti situacije na terenu, te pronaći pravo rješenje tj. donijeti pravu odluku u vrlo kratkom vremenskom periodu. Rezultati istraživanja vezanih uz donošenje odluka povezanih sa smislom za suradnju s loptom ukazuju da se primjenom situacijskog treninga, koji navise približava igračima situacije s utakmice u treningu postižu kvalitetni rezultati trenažnog rada. Trenažnim procesom se pokušava preslikati situacije s utakmice na treningu i na taj način smanjiti faktor iznenađenja, isto tako se želi usavršiti proces taktičkog mišljenja, a to podrazumijeva brže prepoznavanje situacije na terenu i predviđanje ishoda, brže donošenje ispravnih odluka, a posljedično dolazi do uspješnijeg taktičkog djelovanja i ostvarivanja pozitivnih rezultata na natjecanju/ima. Međutim uspješno taktičko mišljenje i djelovanje opet ovisi o razini razvijenosti igračeve nogometne tehnike i razini kondicijskih sposobnosti, a to

nam govori koliko je bitan integrirani pristup nogometnom treningu. Rezultati istraživanja ukazuju da postoji korelacija između brojčanog uspjeha (ocjeni) iz matematike i donošenja kvalitetnih, pravovremenih odluka vezanih za smisao za suradnju s loptom za vrijeme analiziranih nogometnih utakmica. Prema tome, nogomet je kompleksna aktivnost, broj igrača koji sudjeluje u igri je velik, mnoštvo remetećih faktora, nebrojena količina nepredviđenih situacija itd., upravo ove navedene činjenice ne dopuštaju šabloniziranje nogometne igre ili stavljanje u kalupe, nego ističu sposobnost za taktičko mišljenje kao osnovni uvjet za uspješno taktičko djelovanje (donošenja odluka). Ključno u stjecanju taktičkog mišljenja (odluka) je edukacija igrača kroz trenažni proces, igrači moraju znati smisao onoga što vježbaju na treningu, mogućnosti izvedbe zadatka/elementa i biti u stanju procijeniti izvedbu.

Naglasak u suvremenim trenažnom procesu i razvojnim potencijalima je na interdisciplinarnom obliku suradnje stručnjaka. Dobiveni rezultati daju saznanja o značaju procesa donošenja odluka vezanih za smisao za suradnju s loptom u nogometu, te korelaciji sa uspjehom u području nastavnog predmeta matematike. Važno je istaknuti želju i potrebu za daljnjim istraživanjem koja će produbiti tematiku, te da se može bitno utjecati na promjenu načina izvedbe i provedbe trenažnog procesa u nogometu za navedenu populaciju nogometaša.

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Primljen: 23. decembar 2023. / Received: December 23, 2023

Prihvaćen: 30. januar 2024. / Accepted: January 30, 2024



MANAGEMENT FOR STRENGTHENING LITERACY LEARNING CULTURE PHYSICAL EDUCATION IN SECONDARY SCHOOLS IN INDONESIA

SITI UMI KHAYATUN MARDIYAH¹, HENDRA SETYAWAN², RATKO PAVLOVIC³,
ARIEF DARMAWAN⁴, NUGROHO SUSANTO^{5*}, ZHANNETA KOZINA⁶

¹Department of Office Administration Education, Yogyakarta State University, Indonesia

²Department of Primary School Physical Education, Yogyakarta State University, Indonesia

³Faculty of Physical Education and Sport, University of East Sarajevo, East Sarajevo, BIH

⁴Department of Physical Education Health and Recreation, Malang State University, Indonesia

⁵Department of Sport Science, Padang State University, Indonesia

⁶Department of Olympic and Professional Sports, Sports Games and Tourism,
H.S. Skovoroda Kharkiv National Pedagogical University, Ukraine

Correspondence:

Nugroho Susanto, Department of Sport Science, Padang State University, Indonesia
nugrohususanto@fik.unp.ac.id

Abstract: This research explores the management of strengthening literacy culture in Physical Education (PE) 2013 Curriculum learning at Indonesia's junior high school level, combines concurrent embedded model research, with quantitative methods as primary methods and qualitative methods as secondary methods. The quantitative research sample was 105 junior high school PE teacher respondents in eight provinces who represented descriptions of strengthening the literacy culture of PE learning in their respective schools. The qualitative sample consisted of 6 participants consisting of 2 principals, 3 curriculum representatives, and 1 senior middle school PE teacher. Quantitative data was taken using a 1-4 Likert scale questionnaire, while qualitative data was taken using semi-structured interviews. Quantitative data analysis uses descriptive statistics with the help of SPSS, while qualitative data analysis uses data reduction, data presentation, and conclusion. The quantitative research results show that planning to strengthen literacy culture in learning is included in the good category, with a score of 88.73%. This is supported by qualitative data, which states that the planning to strengthen the PE learning literacy culture has gone well. The implementation of strengthening literacy culture in learning is also in the good category, with a score of 87.08%. This is supported by qualitative data, which states that the implementation of strengthening PE learning literacy culture has been carried out and is going quite well. The assessment of strengthening literacy culture in learning is in a good category, with a score of 84.76%. This is supported by qualitative data, which states that the assessment of strengthening literacy culture in PE learning in the 2013 curriculum has gone well. Supporting factors for the implementation of strengthening literacy culture in PE learning in the 2013 curriculum from the aspects of planning, implementation, and assessment, namely: Availability of supporting facilities and infrastructure, a conducive learning atmosphere, the concept of implementing the 2013 curriculum, local government regulations that encourage school literacy movements, consistency of the head schools, the enthusiasm and skills of teaching staff, student motivation for literacy, as well as the implementation of comprehensive tests to measure student learning outcomes.

Keywords: Management, Literacy Culture, PE, Curriculum 2013, Indonesia.

INTRODUCTION

Literacy is knowing, understanding, and interpreting written language in everyday life. Beyond its conventional definition as reading, writing, and arithmetic skills, currently, literacy is defined as a means of identification, understanding, interpretation, creation, digital communication, text/written media, and unlimited information (Unesco, 2021). Mastery of literacy is an important indicator for improving the achievements of the younger generation in achieving success. Literacy is an important skill every student must have because most educational process depends on literacy ability and awareness. The School Literacy Movement (GLS) program is expected to foster a culture of reading, writing, listening, and talking to the school community, principals, students, and teachers, leading to the ability to understand information analytically, critically, and reflectively. Instilling literacy as early as possible must be realized because it is the main capital in creating an intelligent and cultured nation.

Six literacy types have been developed: reading and writing, numeracy, finance, science, digital and Information and Communication Technology (ICT), and cultural and civic literacy (Kemdikbud, 2021). There is physical

literacy that has historically been linked to the issue of threats to active lifestyles (Cariney, Kiez, Roetert, et al., 2019). Literacy is not just the ability to read and write, but literacy can mean being technologically literate, thinking critically, and being sensitive to the surrounding environment. Critical thinking and problem-solving skills are crucial in developing 21st-century learning skills. These 21st-century skills include critical thinking, creativity, collaboration, and 4C communication (Tang, Vezzani, & Eriksson, 2020). The call for educators worldwide to prepare students for the 21st century encourages educators to provide students with a holistic education that emphasizes life skills such as communication, cross-cultural collaboration, and critical thinking (Teo, 2019).

Literacy skills are 21st-century skills that are urgently needed for anyone to compete globally. The literacy competencies needed by students in the current era of globalization are part of the skills or skills aspect of the 21st century. Learning skills, skills, and literacy characterize 21st-century learning. Learning skills are cooperation, communication, and critical and creative thinking. These 21st-century competencies have been adapted to the education system in Indonesia through the 2013 curriculum. The approach used in the 2013 curriculum is a scientific approach consisting of five activities (Pratiwi, Cari, & Aminah, 2019): observing, asking, experimenting, associating, and communicating.

The School Literacy Movement (GLS) is a participatory business or activity involving school residents, academics, publishers, mass media, the community, and stakeholders under the coordination of the Directorate General of Primary and Secondary Education, Ministry of Education and Culture. GLS is a social movement with collaborative support from various elements. Efforts taken to make this happen are in the form of getting students into the habit of reading. This habituation is carried out with a 15-minute reading activity. When the habit of reading is formed, it will then be directed to the development and learning stages accompanied by bills based on the 2013 Curriculum. Variations in activities can be a combination of developing receptive and productive skills. In its implementation, assessments are carried out at certain scheduled periods so that the impact of GLS can be known and continuously developed. GLS is expected to be able to mobilize school members, stakeholders and the community to jointly own, implement and make this movement an important part of life (Kemdikbud, 2016). Literacy culture and character formation are part of the competencies to be achieved in the 2013 Curriculum learning. The 2013 Curriculum is a refinement of the previous curriculum (KTSP 2006) and emphasizes character education and mastery of competencies from attitudes, knowledge and skills (Kemdikbud, 2022). The 2013 curriculum, a development of the previous curriculum, strengthens character education and the literacy movement. Literacy is not just a subject entity but an indicator of successful curriculum implementation. Integrating literacy and character movements in the 2013 curriculum to realize national education goals is very important. Through the 2013 curriculum implementation program, literacy activities must be implemented to strengthen attitudes to form a literacy culture in primary and secondary education level units.

Literacy is not just one subject entity but rather an indicator of the success of curriculum implementation so that all subjects can be part of developing programs to strengthen students' literacy culture. Physical literacy refers to lifelong participation in physical activity (Macdonald & Enright, 2014; Lundwall, 2015) literacy is the idea that a person has the skills to access knowledge (Ennis, 2015). Physical literacy can promote individual physical activity in the fields of sport and public health (Rudd, Pesce, Strafford, et al., 2020; Li, Whitehead, Green, et al., 2022). Physical literacy is each individual's ability to understand how to maintain physical activity throughout life (Balyi, Way, & Higgs, 2020).

PE, a compulsory subject at all levels of primary and secondary education, is very suitable for character formation that emphasizes literacy culture. According to (Knaus, Lechner, & Reimers, 2020) physical education at school increases academic achievement, non-cognitive skills, motor skills, and physical activity.. In physical education, the physical activities carried out involve group games that emphasize students' collaboration or cooperation. Team-based learning is an active learning strategy that encourages students to think critically to solve problems (Silberman, Carpenter, Takemoto, et al., 2020). The discipline of carrying out physical education activities has a protective effect on mental health (Madeira, Saraiva, Túlio, et al., 2019). Children's involvement in physical education and sports has a positive relationship with the functional form of the body (Allen, Telford, Telford, et al., 2019). Game-based learning approaches are indicated to be effective in facilitating the development of 21st-century student skills (Qian & Clark, 2016). Physical education has been proven effective in developing knowledge, attitudes, and physique. It can also increase the potential of the physical education roadmap in the future (Corbin, 2020). The 2013 revised curriculum also provides guidelines that PE learning today is not just about moving and having fun but requires students to

have critical, creative, innovative thinking skills, be able to collaborate and communicate well so that the PE curriculum that is prepared will produce people who have health and skills in the 21st-century era (Mustafa, 2020). Physical education in schools has many benefits, both from cognitive, affective, and psychomotor aspects, and psychological and physical health.

Physical education can be considered the core of a school's physical literacy program (Telford, Olive, Keegan, et al., 2021). Therefore, it is very appropriate if physical education is part of the 2013 curriculum learning, which also has a big role as a means or medium for forming and developing competencies to strengthen literacy culture. Research on physical literacy is essential to address global lifestyle issues and build efforts to achieve goals (Whitehead, Durden-Myers, & Pot, 2018). Physical literacy provides the foundation for elite sports, public health, and physical education (Corbin, 2016); Hyndman & Pill, 2018). Physical literacy development is critical to long-term health (McKean, 2013; Longmuir, Boyer, Lloyd, et al., 2015; Jurbala, 2015).

Even though strengthening literacy culture as part of the scientific learning program in the 2013 curriculum has been running for several years, the reality shows that student literacy culture in Indonesia is still relatively low. PIRLS 2011 International Results in Reading results, Indonesia ranked 45th out of 48 participating countries (IEA, 2012), while the 2009 PISA reading literacy test showed Indonesian students ranked 57th. PISA 2012 shows that Indonesian students are ranked 64th with a 396 (OECD average score of 496). A total of 65 countries participated in PISA 2009 and 2012. Based on PIRLS and PISA data, especially in reading comprehension skills, it shows that the competence of Indonesian students is relatively low (Kemdikbud, 2016). Other countries in Asia, such as South Korea and Singapore, dominate the results of the Program for International Student Assessment (PISA) assessment results. In contrast, other countries from the East Asia region, including Malaysia, also experienced a decline in PISA performance, even though they have spent large budgets for the education sector (Perera & Asadullah, 2019). The fact of decline in literacy achievement in the PISA event can encourage countries in Asia, including Indonesia, to evaluate the sustainability of the educational curriculum that has been implemented currently, especially the implementation of the 2013 curriculum in Indonesia, which has been running for more than five years.

See the fact that the results of the Program for International Student Assessment (PISA) assessment are not under the ideal conditions expected, further research is needed regarding the reality on the ground in the implementation of strengthening literacy culture in the 2013 Curriculum. Research is focused on the learning process and inhibiting and supporting factors implementation in the field. Research related to the implementation of strengthening literacy culture in the 2013 Curriculum has been carried out by previous researchers. The results of research (Wirawan, Trianto, & Gumono, 2018) at one of the Bengkulu City Junior High Schools stated that several literacy programs had been implemented, such as 15-minute activities, library visitor awards, reading corners and study huts, as well as regional library visits, but these programs have not been implemented optimally due to the absence of a school literacy team. The results of research (Sariani, 2020) at one junior high school in Bali province stated that the implementation of the school literacy movement program is at the familiarization stage, with efforts to add enrichment books, create reading areas, text-rich environments, carry out various forms of literacy activities and involve the public in implementing the literacy movement. The obstacles faced include insufficient reading collection, low student discipline, and the need to improve reading habits and progress to the development stage by involving various parties. The research (Nasrullah, 2020) in one of the middle and high schools in Makasar stated that the obstacles faced were students' consistency and awareness of literacy, which was still low, lack of discipline, and tight class hours. Rohmawati & Gayatri (2020), said that scientific literacy in biology subjects, scientific literacy in terms of content aspect, still reached 65.62% in the medium category. Meanwhile, the results of research on students' literacy skills in PE Curriculum 2013 learning at a high school in Bali show that of the entire sample taken, the majority of students have a level of literacy skills in the low category (Artanayasa, Suwiwa, & Arifin, 2020).

Various previous studies related to learning in the 2013 Curriculum have provided some information but have not been aimed at revealing how to manage literacy culture in PE learning in junior high schools in Indonesia. Therefore, it is important to carry out further research to obtain broader information regarding this matter. For this reason, this research aims to explore the management of strengthening literacy culture in the 2013 PE Curriculum learning at the junior high school level in Indonesia. The research focus is directed at three substances, namely: 1) literacy culture planning, 2) implementation of literacy culture, 3) assessment of literacy culture, and 4) supporting factors for managing literacy culture strengthening.

MATERIAL AND METHODS

Participants and design study

This research is a combined/combo of quantitative and qualitative (mixed-method) research, namely a concurrent embedded model, with quantitative methods as primary and qualitative methods as secondary methods. The model combination method or concurrent embedded design is a research method that unequally combines quantitative and qualitative methods (Sugiyono, 2019). This research explores the management of strengthening literacy culture in 2013 curriculum PE learning at junior high schools (SMP) in Indonesia. The research focus is directed at four aspects, namely, 1) literacy culture planning, 2) implementation of literacy culture, 3) assessment of literacy culture, and 4) factors supporting literacy culture. The sample in this research was taken using a purpose sampling system (consideration sample). Purpose sampling is a technique for determining samples with certain considerations (Sugiyono, 2019).

Data collection in quantitative research is carried out by distributing questionnaires to teachers PE sampled in eight provinces in Indonesia. The quantitative research sample in this study was 105 junior high school PE teacher respondents from eight provinces in Indonesia who represent a picture of the management of strengthening PE learning literacy culture in their respective junior high schools (Table 1). As for the qualitative sample, there were 6 participants consisting of 2 principals, 3 principals, and 1 junior high school senior PE teacher. The research was conducted in April-July 2021. This research has received research permission from the Faculty of Sports Science, Yogyakarta State University, in April 2021 with Decree Number.73/UN34.16/PT.01.01/2021

Table 1. Distribution of Respondents and Number of Middle Schools

No	Province	Respondent Numbers
1.	D.I. Yogyakarta	39
2.	Jawa Tengah	28
3.	Riau	12
4.	Sumatra Selatan	9
5.	Kalimantan Barat	7
6.	Bangka Belitung	4
7.	Banten	3
8.	Selawesi selatan	3
	Total	105

Statistical procedures

Quantitative data analysis was carried out using descriptive statistical tests with the help of SPSS software. Descriptive statistics are statistics used to analyze data by describing the data that has been collected as it is without making general conclusions (Sugiyono, 2019). Qualitative data collection was carried out using semi-structured interviews with teachers School PE, Middle School Principals, and Middle School Curriculum Representatives in the eight provinces in Indonesia who were involved were the samples in this research. Data analysis was carried out by carrying out four important steps (Miles and Huberman, 1994), namely analysis, a) collecting data, b) reducing data, c) presenting data, and d) drawing conclusions. In line with this theory, the researcher carefully compiled qualitative data in the form of descriptions based on each category to come up with the right interpretation. The quantitative research instrument used a Likert scale of 1 – 4, with answer choice constructions of 1 = Never; 2 = Rarely; 3 = Often; 4 = Always. The instrument has been prepared based on theoretical concepts and consulted with experts in related fields. The score for each answer item obtained is then added up and then converted into value using the following formula:

$$Presentage = \frac{Score}{Maximum\ score} \times 100$$

Then, from the results obtained, the score is calculated using a percentage to determine the criteria for achieving management of strengthening literacy culture. The percentage calculation formula used is as follows (Table 2):

Table 2. Management Achievement Levels for Strengthening Literacy Culture (Riduwan, 2015)

Percentage	Category
81-100%	Excellent
61-80%	Good
41-60%	Enough
21-40%	Less
0-20%	Very lack

The instrument has been tested for validity (Product Moment Pearson Correlation SPSS) and reliability (Cronbach’s Alpha SPSS) before being used in research. The results of the validity test of the sub-variables for planning to strengthen literacy culture, implementation of strengthening literacy culture, and assessment of strengthening literacy culture based on the Product Moment Pearson Correlation test on all question items have an r-count value (total Pearson correlation score) greater than the r-table value of 0.195 in The significance level is 5% so that all question items are declared valid. In the output correlations, it is known that the sig. (2-tailed) the correlation of all items is $0.000 < 0.05$, and the Pearson correlation is positive, so all items are declared valid (Table 3).

Table 3. Validity

X	Rxy > R-tabel		Sig. 2-tailed < T.Sig		Ket
	Rxy	R-tabel	Sig.2-tailed	T.Sig	
X1.1	0.68	0.195	0	0.05	Valid
X1.2	0.689	0.195	0	0.05	Valid
X1.3	0.641	0.195	0	0.05	Valid
X2.1	0.694	0.195	0	0.05	Valid
X2.2	0.755	0.195	0	0.05	Valid
X2.3	0.717	0.195	0	0.05	Valid
X2.4	0.712	0.195	0	0.05	Valid
X3.1	0.691	0.195	0	0.05	Valid
X3.2	0.705	0.195	0	0.05	Valid
X3.3	0.743	0.195	0	0.05	Valid

The reliability test results for the sub-variables of literacy culture planning, implementation of literacy culture, and assessment of literacy culture based on Cronbach’s alpha test, all question items have a value of 0.886. Cronbach’s alpha value is $0.886 > 0.60$, so it can be concluded that all question items are declared reliable or consistent (Table 4).

Table 4. Statistical Reliability

Cronbach’s Alpha	N of Items
0.886	10

RESULTS

These descriptive statistics show the achievements in planning to strengthen the 2013 PE curriculum learning literacy culture in Indonesia’s Junior High Schools (Table 5, 6, 7).

Planning to Strengthen Literacy Culture in 2013 PE Curriculum Learning

In this study, four aspects were developed to find out how management achieves strengthening literacy culture in four aspects, namely: 1) planning to strengthen literacy culture, 2) implementation of strengthening literacy culture, 3) assessment of strengthening literacy culture, and 4) supporting factors to strengthen literacy culture As has been shown (Table 5), this research shows the results of respondents’ answer scores on planning indicators; making a physical education learning plan that includes strengthening the culture of literacy or reading reaching 87.86%,

making a lesson plan that includes student activities to read or observe the material first before studying/practicing together reaching 90.48%, and making a lesson plan that includes student activities to find out about the material from various sources, both offline and online before studying/practicing together, reaching 87.86%. Meanwhile, the average achievement in planning to strengthen literacy culture is 88.73%.

The answers representing questions (Table 5) from principals, curriculum representatives, and senior middle school PE teachers stated that “Yes, planning to strengthen literacy culture in PE learning in the 2013 curriculum has gone well. “The preparation of lesson plans at the preliminary or opening stage is always planned for literacy activities.”

Table 5. Planning

Indicator	Frequency & Valid Percent %								Mean	Item
	Never		Seldom		Often		Always			
	f	%	f	%	f	%	f	%		
Arrange lesson plan for PE that strengthen literacy	0	0	7	6.7	37	35.2	61	58.1	3.51	87.86
Create a lesson plan that includes student activities to read or observe the material first before studying/practicing together	0	0	2	1.9	36	34.3	67	63.8	3.62	90.48
Create a lesson plan that contains student activities to find out material from various sources. both offline and online. before studying/practicing together	0	0	4	3.8	43	41	58	55.2	3.51	87.86
88.73										

Implementation of Strengthening Literacy Culture in PE Curriculum 2013 Learning

Table 6 shows the results of respondents’ responses to implementation indicators. emphasizing that students seriously understand or analyze the skills in physical education material to create effective movements. reaching 88.81%. with an emphasis on students seriously reading or observing the material first before learning/practicing together in learning physical education 88.1%. with an emphasis on making students’ conclusions about physical education material that they studied/practiced together reached 85.48%. and providing a physical education learning pattern of active search (emphasizing students who actively search for information from different sources and emphasize scientific learning) reached 85.95. Meanwhile. the average achievement in the implementation of the culture of strengthening literacy is 87.08%.

The answers representing the questions (Table 6) of the director. representatives of the curriculum and physical education teachers of upper secondary school are yes; “Yes. the implementation of strengthening the culture of literacy in the TZK classes for the curriculum for 2013 went well. The implementation of the culture of literacy according to the plans that were made. that is. 10 minutes before the beginning of the material.”

Table 6. Implementation

Emphasize students to seriously understand or analyze the skills in physical education learning material to produce effective movements	0	0	4	3.8	39	37.1	62	59	3.55	88.81
Emphasize students to seriously read or observe the material first before studying/practicing together in physical education learning	0	0	2	1.9	46	43.8	57	54.3	3.52	88.1
Emphasize students making conclusion regarding the physical education learning material that has been studied/practiced together	0	0	4	3.8	53	50.5	48	45.7	3.42	85.48
Providing an active-search physical education learning pattern (emphasizing students actively seeking ainformation from various sources and emphasizing scientific	0	0	4	3.8	51	48.6	50	47.6	3.44	85.95
87.08										

Assessment of Strengthening Literacy Culture in 2013 PE Curriculum Learning

This research shows the results of respondents’ answer scores on assessment indicators (Table 7). providing an assessment of student knowledge in the form of a written test with question content that directs students to analyze the learning material reached 85.71%. providing an assessment of student knowledge in the form of a written test with question content that directs students to relate several scientific disciplines to the learning material reached 83.57%. and provide an assessment of student knowledge in the form of a written test with questions that direct students to make a conclusion on the learning material reaching 85%. Meanwhile. the average achievement in the assessment of strengthening literacy culture was 84.76%. The answers representing questions (Table 7) from principals. curriculum representatives. and senior middle school PE teachers stated that; “Yes. the assessment of strengthening literacy culture in PE learning in the 2013 curriculum has gone well. Evaluation of literacy culture is carried out periodically. culminating at the end of the semester by rewarding students who read many books and visit the library.”

Table 7. Assessment

Indicator	Frequency & Valid Percent %								Mean	Item
	Never		Seldom		Often		Always			
	f	%	F	%	f	%	f	%		
Providing an assesment of student knowledge in the form of a written test with questions that direct students to make an analysis of the learning material	0	0	2	1.9	56	53.3	47	44.8	3.43	85.71
Providing an assesment of students knowledge in the form of a written test with question that direct students to link several scientific disciplines to the learning material	1	1	4	3.8	58	55.2	42	40	3.34	83.57
Providing an assesmmnt of students knowledge in the form of a written test with question that direct students to make a conclusion on the learning material	0	0	6	5.7	51	48.6	48	45.7	3.4	85
										84.76

Supporting Factors for Management of Strengthening Literacy Culture in 2013 PE Curriculum Learning

As for the supporting factors for planning. implementing and assessing literacy culture. based on answers representing questions from school principals. curriculum representatives and senior middle school PE teachers. it is stated that:

- Planning:* "Availability of a school library. free WiFi making it easier for students to search for information via the internet. availability of learning resources. availability of facilities and infrastructure. availability of human resources. enthusiastic subject teachers. teaching and administrative staff."
- Implementation:* "Availability of facilities and infrastructure. Availability of learning equipment. conducive teaching and learning. sports book material that is not diverse. human resources for students. the concept of the 2013 curriculum and city government regulations that promote the school literacy movement. Even the city government invites teachers to create a book; enthusiasm is needed for children to read and write in literacy."
- Evaluation:* "Facilities and infrastructure need to start with diagnostic. normative and summative tests. staff capacity. consistent school principals to promote school literacy. supporting factors in the enthusiasm of teachers and students."

DISCUSSION

This research wants to explore how management strengthens the literacy culture of learning in PE Curriculum 2013 for Middle Schools in Indonesia. Four aspects are the focus of this research. including planning to strengthen literacy culture. implementation of strengthening literacy culture. assessment of strengthening literacy culture. and

supporting factors for literacy culture.

