ISSN 2536-569X | eISSN 2536-5703

Journal of Anthropology of Sport and Physical Education

www.jaspe.ac.me

ISSN 2536-569X

JANUARY 2021

VOL.5
No.1

JASPE

Journal of Anthropology of Sport and Physical Education

Editor-in-Chief
Bojan Masanovic | University of Montenegro, Montenegro

Section Editors
Radenko Matic (Cultural Anthropology) | University of Novi Sad, Serbia
Kubilay Ocal (Global Anthropology) | Mugla Sitki Kocman University, Turkey
Dusan Stupar (Biological Anthropology) | Educons University, Serbia
Nina Djukanovic (Medical Anthropology) | University of Belgrade, Serbia

Editorial Board
Fitim Arifi | University of Tetova, North Macedonia
Hassan Sedeghi | University Putra Malayisa, Malaysia
Ivana Cerkez Zovko | University of Mostar, Bosnia and Herzegovina
Izet Bajramovic | University of Sarajevo, Bosnia and Herzegovina
Juel Jarani | Sports university of Tirana, Albania
Luiz Fernando Rojo | Universidade Federal Fluminense, Brazil
Marin Corluka | University of Mostar, Bosnia and Herzegovina
Marko Aleksandrovic | University of Nis, Serbia
Sami Sermaxhaj | Universi College, Kosovo
Stefan Seman | University of Belgrade, Serbia
Taher Afsharnezhad | Shomal University, Iran
Tonci Bavcevic | University of Split, Croatia

Index Coverage
DOAJ; Index Copernicus; Google Scholar; Crossref; ROAD; Open Academic Journals Index

Proofreading Service
Kristina Perovic Mijatovic

Prepress
Milicko Ceranic

Print
Art Grafika | Niksic

Print run
1500

MontenegroSport

CRNOGORSKA SPORTSKA AKADEMIJA • MONTENEGRIN SPORTS ACADEMY

UCG
Univerzitet Crne Gore

Fakultet za sport i fizičko vaspitanje • Univerzitet Crne Gore

ISSN 2536-569X eISSN 2536-5703

JOURNAL OF ANTHROPOLOGY OF SPORT AND PHYSICAL EDUCATION

International Scientific Journal

Vol. 5(2021), No. 1 (1-41)

TABLE OF CONTENTS

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

DOI 10.26773/jaspe.210101

Journal of Anthropology of Sport and Physical Education

ORIGINAL SCIENTIFIC PAPER

Impact of Additional Physical Activity Program on Motor Abilities Development in School Children

Vanja Popovic[1], Fitim Arifi[2], Boris Zarkovic[3], Marin Corluka[4]

[1]Independent Researcher, Podgorica, Montenegro, [2]University of Tetovo, Faculty of Physical Education and Sport, Tetovo, North Macedonia, [3]University of Novi Sad, Faculty of Sport and Physical Education, Novi Sad, Serbia, [4]University of Mostar, Faculty of Mathematics and Science Education, Mostar, Bosnia and Herzegovina

Abstract

The aim of this study is to determine there is a statistically significant difference in motor ability indicators in children of early school age before and after the defined experimental process. The total number of subjects is 40 and the subjects was divided into two subsamples: a subsample of boys (n = 20) with an average age of 6.20 ± 0.34 years and a subsample of a girls (n = 20) with an average age of 6.16 ± 0.62 years. All subjects were participants in the program of the sports school of the children fitness centre Smart Gym from Podgorica. Subsamples were subjected to an experimental process lasting 8 weeks. Immediately before and after the experimental process, motor abilities were measured using the following 10 tests: 5m sprint, 10m sprint, standing long jump, polygon backwards, bent arm hang, sit and reach, climbing and descending, stork balance stand test, sit ups, and throw and catch test. The results of the study show that the experimental process was successful in improving the polygon backwards, forward deep bend and throw and catch test in boys and stork balance stand test, sit ups and throw and catch test in girls. Such a program could improve the working methodology in all sport schools throughout Montenegro.

Keywords: *Motor Skills, Children, School Age, Montenegro*

Introduction

In practice, it is one of the priority tasks in work with children to care about their optimal growth and development (Masanovic, 2019; Banjevic, 2020). In part of motor structure and its development, early school age is a particularly sensitive period for children's development (Horvat, 2010; Djoric & Vukicevic, 2020). It is clear that impact of motor development is crucially important for total children's development in early school age, but there are situations when many think that this could be developed of itself at children, what is the problem of physiology. According to Horvat, Babic & Miholic (2013) impact the level of many physical exercise stimulus on children's motor progressively declining as they get to a grown up stadium, which is often called in practise as a critical development phase. As addition to this, Paušić (2007) says that one of the critical morphological-motoric periods is age 6 to 7, when a child starts school. In this growing up period, speed and coordination in all its shapes develop rapidly, while sensible development period of other motoric abilities is less visible in this age, but their development also speeds up by systematic exercise (Bala, 2007). When it comes to affection on development of motoric abilities which are genetically more caused (such as speed), in sensible periods it must be especially careful and achieve a certain foundation in order to keep working on it (Bjelica, 2005a; 2005b; Arifi, Alaj, Metej, Sermaxhaj, & Nebiu, 2015). This type of problem is interesting at preschool and early school children's age, mostly because this growing up period is characteristic by strong growth and development of all anthropometric points, so it is possible to expect different latent structure of anthropometric characteristics and motoric abilities compared with older age (Katić, Pejčić, & Viskić-Štalec, 2004). In that way, certain movement characteristics of early school children's age (6 and 7 years), compared to older age, may be described as the child is moving more harmoniously and more safely, and it gets outlines of mo-

