ISSN 2536-569X | eISSN 2536-5703

Journal of Anthropology of Sport and Physical Education

www.jaspe.ac.me

ISSN 2536-569X

April 2024

Vol.8 No.2

JASPE

Journal of Anthropology of Sport and Physical Education

Index Coverage
DOAJ; Index Copernicus; ERIH PLUS; Google Scholar; Crossref; ROAD; Open Academic Journals Index; SHERPA/RoMEO; ASCI

Proofreading Service
Danilo Tosic

Prepress
Milicko Ceranic

Print
Art Grafika | Niksic

Print run
550

MontenegroSport

CRNOGORSKA SPORTSKA AKADEMIJA • MONTENEGRIN SPORTS ACADEMY •

ISSN 2536-569X eISSN 2536-5703

JOURNAL OF ANTHROPOLOGY OF SPORT AND PHYSICAL EDUCATION

International Scientific Journal

Vol. 8(2024), No. 2 (1-41)

TABLE OF CONTENTS

Full-text available free of charge at http://www.jaspe.ac.me/

DOI 10.26773/jaspe.240401

Journal of Anthropology of Sport and Physical Education

ORIGINAL SCIENTIFIC PAPER

Influence of health education and physiotherapy on functional independence among Nigerian stroke survivors

Taiwo Joseph Oyewumi[1], Joseph Ogheneruese Ogbe[2], John Ohaju-Obodo[2], Adebisi Isiaka Hammed[1]

[1]Department of Physiotherapy, University of Benin Teaching Hospital, Benin City, Nigeria, [2]Department of Health and Safety Education, Delta State University, Abraka

Abstract

This study was carried out to compare the effectiveness of physiotherapy and combined health education and physiotherapy intervention on functional independence among Nigerian stroke survivors. A total of 50 stroke survivors in University of Benin Teaching Hospital (UBTH) and Irrua Specialist Teaching Hospital (ISTH) were divided into the control (ISTH) and experimental group (UBTH) which were made up of 25 participants each. The experimental group were administered a combination of health education and structured physiotherapy programme while the control group were administered only structured physiotherapy programme. Analysis of co-variance (ANCOVA) was used to test the hypothesis. Bonferroni post-hoc test was used to identify the source of the difference between the groups. Statistical significance was accepted for p value of <0.05. Findings showed that there was improvement in the Functional Independence Measure (FIM) following combined health education and physiotherapy from 32.08 ± 1.10 to 112 ± 1.75. Also, there was improvement in FIM following only physiotherapy from 33.20 ± 1.15 to 55.64 ± 1.81. However, there was an adjusted mean difference of 57.031 ± 2.53 in FIM between the experimental and control group. A variance of 91.5% in FIM was accounted for health education. It is therefore concluded that a combination of physiotherapy with health education is the best approach to substantially optimize the functional independence of Nigerian stroke survivors.

Keywords: *Health education, physiotherapy, functional independence, stroke*

Introduction

Stroke is a cardiovascular accident involving the damage or loss of brain tissue due to a lack of oxygen. It is defined as a brain attack caused by the obstruction of blood supply to part of the brain, due to a blockage in a blood vessel connected to the brain or an internal bleed. The interruption of blood flow to the brain will have an immediately detrimental effect on the normal operation of cerebrovascular regions. This leads to a destabilization of global function within the centre of the cerebrum that prevents healthy cognitive brain function (Akinyemi et al., 2021; Martin, 2014). Stroke rehabilitation starts in the hospital but continues after the individual has returned to the community. It can be described in stages such as the hyperacute/acute, inpatient, outpatient and community reintegration. The goal of the first three stages is to maintain or increase the stroke survivor's capacity for functional independence. As rehabilitation moves towards the community, there is a greater emphasis on the individual's activities and participation in pre-stroke and/or new life roles and enhancing their performance in these areas. The reintegration into community life marks the end point of stroke patient rehabilitation (Young & Forster, 2007, Swinton, 2007, Hammed & Agwubike, 2018).

Moreover, patient health education after stroke is an organized activity for both the patient and their family members in order to help support and encourage health behaviour for active partic-

Correspondence:

Adebisi I Hammed
Department of Physiotherapy, University of Benin Teaching Hospital, Benin City, Nigeria

ipation in all aspects of self-care leading to improved outcomes and better health status (Sanders et al., 2014; Bastable, 2008). Morbidity and mortality arising from stroke is considered the main cause of death among stroke survivors. Thus, physiotherapists and health educators exposed to stroke survivors have always thought that health education does improves the functional independence of stroke patient but little or no real empirical study has been carried out to confirm this claim. Although, Martin (2014) established the value of quality education to improvement in the activity performance of stroke, he did not consider community and health education effort. Although, patient health education is part of treatment of every patient, health educators are not always directly involved as part of the rehabilitation team. The need for alternative to just physiotherapy has become necessary and involving health education professionals is being experimented. This account for the rational for the study. It is thus pertinent to investigate if there would be significant difference in the measures of functional independence of stroke survivors who receive structured physiotherapy programme and stroke survivors who receive a combination of health education and structured physiotherapy programme. It is therefore hypothesized that, there would be no significant difference between the functional independence of structured physiotherapy programme and a combination of health education information and structured physiotherapy programme.

Methods

Research design

A pretest–posttest control-group design was adopted in this study. This study is a true experimental design concerning the place of health education and structured physiotherapy programme as determinants of functional independence among stroke survivors.

Population

A total population of 129 stroke survivors participated in this study. This consists of 68 stroke survivors attending physiotherapy in University of Benin Teaching Hospital (UBTH) and 61 stroke survivors attending physiotherapy at Irrua Specialist Teaching Hospital (ISTH).

Sample size and sampling technique

Simple random sampling technique was used to obtain the sample size. Sixty-eight stroke survivors in UBTH, Physiotherapy Department who qualified for the study were serialized and a random table was used to obtain 25 participants for the study. The same method was applied to control group at ISTH, Physiotherapy Department that had 61 stroke survivors that met the criteria for the study. Therefore, a total of fifty (50) stroke patients were selected for the study using a sampling intensity of 37% and 41% for the experimental group (UBTH) and control group (ISTH).

Intervention and instruments

The health education programme involves education on the importance of community re-integration and community skills programme. Equally, the physiotherapy programme included strength and balance training of hemiplegic limbs.

However, functional independence measure (FIM) is a measurement instrument that was used to measure the functional independence. FIM was developed in 1987, as a response to criticism of the Barthel Index. It was intended to address issues of sensitivity and comprehensiveness, as well as provide a uniform measurement system for disability for use in the medical remuneration system (McDowell & Newell, 1996). Rather than independence or dependence, the FIM assesses physical and cognitive disability in terms of burden of care. It is a composite measure consisting of 18 items assessing 6 areas of function (self-care, sphincter control, mobility, locomotion, communication and social cognition). These fall into 2 basic domains; physical (13 items) and cognitive (5 items). The 13 physical items are based on those found on the Barthel Index, while the cognitive items are intended to assess social interaction, problem-solving and memory. The physical items are collectively referred to as the motor-FIM while the remaining 5 items are referred to as the cognitive-FIM. Each item is scored on a 7-point Likert scale indicative of the amount of assistance required to perform each item (1=total assistance, 7 = total independence). A simple summed score of 18–126 is obtained where 18 represents complete dependence/total assistance and 126 represents complete independence. Subscale scores for the physical and cognitive domains was used and may yield more useful information than combining them into a single FIM score (Linacre et al. 1994).

Reliability of instruments

The FIM has been found to be effective in predicting burden of care following stroke and thus could be used to determine the amount of physical assistance a person might need at home following a stroke (Granger et al. 1993). The FIM can be weighted to possess interval properties, potentially allowing more accurate analysis of change. The FIM has been compared to the Barthel Index to determine its validity and reliability and ease of use in two groups of 25 patients undergoing neurorehabilitation. The FIM was considered to be more valid than Barthel Index, and equally reliable in assessment of disability. The FIM total, domain and subscale score interclass correlation coefficients (ICC) were calculated using ANOVA; FIM item score agreement was assessed with unweighted Kappa coefficient. Total FIM ICC was 0.96; motor domain 0.96 and cognitive domain 0.91; subscale score range: 0.89 (social cognition) to 0.94 (self-care). FIM item Kappa range: 0.53 (memory) to 0.66 (stair climbing). It is concluded that FIM is reliable to determine functional independence of stroke survivors when used by medical rehabilitation clinicians (Dickson, 1995).

Ethics and study approval

An approval letter from the Ethical Committee of UBTH, Benin-City was obtained for permission to conduct this study (ADM/E 22/A/VOL. VII/14830948). All participants were serialized for use consecutively through their hospital files at the Physiotherapy Department, UBTH, Benin-City and ISTH, Irrua. Also, an informed consent form was issued to each of the participants before participating in this study and the objectives of the study were explained to them before they sign the consent form. In addition, the demographic data such as gender, age, ethnicity and marital status were obtained through interview and patients' hospital files. The FIM was administered to both groups (experimental and control groups) to measure their functional independence prior to and following 10-weeks of physiotherapy programme and health education information as interventions.

Physiotherapy intervention protocols

The experimental and control groups went through physiotherapy programme of a frequency of 3 times per week (Monday, Wednesday, and Friday) with each session duration of 1 hour in 10 weeks. The programme included strength, balance and gait speed training aimed at improving the functional independence of the participants, in order to increase their functional status to meet up with their daily challenges.

Upper limb strength training protocol:

Aim:-To improve the strength of the upper limb muscles.

Equipment: - Standard weight (2kg), overhead pulley and an armless chair.

Procedure:-Participants were instructed to sit upright on the chair. The affected upper limb to be strengthened was suspended on one arm of the pulley, while the weight was suspended on the other arm of the pulley.

Instruction: - Each participant was instructed to pull the weight up, by pulling the hand down as much as he/she could. Thereafter, the hand was returned to the starting position. The process was repeated 10 times (10 repetitions) for each participant.

Lower limb strength training protocol:

Aim:-To improve the strength of the lower limb muscles.

Equipment:- A stationary bicycle ergometer

Procedure:-Participants were instructed to sit up right on the bicycle ergometer, with the feet on the pedals. Where the weak limb could not stay on the pedal, it was strapped to it by using a crepe bandage.

Instruction:- The participants were instructed to ride the bicycle as fast as he/she could for 10 minutes.

Balance Training -

Aim:- To improve the static balance of the participant.

Equipment: One leg stance and a parallel bar.

Procedure: - Participants were instructed to stand on one leg within the parallel bar until balance is lost.

Instruction:- Participants were instructed to stand on his/her affected leg with or without holding on to the parallel bar until he/she is tired or about to fall.

Gait Speed Training -

Aim:-To increase the mobility of the participants.

Equipment: - An open space within the gymnasium/the department and a stopwatch.

Procedure:- Each participant was made to walk a distance of 10 meters from one end of the gymnasium to the other.

Instruction: - From the starting point, each participant was instructed to walk without a walking aid as fast as he/she could without running, to the end point. The process was repeated three times with three minutes rest between the sets. Time taken to cover each 10 meters (distance) was recorded in seconds.

Scoring:- The total distance covered (30 meters) by each participant was divided by the total time taken. The result was recorded as the gait speed.

Health education information intervention protocols

For experimental group, in addition to the physiotherapy programme, they were given health education information on importance of community integration. The health education information also include education on the importance of community re-integration and community skills programme. This health education was carried out in group for 30 minutes per session, 3 times a week (Mondays, Wednesdays and Fridays) for a period of 10-weeks.

Measurement instrument

FIM was used to measure functional independence of the participants. It was administered by means of interviews with each participant late in the morning. The FIM contains 18 items, grouped into six dimensions: self-care, locomotion, transfers, communication, sphincter control and social cognition. Each item was scored 1-7, corresponding to complete dependence and complete independence, respectively. Each dimension is analyzed by the sum of the items that comprise it. The total FIM score is the sum of the scores for each dimension, and can range between 18-126 points. Dependence levels are classified according to the total FIM score: 18: complete dependence; 19-60: modified dependence (assistance for up to 50% of tasks); 61-103: modified dependence (assistance for up to 25% of tasks); and 104-126: complete/ modified independence.

Method of data analysis

Inferential statistics of analysis of co-variance (ANCOVA) was used to test the hypothesis. ANCOVA which is a hybrid of ANOVA and regression was used to find out the relationship between the post-test variables of experimental and control group while holding the pre-test variables constant. Bonferroni post-hoc test was used to identify the source of the difference between the groups. Statistical significance was accepted for p value of <0.05. All the analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 23.

Results

The results are presented in Tables 1 and 2.

Table 1. ANCOVA Tests on the difference in the effect of the control and experimental Treatment Measure

Dependent Variable: post						
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Partial Eta Squared**
Corrected Model	40393.082a	2	20196.541	255.114	<0.001	0.916
Intercept	8307.826	1	8307.826	104.941	<0.001	0.691
Pre-FIM	65.082	1	65.082	.822	0.369	0.017
Treatment SSbetween	40243.250	1	40243.250	508.335	<0.001	0.915
Error SSwithin	3720.838	47	79.167			
Total	397250.000	50				
Corrected Total	44113.920	49				

a. R Squared = .916 (Adjusted R Squared = .912)

Table 1 shows F (1,47) = 508.34, ($p < 0.0005$) < $\alpha = 0.05$. Hence, there was a significant difference in post-FIM between the experimental and control group while adjusting for pre-FIM. This means that the null hypothesis was rejected. The partial Eta Squared (0.92) when compared with Cohen's guidelines shows that the effect of this difference is large on the functional independence of stroke survivors. Furthermore, 92% variance in functional independence was accounted for by health education.

The adjusted mean difference (57.03 ± 2.53) between the experimental and control group is presented in Table 2. There was a significant difference (($p < 0.0005$) < $\alpha = 0.05$) between the adjusted means of the experimental and control group while adjusting for the covariate 'pre-FIM'. Thus, stroke patients rehabilitated with professional health education and structured physiotherapy programme (experimental group) were more functionally independent than those rehabilitated with structured physiotherapy programme (control group).

Table 2. Pairwise comparisons of the adjusted means of the effect of the control and experimental treatment measure

Dependent Variable: post						
(I) treatment	(J) treatment	Mean Difference (I-J)	Std. Error	Sig.b	95% Confidence Interval for Differenceb	
					Lower Bound	Upper Bound
1.00	2.00	57.03*	2.530	<0.001	51.94	62.12
2.00	1.00	-57.03*	2.530	<0.001	-62.12	-51.94

Based on estimated marginal means *. The mean difference is significant at the 0.05 level. b. Adjustment for multiple comparisons: Bonferroni.

Discussion

The main finding of this study indicates that a combination of health education information and structured physiotherapy programme have a stronger effect than structured physiotherapy programme alone in the functional independence of stroke survivors. Therefore, stroke survivors who have combination of physiotherapy and health education could regain functional independence faster and prevent the occurrence of complications that are associated with immobility than those who have physiotherapy or health education alone.

The post control and post experimental levels of functional independence was 34.85% (55.64) and 87.44% (112.44). This means that at the end of the study the control group were still being assisted to carry out up to 50% of their tasks (modified dependence) while the experimental group had complete/ modified independence. Thus, the experimental treatment measure was 52.59% more effective than the control treatment intervention in improving the functional independence of the patients. Furthermore, results of ANCOVA of the hypothesis tested showed that the adjusted mean of the experimental group was significantly different from that of the control group. A variance of 92% in functional independence was accounted for the combination of health education and structures physiotherapy programme. Thus, stroke patients rehabilitated with professional health education and structured physiotherapy programme (experimental group) were more functionally independent than those rehabilitated with only structured physiotherapy programme (control group). This is supported by Olawale, Appiah and Jones-Okai (2007) who suggest that a supervised training programme when combined with conventional physiotherapy was more effective than only conventional physiotherapy in improving walking function of stroke patient. Immadi, Achyutha, Reddy and Tatakuntla (2015) assessed the effectiveness of the motor relearning approach to the conventional physiotherapy approach in promoting the physical function of the upper limb after a stroke. After the treatment sessions patients who received motor relearning programme showed significantly better functional ability when assessing their functional status by task-oriented performance than the conventional physiotherapy programme. Also, in a study done by Pollock, Baer, Langhorne and Pomeroy (2007) to determine the functional independence of stroke patients with different approaches, a mixed approach of physiotherapy and health education was found to have a more significant effect on functional independence of stroke survivors than physiotherapy or health education alone. Thus, physiotherapy intervention, using a 'mix' of components from different 'approaches' with health education inclusive is more effective in attaining functional independence following stroke. This is because health education with its power to create awareness is the number one strategy in stroke rehabilitation and prevention to enhance clinical outcomes (Travis, 2003).

Conclusion

Physiotherapy together with health education substantially improves the functional independence of Nigerian stroke survivors better than only physiotherapy. Therefore, those working on stroke survivors should foster health education as one of the referral strategies in stroke rehabilitation engagement in order to fast-track the survivors' functional independence. That is, in order for a better outcome in functional independence, health education should be combined with the conventional structured physiotherapy programme.

Received: 12 February 2024 | **Accepted**: 20 March 2024 | **Published**: 15 April 2024

References

Akinyemi, R.O., Ovbiagele, B., Adeniji, O.A., Sarfo, F.S., Abdallah, F., Adoukonou, T., Ogah, O.S., Naidoo, P., Damasceno, A., Walker, R.W., Ogunniyi, A., Kalaria, R.N., & Owolabi, M.O. (2021). Stroke in Africa: profile, progress, prospects and priorities. *Nature Review Neurology*, 17**,** 634–656.

Bastable, S. (2008). *Nurse as educator*. Jones and Bartlett Publishers.

Dickson, H.G. (1995). Interrater reliability of the 7-level functional independence measure (FIM). Scand J. Rehabil Med., 26(3), 115-9.

Granger, C. V., Cotter, A. C., Hamilton, B. B., & Fiedler, R. C. (1993). Functional assessment scales: a study of persons after stroke. *Arch.Phys.Med Rehabil*., 74(2), 133-138.

Hammed, A. I. and Agwubike, E. O. (2018). Influence of health education programme on community re-integration among stroke survivors. *International J. of Biomedical & Clinical Sciences*, 3(3): 53-60.

Immadi, S. K., Achyutha, K. K., Reddy, A., and Tatakuntla, K. P. (2015). Effectiveness of the motor relearning approach in promoting physical function of the upper limb after a stroke. *Int. J. Physiother*., 2(1): 386-390.

Linacre, J. M., Heinemann, A. W., Wright, B. D., Granger, C. V., & Hamilton, B. B. (1994). The structure and stability of the Functional Independence Measure. *Arch Phys Med Rehabil.*, 75(2), 127-132.

Martin, R. (2014). *Patient education among stroke survivor patients*. Helsinki, Finland.

McDowell, I. & Newell, C. (1996). *Measuring health: A guide to rating scales And questionnaires*. OUP.

Olawale, O., Appiah-Kibi, K. & Jones-Okai, D. (2007). Exercise training improves walking function in an African group of stroke survivors: A randomised controlled trial. *Physiotherapy*, 93(S1), S562.

Patient Education Institute (2013). *Benefits of patient education*. Patient Education Institute.

Pollock, A., Baer, G., Langhorne, P. and Pomeroy, V. (2007). Physiotherapy treatment approaches for the recovery of postural control and lower limb function following stroke: a systematic review. *Clinical Rehabilitation*, 21: 395–410.

Sanders, K., Schnepel, L., Smotherman, C., Livingood, W., Dodani, S., Antonios, N.,... Silliman, S. (2014). Assessing the Impact of Health Literacy on EducationRetention of Stroke Patients. Prev. Chronic. Dis., 11, 1-10.

Swinton, L. (2007). *Rehabilitation and community reintegration*. Alberta Provincial Stroke Strategy (APSS).

Travis, L. H., Flemming, K. D., Brown, R. D., Meissner, I., McClelland, R. L. & Weigand,

S. D. (2003). Awareness of stroke risk factors, symptoms, and treatment is poor in people at highest risk. *Journal of Stroke and Cerebrovascular Diseases, 12*(5): 221-227.

Young, J. & Forster, A. (2007). Rehabilitation after stroke. *British Medical Journal*, 334, 86-90.

DOI 10.26773/jaspe.240402

Journal of Anthropology of Sport and Physical Education

ORIGINAL SCIENTIFIC PAPER

Body composition and motor abilities in 8-year-old children: a pilot study

Stefan Mijalković[1], Maša Antonijević[1], Ana Lilić[1], Ana Stanković[2], Daniel Stanković[1]

[1]Faculty of Sport and Physical Education, University of Niš, Niš, Serbia, [2]Artistic Gymnastics Club "NIŠ", Niš, Serbia

Abstract

The aim of this study was to determine the correlation between body composition and motor abilities in 8-year-old children. The sample of participants consisted of 15 children (8 boys and 7 girls) with a mean chronological age of 8.31±0.24 years. The children attended the second grade of the elementary school "Čegar" in the city of Niš and were participating in some form of sports activities. The following measures were taken to assess body composition: body height, body mass, body mass index, percentage of fat and muscle and daily metabolism. On the other hand, the following tests were used to assess motor abilities: sprint at 5, 10, and 20 m (speed), standing long jump (explosive power), push-ups, sit-ups (repetitive strength) and Yo-Yo Intermittent Recovery (IR) Test Level 1 (endurance). Pearson's correlation analysis was used to determine the correlation between body composition and motor abilities in 8-year-old children. The results of this study indicated a statistically significant correlation between body composition and motor abilities in 8-year-old children. Statistically significant negative correlations were found between the following variables of body composition and motor abilities in 8-year-old children: body mass with sit-ups (p=0.047), body mass index with sit-ups (p=0.007) and the Yo–Yo IR1 (p= 0.014), and between body fat percentage and the 10 m sprint (p=0.05), sit-ups (p=0.012) and the Yo–Yo IR1 (p=0.010). Namely, it could be concluded that increased body mass, body mass index and body fat percentage values were associated with reduced motor performance in 8-year-old children.