Based on the results of quantitative analysis on the planning aspect of strengthening the literacy culture of learning in PE curriculum 2013 for junior high school level. which has been described in the research results subsection. it shows that the respondents' answers to all indicators of planning for strengthening literacy culture are in the very good category with a score above 81%. Likewise. the average achievement value for planning to strengthen literacy culture based on quantitative descriptive statistics is 88.73%. in the 81-100% range. so it is in the very good category. These descriptive statistics show the achievements in planning to strengthen literacy culture in the 2013 curriculum PE learning at Junior High Schools (SMP) in Indonesia in the very good category. This is also supported by qualitative data from answers representing questions from principal participants. curriculum representatives. and senior middle school PE teachers who stated that planning to strengthen literacy culture in 2013 curriculum PE learning has gone well. The preparation of lesson plans at the preliminary stage is always planned for literacy activities in PE learning. This is also supported by research at one of the secondary schools in Bogor. which shows that the implementation of physical education learning strategies based on the 2013 Curriculum is good; this implementation can be seen based on research results from good learning plans (RPP). In line with Fitriana. Iqbal. & Julianti. (2020). the research conducted Tasmawati. Wahira. & Mus (2021) at one junior high school in Makassar stated that the implementation of the literacy program was running in accordance with the school literacy movement guidelines set by the Ministry of Education and Culture which includes 3 stages. namely the habituation. development and learning stages. The habituation stage is carried out by cultivating students' interest in reading through 15 minutes of reading. the development stage is carried out by habituation followed by non-academic bills in the form of literacy journals. and at the learning stage there are academic bills.

The results of quantitative analysis on aspects of the implementation of strengthening the literacy culture of PE curriculum 2013 learning at the junior high school level. which has been described in the research results sub-section. show that the respondents' answers to all indicators of the implementation of strengthening literacy culture are in the very good category with a score above 81%. Likewise. the average achievement value for implementing literacy culture strengthening based on quantitative descriptive statistics is 87.08%. in the 81-100% range. so it is in the very good category. These descriptive statistics show the achievements in the implementation of strengthening literacy culture in the 2013 curriculum PE learning at Junior High Schools (SMP) in Indonesia in the very good category. This is also supported by qualitative data from answers representing questions from principal participants. curriculum representatives. and senior middle school PE teachers who stated that the implementation of strengthening literacy culture in PE learning for the 2013 curriculum had gone well. The implementation of literacy culture is by the plans that have been made. namely. carried out 10 minutes before starting the material. This is also supported by previous research conducted in several secondary schools regarding implementing the literacy strengthening program in 2013 Curriculum Learning. which shows that the literacy strengthening program in learning has been implemented through 15-minute reading habitual activities (Wirawan. Trianto. & Gumono. 2018; Muzaki. 2020; Wibowo. 2021; Tasmawati. Wahira. & Mus. 2021). It was stated that the literacy strengthening program in the 2013 Curriculum learning had been implemented through 15-minute reading habitual activities. The results of Sariyani (2020) at one junior high school in Bali province stated that the implementation of the school literacy movement program was at the familiarization stage by adding enrichment books. creating reading areas and text-rich environments. as well as involving the public in implementing the literacy movement. In their research (Fitriana. Iqbal. & Julianti. 2020) at one of the secondary schools in Bogor. stated that the implementation of Physical Education. Sports. and Health (PE) learning strategies based on the 2013 Curriculum was good. This implementation can be seen based on research results from the learning implementation stage that were good. Results of quantitative analysis on PE aspects. The assessment of strengthening literacy culture in PE curriculum 2013 for junior high school level. which has been described in the research results subsection. shows that the respondents' answers to all assessment indicators for strengthening literacy culture are in the very good category with a score above 81%. Likewise. the average achievement score for strengthening literacy culture based on quantitative descriptive statistics is 84.76%. in the 81-100% range. so it is in the very good category. These descriptive statistics show the achievements in the assessment of strengthening literacy culture in the 2013 curriculum PE learning at Junior High Schools (SMP) in Indonesia in the very good category. This is also supported by qualitative data from answers representing questions from principal participants. curriculum representatives. and senior middle school PE teachers who stated that the assessment of strengthening literacy culture

in 2013 curriculum PE learning had gone well. Literacy culture evaluations are carried out periodically, culminating at the end of the semester by rewarding students who read many books and visit the library.” This is also supported by research (Fitriana, Iqbal, & Julianti, 2020) at one school in Bogor which shows that the implementation of physical education learning strategies based on the 2013 Curriculum is good. This implementation can be seen based on research results from the assessment process which has gone well.

Supporting factors for the implementation of strengthening literacy culture in PE curriculum 2013 learning at junior high school level from the aspects of planning, implementation, and assessment, namely: Availability of facilities and infrastructure (school library, learning resources, free WiFi making it easier for students to search for information, and Availability of human resources teaching and administrative staff), Availability of learning devices, a conducive learning atmosphere, sports book material that is not too diverse, the concept of implementing the 2013 curriculum, local government regulations that encourage school literacy movements, encouragement for teachers to create books, encouragement of children’s enthusiasm for reading and writing. “Comprehensive tests are needed to measure student learning outcomes, consistent school principals to promote school literacy, the ability and willingness of teaching staff, and student motivation.” This is also supported by previous research on the implementation of the literacy strengthening program in the 2013 Curriculum Learning in secondary schools, which states that the supporting factors include cooperation factors from school leaders in creating a school atmosphere that supports the implementation of literacy, support from parents or guardians of students, commitment and cooperation, facilities and infrastructure, supervision of literacy activities, teacher and student factors, supporting facilities and infrastructure (Lestari, Andriani, & Indrayany, 2019; Muzaki, 2020; Wibowo, 2021; Tasmawati, Wahira, & Mus, 2021). In line with the research results (Giblin, Collins, Button, 2014; Edwards, Bryant, Keegan, et al. 2018), physical literacy has become a major focus of physical education, physical activity and sports promotion worldwide. Physical literacy conceptualizes the diverse skills required to realize potential through embodied experiences fully.

CONCLUSION

The results of quantitative research show that planning to strengthen literacy culture in learning is included in the good category supported by qualitative data stating that planning to strengthen literacy culture in learning is going well. The implementation of strengthening literacy culture in learning is also in the good category, supported by qualitative data, which states that the implementation of strengthening literacy culture in PE learning has been carried out and is going quite well. The assessment of strengthening literacy culture in learning is in the good category supported by qualitative data, which states that the assessment of strengthening literacy culture in PE learning in the 2013 curriculum has gone well. The supporting factors for the implementation of strengthening literacy culture in the 2013 curriculum PE learning from the aspects of planning, implementation, and assessment, namely: Availability of supporting facilities and infrastructure, a conducive learning atmosphere, the concept of implementing the 2013 curriculum, local government regulations that encourage school literacy movements, consistency the school principal, the enthusiasm and skills of the teaching staff, the motivation of students to become literate, and comprehensive tests to measure student learning outcomes. Thus, the required role of lecturers, teachers, or trainers in managing classes includes; planning, organizing, implementing, and evaluating/assessing in educational sports or professional sports (Setyawan, Suyanto, Prasetyo, et al. 2023). This is to strengthen the program to strengthen literacy culture in schools so that it impacts the output of literate and competent graduates.

This condition illustrates the implementation of literacy culture in learning in terms of quantity. Junior high school PE has been carried out well; however, in terms of the quality of practice in the field, there are still many shortcomings due to obstacles in the field and the supporting factors not being fulfilled. It is hoped that the results of the research can be input for the Ministry of Education and Culture and Higher Education regarding conditions in the field related to the implementation of strengthening literacy culture in PE learning for the 2013 Middle School Curriculum in Indonesia so that it can be used as consideration in further policy making.

Thank-You Note

The Author would like to especially thank all the Heads of Study Programs, Faculties and Yogyakarta State University (UNY) who have provided facility support for this research. We would also like to thank the Principals, Chairs of MGMP Physical Education, and PE Teachers in eight Provinces in Indonesia who were willing to be sampled in this research.

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Primljen: 11. januar 2024. / Received: January 11, 2024
Prihvaćen: 10. februar 2024. / Accepted: February 10, 2024



CHANGES IN SOME ANTHROPOLOGICAL DIMENSIONS IN JUNIORS IN DANCE UNDER THE INFLUENCE OF THE EXPERIMENTAL PROGRAM

PROMJENE NEKIH ANTROPOLOŠKIH DIMENZIJA KOD JUNIORA U PLESU POD UTICAJEM EKSPERIMENTALNOG PROGRAMA

VELIBOR SRDIĆ

Pan-European University "Apeiron", Banja Luka, Bosnia and Herzegovina

Panevropski univerzitet „Apeiron“, Banja Luka, Bosna i Hercegovina

Correspondence:

Velibor Srdić

Pan-European University "Apeiron", Banja Luka Bosnia and Herzegovina, velibor.g.srdic@apeiron-edu.eu

Korespondencija:

Velibor Srdić

Panevropski univerzitet „Apeiron“, Banja Luka Bosna i Hercegovina, velibor.g.srdic@apeiron-edu.eu

Abstract: The research was conducted on a sample of 84 respondents - young dancers of both sexes aged 11-16 years with the aim of determining global quantitative changes in morphological characteristics, motor, and functional abilities under the influence of an experimental program in junior dance. The sample of respondents consisted of young dancers from Dance Club "Gemma" Banja Luka, Dance Club "City Jazz" Banja Luka, Dance Club "Bolero" Banja Luka and Dance Club "Orion" Pale. The subjects were randomly divided into two groups, an experimental group (N = 44) with whom a three-month experimental program was implemented and a control group (N = 40) who trained according to a standard dance program. The research used 15 morphological variables, 8 motor variables, 7 functional variables and 1 variable used to assess the level of success in performing specific movement structures in dance so that together they form a battery of 31 measuring instruments. The results of multivariate discriminant analysis were used to determine the global quantitative changes of applied variables in subjects of the experimental and control groups in the initial and final measurements. The obtained results of the discriminant analysis in the final measurement indicate that the applied three-month experimental program consisting of a proprioceptive program (exercises on a balance board and exercises on a trampoline) and a program with a screw in junior dance caused statistically significant changes at the global level ($p=0.000$). The obtained research results can serve as a significant orientation in better programming, implementation, and management of the training process in dance with young dancers.

Key words: dance, subjects, experimental group, control group, morphological characteristics, motor abilities, functional abilities.

Sažetak: Istraživanje je provedeno na uzorku od 84 ispitanika - mladih plesača oba pola uzrasta 11 – 16 godina s ciljem utvrđivanja globalnih kvantitativnih promjena morfoloških karakteristika, motoričkih i funkcionalnih sposobnosti pod uticajem eksperimentalnog programa kod juniora u plesu. Uzorak ispitanika činili su mladi plesači iz Plesnog kluba „Gemma“ Banja Luka, Plesni klub „City Jazz“ Banja Luka, Plesni klub „Bolero“ Banja Luka i Plesni klub „Orion“ Pale. Ispitanici su slučajnim izborom podijeljeni u dvije grupe, eksperimentalnu (N = 44) sa kojom je realizovan tromjesečni eksperimentalni program i kontrolnu (N = 40) koji su trenirali po standardnom programu plesa. U istraživanju je primijenjeno 15 morfoloških varijabli, 8 motoričkih, 7 funkcionalnih i 1 varijabla kojom se procjenjivao nivo uspješnosti izvođenja specifičnih struktura kretanja u plesu tako da zajedno čine bateriju od 31 mjernog instrumenta. Za utvrđivanje globalnih kvantitativnih promjena primijenjenih varijabli kod ispitanika eksperimentalne i kontrolne grupe u inicijalnom i finalnom mjeranju primijenjeni su rezultati multivarijantne diskriminativne analize. Dobijeni rezultati diskriminativne analize u finalnom mjeranju ukazuju da je primijenjeni tromjesečni eksperimentalni program sačinjen od proprioceptivnog programa (vježbe na balans ploči i vježbe na trampolini) i programa sa vijačom kod juniora u plesu izazvao statistički značajne promjene na globalnom nivou ($p=0,000$). Dobiveni rezultati istraživanja mogu poslužiti kao značajna orijentacija u kvalitetnijem programiranju, realizaciji i upravljanju trenažnim procesom u plesu sa mladim plesačima.

Ključne riječi: ples, ispitanici, eksperimentalna grupa, kontrolna grupa, morfološke karakteristike, motoričke sposobnosti, funkcionalne sposobnosti.

INTRODUCTION

Research on transformational processes in all sports, including dance, is very relevant today. The main goal of such research is to answer the question of whether and to what extent the mentioned programs can improve success in dance. Often in research, athletes of senior age undergo experimental treatment, however, younger ages, in this experiment juniors, were a challenge, given the inconsistent characteristics of the population aged 11 to 16, but also the fact that they are the base of future top competitors. The physical development of the mentioned age is intense, uneven and heterochronic in nature. Sudden changes occur upon entering puberty and it often happens that the biological age does not coincide with the chronological one. Consequently, the development of motor skills is intermittent and disproportionate, and is individual regardless of gender and previously acquired abilities. At an older age, transformations are slower and more difficult, so the established effects of targeted transformation processes at a younger age have practical value in designing future training programs.

The effects of training work (Bompa, 2006) mainly depend on the quality of the application of the appropriate forms and method of work, volume, and intensity of load in accordance with the individual characteristics of athletes. Determine the most optimal process of transformation of the relevant and dominant dimensions of the athlete's personality under the influence of training and recovery, along with monitoring their effects, is one of the biggest challenges of science, but also provides the basis for planning and programming the training process and the basis for the selection of athletes. Each transformation takes place through several stages in a certain period interval, its integral part is the competition. Several researchers (Drabik 1996; Corbin and Noble, 1980; Malacko, 2002) claims that the effects of the exercise process are different in certain time periods of the maturation process, and the advantage of this form of training work should be reflected in the application of an individualized form of work and determination of the optimal pace of development of abilities and characteristics in accordance with the age, gender and capabilities of each athlete.

Coordination, explosive strength and segmental speed influence performance in sports dance, a modern sports dance training can improve their results (Uzunović, 2008; Uzunović, Kostić and Miletić, 2009). There are studies that confirm the influence of anthropological dimensions on dance in general and to sports dance (Oreb, 1989; Zagorc, Karpljuk and Friedl, 1999; Kostić, Zagorc and Uzunović, 2004; Lukić and Bijelić, 2006; Vlašić,

Uvod

Istraživanja transformacionih procesa u svim sportskim granama pa i u plesu su danas veoma aktuelna. Osnovni cilj takvih istraživanja je da se odgovori na pitanje da li i u kojoj mjeri navedeni programi mogu poboljšati uspjeh u plesu. Često se u istraživanjima, eksperimentalnom tretmanu podvrgavaju sportisti seniorskog uzrasta, međutim, mlađi uzrasti, u ovom eksperimentu juniori, bili su izazov, s obzirom na nekonzistentne karakteristike populacije uzrasta od 11 do 16 godina, ali i činjenice da su oni baza budućih vrhunskih takmičara. Tjelesni razvoj navedenog uzrasta je intenzivan, neravnomjeran i heterohronog karaktera. Nagle promjene se javljaju ulaskom u pubertet i često se dešava da se biološka starost ne podudara sa hronološkom. Samim tim i razvoj motorike je intervalan i nesrazmjeran, a individualan je bez obzira na pol i prethodno stečene sposobnosti. U starijem uzrastu, transformacije su sporije i teže, pa samim tim utvrđeni efekti ciljanih transformacionih procesa u mlađem uzrastu imaju praktičnu vrijednost u osmišljavanju budućih trenažnih programa.

Efekti trenažnog rada (Bompa, 2006) pretežno zavise od kvaliteta primjene odgovarajućih oblika

i metoda rada, obima i intenziteta opterećenja u skladu sa individualnim osobinama sportista. Utvrditi najoptimalniji proces transformacije relevantnih i dominantnih dimenzija ličnosti sportiste

pod uticajem treninga i oporavka, uz praćenje njihovih efekata, predstavlja jedan od najvećih izazova nauke, ali i daje osnovu za planiranje i programiranje trenažnog procesa i podlogu za selekciju sportista. Svaka transformacija se odvija kroz nekoliko etapa u određenim vremenskim intervalima, njen sastavni dio je i takmičenje. Više istraživača (Drabik 1996; Corbin i Noble, 1980;

Malacko, 2002) tvrdi da su uticaji procesa vježbanja različiti u određenim vremenskim periodima

procesa sazrijevanja i trebalo bi da se prednost ovakvog oblikovanja trenažnog rada ogleda u primjeni i individualizovanog oblika rada i određivanja optimalnog tempa razvoja sposobnosti i osobina u skladu sa uzrastom, polom i mogućnostima svakog sportiste.

Koordinacija, eksplozivna snaga i segmentarna brzina utiču na uspješnost u sportskom plesu, a trening modernog sportskog plesa može poboljšati rezultate istih (Uzunović, 2008; Uzunović, Kostić i Miletić, 2009). Postoje istraživanja koja potvrđuju uticaj antropoloških dimenzija na ples

uopšte i na sportski ples (Oreb, 1989; Zagorc, Karpljuk i Friedl, 1999; Kostić, Zagorc i Uzunović, 2004; Lukić i Bijelić, 2006; Vlašić, Oreb, Prlenda i Zagorc,

Oreb, Prlenda and Zagorc, 2011). Dancers spend more than half of their time in the high-intensity zone, from the standpoint of functional load (Zagorc et al., 1999), and standard dances are more demanding (Šika, Banini, and Despot, 2003). It is also interesting to investigate the morphological space (Kostić et al., 2004), according to which dancers who have an ideal body weight without excess fat and a naturally narrow pelvis should be more successful in sports dancing, while Dolgener, Spasof and Džon (1980) determined that female dancers have lower body weight and less fat tissue, as well as that their body measurements are smaller. There is no doubt that the dancer's physique as an aesthetic criterion has an impact on the visual experience during evaluation at dance competitions, but it can also be the cause of various eating disorders at an early age and the consequences of these are insufficiently known (Pigeon, Oliver, Charlet and Rochiccioli, 1997). Today, various types of additional training are used in dance, which include aerobics, yoga, fitness, pilates, tai chi, acro balance and classical ballet classes. Special attention is also paid to the elements conditioning preparations, which certainly include proprioception training and training with a screw.

METHOD OF WORK

A sample of respondents

The sample of respondents consisted of 84 young dancers of both sexes, aged 11-16 years, from Dance Club "Gemma" Banja Luka, Dance Club "City Jazz" Banja Luka, Dance Club "Bolero" Banja Luka and Dance Club "Orion" Pale. The respondents were randomly divided into two groups, the experimental group (N = 44), with which the three-month experimental program was implemented, and control group (N = 40) who trained according to the standard dance program. When selecting respondents for this research, it was considered that all respondents were between the ages of 11 and 16, that all respondents were medically examined, that they regularly attended the experimental program, that they were registered in the current year as competitors in the home dance association at the level of Bosnia Herzegovina. The dance class of the competitors is I (international) and A (highest national).

Ethics approval

The research included subjects in accordance with all relevant national regulations and institutional policies, and followed the principles, ethical guidelines, and rules for research with human subjects in accordance with the Declaration of Helsinki.

2011). Više od polovine vremena plesači provode u zoni visokog intenziteta, sa stanovišta funkcionalnog opterećenja (Zagorc i saradnici, 1999), a standardni plesovi su pri tome zahtjevniji (Šika, Banini i Despot, 2003). Zanimljivo je i istraživanje morfološkog prostora (Kostić i saradnici, 2004) po kojem bi plesači koji imaju idealnu tjelesnu težinu bez viška masti i prirodno užu karlicu trebali biti uspješniji u sportskom plesu, dok su Dolgener, Spasof i Džon (1980) utvrdili da plesačice imaju manju tjelesnu težinu i manje masnog tkiva, kao i da su njihove tjelesne mjere manjeg obima. Nesumnjivo je da građa plesača kao estetski kriterijum ima uticaja na vizuelni doživljaj pri ocjenjivanju na plesnim takmičenjima, ali to može biti i uzrok raznih poremećaja u ishrani u ranoj mladosti i da su posljedice istih nedovoljno poznate (Pigeon, Oliver, Charlet i Rochiccioli, 1997).

Danas se u plesu primjenjuju razne vrste dodatnih treninga, koji uključuju aerobik, jogu, fitnes, pilates, tai chi, akro balans i časove klasičnog baleta. Posebna se pažnja poklanja i elementima kondicione pripreme, kojima sigurno pripadaju trening propriocepcije i trening sa vijačom.

METOD RADA

Uzorak ispitanika

Uzorak ispitanika činilo je 84 mlada plesača oba pola, uzrasta 11 – 16 godina iz Plesnog kluba „Gemma” Banja Luka, Plesni klub „City Jazz” Banja Luka, Plesni klub „Bolero” Banja Luka i Plesni klub „Orion” Pale. Ispitanici su slučajnim izborom podijeljeni u dvije grupe, eksperimentalnu (N = 44) sa kojom je realizovan tromjesečni eksperimentalni program i kontrolnu (N = 40) koji su trenirali po standardnom programu plesa.

Pri izboru ispitanika za ovo istraživanje vodilo se računa da su svi ispitanici uzrasta 11 do 16 godina, da su svi ispitanici ljeakarski pregledani, da su redovno pohađali eksperimentalni program, da su registrovani u tekućoj godini kao takmičari u matičnom plesnom savezu na nivou Bosne Hercegovine. Plesni razred takmičara je I (međunarodni) i A (najviši nacionalni).

Etičko odobrenje

Istraživanje je uključivalo ispitanika u skladu sa svim relevantnim nacionalnim propisima i institucionalnim politikama, a slijedilo je načela, etičke smjernice i pravila za istraživanje s ljudskim predmetima u skladu sa Deklaracijom iz Helsinkija.

Sample variables

A sample of variables for the assessment of morphological characteristics:

1. body height..... AVISTJ
2. arm length ADUJRU
3. leg length..... ADDITIONAL
4. foot length ADJUST
5. abdominal girth AOBTRB
6. circumference of the upper arm AOBNAD
7. circumference of the forearm..... AOBPOD
8. circumference of upper leg AOBNAT
9. lower leg circumference..... AOBPOT
10. body weight..... ATEŽTJ
11. body mass index..... ABMIDX
12. skin fold of the upper arm..... AKNNAD
13. skin fold on the back..... AKNLEDĐ
14. skin fold on the stomach AKNTRB
15. skin fold of lower leg AKNPOT

A sample of variables for the assessment of motor skills

16. Flamingo balance test MFLAMI
17. taping by hand..... MTAPRU
18. foot taping BLUSH
19. standing long jump..... MFESDM
20. Sergeant jump test..... MFEVIS
21. drumming with hands and feet..... MBUBRN
22. lateral change of speed moving to the left side..... MLATBL
23. lateral speed change movement to the right MLATBD

A sample of variables for the assessment of functional abilities

24. forced expiratory volume..... FFEV75
25. maximum expiratory volume in the first second FMFEV1
26. forced vital capacity FFVCAP
27. maximum speed of exhalation FMAPEF
28. maximum voluntary ventilation FMVVNT
29. time needed to exhale lung capacity FFETME
30. heart rate at rest..... FSRFRM

Variables for evaluating the level of success in performing elements of dance technique

31. composite test..... SMKOMT

Structure of the experimental program

Modern training technology in working with younger categories of dancers implies the creation of such ex-

Uzorak varijabli

Uzorak varijabli za procjenu morfoloških karakteristika:

1. tjelesna visina..... AVISTJ
2. dužina ruku ADUŽRU
3. dužina nogu..... ADUŽNO
4. dužina stopala ADUŽST
5. obim trbuha AOBTRB
6. obim nadlaktice..... AOBNAD
7. obim podlaktice AOBPOD
8. obim natkoljenice..... AOBNAT
9. obim potkoljenice AOBPOT
10. tjelesna težina..... ATEŽTJ
11. body mas index ABMIDX
12. kožni nabor nadlaktice AKNNAD
13. kožni nabor na leđima..... AKNLEĐ
14. kožni nabor na trbuhu AKNTRB
15. kožni nabor potkoljenice..... AKNPOT

Uzorak varijabli za procjenu motoričkih sposobnosti

16. Flamingo test ravnoteže..... MFLAMI
17. taping rukom MTAPRU
18. taping nogom MTAPNO
19. skok u dalj iz mjesta MFESDM
20. Sergeant jump test..... MFEVIS
21. bubnjanje rukama i nogama..... MBUBRN
22. lateralna promjena brzine kretanje u lijevu stranu MLATBL
23. lateralna promjena brzine kretanje u desnu stranu MLATBD

Uzorak varijabli za procjenu funkcionalnih sposobnosti

24. forsirani ekspiratorni volumen..... FFEV75
25. maksimalni ekspiratorni volumen u prvoj sekundi FMFEV1
26. forsirani vitalni kapacitet FFVCAP
27. maksimalna brzina izdaha..... FMAPEF
28. maksimalna voljna ventilacija FMVVNT
29. vrijeme potrebno da se izdahne kapacitet pluća FFETME
30. frekvencija srca u mirovanju FSRFRM

Varijable za procjenu nivoa uspješnosti izvođenja elemenata plesne tehnike

31. kompozitni test..... SMKOMT

Struktura eksperimentalnog programa

Savremena trenažna tehnologija u radu sa mlađim kategorijama plesača podrazumijeva izradu takvih ek-

perimental work programs that will be fully adapted to their age abilities. The experimental program implemented in this research through 40 training units consisted of a proprioceptive program (exercises on a balance board and exercises on a trampoline) and a program with a screw. Regular dance training started with a mandatory warm-up lasting 10-15 minutes, and then an experimental program lasting 15-20 minutes. The duration of individual tasks is from 30 seconds to 2 minutes.

The structure of the training content represented in the experimental program was as follows:

- 13 training sessions were carried out on the balance board,
- 13 training sessions were realized with a screw-ball,
- 12 training sessions were carried out on the trampoline and
- 2 training sessions were carried out on a balance board and a combined trampoline.

Data processing methods

Multivariate discriminant analysis was used to determine global changes in morphological characteristics, motor and functional abilities of the experimental and control group of subjects in the initial and final measurements at the multivariate level.

The data obtained in this research were processed using the STATISTICA 6.0 and SPSS 14.0 software packages.

RESULTS AND DISCUSSION

Analyzes of the effects of experimental programs on the transformation of the anthropological dimensions of a large number of entities in the multivariate space are very sensitive, considering the possible complex nature of the characteristics and abilities of the subjects involved in the transformation processes. This is especially true in cases where an experimental and control transformation procedure is defined to determine legality, and thus the experimental and control group, on which such procedures are carried out.

For quality analyzes of the effects of transformation procedures, it is necessary to ensure the virtual equality of groups that will later be subjected to different transformation procedures in the initial state. This requirement is a natural thing, because if such conditions are not ensured at the beginning, it is usually not possible to evaluate different treatments later, because it is very difficult to distinguish which part of the effects can be attributed to certain properties of the treatment, and which to the initial position of some of the groups of respondents.

sperimentalnih programa rada koji će u potpunosti biti prilagođeni njihovim uzrasnim sposobnostima. Eksperimentalni program sproveden u ovom istraživanju kroz 40 trenažnih jedinica sastojao se iz proprioceptivnog programa (vježbe na balans ploči i vježbe na trampolini) i programa sa vijačom. Redovni plesni treninzi su započinjali obavezanim zagrijavanjem u trajanju 10–15 minuta, da bi se onda sprovodio ekperimentalni program u trajanju 15–20 minuta. Trajanje pojedinačnih zadataka je od 30 sekundi do 2 minute.