Correspondence:

Montenegro Sport

V. Popovic
Independent Researcher, Simona Ivanova bb, 81000 Podgorica, Montenegro
E-mail: vanja.vanja.popovic@gmail.com

toric structures which will follow him many years on (Bala, 2009).

At early school children's age, during physical exercise classes, it is rarely taken care of all latent motoric abilities, which child in that age period should practise constantly (Likic, Bajramovic, & Vranesic-Hadzimehmedovic, 2018; Vasiljevic, Bjelica, Popovic, & Gardasevic, 2015). Caused by that reason, parents often choose additional sports activities or sports schools, so that child would better develop its motoric potential and fulfill their own movement necessity (Gardasevic, Bjelica, Popovic, & Vasiljevic, 2015).

Through researches so far, it is clear to see that in early school age were obtained positive results of efficiency of motoric abilities in two time points (Gardašević, Georgiev, & Bjelica, 2012; Masanovic, 2020). However, kinesiologists are still striving for discovery of more functional and more purposeful programs, due to exploitation of critical development periods of motoric abilities at children's of different ages and knowledge levels of movement structures. Through sports schools, through as diverse as possible with sports contents it is tried to give adequate stimulant to motoric ability development at children from 3 to 12 years old. In that are mostly included several basic sports systems (gymnastics and athletics) with supplementation of elements from sports games and martial sports.

This research determines exercise effects on motoric abilities development program of children in early school age (efficiency for this research created working program), therefore, determines values of changes level at certain motoric abilities in a period of 8 weeks and as if it is any at all. Applicable and efficient exercise programs are always needed and welcome so it is justified to assume that this research will be useful for science and praxis.

Methods

Procedure

The presented research is of longitudinal character, and the examination was performed at the beginning (initial state) and at the end (final state) of the experimental process. Experimental process lasted for 8 weeks and it was conducted in the form of modern physical education classes. Children had trainings 2 times per week, and program is made in way that in one week children exercise identical trainings, one training point was for learning and second was for improvement. Entire program of the experimental process is shown in addition.

Participants

In this research sample of respondents consisted of boys and girls of early school age. Total number of respondents is 40 and respondents was divided into two subsamples: subsample boys (n=20) of average age of 6.20±0.34 and subsample girls (n=20) of average age of 6.16±0.62. All respondents were attendants of a sports school program at children's fitness centre Smart Gym from Podgorica, and beside this, they ordinarily went to school and had physical education classes. Also, beside the sports school program, respondents were not included in any other extracurricular sports programs.

Based on research type, the sample of respondents included only children who have done complete measurement treatment and complete experimental treatment between two time points. It is necessary to remind that all parents gave their assent and they had the ability to resign their participation in this research at any point.

Instruments

For motoric ability assessment of children were used standard motoric test (Šoše & Rađo, 1998), so this research was conducted through following motoric tests, which by standardization were adapted to testing 6 years old students: sprint 5m (sec); sprint 10m (sec); standing long jump (cm); polygon backwards (sec); bent arm hang (sec); sit and reach (cm); climbing and descending (sec); stork balance stand (sec); sit ups (repetitions); throw and catch (repetitions).

All measurements were done by students of the Faculty for Sport and Physical Education with help of trainer from children's fitness centre. All measurements were done according to standardized methods (Metikoš, Franjo, Hofman, Pintar, & Oreb 1989), according to younger age categories modification (Bala, 2009).

Statistical analysis

The data obtained through the research were processed using descriptive and comparative statistical procedures. For each variable, central and dispersion parameters have been processed. The significance of the differences between time points for both respondents was determined by Student t-test for small samples, with statistical significance of $p<0.05$. Data were prepare in statistic package „STATISTICA 12.0 for Windows".

Results

In Table 1 there is descriptive parameters review for all examined variables of motoric abilities of boys in both time points (initially and finally), also there is review of statistical significance of difference in results between initial and final state of boys.