Keywords: *anthropometric characteristics, elementary school students, endurance, speed, strength*

Introduction

Childhood obesity is a significant public health challenge in many developed nations (Morrison et al., 2012). Despite being recognized as a complex trait influenced by various factors, physical inactivity is considered one of the main contributors to its emergence (Eisenmann 2006; McAllister et al., 2009; Must & Tybor, 2005). It is also suggested that an increasing number of children are physically inactive (Kavey et al., 2003; Morrison et al., 2012). Habits and attitudes towards physical activity are established in childhood and tend to endure throughout adulthood (Larsen et al., 2017). Regular physical activity in children has significant benefits for maintaining overall health status, preventing various chronic diseases, improving mental and physical well-being (Bencke et al., 2002; Pedersen & Saltin, 2006). One of the significant factors influencing the physical activity of children is their motor abilities performance (Morrison et al., 2012). Namely, it appears crucial to build a broad base of fundamental motor abilities in early to middle childhood to improve the capacity for engaging in physical activities, especially in recreational sports environments (Malina 2001; Okely, Booth, & Patterson, 2001). On the other hand, paying attention to body composition and anthropological characteristics is crucial since they form a necessary foundation for enhancing motor abilities (Mijalković, Mladenović, & Ilić, 2023). Specifically, insufficient development of basic motor abilities and low levels of physical activity have been demonstrated to relate to increased levels of body fat and body mass indexes in children (Deforche et al., 2003; Graf et al., 2004; Okely, Booth, & Chey, 2004).

Certainly, some studies that have investigated the relation between motor abilities and body composition in younger school-aged children have established a significant relation between these variables (Gökmen, Kivrak, Çiçekli, Nurten, &

Correspondence:

S. Mijalković
University of Niš, Faculty of Sport and Physical Education, Čarnojevića 10A, 18000 Niš, Serbia
E-mail: stefimijalkovic@gmail.com

Murat, 2019; Lepes et al., 2014; Marmeleira, Veiga, Cansado, & Raimundo, 2017; Morrison et al., 2012; Webster, Sur, Stevens, & Robinson, 2021). Indeed, it is suggested that there is a relation between body composition and motor abilities of children (Gökmen et al., 2019; Marmeleira et al., 2017). Furthermore, children with higher body mass index values and increased body fat percentage, generally demonstrated lower motor performance in terms of speed, strength, agility and coordination compared to those with normal values of these body composition parameters (Marmeleira et al., 2017; Morrison et al., 2012). Additionally, Lepes et al., (2014) established that higher body weight and increased body fat percentage were related to lower motor abilities. Interestingly, an association between body height and motor abilities has been reported in girls (Lepes et al., 2014). Finally, too much body fat might limit the ability to move efficiently through space and influence the proficiency of motor abilities in younger school-aged children (Webster et al., 2021).

It is essential to monitor body composition parameters and motor abilities in younger school-aged children. Even though this topic has been covered in a certain number of scientific papers (Gökmen, Kivrak, Çiçekli, Nurten, & Murat, 2019; Morrison et al., 2012; Webster, Sur, Stevens, & Robinson, 2021), there is still a lot of interest in it. A growing percentage of children nowadays struggle with obesity, which may be related to decreased motor abilities. Therefore, the aim of this study was to determine the correlation between body composition and motor abilities in 8-year-old children.

Methods

Sample of participants

There were 15 children included in the study (8 boys and 7 girls) whose mean chronological age was 8.31±0.24 years. The children attended the second grade of the elementary school "Čegar" in the city of Niš and were involved in some form of sports activities. During the testing period, all children had to be in good health. The participants' parents or guardians gave permission for their child to participate in the study because participants were minors. The study followed Declaration of Helsinki's ethical criteria.

Testing procedure

The participants' assessments were carried out in the sports center of the elementary school "Čegar" in the city of Niš. First, the anthropometric characteristics of the participants were assessed. The participants wore basic clothing and were barefoot. Martin's GMP 101 anthropometer with an accuracy of 0.01 cm was used to measure each participant's body height. McKenna, Straker, & Smith (2013) have previously reported the validity and reliability of this instrument. On the other hand, the bioelectrical impedance Omron BF511 with an accuracy of 0.1 kg was used to assess participants' body mass index, body mass, percentage of fat and muscle and daily metabolism. Dehghan & Merchant (2008) have reported the validity and reliability of the instrument.

A 15-minute warm-up program that included static and dynamic stretching exercises along with some light running was administered to the participants. The warm-up protocol was followed by a speed assessment. The speed was assessed using 5, 10, and 20-meter sprints. Witty photocell gates (Microgate, Italy) with 0.01 s accuracy were used for measuring the sprints. Rumpf, Cronin, Oliver, & Hughes (2011) have reported the validity and reliability of these sprints. The photocells were placed at the starting line, 5, 10 and 20 meters (finish line). The participants were instructed to aim for the quickest time by covering the required distance from a standing position and starting to run as soon as the measurer signaled. Additionally, the standing long jump was used for assessing explosive power. Participants were instructed to perform a standing long jump starting from a position behind the starting line. The test was performed with participants in a high starting position, with their knees slightly bent. Upon the measurer's signal, the participant was required to jump as far as possible. They used arm swing momentum. After completing the long jump, the measurer measured the distance using a measuring tape. The best outcome was noted after the test had been performed three times. The standing long jump's validity and reliability have been previously reported by Ab Rahman, Kamal, Noor, & Geok, (2021). Additionally, repetitive strength of the upper limbs and repetitive strength of the body were assessed in this study. Repetitive strength of the upper limbs was assessed by push-ups and repetitive strength of the body was assessed by sit-ups for one minute (Potter, Spence, Boulé, Stearns, & Carson, 2017). Push-ups were performed with the participants in a plank position with their hands slightly wider than shoulder width. The participants lowered their body almost to the ground with their arms bent at the elbow joint, and then returned to the starting position. They were required to do the maximum number of push-ups in a time interval of one minute. Sit-ups were performed with the participants lying on their backs with knees bent and feet on the ground. The participants' arms were positioned behind their heads. The participant's task was to lift the shoulders and upper back up using the abdominal muscles, and then return down to the starting position. The maximum number of sit-ups for one minute was registered. In these tests, time was measured using a handheld stopwatch, whose validity and reliability were reported by Hetzler, Stickley, Lundquist, & Kimura (2008).

Participants' endurance was assessed by using the Yo-Yo Intermittent Recovery Test Level 1 (Yo–Yo IR1). Initially, the cones were positioned 16 meters apart. The participants stood behind the cones, and each of them had their own cone to follow. The participants followed the measurer's instructions and ran to the opposite cone and back at his signal. The level was considered completed only when the participant ran to and from the opposite cone, covering a distance of 32 meters. The test may be stopped whenever the participants desired, and they could be late for a maximum of twice before they were eliminated. Reliability and validity of Yo–Yo IR1 was previously reported by Ahler, Bendiksen, Krustrup, & Wedderkopp, (2012).

Data analysis

IBM SPSS Statistics 20 was used for the data analysis in this study. The One-Sample Kolmogorov-Smirnov Test was used to determine the distribution's normality after the descriptive statistics for the variables under observation were provided. Consequently, the correlation between the 8-year-old children's motor abilities and body composition was determined using Pearson's correlation analysis. According to Hopkins, Marshall, Batterham, & Hanin, (2009) the correlation coefficient was displayed as follows: trivial ($0 < r < 0.1$), small ($0.1 < r < 0.3$), moderate ($0.3 < r < 0.5$), large ($0.5 < r < 0.7$), very large ($0.7 < r < 0.9$) and almost perfect ($0.9 < r < 1$).

Results

Table 1 presents the descriptive statistics of monitored variables of body composition (body height, body mass, body mass index, percentage of fat and muscle and daily metabolism) and motor abilities (sprint at 5, 10 and 20 meters, standing long jump, push-ups, sit-ups and Yo–Yo IR1). Also, Table 1 contains the results of One-Sample Kolmogorov-Smirnov Test.

Table 1. Descriptive statistics and One-Sample Kolmogorov-Smirnov Test.

	Mean±Std. Deviation	KS Test
BH	133.43±6.68	0.72
BM	31.27±8.58	0.73
BMI	17.31±3.35	0.92
%fat	19.75±8.62	0.98
%muscle	29.97±3.34	0.63
DM	1135.13±146.13	0.88
5m (s)	1.65±0.12	0.87
10m (s)	2.71±0.20	0.88
20m (s)	4.92±0.48	0.64
SLJ (cm)	110.60±18.03	0.99
push-ups (1min)	14.87±9.51	0.98
sit-ups (1min)	32.33±11.06	0.61
Yo-Yo (m)	394.67±269.27	0.56

Legend: KS Test - One-Sample Kolmogorov-Smirnov Test; BH – body height; BM – body mass; BMI – body mass index; %fat - fat percentage; %muscle - muscle percentage; DM -daily metabolism; 5m - 5 meter sprint; 10m – 10 meter sprint; 20m – 20 meter sprint; SLJ - standing long jump; Yo-Yo - Yo-Yo Intermittent Recovery Test Level 1.

According to the results of One-Sample Kolmogorov-Smirnov Test, data were normally distributed. Therefore, Pearson's correlation analysis was employed to determine the correlation between body composition and motor abilities in 8-year-old children. The results of the Pearson's correlation analysis are shown in Table 2.

Table 2. Pearson's correlation analysis.

Monitored variables	5m (s)	10m(s)	20m(s)	SLJ (cm)	push-up (1min)	sit-ups (1min)	Yo-Yo (m)
BH	-0.078	-0.111	-0.134	0.164	-0.178	-0.136	-0.189
BM	0.172	0.232	0.213	-0.198	-0.408	-0.519*	-0.504
BMI	0.295	0.403	0.384	-0.393	-0.474	-0.660*	-0.618*
%fat	0.380	0.506*	0.486	-0.473	-0.488	-0.631*	-0.641*
%muscle	-0.175	-0.271	-0.299	0.091	0.113	0.089	-0.123
DM	0.047	0.048	0.036	-0.073	-0.184	-0.335	-0.474

Legend: * - statistical significance ($p < 0.05$); BH – body height; BM – body mass; BMI – body mass index; %fat - fat percentage; %muscle - muscle percentage; DM -daily metabolism; 5m - 5 meter sprint; 10m – 10 meter sprint; 20m – 20 meter sprint; SLJ - standing long jump; Yo-Yo - Yo-Yo Intermittent Recovery Test Level 1.

Based on the results of Pearson's correlation analysis presented in Table 2, it could be concluded that there was a statistically significant correlation between body composition and motor abilities in 8-year-old children. More precisely, a statistically significant negative correlation was identified between body mass and sit-ups ($p=0.047$), emphasizing that children with lower body mass would perform better this motor ability test. Furthermore, a statistically significant negative correlation was identified between body mass index and sit-ups ($p=0.007$) and the Yo–Yo IR1 ($p=0.014$). Finally, a statistically significant negative correlation was determined between body fat percentage and the 10 m sprint ($p=0.05$), sit-ups ($p=0.012$) and the Yo–Yo IR1 ($p=0.010$). This indicates that children with lower body mass index and lower body fat percentage may potentially achieve better motor performance compared to children with higher values of these body composition variables. The correlation coefficients indicated that it was a large correlation.

Discussion

The aim of this study was to determine the correlation between body composition and motor abilities in 8-year-old children. Based on Pearson's correlation analysis, it could be concluded that there was a statistically significant negative large correlation between body composition and motor abilities in younger school-aged children. Namely, a statistically significant correlation has been found between body mass and sit-ups, body mass index and sit-ups, as well as the Yo-Yo IR1 test, and body fat percentage with a 10-meter sprint, sit-ups and the Yo-Yo IR1 test. More specifically, higher values for body composition parameters were related to lower motor abilities, whereas lower values of the body composition parameters were related to higher levels of motor abilities. Therefore, it is crucial to monitor both body composition and motor abilities in this population.

When discussing body mass as an aspect of body composition, the results of our study indicated a negative correlation between body mass and the achieved maximum number of sit-ups within a one-minute time interval. This potentially indicates that children with higher body mass may be less successful in this test of motor abilities compared to children with normal values of this parameter. These results are in line with the findings reported by Esmaeilzadeh & Ebadollahzadeh (2012). A negative correlation between body mass and the number of sit-ups performed in one minute was also established in their study. These findings suggest that monitoring body mass from early childhood is of great im-

portance to have better repetitive strength and be more successful in sports activities. Also, the results of our study indicate a statistically significant negative correlation between body mass index and the achieved maximum number of sit-ups and the Yo-Yo IR1 endurance test. Butterfield, Lehnhard, & Coladarci (2002) also found a negative correlation between body mass index and the achieved maximum number of sit-ups in children. In addition, Ørntoft et al., (2018) found that children with higher body mass and body mass index were less successful in performing the Yo-Yo IR1. This is in line with our results, as higher values of body mass index were also related to lower endurance at the present study. Also, engaging in physical activity is a primary mechanism for the development of motor abilities and the regulation of children's body composition (Lohman et al., 2008; Stodden et al., 2008). It has been established that children of physically inactive parents are also less physically active, have inferior motor performance, are more susceptible to obesity and participate less frequently in sports and recreational activities than children of physically active parents (Zahner et al., 2009). Consequently, parents are advised to enroll their children in some form of sports activities to improve body composition values and thereby enhance motor abilities performance.

Finally, the results of our study also revealed a negative correlation between body fat percentage and a 10-meter sprint, the maximum number of achieved sit-ups, and the Yo-Yo IR1 endurance test. Several studies have reported similar findings (Gökmen et al., 2019; Lepes et al., 2014; Marmeleira et al., 2017). Indeed, it was established that higher percentages of body fat were negatively correlated with the performance of motor abilities such as speed, repetitive strength and endurance. Having too much body fat and a sedentary lifestyle, along with less physical activity among today's children and youth, clearly shows that having a higher percentage of body fat negatively affects the motor abilities of younger school-age children (Lepes et al., 2014). It has been established that regular physical activity leads to improvements in physical fitness, health behavior, and overall lifestyle in children and leads to a reduction in body fat percentage (Andersen, Wedderkopp, Hansen, Cooper, & Froberg, 2003; Pate, Trost, Levin, & Dowda, 2000; Zahner et al., 2009). Namely, one of the most important factors for children's participation in sports activities is the influence of parents and coaches (Webster, Sur, Stevens, & Robinson, 2021). Therefore, coaches and parents can be advised to pay attention to the lifestyle and body fat percentage of their children to ensure better motor performance and overall health.

The limitation of this study primarily lies in the small number of participants involved in the testing. The testing was conducted at the end of the school semester which could be one of the reasons for the small number of participants. Also, a large number of children at the time of testing had health issues. Due to the small number of participants, the results cannot be generalized and applied to the entire age population. Taking everything in consideration, this study is a pilot study that will serve as a starting point for further research.

Conclusion

This study advances our knowledge of the relations between 8-year-old children's motor abilities and body composition. More precisely, a statistically significant correlation between younger school-aged children's motor abilities and body composition was identified in this study. Understanding these relations can contribute to the development of training programs and strategies to improve motor abilities and reduce body composition in this population. It is important to assess both motor abilities and body composition parameters in younger school-aged children because children can improve their athletic performance in this way.

Conflict of interest

The authors declare that there is no conflict of interest.

Ethical Approval

The study was approved by the Faculty of Sport and Physical Education, University of Niš Ethical Committee (04-1955/2).

Future research

This pilot study is raising the need for future research. Future research should include a larger number of participants as well as a greater variety of tests to assess motor abilities. This way, the results can be generalized.

Received: 31 January 2024 | **Accepted**: 18 March 2024 | **Published**: 15 April 2024

References

Ab Rahman, Z., Kamal, A. A., Noor, M. A. M., & Geok, S. K. (2021). Reliability, validity, and norm references of standing broad jump. *Revista Geintec-Gestao Inovacao E Tecnologias*, *11*(3), 1340-1354.

Ahler, T., Bendiksen, M., Krustrup, P., & Wedderkopp, N. (2012). Aerobic fitness testing in 6-to 9-year-old children: reliability and validity of a modified Yo–Yo IR1 test and the Andersen test. *European journal of applied physiology*, *112*, 871-876.

Andersen, L. B., Wedderkopp, N., Hansen, H. S., Cooper, A. R., & Froberg, K. (2003). Biological cardiovascular risk factors cluster in Danish children and adolescents: the European Youth Heart Study. *Preventive medicine*, *37*(4), 363-367.

Bencke, J., Damsgaard, R., Saekmose, A., Jørgensen, P., Jørgensen, K., & Klausen, K. (2002). Anaerobic power and muscle strength characteristics of 11 years old elite and non-elite boys and girls from gymnastics, team handball, tennis and swimming. *Scandinavian journal of medicine & science in sports*, *12*(3), 171-178.

Butterfield, S. A., Lehnhard, R. A., & Coladarci, T. (2002). Age, sex, and body mass index in performance of selected locomotor and fitness tasks by children in grades K-2. *Perceptual and motor skills*, *94*(1), 80-86.

Deforche, B., Lefevre, J., De Bourdeaudhuij, I., Hills, A. P., Duquet, W., & Bouckaert, J. (2003). Physical fitness and physical activity in obese and nonobese Flemish youth. *Obesity research*, *11*(3), 434-441.

Dehghan, M., & Merchant, A. T. (2008). Is bioelectrical impedance accurate for use in large epidemiological studies?. *Nutrition journal, 7*(1), 1-7.

Eisenmann, J. C. (2006). Insight into the causes of the recent secular trend in pediatric obesity: common sense does not always prevail for complex, multi-factorial phenotypes. *Preventive medicine*, *42*(5), 329-335.

Esmaeilzadeh, S., & Ebadollahzadeh, K. (2012). Physical fitness, physical activity and sedentary activities of 7 to 11 year old boys with different body mass indexes. *Asian journal of sports medicine*, *3*(2), 105.

Gökmen, M. H., Kivrak, B., Çiçekli, C., Nurten, D. İ. N. Ç., & Murat, T. A. Ş. (2019). The Evaluation of The Connectıon Between Motor Performance Skills and Body Composition of 6-10 Year Old Children. *Sportive*, *2*(2), 16-26.

Graf, C., Koch, B., Kretschmann-Kandel, E., Falkowski, G., Christ, H., Coburger, S., ... & Dordel, S. (2004). Correlation between BMI, leisure habits and motor abilities in childhood (CHILT-project). *International journal of obesity*, *28*(1), 22-26.

Hetzler, R. K., Stickley, C. D., Lundquist, K. M., & Kimura, I. F. (2008). Reliability and accuracy of handheld stopwatches compared with electronic timing in measuring sprint performance. *The Journal of Strength & Conditioning Research, 22*(6), 1969-1976.

Hopkins, W., Marshall, S., Batterham, A., & Hanin, J. (2009). Progressive statistics for studies in sports medicine and exercise science. *Medicine+ Science in Sports+ Exercise, 41*(1), 3.

Kavey, R. E. W., Daniels, S. R., Lauer, R. M., Atkins, D. L., Hayman, L. L., & Taubert, K. (2003). American Heart Association guidelines for primary prevention of atherosclerotic cardiovascular disease beginning in childhood. *Circulation*, *107*(11), 1562-1566.

Larsen, M. N., Nielsen, C. M., Ørntoft, C. Ø., Randers, M. B., Manniche, V., Hansen, L., ... & Krustrup, P. (2017). Physical fitness and body composition in 8–10-year-old Danish children are associated with sports club participation. *Journal of strength and conditioning research*, *31*(12), 3425.

Lepes, J., Halasi, S., Mandaric, S., Tanovic, N., Lepes, J., Halasi, S., ... & Tanovic, N. (2014). Relation between body composition and motor abilities of children up to 7 years of age. *Int. J. Morphol*, *32*(4), 1179-1183.

Lohman, T. G., Ring, K., Pfeiffer, K., Camhi, S., Arredondo, E., Pratt, C., ... & Webber, L. S. (2008). Relationships among fitness, body composition, and physical activity. *Medicine and science in sports and exercise*, *40*(6), 1163.

Malina, R. M. (2001). Physical activity and fitness: pathways from childhood to adulthood. *American Journal of Human Biology: The Official Journal of the Human Biology Association*, *13*(2), 162-172.

Marmeleira, J., Veiga, G., Cansado, H., & Raimundo, A. (2017). Relationship between motor proficiency and body composition in 6-to 10-year-old children. *Journal of paediatrics and child health*, *53*(4), 348-353.

McAllister, E. J., Dhurandhar, N. V., Keith, S. W., Aronne, L. J., Barger, J., Baskin, M., ... & Allison, D. B. (2009). Ten putative contributors to the obesity epidemic. *Critical reviews in food science and nutrition*, *49*(10), 868-913.

McKenna, L., Straker, L., & Smith, A. (2013). The inter-tester reliability of anthropometric measurement with portable tools. *The European Journal of Physiotherapy, 15*(1), 34-41.

Mijalković, S., Mladenović, K., & Ilić, T. (2023). Body Composition And Motor Abilities Of Young Football Players. *Journal of Anthropology of Sport and Physical Education*, *7*(2), 19-22.

Morrison, K. M., Bugge, A., El-Naaman, B., Eisenmann, J. C., Froberg, K., Pfeiffer, K. A., & Andersen, L. B. (2012). Inter-relationships among physical activity, body fat, and motor performance in 6-to 8-year-old Danish children. *Pediatric exercise science*, *24*(2), 199-209.