Struktura trenažnih sadržaja koja je zastupljena u eksperimentalnom programu bila je sljedeća:

- 13 treninga realizovano je na balans ploči,
- 13 treninga realizovano je sa vijačom,
- 12 treninga realizovano je na trampolini i
- 2 treninga realizovana su na balans ploči i trampolini kombinovano.

Metode obrade podataka

Za utvrđivanje globalnih promjena morfoloških karakteristika, motoričkih i funkcionalnih sposobnosti eksperimentalne i kontrolne grupe ispitanika u inicijalnom i finalnom mjerenju na multivarijantnom nivou primijenjena je multivarijantna diskriminativna analiza.

Podaci dobijeni u ovom istraživanju obrađeni su pomoću programskog paketa STATISTICA 6.0 i SPSS 14.0.

REZULTATI I DISKUSIJA

Analize efekata eksperimentalnih programa na transformaciju antropoloških dimenzija većeg broja entiteta u multivarijantnom prostoru su vrlo osjetljive, s obzirom na mogući složeni karakter svojstava i sposobnosti ispitanika uključenih u transformacione procese. Posebno to vrijedi u slučajevima kad se za utvrđivanje zakonitosti definišu eksperimentalni i kontrolni transformacioni postupak, a time i eksperimentalna i kontrolna grupa, nad kojima se takvi postupci provode.

Za kvalitetne analize efekata transformacionih postupaka, potrebno je u inicijalnom stanju osigurati virtualnu jednakost grupa koje će kasnije biti podvrgnute različitim transformacionim postupcima. Ovaj zahtjev je prirodna stvar, jer ukoliko takvi uslovi nisu osigurani na početku, najčešće kasnije nije moguće evaluirati različite tretmane, jer je jako teško razlučiti koji dio efekata se može pripisati određenim svojstvima tretmana, a koji početnoj poziciji neke od grupa ispitanika.

Multivariate discriminative analysis of subjects in the experimental and control groups in the initial measurement

Table 1 shows the results of the discriminant analysis with indicators of the significance of the differences between the experimental and control groups in the applied variables in the initial measurement. As can be seen from the presented table, one statistically significant discriminative function was obtained, which has a statistically significant value of $R = 0.73$ and which shows that at the overall level there is a significant difference between the experimental and control groups at the significance level of $p = 0.0136$.

Table 1. Significance of the isolated discriminative function - initial measurement

R	R2	ROOT	LAMBDA	HI	DF	P
0.7339	0.5386	1.1675	0.4614	51.4435	31	0.0136

Tables 2 and 3 present the results that indicate very important information about the differences between the experimental and control groups in the initial measurement. Table 2 shows the structure of the discriminant function in the initial measurement. We identify the structure of the discriminative function based on the position of the centroid. According to the centroid values, all values of the discriminant function tending to high (positive) values will indicate the experimental group and vice versa, the lower the centroid values, the more they will describe the subjects of the control group.

Table 2 (column F1) presents the contribution of individual variables to the differentiation of groups, but in the case when all variables are included in the system. It is evident from the table that the total difference between the experimental and control groups in all applied variables is obtained at the expense of all variables and there are no distinct variables that statistically significantly contribute to the difference between the groups in the initial measurement. Somewhat more statistically significant are the Sergeant jump test (MFESVM 0.4936) and the test for assessing the level of success in performing dance technique elements (SMKOMT 0.4215).

Multivarijantna diskriminativna analiza ispitanika eksperimentalne i kontrolne grupe u inicijalnom mjerenju

U tabeli 1 prikazani su rezultati diskriminativne analize sa pokazateljima značajnosti razlika eksperimentalne i kontrolne grupe u primijenjenim varijablama u inicijalnom mjerenju. Kao što se vidi iz prikazane tabele dobijena je jedna statistički značajna diskriminativna funkcija koja ima statistički značajnu vrijednost $R = 0,73$ i koja pokazuje da na ukupnom nivou postoji značajna razlika između eksperimentalne i kontrolne grupe na nivou značajnosti $p = 0,0136$.

Tabela 1. Značajnost izolovane diskriminativne funkcije – inicijalno mjerenje

U tabelama 2 i 3 prezentovani su rezultati koji nam ukazuju na veoma bitne informacije o razlikama između eksperimentalne i kontrolne grupe u inicijalnom mjerenju. U tabeli 2 prikazana je struktura diskriminativne funkcije u inicijalnom mjerenju. Strukturu diskriminativne funkcije identifikujemo na osnovu položaja centroida. Prema vrijednostima centroida sve vrijednosti diskriminativne funkcije koje teže visokim (pozitivnim) vrijednostima označavaće eksperimentalnu grupu i obrnuto, što su vrijednosti centroida niže to će u većoj mjeri opisivati ispitanike kontrolne grupe.

U tabeli 2 (kolona F1) predstavljen je doprinos pojedinih varijabli razlikovanju grupa, ali u slučaju kada su sve varijable uključene u sistem. Iz tabele je vidljivo da se ukupna razlika između eksperimentalne i kontrolne grupe u svim primijenjenim varijablama dobija na teret svih varijabli i nema izrazitih varijabli koje statistički značajnije doprinose razlikovanju grupa u inicijalnom mjerenju. Nešto statistički značajnije izdvaja se Sergeant jump test (MFESVM 0,4936) i test za procjenu nivoa uspješnosti izvođenja elemenata plesne tehnike (SMKOMT 0,4215).

Table 2. Structure of the discriminative function (F1) and utilities (H) – initial measurement

Variables	F 1	H
AVISTJ	0.2125	0.0451
ATEŽTJ	0.0835	0.007
ABMIDX	0.0322	0.001
ADUŽRU	0.104	0.0108
ADUŽNO	0.1218	0.0148
ADUŽST	0.2758	0.0761
AOBTRB	0.2101	0.0441
AOBNAD	0.2328	0.0542
AOBPOD	0.2184	0.0477
AOBNAT	0.259	0.0671
AOBPOT	0.2393	0.0573
AKNNAD	0.1115	0.0124
AKNLEĐ	-0.0942	0.0089
AKNTRB	-0.0149	0.0002
AKNPOT	-0.0353	0.0012

(*P* 0,01 *R* = 0,2736; *P* 0,05 *R* = 0,2115)

For the final differentiation of the groups, it is necessary to look at table 3, which shows the standardized centroids of the groups on the discriminative function (F1).

Table 3. Standardized group centroids on the discriminative function (F1) – initial measurement

Groups	F1
Experimental	0.1074
Control	-0.1074

Multivariate discriminant analysis of experimental and control group subjects in the final measurement

Table 4 shows the results of the discriminant analysis with indicators of the significance of the differences between the experimental and control groups in the applied variables in the final measurement. As can be seen from the presented table, one statistically significant discriminative function was obtained, which has a statistically significant value of *R* = 0,83 and which shows that in the final measurement there is a statistically significant difference between the experimental and control groups at the significance level of *p* = 0,0000.

Tabela 2. Struktura diskriminativne funkcije (F1) i komunaliteti (H) – inicijalno mjerenje

FFE75	0.2753	0.0758
FMFEV1	0.2323	0.054
FFVCAP	0.1974	0.039
FMAPEF	0.3199	0.1023
FMVVNT	0.2561	0.0656
FFETME	-0.0799	0.0064
FSRFRM	0.3954	0.1564
MFLAMI	-0.1161	0.0135
MTAPRU	-0.1708	0.0292
MTAPNO	-0.0298	0.0009
MBUBRN	0.3075	0.0946
MFESDM	0.3386	0.1147
MFEVIS	0.4936	0.2436
MLATBL	-0.2532	0.0641
MLATBD	-0.3639	0.1324
SMKOMT	0.4215	0.1777

(*P* 0,01 *R* = 0,2736; *P* 0,05 *R* = 0,2115)

Za konačno razlikovanje grupa potrebno je pogledati tabelu 3 u kojoj su prikazani standardizovani centriodi grupa na diskriminativnoj funkciji (F1).

Tabela 3. Standardizovani centriodi grupa na diskriminativnoj funkciji (F1) – inicijalno mjerenje

Grupe	F1
Eksperimentalna	0,1074
Kontrolna	-0.1074

Multivarijantna diskriminativna analiza ispitanika eksperimentalne i kontrolne grupe u finalnom mjerenju

U tabeli 4 prikazani su rezultati diskriminativne analize sa pokazateljima značajnosti razlika između eksperimentalne i kontrolne grupe u primijenjenim varijablama u finalnom mjerenju. Kao što se vidi iz prikazane tabele dobijena je jedna statistički značajna diskriminativna funkcija koja ima statistički značajnu vrijednost *R* = 0,83 i koja pokazuje da u finalnom mjerenju postoji statistički značajna razlika između eksperimentalne i kontrolne grupe na nivou značajnosti *p* = 0,0000.

Table 4. Testing the significance of the discriminative function – final measurement

R	R2	ROOT	LAMBDA	HI	DF	P
0.8351	0.6973	2.3039	0.3027	79.4738	31	0.0000

Table 5 shows the structure of the discriminative function in the final measurement. Based on the results in table 5, it can be seen that the highest correlation with the discriminative function, i.e. with the variable that maximally differentiates the values of the results of the applied variables of the two subsamples (experimental and control groups), have the following variables: two manifest variables for assessing the longitudinal dimensionality of morphological characteristics (AVISTJ and ADUŽST), two manifest variables for the assessment of explosive leg strength (MFESDM and MFESVM), two manifest variables for the assessment of agility (MLATBL and MLATBD) and one manifest variable for the assessment of coordination (MBUBRN) from the area of motor skills, as well as one manifest variable (FSRFRM) for estimating heart rates at rest from the space of functional capabilities. The biggest differences between the two subsamples of respondents in the final measurement appeared in the test for assessing the adoption of elements of dance technique (SMKOMT). This means that in these variables, after the realization of the experimental program, the biggest differences (changes) in the values of the results of the applied variables are between the experimental and control groups of subjects. What can be generally concluded is that proprioceptive training and training with a screwdriver had the greatest impact on improving motor skills and specific movement structures.

Further analysis of the structure of the discriminative function shows that an even greater number of variables significantly contribute to the discrimination of the two groups of respondents and that the correlation values with the discriminative function are uniform.

Table 5. Structure of discriminative function (F1) and utilities (H) – final measurement

Variables/Varijable	F1	H
AVISTJ	0.2225	0.0495
ATEŽTJ	0.1264	0.016
ABMIDX	0.0834	0.0069
ADUŽRU	0.1863	0.0347
ADUŽNO	0.1529	0.0234
ADUŽST	0.2932	0.086
AOBTRB	0.1666	0.0278
AOBNAD	0.1258	0.0158
AOBPOD	0.1247	0.0156
AOBNAT	0.1545	0.0239

Tabela 4. Testiranje značajnosti diskriminativne funkcije – finalno mjerenje

U tabeli 5 prikazana je struktura diskriminativne funkcije u finalnom mjerenju. Na osnovu rezultata u tabeli 5 može se vidjeti da najveća korelacija sa diskriminativnom funkcijom, odnosno sa varijablom koja maksimalno razlikuje vrijednosti rezultata primijenjenih varijabli dva subuzorka (eksperimentalne i kontrolne grupe), imaju sljedeće varijable: dvije manifestne varijable za procjenu longitudinalne dimenzionalnosti morfoloških karakteristika (AVISTJ i ADUŽST), dvije manifestne varijable za procjenu eksplozivne snage nogu (MFESDM i MFESVM), dvije manifestne varijable za procjenu agilnosti (MLATBL i MLATBD) i jedna manifestna varijabla za procjenu koordinacije (MBUBRN) iz prostora motoričkih sposobnosti, kao i jedna manifestna varijabla (FSRFRM) za procjenu frekvencija srca u mirovanju iz prostora funkcionalnih sposobnosti. Najveće razlike između dva subuzorka ispitanika u finalnom mjerenju su se pojavile u testu za procjenu usvojenosti elemenata tehnike plesa (SMKOMT). To znači, u ovim varijablama, poslije realizacije eksperimentalnog programa, najveće su razlike (promjene) vrijednosti rezultata primijenjenih varijabli između eksperimentalne i kontrolne grupe ispitanika. Ono što se generalno može zaključiti je to, da je proprioceptivni trening i trening sa vijačom najveći uticaj ostvario na poboljšanje motoričkih sposobnosti i specifičnih struktura kretanja.

Daljnjom analizom strukture diskriminativne funkcije može se vidjeti da još veći broj varijabli značajno doprinosi diskriminaciji dvije grupe ispitanika i da su vrijednosti korelacija sa diskriminativnom funkcijom ujednačene.

Tabela 5. Struktura diskriminativne funkcije (F1) i komunaliteti (H) – finalno mjerenje

Variables/Varijable	F1	H
AOBPOT	0.1065	0.0113
AKNNAD	0.0253	0.0006
AKNLEĐ	-0.0778	0.0061
AKNTRB	-0.0474	0.0023
AKNPOT	-0.0544	0.003
FFE75	0.1852	0.0343
FMFEV1	0.1809	0.0327
FFVCAP	0.0732	0.0054
FMAPEF	0.1506	0.0227
FMVVNT	0.1799	0.0324
FFETME	-0.1253	0.0157

FSRFRM	0.5821	0.3388
MFLAMI	-0.1476	0.0218
MTAPRU	0.1938	0.0375
MTAPNO	0.0507	0.0026
MBUBRN	0.4515	0.2039

(*P* 0,01 *R* = 0,2736; *P* 0,05 *R* = 0,2115)

For the final differentiation of the groups, it is necessary to look at table 6, from which it is evident that the subjects of the control group tend to lower values, and the subjects of the experimental group to higher values.

Table 6. Standardized group centroids on the discriminative function (F1) - final measurement

Groups	F1
Experimental	0.1137
Control	- 0.1137

CONCLUSION

The research was conducted on a selected sample of 84 respondents - young dancers of both sexes aged 11-16 years from Dance Club "Gemma" Banja Luka, Dance Club "City Jazz" Banja Luka, Dance Club "Bolero" Banja Luka and Dance club "Orion" Pale. The subjects were randomly divided into two groups, an experimental group (N = 44) with which a three-month experimental program was implemented, and a control group (N = 40) who trained according to a standard dance program. When selecting respondents for this research, it was considered that all respondents were between the ages of 11 and 16, that all respondents were medically examined, that they regularly attended the experimental program, that they were registered in the current year as competitors in the home dance association at the level of Bosnia Herzegovina. The dance class of the competitors is I (international) and A (highest national).

In the research, 15 variables were used to assess morphological characteristics, 8 variables to assess motor abilities, 7 variables to assess functional abilities and 1 variable to assess performance in dance. The control group based its work on the existing dance program (three times a week for 70 min.), while the experimental group, in addition to the standard dance training, additionally did a program of proprioceptive training and training with a screw (three times a week before dance training for 30 min). To provide the best possible insight into the level of transformational changes in morphological characteristics, motor, and functional abilities on a global level under the influence of three-month proprioceptive

MFESDM	0.2669	0.0712
MFEVIS	0.4261	0.1816
MLATBL	-0.4202	0.1765
MLATBD	-0.4211	0.1773
SMKOMT	0.6383	0.4074

(*P* 0,01 *R* = 0,2736; *P* 0,05 *R* = 0,2115)

Za konačno razlikovanje grupa potrebno je pogledati tabelu 6 iz koje je vidljivo da ispitanici kontrolne grupe teže nižim vrijednostima, a ispitanici eksperimentalne grupe višim vrijednostima.

Tabela 6. Standardizovani centroidi grupa na diskriminativnoj funkciji (F1) – finalno mjerenje

Grupe	F1
Eksperimentalna	0,1137
Kontrolna	- 0,1137

ZAKLJUČAK

istraživanje provedeno na selekcionisanom uzorku od 84 ispitanika - mladih plesača oba pola uzrasta 11 – 16 godina iz Plesnog kluba "Gemma" Banja Luka, Plesni klub "City Jazz" Banja Luka, Plesni klub "Bolero" Banja Luka i Plesni klub "Orion" Pale. Ispitanici su slučajnim izborom podijeljeni u dvije grupe, eksperimentalnu (N = 44) sa kojom je realizovan tromjesečni eksperimentalni program i kontrolnu grupu (N = 40) koji su trenirali po standardnom programu plesa. Pri izboru ispitanika za ovo istraživanje vodilo se računa da su svi ispitanici uzrasta 11 do 16 godina, da su svi ispitanici ljekarski pregledani, da su redovno pohađali eksperimentalni program, da su registrovani u tekućoj godini kao takmičari u matičnom plesnom savezu na nivou Bosne Hercegovine. Plesni razred takmičara je I (međunarodni) i A (najviši nacionalni).

U istraživanju je primijenjeno 15 varijabli za procjenu morfoloških karakteristika, 8 varijabli za procjenu motoričkih sposobnosti, 7 varijabli za procjenu funkcionalnih sposobnosti i 1 varijabla za procjenu uspješnosti u plesu. Kontrolna grupa je svoj rad bazirala na postojećem programu plesa, (tri puta nedeljno po 70 min.), dok je eksperimentalna grupa pored standardnog treninga plesa dodatno radila program proprioceptivnog treninga i treninga sa vijačom (tri puta nedeljno prije treninga plesa po 30 min). Da bi se izvršio što kvalitetniji uvid u nivo transformacionih promjena morfoloških karakteristika, motoričkih i funkcionalnih sposobnosti na globalnom nivou pod uticajem tromjesečnog proprioceptivnog treninga i treninga sa vijačom primijenjena je multivarijantna

training and training with a screwdriver, a multivariate discriminant analysis was applied, using the statistical programs Statistica 6 and SPSS 14.

Based on the obtained results of the multivariate discriminant analysis in the initial measurement, there is a statistically significant difference between the experimental and control groups, but the total difference of all applied variables is obtained at the expense of all variables and there are no distinct variables that statistically significantly contribute to the difference between the groups in the initial measurement. Somewhat more statistically significant are the Sergeant jump test (MFESVM 0.4936) and the test for assessing the level of success in performing dance technique elements (SMKOMT 0.4215).

Based on the results of the multivariate discriminant analysis in the final measurement, the applied experimental program produced statistically significant changes at the significance level of $p = 0.0000$ in a greater number of applied variables and thus contributed to the difference between the experimental and control groups.

By analyzing the structure of the discriminative function, in the final measurement, the number of variables that significantly contribute to the discrimination of the two groups of subjects increased, and what can generally be concluded is that the proprioceptive training and the training with the screwdriver achieved the greatest changes in the improvement of motor skills and specific dance skills. movement structure.

Therefore, it can be concluded that after the implementation of the experimental program lasting three months (40 training units), there were statistically significant changes in all investigated areas in the subjects of the experimental group, that is, there were statistically significant differences between the control and experimental groups of subjects.

The results of the research provided useful information about the possibility of desired changes in morphological characteristics and motor-functional abilities important for success in performing specific dance structures, and thus their role for success in dance, which must be considered when programming, monitoring, and managing the training process at work. with young dancers.

The results of this research are directly applicable in practice as a significant factor in programming, monitoring, and managing the training process in dance with young dancers.

diskriminativna analiza, koristeći se statističkim programima Statistica 6 i SPSS 14.

Na osnovu dobijenih rezultata multivarijantne diskriminativne analize u inicijalnom mjerenju može se vidjeti da postoji statistički značajna razlika između eksperimentalne i kontrolne grupe, ali se ukupna razlika svih primijenjenih varijabli dobija na teret svih varijabli i nema izrazitih varijabli koje statistički značajnije doprinose razlikovanju grupa u inicijalnom mjerenju. Nešto statistički značajnije izdvaja se Sergeant jump test (MFESVM 0,4936) i test za procjenu nivoa uspješnosti izvođenja elemenata plesne tehnike (SMKOMT 0,4215).

Na osnovu dobijenih rezultata multivarijantne diskriminativne analize u finalnom mjerenju može se vidjeti da je primijenjeni eksperimentalni program kod ispitanika eksperimentalne grupe proizveo statistički značajne promjene na nivou značajnosti $p = 0,0000$ u većem broju primijenjenih varijabli i time doprinio razlikovanju između eksperimentalne i kontrolne grupe.

Analizom strukture diskriminativne funkcije može se vidjeti da se u finalnom mjerenju povećao broj varijabli koji značajno doprinosi diskriminiranju dvije grupe ispitanika i ono što se generalno može zaključiti je to, da je proprioceptivni trening i trening sa vijačom najveće promjene ostvario na poboljšanje motoričkih sposobnosti i specifičnih plesnih struktura kretanja.

Prema tome, može se konstatovati da je poslije realizacije eksperimentalnog programa u trajanju tri mjeseca (40 trenažnih jedinica) došlo do statistički značajnih promjena u svim istraživanim prostorima kod ispitanika eksperimentalne grupe, odnosno došlo je do statistički značajnih razlika između kontrolne i eksperimentalne grupe ispitanika.

Rezultati istraživanja dali su korisne informacije o mogućnosti željenih promjena morfoloških karakteristika i motoričko-funcionalnih sposobnostiznačajnih za uspješnost u izvođenju specifičnih plesnih struktura, a time i njihove uloge za uspješnost u plesu o čemu je neophodno voditi računa prilikom programiranja, praćenja i upravljanja trenažnim procesom u radu sa mladim plesačima.

Rezultati ovog istraživanja direktno su primjenjivi u praksi kao značajan faktor u programiranju, praćenju i upravljanju trenažnim procesom u plesu sa mladim plesačima.

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Primljen: 30. oktobar 2023. / Received: October 30, 2023
Prihvaćen: 7. novembar 2023. / Accepted: November 7, 2023



DIFFERENCES IN CERTAIN ANTHROPOLOGICAL INDICATORS OF SEVENTH-GRADE ELEMENTARY SCHOOL FEMALE STUDENTS IN RURAL AND URBAN AREAS

RAZLIKE U ODREĐENIM ANTROPOLOŠKIM POKAZATELJIMA UČENICA SEDMOG RAZREDA OSNOVNE ŠKOLE RURALNE I URBANE SREDINE

KONSTANTINOS STRATAKIS, DALIBORKA STANKOVIĆ

Faculty of Medicine, University of Belgrade, Serbia

Medicinski Fakultet, Univerzitet u Beogradu, Srbija

Correspondence:

Daliborka Stanković

Faculty of Medicine, University of Belgrade, Serbia
daliborka7.ds@gmail.com

Korespondencija:

Daliborka Stanković

Medicinski Fakultet, Univerzitet u Beogradu, Srbija
daliborka7.ds@gmail.com

Abstract: The process of programming and implementing a system for monitoring the morphological characteristics and motor abilities of elementary school students is particularly important in physical education. However, a small number of studies have dealt with the effects of the subjects' residential status on their morpho-motoric status. The aim of this study was to examine and determine the differences in certain anthropological indicators of seventh-grade elementary female students in urban and suburban areas in the territory of Lasithi, Crete. The study was conducted on a sample of 112 seventh-grade female students from four elementary schools (one from the urban and three from the rural part of Lasithi). The subjects were divided into two subsamples: urban and rural Lasithi from Crete, 56 girls each (urban = 56 subjects, rural = 56 subjects). The results of this study are significant, confirming the assumption that areal factors contributed to the difference in the morpho-motoric status of the subjects. Specifically, statistically significant differences were recorded in the variable body height, while in the variable body weight, such differences did not exist. Regarding motor variables, girls from rural areas were significantly better on two out of seven motor tests, while girls from urban areas were only better on one. No statistically significant differences were recorded on the other tests. Considering that this study was conducted on a relatively small sample of subjects (112) and a limited geographical area, the results obtained cannot be generalized.

Keywords: morphological characteristics, motor skills, girls, seventh grade.

Sažetak: Proces programiranja i sprovođenja sistema praćenja morfoloških i motoričkih sposobnosti učenika osnovnoškolskog uzrasta bile su od posebnog značaja u fizičkoj kulturi, međutim, činjenica je da postoji veoma mali broj istraživanja koja su se bavila uticajima rezidencijalnog statusa ispitanika na njihovu morfo-motoričku statusu. Cilj ovog istraživanja je da se ispituju i utvrde razlike u određenim antropološkim pokazateljima učenica sedmog razreda osnovne škole u urbanoj i prigradskoj sredini na teritoriji Lasithia sa Krita. Predmet istraživanja su određeni antropološki pokazatelji učenica sedmog razreda osnovne škole urbane i prigradske sredine. Istraživanje je sprovedeno na uzorku od 112 ispitanika, podeljenih u dva subuzorka: urbani i ruralni deo Lasithia sa Krita po 56 devojčica (urbana = 56 ispitanica, ruralna = 56 ispitanica) sedmog razreda iz četiri osnovne škole (jedna iz urbanog dela Lasithia i tri iz ruralnog dela Lasithia). Dobijeni rezultati potvrđuju pretpostavku da sredinski faktori doprinose razlici u morfo-motoričkom statusu ispitanika. Kada je reč o morfološkim varijablama između učenica sedmog razreda urbane i ruralne sredine, zabeležene su statistički značajne razlike u varijabli telesna visina, dok u varijabli telesna masa te razlike ne postoje. Od motoričkih varijabli devojčice iz ruralne sredine bile značajno bolje na 2 od 7 motoričkih testova, dok devojčice iz urbane sredine samo na 1. Na ostalim testovima nisu evidentirane statistički značajne razlike. S obzirom na činjenicu da je ovo istraživanje sprovedeno na relativno malom uzorku ispitanika (112) i ograničenom geografskom području, dobijeni rezultati ne mogu da se generalizuju.

Ključne reči: morfološke karakteristike, motoričke sposobnosti, devojčice, sedmi razred.

INTRODUCTION

The daily life of schoolchildren today generally includes inadequate nutrition, sitting for long periods in

Uvod

Svakodnevni život deteta školskog uzrasta, danas uglavnom podrazumeva neadekvatnu ishranu, dugo se-

and out of school, learning foreign languages, and playing musical instruments. At the same time, free time is spent playing video games and watching TV for hours. Generally, children are not motivated enough for any form of more demanding physical activity or lack adequate physical education and training; the modern lifestyle contributes to numerous negative consequences (Fahrud, 2015). In this regard, sufficient physical activity plays a vital role in the proper growth and development and motor and emotional maturation of each child into a functional social person. For physical activity to produce the desired results (correct body posture, good health, appropriate motor training, and satisfactory physical preparation), it is necessary to make it continuous, appropriately selected, and adequately dosed according to age, gender, and level of current physical preparation of each individual (Višnjić et al., 2004; Mišigoj & Duraković, 2008; Trunić, 2013). In terms of the motor development of schoolchildren, it is imperative to increase the level of certain motor skills such as coordination, flexibility, strength, speed, and endurance, as these are the basis of all motor skills, from the simplest to the most complex ones and they provide increased physical working capacity. Each child is characterized by a different level of development of motor skills; therefore, one of the main goals defined by the curriculum of physical education for students in elementary school is precisely the improvement of individual motor skills from the existing to the desired level (Višnjić et al., 2004). According to the very same authors the appropriate level of motor skill development is the one that matches the physical development of the child. It should enable them to make further progress in their development, facilitate effective learning, improve different motor skills outlined in the curriculum for their age, and allow them to participate in sports school competitions without harming their health. Moreover, it should help them perform daily movement activities efficiently (Višnjić et al., 2004). Physical education teaching in primary schools in urban and rural areas should be identical in terms of material working conditions. At the same time, previous studies show differences in the development of certain motor skills in children from different social areas.

According to some authors (Matić et al., 2010; Gadžić & Vučković, 2012; Cvetković et al., 2014), factors of the social area, through their indirect action, may have an influence on the development of motor skills in children from a given area, as well as on the level of their engagement in physical (sports) activities. Some of these factors are social standards, the social status

denje u školi i van nje, učenje stranih jezika i sviranje nekog muzičkog instrumenta, a slobodno vreme se provodi u višesatnom igranju video igrice i gledanju TV-a. Deca uglavnom nisu dovoljno motivisana za bilo kakav oblik zahtevnije fizičke aktivnosti ili prosto nemaju adekvatno fizičko vaspitanje i obrazovanje, gde savremen način nosi sa sobom mnogobrojne negativne posledice (Fahrud, 2015). S tim u vezi, adekvatna fizička aktivnost igra veoma važnu ulogu na putu pravilnog rasta i razvoja, motoričkog i emocionalnog sazrevanja svakog deteta u funkcionalnu društvenu osobu. Da bi fizička aktivnost dala željene rezultate (pravilnu telesnu posturu, dobro zdravlje, odgovarajuću motoričku obučenost i zadovoljavajuću fizičku pripremljenost), neophodno je da ona bude kontinuirana, pravilno odabrana i adekvatno dozirana u odnosu na uzrast, pol i nivo trenutne fizičke pripremljenosti svakog pojedinca (Višnjić i sar., 2004; Mišigoj - Duraković, 2008; Trunić, 2013)

Kada je reč o motoričkom razvoju deteta školskog uzrasta, imperativ jeste povećanje nivoa pojedinih motoričkih sposobnosti (kao što su koordinacija, fleksibilnost, snaga, brzina, izdržljivost), i to sa razlogom, jer se one nalaze u osnovi svih motoričkih veština od najjednostavnijih do najkompleksnijih i obezbeđuju povećanu fizičku radnu sposobnost. Svako dete se odlikuje različitim stepenom razvijenosti motoričkih sposobnosti, pa je shodno tome jedan od glavnih ciljeva definisanih nastavnim programom fizičkog vaspitanja učenika u osnovnoj školi upravo poboljšanje pojedinih motoričkih sposobnosti (brzine, snage, fleksibilnosti, izdržljivosti) od postojećeg do poželjnog nivoa (Višnjić i sar., 2004).

Prema istim autorima, poželjan nivo razvijenosti motoričkih sposobnosti jeste onaj koji je u skladu s fizičkim razvojem samog deteta i koji mu omogućava: dalji napredak u razvoju istih, efikasno učenje i usavršavanje različitih motoričkih veština koje su predviđene nastavnim programom za dati uzrast, učešće u sportskim školskim takmičenjima bez eventualnih štetnih posledica po zdravlje, efikasno obavljanje različitih svakodnevnih kretnih aktivnosti (Višnjić i sar., 2004). Nastava fizičkog vaspitanja u osnovnim školama urbane i ruralne sredine bi trebalo da bude identična po pitanju materijalnih uslova rada, dok dosadašnja istraživanja koja su navedena ispod pokazuju da postoje razlike u razvijenosti pojedinih motoričkih sposobnosti kod dece iz različitih socijalnih sredina.

Prema pojedinim autorima (Matić i sar., 2010; Gadžić i Vučković, 2012; Cvetković i sar., 2014) činioци socijalne sredine svojim posrednim delovanjem mogu imati uticaj na razvoj motoričkih sposobnosti kod dece iz date sredine kao i na nivo angažovanosti istih u fizičkim

of parents, the cultural level of the area, and the role of physical education in the given area. Furthermore, the influence on the degree of physical engagement in different living areas and climatic and atmospheric conditions was recorded (Petrić et al., 2010). In the aforementioned study, urban and rural parts of the same area differ in living conditions, which are expected to be better in urban parts of the city (better traffic and communal infrastructure, greater number of trade and business facilities) compared to rural parts. Also, sports and sports recreational facilities are concentrated mainly in urban parts of the city, while suburban areas offer significantly more free space for various sports recreational activities in nature.

The aim of the study was to examine the differences in certain anthropological indicators: body height, body mass, coordination, speed, balance, mobility, and strength of seventh-grade female students of four elementary schools from the territory of Lasithi, Crete.

METHOD

The study was conducted on a sample of 112 subjects (girls), divided into two subsamples: urban (urban) and suburban (rural) part of Lasithi with 56 subjects each. The average age of the entire sample of girls was 13.84 years. The subjects were students of the seventh grade of elementary schools "Gimnasio Tzermiadon," "Gimnasio Kritsas," and "Gimnasio Koutsoura," from the suburban part of Lasithi and "1o Gimnasio Agiou Nikolaou" from the urban part of Lasithi in Crete, who attended all physical education classes in February of the school year 2019/2020.

The sample of variables in this study includes two variables of the morphological status of seventh-grade girls:

1. Body height (BH) and
2. Body weight (BW).

In addition to variables for describing fundamental morphological indicators, a set of seven variables was applied to assess the motor skills of female students (Gredelj, etc., 1975):

1. For assessment of the ability to accurately and quickly perform movements in a rhythm with a predetermined sequence of movements – Hands and feet drumming (HFD)
2. For assessment of the movement speed, defined as the ability to quickly perform movements with a given amplitude – Hand tapping (HT)
3. For assessment of the ability to balance in static performance conditions – Single leg stance test (SLST)

(sportskim) aktivnostima. Neki od tih činioca su: društveni standard, socijalni status roditelja, kulturni nivo sredine, uloga fizičkog vaspitanja u datoj sredini. Takođe, evidentiran je i uticaj na stepen fizičke angažovanosti u različitim životnim sredinama način života u istim, kao i klimatski i atmosferski uslovi (Petrić i sar., 2010). Urbani i ruralni delovi iste sredine, u pomenutom istraživanju, razlikuju se po kvalitetu uslova za život, koji su očekivano bolji u urbanim delovima grada (bolja saobraćajna i komunalna infrastruktura, veći broj trgovinskih i poslovnih objekata) u odnosu na ruralne delove. Takođe, i sportski i sportsko – rekreativni objekti su u velikoj meri koncentrisani u urbanim delovima grada, dok s druge strane prigradski delovi nude znatno više slobodnog prostora za različite sportsko – rekreativne aktivnosti u prirodi.

Cilj istraživanje je bio da se ispituju razlike u određenim antropološkim pokazateljima: telesnoj visini, telesnoj masi, koordinaciji, brzini, ravnoteži, pokretljivosti i snazi učenica sedmog razreda dve osnovne škole sa teritorije Lasithia sa Krita.

METOD

Istraživanje je sprovedeno na uzorku od 112 ispitanika (devojčica), podeljenih u dva subuzorka: gradski (urbani) i prigradski (ruralni) deo Lasithia sa po 56 ispitanika. Prosečna starost celokupnog uzorka devojčica je iznosila 13,84 godina. Ispitanici su učenice sedmog razreda osnovnih škola "Gimnasio Tzermiadon", "Gimnasio Kritsas", i "Gimnasio Koutsoura", iz prigradskog dela Lasithia i "1o Gimnasio Agiou Nikolaou" iz gradskog dela Lasithia na Kritu, koji su u februaru mesecu školske 2019/2020. godine prisustvovali svim časovima fizičkog vaspitanja.

1. Uzorak varijabli u ovom istraživanju obuhvata dve varijable morfološkog statusa devojčica sedmog razreda: *Telesna visina* (TVIS) i
2. *Telesna masa* (TMAS).

Pored varijabli za opis osnovnih morfoloških pokazatelja, primenjen je i set od sedam varijabli za procenu motoričkih sposobnosti učenica (Gredelj, i sar., 1975):

1. Za procenu sposobnosti tačnog i brzog izvođenja pokreta u ritmu sa unapred određenim redosledom izvođenja pokreta – *Bubnjanje rukama i nogama* (BURN).
2. Za procenu brzine pokreta koja je definisana kao sposobnost brzog izvođenja pokreta sa zadatom amplitudom – *Taping rukom* (TAPR).
3. Svrha ovog testa je procena sposobnosti ravnoteže u statičkim uslovima izvođenja – *Stajanje na jednoj nozi sa zatvorenim očima* (SZOJ).

4. For assessment of the flexibility of the lower extremities and spinal column – Split stance reach (SSR)
5. For assessment of the explosive power – Standing long jump (SLJ)
6. For assessment of the repetitive strength of the trunk – 30-second Trunk lift in (TSTL)
7. For assessment of static endurance in the strength of the shoulder girdle muscles – Dead hang (DH)

The data obtained were analyzed using descriptive statistics methods. Excel and the statistical program SPSS v25 were used for database preparation and statistical processing. All measurements were described by measures of central tendency, standard deviation, minimum, maximum, and t-test for dependent samples.

All p-values below 0.05 were to be considered of statistical significance.

RESULTS

Table 1 indicates higher ranges when it comes to morphological indicators, body height (35.00), and body weight (48.10), which is understandable given the sample respondents being in an intensive period of growth and development (13-14 years). The standard deviation indicates greater homogeneity in the body height variable (6.69) compared to the body weight variable (9.07). Regarding variables from motor space, the highest value of the deviation standard is in the standing long jump test (23.44), whose range is 107.0, which indicates the highest dispersion of the results in that variable. Such results are not surprising given that this test assesses explosive strength, which is highly genetically determined; hence, there are such significant individual differences in results. The maximum value of this variable is 201.5, and the minimum is 94.5, with an arithmetic mean of 151.62.

It has been observed that the dead hang variable has a higher dispersion of recorded results (DH = 14.68; Range = 71.6). This suggests that there are larger individual differences in terms of the static endurance strength ability of the shoulder girdle muscles. Since hereditary factors have less influence on this ability, there are likely greater differences in the level and type of physical activity among female students. The slightest deviation of the results is in the hands and feet drumming (HFD) test, with a standard deviation of 3.23, indicating the homogeneity of the group in the tested ability. The range of results on that test is 15.00. Surprisingly, the minimum score on the same test was 0.00, which means some subjects could not

4. Svrha ovog testa je procena fleksibilnosti donjih ekstremiteta i kičmenog stuba – *Pretklon rasko-račno* (PRAS).
5. Svrha ovog testa jes procena eksplozivne snage koja označava sposobnost aktiviranja maksimalnog broja motoričkih jedinica u jedinici vremena pri realizaciji jednostavnih motoričkih struktura s konstantnim otporom ili sa otporom proporcionalnim masi tela – *Skok u dalj iz mesta* (SUDM).
6. Svrha ove mere je procena repetativne snage trupa, koja se definiše kao sposobnost dugotrajnog rada mišića trupa u izotoničnom režimu naprezanja – *Podizanje trupa za 30 sekundi* (PTTS).
7. Svrha ove mere je procena statičke izdržljivosti u snazi mišića ramenog pojasa – *Vis u zgibu* (VISZ).

Analiza podataka vršila se metodama deskriptivne statistike. Za pripremu baze podataka i statističku obradu je korišćen Exel i statistički program SPSS verzija 25. Sva merenja su opisana merama centralne tendencije, standardne devijacije, minimuma, maksimuma, t testa za zavisne uzorke. Sve vrednosti p ispod 0.05 smatraju se statistički značajnim.

REZULTATI

Rezultati Tabele 1. ukazuju na veće raspone kada su u pitanju morfološki pokazatelji, telesna visina (35.00) i telesna masa (48.10), što je i razumljivo s obzirom da se radi o uzorku ispitanica koje su u intenzivnom periodu rasta i razvoja (13-14 godina). Standardna devijacija ukazuje da je utvrđena veća homogenost kod varijable telesna visina (6.69) u odnosu na varijablu telesna masa (9.07). Kada su u pitanju varijable iz motoričkog prostora, najveća vrednost standarde devijacije je u testu *Skok u dalj iz mesta* (23.44), čiji je raspon 107.0, što sve jasno ukazuje na najveću disperziju rezultata u toj varijabli. Takvi rezultati nisu iznenađujući s obzirom da se radi o testu za procenu eksplozivne snage, a koja je visoko genetski determinisana pa otuda potiču ovako velike individualne razlike rezultata. Maksimalna vrednost ove varijable je 201.5, a minimalna 94.5, sa aritmetičkom sredinom od 151.62.

Sledeća varijabla gde je evidentirana veća disperzija rezultata je *Vis u zgibu* (SD = 14.68; Range = 71.6). Ovi rezultati ukazuju na postojanje većih individualnih razlika kada je sposobnost statičke izdržljivosti u snazi mišića ramenog pojasa u pitanju. S obzirom da je ova sposobnost pod manjim uticajem naslednih faktora, verovatno da postoje veće razlike univou fizičke aktivnosti (vežbanja) tipa snage kod učenica u ovom slučaju.

Najmanje odstupanje rezultata je u testu *Bubnjanje rukama i nogama* (BURN) sa standardnom devijacijom

accurately and quickly perform movements in a predetermined sequence of movements rhythm.

Table 1. Descriptive statistics of morphological and motor variables of urban area girls.

Variable	N	Range	Min	Max	Mean	SD
BH	56	35.0	141.5	176.5	162.50	6.69
BM	56	48.1	34.2	82.3	54.94	9.07
SLST	56	54.9	4.8	59.7	15.18	10.53
HFD	56	15.0	0.0	15.0	6.68	3.23
HT	56	25.0	25.0	50.0	37.80	4.89
SSR	56	40.0	33.5	73.5	50.70	10.31
SLJ	56	107.0	94.5	201.5	151.62	23.44
TLTS	56	29.0	3.0	32.0	18.55	4.52
DH	56	71.6	0.5	72.1	15.11	14.68

BH – body height; **BM** - body mass; **SLST**- Single leg stance test; **HFD** - hands and feet drumming; **HT** – Hand tapping; **SSR** – Split stance reach; **SLJ** – Standing long jump; **TSTL** – 30-seconds trunk lift; **DH** – Dead hang;

Table 2 shows that the morphological indicators, body height (34.00) and body weight (42.90), have higher ranges. The standard deviation reveals that there is greater uniformity in the body height variable (7.25) than in the body weight variable (9.90). This confirms that the sample consists of subjects in intensive growth and development. Regarding motor skills, the highest value of the standard deviation is in the Long Jump test (20.45), whose range is 100.5. The maximum value of this variable is 200.5, and the minimum is 100.5, with an arithmetic mean of 156.71.

In addition, the high standard deviation is found in the single-leg stance test (SLST), with 15.90, whose range is 93.1. The maximum value of this variable is 99.00, and the smallest one is 5.9, with an arithmetic mean of 23.20. In the same category, with a large standard deviation, is dead hang (DH), with 13.36, whose range is 65.2. The maximum value of this variable is 66.3, and the smallest one is 11, with an arithmetic mean of 20.38.

The lowest deviation is in the hands and feet drumming (HFD) test, with a standard deviation 2.85. The variable hands and feet drumming (HFD) range is 13.00. Also, a slight deviation is observed in the 30-second Tunk lift test, which has a standard deviation of 4.82, and in the hand tapping test (HT), which has a standard deviation of 4.18. It is somewhat surprising that the minimum score on the hands and feet drumming (HFD) test was 0.00, which means that there are subjects who cannot accurately and quickly perform movements in rhythm with a predetermined sequence of movements and that on the

od 3.23 što ukazuje na homogenost grupe u ispitivanoj sposobnosti. Raspon rezultata na tom testu je 15.00. Pomalo je iznenađujuće da je minimalni rezultat na istom testu bio 0.00, što znači da je bilo ispitanika koji nisu mogli tačno i brzo izvoditi pokrete u ritmu sa unapred određenim redosledom izvođenja pokreta.

Tabela 1. Deskriptivna statistika morfoloških i motoričkih varijabli devojčica urbane sredine.

Varijabla	N	Range	Min	Max	Mean	SD
TVIS	56	35.0	141.5	176.5	162.50	6.69
TMAS	56	48.1	34.2	82.3	54.94	9.07
SZOJ	56	54.9	4.8	59.7	15.18	10.53
BURN	56	15.0	0.0	15.0	6.68	3.23
TAPR	56	25.0	25.0	50.0	37.80	4.89
PRAS	56	40.0	33.5	73.5	50.70	10.31
SUDM	56	107.0	94.5	201.5	151.62	23.44
PTTS	56	29.0	3.0	32.0	18.55	4.52
VISZ	56	71.6	0.5	72.1	15.11	14.68

TVIS – telesna visina; **TMAS** - telesna masa; **SZOJ** - Stajanje na jednoj nozi sa zatvorenim; **BURN** - Bubnjanje rukama i nogama; **TAPR** - Taping rukom; **PRAS** - Pretklon raskoračno; **SUDM** - Skok u dalj iz mesta; **PTTS** - Podizanje trupa za 30 sekundi; **VISZ** - Vis u zgibu;

Rezultati Tabele 2. ukazuju na veće raspone kada su u pitanju morfološki pokazatelji, telesna visina (34.00) i telesna masa (42.90). Standardna devijacija ukazuje da je utvrđena veća homogenost kod varijable telesna visina (7.25) u odnosu na varijablu telesna masa (9.90) što dodatno potvrđuje prethodno rečeno jer se radi o uzorku ispitanica koje se nalaze u periodu intezivnog rasta i razvoja. Kada se radi o motoričkim sposobnostima ponovo najveća vrednost standardne devijacije je u testu Skok u dalj iz mesta (20.45), čiji je raspon 100.5. Maksimalna vrednost ove varijable je 200.5, a minimalna 100.5, sa aritmetičkom sredinom od 156.71.

Takođe, velika vrednost standardne devijacije nalazimo u testu Stajanje na jednoj nozi sa zatvorenim očima (SZOJ) sa 15.90 čiji je raspon 93.1. Maksimalna vrednost ove varijable jeste 99.00, a najmanja vrednost je 5,9 sa aritmetičkom sredinom 23.20.

U istoj kategoriji sa velikom standardnom devijacijom se nalazi test Vis u zgibu (VISZ) sa 13.36 čiji je raspon 65.2. Maksimalna vrednost ove varijable jeste 66.3 a najmanja vrednost je 11 sa aritmetičkom sredinom 20.38.

Najmanje odstupanje je u testu *Bubnjanje rukama i nogama* (BURN) sa standardnom devijacijom od 2.85. Raspon kod varijable *Bubnjanje rukama i nogama* (BURN) je 13.00.

deadhang test (DH) the minimum score was 1.1, which means that the subject does not have a sufficiently developed strength of the shoulder girdle muscles.

Table 2. Descriptive statistics of morphological characteristics and motor variables of rural area girls

Variable	N	Range	Min	Max	Mean	SD
BH	56	34.0	142.5	176.5	159.58	7.25
BM	56	42.9	37.8	80.7	52.88	9.90
SLST	56	93.1	5.9	99.0	23.20	15.90
HFD	56	13.0	0.0	13.0	6.32	2.85
HT	56	21.0	26.0	47.0	38.96	4.18
SSR	56	60.0	27.0	87.0	46.07	11.37
SLJ	56	100.5	100.0	200.5	156.71	20.45
TSTL	56	23.0	5.0	28.0	19.34	4.82
DH	56	65.2	1.1	66.3	20.38	13.36

BH – body height; **BM** - body mass; **SLST**- Single leg stance test; **HFD** - hands and feet drumming; **HT** – Hand tapping; **SSR** – Split stance reach; **SLJ** – Standing long jump; **TSTL** – 30-seconds trunk lift; **DH** – Dead hang

Table 3 shows that, by comparing the body height and body weight of girls from urban and rural areas, the arithmetic mean of the height and body mass of urban girls is statistically higher than girls in rural areas, and the standard deviations for these parameters are very similar. Amongst motor variables, statistically significant differences were observed in the single leg stance test (SLST) and dead hang (DH), where girls from rural areas performed better. Statistically significant differences were also found in the Split stance reach (SSR), where urban girls had better results. No statistically significant differences were recorded on the other tests.

Table 3. Motor skills T-test results of urban and rural area girls

Variable	Urban area girls		Suburban area girls		t - test	p
	Mean	SD	Mean	SD		
BH	15.18	10.53	23.20	15.90	-3.14	0.02
BM	6.68	3.23	6.32	2.85	0.62	0.54
SLST	37.80	4.89	38.96	4.18	-1.35	0.18
HFD	50.70	10.31	46.07	11.37	2.25	0.03
HT	151.62	23.44	156.71	20.45	-1.22	0.22
SSR	18.55	4.52	19.34	4.82	-0.89	0.38
SLJ	15.11	14.68	20.38	13.36	-1.98	0.05

BH – body height; **BM** - body mass; **SLST**- Single leg stance test; **HFD** - hands and feet drumming; **HT** – Hand tapping; **SSR** – Split stance reach; **SLJ** – Standing long jump; **TSTL** – 30-seconds trunk lift; **DH** – Dead hang

Takođe, malo odstupanje je u testu Podizanje trupa za 30 sekundi (PTTS) sa standardnom devijacijom od 4.82 i u testu Taping rukom (TAPR) sa standardnom devijacijom od 4.18.

Pomalo je iznenađujuće da je minimalni rezultat na testu Bubnjanje rukama i nogama (BURN) bio 0.00, što znači da ima ispitanika koji ne mogu tačno i brzo izvoditi pokrete u ritmu sa unapred određenim redosledom izvođenja pokreta i da je na testu Vis u zgibu (VISZ) minimalni rezultat bio 1.1 što znači da ispitanik nema dovoljno razvijenu snagu mišića ramenog pojasa.

Tabela 2. Deskriptivna statistika morfoloških i motoričkih varijabli devojčica ruralne sredine.

Varijabla	N	Range	Min	Max	Mean	SD
TVIS	56	34.0	142.5	176.5	159.58	7.25
TMAS	56	42.9	37.8	80.7	52.88	9.90
SZOJ	56	93.1	5.9	99.0	23.20	15.90
BURN	56	13.0	0.0	13.0	6.32	2.85
TAPR	56	21.0	26.0	47.0	38.96	4.18
PRAS	56	60.0	27.0	87.0	46.07	11.37
SUDM	56	100.5	100.0	200.5	156.71	20.45
PTTS	56	23.0	5.0	28.0	19.34	4.82
VISZ	56	65.2	1.1	66.3	20.38	13.36

TVIS – telesna visina; **TMAS** - telesna masa; **SZOJ** - Stajanje na jednoj nozi sa zatvorenim; **BURN** - Bubnjanje rukama i nogama; **TAPR** - Taping rukom; **PRAS** - Pretklon raskoračno; **SUDM** - Skok u dalj iz mesta; **PTTS** - Podizanje trupa za 30 sekundi; **VISZ** - Vis u zgibu;

Rezultati Tabele 3. pokazuju da se upoređivanjem telesne visine i telesne mase devojčica iz urbane i ruralne sredine, dolazi do podatka da je aritmetička sredina visine i telesne mase devojčica urbane sredine, statistički veća od devojčica ruralne sredine, a standardne devijacije za ove parametre su jako slične.

Od motoričkih varijabli, statistički značajne razlike su evidentirane na testovima Stajanje na jednoj nozi sa zatvorenim očima (SZOJ) i Vis u zgibu (VISZ) gde su devojčice iz ruralne sredine imale bolje rezultate. Statistički značajne razlike su utvrđene i na testu Pretklon raskoračno (PRAS) gde su devojčice gradske sredine imale bolje rezultate. Na ostalim testovima nisu evidentirane statistički značajne razlike.

DISCUSSION

The study used descriptive statistical methods to calculate the central and dispersion parameters of different variables. Specifically, the study examined the morphological characteristics using two variables and motor skills using seven tests. The results of the study revealed significant differences in certain morphological and motor indicators between seventh-grade students from urban and rural areas in Lasithi, Crete. Regarding morphological variables (body height and weight) in female students from urban and rural areas, the arithmetic mean of height and body mass of the girls from urban areas was statistically higher than that of the girls from rural areas. The standard deviations for both parameters from both categories were very similar (Tables 1 and 2). According to the findings in Table 1, girls from urban areas showed wider ranges in morphological indicators, body height (35.00), and body mass (48.10). The standard deviation revealed that the variable body height (6.69) had a greater homogeneity compared to the variable body mass (9.07). In Table 2, results showed that girls from rural areas had larger ranges in morphological indicators, body height (34.00), and body mass (42.90). The standard deviation again indicated greater homogeneity in the variable body height (7.25) compared to the variable body mass (9.90). Regarding motor skills, it was found that there is a greater diversity in the results of tests that evaluate explosive leg strength, balance, flexibility, and static strength (SLJ, SLST, SSR, DH). This indicates larger individual differences in these abilities among the test subjects. This is not surprising considering that the test subjects are in the pre-puberty phase of growth and development, characterized by greater individual differences in motor abilities. In the test for assessing balance in static performance conditions (SLST) and static endurance in shoulder girdle strength (DH), girls from rural areas performed significantly better (t -test = 3.14 and 1.98, respectively). These findings support previous studies conducted by Gadžić & Vučković (2012), Badrić & Petračić (2007), which also found that girls from suburban areas have better balance in static performance conditions (SLST) and static endurance in shoulder girdle strength (DH). After closely observing physical education classes conducted by teachers from rural and urban areas, it was determined that the teaching approach played a significant role in the student's physical abilities. During physical education classes, rural teachers assigned complex tasks that required a combination of static balance and strength endurance, while urban teachers focused more on developing flexibility and functional abilities. Additionally, rural

Tabela 3. Rezultati t -testa za motoričke sposobnosti učenica urbane i ruralne sredine.