Must, A., & Tybor, D. J. (2005). Physical activity and sedentary behavior: a review of longitudinal studies of weight and adiposity in youth. *International journal of obesity*, *29*(2), S84-S96.

Okely, A. D., Booth, M. L., & Chey, T. (2004). Relationships between body composition and fundamental movement skills among children and adolescents. *Research quarterly for exercise and sport*, *75*(3), 238-247.

Okely, A. D., Booth, M. L., & Patterson, J. W. (2001). Relationship of physical activity to fundamental movement skills among adolescents. *Medicine and science in sports and exercise*, *33*(11), 1899-1904.

Ørntoft, C., Larsen, M. N., Madsen, M., Sandager, L., Lundager, I., Møller, A., ... & Krustrup, P. (2018). Physical fitness and body composition in 10–12-year-old Danish children in relation to leisure-time club-based sporting activities. *BioMed research international*, *2018*.

Pate, R. R., Trost, S. G., Levin, S., & Dowda, M. (2000). Sports participation and health-related behaviors among US youth. *Archives of pediatrics & adolescent medicine*, *154*(9), 904-911.

Pedersen, B. K., & Saltin, B. (2006). Evidence for prescribing exercise as therapy in chronic disease. *Scandinavian journal of medicine & science in sports*, *16*(S1), 3-63.

Potter, M., Spence, J. C., Boulé, N. G., Stearns, J. A., & Carson, V. (2017). Associations between physical activity, screen time, and fitness among 6-to 10-year-old children living in Edmonton, Canada. *Applied physiology, nutrition, and metabolism*, *42*(5), 487-494.

Rumpf, M. C., Cronin, J. B., Oliver, J. L., & Hughes, M. (2011). Assessing youth sprint ability–Methodological issues, reliability and performance data. *Pediatric exercise science*, *23*(4), 442-467.

Stodden, D. F., Goodway, J. D., Langendorfer, S. J., Roberton, M. A., Rudisill, M. E., Garcia, C., & Garcia, L. E. (2008). A developmental perspective on the role of motor skill competence in physical activity: An emergent relationship. *Quest*, *60*(2), 290-306.

Webster, E. K., Sur, I., Stevens, A., & Robinson, L. E. (2021). Associations between body composition and fundamental motor skill competency in children. *BMC pediatrics*, *21*(1), 1-8.

Weiss, M. R. (2013). Back to the future: Research trends in youth motivation and physical activity. *Pediatric exercise science*, *25*(4), 561-572.

Zahner, L., Muehlbauer, T., Schmid, M., Meyer, U., Puder, J., & Kriemler, S. (2009). Association of sports club participation with fitness and fatness in children. *Medicine+ Science in Sports+ Exercise*, *41*(2), 344.

DOI 10.26773/jaspe.240403

Journal of Anthropology of Sport and Physical Education

ORIGINAL SCIENTIFIC PAPER

Olympism and role of Olympic Values in Sport

Diellza Kelmendi[1], Besa Hvziu[2], Fitim Arifi[1]

[1]Kosovo Olympic Academy, Pristina, Kosovo, [2]University of Tetovo, Faculty of Pedagogy, North Macedonia

Abstract

The Olympic Movement is one of the most amazing phenomena in the history of mankind. Olympism and the Olympic Movement strongly promote ethics, values, education, excellence, fair play and cultural understanding among people. Olympic games represent the largest sports festival in the world where the athletes get an opportunity to meet and compete with athletes form all over the world. Only a small number of people in the world become Olympians, but every person can enjoy the benefits of being physically active. Blending sport with culture and education, Olympism seek to create a way of life based on the joy found in effort, the education value of good example and respect for universal fundamental ethic principles. Sport is the most effective tool that promotes education, health, peace, gender equality and violence prevention. In addition, it is globally valued as an excellent mechanism for developing character and contributing to world peace and safety. Over the past 120 years Olympism has been adapted by the Olympic Movement and associated with values present at the given times since its formative years. The Olympic Movement has lived with the need to articulate competition and education, individual and nation, sports for the elite and sports for everybody. To this day the Olympic Games present themselves to be a non-political festivity in the spirit of humanity, free from discrimination based on gender, sex, race, color, sexual orientation, religious or political opinion. The aim of this article is to discuss the concept of Olympism, Olympic Games, Olympic Values and the role of values which are extremely important currently in the 21st century.

Keywords: *Olympism, Olympic Games, Olympic Values*

Introduction

History of the Olympics shows that Olympic sports unifying sport with culture and education, have been seeking to create a lifestyle based on taking a delight in every effort, the educational power of a good example as well as holding in respect global ethics (Motiejunaite, 2019). Through Olympic Games, sport is becoming a global culture (Cartalis, 2000); meanwhile, Olympic Education is trying to improve humanity through balancing the physical and intellectual aspects of the body. Sport is considered as a valued human practice (Arnold, 1979, 1994, 1999). The discourse of what is undeniably one of sport's most vexatious discussion questions, essentially focuses upon the merits and demerits of the ideology of Olympism (Horton, 1998). The values and ideals of Olympism are derived from the Olympic Games, at Ancient Olympia, where they were held every four years with all the cities of antiquity participating. Olympic Games have been one of the common values that were created by civilization and benefited by the entire society in today's world in which differences are regarded as richness (Parry, 2006). The new period Olympiad believed that the Olympic Games are not just considered as a sport event, but also is a milestone in the broader social and cultural movement (Lyan, 1992). The true excellence of the Games rests in their ability to unite humanity around universal aspirations: equality, fair play, sportsmanship, tolerance and, peace (Ramón, 2012). Therefore, the ancient Olympic Games were a venue for festivals in which not only athletes but also scholars and artists participated. Gathering athletes from all over the Earth in a specific place every four years create the biggest and the most unique sports festival which originated from the foundations and principles of Olympics Charter (Shantz, 1998). Through Olympic Games, sport is becoming a global culture (Cartalis, 2000). Becoming an Olympian requires not only exceptional athletic abilities but

Correspondence:

Diellza Kelmendi
Kosovo Olympic Academy
Email: diellza.kelmendi@noc-kos.academy

also perseverance, discipline, and a passion for the sport. It is remarkable journey that involves not just reaching the pinnacle of athletic achievement but also embodying the values that the Olympic Games stand for.

Olympians serve as role models and inspire others through their dedication, sportsmanship, and achievements. Olympians possess a strong competitive spirit, always aiming to improve and surpass their own records or their rival's achievements. The IOC leads the Olympic Movement with the main mission of promoting Olympism around the world, emphasizing the encouragement and support of the activities of the International Olympic Academy (Olympic Charter, 2020). The International Olympic Committee (IOC) encourages the development of sports. It cooperates with other sports organizations in order to bring sports at the service of humanity (Siljak & Djurovic, 2017).

It is important to note that the Olympic Charter states that the IOC has a role to promote a positive legacy from the Olympic Games to host-cities and countries (Olympics, 2019). The objective of the Olympic Movement is to help to build a peaceful and better world by educating youth through sport in accordance with Olympism and its values (IOC, 2017). Binder (2001) cites, Coubertin and the IOC came to specify the four aims of the Olympic Movement as follows:

1. To promote the development of physical and moral qualities which are the basis of sport;

2. To educate young people through sport in a spirit of better understanding between each other and of friendship, thereby helping to build a better and more peaceful world;

3. To spread the Olympic principles throughout the world, thereby creating international goodwill;

4. To bring together the athletes of the world in a great four-yearly sports festival the Olympic Games.

The mission of the IOC is to not just to celebrate the Olympic Games, but also to promote Olympism around the world, promote sport in society, and support sports organizations. The International Olympic Committee (IOC, 2010) argue that the goal of the Olympic Movement is to contribute in building a peaceful and better world by educating youth through sport practiced in accordance with Olympism and its values.

Olympism is a philosophy of life, harmoniously combining the qualities of body, will and mind. Blending sport with culture and education, Olympism seeks to create a way of life based on the joy of effort, the educational value of good example, social responsibility and respect for universal fundamental ethical principles (Olympic Charter, 2020).

The Olympic movement is a striking example on how leading social groups are able to control their own representation, by creating a narrative which is based on the "idolisation" of its particular authorities and a lack of self-criticism, while at the same time distancing itself from its image and culture which results in "institutional narcissism" (Cazorla, Minguet & Fernández, 2011). A structural implementation of perceived values is deemed one of the most important skills that an educational process needs to provide in order for the successful development of a healthy personality. Education is the foundation of modern society. The future of our civilization does not rest on political or economic foundations. It wholly depends on the direction given to education (Chenyu, 2022). Great examples are the International Olympic Academy, as well as the Olympic Study Centres which are key instruments to propagate the Olympic narrative (Cazorla, Minguet & Fernández, 2011).

The purpose of this review of current literature is to show the importance and role of Olympism, Olympic Games and the impact of Olympic Values. The methodology used for this literature review is identification of previous and current scientific evidence (articles, books and policy documents published between 1912 and 2023) treating these concepts.

Types of Literature used in this paper: 14 Official IOC Documents, 5 Books, 2 Review Articles, 25 Articles, 1 Conference, 1 Dissertation, 1 Master Thesis, 1 Symposium, 3 International Olympic Academy documents.

Platforms and key terms used to locate data: Olympic Library, Olympic Charter, Olympism, Olympic Values, and Olympic Games.

Literature Review

Olympism

Olympism is a social philosophy, which emphasizes the role of sport in world development, international understanding, peaceful co-existence, and social and moral education (Parry, 2012). A universal philosophy by definition applies to everyone, regardless of nation, race, gender, social class, religion or ideology, and so the Olympic Movement has worked for a coherent universal representation of itself - a concept of Olympism which identifies a range of values (Parry, 1998). Modern Olympism is rooted in the writings of the Baron Pierre de Coubertin, the founding father of the first modern Olympic Games (1896), in Athens (Gebauer, 2020). Olympism, the ancient philosophy behind the Olympic Games, has been looked to by various educators (Binder, 2005; Bronikowski, 2006; Culpan, 2007; Naul, 2008) to combat these challenges and reaffirm sport's connection with culture and education. Pierre de Coubertin (1863-1937), firmly believed that sport can help people to push beyond their limits, but also to transcend their differences, and draw closer together and better understand each other. In (1908), Coubertin established his concept of Olympism in a more schematic way when he considers it a fraternal doctrine between the body and the spirit (Durántez, 2001). The timeless character of Olympism is highlighted in the argument by de Coubertin (1918) in Hsu (2000), where he states that "Olympism is nor a system; it is a state of mind. At the same time, Olympism blends together sport, culture and education with the aim to create a way of life based on joy of effort, the educational value of good example, social responsibility and respect for universal fundamental ethical principles.

For Coubertin, the Games represented the consolidation of the concept of sports practice that transformed the physical demonstration into an educational, cultural and social enterprise, producing reflexes in individual, regional, national and international levels. In an effort to establish education as an important pillar in shaping modern citizens, de Coubertin idealized the Olympic athlete, set aside his imperfections and aimed at the internationalization of the values that express "Olympism" to the benefit of the concept of education. As an educator, de Coubertin recognized the holistic nature of the individual, as expressed in the idea of a perfect harmony between body, mind and spirit. He believed that sport education could effectively contribute to the betterment of society (Girginov & Parry, 2005). According to Coubertin (Müller, 2004), Olympic principles should engage all people no matter of religion, race, age, nationality, occupation. This can be seen during the Olympic Games where athletes from all around the world gather at one place sharing cultures, ideas, knowledge and differences which is the way how some principles of Olympism are respected and implemented. Olympism seeks to create a way of life based on the joy of effort, the educational value of good example, social responsibility and respect for universal fundamental ethical principles (Coubertin, 1935).

According to (Loland, 1994) Olympism has four main goals:

- to educate and cultivate the individual through sport,
- to cultivate the relations of humans in society,
- to promote international understanding and peace, and
- to worship human greatness and possibility.

According to (Kidd, 1996) "Coubertin's Olympism constituted a "broad educational movement that, through the activity of sport and culture, would enhance human development and generally make the world a better place". Arnold (1997) supports the view that Olympism is a rightful and legitimate part of physical education, arguing the promotion of Olympism is best maximized through physical education and sport education in schools. Olympism is the entire collection of values which, over and above physical strength, are developed when we participate in sport. (Malter, 1996). In that respect, the values of achievement and performance, victory and psycho-physical perfection and character-building by strenuous training and sports, is a very important main factor like also the one on social encounters, no discrimination and the independence of the Olympic movement. (Gangas & Georgiadis, 2021). Yet, the narrative about the values of Olympism took a sharp turn with Juan Antonio Samaranch becoming IOC President (1980-2001) (Edwards, 2012). He modernized the IOC and further introduced a profit-oriented approach towards managing the Olympic Games (Gebauer, 2020). At the same time, Olympism blends together sport, culture and education with the aim to create a way of life based on joy of effort, the educational value of good example, social responsibility and respect for universal fundamental ethical principles. (Olympic Charter, IOC, 2007). More precisely, "the Olympic idea" and the idea of "taking part" are "the most important thing" (Coubertin 1908, quoting the Bishop of Pennsylvania). In that respect, the values of achievement and performance, victory and psycho-physical perfection and character-building by strenuous training and sports is a very important main factor like also the one on social encounters, no discrimination and the independence of the Olympic movement (Gangas & Georgiadis, 2021).

Sport and in particular the Olympic Games are an international media platform which can be used to highlight certain causes or become "alternative diplomatic tools". This can lead to greater awareness by the public, draw attention to a conflict, serve as an example of peaceful combat, etc. Sport and Olympism are tools for civic education which help to develop important individual and social competences, and thus to know one another better and live together better (IOC, 2011). Olympism is a philosophy of life, exalting and combining in a balanced whole the qualities of body, will and mind. Blending sport with culture and education, Olympism seeks to create a way of life based on the joy of effort, the educational value of good example, social responsibility and respect for internationally recognized human rights and universal fundamental ethical principles within the remit of the Olympic Movement (Olympic Charter, 2023).

Importance of Olympic Values

Since Olympism is what makes something "Olympic," it is crucial that the Olympic Movement, is guided by its values. In this way, Olympism functions as a corporate philosophy that articulates the Movement's values, guides its decisions, and serves as a standard for evaluating its actions. (Klein, 2020). Values are the principles and fundamental convictions that we each have and that guide each person's behavior. Values provide the standards by which particular actions are judged to be good or desirable, (IOC, 2023). The educational aspect of Olympism as philosophy of life and the Olympic values are the foundation of the unique character of the Olympic Movement (Girard-Savoy, 2017). Coubertin used values as a basic to develop his sport philosophy known as Olympism which he describes as a 'philosophy of life'. The relationship between sport and values is that the values are developed when we participate in sport (Müller, 2010).

The five Olympic educational values can be identified as follows:

- Joy of Effort.
- Fair Play.
- Practicing Respect.
- Pursuit of Excellence.
- Balance between Body Will and Mind.

The five-key educational themes are used by the Olympic movement with the intention of helping young people to practice and understand the principles of Olympism. Olympic sports have continued to be promoted and the significance of educational ideas and values are highlighted in the Fundamental Principles of the current Olympic Charter (IOC, 2017). Rather than giving a clear definition of those principles, the Olympic Movement puts forward three core values supporting these universal fundamental ethical principles: Excellence, Respect and Friendship (IOC, 2016). The Olympic Movement aspires also to spread these values beyond the realm of sport (Dziubiński, 2008).

The IOC (2013), defines 'excellence' as follows: Giving one's best on the field of play or in life, without measuring oneself with others, but above all aiming at reaching one's personal objectives with determination in the effort. It is not only about winning, but is mainly about participating, making progress against personal goals, striving to be and to do our best in our daily lives and benefitting from the combination of a strong body, will and mind. Friendship" is seen by a way of considering sport as a tool for mutual understanding among people from different cultures, religions, beliefs, races and gender. It is the joy of playing, overcoming these differences and bringing people together (IOC, 2018). Friendship played a key role in coexistence and competition, promoting equal access to opportunities despite in the face of social prejudice situation. The establishment of friendship also made sport an instrument of social integration, reflecting the quality of life (Chenyu, 2022). Respect is about following the rules not only because it is illegal to break them. It includes the respect for the fairness among competitors, for yours and your opponent's health and for the environment (IOC, 2018). More specifically, Loland (2007) argued that practicing respect in sports is based on the respect for the rules of participation (beyond their application by a referee), respect for the rivals (beyond the field of play) and respect for oneself (beyond improving personal results). In sportsmanship, victory at all costs is rejected. Based on the "Inside-out Pattern" approach to Respect, the approach of the Olympic Movement to interpret Respect is through Olympic sports.

Participation as the Olympic Charter indicates: "to place sport at the service of the harmonious development of humankind, with a view to promoting a peaceful society concerned with the preservation of human dignity" (Gangas & Georgiadis, 2021). Implying recognition of virtues presented, respect is considered to be the core of sportsmanship and involves not only compliance with the rules, but essentially the incorporation of values that lift or reduce the necessity for mandatory regulations to be enforced (Pérez-Triviño, 2012).

IOC holds the Olympic values as the core values of the Olympic Games and the Olympic movement, which have always been indicators of a well- developed sports culture (Guzel & Ozbey, 2013). According to Todt, (2014), the three traditional values (excellence, friendship and respect) were interpreted as 'Nuclear Values' proclaimed by the International Olympic Committee, considering its universal meaning. Additionally, the Olympic values of honesty, equality, fairness, justice, virtue and a generally spiritual ethos, as well as competitiveness and respect for one's opponent are what inspired Pierre de Coubertin to revive the Olympic Games.

Fair play is another theme centered in Olympic Values and is used as a synonym of good behavior on many occasions. Fair play is a sports concept, but it is applied worldwide today in many different ways (Valler et al., 1996). It is defined as a central concept which is multi-dimensional in nature and that involves: sports,

rules, social conventions, the opponent, and finally a positive way of understanding sports to avoid winning at all costs. Leo Hsu (2000) mentions the values included in the Olympic spirit, such as "truce, honor and honesty, beauty, healthy body towards healthy mind, fair play, pursuit of excellence, a concept that denoted the successful integration of moral, artistic, intellectual, and physical creativity". Balance of Body, Will and Mind Embracing Olympic values can help young people achieve a well-balanced approach to life, and an international revival of the Olympic Games would stimulate interest in sport and physical activity among young people (IOC, 2017).

Regardless of the form or the content, the concepts contained in the modern understanding of Olympism have evolved from Greek antiquity to become a dynamic framework of values and ethical rules that are applied through sporting activity and are extended to our contemporary daily lives (Gangas, 2021). In social science research, Olympic Values have mostly been conceptualized from philosophy, psychology and anthropology (Chenyu, 2022).

Excellence, friendship, respect, universality, sustainability and non-discrimination are all fundamental Olympic Values which everyone has to adhere (Guzel & Ozbey, 2013). Chatziefestathiou, (2005) suggests that Olympic values in a global world context should be: equity, excellence, fair play, amateurism, universalism, internationalism, multiculturalism and environmentalism.

Conclusion

This article examines the impact of Olympism, Olympic Movement, and the core of Olympic Values. The foundation of Olympism and the Olympic Movement has played a major role in the education and development of sports around the world. Every era discussed in this study is influenced by the previous era. IOC has a great deal of power – more than in the past – and consequently plays an important role in the new sport world order (Brookes, 2002; Tomlinson, 2006). Today, the Olympics is not simply a sporting event. Olympic Games are important sport festivals in the modern world. They are grandiose and brilliant feasts of a global magnitude where, irrespective of the tough competition and strong sporting rivalries, friendship and solidarity reign supreme.

Being an Olympian is an extraordinary achievement that involves rigorous dedication, hard work, and immense talent in a particular sport. Today, the Olympic values of excellence, friendship and respect are the heart and soul of the Olympic Movement. The sustainability of these values over time has not only elevated the discipline of sport on a world stage, but has also played a major role in the Olympic Movement's long-term success.

The educational aspects and Olympic values are the foundation of the unique character of the Olympic Movement. Thus, sport represents a powerful tool and has the potential to play a fundamental role within society in general, especially concerning younger generations. The overarching philosophy of Olympism challenges us to uphold the principles of peace and fair play to create a peaceful society. As we look to the future, the principles of Olympism will undoubtedly remain instrumental in shaping the evolution of sports and promoting greater understanding among nations.

Acknowledgements

The authors would like to thank all the researchers who have contributed to the research, analyses and summary of the literature regarding the Olympic Movement, Olympic Games, Olympism, and Olympic Values.

Conflicts of interest

This study does not contain any conflicts of interest.

Received: 22 February 2024 | **Accepted**: 26 March 2024 | **Published**: 15 April 2024

Reference

Arnold, P. (1979). *Meaning in movement, sport and physical education*. London: Heinemann.

Arnold, P. (1994). Sport and moral education. *Journal of Moral Education*. 23(1), 75. *https://doi.org/10.1080/0305724940230106*

Arnold, P. (1997), *Sport, Ethics and Education*. Cassel; Publishing, London.

Binder, D. (2000). *Be a champion in life: An international teacher's resource manual*. Athens: Foundation for Olympic and Sport Education.

Binder, D. (2001). "Olympism" revisited as context for global education: Implications for physical education. *Quest, 53*(1), 14-34.

Binder, D. (2005). *Teaching Olympism in schools: Olympic education as a focus on values education.* Barcelona: Centre d'Estudis Olimpics, University of Autonoma, Barcelona.

Brookes R. (2002). *Representing Sport*. New York: Oxford University Press.

Bronikowski, M. (2006). Achievements in Teaching Olympism in Polish Schools. Research Yearbook; *Medsportpress, 12*(2), 184-189.