Varijabla	Devojčice urbana sredina		Devojčice prigradska sredina		t - test	p
	Mean	SD	Mean	SD		
SZOJ	15.18	10.53	23.20	15.90	-3.14	0.02
BURN	6.68	3.23	6.32	2.85	0.62	0.54
TAPR	37.80	4.89	38.96	4.18	-1.35	0.18
PRAS	50.70	10.31	46.07	11.37	2.25	0.03
SUDM	151.62	23.44	156.71	20.45	-1.22	0.22
PTTS	18.55	4.52	19.34	4.82	-0.89	0.38
VISZ	15.11	14.68	20.38	13.36	-1.98	0.05

TVIS – telesna visina; **TMAS** - telesna masa; **SZOJ** - Stajanje na jednoj nozi sa zatvorenim; **BURN** - Bubnjanje rukama i nogama; **TAPR** - Taping rukom; **PRAS** - Pretklon raskoračno; **SUDM** - Skok u dalj iz mesta; **PTTS** - Podizanje trupa za 30 sekundi; **VISZ** - Vis u zgibu;

DISKUSIJA

Deskriptivnim statističkim procedurama izračunati su osnovni centralni i disperzioni parametri ispitivanih varijabli. Ispitivane su morfološke karakteristike sa dve varijable (telesna visina i telesna masa) kao i motoričke sposobnosti sa 7 testova. Dobijeni rezultati u okviru ovog istraživanja pokazuju da postoje određene statistički značajne razlike u pojedinim morfološkim i motoričkim pokazateljima između učenica sedmog razreda urbane i ruralne sredine, u Lasithiu sa Krita.

Kada je reč o morfološkim varijablama (telesna visina i težina) kod učenica iz urbane i ruralne sredine, dolazi se do podatka da je aritmetička sredina visine i telesne mase devojčica urbane sredine, statistički veća od devojčica ruralne sredine, a standardna devijacija za oba parametra iz obe kategorije je jako slična (Tabele 1 i 2). Rezultati Tabele 1. ukazuju na veće raspone kada su u pitanju morfološki pokazatelji, telesna visina (35.00) i telesna masa (48.10) kod devojčice urbane sredine, a standardna devijacija ukazuje da je utvrđena veća homogenost kod varijable telesna visina (6.69) u odnosu na varijablu telesna masa (9.07). Rezultati Tabele 2. ukazuju na veće raspone kada su u pitanju morfološki pokazatelji, telesna visina (34.00) i telesna masa (42.90) kod devojčice ruralne sredine, a standardna devijacija ponovo ukazuje da je utvrđena veća homogenost kod varijable telesna visina (7.25) u odnosu na varijablu telesna masa (9.90).

Kada je reč o motoričkim sposobnostima vrednosti standardne devijacije i raspona rezultata pokazali su, da je najveća heterogenost prisutna na testovima za procenu eksplozivne snage nogu, ravnoteže, fleksibilnosti i sta-

students were significantly more active outside of school, engaging in medium to high-intensity cyclic and acyclic physical activities that involved dynamic and static work conditions. This fact is supported by a study conducted by Bathrellou et al. (2007).

Regarding assessing flexibility in the lower limbs and spine (SSR), the results show that girls from urban areas performed significantly better than rural girls (t -test = 2.25). The findings on flexibility are consistent with studies conducted by Nikolić (2015) and Chilion (2011) but differ from studies by Gadžić & Vučković (2012), Badrić & Petračić (2007), and Tinazci and Emiroglu (2010), where students from rural areas were found to be more flexible than their urban peers. According to statements made by subject teachers, one possible explanation for the difference in flexibility levels among female students from urban and rural areas is that flexibility exercises are emphasized more in physical education classes in urban primary schools than in rural areas.

Regarding explosive leg strength (SLJ), it was found that although girls from urban areas had better results, no statistically significant difference was recorded between the subjects of the two areas. Based on the results, it can be concluded that the respondents are at a similar level of development when it comes to horizontal jumping, which is consistent with the results of a study conducted by Tanović et al., (2013). However, our results do not align with the study conducted by Badrić & Petračić (2007), where the authors concluded that subjects from rural areas achieved better results in explosive power than those from urban areas.

The analysis showed that female students from different residential statuses differ significantly in their examined motor skills, and those from rural areas have better results in several tests. Although female students from rural areas have better average results on a larger number of tests (on five out of seven tests), the differences in three out of these five tests were minimal. It's important to note that this study was conducted on a relatively small sample of subjects (112) and a limited geographical area, so the results cannot be generalized. Therefore, future studies should be conducted on a larger geographical area and with a greater sample size, with the application of a higher number of variables related to the lifestyle of the respondents (such as physical activity level, type, etc.), which will probably provide a complete insight into the state of motor skills of respondents from different residential statuses.

tičke snage (SUDM, SZOJ, PRAS, VISZ) što ukazuje na veće individualne razlike ispitanica u tim sposobnostima. To je donekle očekivano s obzirom da se ispitanice nalaze u predpubertetsko-pubertetskoj fazi rasta i razvoja koje karakterišu veće individualne razlike motoričkih sposobnosti. U testu za procenu ravnoteže u statičkim uslovima izvođenja (SZOJ) i statičku izdržljivost u snazi ramenog pojasa (VISZ), devojčice iz ruralne sredine imale značajno bolje rezultate, (t – test = 3.14 i 1.98). Naši rezultati su u skladu sa rezultatima studija koji su sprovedi Gadžić i Vučković (2012) i Badrić i Petračić (2007), koje pokazuju da devojčice iz prigradskog naselja imaju bolju ravnotežu u statičkim uslovima izvođenja (SZOJ) i statičku izdržljivost u snazi ramenog pojasa (VISZ).

Na osnovu pažljivog posmatranja časova fizičkog vaspitanja nastavnika iz obe sredine, utvrđeno je da na taj fenomen utiče pristup u radu nastavnika fizičkog vaspitanja. Nastavnici iz ruralne sredine u toku vežbi oblikovanja zadaje kompleksne zadatke koje zahtevaju kombinaciju ovih sposobnosti (statičke ravnoteže i statičke izdržljivosti u snazi). Naprotiv, nastavnik iz urbane sredine se više fokusira na razvoj fleksibilnosti i funkcionalne sposobnosti dece. Takođe, nije zanemarljiva činjenica da su deca iz ruralne sredine značajno aktivnija izvan škole. Na osnovu razgovora sa učenicima iz ruralne sredine nakon testiranja utvrđeno je zapravo da je u njihov raspored uključena fizička aktivnost cikličnog i acikličnog tipa srednjeg do velikog inteziteta, u kojoj je uključeno značajno angažovanje donjih i gornjih ekstremiteta, u dinamičkim i statičkim uslovima rada. Ovu činjenicu potvrđuje i istraživanje koje su sprovedi Bathrellou i saradnici (2007).

Što se tiče procene fleksibilnosti donjih ekstremiteta i kičmenog stuba (PRAS) devojčice iz urbane sredine su imale značajno bolje rezultate (t – test = 2.25). Na ostalim testovima nisu evidentirane statistički značajne razlike. Kada je reč o fleksibilnosti, dobijeni rezultati u ovom istraživanju su u skladu sa rezultatima studija koja su sprovedi Nikolić (2015) i Chilion (2011) sa saradnicima, dok su u suprotnosti sa istraživanjima koja su sprovedi Gadžić i Vučković (2012), Badrić i Petračić (2007) i Tinazci i Emiroglu (2010), kod kojih su ispitanici iz ruralne sredine znatno fleksibilniji od vršnjaka iz ruralnih sredina. Jedan od razloga postojanja značajne razlike u nivou fleksibilnosti (razgibanosti) učenica iz urbanih sredina, jeste taj što je vežbama fleksibilnosti u osnovnim školama iz ovog dela Laisthia, (na osnovu izjave predmetnog nastavnika) data veća značajnost, odnosno više korišćene u radu na časovima fizičkog vaspitanja nego što je to slučaj sa ispitanicima koji dolaze iz ruralnih sredina.

CONCLUSION

Motor tests are necessary in physical education classes to measure the development of certain motor abilities among schoolchildren. These results help in planning subsequent motor activities. This paper compares certain anthropological indicators of seventh-grade elementary female students from rural and urban areas of Lasithi. The study measured two morphological and seven motor variables in the May 2019/2020 academic year. The results confirm that location contributes to the difference in the morpho-motoric status of the subjects. Girls from rural areas were significantly better on two out of seven motor tests, whereas girls from urban areas were better on one. There were no significant differences in the other tests. The study concludes that the differences recorded between the seventh-grade female primary school students in the urban and rural areas of Lasithi are sufficient to talk about their motor status. However, the study's sample size was limited to female students of the municipality of Lasithi. Therefore, it cannot be claimed that female students from the urban or rural part of the city are more developed and dominant in the selected motor skills compared to their peers from other social areas of Crete. Future studies should include a larger number of urban and rural parts of Crete to have a broader picture of the development level of children's motor skills. This study may be significant and valuable for every physical education teacher, as it provides insight into the state of physical preparation and each student's physical development trend.

ZAKLJUČAK

Slično sportu i u nastavi fizičkog vaspitanja je neophodno obavljati motorička testiranja (merjenja) razvijenosti pojedinih motoričkih sposobnosti (kao veoma bitnih elemenata motoričke razvijenosti organizma), kako bi se na osnovu dobijenih rezultata mogle planirati naredne motoričke aktivnosti u radu sa decom školskog uzrasta.

S tim u vezi, predmet ovog rada je bila komparativna analiza pojedinih antropoloških pokazatelja (dva morfološka i sedam motoričkih), čenica sedmog razreda osnovne škole sa Lasithia (urbanog područja Lasithia)(ruralnog područja Lasithia), izmerenih u maju mesecu školske 2019/2020. godine.

Dobijeni rezultati potvrđuju pretpostavku da sredinski faktori doprinose razlici u morfo-motoričkom statusu ispitanika. Kada je reč o morfološkim varijablama između učenica sedmog razreda urbane i ruralne sredine, zabeležene su statistički značajne razlike u varijabli telesna visina, dok u varijabli telesna masa te razlike ne postoje. Od motoričkih varijabli devojčice iz ruralne sredine bile značajno bolje na 2 od 7 motoričkih testova, dok devojčice iz ruralne sredine samo na 1. Na ostalim testovima nisu evidentirane statistički značajne razlike.

S obzirom da je ovo istraživanje obuhvatilo testiranje (merenje) sedam motoričkih sposobnosti, zabeležene razlike u istim između učenica sedmog razreda osnovne škole urbanog i ruralnog dela Lasithia, su dovoljne da bi se govorilo o motoričkom statusu istih. Slična situacija je i kada je reč o morfološkim obeležjima. Takođe, kako bi se imala šira slika o nivou razvijenosti odabranih motoričkih sposobnosti deca ovadva dela istog naselja, buduća istraživanja bi trebalo da obuhvate i komparaciju razvijenosti istih kod učenika i učenica što u ovom radu nije bio slučaj. S obzirom da su uzorak činili učenice iz limitiranog broja opštine grada Lasithia, ne može se u potpunosti govoriti da su učenice urbanog ili ruralnog dela grada u odabranim (testiranim) motoričkim sposobnostima razvije-

Kada je reč o eksplozivnoj snazi nogu (SUDM), iako su devojčice iz urbane sredine imale bolje rezultate, nije zabeležena statistički značajna razlika između ispitanika dve sredine. Na osnovu rezultata može se reći da su ispitanici približnog nivoa razvijenosti kada je u pitanju skočnost horizontalnog tipa, što je donekle u skladu sa rezultatima istraživanja koje je sproveo Tanović sa saradnicima (2013). Sa druge strane, naši rezultati nisu u skladu sa studijom koju su sproveli Badrić i Petračić (2007). Oni su došli do zaključka da su ispitanici iz ruralne sredine ostvarili bolji rezultat u eksplozivnoj snazi u odnosu na ispitanike iz urbane sredine.

Rezultati analize pokazali su da se učenice različitog rezidencijalnog statusa značajno razlikuju u ispitivanim motoričkim sposobnostima i da učenice ruralne sredine imaju bolje rezultate u više testova. Naime, iako učenice ruralne sredine imaju bolje prosečne rezultate na većem broju testova (na 5 od 7 testova), razlike u 3 od ovih 5 testova su bile minimalne. Obzirom na činjenicu da je ovo istraživanje sprovedeno na relativno malom uzorku ispitanika (112) i ograničenom geografskom području, dobijeni rezultati ne mogu da se generalizuju. Iz tih razloga buduća istraživanja trebalo bi provesti na većem geografskom području i sa većim uzorkom, uz primenu većeg broja varijabli koje se odnose na stil života ispitanika (sa aspekta fizičke aktivnosti: aktivan – neaktivan, vrsta i nivo aktivnosti i sl.) čime bi se verovatno stekao potpuniji uvid u stanje motoričkih sposobnosti ispitanica različitog rezidencijalnog statusa.

nija i dominantnija u odnosu na svoje vršnjake iz druge socijalno-životne sredine Krita. Iz tog razloga, neka buduća istraživanja bi trebala da obuhvate veći broj urbanih i ruralnih delova čitavog Krita. Istraživanja ovog tipa mogu biti veoma značajna i korisna za svakog nastavnika fizičkog vaspitanja, jer mu omogućavaju da ima uvid u stanje fizičke pripremljenosti, kao i u trend telesnog razvoja (stagnacije ili napretka) svakog učenika, a takođe mu pružaju i putokaz narazvoj kojih sposobnosti motoričkog statusa kod svojih učenika treba da usmeri svoje delovanje.

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Primljen: 08. februar 2024. / Received: February 08, 2024

Izmjene primljene: 19. mart 2024. / Changes Received: March 19, 2024

Prihvaćen: 22. mart 2024. / Accepted: March 22, 2024



**THE EFFECT OF IMPLEMENTING PHYSICAL EDUCATION CLASS
MANAGEMENT BADMINTON MATERIAL TO IMPROVE CONCENTRATION
OF ELEMENTARY SCHOOL STUDENTS**

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**USE THE PLS MICRO-SQUARES METHOD FOR MEASURING THE
TEACHING COMPETENCE OF PROFESSORS OF PHYSICAL AND SPORTS
EDUCATION**

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SPRINT CHARACTERISTICS AND DISTANCE COVERED OF FEMALE SOCCER PLAYERS DURING THE GAME

EGGY NUR ARFIANSYAH, AHMAD NASRULLOH

Department of Sports Science, Faculty of Sports and Health Sciences, Yogyakarta State University, Indonesia

Correspondence:

Eggy Nur Arfiansyah, Department of Sports Science, Faculty of Sports and Health Sciences, Yogyakarta State University, Indonesia, eggynur.2022@student.uny.ac.id

Abstract: The purpose of writing this review is to increase our understanding of the physical demands of women's soccer matches, especially the differences in sprint ratio and cruising power during matches with higher standards of play and between playing positions. The systematic review was conducted by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement. An electronic systematic search of databases (Elsevier, PubMed, and Sage Journals) was completed on February 21, 2024, with no date restrictions applied. Electronic database searches identified 292 articles. A total of 16 articles remained for analysis after removal of duplicates, and initial and full-text screening. Then the number of articles was screened through several stages concerning the planned inclusion criteria and 8 articles met the inclusion criteria. The results of the current study show based on playing standards, the population is divided into semi-professionals, professionals, domestic and international players, national teams, and student or college classes. The locations of the studies varied from the European zone (Denmark, Spain, and UEFA Standards), America, Asia-Oceania zone (Korea and Australia), and Brazil. According to the age levels in the study, they range from U-17 players, U-20 players, College Students, to Seniors. Female professional soccer players cover long distances and perform high-intensity training like male players and that there are differences in movement patterns for each position. Therefore, to improve the performance of female soccer players and prevent injuries, it is necessary to develop training programs that take into account the characteristics of each player and playing position.

Keywords: Sprint, distance covered, female, soccer.

INTRODUCTION

Scholarly interest in women's football has increased over recent years (Harkness-Armstrong et al., 2022). One of the topics attracting more attention in the literature concerns the analysis of the compatibility of locomotor activity performed across different speeds. However, even with the growing interest in sports science and performance, a thorough understanding of the physical demands of female soccer athletes has yet to be widely explored (Castellano et al., 2011; Loturco et al., 2015; Ramirez-Campillo et al., 2016). Scientific research on female soccer athletes remains scarce, especially at the professional level (Faul et al., 2007). Additionally, much of the research that has been published to date has been completed using small sample sizes concerning the number of players, number of matches, or both (McCormack et al., 2014). There has been huge global growth and development in women's football in recent years. Global, continental and national government bodies have implemented women-specific football strategies and increased investment, to support the development of the sport from the grassroots level to elite playing standards (FIFA, 2018, 2019).

Although the popularity of women's football is lower than men's football, recently it has increased rapidly compared to before. The number of studies on women's football is increasing as the popularity of women's football increases. The performance ratio for each intensity exercise, such as standing, walking, jogging, high-intensity running, and sprinting in women's soccer matches is the same as that performed by men's soccer players (Fessi et al., 2016; Mohr et al., 2008). However, men and women can differ dramatically in terms of physical performance characteristics, with male players undertaking 30% more high-intensity activity during competition (Mohr et al., 2008), and demonstrating superior performance across a variety of fitness assessments (Mujika, Santisteban, et al., 2009; Mujika, Spencer, et al., 2009; Tønnessen et al., 2014).

The physical dimension has been studied more deeply than any other dimension during football competition. Several studies measure the physical characteristics of players for each 15-minute time period, which observed, on

the one hand, the first 15 minutes of a match are consistently the most demanding period, and on the other hand, a decline in performance in various variables, such as the total distance covered undertaken, running or sprinting at high speed as the game progresses, especially in the last 15 minutes of the game period (Hewitt et al., 2014; Mara et al., 2017). Across all tracking systems, the total distance covered is usually in the range of 9.2-11.3 km, while the distance covered by high-speed running is in the range of 1.2-2.7 km and the sprint range is 160-460 m. Several studies have investigated the demands of the game and found differences between the two playing positions. However, most previous studies have used less specific positional categorization, using defenders, midfielders and attackers (Bendiksen et al., 2013; Bradley et al., 2014).

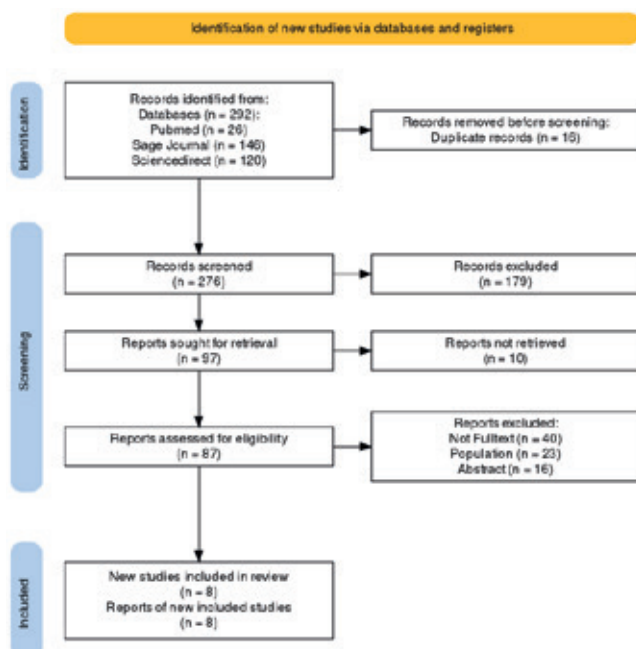
Thus, the aerobic and anaerobic needs of female soccer athletes need to be considered during the competition season so that fatigue does not occur which could put the athletes at risk of injury. Because injuries to elite soccer players occur more often at the end of the season than at the beginning and middle of the season (Morgan & Oberlander, 2001). It can also be used as a reference in choosing the right strategy for creating a training program by paying attention to the tactical aspects of the game. Therefore, the purpose of writing this review is to increase our understanding of the physical demands of women’s soccer matches, especially the differences in sprint ratio and distance covered during matches with higher standards of play and between playing positions, which is necessary for coaches and sports scientists to prescribe more appropriate training to maximize performance and minimize the risk of injury.

MATERIAL AND METHODS

The systematic review was conducted by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement. An electronic systematic search of databases (Elsevier, PubMed, and Sage Journals) was completed on February 21, 2024, with no date restrictions applied. The search strategy included terms for population (‘female’ OR ‘girl’ OR ‘women’), AND sport (‘soccer’ OR ‘football’), AND sprint characteristics (‘Sprint’) AND, cruising range (‘distance covered’). The search strategy has previously been planned with PICOC analysis which can be seen in the following table:

Table 1. Study search method with PICOC analysis

Population	Soccer female athlete
Intervetion	Match Analysis
Compare	n/a
Outcome	Sprint dan Distance covered
Context	Ratio <i>sprint</i> and distance covered during a match



Electronic database searches identified 292 articles. A total of 16 articles remained for analysis after removal of duplicates, and initial and full-text screening. Then the number of articles was screened through several stages regarding the planned inclusion criteria and 8 articles met the inclusion criteria.

Figure 1. Flow diagram search database (Haddaway et al., 2022)

RESULT

Population Distribution

Table 2 shows the population distribution in the 8 studies that met the inclusion criteria. Based on playing standards, the population is divided into semi-professionals, professionals, domestic and international players, national teams, and student or college classes. The locations of the studies varied from the European zone (Denmark, Spain, and UEFA Standards), America, the Asia-Oceania zone (Korea and Australia), and Brazil. According to the age levels in the study, they range from U-17 players, U-20 players, College Students, to Seniors. The average age of the players from the youngest is 15.6 years to 27.8 years.

Table 2. Population distribution in the study

Study	Years	Country/Location	Group	Standard/Class	Age
(Panduro et al., 2022)	2022	Denmark	Senior	Semi-Profesional	22.5 ± 4.2 years
(Griffin et al., 2021)	2021	Australia	Senior	Domestic dan Internasional	25.7 ± 3.1 years
(Ramos et al., 2019)	2019	Brazil	U-17, U-20, and Senior	National Team	15.6 ± 0.5, 18.1 ± 0.8, dan 27 ± 4.5 years
(Sausaman et al., 2019)	2019	Amerika	College Student	NCAA	20.6 ± 1.0 years
(Errekagorri et al., 2022)	2022	Spanyol	Senior	Semi-Profesional	24.6 ± 4.0 years
(Choi & Joo, 2022)	2022	Korea	Senior	Profesional	27.8 ± 3.9 years
(Riboli et al., 2024)	2024	Eropa	Senior	Profesional	n/a
(Fernandes et al., 2022)	2022	Portugal	Senior	Profesional	24.6 ± 2.3 years

Sprint Ratio During a Match

The characteristics of sprinting during a match vary, in table 3 you can see a picture of the average sprint distance of players divided by playing position. The Forward position is the position with the highest average total sprint distance, the midfielder position has the middle sprint distance and the smallest is the defender position. Judging from the player's standards, the average sprint distance performed by the player is following the level or standard of play. Then the sprint ratio can also be differentiated based on the match round where players sprint more in the first half of the match.

Table 3. Sprint characteristics of female soccer athletes during a match

Study	Standard	Sprint Characteristic (m)							
		Based on Playing Position				Based on Match Round		Based on level	
		GK	DF	MF	FW	1 st Half	2 nd Half	D	I
(Ramos et al., 2019)	National team	-	198.8	298.5	351.7	-	-	-	-
(Sausaman et al., 2019)	NCAA	-	385	267	633	-	-	-	-
(Griffin et al., 2021)	Domestic dan Internasional	-	-	-	-	-	-	306.3	363.7
(Choi & Joo, 2022)	Profesional	-	56.3 (CB) 117.6 (FB)	51.2	236.2 (WF) 184.3 (CF)	110.2	96.9	-	-
(Panduro et al., 2022)	Semi-Profesional	1	65	124	56	-	-	-	-
(Errekagorri et al., 2022)	Semi-Profesional	-	-	-	-	1463	1205.5	-	-

NB: Goalkeeper (GK), Defender (DF), Midfielder (MF), Forward (FW), Domestik (D), Internasional (I), Fullback (FB), Wing Forward (WF)

Total Distance Covered During the Game

The characteristics of sprinting during a match vary, in table 4 you can see a picture of the average total cruising power of players divided by playing position. The MF position is the position with the highest average total sprint distance, the DF position has the middle sprint distance and the smallest is the FW position. Judging from the player's standards, the average distance travelled by the player is under the level or standard of play. Then the exploration ratio can also be differentiated based on the match round where players explore more of the game area in the first round of the match.

Table 4. Distance covered characteristics of female soccer athletes during a match

Study	Standard	Distance Covered (m)							
		Based on Playing Position				Based on Match Round		Based on level	
		GK	DF	MF	FW	1 st Half	2 nd Half	D	I
(Ramos et al., 2019)	National team	-	10,237.8	10,376.5	9,825.1	-	-	-	-
(Sausaman et al., 2019)	NCAA	-	9039	9536	9882	-	-	-	-
(Griffin et al., 2021)	Domestic dan International	-	-	-	-	-	-	8727.5	9432.5
(Choi & Joo, 2022)	Profesional	-	8800 (CB) 9900 (FB)	10500	9200 (WF) 9200 (CF)	9500	9600	-	-
(Panduro et al., 2022)	Semi-Profesional	-	9274	10572	9745	-	-	-	-
(Errekagorri et al., 2022)	Semi-Profesional	-	-	-	-	15,658.1	14,014.5	-	-

Note: Goalkeeper (GK), Defender (DF), Midfielder (MF), Forward (FW), Domestik (D), Internasional (I), Fullback (FB), Wing Forward (WF)

DISCUSSION

This research was conducted to analyze the activities of female soccer players during matches. Female professional soccer players cover distances of more than 9.5 km and 400 m of high-intensity running per game. The position that covers the furthest movement distance during a match is the Midfielder (MF), and the movement distance for each training intensity varies, depending on the position. This is inconsistent with previous research because it was reported that FW players can reach the furthest distance when running (Dellal et al., 2010, 2011). No significant differences were seen in all scores between the first and second halves of the season, as well as between home and away games. In line with previous research, this review revealed that players competing in international matches demonstrated higher speed and total running distance when compared to players in domestic competitions (Gabbett & Mulvey, 2008).

Soccer players are required to have specific physical demands in each position due to the characteristics of the playing style and tactics used by the team (Abbott et al., 2018). In the current research, the position that covers the furthest distance in a match is MF, and vice versa for the Central Back (CB) position. The position that covers the furthest distance in a match is midfield, followed by the defensive and attacking positions (Vigne et al., 2010). The midfielder moves the furthest during the game, which is closely related to the activity area on the pitch in the MF position. MF is actively involved in both attacking and defensive situations compared to other positions. CBs performed the shortest cover during the match, which is also related to their tactical movement patterns. During the 5-minute peak period, CBs typically have the least total distance (TD) (Harkness-Armstrong et al., 2021; Trewin et al., 2018). The CB's main role is to play and block opposing attackers rather than taking part in the attack. Therefore, CB requires less activity in attacking situations compared to other positions.

Then among playing standards, college players cover the highest relative TD (Benjamin et al., 2020; Bozzini

et al., 2020; Wells et al., 2015), while senior international players cover more TD (Meylan et al., 2017), than senior domestic players (Julian et al., 2021; Romero-Moraleda et al., 2021), and young players cover relative TD smallest. Regarding the tactical dimension, it should be noted that although there is an increasing trend in the first part and a decreasing trend in the second part, there are no significant differences in the average values of the match period in any of the tactical variables. The team showed an increase in defensive width, length and height values from the start of the match to the break. In the second half, teams tended to play more compactly and compactly at a defensive level that got closer to their goal as the match progressed. One understanding is related to the superiority demonstrated by a team throughout the season, which on many occasions, took the lead in the final part of the match, causing the opponent to take the initiative in the match. The rivals, in particular, but also the situational variables, are part of the activity of playing a football match (Carling, 2013; Castellano et al., 2022).

Generally, higher win rates in football are observed during home games due to home advantage (Pollard & Pollard, 2005). Players can cover more running distance and high-intensity training during home games than away games due to the familiar stadium environment and support from fans. Since participating teams usually dominate matches with a higher level of ball possession compared to opposing teams, not only in home matches but also in the unfamiliar environment of away matches, match activity will not differ significantly between home and away matches in this study. However, in this study, there were no differences in all the variables measured, including the total distance in home and away matches. Previous research has shown that the amount of movement (>14.4 km/h) in a winning situation during a match is less than in a draw situation (Buchheit et al., 2018).

It has been demonstrated that the physical demands of women's soccer increase linearly as the standard of the game progresses from youth to college and beyond college to professional and international levels (Andersson Helena Åand Randers et al., 2010; Krustup et al., 2005; Mohr et al., 2008; Vescovi & Favero, 2014). The need to improve football-specific fitness components to improve players across standards is apparent. Intermittent endurance training and the ability to sprint repeatedly are highly correlated with match performance, especially with the ability to perform high-intensity work, the assessment of which players often use field tests and the implementation of training strategies aimed at improving these components of fitness (e.g., prescribing training high-intensity intervals) is highly recommended. If intensity management is unbalanced, players may experience an increased risk of injury, decreased aerobic capacity, and reduced performance (Silva et al., 2016). Exposure to high workloads has a real possibility of resulting in non-functional overreaching or overtraining (Banister & Calvert, 1980; Cunanan et al., 2018), possibly increasing the risk of overtraining injuries (Gabbett & Jenkins, 2011). Also importantly, rapid and repeated decelerations after sprinting can be one of the main causes of post-competition muscle damage (Howatson & Milak, 2009).

This analysis or review has several practical applications. In practice, coaches and sports scientists can utilize the most demanding sections determined during official matches as a reference for training prescriptions and performance development during daily routines on the field. The results of the current study show that female professional soccer players cover long distances and perform high-intensity training like male players and that there are differences in movement patterns for each position. Therefore, to improve the performance of female soccer players and prevent injuries, it is necessary to develop training programs that take into account the characteristics of each player and playing position.

This review has presented the overall limitations of the study, and caution is needed when interpreting the results or informing practical applications. For example, this review has identified key methodological limitations in the literature that limit comparisons between studies, including; single team samples; and different data collection methods; and there are no standard speeds and acceleration/deceleration thresholds. The heterogeneity of the sample of included studies precluded the inclusion of the meta-analysis in the current systematic review. Given the large current of existing reviews summarizing all the characteristics of sprinting and cruising during a match, across the standards of the women's football game, there are very mixed and perhaps exaggerated results. However, given the growth, development and recent investment in women's football, the author strongly believes that there is an appropriate need at the time of this review to gather all the current evidence regarding the characteristics of the women's game and provide practitioners with an important resource with which to develop information evidence of practice in a female soccer population.

CONCLUSION

Quantifying and understanding sprint and distance covered characteristics in match-play is important to inform practice across the female soccer population. Furthermore, this review provides critical evidence-based resources that can be used to inform population-specific practices across the standard areas of the women's game of football. Additionally, further evidence is needed regarding contextual factors in match play, to understand how the characteristics players encounter during match play vary. Future research might also seek to improve our understanding of match-to-match variation within the female soccer population.

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Primljen: 08. mart 2024. / Received: March 08, 2024
Prihvaćen: 18. mart 2024. / Accepted: March 08, 2024



ANALYSIS OF ONE-HOLE GAME TOOLS IN DEVELOPING FINE MOTOR SKILLS IN EARLY CHILDHOOD

SUSANTO SUSANTO¹, HENDRA SETYAWAN², JOSÉ VICENTE GARCÍA-JIMÉNEZ³, RATKO PAVLOVIC⁴, AGNIESZKA MAGDALENA NOWAK⁵, NUGROHO SUSANTO⁶

¹State Islamic University Sayyid Ali Rahmatullah Tulungagung, Tulungagung, Indonesia

²Department of Primary School Physical Education, Faculty of Sport and Health Sciences, Universitas Negeri Yogyakarta (UNY), Indonesia

³Department of Music, Artistic and Physical Education, Faculty of Education, University of Murcia, Spain

⁴Faculty of Physical Education and Sport, University of East Sarajevo, Bosnia and Herzegovina

⁵Faculty of Rehabilitation, Josef Pilsudski University of Physical Education in Warsaw, Poland

⁶Department of Sport Science, Faculty of Sport Science, Padang State University (UNP), Indonesia

Correspondence:

Nugroho Susanto, Department of Sport Science, Faculty of Sport Science, Padang State University (UNP), Indonesia
nugrohosusanto@fik.unp.ac.id

Abstract: *One of the child's fine motor development is influenced by the use of educational games. There are many types of educational games used in stimulating children's fine motor development. But unfortunately in educational institutions, activities that can stimulate children's fine motor development are still not optimal, in this case educative game media facilities are still lacking. So that children's fine motor development is still lacking. This study aims to determine how influential the use of educational game tools with the type of one-hole game is on the fine motor development of preschool children. This study used a quasi experiment design with a pretest and posttest design. The sampling technique used total sampling of 25 children with details of 15 girls and 10 boys and aged 4 years to 6 years. Data collection methods using questionnaires and observation. Assessment using the DENVER II instrument sheet taken from the fine motor measurement aspects. Data analysis used was paired sample t-test 2 samples. The results of the study prove that there is an effect of educational game intervention of one hole game type on fine motor development of preschool children. Based on the results of this study that to stimulate children's fine motor development, it is necessary to increase the frequency of one-hole games.*

Keywords: *Fine motor, Learning media, Accuracy.*

INTRODUCTION

The world of children cannot be separated from playing activities, it makes children more selective in choosing various types of play activities. In line with the opinion of Pratiwi (2017) the world of children is the world of play. This is of course we understand that children are not easily tired when they are playing, this is in accordance with the energy surplus theory that we know. Energy surplus theory itself is one of the theories that reveals that children have excess energy, with the excess energy used by children for play activities (Muslihin, 2020). In addition, with a variety of motion experiences for children through play activities, it can help in the process of bone density. The purpose of early childhood play cannot be separated from the psychological aspect, where by playing children can train emotional restraint, self-confidence, responsibility and various other characters (Susanto et al., 2021).

Various types and kinds of games today have sprung up even to viral in various media, in addition, the lato-lato game fever is not only loved by children but also adults like the game that is currently viral. According to Mayesty, play is an activity that children do all day, because for children play is life and life is for play. In addition, playing through traditional games can stimulate children's character and critical thinking (Susanto et al., 2022). One of the games that is currently viral is the lato-lato game, this game has a very high hypnotic power, because it is very interesting and makes many people challenged to try to play it. Lato-lato itself relies on stable fingers and balance in order to maintain the rhythm of the collision of two plastic balls.

The game is useful in training fine motor skills, and not only that, it can also entertain the mood. But behind the benefits themselves we hear and see in various media, that the lato-lato game itself if it is less wise in playing it causes various kinds of injuries to the person playing it as an example of injury to the face area, injury to the head area and injury to the hands. Indeed, games for children must of course meet the rules of safety in playing the aim is

to minimize the risk of injury by means of, such as the use of good safety equipment, materials or tools used in the game are not pointed, and always follow the rules of play.

Fine motor is the process of contraction of small muscles as a result of the activity of the body in motion. Fine motor is a movement skill that involves small muscles consisting of coordinated eye and hand coordination in a balanced manner (Sutini et al., 2018). In addition, fine motor is a movement that involves certain parts and performs small muscle movements (Primayana, K. H. 2020). One part of the fine muscles that need to be trained is the fingers. This requires media or tools as training in stimulating these fine muscles. Elizabeth Hurlock (1950), mentions several reasons for the function of motor development in the constellation of personal development: First, motor skills keep children entertained and give them a feeling of joy. Throwing and catching balls, playing one hole games, and using other tools.

One of the media needed is by making a game tool that can provide benefits to train fine motor skills, especially in children. As for other benefits of fine motor training on children's fingers, among others, first, it can train hand coordination. Second, fingers are easily adapted from activities that require fingers such as writing, cutting. Third, it is not easy to get tired when doing activities using fingers. By training fine motor skills in early childhood, it aims to develop children's fine motor skills (Robingatin et al., 2022). According to Endang Rini Sukamti (2015: 15) that motor development is a golden process or movement that directly involves the muscles to move and the innervation process that becomes a person able to move his body. According to Beaty (2011: 55), fine motor development in children is the child's ability to show and obtain muscle movements in the form of coordination, dexterity, and dexterity in the use of hands and fingers.

Educational games need to be introduced to preschool children, this can improve children's cognition (Veronica, N. 2018). Educational games are games that have educational elements, therefore it is necessary to make a game that can accommodate the development and growth of children (Aprilianto, A., & Mariana, W. (2018). Thus, making educational games does not have to be at a high cost, in this case we can make a game that utilizes household waste materials to be used as educational games.

Leftover building materials are often found at home as an example of plywood and wood boards. Leftover materials are materials that come from items that are no longer used (Nurhafizah, 2018). Not used anymore (Nurhafizah, 2018). Thus, these leftover items can be utilized to make various kinds of useful items, one of which is by making play tools for children. The making of this game tool aims to train fine motor skills, especially on the fingers. This game by the author himself is named one hole game, which man equipment needed in playing consists of a rectangular board with a size of 40x45 cm, and colorful plastic coin seeds with a diameter of 2 cm. The following one hole game is shown in Figure 1.

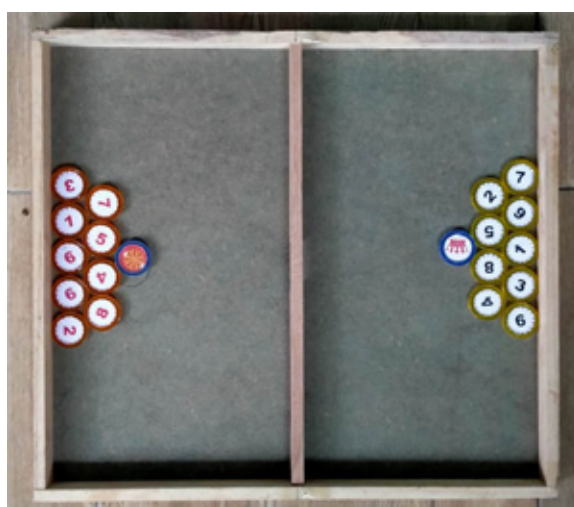


Figure 1: One Hole Game Board

The reason this game is called 'one hole game' is because this game is characterized by only one hole to insert coins. Therefore, the author wants to know how much influence one-hole games have in improving fine motor skills in early childhood, especially fine motor skills of the fingers.

METHOD

This study used a quasi-experimental research design using a pretest and posttest design. To measure the pretest and posttest using the t test where the dependent sample t test is used to see if there is an effect of pretest and posttest on the intervention group given the one hole game. The population in this study were 25 preschool-age children in Clering Jepara Indonesia. the sampling method used saturated samples or total sampling. According to Sugiyono, (2016: 85) the method of determining saturated samples or total sampling is a sampling technique when all members of the population are used as samples. The samples in this study were preschool children who met the inclusion criteria. With details of 15 girls and 10 boys so the total sample of 25 children, and ages between 4 years and 6 years. The study was conducted for 1 (one) month, the assessment used a biodata questionnaire sheet of preschool children, an instrument to see the fine motor development of preschool children modified fine motor aspects (Denver II is a major revision of the re-standardization of the Denver Development Screening Test (DDST) and the Revised Denver Developmental Screening Test (DDST-R). DDST is one of the screening methods for child developmental abnormalities and the time required is between 15 - 20 minutes) and the procedure for using the educational game tool one hole game. After the data is collected, it is then analyzed using the normality test, after the data is declared normal, it is continued with the bivariate paired sample t test.

RESULT

1. The average fine motor development of children before and after being given educational games of one hole game.

Table 1. Average results of Pretest and Posttest of fine motor development after being given the one-hole game

Variabel	Mean (Average)	SD (Standard Deviation)	Minimal-Maksimal	95%CI (The range of values that there is an average difference)
Pretest	3.35	0.493	3-4	3.10-3.61
Posttest	1.88	0.600	1-3	1.57-2.19

Based on table 1. by paying attention to the results of the distribution of values on the pretest of educational game intervention type one hole game, the pretest average is 3.35, (95% CI = 3.10-3.61) with SD 0.493, the lowest score value is 3 and the highest is 4. From the results of the interval estimation, it is concluded that 95% is believed that the average pretest of children's fine motor development with the one hole game educational game intervention group is between 3.10 and 3.61. While the results of the distribution of values on the posttest after the intervention of educational games of the one hole game type obtained an average of 1.88, (95% CI = 1.57-2.19) with SD 0.600, the lowest score value is 1 and the highest is 3. From the results of the interval estimation it is concluded that 95% is believed that the average posttest of children's fine motor development with the intervention group of educational games of one hole game is between 1.57 to 2.19. From the results of the interval estimation, it was concluded that 95% believed that the difference in the average increase in children's fine motor development before and after the intervention of educational games of the one hole game type was between 1.53 and 1.42.

2. Analysis of the effect of using educational game tools one hole game on fine motor development of preschool children.

Table 2. Results of the effect of using one hole game tools on fine motor development

Variabel	Mean (Average)	SD (Standard Deviation)	SE	P value	N
Pretest	3.35	0.493	0.119	0.0001	25
Posttest	1.88	0.600	0.146	0.0001	25

Based on table 2. shows that the average fine motor development before the one hole game or pretest is 3.35 with a standard deviation of 0.493. After the one hole game or posttest, the average fine motor development was 1.88

with a standard deviation of 0.600. It can be seen that the mean difference between pretest and posttest is 1.47 with a standard deviation of 0.624. The statistical test results obtained a value of $p = 0.0001$, it can be concluded that there is a significant difference in the average fine motor development before and after the one hole game.

DISCUSSION

The results showed that in the one hole game intervention group before being given the intervention of educational games of the one hole game type, namely with an average value of 3.35. While after being given the intervention of educational games of the one hole game type, the average value is 1.88. From the results of the interval estimation, it is concluded that 95% is believed that the average change in children's fine motor development before the intervention of educational games of the one hole game type is between 3.10 to 3.61. Then from the results of the interval estimation it is concluded that 95% is believed that the average fine motor development of children after the intervention of the type of one hole game is between 1.57 to 2.19. So it can be seen that the difference in the average increase in fine motor development before and after the intervention of educational games of the one hole game type is between 1.53 to 1.42. From the results of the study, it was found that 25 people in the one hole game intervention group consisted of 11 boys and 14 girls, it was found that most of the children before being given educational games of the one hole game type, their fine motor skills were moderate, namely 11 respondents (64.7%), the rest were 6 (35.3%) respondents had low fine motor development. Then after the intervention of educational games of the one hole game type, it was found that most of the fine motor children were in the high criteria, namely 11 (64.7%) respondents, then children with very high fine motor development were 4 (23.5) respondents and the rest were 2 (11.8%) respondents who had moderate fine motor development.

One hole games are a form of play that is highly regarded as a medium that can help develop fine motor skills and with coordination between hands and eyes, arranging one hole games into the shape of an animal, plane, ship and so on. One hole game is one type of educational game tool that is interesting to introduce to pre-school children. In line with the results of this study, that playing one hole games can stimulate or improve children's fine motor skills. Playing one hole game is an activity where children play a game of inserting coins in one hole towards the opponent's area. In inserting coins one hole game involves or relates to the small muscles of the child, especially the hands and fingers. Through the activity of playing one hole game, without realizing it, children will actively learn to use their fingers to arrange the right picture and this can unconsciously train eye and hand coordination well so that it can stimulate children's fine motor skills. The results of this study are in line with the results of Pramono's (2008) research on the effectiveness of educational game tools of the type one hole game on fine motor development in children aged 4-5 years, stating that there is an effect of educational games one hole game on fine motor skills of children aged 4-5 years.

CONCLUSION

The results of the research Media one hole game is highly recommended for use in PAUD (Early Childhood Education) schools, because the media game one hole game is one form of game that has educational values. In the one hole game requires accuracy, children are trained to insert coins or pins into one hole, because this activity children must concentrate when inserting coins or pins into the hole using their fingers to enter the opponent's area. By playing the one hole game, children learn to understand the concepts of fine motor, accuracy and addition. Of course, the shape of the pins used in the one hole game is more diverse and has more striking colors.

Acknowledgments

We are grateful to Clering Pre-School for granting permission.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Primljen: 22. decembar 2023. / Received: December 22, 2023

Izmjene primljene: 15. februar 2024. / Changes Received: February 15, 2024

Prihvaćen: 18. februar 2024/ Accepted: February 18, 2024



ATTITUDE OF TAEKWONDO COACHES TOWARDS COACHING WORK AND PEDAGOGICAL COMPETENCE

ODNOS TEKVONDO TRENERA PREMA TREnersKOM RADU I PEDAGOŠKOJ KOMPETENTNOSTI

JOVANA NJEGOVAN¹, DRAŽENKO JORGIĆ²

¹JU Elementary School "Branko Ćopić", Prnjavor, Bosnia and Herzegovina

¹JU OS „Branko Ćopić“, Prnjavor, Bosna i Hercegovina

²University of Banja Luka, Faculty of Philosophy, Banja Luka, Bosnia and Herzegovina

²Univerzitet u Banjoj Luci, Filozofski fakultet Banja Luka, Bosna i Hercegovina

Correspondence:

Jovana Njegovan

JU Elementary School "Branko Ćopić", Prnjavor, Bosnia and Herzegovina
njegan.j@gmail.com

Korespondencija:

Jovana Njegovan

JU OŠ „Branko Ćopić“, Prnjavor, Bosna i Hercegovina
njegovan.j@gmail.com

Abstract: The goal of this research was to examine the deeper meaning of the answers of taekwondo coaches about coaching work and pedagogical competence. The research sample was represented by 10 coaches of the Taekwondo Federation of Bosnia and Herzegovina. For this purpose, a qualitative research, in-depth interview technique, was carried out. In accordance with the specific research questions and qualitative coding methods, four areas and 11 categories with corresponding dimensions were separated in the final version of the code tree. Separated areas are attitude towards sportsmen who experience defeat, praise to sportsmen, forms of sportsmen's motivation and coach's attitude towards sportsmen with regard to the age and gender of sportsmen. Based on the responses of taekwondo coaches, it was found out that most coaches are dedicated to coaching work and that they recognize the importance of developing pedagogical competencies in coaching work.

Keywords: pedagogical ability, coaching qualification, beliefs of sports pedagogues.

Sažetak: Cilj ovog istraživanja bio je ispitivanje dubljeg značenja odgovora tekvondo trenera o trenerskom radu i pedagoškoj kompetentnosti. Uzorak istraživanja predstavljalo je 10 trenera Tekvondo saveza Bosne i Hercegovine. U tu svrhu realizovano je kvalitativno istraživanje, tehnika dubinskog intervjua. U skladu sa specifičnim istraživačkim pitanjima i kvalitativne metode kodiranja u finalnoj verziji kodnog stabla izdvojena su četiri područja i 11 kategorija sa pripadajućim dimenzijama. Izdvojena područja su: odnos prema sportistima koji doživljavaju poraz, pohvale sportistima, oblici motivacije sportista i odnos trenera prema sportistima s obzirom na uzrast i pol sportista. Na osnovu odgovora tekvondo trenera došlo se do saznanja da je većinski dio trenera posvećen trenerskom radu i da prepoznaju značaj razvijenosti pedagoških kompetencija u trenerskom radu.

Ključne riječi: pedagoška sposobnost, trenerska kvalifikovanost, uvjerenja sportskih pedagoga.

INTRODUCTION

Basic personnel in sports and bearers of sports training are coaches (Milanović et al., 2010). Playing sports, whether professional or recreational, is important for all people because sports activity is a predictor for a healthy life (Torbarina, 2011). When we talk about pedagogical competences, we can say that they refer to various types of abilities that a pedagogue, i.e. a sports coach, must possess in his work with children (Kostović - Vranješ & Ljubetić, 2008). Lepir (2021) states that the role of a sports coach has evolved over time and that it is more appropriate to speak of a coach as a sports pedagogue. A sports pedagogue car-

Uvod

Osnovni kadrovi u sportu i nosioci sportske pripreme su treneri (Milanović i sar., 2010). Bavljenje sportom, bilo profesionalno ili rekreativno od značaja je za sve ljude jer je sportska aktivnost prediktor za zdrav život (Torbarina, 2011). Kada govorimo o pedagoškim kompetencijama možemo reći da se one odnose na razne vrste sposobnosti koju pedagog tj. sportski trener mora da posjeduje u svome radu sa djecom (Kostović – Vranješ i Ljubetić, 2008). Lepir (2021) navodi da se uloga sportskog trenera vremenom evoluirala i da je primjerenije govoriti o treneru kao sportskom pedagogu. Sport-

ries with him many responsibilities which, according to Lepir (2021), completely go beyond sports competences.

A coach who possesses competencies in various aspects of pedagogical activity, a coach who thinks critically about himself and his training practice, and who changes and improves his behavior and creates a stimulating environment in the club, can expect that the sporting successes of young athletes will be at a high level (Grk, 2010). A good coach is not one who imitates reputable coaches, but one who knows and takes care of the characteristics of his team and develops a positive and warm atmosphere in the sports collective (Jovanović, 2015). It is learned that the role of the coach is of key importance for the overall psycho-physical development of the athlete and his achieved sports results. If the training process is repeated continuously and long enough (several months and years), there is a permanent strengthening of the defense function of the immune system (Booth, 2014).

The aim of this research is to describe and understand the way of coaching work and the development of pedagogical competences of taekwondo coaches. To realize the goal, we started from the fundamental research question: How do you treat athletes when they experience defeat? Based on the basic research question, specific research questions were derived: a) How often do you give praise to athletes? b) How do you motivate athletes? c) Is there a difference in your relationship based on the age of the athletes (younger/older athletes)? If there is, explain the difference! č) Is there a difference in your behavior in relation to the gender of the athlete (male/female)? If there is, explain the difference!

METHOD

Qualitative research was conducted at the work. In this way, data were obtained that are based on the personal opinions and attitude of taekwondo coaches towards coaching work and pedagogical competence. Through qualitative analysis, which entails in-depth description and interpretation of the investigated phenomenon, the experiences of the participants are arrived at, which reflect their perception of reality and the way they face it (Milas, 2009). The technique used in this research is an in-depth interview that has a high degree of spontaneity.

The goal of an in-depth interview is to get to know and understand the social reality, identify shortcomings, and understand the way people think or feel (Halmi, 2005). In this research, an in-depth interview was conducted as a type of individual conversation, i.e. individually with each of the deliberately chosen taekwondo coaches.

ski pedagog nosi sa sobom mnoge odgovornosti koje po mišljenju Lepira (2021) u potpunosti prevazilazi sportske kompetencije.

Trener koji posjeduje kompetencije u različitim aspektima pedagoškog djelovanja, trener koji kritički razmišlja o sebi i svojoj trenažnoj praksi, te mijenja i unapređuje svoja ponašanja i stvara podsticajno okruženje u klubu, može očekivati da će sportski uspjesi mladih sportista biti na visokom nivou (Grk, 2010). Dobar trener nije onaj koji imitira ugledne trenere, nego onaj koji poznaje i vodi računa o karakteristikama svoje ekipe i razvija pozitivnu i toplu atmosferu u sportskom kolektivu (Jovanović, 2015). Dolazi se do saznanja da je uloga trenera od ključnog značaja za cjelokupan psiho-fizički razvoj sportiste i njegove ostavarene sportske rezultate. Ukoliko se trenažni proces kontinuirano ponavlja i dovoljno dugo (više mjeseci i godina), dolazi do trajnog jačanja obrambene funkcije imunološkog sistema (Booth, 2014).

Cilj ovog istraživanja jeste opisati i razumijeti način trenerskog rada i razvijenost pedagoških kompetencija tekvondo trenera. Kako bi se cilj realizovao krenulo se od temeljnog istraživačkog pitanja: Kako se odnosite prema sportistima kada dožive poraz? Na osnovu temeljnog istraživačkog pitanja izvedena su specifična istraživačka pitanja: a) Koliko često pružate pohvale sportistima? b) Kako motivišete sportiste? c) Postoji li razlika u Vašem odnosu na osnovu uzrasta sportista (mlađi/stariji sportisti)? Ako postoji objasnite razliku! č) Postoji li razlika u Vašem ponašanju u odnosu pol sportiste (muško/žensko)? Ako postoji objasnite razliku!

METOD

U radu je sprovedeno kvalitativno istraživanje. Na taj način dobijeni su podaci koji su zasnovani na ličnim mišljenjima i odnosu tekvondo trenera prema trenerskom radu i pedagoškoj kompetentnosti. Putem kvalitativne analize koja podrazumijeva dubinsko opisivanje i tumačenje istraživane pojave, dolazi se do iskustava učesnika koja odražavaju njihovo viđenje stvarnosti i načina na koji se suočavaju sa njom (Milas, 2009). Tehnika koje se primjenjivala u ovom istraživanju je dubinski intervju koji ima visok stepen spontanosti.