Cazorla, L. J. R, Minguet. J. L. C., & Fernández, I. L. (2011). Rhetoric and Power: Thec Idealism and 'Philosophy of Life' of the Olympic Movement. *Quest, 63*(4), 352- 365. DOI: 10.1080/00336297.2011.10483686.

Culpan, I., Wigmore, S. (2010). The delivery of Cartalis, C. (2000). Linking sports with culture and education in the framework of the Cultural Olympiad. *The Sport Journal*. Vol, 3, No, 1, pp: 66-73. Olympism education within a physical education context drawing on critical pedagogy. International *Journal of Sport and Health Science, 8,* 67-76. http://doi.org/dcqp4g.

Coubertin, P. (1098). 'To the Editor of the Times: The Olympic Games, in N. Müller, ed., *Pierre de Coubertin 1863–1937 – Olympism: Selected Writings* (Lausanne, 1997), p. 736.

Coubertin P. (1912). Les femmes aux Jeux Olympiques. *Revista Olímpica*.

Coubertin, P. (1918). Olympic letter V. *Olympic pedagogy"*, in Müller, N. (ed.) (2000).

Coubertin, P. (1935, 2000). *The Philosophic Foundation of Modern Olympism*. In The Philosophic Foundation of Mode rn Olympism, ed. N Muller.

Edwards, G. (2012). Faster, Higher, Stronger: A Critical Analysis of the Olympics.. *Irish Marxist Rev,* 1(2), 73-87.

Chatziefstathiou, D. (2005*). Changing Nature of the Ideology of Olympism in the Modern Olympic Era.* Doctoral Dissertation. Loughborough University, UK..

Chenyu,W. (2022). Perception of Olympic Values by High School Students: A Qualitative Approach. *International Journal of Humanities Social Sciences and Education*. Volume 9, Issue 7, July 2022, PP 81-90 ISSN 2349-0373 (Print) & ISSN 2349-0381,https://doi.org/10.20431/2349-0381.0907009.

Durantez C. (2001*). El dopaje como fraude y violencia en el deporte*. Métodos prohibidos. Madrid: Academia Olímpica Española.

Dziubiński, Z. (2008). Olympism in the Context of Modernity. Research yearbook, *Medsportpress, 14*, (2),15-124.

Gangas D., Georgiadis, K. (2021). *Looking Towards the Future with Hope*. International Olympic Academy. ISBN: 978-960-9454-56.

Gurbuz. P.G, Ozbey,S. (2013). Promotion of olympic values based on olympic solidarity programs. *International Journal of Academy Research Part B, 5*(2), 275-286. DOI:10.7813/2075-4124.2013/5-3/B.43.

Gebauer, G. (2020). *Olympische Spiele*. Stuttgart: Reclam.

Girard-Savoy.N (2017).*The Educational programmes of Olympic Solidarity. International Olympic Academy.* 14t^{h} Joint International Session for President or Directors of National Olympic Academy and Officials of National Olympic Committee.

Horton, P. (1998). Olympism in the Asia-Pacific region: A question on naivety or pragmatism? Culture, *Sport and Society, 1*(1), 169-184.

Hsu, L. (2000). Olympism: A Dead Ideal and a Western Product?. *Fifth International Symposium for Olympic Research*, pp. 249-256.

José Serrano-Durá, Pere Molina & Alejandro Martínez-Baena (2020). Systematic review of research on fair play and sporting competition. *Sports, Education and Society, 26(* 6), p648-662.

International Olympic Committee (2007). *Olympic Charter.* Lausanne/ Switzerland, Published by the International Olympic Committee.

International Olympic Committee (2010). *Olympic Charter.* Lausanne/ Switzerland, Published by the International Olympic Committee.

International Olympic Committee (2011). *The Olympic Museum. Educational and Cultural Service*. Lausanne 1st edition, 2011.

International Olympic Committee (2013). *Olympic Games*: legacies and impacts, Bibliography. Lausanne IOC.

International Olympic Committee (2013). *Olympic Charter.* Lausanne/ Switzerland, Published by the International Olympic Committee.

International Olympic Committee (2016,). *The Fundamentals of Olympic Values Education*, A Sports-Based Programme 2nd Edition International Olympic Committee.

International Olympic Committee (2017). *Olympic Charter.* Lausanne/ Switzerland, Published by the International Olympic Committee.

International Olympic Committee (2017*). The Fundamentals of Olympic Values Education. Retrieved from* https://stillmed.olympics.com/media/Document%20Library/OlympicOrg/IOC/What-We-Do/Promote-Olympism/Olympic-Values-Education-Programme/Toolkit/The-Fundamentals/English.pdf.

International Olympic Committee (2017). *Olympic Charter*. Lausanne/ Switzerland, Published by the International Olympic Committee.

International Olympic Committee (2018*). Living the Olympic Values* (video). Retrieved on December 18, 2018, from https://www.olympic.org/videos/living-the-olympic-values.

International Olympic Committee (2020). *Olympic Charter*. Lausanne/ Switzerland, Published by the International Olympic Committee.

International Olympic Committee (2021*).Olympic Charter.* Lausanne/ Switzerland, Published by the International Olympic Committee.

International Olympic Committee (2023). *Olympic Charter.* Amendments approved by 141st IOC Session'IOC News, 15October,availableat: https://olympics.com/ioc/news/olympic-charter-amendments-approved-by-141st-ioc-session (last accessed 07/11/2023).

Kidd, B. (1996). *Aspirations of Olympism: A framework for considering the athlete's experience in the Olympic Movement at the close of the twentieth century*. Paper presented at the Centre d'Estudies Olimpics UAB, Barcelona.

Klein, A. 1984. Review of 'Soccer Madness' (Lever, 1983). *Sociology of Sport Journal 1*, no. 2: 195–7.

Loland, S. (1994). *Pierre de Coubertin's ideology of Olympism from the perspective of the history of ideas.* Paper presented at the 2nd International Symposium for Olympic Research, London.

Loland, S. (2007). Justice in sport: An ideal and its interpretations. *Sport, Ethics and Philosophy, 1*(1), 78–95. Olympism: still colonizing children's minds. *Educational Review, 64*(3), 265-274. DOI: 10.1080/00131911.2012.667389.

Lyan H. (1992). *The Olympic dream, 31th session*, IAO. July 1992.

Malter. R. (1996). *Eurythmie des Lebens" als Ideal menschlicher Existenz. Bemerkungen zu Coubertins geschichtsphilosophischer Anthropologie.* In: Müller, N../Messing, M.(Eds.): Auf der Suche nach der Olympischen Idee. Kassel, Agon , 1996, pp.9-16.

Müller, N. (2000): *Olympism: selected writings of Pierre de Coubertin*. Lausanne : IOC, p. 222-226.

Muller, N. (2004). Lecture notes: Olympic Education [online]. Catalonia, Barcelona: Centre d´EstudisOlímpics (UAB).[cit.2004]. RetrievedfromWWW:http://olympicstudies.uab.es/lec/pdf/muller.pdf

Müller, N. (2010), *Olympic Education*: university lectures on the, UAB, Barcelona, Spain Müller, Norbert. (2004). Olympic education: university lecture on the Olympics. Barcelona: Centre d'Estudis Olímpics UAB. International Chair in Olympism (IOC-UAB). [Date of consulted: 14/10/04].

Malter. R. (1996). *Eurythmie des Lebens" als Ideal menschlicher Existenz. Bemerkungen zu Coubertins geschichtsphilosophischer Anthropologie*. In: Müller, N./Messing, M.(Eds.): Auf der Suche nach der Olympischen Idee. Kassel, Agon , pp.9-16.

Motiejunatie, R. (2019).14th Joint International Session for President of Directores of National Olympic Academy and Officials of National Olympic Committees. *International Olympic Academy*.

Naul, R. (2008). *Olympic education*. Maidenhead, UK: Meyer & Meyer.

Olympics. (2019). Olympic Charter. Retrieved from https://www.olympic.org/documents/olympic-charter

Parry, J. (1998). Physical education as Olympic education. *European Physical Education Review. 4*(2), 153-167. Parry, J. (2006). Sport and Olympism: Universals and multiculturalism. *Journal of the Philosophy of Sport, 33*: 188-204.

Parry,J., Girinov. (2005). *The Olympic Games Explained: A* Student Guide to the Evolution of the Modern Olympic Games. Routledge.

Parry, J. (2012). Sport and Olympism: Universals and Multiculturalism. *Journal of the Philosophy of Sport.*

Pérez-Triviño, J. L. (2012). Strategic intentional fouls, spoiling the game and gamesmanship. *Sport, Ethics and Philosophy, 6* (1), 67–77.P. Guzel, S. Ozbey. (2013).Promotion of olympic values ba sed on olympic solidarity programs. *International Journal of Academic Research Part B*, *5*(2), 275-286. DOI: 10.7813/2075-4124.2013/5-3/B.43.

Shantz, O. (1998). Olympic ideals & the history of the Olympic Games, 6th International Postgraduate seminary on Olympic Games. IAO. *Olympic.*

Schantz, O. (1996): "*Werte des Olympismus für die Sporterziehung",* in N. Müller and M.Messing (eds.): Auf der Suche nach der Olympischen Idee. Kassel: Agon, p. 83-88.

Schneider, A. J. (2000). *Olympic reform: Are we there yet?* In Bridging Three Centuries: Intellectual Crossroads and the Modern Olympic Movement. (Ed.).

Smith, B. & Sparkes, A. (2016). Handbook of Qualitative Research in Sport and Exercise. London: Taylor and Francis.

Ramón, S. (2012). Olympic rings of peace? The Olympic movement, peacemaking and intercultural understanding. *Sport in Society, 15*(6): 761-774.

Stevens,S. (2021). *Olympism practiced through sport: An insight from youth*. Thesis discipline Education. University of Canterbury. School of Sciences and Physical Education. http://dx.doi.org/10.26021/9967.

Todt, N. S. (2014). *Worldwide practices combining Olympic values and Sport: Encouraging transferable life skills to disadvantaged Brazilian communities.* In Chatziefstathiou, D., & Müller, N. (Eds.), Olympism, Olympic Education and Learning Legacies (pp. 194-206). Newcastle, England: Cambridge Scholars Publishing.

Tomlinson, A. (2006). The Commercialization of the Olympics: Cities, Corporations and the Olympic Commodity. *http://alantomlinson.typepad.com/alan_tomlinson/*.

Vallerand, R. J., Deshaies, P., Cuerrier, J. P., Briere, N. M., & Pelletier, L. G. (1996). Toward a multidimensional definition of sportsmanship. *Journal of Applied Sport Psychology, 8*(1), 89–101.

Vassil Girginov V., Parry. J. (2005) *The Olympic Games Explained.* Routledge. Taylor& Francis Group.

Siljak, *V.,* Dejan Djurovic , *D. (2021).* Historical Development of the Olympic Movement. Sport Mont 15, (3): 43–46, DOI: 10.26773/smj.2017.10.008**.**

Wickramaratne, Ch., (2021). Review of Olympic Values: For the Betterment of the Athletes. *International Journal of Research in Humanities and Social Studies.* Volume 8, Issue 3, DOI: https://doi.org/10.22259/2694-6296.0803005).

DOI 10.26773/jaspe.240404

Journal of Anthropology of Sport and Physical Education

ORIGINAL SCIENTIFIC PAPER

Exploring anthropometric characteristics, weight status, and posture among preschool children in Serbia

Jovica Peulić[1], Borko Katanić[2], Nataša Jovanović[3], Dusko Bjelica[4]

[1]Preschool Institution "My Childhood", Čačak, Serbia, [2]Montenegrin Sports Academy, Podgorica, Montenegro, [3]Children's Dispensary of the Health Center Čačak, Serbia, [4]University of Montenegro, Faculty for Sports and Physical Education, Niksic, Montenegro

Abstract

The aim of this cross-sectional study was to determine the anthropometric characteristics, weight status, and posture of 6- and 7-year-old preschool-aged children. The sample of 922 children was divided by gender and age (monthly quartiles). Anthropometric characteristics were assessed using a battery of three variables: body height (BH), body mass (BM), and body mass index (BMI). BMI was categorized based on the World Health Organization (WHO) cutoff values, determining the degree of children's weight status. Postural status was assessed by evaluating the following postural parameters: foot status, scoliosis, and dropped shoulders. Independent samples t-test showed no differences in anthropometric characteristics between boys and girls. According to ANOVA test, all three older groups (III, IV, and V) had significantly higher values in body height than the first two younger groups. In terms of body mass, IV and V groups had higher values than group I, and V had higher values than group II. Normal-weight children constituted 73.5%, while 14.4% were overweight and 8.8% were obese. Chi-square test revealed no difference in the degree of weight status by gender. Regarding postural status, 24.1% of children had scoliosis, 75.4% had abnormal foot status, and 59.8% had dropped shoulders. Chi-square test showed no difference between gender and postural deviations, except for foot status where boys significantly had more deviations than girls. This study contributed to diagnosing the anthropometric characteristics and posture of children and can be considered significant as the first study in this part of Serbia, serving as a starting point for future practical and research steps.

Keywords: *morphological characteristics, BMI status, postural status, prevalence of obesity, preschoolers*

Introduction

Preschool age is considered a key phase in the holistic development of an individual (Bala, 2002). Children's participation in society is of exceptional importance, and monitoring their developmental process is crucial for analyzing health trends and formulating strategies (Sofi & Senthilvelan, 2021).

Children today engage in limited physical activity and spend most of their day sitting with screens (Colley et al., 2013). When inadequate physical activity (hypokinesia) and inadequate nutrition are added to this, all conditions leading to obesity are fulfilled (Mendonça & Anjos, 2004). Obesity is highly prevalent among children and is currently considered one of the most common public health problems (Kišić-Tepavčević et al., 2008; Kumar & Kaufman, 2018). The World Health Organization (WHO) highlights a significant increase in the proportion of obese children worldwide, from 4% in 1975 to over 18% in 2016 (World Health Organization, 2021). According to a recent comprehensive study by Spineli et al. (2021), 28.7% of boys and 26.5% of girls are overweight.

Today, the negative impacts of obesity on health are well-doc-

Correspondence:

Borko Katanić
Montenegrin Sports Academy, Đoka Miraševića, 1/10, 81000 Podgorica, Montenegro
Email: borkokatanic@gmail.com

umented, with particular emphasis on type 2 diabetes, asthma, hypertension, early atherosclerosis, as well as psychosocial and other health problems (Dikanović & Vignjević, 2009). With the aim of preventing and reducing the prevalence of obesity, especially in children, numerous health institutions have been involved in proposing guidelines on protocols for physical activity, nutrition, and sedentary behavior (Guan et al., 2020; WHO, 2021). It is not surprising, therefore, that an increasing number of studies are focusing on the anthropometric characteristics and prevalence of obesity in children (Cadenas Sánchez et al., 2015; Bjelica et al., 2021; Sofi & Senthilvelan, 2021; Katanic et al., 2023b).

In addition to optimal body composition, monitoring posture in children is exceptionally important as part of proper physical development (Pasichnyk et al., 2018). Recent studies suggest a consistent rise in the prevalence of spinal column postural deviations (Radaković et al., 2017; Vukićević, Čokorilo, Lukić, Miličković & Bjelica, 2018). Notably, foot abnormalities are detected in up to 60% of children (Romanov, Stupar, Međedović, & Brkin, 2014), while deviations from optimal spinal posture in both frontal and sagittal planes affect approximately 70% of participants, with boys exhibiting scoliotic posture more frequently (Romanov et al., 2014).

Although there are certain studies on this topic, there is no study that has comprehensively covered the detailed anthropometric, weight, and postural status of preschool children in Serbia. In this regard, the aim of this cross-sectional study was to determine the anthropometric characteristics, weight status, and posture of 6- and 7-year-old preschool-aged children in the territory of the municipality of Čačak. Secondary objectives included examining gender and age differences among children in these parameters. This study will contribute to the diagnosis of physical development in preschool-aged children and determine the level of weight and postural status, thus filling gaps in the literature, particularly related to this area.

Methods

Participants

This cross-sectional study included children aged 6-7 from the municipality of Čačak, Serbia. The sample consisted of a total of 922 children (452 boys and 470 girls) from the preschool institution. Criteria for inclusion in the study implied that the participants should be healthy children, of both genders, aged 6 and 7 years. The sample was divided by gender and age. Age groups were created according to monthly quartiles (Table 1). Students participated voluntarily with parental consent, adhering to the ethical principles outlined in the Helsinki Declaration.

Table 1. Characteristics of sample population (n-922)

Gender (number, %)	
Boys	452 (49.02%)
Girls	470 (50.98%)
Aged (number, %)	
6.0-6.3	103 (11.17%)
6.4-6.6	252 (27.33%)
6.7-6.9	265 (28.74%)
6.10-7.0	233 (25.27%)
7.1-7.4	69 (7.48%)

Measurements

Anthropometric and weight parameters

The standard international biological procedure was used to determine morphological characteristics (Eston & Reilly, 2013). Anthropometric characteristics were assessed using a battery of three variables: body height (BH), and body weight (BW). Body mass index (BMI) was calculated based on the standard formula: BMI = BM (kg)/BH (m)2 (BM - body mass, BH - body height). BMI was categorized based on the World Health Organisation's (WHO) cut-offs to underweight, normal weight, overweight and obese individuals (Onis et al., 2007). The body mass index has a high correlation with the amount of body fat and for these reasons is used as an indicator of weight status in children (Wilmore, Costill, & Kenney, 2008).

Body posture parameters

The postural status was assessed by a specialist in physical medicine using a visual method of Napoleon Volanski (Vukićević, Čokorilo, Lukić, Miličković, & Bjelica, 2018; Aleksić Veljković, Peulić, Katanić, & Jovanović, 2023). The physiatrist holds a certificate and years of experience in assessing postural deviations using the given method, which is utilized as part of the systematic examination of children before starting school in the Republic of Serbia. During the postural examination, the physiatrist assessed the following postural parameters: foot status, scoliosis, and shoulder droop syndrome.

Statistics

Basic parameters of descriptive statistics were calculated: arithmetic mean, standard deviation, minimum, maximum, and percentages. Sex differences in anthropometric characteristics were calculated using independent samples t-tests, while differences between age groups were calculated using ANOVA and post-hoc tests. The Chi-square ($\chi 2$) test was used to determine the association between weight and postural status according to the gender. For all statistical analyses, significance was accepted at $p<0.05$. Data processing was performed using the statistical program SPSS 26 (Statistical Package for Social Sciences, v26.0, SPSS Inc., Chicago, IL, USA) and Microsoft Excel (version 13 of Microsoft Corporation, Redmond, WA, USA).

Results

Based on descriptive statistics (Table 2), it was determined that preschool boys had an average body height of 124.64±5.38 cm, body weight of 25.24±4.78 kg, and BMI of 16.09±2.24, while children from rural areas had an average body height of 124.02±5.57 cm, body weight of 24.79±5.01 kg, and BMI of 15.97±2.28.

Table 3 presents the descriptive anthropometric parameters according to age groups. A noticeable linear increase in both body height and weight values is observed among the groups.

Table 2. Descriptive statistics of anthropometric parameters in preschool children

		N	Mean	SD	Min	Max	Range
Boys	Age	452	6.63	0.27	6.00	7.42	1.42
	Body height	452	124.64	5.38	110.00	142.00	32.00
	Body weight	452	25.24	4.78	15.50	51.50	36.00
	BMI	452	16.09	2.24	11.52	28.80	17.28
Girls	Age	470	6.66	0.29	6.00	7.42	1.42
	Body height	470	124.02	5.57	104.50	144.00	39.50
	Body weight	470	24.79	5.01	15.50	47.00	31.50
	BMI	470	15.97	2.28	11.10	26.57	15.47
Total	Age	922	6.65	0.28	6.00	7.42	1.42
	Body height	922	124.32	5.48	104.50	144.00	39.50
	Body weight	922	25.01	4.90	15.50	51.50	36.00
	BMI	922	16.03	2.26	11.10	28.80	17.70

Table 3. Descriptive statistics of anthropometric parameters in children according to the age groups

		N	Mean	SD	Min	Max	Range
6.0-6.3 (Group I)	Age	103	6.21	0.08	6.00	6.50	0.50
	Body height	103	121.60	4.53	112.50	133.00	20.50
	Body weight	103	23.99	3.73	17.00	35.00	18.00
	BMI	103	16.15	1.94	12.53	22.00	9.47
6.4-6.6 (Group II)	Age	252	6.43	0.10	6.17	7.25	1.08
	Body height	252	123.20	5.39	104.50	138.50	34.00
	Body weight	252	24.21	4.78	15.50	48.00	32.50
	BMI	252	15.83	2.24	11.52	25.20	13.68
6.7-6.9 (Group III)	Age	265	6.66	0.08	6.00	6.83	0.83
	Body height	265	124.56	5.33	112.00	140.00	28.00
	Body weight	265	25.27	4.94	16.50	51.50	35.00
	BMI	265	16.11	2.26	12.40	26.00	13.60
6.10-7.0 (Group IV)	Age	233	6.91	0.08	6.25	7.00	0.75
	Body height	233	125.55	5.07	110.50	140.50	30.00
	Body weight	233	25.59	4.93	16.00	47.00	31.00
	BMI	233	16.08	2.36	11.10	28.80	17.70
7.1-7.4 (Group V)	Age	69	7.14	0.12	6.58	7.42	0.84
	Body height	69	127.45	0.33	112.50	144.00	31.50
	Body weight	69	26.55	5.88	19.00	46.50	27.50
	BMI	69	16.07	2.44	12.20	24.70	12.50

Table 4. Sex differences in anthropometric characteristics (t-test)

	Boys	Girls	t	p
Age	6.63±0.27	6.66±0.29	-1.167	0.244
Body height	124.64±5.38	124.02±5.57	1.706	0.088
Body weight	25.24±4.78	24.79±5.01	1.379	0.168
BMI	16.09±2.24	15.97±2.28	0.788	0.431

Based on an independent samples t-test (Table 4), it was determined that there are no significant differences between the groups of boys and girls in any anthropometric parameter.

Based on ANOVA analysis (table 5), differences were observed among the groups regarding age categories in body height ($p<0.0001$) and body weight ($p<0.0001$). However, there were no differences among the groups in BMI. By applying post-hoc tests, it was determined that Group III, IV, and V significantly exceeded Group I and II, as well as Group V exceeded Group III in terms of body height. The same test showed that concerning body weight, Groups IV and V achieved higher values than Groups I and II.

Table 5. Differences in anthropometric characteristics across age categories (ANOVA)

	6-6.3	6.4-6.6	6.7-6.9	6.10-7	7.1-7.4	p	Post-hoc
Age	6.21±0.08	6.43±0.10	6.66±0.08	6.91±0.08	7.14±0.12	-	-
Body height	121.60±4.53	123.20±5.39	124.56±5.33	125.55±5.07	127.45±6.33	<0.0001*	III>I IV>I V>I III>II IV>II V>II V>III
Body weight	23.99±3.73	24.21±4.78	25.27±4.94	25.59±4.93	26.55±5.88	<0.0001*	IV>I V>I IV>II V>II
BMI	16.15±1.94	15.83±2.24	16.11±2.26	16.08±2.36	16.07±2.44	0.593	/

Figure 1 shows the prevalence of obesity among boys and girls. Among boys, 73.5% are normal weight, 14.6% are overweight, and 9.3% are obese, while only 2.7% are underweight. A similar distribution is observed among girls, with 73.2% being normal weight, 14.3% overweight, and 8.3% obese, while 4.3% are underweight. It should be noted that based on the Chi-square test, there is no association between the degree of nourishment and gender.

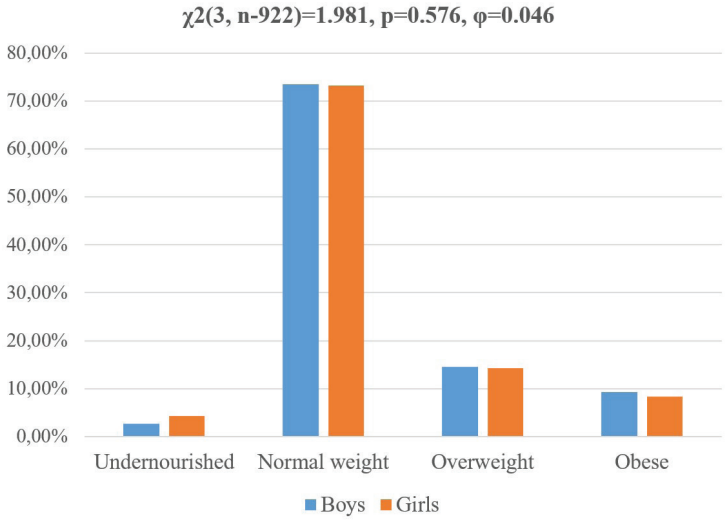


FIGURE 1. The association between the weight status and the gender in children

Table 6. Association between scoliosis and gender in children

	No deviation	Has deviation	Total
Boys	341 75.4%	111 24.6%	452 100%
Girls	359 76.4%	111 23.6%	470 100%
Total	700 75.9%	222 24.1%	922 100%
χ^2(1, n-922)=0.066, p=0.797, φ=-0.011			

When it comes to deviations, Table 6 shows a similar distribution of scoliosis among boys and girls (24.6% and 23.6%, respectively). Additionally, the same table indicates that there is no association between scoliosis and gender.

Table 7 indicates that as many as 82.1% of boys have foot deviations, while the number is lower among girls (68.9%). The chi-square test confirmed an association between foot status and gender (p<0.0001), indicating differences between genders in foot status.

Dropped shoulder is present in 61.9% of boys and slightly fewer (57.7%) girls (Table 8). From the table, it can be seen that there is no association between the prevalence of dropped shoulder deviation and gender.

Table 7. Association between foot status and gender in children

	No deviation	Has deviation	Total
Boys	81 17.9%	371 82.1%	452 100%
Girls	146 31.1%	324 68.9%	470 100%
Total	227 24.6%	695 75.4%	922 100%
χ^2(1, n-922)=20.745, p<0.0001, φ=-0.153			

Table 8. The association between dropped shoulders and gender in children

	No deviation	Has deviation	Total
Boys	172 38.1%	280 61.9%	452 100%
Girls	199 42.3%	271 57.7%	470 100%
Total	371 40.2%	551 59.8%	922 100%
$\chi^2(1, n\text{-}922)=1.587, p=0.208, \varphi=-0.044$			

Discussion

The aim of this cross-sectional study was to determine the anthropometric characteristics, weight status, and posture of 6- and 7-year-old preschool-aged children. Secondary objectives included examining gender and age differences among children in these parameters. This study had several significant findings. The prevalence of weight status was established, with 73.5% of boys being normal weight, 14.6% overweight, and 9.3% obese, while only 2.7% were underweight. A similar distribution was observed among girls, with 73.2% being normal weight, 14.3% overweight, and 8.3% obese, while 4.3% were underweight. It should be noted that there is no association between weight status and gender. Additionally, there were no differences in anthropometric characteristics between genders. Regarding differences in age categories, differences were found in body height and body weight. However, there were no differences among the groups in BMI. When it comes to deviations, almost every fourth child has scoliosis, while as many as 60% of children have dropped shoulders. There is no association between these deviations and gender. The only difference between genders was observed in foot deviation, with this deviation being more common in boys (82%) compared to girls (69%).

Our results indicate that every fourth child is overweight. Compared to previous research, there are variations in data regarding different European countries. For example, some countries have a similar percentage of childhood obesity (26-31%) as observed in Montenegro (Katanic et al., 2021; Katanic et al., 2023b), while a slightly higher percentage of obesity compared to our study was noted in Greece (33%) and Italy (36%), and in some countries a lower percentage compared to our results, such as 13% in Finland, and 16% obese in the Czech Republic (Cali & Caprio, 2008).

We are witnessing a constant increase in the prevalence of obesity worldwide over the last 2-3 decades (Lobstein & Frelut, 2003; World Health Organization, 2021). There are numerous potential reasons for childhood obesity, with sedentary lifestyle, insufficient physical activity (PA), and improper nutrition being considered the main contributors (Mendonca et al., 2024). In any case, it is essential to detect and treat obesity in childhood promptly to prevent later consequences.

When it comes to postural deviations, similar findings have been obtained in other studies. For example, in one study conducted in Novi Sad, 71.5% of girls of the same age had foot deviations (Mihajlović, Smajić, & Sente, 2010), while in another study in the same area, this percentage was slightly lower - 60% (Romanov, Stupar, Međedović, & Brkin, 2014). Regarding scoliosis, one study showed that a significantly smaller number of children had scoliosis compared to our results (Simov, Minić, & Stojanović 2011). In contrast, another study found a much higher percentage of children with scoliosis (Vukićević et al., 2018). However, these results should be interpreted with caution due to differences in measurement methodology.

It should also be noted that numerous studies have shown that obese children engage in less physical activity (Elmesmari, Martin, Reilly, & Paton, 2018), have poorer motor skills (Barnett et al., 2016; Banjević et al., 2022), and more frequently have postural problems (Shapouri et al., 2019) compared to normal-weight children. This is why the World Health Organization adopted the Global Strategy on Diet, Physical Activity, and Health to support health and proper physical and motor development (WHO, 2021). Monitoring body weight and postural status in early childhood may be the first step in preventing obesity, reducing health risks, and addressing posture problems (Noorwali, Aljaadi, & Al-Otaibi, 2023). Furthermore, it is important for each country to conduct national surveys and implement strategies in line with WHO guidelines to address the global problem of childhood obesity, as these factors play an important role in assessing quality of life and future health (Pokos, Lauš, & Badrov, 2014).

These results indicate the need to influence policies to promote physical activity and healthy lifestyles in children, which implies that we all need to get involved and take necessary steps. It is also crucial to highlight the role of the family, particularly the key role of parents, especially considering that parental physical inactivity strongly influences children's inactivity which leads to impaired physical development (Sothern, 2004). Therefore, it is important to urge parents to set an example by being physically more active themselves to encourage children to adopt a more active lifestyle (Katanic et al., 2023a). Certainly, these results can be helpful for healthcare workers and experts dealing with the problem of obesity and physical development in general. In line with the authors' plea (Bubanja, Katanic, & Bjelica, 2023), it is necessary to promptly identify the current situation and refer obese children for urgent intervention, not only in terms of treatment but also with a strong emphasis on prevention.

The main strength of this study lies in the fact that a large sample of participants was provided from the population of preschool-aged children, aged 6 and 7 years, making the results highly generalizable. Additionally, the strength of the study is reflected in the detailed analysis by gender and age categories, and primarily in the fact that this is the first study of weight and postural status in this part of Serbia.

Despite the significance of this study, like any research, it has certain limitations. The primary limitation of this study concerns the assessment of postural status using the Volansky method, therefore future research should consider incorporating modern measuring instruments for posture assessment. Additionally, a broader system of variables should be included for examining anthropometric status.

Conclusion

In this study, it was found that almost every fourth child is overweight. The highest prevalence of foot deviations and dropped shoulders in children is 60-80%, while every fourth child has scoliosis. There was no association between weight status and gender, and no difference in anthropometric characteristics between genders. The only association between body deviations and

gender was found in the prevalence of foot deviations, while there was no association between other deviations and gender.

The practical significance of this research lies in diagnosing the current weight and postural status of preschool-aged children and taking subsequent steps in the prevention and treatment of obesity and postural deviations in children. This information can be useful for physical education teachers and physiotherapists in assessing the current physical condition of children and creating appropriate exercise protocols aimed at reducing the percentage of obesity and improving the postural status of children. Further research is also necessary to gain a more comprehensive understanding of children's physical development through a thorough analysis of anthropometric and postural parameters.

Conflict of Interest

The author declares that there is no conflict of interest.

Received: 29 February 2024 | **Accepted**: 01 April 2024 | **Published**: 15 April 2024

References

Aleksić Veljković, A., Peulić, J., Katanić, B., & Jovanović, N. (2023). Comparative analysis of anthropometric characteristics and postural status between preschool children from urban and rural areas in the municipality of Čačak. In *Stojiljković, N. (Ed.): Book of Proceedings from XXIV International Scientific Conference "FIS Communications 2023" in Physical Education, Sports and Recreation*. Niš: Faculty of Sport and Physical Education.

Bala, G. (2002). Strukturalne razlike motoričkih sposobnosti dečaka i devojčica u predškolskom uzrastu [Structural differences in motor abilities of boys and girls in preschool age]. *Pedagoška stvarnost, 48*(9-10), 744-752.

Banjevic, B., Aleksic, D., Aleksic Veljkovic, A., Katanic, B., & Masanovic, B. (2022). Differences between Healthy-Weight and Overweight Serbian Preschool Children in Motor and Cognitive Abilities. *International Journal of Environmental Research and Public Health, 19*(18), 11325.

Barnett, L. M., Lai, S. K., Veldman, S. L., Hardy, L. L., Cliff, D. P., Morgan, P. J., ... & Okely, A. D. (2016). Correlates of gross motor competence in children and adolescents: a systematic review and metaanalysis. *Sports Medicine, 46,* 1663-1688.

Bjelica, D., Katanic, B., Corluka, M., Zovko, I. C., Gardasevic, J., & Pehar, M. (2021). Differences in Morphological Characteristics and Nutritional Status of School Children according to Different Regions in Montenegro. *Homosporticus, 23*(2), 46-50.

Bubanja, M., Katanic, B., & Bjelica, D. (2023). The Impact of School Environment Factors on Children's Nutrition in Montenegro. In *Book of Abstracts from 17th European Congress "100 years of FIEPS"* (6). Galati, Romania: Physical Education and Sport Faculty.

Cadenas Sánchez, C., Artero, E. G., Concha, F., Leyton Dinamarca, B., & Kain, J. (2015). Anthropometric characteristics and physical fitness level in relation to body weight status in Chilean preschool children. *Nutricion Hospitalaria, 32*(1), 346-353.

Cali, A. M., & Caprio, S. (2008). Obesity in children and adolescents. *The Journal of Clinical Endocrinology & Metabolism, 93*(11_supplement_1), s31-s36.

Colley, R. C., Garriguet, D., Adamo, K. B., Carson, V., Janssen, I., Timmons, B. W., & Tremblay, M. S. (2013). Physical activity and sedentary behavior during the early years in Canada: a cross-sectional study. *International Journal of Behavioral Nutrition and Physical Activity, 10*(1), 1-9.

Dikanović, V., i Vignjević, Z. (2009). Gojaznost dece uzrasta 7 do 15 godina i rizik za pojavu dijabetes mellitusa tipa 2 [Obesity in children aged 7 to 15 years and the risk of type 2 diabetes mellitus]. U *Živić. S. (Ur.). 42. Pedijatrijski Dani Srbije Sa Međunarodnim Učešćem* (str. 117). Niš: Udruženje pedijatra Srbije.

Elmesmari, R., Martin, A., Reilly, J. J., & Paton, J. Y. (2018). Comparison of accelerometer measured levels of physical activity and sedentary time between obese and non-obese children and adolescents: a systematic review. *BMC Pediatrics, 18*, 1-22

Eston, R., & Reilly, T. (2013). *Kinanthropometry and exercise physiology laboratory manual: tests. procedures and data: volume two: physiology.* London: Routledge.

Guan, H., Zhang, Z., Wang, B., Okely, A. D., Tong, M., Wu, J., & Zhang, T. (2020). Proportion of kindergarten children meeting the WHO guidelines on physical activity, sedentary behaviour and sleep and associations with adiposity in urban Beijing. *BMC Pediatrics, 20*(1), 1-9.

Katanic, B., Bjelica, D., Stankovic, M., Milosevic, Z., Vukovic, J., & Mekic, A. (2023a). Anthropometric Characteristics and Weight Status of Early Adolescents (Aged 12–14) in Montenegro; Urban–Rural and Regional Differences. *Children, 10*(10), 1664.

Katanic, B., Prvulovic, N., Preljevic, A., Osmani, A., Corluka, M., & Bjelica, D. (2023b). Morphological Characteristics and Body Mass Status of School Girls according to Different Regional Zones. *Sport Mont, 21*(1), 61-64. doi: 10.26773/smj.230210

Katanic, B., Zovko, I. C., Bjelica D., Nokic A., Pehar, M., & Corluka, M. (2021). Morphological Characteristics and Nutritional Status in School Children. *Homosporticus, 23*(2), 28-32.

Kisić-Tepavčević, D., Jovanović, N., Kisić, V., Nalić, D., Repčić, M., Popović, A., & Pekmezović, T. (2008). The prevalence of childhood obesity in a sample of schoolchildren in Belgrade. *Srpski arhiv za celokupno lekarstvo, 136*(11-12), 621-624.

Kumar, S., & Kaufman, T. (2018). Childhood obesity. *Panminerva Medica, 60*(4), 200-212.

Lobstein, T., & Frelut, M. L. (2003). Prevalence of overweight among children in Europe. *Obesity Reviews, 4*(4), 195-200.

Mendonça, C. P., & Anjos, L. A. D. (2004). Dietary and physical activity factors as determinants of the increase in overweight/obesity in Brazil. *Cadernos de Saúde Pública, 20*(3), 698-709.

Mihajlović, I., Smajić, M. & Sente, J. (2010). Učestalost deformiteta stopala kod devojčica predškolskog uzrasta [Frequency of foot deformities in pre-school girls]. *Vojnosanitetski pregled, 67*(11), 928-932.

Noorwali, E. A., Aljaadi, A. M., & Al-Otaibi, H. H. (2023). Change in Growth Status and Obesity Rates among Saudi Children and Adolescents Is Partially Attributed to Discrepancies in Definitions Used: A Review of Anthropometric Measurements. *Healthcare, 11*(7), 1010

Onis, M. D., Onyango, A. W., Borghi, E., Siyam, A., Nishida, C., & Siekmann, J. (2007). Development of a WHO growth reference for school-aged children and adolescents. *Bulletin of the World Health Organization, 85*, 660-667.

Pasichnyk, V., Pityn, M., Melnyk, V., Karatnyk, I., Hakman, A., & Galan, Y. (2018). Prerequisites for the physical development of preschool children for the realization of the tasks of physical education. *Physical Activity Review* (6), 117-126.

Pokos, H., Lauš, D., & Badrov, T. (2014). Razvoj stanja uhranjenosti petogodišnjih djevojčica i dječaka od 2008. do 2012. godine [Development of nutritional status of five-year-old girls and boys from 2008th to 2012th]. *Sestrinski glasnik, 19*(1), 17-21.

Radaković, M., Protić-Gava, B., Radaković, K., Madić, D., Šćepanović, T., Radanović, D., & Gušić, M. (2017). Differences in postural status of primary school students who engage in different sports and their peers who do not engage in sports. *Facta Universitatis, Series: Physical Education and Sport, 15*(1), 063-071.

Romanov, R., Stupar, D., Međedović, B., & Brkin, D. (2014). Posturalni status dece predškolskog uzrasta na teritoriji Novog Sada [Postural status of preschool children in the territory of Novi Sad]. *Tims.Acta: Naučni časopis za sport, turizam i velnes, 8*(2).

Shapouri, J., Aghaali, M., Aghaei, M., Iranikhah, A., Ahmadi, R., & Hovsepian, S. (2019). Prevalence of lower extremities' postural deformities in overweight and normal weight school children. *Iranian Journal of Pediatrics, 29*(5), 6.

Simov, S. B., Minić, S. M. & Stojanović, D. O. (2011). Učestalost pojave lošeg držanja tela i ravnih stopala kod dece predškolskog uzrasta [Frequency of poor posture and flat feet in preschool children]. *Apollinem Medicum et Aesculapium, 9*(2), 5-8.

Sofi, M. A., & Senthilvelan, S. (2021). Study of Anthropometric Measurements among Rural and Urban Area School Boys of Kashmir Region. *Turkish Online Journal of Qualitative Inquiry, 12*(7), 1-14.

Sothern, M. S. (2004). Obesity prevention in children: physical activity and nutrition. *Nutrition, 20*(7-8), 704-708.

Spinelli, A., Buoncristiano, M., Nardone, P., Starc, G., Hejgaard, T., Júlíusson, P. B., ... & Breda, J. (2021). Thinness, overweight, and obesity in 6-to 9-year-old children from 36 countries: The World Health Organization European Childhood Obesity Surveillance Initiative—COSI 2015–2017. *Obesity Reviews, 22,* e13214.

Vukićević, V., Čokorilo, D., Lukić, N., Miličković, V., & Bjelica, M. (2018). The presence of postural disorders in children of the younger school age. *Timočki Medicinski Glasnik, 43*(3), 100-107.

Wilmore, J. H., Costill, D. L., & Kenney, W. L. (2008). *Physiology of Sport and Exercise, 4th*. Champaign, Ill: Human Kinetics.

World Health Organization, (2021). *Obesity and overweight.* Retrieved from https://www.who.int/en/news-room/fact-sheets/detail/obesity–and-overweight (accessed on 24. November, 2021).

DOI 10.26773/jaspe.240405

Journal of Anthropology of Sport and Physical Education

REVIEW PAPER

Status of the feet of preschool children

Dušan Nikolić[1], Stevan Stamenković[2], Maša Antonijević[2], Aleksandar Gadžić[3]

[1]Academy of Vocational Studies South Serbia, Department of High School for Teachers Bujanovac, [2]Faculty of Sports and Physical Education, University of Niš, Serbia, [3]Faculty of Physical Culture and Management in Sports, Singidunum University Belgrade

Abstract

The postural status of preschool children is at great risk. Without timely detection, poor posture in preschool children can cause extremely serious health problems later in life, so prevention and early diagnosis are very important. The aim of this review is to analyze the research that studied the foot status of preschool children in the period from 2000 to 2022 in the territory of Serbia and Republika Srpska. A descriptive method and theoretical analysis were used for the collection, classification and analysis of targeted research, and the material was searched on: Google, Google Scholar, PubMed and Kobson. The search is limited to works published in the period from 2000 to 2022. In total, we collected 15 studies, 13 of which were conducted in the territory of the Republic of Serbia, and two in the territory of Republika Srpska. All research included preschool children aged 3 to 7 years. Previous research shows that foot deformities of preschool children are present in a high percentage in both sexes. Decreased movement due to an increasing amount of time spent near modern means of communication has negative consequences for the growth and development of preschool children. Educators, parents and the system as a whole must deal with the prevention of the mentioned postural disorders much more than they did before in order to stop the trend of their growth.

Keywords: *foot, deformities, preschool children, pes planus, pes cavus*

Introduction

Preschool age represents the period in which the foundations for human development are acquired, and at the same time provides a prerequisite for further successful education and upbringing (Koničanin, 2011). The postural status of children in this age period is exposed to great risk (Mihajlović & Tončev, 2008). From early childhood, the child's posture goes through significant changes (Civkaroski & Milenković, 2022), and there are three critical periods susceptible to postural deviation: the child standing up, starting school, and puberty (Maksimović & Lertua, 2018). Without timely detection, poor posture in preschool children can cause extremely serious health problems later in life (Ivanović, Gajević, Gajić & Atanasov, 2018; Miletić, Milić, Savićević & Ujsasi, 2022), so prevention and early diagnosis are very important (Maksimović & Lertua, 2018). Children mostly rest passively with video games and computers, so a large percentage of deformities in the preschool population is a fact that parents and pedagogical workers encounter every day (Mihajlović & Tončev, 2008). Weak muscle development, caused by insufficient physical activity, often causes improper body posture (Biševac, Mahmutović, Mekić & Dolićanin, 2021). One of the primary reasons for the unsatisfactory postural status of preschool children is foot deformity (Mihajlović & Tončev, 2008). Foot deformities are a health challenge of the 21st century. A large percentage of children of preschool age have some form of foot deformity, most often, a lowered arch of the foot (Mitrović & Stević, 2017). The frequency of this deformity occurs in 40-75% of cases. The function of the foot depends on the state of the active and passive elements of the biomotor apparatus. First, the muscles relax, then the ligaments and joints cannot stop it, so it stops at the bone segments, which are deformed in morphology and structure (Živković, 2009). The aim of this review is to analyze the research that studied the foot status of preschool children in the period from 2000 to 2022 in the territory of Serbia and Republika Srpska.