Cilj dubinskog intevjua je upoznavanje i razumijevanje socijalne stvarnosti, utvrđivanje nedostataka i razumijevanje načina na koji ljudi razmišljaju ili osjećaju (Halmi, 2005). U ovom istraživanju dubinski intervju bio je sproveden kao vid individualnog razgovora, odnosno pojedinačno sa svakim od namjerno izabраниh tekvondo trenera.

A sample of respondents

The sample of this research was chosen from the population of taekwondo trainers in Bosnia and Herzegovina. The sample consists of a total of 10 coaches (men) out of 155 licensed taekwondo coaches. The average age of coaches is 41 years, while the length of coaching work ranges from 6 to 30 years.

INSTRUMENT

The "PIT" interview protocol for coaches is intended for individual and indirect examination of the opinions and attitudes of taekwondo coaches towards coaching work and the development of personal pedagogical competences. The protocol is composed of 6 previously defined research questions. The obtained data were processed through multiple recursive analysis (Braun and Clarke, 2006). This data analysis includes the following stages: 1. transcription, 2. coding, 3. analysis, 4. conclusion and 5. report writing.

RESULTS AND DISCUSSION

A code tree with associated areas, categories and dimensions was built using the qualitative coding method. In the final version of the code tree, four areas and 11 categories with corresponding dimensions are defined.

Uzorak ispitanika

Uzorak ovog istraživanja izabran je iz populacije tekvondo trenera Bosne i Hercegovine. Uzorak čini ukupno 10 trenera (muškaraca) od 155 licenciranih tekvondo trenera. Prosječna starost trenera je 41 godina, dok dužina trenerskog rada iznosi od 6 do 30 godina.

INSTRUMENT

Protokol intervjuja za trenere „PIT“ namijenjen je za individualno i indirektno ispitivanje mišljenja i odnosu tekvondo trenera prema trenerskom radu i razvijenosti ličnih pedagoških komepetencija. Protokol je sastavljen od 6 prethodno definisanih istraživačkih pitanja. Dobijeni podaci obrađeni su kroz višestruku rekurzivnu analizu (Braun and Clarke, 2006). Ova analiza podataka obuhvata sljedeće faze: 1. transkripciju, 2. kodiranje, 3. analizu, 4. zaključivanje i 5. pisanje izvještaja.

REZULTATI I DISKUSIJA

Kvalitativnom metodom kodiranja izgrađeno je kodno stablo sa pripadajućim područjima, kategorijama i dimenzijama. U finalnoj verziji kodnog stabla definisana su četiri područja i 11 kategorija sa pripadajućim dimenzijama.

Table 1. Code tree - The attitude of taekwondo coaches towards coaching work, pedagogical competence, and motivation for permanent education

AREAS	CATEGORIES	DIMENSIONS
1. Attitude towards sportsmen who experience defeat	1. Providing support sportsites 2. Pointing to mistakes of athletes 3. Organization more strenuous and additional training for athletes	<ul style="list-style-type: none"> • Coach as support • Complimenting sportsmen for their hard work and combativeness • Presenting constructive criticism to the athlete • Not accepting the athlete's efforts in case he is defeated
2. Praise to the athletes	4. Praise for effort, progress i discipline 5. Compliments addressed only to winners 6. Continuous praises	<ul style="list-style-type: none"> • Praise as a means of motivating the athlete for progress and raising self-confidence • Only the best athletes deserve praise • Continuous praise with the aim of immediate satisfaction of children and parents
3. Forms of sportsmen's motivation	7. Intrinsic motives as means motivation sportsman 8. Extrinsic motives as means motivation sportsman	<ul style="list-style-type: none"> • Transmitting love for sports and a healthy lifestyle • Motivating athletes through praise, advice and constructive criticism • Motivating older athletes by transferring responsibility • Motivating athletes through the organization of joint trips and socializing • Motivational means of every athlete: medals, trophies, plaque or cash prizes
4. The coach's attitude towards the athletes with regard to the age and gender of the athletes	9. Clear difference with regard to gender athletes 10. There is no difference in relative to gender athletes 11. Clear difference in relative to age athletes	<ul style="list-style-type: none"> • A gentler and more careful attitude towards girls • There is no gender difference in combat sports • Establishing a precise difference in relation to age

Tabela 1. Kodno stablo – Odnos tekvondo trenera prema trenerskom radu, pedagoškoj kompetentnosti i motivaciji za permanentnim obrazovanjem

PODRUČJA	KATEGORIJE	DIMENZIJE
1. Odnos prema sportistima koji doživljavaju poraz	1. Pružanje podrške sportsitima 2. Ukazivanje na greške sportistima 3. Organizacija napornijih i dodatnih treninga sportistima	<ul style="list-style-type: none"> • Trener kao podrška • Pružanje pohvale sportistima za trud i borbenost • Izlaganje konstruktivnih kritika sportisti • Neprihvatanje truda sportiste u slučaju da je poražen
2. Pohvale sportistima	4. Pohvale za trud, napredak i disciplinu 5. Pohvale upućene samo pobjednicima 6. Kontinuirane pohvale	<ul style="list-style-type: none"> • Pohvala kao sredstvo motivisanja sportiste za napredak i podizanja samopouzdanja • Samo najbolji sportisti zaslužuju pohvale • Kontinuirane pohvale s ciljem trenutnog zadovoljstva djece i roditelja
3. Oblici motivacije sportista	7. Intrinzični motivi kao sredstvo motivisanja sportista 8. Ektrinzični motivi kao sredstvo motivisanja sportista	<ul style="list-style-type: none"> • Prenošnje ljubavi prema sportu i zdravom načinu života • Motivisanje sportista kroz pohvale, savjete i konstruktivne kritike • Motivisanje starijih sportista kroz prenošenje odgovornosti • Motivisanje sportista kroz organizaciju zajedničkih putovanja i druženja • Motivaciona sredstva svakog sportiste: medalje, pehari, plaket ili novčane nagrade
4. Odnos trenera prema sportistima s obzirom na uzrast i pol sportista	9. Jasna razlika s obzirom na pol sportiste 10. Nema razlike u odnosu na pol sportiste 11. Jasna razlika u odnosu na uzrast sportiste	<ul style="list-style-type: none"> • Nježniji i oprezniji odnos prema devojkicama • U borbilačkim sportovima ne postoji razlika u odnosu na pol • Postavljanje precizne razlike u odnosu na uzrast

In accordance with the specific research questions and the qualitative method of coding, the defined areas, categories, and dimensions of the taekwondo coach's relationship with coaching work and pedagogical competence are tabulated.

1. Attitude towards sportsmen who experience defeat

The first area in this research is the attitude towards sportsmen who experience defeat. Based on the answers of 10 taekwondo coaches of the defined area, the following categories were selected:

Providing support to sportsites

Through a logical analysis of the answers received, all 10 coaches state that they provide some form of support to athletes after a defeat. The coach must be aware that his attitude and attitude towards the team is more important than the attitude of any individual because his main function is teaching and leadership (Nović & Čančarević, 2015).

[T1] "It depends on the athlete himself. Sometimes it is enough to hug the child, to tell him that he was fine. Sometimes it's best to let the competitor cool down and point out mistakes later."

U skladu sa specifičnim istraživačkim pitanjima i kvalitativnom metodom kodiranja tabelarno su prikazana definisana područja, kategorije i dimenzije odnosa tekvondo trenera o trenerskom radu i pedagoškoj kompetentnosti.

1. Odnos prema sportistima koji doživljavaju poraz

Prvo područje u ovome istraživanju je odnos prema sportistima koji doživljavaju poraz. Na osnovu odgovora 10 tekvondo trenera definisanog područja izdvojene su sljedeće kategorije:

Pružanje podrške sportsitima

Kroz logičku analizu dobijenih odgovora svih 10 trenera navodi da sportistima nakon poraza pružaju neki vid podrške. Trener mora biti svjestan da je njegov stav i odnos prema ekipi važniji od stava bilo kojeg pojedinca jer je njegova glavna funkcija podučavanje i vođstvo (Nović i Čančarević, 2015).

[T1] „Zavisio od samog sportiste. Neka je dijete dovoljno zagrliti, reći mu da je bilo dobro. Neka je najbolje pustiti takmičara da se ohladi, a kasnije ukazati na greške.”

O'Neil conducted research on the value of emotional intelligence in elite sports and creating an emotional bond between coaches and athletes as much as possible. Empathy and support is useful in many ways for the motivation of athletes, the progress of athletes and the establishment of a healthy social environment. For coaches who spread a positive emotional atmosphere and understand the moods of athletes, the author believes that they can achieve effective sports activity (O'Neil, 2011).

Pointing out mistakes to athletes

In the answers received, all coaches stated that they point out mistakes to athletes after a defeat.

[T4]: Competitors must be aware of mistakes made. Through work and persistence, I can improve my technique.”

[T8]: “Defeat is an integral part of sport. They have to learn to deal with failure.”

In communication, it often happens that the participants misunderstand each other, so the coach must take care of the way of communication with the athlete (Knjaz et al., 2010).

Organization of harder and additional training for athletes

Out of the total sample of taekwondo coaches examined, two coaches stated that they organize harder and additional training for athletes who experience defeat in the competition.

[T2] “If he lost the fight, he didn't train enough. Harder training awaits them”.

Although the intensity of training should be adjusted to the capabilities and abilities of the athlete himself, additional training in this case may represent a form of punishment for athletes and not a means of advancement.

2. Praise to the athletes

Another determined area refers to the provision of praise to sportsmen. In this area, taekwondo coaches have given various answers, which in some cases coincide but also differ completely. The defined categories of this area are:

Praise for effort, progress and discipline

Through the analysis of the responses, it was observed that the coaches praise the athletes for their progress and discipline. Out of 10 coaches, three coaches point out that in the process of giving praise to athletes, it is important that the praise be realistic and given at an adequate time, without exaggeration.

[T1] “I give praise when athletes deserve it. When I see effort, persistence, progress...”

[T7] “I try to be moderate and realistic in praise”.

O'Neil je sproveo istraživanje o vrijednostima emocionalne inteligencije u vrhunskom sportu i stvaranju emocionalne veze između trenera i sportista što se može. Empatija i podrška je višestruko korisna za motivaciju sportista, napredak sportiste i uspostavljanja zdravog socijalnog okruženja. Za trenere koji šire pozitivnu emocionalnu atmosferu i razumiju raspoloženja sportista autor smatra da mogu da ostvare učinkovitu sportsku aktivnost (O'Neil, 2011).

Ukazivanje na greške sportistima

U dobijenim odgovorima svi treneri su naveli da sportistima nakon poraza ukazuju na greške.

[T4]: Takmičari moraju biti svjesni napravljenih grešaka. Kroz rad i upornost mogu poboljšati svoju tehniku.”

[T8]: „Poraz je sastavni dio sporta. Moraju naučiti da se nose sa neuspjehom.”

U komunikaciji se često događa da se učesnici krivo razumiju zato trener mora voditi računa o načinu komunikacije sa sportistom (Knjaz i sar., 2010).

Organizacija napornijih i dodatnih treninga sportistima

Od ukupnog uzorka ispitanih tekvondo trenera, dva trenera su navela da za sportiste koji dožive poraz na takmičenju organizuju napornije i dodatne treninge.

[T2] „Ako je izgubio borbu nije dovoljno trenirao. Čekaju ih naporniji treninzi”.

Iako bi se intenzitet treninga trebao uskladiti sa mogućnostima i sposobnostima samog sportiste, dodatni treninzi u ovom slučaju za sportiste mogu predstavljati vid kazne i ne predstavljati sredstvo za napredovanje.

2. Pohvale sportistima

Drugo determinisano područje se odnosi na pružanje pohvale sportistima. U ovome području tekvondo treneri su dali raznovrsne odgovore koji se u pojedinim slučajevima poklapaju ali i u potpunosti razlikuju. Definisane kategorije ovoga područja su:

Pohvale za trud, napredak i disciplinu

Kroz analizu odgovora uočeno je da treneri sportiste pohvaljuju za napredak i disciplinu. Od 10 trenera tri trenera ističu da je u procesu pružanja pohvale sportistima važno da pohvala bude realna i pružena u adekvatno vrijeme, bez pretjerivanja.

[T1] „Pohvale pružam kada su sportisti to zaslužili. Kada uočim trud, upornost, napredak...”

[T7] „Trudim se da budem umjeren i realan u po-

Through the encouragement of young sportsmen and recognition for the effort and work invested, the true happiness of sportsmen during training is created (Juul, 2013).

Compliments addressed only to the winners

Out of 10 coaches, one coach points out that he praises athletes only if they emerge from the fight as winners.

[T2] “They are praised when they win, but I know that I can always do better.”

Continuous praise

During the logical analysis of the answers, it was observed that two coaches continuously praised the athletes.

[T3] “Always, even when they are not the best, it is important to praise children and boost their confidence.”

[T6] “Constantly, both children and parents love it.”

In the answer of coach six, it can be said that praise is partly used for manipulative purposes, which can certainly leave negative consequences for parents and athletes.

3. Forms of sportsmen’s motivation

In this area, we talk about the way to motivate taekwondo athletes based on the actions of their coaches. In modern sports, which are developing more and more every year, the level of physical fitness among athletes is increasing (Katanić et al., 2020). Accordingly, it is necessary for the coach to use adequate forms of motivation. Through the answers of taekwondo coaches in this area, the following categories can be distinguished:

Intrinsic motives as a means of motivating athletes

Intrinsic motivation is motivation towards a specific activity that is a purpose (Lepir, 2021). In the research conducted by Alić et al. (2021) on a sample of students from the University “Džemal Bijedić” in Mostar, the factor of motivation in the implementation of sports and recreational activities was examined. The results indicate that out of the total number, 26% of the respondents are mostly motivated by love for a particular sport. Love for sport is classified as intrinsic motives, and the above is closely related to the results obtained by taekwondo coaches in the defined category.

[T8] “I try to make children like sports. I hope that individual children will acquire that love for taekwondo as well”.

[T5] “When you love sports, you are always in sports. Love for sports makes life healthier, forms positive life habits and disciplines”.

The goal of the activities is in themselves before they are a means to achieve the goal” (Deci, 1975). Through

hvalama”.

Kroz ohrabriranje mladih sportista i priznanje za uloženi trud i rad, nastaje i istinska sreća sportista pri treniranju (Juul, 2013).

Pohvale upućene samo pobjednicima

Od 10 trenera, jedan trener ističe da sportistima pruža pohvalu jedino ako iz borbe izađu kao pobjednici.

[T2] „Pohvaljeni su kada pobjede ali kod mene se zna da uvijek može bolje.“

Kontinuirane pohvale

Tokom logičke analize odgovora uočeno je da dva trenera pružaju kontinuirane pohvale sportistima.

[T3] „Uvijek, i kada nisu najbolji djecu je važno pohvaliti i dizati im samopouzdanje.”

[T6] „Stalno, to vole i djeca i roditelji.“

U odgovoru trenera šest može se reći da se pohvala djelomično koristi i u manipulativne svrhe što svakako može da ostavlja negativne posljedice na roditelje i sportiste.

3. Oblici motivacije sportista

U ovom području govori se o načinu motivisanja tekvondo sportista na osnovu postupanja njihovih trenera. U savremenom sportu koji se razvija iz godine u godinu sve više, nivo fizičke spremne među sportistima se povećava (Katanić i sar., 2020). Shodno tome potrebno je da trener koristi adekvatne oblike motivacije. Kroz odgovore tekvondo trenera u ovom području mogu se izdvojiti sljedeće kategorije:

Intrinzični motivi kao sredstvo motivisanja sportista

Intrinzična motivacija je motivisanost prema određenoj aktivnosti koja se sama po sebi svrha (Lepir, 2021). U istraživanju koju je sprovedi Alić i sar. (2021) na uzorku studenata Univerziteta “Džemal Bijedić” u Mostaru ispitan je faktor motivacije u realizaciji sportsko-rekreativnih aktivnosti. Rezultati ukazuju da od ukupnog broja, 26% ispitanika najviše motiviše ljubav prema određenom sportu. Ljubav prema sportu svrstava se u intrinzične motive, a navedeno je u uskoj vezi sa dobijenim odgoorima tekvondo trenera u definisanoj kategoriji.

[T8] „Trudim se da djeca zavole sport. Nadam se da će pojedina djeca steći tu ljubav i prema tekvondou”.

[T5] „Kada zavoliš sport uvijek si u sportu. Ljubav prema sportu čini život zdravijim, formira pozitivne životne navike i discipline”.

Cilj aktivnosti je u njima samima prije nego što su

the conversation with the coaches, it was concluded that they agree that it is important for children to love sports, to play sports in their free time, to live a healthy life.

Extrinsic motives as a means of motivating athletes

All 10 coaches cite numerous extrinsic motives as a means of motivating athletes. Through the process of logical analysis of the answers, the following stand out the most: medals, cups, money and friendship. In the aforementioned research, the results indicate that the motive for physical exercise is reflected in the respondents' desire to improve their health, physical appearance and friendship (Alić et al., 2021).

[T10] "I try to praise them, so that they are aware of their progress... Children are certainly motivated by won medals and cups".

[T8] "Praise means a lot in sports, as do achieved results."

It can be concluded that the forms of motivation of sportsmen are numerous, and that intrinsic and extrinsic motives complement each other, in some cases even overlap, but are also completely different. Learning occurs when an individual is in the mood for training and when his positive emotions encourage him to do so (Chabot & Chabot, 2009).

4. The coach's attitude towards the athletes regarding the age and gender of the athletes

The last area is based on the attitude of the coach towards the athletes regarding age and gender. The programmed training process in relation to the characteristics of the athletes contributes to better physical fitness of the athletes themselves (Milić et al., 2020). In this area, 3 categories were distinguished through the answers of taekwondo coaches.

A clear difference in relation to the age of the athlete

Through the analysis of the received answers, it can be concluded that all coaches emphasize a clear difference in their attitude towards younger and older athletes. You should keep in mind that there are certain differences between children in the pace of growth and development (Mikić et al., 2016). Training sessions are organized for younger athletes in which they learn through play, while older athletes are approached more seriously and systematically in setting clear goals and progress of the athlete himself. Older athletes are ready to put up with greater training requirements, fitness exercises become specific for a certain sport, and their intensity increases with the aim of improving the level of competitive performance (Bompa, et al., 2012). Taekwondo coaches are of a similar opinion to the above, which can be

one sredstvo za postizanje cilja" (Deci, 1975). Kroz razgovor sa trenerima zaključeno je da se slažu da je važno da djeca zavole sport, da se bave sportom u slobodno vrijeme, da žive zdrav život.

Ektrinzični motivi kao sredstvo motivisanja sportista

Svih 10 trenera navode mnogobrojne ektrinzične motive kao sredstvo motivisanja sportista. Kroz proces logičke analize odgovora najviše se ističu: medalje, pehari, novac i prijateljstvo. U prethodno navedenom istraživanju rezultati ukazuju da se motiv za fizičko vježbanje ogleda u želji ispitanika za poboljšanjem zdravlja, fizičkog izgleda i prijateljstvu (Alić i sar., 2021).

[T10] „Trudim se da ih pohvalim, da oni budu svjesni svoga napretka... Djecu svakako motivišu i osvojene medalje i pehari“.

[T8] „Pohvale mnogo znače u sportu, kao i ostvareni rezultati“.

Može se zaključiti da su oblici motivacije sportista mnogobrojni, a da se intrinzički i ektrinzički motivi nadopunjavaju, u pojedinim slučajevima i preklapaju ali isto tako i u potpunosti razlikuju. Učenje se događa kada je pojedinac raspoložen za trening i kada ga na to podstiču njegove pozitivne emocije (Chabot & Chabot, 2009).

4. Odnos trenera prema sportistima s obzirom na uzrast i pol sportista

Posljednje područje je zasnovano na odnosu trenera prema sportistima s obzirom na uzrast i pol. Programirani trenažni proces u odnosu na karakteristike sportista doprinosi boljoj fizičkoj spremnosti samih sportista (Milić i sar., 2020). U ovom području kroz odgovore tekvondo trenera izdvojene su 3 kategorije.

Jasna razlika u odnosu na uzrast sportiste

Kroz analizu dobijenih odgovora može se zaključiti da svi treneri ističu jasnu razliku u njihovom odnosu prema mlađim i prema starijim sportistima. Teba imati u vidu da postoje određene razlike između djece u tempu rasta i razvoja (Mikić i sar., 2016). Mlađim sportistima organizuju se treninzi u kojim oni uče kroz igru, dok se sa starijim sportistima pristupa ozbiljnije i sistematičnije u postavljanju jasnih ciljeva i napretka samog sportiste. Stariji sportisti su spremni podnijeti veće zahtjeve treninga, kondicijske vježbe postaju specifične za određenu sportsku granu, a njihov se intenzitet povećava s ciljem poboljšanja nivoa takmičarske uspješnosti (Bompa, et al., 2012). Tekvondo treneri su sličnog mišljenja sa navedenim što može da se

concluded in the interpretation of the answers received.

[T7] "The organization and goals are adjusted to the age of the athletes. Older people train more seriously, with children the goal is to develop love for sports, responsibility".

[T10] "Athletes are divided into groups. This means that the structure of the training depends on their age, their abilities, their goals..."

Pedagogical activities of coaches aimed at working with older adolescents and adults should consist of an adequate rest period, the creation of a training process based on the principles of deliberate practice and assessment of physical and tactical skills in a safe environment (Côte' et al., 2014).

A clear difference considering the gender of the athlete

Most coaches point out that there is a clear difference regarding the gender of the athlete. The differences mainly relate to the personal relationship of the coach towards the female athletes. The organization of the training process is in most cases the same for all athletes.

[T6] "I am more attentive to girls; I always point out that they are easier to work with."

[T9] "There is a difference, I am gentler with girls. Children must be aware that they are practicing contact sports."

Through a logical analysis of the received answers, it was possible to conclude that 8 coaches point out a clear difference in relation to the gender of the athlete, but that these differences are very small and do not relate to the way the training process is organized, but mainly to their personal attitude and caution.

There is no difference in relation to the gender of the athlete

Analyzing the answers, it was concluded that two coaches state that there is no difference in the organization and structure of training when the gender of the athlete is taken into account.

[T7] "Boy, girl, there is no big difference, they are all fighters".

Through the training process, athletes should be provided with optimal conditions for growth and development in accordance with their psycho-physical abilities and thus reduce the possibility of injuries or the risk of today's diseases (Bajrić et al., 2021).

CONCLUSION

The data obtained through this research indicate that most taekwondo coaches have developed pedagogical competences and that through their own coaching work they mostly leave a positive impact on the psycho-physical

zaključci u interpretaciji dobijenih odgovora.

[T7] „Organizacija ali i ciljevi se prilagođavaju uzrastu sportista. Sa starijima se ozbiljnije trenira, kod djece je cilj da se razvije ljubav prema sportu, odgovornost”.

[T10] „Sportisti su podijeljivi u grupe. To znači da struktura treninga zavisi od njihovog uzrasta, njihovih sposobnosti, ciljeva...”

Pedagoško djelovanje trenera usmjereno na rad sa starijim adolescentima i odraslim treba da se sastoji od adekvatnog perioda za odmor, kreiranje trenažnog procesa zasnovanog na principima namjerne prakse i procjene fizičke i taktičke vještine u sigurnom okruženju (Côte' et al., 2014).

Jasna razlika s obzirom na pol sportiste

Većina trenera ističe da postoji jasna razlika s obzirom na pol sportiste. Razlike se uglavnom odnose na lični odnos trenera prema ženskim sportistima. Organizaciju trenažnog procesa je u većini slučajeva ista za sve sportiste.

[T6] „Prema curicama sam pažljiviji, uvijek ističem da se sa njima lakše radi.“

[T9] „Postoji razlika, ja sam prema djevojčicama nježniji Djeca ipak moraju biti svjesna da treniraju sport sa kontaktom.”

Kroz logičku analizu dobijenih odgovora moglo se zaključiti da 8 trenera ističe jasno razliku u odnosu na pol sportiste ali da su te razlike veoma male i da se ne odnose na način organizacije trenažnog procesa nego uglavom na njihov lični odnos i opreznost.

Nema razlike u odnosu na pol sportiste

Analizom dobijenih odgovora zaključeno je da dva trenera navode da nema razlike u organizaciji i strukturi treninga kada se uzme u obzir pol sportiste.

[T7] „Dječak, djevojčica, ne postoji neka velika razlika, to su svi borci“.

Sportistima bi se kroz trenažni proces trebao osigurati optimalni uslovi za rast i razvoj u skladu sa njihovim psiho-fizičkim sposobnostima i na taj način smanjiti mogućnost povreda ili rizika od bolesti današnjice (Bajrić i sar., 2021).

ZAKLJUČAK

Podaci dobijeni ovim istraživanjem ukazuju da većina tekvondo trenera ima razvijene pedagoške kompetencije i da kroz sebi sopstven trenerski rad uglavnom ostavljaju pozitivan uticaj na psiho-fizički razvoj sportista. Sportski treneri imaju važnu ulogu u sportskom

development of athletes. Sports coaches play an important role in the sports development of athletes. In addition to influencing the sports development and the achievement of the full potential of their athletes, coaches are often great role models for their athletes (Beljan, 2022). By appreciating the child's personality through the training process, the individual characteristics of the child, the trainer creates a sense of security and trust and therefore significantly influences the progress and complete development of the child (Đedović et al., 2021). Cooperation between teammates and coaches is an important element in the process of socialization and development of psycho-physical competencies (Goričanec-Obadić, 2015). The importance of the coach's pedagogical competence is reflected in the questioning of personal actions and the desire for continuous improvement and lifelong training (Računica, 2020).

Every coach should strive to develop his competences with new knowledge through constant learning and sports and pedagogical training. Sports pedagogues should be dynamic, self-initiative, love their work, sport and strive for professional progress and their personal development, because the same requires sacrifice and time. Lifelong learning must be the guiding principle of education, as well as the basis for the development of individuals and social connection. Adult education includes requalifications, requalifications, professional training and other activities related to lifelong learning. Access to this education is not limited regardless of age (Uremević and Tatarević, 2020).