Method

A descriptive method and theoretical analysis were used for the collection, classification and analysis of targeted research, and the material was searched on: Google, Google Scholar, PubMed

Correspondence:

Dušan Nikolić
Academy of Vocational Studies South Serbia, Department of High School for Teachers Bujanovac s.Katun BB, 17500 Vranje, Serbia
E-mail: nikolicdusan287@gmail.com

and Kobson. The search is limited to works published in the period from 2000 to 2022. Key words used during the search are: foot status, preschool children, flat foot, postural disorders. References from all papers were aslo reviewed in order to find more studies dealing with this topic.

All research is shown in Table 1. In total, we collected 15 research works, 13 of which were conducted in the territory of the Republic of Serbia, and two in the territory of Republika Srpska. The largest number of surveys was conducted in the territory of Vojvodina - six surveys, namely: Vojvodina -1; Novi Sad - 4; Sombor, Sremska Mitrovica, Bačka Palanka - 1. Then follow: Serbia - 2 (no cities listed); Užice, Prijepolje, Nova Varoš - 1; Leskovac - 1; Tutin - 1; Kruševac – 1; Šabac – 1. Two surveys from the territory of Republika Srpska were conducted in Bjeljina. The oldest research is by Sabo (2006), and the most recent by Kojić et al. (2021). The number of respondents in the analyzed papers ranged from 50 respondents in the study by Mitrović & Stević (2017), to 1259 respondents in the research by Sabo (2006). The total number of respondents included in all works is 5265 children. All research included preschool children aged 3 to 7 years.

Results

Table 1 presents all the research by chronological age, as well as the results obtained by the corresponding reserach.

Table 1. Research results - list of all papers

FOOT STATUS								
Reference	**Sample of respondents**					**Results**		
	N	**M**	**F**	**P**	**Y**	**BOYS**	**GIRLS**	**Σ**
Sabo (2006)	1259	656	603	Vojvodina	3,5-7	PP1 (301) 23,9% PP2 (21) 1,7%	PP1 (226) 18% PP2 (5) 0,4%	PP1 (527) 41,9% PP2 (26) 2,1%
Sabo (2007)	280	141	139	Sombor, Sremska Mitrovica, Bačka Palanka	4-7	PP1 (80) 56,7% PP2 (1) 0,7%	PP1 (60) 43,2% PP2 (0) 0%	PP1 (140) 50% PP2 (1) 0,4%
Mihajlović & Tončev (2008)	559	287	272	Novi Sad	4-6	PP1 (25) 8,7% PP2 (79) 27,5% PP3 (76) 26,5% PP4 (55) 19,2%	PP1 (51) 18,8% PP2 (68) 25% PP3 (62) 22,8% PP4 (32) 11,8%	PT (520) 93,02% CV (518) 92,67% PP1 (77) 13,77% PP2 (147) 26,3% PP3 (139) 24,87% PP4 (86) 15,38%
Mihajlović, Smajić & Sente (2010)	272	0	272	Novi Sad	4-7	/	PC (44) 16,7% PT (253) 93,38% CV (253) 93,38% PP (213) 78,31%	/
					4	/	PC (5) 9,4% PT (51) 96,2% CV (51) 96,2% PP1 (8) 15,1% PP2 (11) 20,8% PP3 (17) 32,1% PP4 (10) 18,9%	/
					5	/	PC (17) 15% PT (106) 93,8% CV (106) 93,8% PP1 (24) 21,2% PP2 (28) 24,8% PP3 (24) 21,2% PP4 (16) 14,2%	/
					6	/	PC (18) 21,4% PT (77) 91,7% CV (76) 90,5% PP1 (13) 15,5% PP2 (26) 31,0% PP3 (16) 19,0% PP4 (5) 6,0%	/
					7	/	PC (4) 18,2% PT (19) 86,4% CV (19) 86,4% PP1 (6) 27,3% PP2 (3) 13,6% PP3 (5) 22,7% PP4 (1) 4,5%	/

(continued on next page)

(continued from previous page)

Reference	FOOT STATUS							
	Sample of respondents					Results		
	N	M	F	P	Y	BOYS	GIRLS	Σ
Simov, Minić & Stojanović (2011)	968	/	/	Leskovac	6-7	/	/	PP1 (171) 17,66% PP2 (81) 8,37% PP3 (38) 3,92% PP4 (8) 0,83% PPΣ (298) 30,78%
Koničanin (2011)	220	92	128	Tutin	6-7	PP (17) 18,47%	PP (16) 12,05%	PP (33) 15%
Pavlović (2012)	638	/	/	Užice, Prijepolje, Nova Varoš	6-7	PP (104) 16,3%	PP (62) 9,72%	PP (166) 26,01%
Romanov, Stupar, Međedović & Brkin (2014)	423	213	210	Novi Sad	6-7	PC L (22) 10,3% PC R (19) 8,9% PP1 L (90) 42,3% PP2 L (46) 21,6% PP1 R (97) 45,5% PP2 R (44) 20,6%	PC L (25) 11.9% PC R (20) 9,52% PP1 L (91) 43,3% PP2 L (26) 12,4% PP1 R (89) 42,4% PP2 R (25) 11.9%	PC L (47) 11,% PC R (39) 9,2% PP1 L (181) 42,8% PP2 L (72) 17,0% PP1 R (186) 43,9% PP2 R (69) 16,3%
Stanišić, Đorđević & Maksimović (2014)	60	21	39	Kruševac	6	PP1 (3) 14,3% PP2 (1) 4,7%	PP1 (15) 38,5% PP2 (3) 7,7%	PP1 (18) 30% PP2 (4) 6,7%
Drljačić, Tirić, Đupovac & Arsić (2016)	52	30	22	Srbija	5	/	/	PP1 (22) 42,3% PP2 (5) 9,6%
Galić (2017)	120	/	/	Novi Sad	5-7	/	/	PT1 (33) 27,5% PT2 (3) 2,5% PP1 (34) 28,33% PP2 (21) 17,5% PC1 (0) 0% PC2 (0) 0%
Mitrović & Stević (2017)	50	25	25	Bijeljina	/	PP1 (7) 28% PP2 (10) 40% PP3 (5) 20% PP4 (3) 12%	PP1 (5) 20% PP2 (7) 28% PP3 (4) 16% PP4 (4) 16%	PP1 (12) 24% PP2 (17) 34% PP3 (9) 18% PP4 (7) 14%
Maksimović & Lertua (2018)	70	/	/	Šabac	5	/	/	PP1 (12) 34,3% PP2 (19) 54,3%
					6,5	/	/	PP1 (14) 40% PP2 (4) 11,4%
					Σ	/	/	PP1 (26) 37,1% PP2 (23) 32,9%
Mitrović, Dragosavljević, Cvejić & Zrnzević (2021)	92	45	47	Bijeljina	6	/	/	PP1 (1) 1,1% PP2 (42) 45,7% PP3 (34) 37% PP4 (8) 8,7%
Kojić, Protić Gava, Bajin, Vasiljević, Bašić, Stojaković & Ilić (2021)	202	141	61	Srbija	4-6,5	PP (32) 22,7%	PP (9) 14,8%	PC (90) 44,6% PP (41) 20,3%

Legend: N - sample of respondents; M - male; F - female; Y - years of age; P - place; PP - pes planus; PP1 - pes planus first degree; PP2 - pes planus second degree; PP1 L - pes planus first degree left foot; PP1 R - pes planus first degree right foot; PP2 L - pes planus second degree left foot; PP2 R - pes planus second degree right foot; PP3 - pes planus third degree; PP4 - pes planus fourth degree; PT - pes transversoplanus; PT1 - pes transversoplanus first degree; PT2 - pes transversoplanus second degree; CV - calcaneo valgi; PC - pes cavus.

The results shown in Table 1 show that the condition of the feet of preschool children in Serbia is alarming. On a sample of preschool children in Vojvodina aged 3.5 to 7 years, Sabo (2006) found that 41.9% of children have smaller and 2.1% of children have larger deviations from the normal arch of the foot (pes planus). The findings of Sabo (2006) indicate that boys have significantly greater deviation from the normal foot status than girls. Indeed, 23.9% of the boys have minor deviations from the normal

foot arch versus 18% in girls, while 1.7% of boys have greater deviations from the normal foot status versus 0.4% in girls. Sabo (2007) obtained similar results a year later in the cities: Sombor, Sremska Mitrovica, Bačka Palanka. The data show that 50% of the children have smaller and 0.4% of the children have larger deviations from the normal arch of the foot. In this research, the author showed that boys have significantly greater deviation from the normal foot status than girls. In boys, 56.7% have minor deviations from the normal foot arch versus 43.2% in girls, while 0.7% of boys have greater deviations from the normal foot status versus 0% in girls. The results of the aforementioned research showed that a far greater number of children have deviations from the normal status of the feet, which are in the form of functional deformity, and their removal requires corrective work (Sabo, 2007). Mihajlović & Tončev (2008) obtained even more alarming data on a sample of preschool children from Novi Sad, aged 4 to 6 years. The authors found that as many as 93% of children have pes transfersoplanus, 92.67% calcaneo valgi, while 80.32% have some degree of pes planus, namely: 13.77% pes planus 1; 26.3% pes planus 2; 24.87% pes planus 3; 15.38% pes planus 4. Lowered arch of the foot occurs in both boys and girls. The prevalence of pes planus 1 in boys is 8.7%, and in girls 18.8%; pes planus 2 in boys 27.5%, and in girls 25%; pes planus 3 in boys 26.5% and in girls 22.8%; pes planus 4 in boys 19.2% and in girls 11.8%. Mihajlović, Smajić & Sente (2010) reported similar results on a sample of preschool girls from Novi Sad, aged 4 to 7 years, and determined that the percentage of foot deformities is very high: pes cavus 16.7%; pes transfersoplanus 93.38%; calcaneo valgi 93.38% and pes planus 78.31%. Somewhat better, but still worrisome, data on the foot status of preschool children were obtained by Simov, Minić & Stojanović (2011) on a sample of preschool children aged 6-7 years from Leskovac. The authors determined that 30.78% of children have a lowered foot arch, namely: 17.66% pes planus 1; 8.37% pes planus 2; 3.92% pes planus 3; 0.83% pes planus 4. Lower percentages of deviations from the normal status of the feet in relation to the aforementioned studies were obtained by Koničanin (2011) on a sample of preschool children aged 6-7 years from Tutin. The author indicates that 15% of children have pes planus and confirms some previous research which shows that flat feet are more prevalent in boys than in girls, namely: 18.47% in boys and 12.05% in girls. Pavlović (2012) found that pes planus was present in 26.01% of preschool children aged 6-7 years from Užice, Prijepolje and Nova Varoš. The author also found that flat feet were more prevalent in boys (16.3%) than in girls (9.72%). Romanov, Stupar, Međedović & Brkin (2014) reported similar results on a sample of children from Novi Sad. They suggested that there is a need for the application of corrective gymnastics as part of activities in a preschool institution with the aim of correcting and preventing postural disorders. These authors determined that pes planus I degree is represented by 43.23%, and pes planus II degree by 16.66%, while pes cavus is represented by 10.16%. Furthermore, Stanišić, Đorđević & Maksimović (2014) determined on a sample of preschool children from Kruševac that 30% of children have pes planus I degree, while 6.7% of children have pes planus II degree. It is interesting that the authors, in contrast to the previous research by Sabo (2006), Sabo (2007), Koničanin (2011) and Pavlović (2012), found that pes planus I and II degree are more common in girls than in boys. The results show that pes planus I degree is represented by 38.5% in girls and 14.3% in boys, while pes planus II degree in girls is represented by 7.7% and in boys by 4.7%. Drljačić, Tirić, Đupovac & Arsić (2016) confirmed previous research and determined that a large percentage of children have a lowered foot arch, namely: pes planus I degree 42.3% of children, and pes planus II degree 9.6% of children. Galić (2017) also found on a sample of preschool children from Novi Sad that 68.3% had elements of bad posture, and the most frequent deviations from the normal position were in the form of lowered feet, i.e. 45.8%. The author determined that pes planus I degree is represented by 28.33%, pes planus II degree by 17.5%, pes transfersoplanus I degree by 27.5%, pes transfersoplanus II degree by 2.5%, while there were no children with pes cavus. Mitrović & Stević (2017) found on a sample of preschool children from Bjeljina that most of the analyzed children have a lowered foot arch, namely: pes planus I degree 24% of children, pes planus II degree 34% of children, pes planus III degree 18% of children and pes planus IV degree 14% of children. Maksimović & Lertua (2018) showed similar results on a sample of preschool children from Šabac that are in line with the devastating results of the previous research. The results of their research show that 37.1% of children have pes planus I degree, and 32.9% pes planus II degree. Mitrović, Dragosavljević, Cvejić & Zrnzević (2021) also show thatthat 1.1% of the children from Bjelina have pes planus I degree, 45.7% have pes planus II degree, 37% have pes planus III degree and 8, 7% have pes planus IV degree. Kojić, Protić Gava, Bajin, Vasiljević, Bašić, Stojaković & Ilić (2021) found that 20.3% of children have a lowered arch of the foot, and 44.6% have pes cavus. Thier research is in line with the findings of Sabo (2006), Sabo (2007), Koničanin (2011) and Pavlović (2012), and indicate that a lowered arch of the foot is more pronounced in boys (22.7%) than in girls (14.8%).

Discussion

Previous research shows that foot deformities of preschool children are present in a high percentage in both sexes. Koničanin (2011) points out that in the work on the physical development of children there are still a number of shortcomings that need to be removed, with which we can agree if we look at the results of the presented research, which showed that there is a very high percentage of preschool children who have some form of foot deformity, and in the research of Mihajlović & Tončev (2008) that percentage is even 93%. Galić (2017) finds that the most common deviations from the normal postural position of preschool children are in the form of lowered feet, and that is 45.8%. Mitrović & Stević (2017) believe that foot deformities represent a health challenge of the 21st century. Most often, a lowered foot arch (pes planus) occurs, but most of it is still in the functional stage, which means that a well-planned corrective treatment would have a positive effect on the normalization of the foot arch condition. However, it would be more important to have a preventive effect on the occurrence of postural disorders of the feet of preschool children through adequate physical education activities. Therefore, Romanov, Stupar, Međedović & Brkin (2014) point to the need to apply corrective gymnastics in order to correct and prevent postural disorders by introducing the same as daily directed activities of the preschool population. In order for this to be feasible, it is necessary to train students and future teachers about planning and tailoring programs in physical education aiming to improve postural status of children. Similar directions were provided by Maksimović & Lertua (2018). Stanišić, Đorđević & Maksimović (2014) showed that corrective treatment within the framework of directed activities in the physical education of preschool children has a positive effect on the status of the feet of preschool children. The authors applied exercises with six-year-old preschool children as part of targeted activities for the correction of leg and arch irregularities. The treatment lasted two months and was performed three times a week. After the treatment, the authors concluded that the corrective exercise program within the directed activities has a positive effect on the correction of foot arch disorders. Mihajlović, Smajić & Sente (2010) found that the percentage of pes transversoplanus and calcaneo valgi foot deformities is very high in girls. Also, it was established that pes planus in girls is very high, but that there

is an improvement with age. The authors believe that there is a significant connection between the age of children and pes planus, and that the formation of the arches of the feet most likely does not end from the age of 3 to 4, but continues until school age. This raises the need and the importance of physical education activities that should contribute to encouraging the proper development of children's feet in the preschool period. This can only be achieved if the development of foot and leg muscles is encouraged through play and movement. Mitrović, Dragosavljević, Cvejić & Zrnzević (2021) indicate that the physical activity and movement of children has a positive effect on the status of the feet of preschool children. The authors examined the influence of the training process according to the "school of sport" model on changes in the status of the arch of the foot. The treatment lasted three months, twice a week for 45 minutes. Although the percentage of children with foot deformity at the final measurement was the same as at the initial measurement, there were slight improvements in certain categories of the assessed variable. More precisely, the number of children in the third and second degrees has decreased. However, it is yet not clear whether the program based on the model of the sports school had a positive effect on the resulting changes, because the improvements were visible in both the experimental and control groups. Feet grow faster than other parts of the body and their growth is completed before adolescence, so early detection during regular systematic examinations and controls by parents, educators, etc. is the most important for their successful treatment. Kojić, Protić Gava, Bajin, Vasiljević, Bašić, Stojaković & Ilić (2021) showed that the status of the foot has a significant influence on the results of motor tests. The authors concluded that motor development is the most turbulent in the preschool period and that what is missed then is difficult to make up during future growth and development, and that it is important to stimulate the function and development of the arches of the feet. Simov, Minić & Stojanović (2011) believe that there is an obligation on the part of educators and parents at home to instruct children on proper posture when sitting, walking and doing physical activities. Drljačić, Tirić, Đupovac & Arsić (2016) believe that it is necessary to apply systematic exercise in working with children at an early age, which has a positive effect on the postural status of children, in the form of its preservation, but also the elimination of functional deformities that in a later period could leave permanent consequences on children's body. Pavlović (2012) suggests that the presence of a large number of physical deformities can be reduced by engaging a greater number of experts in the field of physical education, in order to complete the needs of children for proper and adequate exercise. Previous works (Sabo, 2006 and Sabo, 2007) also show that a large number of children (boys and girls) have a functional stage of deformity, i.e. a certain deviation from normal, good posture and that this represents a potential danger for the formation of the so-called structural changes, which to a lesser or greater extent threaten health, the general functioning of the organism and his ability to work. The author believes that the functional stage of the deformity can be successfully removed by corrective work in the kindergarten.

Conclusion

Previous research shows that foot deformities of preschool children are present in a high percentage in both sexes. Decreased movement due to an increasing amount of time spent near modern means of communication has negative consequences for the growth and development of preschool children. Educators, parents and the system as a whole must deal with the prevention of the mentioned postural disorders much more than they did before in order to stop the trend of their growth.

Acknowledgments
There are no acknowledgments.

Conflicts of interest:
The authors have no conflicts of interest to declare.

Received: 18 March 2024 | **Accepted:** 13 April 2024 | **Published:** 15 April 2024

References

Biševac, E. M., Mahmutović, E. H., Mekić, R. H., & Dolićanin, Z. Ć. (2021). Effect of corrective exercises on functional spinal deformities in preschool and school-aged children. *Specijalna edukacija i rehabilitacija*, 20 (1), 51-63.

Civkaroski, D., & Milenković, S. (2022). The prevalence of spinal deformities in children and differenece between pre school and school children. *Knowledge-international journal*, 51 (4), 591-594.

Drljačić, D., Tirić, N., Đupovac, M., & Arsić, N. (2016). Uticaj programiranog vežbanja u okviru predškolske ustanove na posturalni status dece. *PONS - medicinski časopis*, 13 (1), 9-12.

Galić, M. (2017). Minor neurological dysfunction and bad posture in children at preschool age. Doctoral dissertation. *Medical Faculty*, University of Novi Sad.

Ivanović, J., Gajević, A., Gajić, I., & Atanasov, D. (2018). Sagital plane poor posture among seven–year-old children. In Lence A. Velickovska (Ed.), *3rd International scientific conference, research in physical education, sport, and health* (pp.101-111). Skopje: Ss. Cyril and Methodius University in Skopje, Faculty of Physical Education, Sport, and Health, Skopje.

Koničanin, A. (2011). Ravna stopala kod dece predškolskog uzrasta. Časopis za sport, fizičko vaspitanje i zdravlje - Sport mont, 8 (25,26,27), 450 - 453.

Kojić, M., Protić Gava, B., Bajin, M., Vasiljević, M., Bašić, J., Stojaković, D., & Ilić, M. P. (2021). The relationship between foot status and motor status in preschool children: a simple, comparative observational study. *Healthcare*, 9 (8), 936-948.

Maksimović, S., i Lertua, S. (2018). Posturalni status kao faktor planiranja u fizičkom vaspitanju predkolske dece. *Inovacije u nastavi*, 1, 119-128.

Mihajlović, I., & Tončev, I. (2008). Establishment of the foot arch initial status in pre-school children. *Sport Science*, 1 (2), 44-49.

Mihajlović, I., Smajić, M., & Sente, J. (2010). Učestalost deformiteta stopala kod devojčica predškolskog uzrasta. *Vojnosanitetski pregled*, 67 (11), 928-932.

Mitrović, N., & Stević, D. (2017). Razlike u statusu svoda stopala između dečaka i devojčica predškolskog uzrasta iz Bijeljine. Nova škola. 12 (1), 46-53.

Mitrović, N., Dragosavljević, S., Cvejić, D., & Zrnzević, N. (2021). The changes in the status of the foot arch, motor abilities and morphological characteristics under the influence of training processes of sports school. *Sports science & health*, *11* (1), 94-107.

Pavlović, S. (2012). Prisustvo telesnih deformiteta dece predškolskog uzrasta. *Univerzitetska misao*, (11), 6-14.

Romanov, R., Stupar, D., Međedović, B., & Brkin, D. (2014). Posturalni status dece predškolskog uzrasta na teritoriji Novog Sada. *Tims. Acta: naučni časopis za sport, turizam i velnes*, 8 (2), 129-135.

Sabo, E. (2006). Postural state of preschool children on territory of Vojvodina. *Fizička kultura*, 60 (2), 157-164.

Sabo, E. (2007). Postural status in children of preschool age in areas of Sombor, Sremska Mitrovica and Backa Palanka municipalities. *Norma*, 12 (1), 125-134.

Simov, S. B., Minić, S. M., & Stojanović, D. O. (2011). Učestalost pojave lošeg držanja tela i ravnih stopala kod dece predškolskog uzrasta. *Apollinem medicum et aesculapium*, 9 (2), 5-8.

Stanišić, I., Đorđević, M., & Maksimović, S. (2014). Posturalni status nogu i svoda stopala kod dece predškolskog uzrasta i efekti korektivnog vežbanja u okviru usmerenih aktivnosti. *Sinteze*, 5, 63-71.

Živković, D. (2009). *Osnove kineziologije sa elementima kliničke kineziologije*. Niš: Fakultet sporta i fizičkog vaspitanja.

Guidelines for Authors

Revised October 2017

*** Please use the bookmark function to navigate within the guidelines. ***

When preparing the final version of the manuscripts, either NEW or REVISED authors should strictly follow the guidelines. Manuscripts departing substantially from the guidelines will be returned to the authors for revision or, rejected.

1. UNIFORM REQUIREMENTS

1.1. Overview

The *Journal of Anthropology of Sport and Physical Education* (JASPE) applies the Creative Commons Attribution (CC BY) license to articles and other works it publishes.

There is no charge for submissions and no page charge for accepted manuscripts. However, if the manuscript contains graphics in color, note that printing in color is charged.

JASPE adopts a double-blind approach for peer reviewing in which the reviewer's name is always concealed from the submitting authors as well as the author(s)'s name from the selected reviewers.

JASPE honors six-weeks for an initial decision of manuscript submission.

Authors should submit the manuscripts as one Microsoft Word (.doc) file.

Manuscripts must be provided either in standard UK or US English or Montenegrin language. Chosen language standards should be consistent throughout the manuscripts.

Format the manuscript in A4 paper size; margins are 1 inch or 2.5 cm all around.

Type the whole manuscript double-spaced, justified alignment.

Use Times New Roman font, size eleven (11) point.

Number (Arabic numerals) the pages consecutively (centering at the bottom of each page), beginning with the title page as page 1 and ending with the Figure legend page.

Include line numbers (continuous) for the convenience of the reviewers.

Apart from chapter headings and sub-headings avoid any kind of formatting in the main text of the manuscripts.

1.2. Type & Length

JASPE publishes following types of papers:

Original scientific papers are the results of empirically- or theoretically-based scientific research, which employ scientific methods, and which report experimental or observational aspects of anthropology of sport and physical education from five major fields of anthropology: cultural, global, biological, linguistic and medical. Descriptive analyses or data inferences should include rigorous methodological structure as well as sound theory. Your manuscript should include the following sections: Introduction, Methods, Results, and Discussion.

☑Open Submissions ☑Indexed ☑Peer Reviewed

Original scientific papers should be:

- Up to 3000 words (excluding title, abstract, tables/figures, figure legends, Acknowledgements, Conflict of Interest, and References);
- A structured abstract of less than 250 words;
- Maximum number of references is 30;
- Maximum combined total of 6 Tables/Figures.

Review papers should provide concise in-depth reviews of both established and new areas, based on a critical examination of the literature, analyzing the various approaches to a specific topic in all aspects of anthropology of sport and physical education from five major fields of anthropology: cultural, global, biological, linguistic and medical.

☑Open Submissions ☑Indexed ☑Peer Reviewed

Review papers should be:
- Up to 6000 words (excluding title, abstract, tables/figures, figure legends, Acknowledgements, Conflict of Interest, and References);
- A structured abstract of less than 250 words;
- Maximum number of references is 100.

Editorials are written or commissioned by the editors, but suggestions for possible topics and authors are welcome. It could be peer reviewed by two reviewers who may be external or by the Editorial Board.

☐Open Submissions ☑Indexed ☑Peer Reviewed

Editorials should be:
- Up to 1000 words (excluding title, abstract, tables/figures, figure legends, Acknowledgements, Conflict of Interest, and References);
- A structured abstract of less than 250 words;
- Maximum number of references is 10.

Short reports of experimental work, new methods, or a preliminary report can be accepted as two page papers. Your manuscript should include the following sections: Introduction, Methods, Results, and Discussion.

☑Open Submissions ☑Indexed ☑Peer Reviewed

Short reports should be:
- Up to 1500 words (excluding title, abstract, tables/figures, figure legends, Acknowledgements, Conflict of Interest, and References);
- A structured abstract of less than 250 words;
- Maximum number of references is 15.

Peer review - fair review provides authors who feel their paper has been unfairly rejected (at any journal) the opportunity to share reviewer comments, explain their concerns, and have their paper reviewed for possible publication in JASPE.

☑Open Submissions ☑Indexed ☐Peer Reviewed

Peer review - fair review should be:
- Up to 1500 words (excluding title, abstract, tables/figures, figure legends, Acknowledgements, Conflict of Interest, and References);
- A structured abstract of less than 250 words;
- Maximum number of references is 15.

Invited papers and award papers include invited papers from authors with outstanding scientific credentials. Nomination of invited authors is at the discretion of the JASPE editorial board. JASPE also publishes award papers selected by the scientific committee of the publisher's conferences.

☐Open Submissions ☑Indexed ☐Peer Reviewed

Invited papers and award papers should be:
- Up to 3000 words (excluding title, abstract, tables/figures, figure legends, Acknowledgements, Conflict of Interest, and References);
- A structured abstract of less than 250 words;
- Maximum number of references is 30;
- Maximum combined total of 6 Tables/Figures.

1.3. Submission

JASPE only accepts electronic submission to the e-mail of the Journal Office: **office.jaspe.mne@gmail.com; vasileva.jaspe@gmail.com**.

Submitted material includes:

- A manuscript prepared according to the Guidelines for the Authors;
- A signed form that states the study was not previously published, nor has been submitted simultaneously for consideration of publication elsewhere, that states that all of the authors are in agreement with submission of the manuscript to JASPE, and that, for studies that use animal or human individuals, authors must include information regarding their institution's ethics committee, and which identifies the official approval number;
- A signed form that there is no conflict of interest.

Name the files according to the family name of the first author. Authors submitting revised versions of the manuscript can use the identification number of their manuscript as provided by the Journal Office. *See* example:

- ✓ FAMILY NAME-manuscript.doc – (main manuscript file)
- ✓ FAMILY NAME-statement.PDF – (authorship statement)
- ✓ FAMILY NAME-declaration.PDF – (declaration of potential conflict of interest)
- ✓ FAMILY NAME-fig1.tiff – (Figure 1)

1.4. Peer Review Process

A manuscript submitted for publication will be submitted to the review process as long as it fits the following criteria:

- The study was not previously published, nor has been submitted simultaneously for consideration of publication elsewhere;
- All persons listed as authors approved its submission to JASPE;
- Any person cited as a source of personal communication has approved the quote;
- The opinions expressed by the authors are their exclusive responsibility;
- The author signs a formal statement that the submitted manuscript complies with the directions and guidelines of JASPE.

The editors-in-chief and associate editors will make a preliminary analysis regarding the appropriateness, quality, originality and written style/grammar of the submitted manuscript. The editors reserve the right to request additional information, corrections, and guideline compliance before they submit the manuscript to the ad-hoc review process.

JASPE uses ad-hoc reviewers, who volunteer to analyze the merit of the study. Typically, one or two expert reviewers are consulted in a double-blind process. Authors are notified by e-mail when their submission has been accepted (or rejected). Minor changes in the text may be made at the discretion of the editors-in-chief and/or associate editors. Changes can include spelling and grammar in the chosen language, written style, journal citations, and reference guidelines. The author is notified of changes via email. The final version is available to the author for his or her approval before it is published.

1.5. Open Access License and Publisher Copyright Policies

JASPE applies the Creative Commons Attribution (CC BY) license to articles and other works it publishes. If author(s) submit its paper for publication by JASPE, they agree to have the CC BY license applied to their work. Under this Open Access license, the author(s) agree that anyone can reuse their article in whole or part for any purpose, for free, even for commercial purposes. Anyone may copy, distribute, or reuse the content as long as the author(s) and original source are properly cited. This facilitates freedom in re-use and also ensures that JASPE content can be mined without barriers for the needs of research. On the other hand, the author(s) may use content owned by someone else in their article if they have written permission to do so. If the manuscript contains content such as photos, images, figures, tables, audio files, videos, et cetera, that the author(s) do not own, JASPE will require them to provide it with proof that the owner of that content has given them written permission to use it, and has approved of the CC BY license being applied to their content. Otherwise, JASPE will ask the author(s) to remove that content and/or replace it with other content that you own or have such permission to use. JASPE provides a form the author(s) can use to ask for and obtain permission from the owner.

In addition, the author(s) may freely use the content they previously published in a paper through another publisher and they own the rights to that content; however, that's not necessarily the case and it depends on the license that covers the other paper. Some publishers allow free and unrestricted reuse of article content they own, such as under the CC BY

license. Other publishers use licenses that allow reuse only if the same license is applied by the person or publisher reusing the content. If the article was published under a CC BY license or another license that allows free and unrestricted use, the author(s) may use the content in the submitted manuscript provided that the author(s) give proper attribution, as explained above. If the content was published under a more restrictive license, the author(s) must ascertain what rights they have under that license. JASPE advices the author(s) not to include any content in the submitted manuscript which they do not have rights to use, and always give proper attribution.

The editors of JASPE consider plagiarism to be a serious breach of academic ethics. Any author who practices plagiarism (in part or totality) will be suspended for six years from submitting new submissions to JASPE. If such a manuscript is approved and published, public exposure of the article with a printed mark ("plagiarized" or "retracted") on each page of the published file, as well as suspension for future publication for at least six years, or a period determined by the editorial board. Third party plagiarized authors or institutions will be notified, informing them about the faulty authors. Plagiarism will result in immediate rejection of the manuscript.

JASPE only publishes studies that have been approved by an institutional ethics committee (when a study involves humans or animals). Fail to provide such information prevent its publication. To ensure these requirements, it is essential that submission documentation is complete. If you have not completed this step yet, go to JASPE website and fill out the two required documents: Declaration of Potential Conflict of Interest and Authorship Statement. Whether or not your study uses humans or animals, these documents must be completed and signed by all authors and attached as supplementary files in the originally submitted manuscript.

1.6. After Acceptance

After the manuscript has been accepted, authors will receive a PDF version of the manuscripts for authorization, as it should look in printed version of JASPE. Authors should carefully check for omissions. Reporting errors after this point will not be possible and the Editorial Board will not be eligible for them.

Should there be any errors, authors should report them to the Office e-mail address **jaspe@ucg.ac.me.** If there are not any errors authors should also write a short e-mail stating that they agree with the received version.

1.7. Code of Conduct Ethics Committee of Publications

JASPE is hosting the Code of Conduct Ethics Committee of Publications of the **COPE** (the Committee on Publication Ethics), which provides a forum for publishers and Editors of scientific journals to discuss issues relating to the integrity of the work submitted to or published in their journals.

2. MANUSCRIPT STRUCTURE

2.1. Title Page

The first page of the manuscripts should be the title page, containing: title, type of publication, running head, authors, affiliations, corresponding author, and manuscript information. *See* example:

Analysis of Dietary Intake and Body Composition of Female Athletes over a Competitive Season

Original Scientific Paper

Diet and Body Composition of Female Athletes

Svetlana Nepocatych[1], Gytis Balilionis[1], Eric K. O'Neal[2]

[1]Elon University, Department of Exercise Science1, Elon, NC 27215
[2]University of North Alabama, Department of Health, Physical Education and Recreation, Florence, AL 35632

Corresponding author:

S. Nepocatych

Elon University

Department of Exercise Science

100 Campus Dr.

2525 CB

Elon, NC 27244

United States

E-mail: snepocatych@elon.edu

Word count: 2,946

Word count: 4259

Abstract word count: 211

Number of Tables: 3

2.1.1. Title

Title should be short and informative and the recommended length is no more than 20 words. The title should be in Title Case, written in uppercase and lowercase letters (initial uppercase for all words except articles, conjunctions, short prepositions no longer than four letters etc.) so that first letters of the words in the title are capitalized. Exceptions are words like: "and", "or", "between" etc. The word following a colon (:) or a hyphen (-) in the title is always capitalized.

2.1.2. Type of publication

Authors should suggest the type of their submission.

2.1.3. Running head

Short running title should not exceed 50 characters including spaces.

2.1.4. Authors

The form of an author's name is first name, middle initial(s), and last name. In one line list all authors with full names separated by a comma (and space). Avoid any abbreviations of academic or professional titles. If authors belong to different institutions, following a family name of the author there should be a number in superscript designating affiliation.

2.1.5. Affiliations

Affiliation consists of the name of an institution, department, city, country/territory (in this order) to which the author(s) belong and to which the presented / submitted work should be attributed. List all affiliations (each in a separate line) in the order corresponding to the list of authors. Affiliations must be written in English, so carefully check the official English translation of the names of institutions and departments.

Only if there is more than one affiliation, should a number be given to each affiliation in order of appearance. This number should be written in superscript at the beginning of the line, separated from corresponding affiliation with a space. This number should also be put after corresponding name of the author, in superscript with no space in between.

If an author belongs to more than one institution, all corresponding superscript digits, separated with a comma with no space in between, should be present behind the family name of this author.

In case all authors belong to the same institution affiliation numbering is not needed.

Whenever possible expand your authors' affiliations with departments, or some other, specific and lower levels of organization.

2.1.6. Corresponding author

Corresponding author's name with full postal address in English and e-mail address should appear, after the affiliations. It is preferred that submitted address is institutional and not private. Corresponding author's name should include only initials of the first and middle names separated by a full stop (and a space) and the last name. Postal address should be written in the following line in sentence case. Parts of the address should be separated by a comma instead of a line break. E-mail (if possible) should be placed in the line following the postal address. Author should clearly state whether or not the e-mail should be published.

2.1.7. Manuscript information

All authors are required to provide word count (excluding title page, abstract, tables/figures, figure legends, Acknowledgements, Conflict of Interest, and References), the Abstract word count, the number of Tables, and the number of Figures.

2.2. Abstract

The second page of the manuscripts should be the abstract and key words. It should be placed on second page of the manuscripts after the standard title written in upper and lower case letters, bold.

Since abstract is independent part of your paper, all abbreviations used in the abstract should also be explained in it. If an abbreviation is used, the term should always be first written in full with the abbreviation in parentheses immediately after it. Abstract should not have any special headings (e.g., Aim, Results…).

Authors should provide up to six key words that capture the main topics of the article. Terms from the Medical Subject Headings (MeSH) list of Index Medicus are recommended to be used.

Key words should be placed on the second page of the manuscript right below the abstract, written in italic. Separate each key word by a comma (and a space). Do not put a full stop after the last key word. *See* example:

Abstract

Results of the analysis of

Key words: *spatial memory, blind, transfer of learning, feedback*

2.3. Main Chapters

Starting from the third page of the manuscripts, it should be the main chapters. Depending on the type of publication main manuscript chapters may vary. The general outline is: Introduction, Methods, Results, Discussion, Acknowledgements (optional), Conflict of Interest (optional), and Title, Author's Affiliations, Abstract and Key words must be in English (for both each chosen language of full paper). However, this scheme may not be suitable for reviews or publications from some areas and authors should then adjust their chapters accordingly but use the general outline as much as possible.

2.3.1. Headings

Main chapter headings: written in bold and in Title Case. *See* example:

- ✓ **Methods**

Sub-headings: written in italic and in normal sentence case. Do not put a full stop or any other sign at the end of the title. Do not create more than one level of sub-heading. *See* example:

- ✓ *Table position of the research football team*

2.3.2 Ethics

When reporting experiments on human subjects, there must be a declaration of Ethics compliance. Inclusion of a statement such as follow in Methods section will be understood by the Editor as authors' affirmation of compliance: "This study was approved in advance by [name of committee and/or its institutional sponsor]. Each participant voluntarily provided written informed consent before participating." Authors that fail to submit an Ethics statement will be asked to resubmit the manuscripts, which may delay publication.

2.3.3 Statistics reporting

JASPE encourages authors to report precise p-values. When possible, quantify findings and present them with appropriate indicators of measurement error or uncertainty (such as confidence intervals). Use normal text (i.e., non-capitalized, non-italic) for statistical term "p".

2.3.4. 'Acknowledgements' and 'Conflict of Interest' (optional)

All contributors who do not meet the criteria for authorship should be listed in the 'Acknowledgements' section. If applicable, in 'Conflict of Interest' section, authors must clearly disclose any grants, financial or material supports, or any sort of technical assistances from an institution, organization, group or an individual that might be perceived as leading to a conflict of interest.

2.4. References

References should be placed on a new page after the standard title written in upper and lower case letters, bold.

All information needed for each type of must be present as specified in guidelines. Authors are solely responsible for accuracy of each reference. Use authoritative source for information such as Web of Science, Medline, or PubMed to check the validity of citations.

2.4.1. References style

JASPE adheres to the American Psychological Association 6th Edition reference style. Check "American Psychological Association. (2009). Concise rules of APA style. American Psychological Association." to ensure the manuscripts conform to this reference style. Authors using EndNote® to organize the references must convert the citations and bibliography to plain text before submission.

2.4.2. Examples for Reference citations

One work by one author
- ✓ In one study (Reilly, 1997), soccer players
- ✓ In the study by Reilly (1997), soccer players
- ✓ In 1997, Reilly's study of soccer players

Works by two authors
- ✓ Duffield and Marino (2007) studied
- ✓ In one study (Duffield & Marino, 2007), soccer players
- ✓ In 2007, Duffield and Marino's study of soccer players

Works by three to five authors: cite all the author names the first time the reference occurs and then subsequently include only the first author followed by et al.
- ✓ First citation: Bangsbo, Iaia, and Krustrup (2008) stated that
- ✓ Subséquent citation: Bangsbo et al. (2008) stated that

Works by six or more authors: cite only the name of the first author followed by et al. and the year
- ✓ Krustrup et al. (2003) studied
- ✓ In one study (Krustrup et al., 2003), soccer players

Two or more works in the same parenthetical citation: Citation of two or more works in the same parentheses should be listed in the order they appear in the reference list (i.e., alphabetically, then chronologically)
- ✓ Several studies (Bangsbo et al., 2008; Duffield & Marino, 2007; Reilly, 1997) suggest that

2.4.3. Examples for Reference list

Journal article (print):

Nepocatych, S., Balilionis, G., & O'Neal, E. K. (2017). Analysis of dietary intake and body composition of female athletes over a competitive season. *Montenegrin Journal of Sports Science and Medicine, 6*(2), 57-65. doi: 10.26773/mjssm.2017.09.008

Duffield, R., & Marino, F. E. (2007). Effects of pre-cooling procedures on intermittent-sprint exercise performance in warm conditions. *European Journal of Applied Physiology, 100*(6), 727-735. doi: 10.1007/s00421-007-0468-x

Krustrup, P., Mohr, M., Amstrup, T., Rysgaard, T., Johansen, J., Steensberg, A., Bangsbo, J. (2003). The yo-yo intermittent recovery test: physiological response, reliability, and validity. *Medicine and Science in Sports and Exercise, 35*(4), 697-705. doi: 10.1249/01.MSS.0000058441.94520.32

Journal article (online; electronic version of print source):

Williams, R. (2016). Krishna's Neglected Responsibilities: Religious devotion and social critique in eighteenth-century North India [Electronic version]. *Modern Asian Studies, 50*(5), 1403-1440. doi:10.1017/S0026749X14000444

Journal article (online; electronic only):

Chantavanich, S. (2003, October). Recent research on human trafficking. *Kyoto Review of Southeast Asia, 4*. Retrieved November 15, 2005, from http://kyotoreview.cseas.kyoto-u.ac.jp/issue/issue3/index.html

Conference paper:

Pasadilla, G. O., & Milo, M. (2005, June 27). *Effect of liberalization on banking competition*. Paper presented at the conference on Policies to Strengthen Productivity in the Philippines, Manila, Philippines. Retrieved August 23, 2006, from http://siteresources.worldbank.org/INTPHILIPPINES/Resources/Pasadilla.pdf

Encyclopedia entry (print, with author):

Pittau, J. (1983). Meiji constitution. In *Kodansha encyclopedia of Japan* (Vol. 2, pp. 1-3). Tokyo: Kodansha.

Encyclopedia entry (online, no author):

Ethnology. (2005, July). In *The Columbia encyclopedia* (6th ed.). New York: Columbia University Press. Retrieved November 21, 2005, from http://www.bartleby.com/65/et/ethnolog.html

Thesis and dissertation:

Pyun, D. Y. (2006). *The proposed model of attitude toward advertising through sport.* Unpublished Doctoral Dissertation. Tallahassee, FL: The Florida State University.

Book:
Borg, G. (1998). *Borg's perceived exertion and pain scales*: Human kinetics.

Chapter of a book:
Kellmann, M. (2012). Chapter 31-Overtraining and recovery: Chapter taken from Routledge Handbook of Applied Sport Psychology ISBN: 978-0-203-85104-3 *Routledge Online Studies on the Olympic and Paralympic Games* (Vol. 1, pp. 292-302).

Reference to an internet source:
Agency. (2007). Water for Health: Hydration Best Practice Toolkit for Hospitals and Healthcare. Retrieved 10/29, 2013, from www.rcn.org.uk/newsevents/hydration

2.5. Tables

All tables should be included in the main manuscript file, each on a separate page right after the Reference section.