Pedagogical training of coaches is impossible without knowing some of the basic pedagogical principles. The term principle is of Latin origin. It refers to a general and basic rule, starting point or guideline in work (Potkonjak, 1993). The principles derive from the essence of the teaching, or in this case, the essence of the training process. The principles are derived based on the analysis of practice, based on the demands of society and the development of pedagogical science. Therefore, the principles are changing and developing (Babić-Kekez and Tasić, 2012). There are different approaches in classifying pedagogical principles. In some cases, individual principles are stated separately from each other, while in other cases, the principles are combined. For example, the principle of scientificity and the principle of positive orientation of all activities can be constituted and explained as special pedagogical principles or in some cases they are constituted and unified as one principle (Trnavac and Đorđević, 2010). There are different classifications of the principles of education in pedagogy textbooks, and in one of them the following are stated as general principles of educational work: (1) the principle of scientific basis and positive educational orientation of all activities, (2) the principle of conscious activity, (3)

razvoju sportista. Osim uticaja na sportski razvoj i postizanje punih potencijala svojih sportista, treneri su često i veliki životni uzori svojim sportistima (Beljan, 2022). Uvažavanjem dječje ličnosti kroz trenažni proces, individualnih karakteristika djeteta trener stvara osjećaj sigurnosti i povjerenja i samim tim značajno utiče na napredak i kompletni dječji razvoj (Đedović i sar., 2021). Saradnja između sportista i trenera bitan je element u procesu socijalizacije i razvoja psiho-fizičkih kompetencija (Goričanec-Obadić, 2015). Važnost trenerove pedagoške kompetentnosti ogleda se u preispitivanju ličnih postupaka i želje za kontinuiranim poboljšanjem i cjeloživotnim usavršavanjem (Računica, 2020).

Svaki trener treba da teži da razvija svoje kompetentnosti sa novim znanjima kroz stalno učenje i sportsko i pedagoško usavršavanje. Sportski pedagozi trebaju biti dinamični, samoinicijativni, voljeti svoj posao, sport i težiti ka profesionalnom napretku i svom ličnom razvoju jer isto zahtjeva odricanje i vrijeme. Cjeloživotno učenje mora biti vodeći princip obrazovanja, kao i temelj za razvoj pojedinaca i društvene povezanosti. Obrazovanje odraslih obuhvata prekvalifikacije, dokvalifikacije, profesionalnu obuku i ostale aktivnosti koje su vezane za doživotno učenje. Pristup ovom obrazovanju nije ograničen bez obzira na godine života (Uremević i Tatarević, 2020).

Pedagoško usavršavanje trenera je nemoguće bez poznavanja nekih od osnovnih pedagoških principa. Termin *princip* je latinskog porijekla. Odnosi se na opšte i osnovno pravilo, polazište ili smjernicu u radu (Potkonjak, 1993). Principi proizilaze iz suštine nastave, odnosno u ovom slučaju suštine trenažnog procesa. Principi se izvode na osnovu analize prakse, na osnovu zahtjeva društva i razvijenosti pedagoške nauke. Prema tome, principi su promjenljivi i razvojni (Babić-Kekez i Tasić, 2012). Postoje različiti pristupi u razvrstavanju pedagoških principa. U nekim slučajevima pojedini principi se navode odvojeno jedan od drugog, dok se u nekim slučajevima principi objedinjavaju. Na primjer, princip naučnosti i princip pozitivne usmjerenosti svih aktivnosti može se konstituisati i obrazložiti kao posebni pedagoški principi ili se u nekim slučajevima konstituiše i objedinjuje kao jedan princip (Trnavac i Đorđević, 2010). Postoje različita razvrstavanja principa vaspitanja u udžbenicima pedagogije, a u jednom od njih kao opšti principi vaspitnog rada navedeni su sljedeći: (1) princip naučne zasnovanosti i pozitivne vaspitne usmjerenosti svih aktivnosti, (2) princip svjesne aktivnosti, (3) princip humanosti i demokratičnosti vaspitanja, (4), princip individualizacije i socijalizacije u vaspitanju i (5) princip

the principle of humanity and democracy of education , (4), the principle of individualization and socialization in education and (5) the principle of the unified action of all factors in education (Antonijević, 2014).

The principle of scientific basis and positive educational orientation focuses on the positive attitude of the personality towards its environment and its ability to manifest its life potentials in a scientific and research way. The educational focus of all content, practical activities and methodical procedures should put science and its achievements on a progressive level (Bandjur and Potkonjak, 1999). Consciously acquiring knowledge means understanding its essence and being active means acquiring knowledge and mentally processing it through practical application. The teacher, i.e. the coach, should guide the children and use stimulating tasks to make them reach the desired conclusions and progress on their own (Milutinović, 2008). The essence of humanistic education and democracy can be expressed through the identification of the needs of students, through encouraging independence, active involvement in collaborative relationships, through training for assuming responsibility, through self-actualization and through emotional education. In humanistic education based in this way, the goal is always an emancipated personality (Mikanović, 2015). The principle of individualization and socialization refers to the ability of a teacher or coach to consider the possibilities, abilities, knowledge and skills of each child individually in organizing adequate tasks for progress and encouraging a positive atmosphere and empathy of the entire team (Rot, 2010). Based on the above, it can be said that the entire education must be directed towards achieving a goal that is unique, and this reflects the principle of the unique action of all factors in education. The principles cannot always apply to all concrete problems and cannot replace the creative work and activity of the trainer. The number of possible concrete situations is so diverse that it is not possible to look for and expect answers for every single case from didactic theory and didactic-pedagogical principles (Bjelica & Bilic, 2008).

One of the advantages of this research is a detailed description and the possibility of understanding the attitudes of taekwondo coaches, while the limitation of this research may be that direct observation of experts in coaching work at competitions or the training process is excluded. Based on the above, it can be concluded that external observation in subsequent research would contribute to a more complete and objective presentation of coaching work. Considering the sample of coaches, we cannot generalize the data obtained, but they helped us gain a more concrete insight into the coaching work and the pedagogical competences of taekwondo coaches.

jedinstvenog djelovanja svih činilaca u vaspitanju (Antonijević, 2014).

Princip naučne zasnovanosti i pozitivne vaspitne usmjerenosti fokus stavlja na pozitivan stav ličnosti prema svome okruženju i njenoj osposobljenosti da na naučno-istraživački način ispoljava svoje životne potencijale. Vaspitna usmjerenost svih sadržaja, praktičnih aktivnosti i metodičkih postupaka treba da nauku i njena dostignuća stavi na progresivan nivo (Bandur i Potkonjak, 1999). Svjesno usvojiti znanje znači shvatiti njegovu suštinu, a biti aktivan znači usvajati znanja i misaono ih preradivati kroz praktičnu primjenu. Nastavnik, tj. trener treba da usmjerava djecu i podsticajnim zadacima ih navodi da sami dolaze do traženih zaključaka i napretka (Milutinović, 2008). Suština humanističkog vaspitanja i demokracije može se iskazati kroz identifikaciju potreba vaspitanika, kroz podsticanje samostalnosti, aktivno uključivanje u saradničke odnose, kroz osposobljavanje za preuzimanje odgovornosti, kroz samoaktualizuju i kroz emocionalno vaspitanje. U ovako zasnovanom humanističkom vaspitanju cilj je uvijek emancipovana i ličnost (Mikanović, 2015). Princip individualizacije i socijalizacije se odnosi na sposobnost nastavnika ili trenera da uzima u obzir mogućnosti, sposobnosti, znanja i vještine svakog djeteta pojedinačno u organizaciji adekvatnih zadataka za napredak i podsticanje pozitivne atmosfere i empatičnosti cijelog kolektiva (Rot, 2010). Na osnovu navedenog može se reći da čitavo vaspitanje mora biti usmjereno ka ostvarivanju cilja koji je jedinstven, a u tome se ogleda i princip jedinstvenog djelovanja svih činilaca u vaspitanju. Principi se ne mogu uvijek odnositi na sve konkretne probleme i ne mogu zamijeniti stvaralački rad i aktivnost trenera. Broj mogućih konkretnih situacija je raznovrstan da od didaktičke teorije i didaktičko-pedagoških principa nije moguće tražiti i očekivati odgovore za svaki pojedinačni slučaj (Bjelica and Bilic, 2008).

Jedno od prednosti ovog istraživanja jeste detaljan opis i mogućnost razumijevanja stavova tekvondo trenera, dok ograničenje ovog istraživanja može predstavljati to što je isključeno direktno posmatranje eksperta u trenerski rad na takmičenjima ili trenažnom procesu. Na osnovu navedenoga može se zaključiti da bi spoljno posmatranje u narednim istraživanjima doprinijelo potpunijem i objektivnijem prikazu trenerskog rada. S obzirom na uzorak trenera dobijene podatke ne možemo široko postaviti ali isti su nam pomogli da steknemo konkretniji uvid u trenerski rad i pedagoške kompetencije tekvondo trenera.

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Primljen: 05. novembar 2023. / Received: November 05, 2023

Izmjene primljene: 25. decembar 2023. / Changes Received: December 25, 2023

Prihvaćen: 28. decembar 2023. / Accepted: December 28, 2023



THE INFLUENCE OF MODIFIED ONE-HOLE GAME MEDIA IN IMPROVING FINE MOTOR SKILLS IN EARLY CHILDHOOD

SUSANTO SUSANTO¹, HENDRA SETYAWAN², NUGROHO SUSANTO³, JOSÉ VICENTE GARCÍA-JIMÉNEZ⁴, FRANCESCA LATINO⁵, FRANCESCO TAFURI⁶, ÖZGÜR EKEN⁷

¹State Islamic University Sayyid Ali Rahmatullah Tulungagung, Tulungagung, Indonesia

²Department of Primary School Physical Education, Faculty of Sport and Health Sciences, Universitas Negeri Yogyakarta (UNY), Indonesia

³Department of Sport Science, Faculty of Sport Science, Padang State University (UNP), Indonesia

⁴Department of Music, Artistic and Physical Education, Faculty of Education, University of Murcia, Spain

⁵Department of Human Sciences, Pegaso University, Naples - Italy

⁶Heracle Lab Research in Educational Neuroscience, Niccolò Cusano University, Rome - Italy

⁷Institutional Affiliation: Faculty of Sport Sciences, Inonu University, Turkey

Correspondence:

Nugroho Susanto, Department of Sport Science, Faculty of Sport Science, Padang State University (UNP), Indonesia
nugrohosusanto@fik.unp.ac.id

Abstract: Fine motor development in children is strongly influenced by children's play activities, one of which is educational games. There are many types of educational games that can help develop children's fine motor skills, one of which is the one-hole game. But unfortunately, activities to improve children's motor development have not been optimized and the frequency is still lower than in previous years. As a result, children's fine motor development is not optimal. The purpose of this study was to determine how much influence the use of educational game tools one hole game has on the fine motor development of preschool children. This study used quasi experiment with pre and posttest approach with control. Data collection tools using the Developmental Pre-Screening Questionnaire sheet. Data analysis technique using paired-samples t test. The results of the study informed that there was an increase in children's motor skills after intervention with one hole game in early childhood school in Jugo Village, Jepara Regency. The results showed that the intervention of One Hole Game educational game has a great influence on the fine motor development of preschool children. Conclusion: Based on the results of the study, one hole game has an influence on the fine motor development of preschool children. The implication of this study is that parents need to know the right way to stimulate children's growth and development, namely with one-hole games that provide many good benefits for early childhood.

Keywords: Fine motor, Media, Accuracy, One hole game.

INTRODUCTION

Children's world cannot be separated from play activities, thus allowing children to be more selective in choosing various play activities. According to Pratiwi (2017), a child's world is the world of play. Of course we understand this, children do not get tired easily when playing, this is also in accordance with the energy surplus theory that we know. The energy surplus theory itself is a theory that reveals excess energy in children who use excess energy for play activities (Muslihin et al., 2020). In addition, providing children with various sports experiences through play activities can help increase bone density. The purpose of children's games cannot be separated from the psychological aspects, through games emotional control, self-confidence, a sense of responsibility and other characters can be developed in children (Susanto et al., 2021).

Currently, all kinds and types of games are popping up like mushrooms after the rain and even going viral in various media, especially since the hobby of playing the game La Torato is not only loved by children, even adults are also enjoying this viral game. According to Mayesty, playing is an activity that children do all day long because for children playing is life, and life is about playing. Apart from that, playing through traditional games can stimulate children's character and critical thinking (Susanto et al., 2022). One of the games that is currently popular is the lato-lato game, this game has very high hypnotic power because it is so interesting that many people challenge themselves to try playing it. Lato-lato itself relies on finger stability and balance to maintain the rhythm of the collision of two plastic balls.

Stimulation of fine motor development is also carried out by cutting which provides the benefit of training cooperation between hands and eyes and increasing concentration in children. Stimulation with collage is able to train finger, hand and eye muscle cooperation (Sari Kumala et al., 2012). Another method is finger painting which is useful for establishing eye and hand cooperation and training concentration and can be used as a medium to express emotional conditions in children (Nurjanah et al., 2017). The method of playing puzzles is useful for training hand and eye muscle coordination and training accuracy (Ayu, 2022). Stimulation of early childhood fine motor development should be done by the child's parents. In addition to parents, stimulation of fine motor development can also be done by their teachers when early childhood is in their school (Saleh et al., 2023). The fine motor skills of individuals can be seen from the ability to complete tasks in everyday life, such as editing, writing, grasping objects, brushing teeth, using clothes, cleaning up toys, typing, folding, holding cutlery (Johnstone et al., 2022). Early childhood can practice grasping objects such as balls to improve their fine motor skills. Early childhood can practice brushing their own teeth so that they will become accustomed (Bondi et al., 2022).

This game not only trains fine motor skills but also cheers up the mood. However, behind the benefits that we hear and see in various media, the game La Torato itself, if not played wisely, can cause various kinds of injuries to those who play it, such as facial injuries, physical injuries, etc. Injuries to the head and hand area. It is true that children's games must of course comply with safety rules when playing, with the aim of minimizing the risk of injury through methods such as using good safety equipment, not using sharp materials or tools in the game, and always adhering to the rules of the game.

Fine movement is the process of contracting small muscles due to body movement activities. Fine motor skills are motor skills that involve small muscles that coordinate the eyes and hands in a balanced manner (Sutini et al., 2018). Furthermore, fine motor movements are movements that involve certain parts and carry out small muscle movements (Primayana, 2020). One of the smooth muscles that needs to be trained is the fingers. For this reason, media or tools are needed as training to stimulate these smooth muscles. Elizabeth Hurlock (1950) mentioned several reasons why motor development plays a role in personal development: First, motor skills keep children entertained and give them a sense of joy. Throwing and catching, playing hole games, and using other tools.

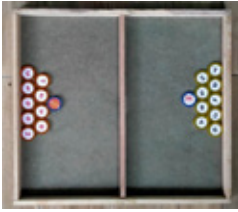
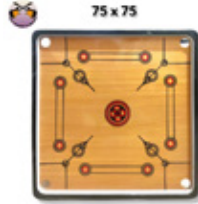
One of the media needed is to create a play tool that can provide benefits for training fine motor skills, especially in children. Another benefit of practicing fine motor skills in children's fingers is that they can train hand coordination. Second, fingers easily adapt to activities that require fingers, such as writing, cutting, etc. Third, there is little chance of feeling tired when using your fingers for activities. By training fine motor skills in early childhood, the aim is to develop children's fine motor skills (Robingatin et al., 2022). According to Endang Rini Sukanti (2015), motor development is a golden process or movement that directly involves movement and innervation of muscles to become a body capable of movement. Beaty (2011), believes that the development of children's fine motor skills refers to the child's ability to express and acquire muscle movements in the form of coordination, dexterity and dexterity in the use of hands and fingers.

There is a need to introduce educational games to preschool children which can improve children's cognitive abilities (Veronica, 2018). Educational games are games that have educational elements, so it is necessary to make a game that can adapt to the development and growth of children (Aprilianto et al., 2018). Therefore, making educational games does not have to be expensive if it is expensive, then we can make a game that uses household waste materials as an educational game.

Remains of building materials such as plywood and boards are often found in homes. Excess materials are materials that come from items that are no longer used (Nurhafizah, 2018). It is no longer used (Nurhafizah, 2018). Therefore, these leftover items can be used to make various useful items, one of which is making children's play equipment. This play tool is made to train fine motor skills, especially fingers. The author himself calls this game "One Hole Game". The equipment needed to play this game is a rectangular chess board measuring 40x45 cm and colored plastic coins with a diameter of 2 cm.

The reason this game is called a one-hole game is because this game is characterized by having only one hole to insert coins. Therefore, the author wants to know how much influence the one-hole game has in developing fine motor skills in early childhood. This one-hole game is inspired by the game karambol. The carambol game is a game that uses a square table with a game tool in the form of carambol coins (Atmaja et al., 2017). The purpose of the carambol game is similar to the one-hole game, which is to train fine motor skills (Yulianti, 2016). The explanation of the similarities and differences between the two games is explained in table 1.

Table 1. Similarities and differences between one-hole and karambol games

No	The game	Equation	Difference
1	One hole game 	Aims to train fine motor skills	Rectangular table papa size 40 X 45 cm Coin insertion hole is only 1 (one) hole only Number of players 2 (two) people.
2	Karambol 	Aims to train fine motor skills	Table papa sizes vary between 60 x 60, 75 x 75 and 90 x 90. There are 4 (four) holes for inserting coins Number of players 2 to 4 people.

In the explanation in table 1, although there are several aspects that have similarities and differences between the two games, this will help researchers in testing how big the influence of the one-hole game media is. Therefore, the author wants to know how much influence one-hole games have in improving fine motor skills in early childhood, especially fine motor skills of the fingers.

METHOD

This study used a quasi-experimental design with a “one group pretest posttest” approach that refers to Campbell & Stanley’s (1966) theory (Hastjarjo, 2019). The population in this study were children aged 4, 5, and 6 years at the Jugo Village Early Childhood School, Jepara Regency, totaling 30 children. The sampling technique used in this study was total sampling. The sample in this study amounted to 30 children who were divided into one group, namely 30 children in the intervention group. The data collection tool used was the Developmental Pre-Screening Questionnaire sheet which refers to a score of 0-10. This instrument was obtained from the Ministry of Health of the Republic of Indonesia in 2017. Univariate data analysis using frequency distribution and bivariate analysis using paired-samples t test.

RESULT

The researcher presents the data from the research that has been conducted. The explanation of the results of this study includes an overview of the research location, demographic characteristics of respondents consisting of gender and age.

Table 2: Frequency Distribution Based on Respondent Gender

Gender	Frequency	Percentage
Male	18	60.0
Female	12	40.0
Total	30	100.0

From the explanation in table 1, there are results that of the 30 respondents, the majority are male (60%).

Table 3: Frequency Distribution Based on Age of Respondents

Age	Frequency	Percentage
3-4	13	43.3
4-5	10	33.3
5-6	7	23.3
Total	30	100.0

Table 4: Frequency Distribution of the Effect of Fine Motor Development of Children 3-6 Years Old Before and After One Hole Game

No	Fine Motor Development	Before		After	
		F	%	F	%
1	Corresponding	6	20.0	18	60.0
2	Doubtful	17	56.7	10	33.3
3	Deviate	7	23.7	2	6.7
	Total	30	100.0	30	100.0

Based on table 3, it was found that the fine motor development of children at Jugo Early Childhood School before and after being given the one hole game tool from doubtful to appropriate was 18 respondents (60%), doubtful was 10 respondents (33.3%) and deviant was 2 respondents (6.7%).

Table 5: Calculation Results with Paired Sample Test

Paired Differences			t	df	Sig. (2- tailed)	
Std.Deviation	Std.Error Mean	95% Confidence Interval of the Difference				
		Lower	Upper			
.567	.935	.217	.916	3.319	29	.002

Based on the results of calculations using the Paired Sample Test test, the results obtained P value = 0.02 <0.05, meaning that there is an effect of one hole game on fine motor development of preschool children.

DISCUSSION

Early childhood is known as the golden period, especially gross motor, children love physical activities begin to develop new skills and improve previous skills. Fine motor develops more slowly, but is still assisted by providing the widest possible opportunity, as well as appropriate equipment and materials and continuous support given to children, as well as problems or difficulties faced by children in fine motor development. Children’s fine motor development activities are very useful for training children’s motor coordination skills including coordination between hands and eyes that can be developed through play activities. The purpose of fine motor development is to be able to function small muscles, such as finger movements, being able to coordinate hand and eye speed. Another benefit of fine motor development is to support other aspects of development, such as cognitive, language, and social. Because each aspect of development is not separate from one another (Ariyana & Rini, 2019). Girls are generally easier to manage and obedient to parents, this is in contrast to boys who tend to be difficult to manage, directed and boys usually often argue with parents and are more aggressive (Huedo et al., 2017). Where in this age range the child’s fine motor development is stable and the child has almost completed the developmental tasks of preschool age. Fine motor development at this age can be stable and there is still an increase in growth and development, especially in physical activity and cognitive abilities (Barrocas et al., 2020).

The One Hole Game is a form of play that is thought to help develop fine motor skills and hand-eye coordination. The one-hole game is an interesting educational game tool to be introduced to preschool-age children. In line with the findings of this study, playing one-hole games can stimulate or improve children’s fine motor skills. One-hole game is a game where children throw coins through a hole into each other’s area. When tossing coins, the one-hole game involves the fingers of the hands which are associated with small muscles, especially the hands and fingers. Through playing one hole game activities, without realizing it, children will actively learn to use their fingers to move by pushing coins right into the hole and this can unwittingly train eye and hand coordination well so that it can stimulate children’s fine motor skills. The results of this study are in line with the results of Pramono’s (2008) research on the effectiveness of educational game tools of the type of one-hole game on fine motor development in children aged 4-5 years which states that there is an effect of educational game tools of the type of one-hole game on the fine motor skills of children aged 4-5 years. In addition, the karambol educational game which is almost the same as the one-hole game also improves fine motor skills (Susanti, 2018). These two games that use coins can also stimulate children’s critical thinking (Eni et al., 2020). To refine motor skills, children are required to continue doing various

activities (Rocha et al., 2021). Slow motor factors can be caused by several things. One of the causes of motor development disorders is tonus disorders or neuromuscular diseases. Environmental factors and the child's personality can also affect delays in motor development. The impact of delayed fine motor can result in the child's development being inhibited and not age-appropriate, and there tends to be a disorder of the nervous system (Maghfuroh, 2018).

In addition, there is a type of game that is almost the same as the one-hole game, namely the karambol game. The definition of this game is one of the games that uses a square table with the game tool in the form of coins (Atmaja et al., 2017). Both of these games are the same in using the fingers of the hands in playing the game and the purpose of the game is the same to enter the coin. The purpose of the carambol game is to enter the carambol coin (Karambol Board et al., 2019). But from some similarities in these games, of course, there are differences including, (1) The pin or coin in the one-hole game is directed at the hole to enter the opponent's area, while in the karambol game, the coin is directed at the opponent's coin so that the opponent's coin enters the hole. (2) The board or media used in the one-hole game is smaller than the board used in the carambol game. In addition to improving fine motor skills in children, these two games can improve cognitive and science (Lestari et al., 2023)(Hidayat et al., 2022)(Novitasari 2017). In addition, both games can also control children's emotions (Amin et al., 2023). With the use of one-hole and karambol games can also improve learning outcomes in counting (Susilawati et al., 2022)(Asisningtyas et al., 2017).

CONCLUSION

The one-hole game is a fun and educational game for early childhood. The researchers informed that most of the early childhood motor skills were doubtful during the pre-intervention assessment. Children's fine motor skills improved or were in the appropriate category after being given treatment by playing the one-hole game and after going through the paired sample t test. One-hole game media is highly recommended for use in early childhood schools because, one-hole modified game media is one form of game that has educational value. Accuracy in this one-hole modification game is needed to train children in inserting plastic coins into the hole, because in this activity children must concentrate when inserting coins into the hole with their fingers so that plastic coins enter the opponent's area. By playing the one-hole game, children learn to understand fine motor skills, accuracy, and the concept of addition. Of course, the coins used in this one-hole game have more diverse shapes and patterns, as well as more attractive colors, so that children are interested in playing it. The implication of this research is that one-hole games provide benefits for child development. In addition, parents need to provide facilities for this game to be played at home and early childhood school teachers also need to stimulate children to play with one-hole games at school.

Acknowledgments

We are grateful to Jugo Pre-School for granting permission.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Primljen: 04. decembar 2023. / Received: December 04, 2023

Izmjene primljene: 25. januar 2024. / Changes Received: January 15, 2024

Prihvaćen: 19. mart 2024/ Accepted: March 19, 2024



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- Kod objavljenih članka, informacije o relevantnim potencijalnim sukobima interesa biće dostupne javnosti.

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- Autori moraju da potvrde da je njihov rukopis njihovo autorsko djelo.
- Autori moraju da potvrde da njihov rukopis nije prethodno objavljen na nekom drugom mjestu.
- U slučaju da je poslati rukopis rezultat naučnoistraživačkog projekta ili da je, u prethodnoj verziji, bio izložen na skupu u vidu usmenog saopštenja (pod istim ili sličnim naslovom), detaljniji podaci o projektu, konferenciji i slično, navode se u navesti gdje se navode. Rad koji je već objavljen u nekom časopisu ne može biti preštampan u ovom časopisu.
- Autori moraju da potvrde da se njihov rukopis trenutno ne razmatra za objavljivanje negdje drugdje.
- Autori su dužni da navedu sve izvore koje su koristili u pisanju njihovog rukopisa.
- Autori su dužni da se pridržavaju etičkih standarda koji se odnose na naučnoistraživački rad.

Obaveze recenzenta

- Recenzija mora biti objektivna. Komentari koji se tiču ličnosti autora smatraju se neprimjerenim. Sud recenzenta mora biti jasan i potkrepljen argumentima.
- Recenzenti bi trebalo svoje stavove da iskažu jasno, sa pratećim argumentima.
- Recenzenti bi trebalo da čuvaju u povjerenju sve informacije u vezi članka i smatraju ih privilegovanim informacijama.
- Recenzent ne smije da bude u sukobu interesa sa autorima ili financijerom istraživanja. Ukoliko postoji sukob interesa, recenzent je dužan da o tome momentalno obavijesti urednika.
- Recenzent koji sebe smatra nekompetentnim za temu ili oblast kojom se rukopis bavi dužan je da o tome obavijesti urednika.

Obaveze urednika

- Urednici imaju punu odgovornost i ovlaštenje da odbiju/prihvate članak.
- Urednici su odgovorni za sadržaj i ukupni kvalitet publikacije.
- Urednici bi uvijek trebalo da razmotre potrebe autora i čitaoca pri pokušaju da se poboljša publikacija.
- Urednici bi trebalo da sačuvaju anonimnost pregledanog članka.
- Urednici bi trebali da osiguraju da je sav materijal koji objavljuju u skladu sa međunarodno prihvatljivim etičkim smjernicama.
- Urednici bi trebalo da djeluju ukoliko posumnjaju na zloupotrebu, bez obzira da li je rad objavljen ili ne, i preduzmu mjere kako bi uspjeli da riješe problem.
- Urednici ne bi trebalo da odbace članak na osnovu sumnje.

ISSN 2232-8211



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