Tables should be presented as standard MS Word tables.

Number (Arabic) tables consecutively in the order of their first citation in the text.

Tables and table headings should be completely intelligible without reference to the text. Give each column a short or abbreviated heading. Authors should place explanatory matter in footnotes, not in the heading. All abbreviations appearing in a table and not considered standard must be explained in a footnote of that table. Avoid any shading or coloring in your tables and be sure that each table is cited in the text.

If you use data from another published or unpublished source, it is the authors' responsibility to obtain permission and acknowledge them fully.

2.5.1. Table heading

Table heading should be written above the table, in Title Case, and without a full stop at the end of the heading. Do not use suffix letters (e.g., Table 1a, 1b, 1c); instead, combine the related tables. *See* example:

- ✓ **Table 1.** Repeated Sprint Time Following Ingestion of Carbohydrate-Electrolyte Beverage

2.5.2. Table sub-heading

All text appearing in tables should be written beginning only with first letter of the first word in all capitals, i.e., all words for variable names, column headings etc. in tables should start with the first letter in all capitals. Avoid any formatting (e.g., bold, italic, underline) in tables.

2.5.3. Table footnotes

Table footnotes should be written below the table.

General notes explain, qualify or provide information about the table as a whole. Put explanations of abbreviations, symbols, etc. here. General notes are designated by the word *Note* (italicized) followed by a period.

- ✓ *Note.* CI: confidence interval; Con: control group; CE: carbohydrate-electrolyte group.

Specific notes explain, qualify or provide information about a particular column, row, or individual entry. To indicate specific notes, use superscript lowercase letters (e.g. $^{a, b, c}$), and order the superscripts from left to right, top to bottom. Each table's first footnote must be the superscript ^{a}.

- ✓ ^{a}One participant was diagnosed with heat illness and n = 19.^{b}n =20.

Probability notes provide the reader with the results of the texts for statistical significance. Probability notes must be indicated with consecutive use of the following symbols: * † ‡ § ¶ || etc.

- ✓ *P<0.05,†p<0.01.

2.5.4. Table citation

In the text, tables should be cited as full words. *See* example:

- ✓ Table 1 (first letter in all capitals and no full stop)
- ✓ ...as shown in Tables 1 and 3. (citing more tables at once)
- ✓ ...result has shown (Tables 1-3) that... (citing more tables at once)
- ✓ ....in our results (Tables 1, 2 and 5)... (citing more tables at once)

2.6. Figures

On the last separate page of the main manuscript file, authors should place the legends of all the figures submitted separately.

All graphic materials should be of sufficient quality for print with a minimum resolution of 600 dpi. JASPE prefers TIFF, EPS and PNG formats.

If a figure has been published previously, acknowledge the original source and submit a written permission from the copyright holder to reproduce the material. Permission is required irrespective of authorship or publisher except for documents in the public domain. If photographs of people are used, either the subjects must not be identifiable or their pictures must be accompanied by written permission to use the photograph whenever possible permission for publication should be obtained.

Figures and figure legends should be completely intelligible without reference to the text.

The price of printing in color is 50 EUR per page as printed in an issue of JASPE.

2.6.1. Figure legends

Figures should not contain footnotes. All information, including explanations of abbreviations must be present in figure legends. Figure legends should be written bellow the figure, in sentence case. *See* example:

- ✓ **Figure 1.** Changes in accuracy of instep football kick measured before and after fatigued. SR – resting state, SF – state of fatigue, *p>0.01, †p>0.05.

2.6.2. Figure citation

All graphic materials should be referred to as Figures in the text. Figures are cited in the text as full words. *See* example:

- ✓ Figure 1
  - × figure 1
  - × Figure 1.
  - ✓ ….exhibit greater variance than the year before (Figure 2). Therefore…
  - ✓ ….as shown in Figures 1 and 3. (citing more figures at once)
  - ✓ ….result has shown (Figures 1-3) that... (citing more figures at once)
  - ✓ ….in our results (Figures 1, 2 and 5)... (citing more figures at once)

2.6.3. Sub-figures

If there is a figure divided in several sub-figures, each sub-figure should be marked with a small letter, starting with a, b, c etc. The letter should be marked for each subfigure in a logical and consistent way. *See* example:

- ✓ Figure 1a
- ✓ …in Figures 1a and b we can…
- ✓ …data represent (Figures 1a-d)…

2.7. Scientific Terminology

All units of measures should conform to the International System of Units (SI).

Measurements of length, height, weight, and volume should be reported in metric units (meter, kilogram, or liter) or their decimal multiples.

Decimal places in English language are separated with a full stop and not with a comma. Thousands are separated with a comma.

Percentage	Degrees	All other units of measure	Ratios	Decimal numbers
✓ 10%	✓ 10º	✓ 10 kg	✓ 12:2	✓ 0.056
× 10 %	× 10 º	× 10kg	× 12 : 2	× .056

Signs should be placed immediately preceding the relevant number.		
✓ 45±3.4	✓ p<0.01	✓ males >30 years of age
× 45 ± 3.4	× p < 0.01	× males > 30 years of age

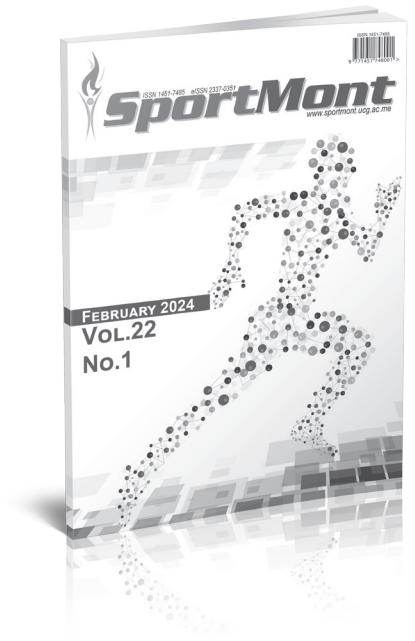
2.8. Latin Names

Latin names of species, families etc. should be written in italics (even in titles). If you mention Latin names in your abstract they should be written in non-italic since the rest of the text in abstract is in italic. The first time the name of a species appears in the text both genus and species must be present; later on in the text it is possible to use genus abbreviations. *See* example:

- ✓ First time appearing: *musculus biceps brachii*

Abbreviated: *m. biceps brachii*

ISSN 1451-7485 eISSN 2337-0351
SportMont
www.sportmont.ucg.ac.me



ISSN 1451-7485

Sport Mont Journal (SMJ) is a print (ISSN 1451-7485) and electronic scientific journal (eISSN 2337-0351) aims to present easy access to the scientific knowledge for sport-conscious individuals using contemporary methods. The purpose is to minimize the problems like the delays in publishing process of the articles or to acquire previous issues by drawing advantage from electronic medium. Hence, it provides:

- Open-access and freely accessible online;
- Fast publication time;
- Peer review by expert, practicing researchers;
- Post-publication tools to indicate quality and impact;
- Community-based dialogue on articles;
- Worldwide media coverage.

SMJ is published three times a year, in February, June and October of each year. SMJ publishes original scientific papers, review papers, editorials, short reports, peer review - fair review, as well as invited papers and award papers in the fields of Sports Science and Medicine, as well as it can function as an open discussion forum on significant issues of current interest.

SMJ covers all aspects of sports science and medicine; all clinical aspects of exercise, health, and sport; exercise physiology and biophysical investigation of sports performance; sport biomechanics; sports nutrition; rehabilitation, physiotherapy; sports psychology; sport pedagogy, sport history, sport philosophy, sport sociology, sport management; and all aspects of scientific support of the sports coaches from the natural, social and humanistic side.

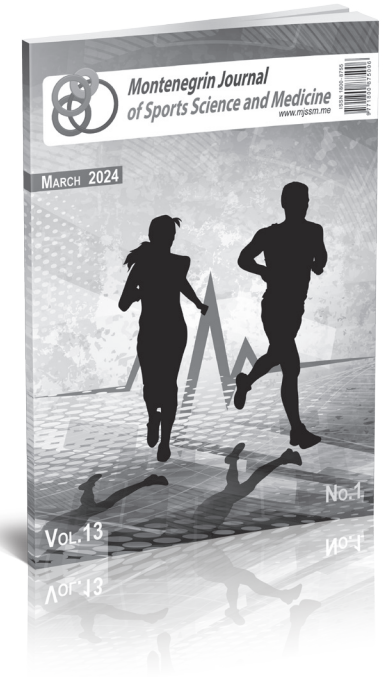
Prospective authors should submit manuscripts for consideration in Microsoft Word-compatible format. For more complete descriptions and submission instructions, please access the Guidelines for Authors pages at the SMJ website: http://www.sportmont.ucg.ac.me/?sekcija=page&p=51. Contributors are urged to read SMJ's guidelines for the authors carefully before submitting manuscripts. Manuscripts submissions should be sent in electronic format to sportmont@ucg.ac.me or contact following Editors:

Dusko BJELICA, Editor-in Chief – sportmont@t-com.me
Zoran MILOSEVIC, Editor-in Chief – zoranais@eunet.rs
Borko KATANIC, Managing Editor – borkokatanic@gmail.com
Nedim COVIC, Managing Editor – nedimcovic@gmail.com

Publication date: Summer issue – June 2024
Autumn issue – October 2024
Winter issue – February 2025

Montenegrin Journal of Sports Science and Medicine

MONTENEGRIN **J**OURNAL
OF **S**PORTS **S**CIENCE
AND **M**EDICINE



ISSN 1800-8755

CALL FOR CONTRIBUTIONS

Montenegrin Journal of Sports Science and Medicine (MJSSM) is a print (ISSN 1800-8755) and electronic scientific journal (eISSN 1800-8763) aims to present easy access to the scientific knowledge for sport-conscious individuals using contemporary methods. The purpose is to minimize the problems like the delays in publishing process of the articles or to acquire previous issues by drawing advantage from electronic medium. Hence, it provides:

- Open-access and freely accessible online;
- Fast publication time;
- Peer review by expert, practicing researchers;
- Post-publication tools to indicate quality and impact;
- Community-based dialogue on articles;
- Worldwide media coverage.

MJSSM is published biannually, in September and March of each year. MJSSM publishes original scientific papers, review papers, editorials, short reports, peer review - fair review, as well as invited papers and award papers in the fields of Sports Science and Medicine, as well as it can function as an open discussion forum on significant issues of current interest.

MJSSM covers all aspects of sports science and medicine; all clinical aspects of exercise, health, and sport; exercise physiology and biophysical investigation of sports performance; sport biomechanics; sports nutrition; rehabilitation, physiotherapy; sports psychology; sport pedagogy, sport history, sport philosophy, sport sociology, sport management; and all aspects of scientific support of the sports coaches from the natural, social and humanistic side.

Prospective authors should submit manuscripts for consideration in Microsoft Word-compatible format. For more complete descriptions and submission instructions, please access the Guidelines for Authors pages at the MJSSM website: http://www.mjssm.me/?sekcija=page&p=51. Contributors are urged to read MJSSM's guidelines for the authors carefully before submitting manuscripts. Manuscripts submissions should be sent in electronic format to office@mjssm.me or contact following Editors:

Dusko BJELICA, Editor-in Chief – sportmont@t-com.me
Damir SEKULIC, Editor-in Chief – damirsekulic.mjssm@gmail.com

Publication date: Autumn issue – September 2024
Spring issue – March 2025

MONTENEGRIN SPORTS ACADEMY

Founded in 2003 in Podgorica (Montenegro), the Montenegrin Sports Academy (MSA) is a sports scientific society dedicated to the collection, generation and dissemination of scientific knowledge at the Montenegrin level and beyond.

The Montenegrin Sports Academy (MSA) is the leading association of sports scientists at the Montenegrin level, which maintains extensive co-operation with the corresponding associations from abroad. The purpose of the MSA is the promotion of science and research, with special attention to sports science across Montenegro and beyond. Its topics include motivation, attitudes, values and responses, adaptation, performance and health aspects of people engaged in physical activity and the relation of physical activity and lifestyle to health, prevention and aging. These topics are investigated on an interdisciplinary basis and they bring together scientists from all areas of sports science, such as adapted physical activity, biochemistry, biomechanics, chronic disease and exercise, coaching and performance, doping, education, engineering and technology, environmental physiology, ethics, exercise and health, exercise, lifestyle and fitness, gender in sports, growth and development, human performance and aging, management and sports law, molecular biology and genetics, motor control and learning, muscle mechanics and neuromuscular control, muscle metabolism and hemodynamics, nutrition and exercise, overtraining, physiology, physiotherapy, rehabilitation, sports history, sports medicine, sports pedagogy, sports philosophy, sports psychology, sports sociology, training and testing.

The MSA is a non-profit organization. It supports Montenegrin institutions, such as the Ministry of Education and Sports, the Ministry of Science and the Montenegrin Olympic Committee, by offering scientific advice and assistance for carrying out coordinated national and European research projects defined by these bodies. In addition, the MSA serves as the most important Montenegrin and regional network of sports scientists from all relevant subdisciplines.

The main scientific event organized by the Montenegrin Sports Academy (MSA) is the annual conference held in the first week of April.

Annual conferences have been organized since the inauguration of the MSA in 2003. Today the MSA conference ranks among the leading sports scientific congresses in the Western Balkans. The conference comprises a range of invited lecturers, oral and poster presentations from multi- and mono-disciplinary areas, as well as various types of workshops. The MSA conference is attended by national, regional and international sports scientists with academic careers. The MSA conference now welcomes up to 200 participants from all over the world.

It is our great pleasure to announce the upcoming 21th Annual Scientific Conference of Montenegrin Sports Academy “Sport, Physical Activity and Health: Contemporary Perspectives” to be held in Dubrovnik, Croatia, from 18 to 21 April, 2024. It is planned to be once again organized by the Montenegrin Sports Academy, in cooperation with the Faculty of Sport and Physical Education, University of Montenegro and other international partner institutions (specified in the partner section).

The conference is focused on very current topics from all areas of sports science and sports medicine including physiology and sports medicine, social sciences and humanities, biomechanics and neuromuscular (see Abstract Submission page for more information).

We do believe that the topics offered to our conference participants will serve as a useful forum for the presentation of the latest research, as well as both for the theoretical and applied insight into the field of sports science and sports medicine disciplines.

USEFUL CONTACTS

Editorial enquiries and journal proposals:
Dusko Bjelica
Damir Sekulic
Editors-in-Chief
Email: **damirsekulic.mjssm@gmail.com**

Selcuk Akpinar
Executive Editor
Email: **office@mjssm.me**

Marketing enquiries:
Fidanka Vasileva
Marketing Manager
Email: **damirsekulic.mjssm@gmail.com**

Sports Science and Medicine Journals

from Montenegrin Sports Academy

We have expanded the quality of our journals considerably over the past years and can now claim to be the market leader in terms of breadth of coverage.

As we continue to increase the quality of our publications across the field, we hope that you will continue to regard MSA journals as authoritative and stimulating sources for your research. We would be delighted to receive your comments and suggestions, mostly due to the reason your proposals are always welcome.

Look Inside!

Sport Mont Journal

Editors-in-Chief: **Dusko Bjelica**, Montenegro; **Zoran Milosevic**, Serbia
Managing Editor: **Borko Katanic**, Montenegro; **Nedim Covic**, Bosnia and Herzegovina

Volume 22, 2024, 3 issues per year; Print ISSN: 1451-7485, Online ISSN: 2337-0351

Sport Mont Journal is a scientific journal that provides: Open-access and freely accessible online; Fast publication time; Peer review by expert, practicing researchers; Post-publication tools to indicate quality and impact; Community-based dialogue on articles; Worldwide media coverage. SMJ is published three times a year, in February, June and October of each year. SMJ publishes original scientific papers, review papers, editorials, short reports, peer review - fair review, as well as invited papers and award papers in the fields of Sports Science and Medicine, as well as it can function as an open discussion forum on significant issues of current interest.

www.sportmont.ucg.ac.me

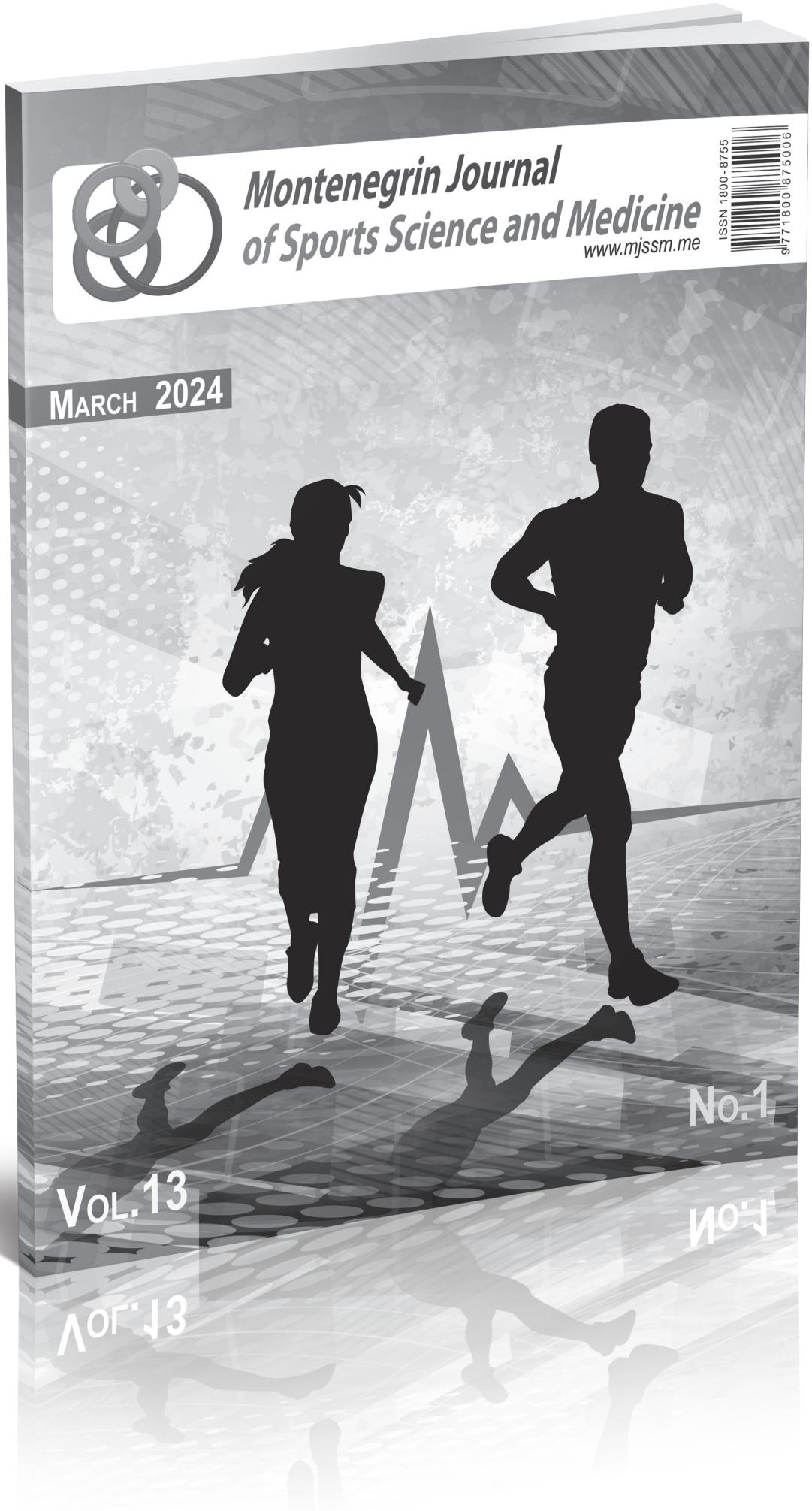
Montenegrin Journal of Sports Science and Medicine

Editors-in-Chief: **Dusko Bjelica**, Montenegro; **Damir Sekulic**, Croatia
Executive Editor: **Selcuk Akpinar**, Turkey
Associate Editors: **Mehmet Uygur**, USA; **Catalina Casaru**, USA; and **Predrag Bozic**, Serbia

Volume 13, 2024, 2 issues per year; Print ISSN: 1800-8755, Online ISSN: 1800-8763

Montenegrin Journal of Sports Science and Medicine (MJSSM) is published biannually, in September and March of each year. MJSSM publishes original scientific papers, review papers, editorials, short reports, peer review - fair review, as well as invited papers and award papers in the fields of Sports Science and Medicine, as well as it can function as an open discussion forum on significant issues of current interest. MJSSM covers all aspects of sports science and medicine; all clinical aspects of exercise, health, and sport; exercise physiology and biophysical investigation of sports performance; sport biomechanics; sports nutrition; rehabilitation, physiotherapy; sports psychology; sport pedagogy, sport history, sport philosophy, sport sociology, sport management; and all aspects of scientific support of the sports coaches from the natural, social and humanistic side.

www.mjssm.me


Montenegrin Journal
of Sports Science and Medicine
www.mjssm.me
ISSN 1800-8755
MARCH 2024
VOL.13
No.1

CRNOGORSKI OLIMPIJSKI KOMITET
MONTENEGRIN OLYMPIC COMMITTEE

CIP – Каталогизација у публикацији
Национална библиотека Црне Горе, Цетиње

ISSN 2536-569X
COBISS.CG-ID 33826832

MSA Conference 2024

21th Annual Scientific Conference of Montenegrin Sports Academy "Sport, Physical Activity and Health: Contemporary perspectives"

http://www.csakademija.me/conference/

CRNOGORSKA SPORTSKA AKADEMIJA • MONTENEGRIN SPORTS ACADEMY •

18th - 21th April 2024,
Dubrovnik - Croatia