Table 1. Descriptive data and difference between motoric abilities at initial and final measurement of boys (n=20**)**

	Initial measurement	Final measurement		
Variable	Mean±SD	Mean±SD	t - value	Sig
Sprint 5m	1.64±0.20	1.53±0.14	1.90	.062
Sprint 10m	2.77±0.29	2.62±0.22	1.89	.071
Standing long jump	120.70±18.09	129.50±19.17	-1.49	.144
Polygon backwards	23.99±8.32	18.34±4.99	2.61	.008*
Bent arm hang	14.22±18.24	17.48±18.75	-0.56	.578
Sit and reach	36.80±10.30	44.15±12.53	-2.03	.047*
Climbing and descending	27.29±9.36	22.63±6.79	1.80	.081
Stork balance stand	26.64±19.80	33.94±19.12	-1.19	.243
Sit ups	15.30±4.94	18.05±4.88	-1.77	.080
Throw and catch	2.30±1.92	3.90±1.37	-3.03	.000*

Note: Mean – arithmetic mean; SD – standard deviation; t – value – strength difference between groups; Sig – statistical significance of differences; * - statistical significance $p\leq0.05$

Review of Table 1 clearly reveals that at 3 variables, in the final state is visible statistically significant difference of values compared to initial state. It is interesting that two variables assessed primarily coordination in different shapes. At throw and catch variable it is determined statistically significant difference at p=0.00 level of statistical significance, and negative t-value of -3.03, which means that respondents on final testing of assessment of throwing and catching ball against the wall made better result compared to initial state for average 1.60 repetitions.

Variable polygon backwards showed difference between two time points at p=0.01 level of statistical significance with 2.61 positive t-value. With this it is clearly visible, as with review of Figure 1 that boys at final measurement were for average 5.66 sec better than at initial testing.

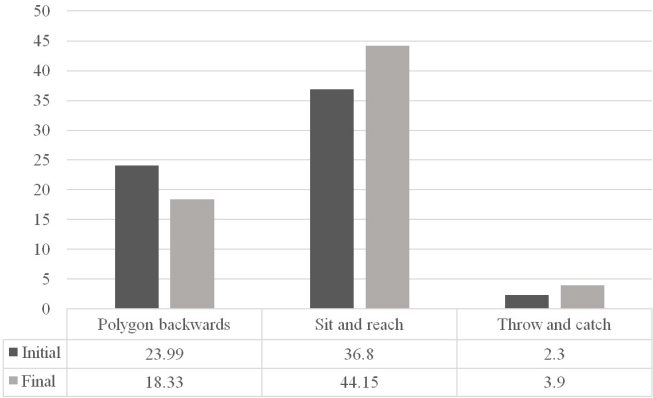


FIGURE 1. Statistically significant differences between two time points at boys

On the other side one variable for flexibility assessment, sit and reach, showed difference at p≤0.05 level of statistical significance, where respondents at final measurement had an average result of 44.14 cm compared to initial state when they had average result of 36.80 cm. It is visible that boys significantly improved flexibility through this experimental program, while also the biggest improvement was noticeable at variables for coordination in space and around hands coordination assessment. So that this experimental training program gave certain statistically significant improvements at boys.

In Table 2 there is review of descriptive parameters for all conducted variables of motoric abilities for girls in both time points (initially and finally), also there is review of statistical significance of differences between results of initial and final state of girls.

Table 2. Descriptive data and difference between motoric abilities at initial and final measurement of girls (n=20)

	Initial measurement	Final measurement		
Variable	Mean±SD	Mean±SD	t - value	Sig
Sprint 5 m	1.62±0.11	1.63±0.27	-0.23	0.821
Sprint 10 m	2.81±0.15	2.75±0.17	1.06	0.299
Standing long jump	112.45±18.31	122.2±15.54	-1.82	0.082
Polygon bacwards	24.21±8.71	20.25±5.98	1.67	0.104
Bent arm hang	13.97±17.35	19.07±17.29	-0.93	0.361
Sit and reach	40±8.95	46.15±11.91	-1.85	0.068
Climbing and descending	27.29±9.66	24.25±7.19	1.13	0.272
Stork balance stand	29.92±18.63	42.13±17.76	-2.12	0.040*
Sit ups	16.2±3.91	18.95±4.71	-2.01	0.045*
Throw and catch	2.1±1.97	3.4±1.54	-2.33	0.031*

Table 2 review, which contains information about differences of motoric abilities between initial and final state at girls, reveals that at three variables is noticeable statistically significat difference. Difference at p=0.03 level of statistical significance is visible again at variable throw and catch, which means this experimental process had positive impact at around hands coordination at both subsamples. Also, by further reviewing Table 2 and graphics, it is clearly visible that at the final testing girl for average 1.30 repetitions made better results compared to initial state.

Unlike boys, at girls differences are shown at variables for balance and repetitive strength of abdominal wall assessment. At variable Stork balance stand test difference is determined at p=0.04 level of statistical significance, where respondents at final testing had average result of 42.13 sec which is significant improvement compared to initial state of average 29.92 sec. There is conclusion that many exercises for balance keeping through the polygon system of work, lead to adequate effect and improve this ability at girls.

Also in the variable Sit-up for girls, with a significant difference at the level of p = 0.05 statistical significance, the initial result on the final test was improved by an average of 2.75 repetitions, which was an average of 16.20 repetitions. This was achieved with t-value of -2.33 which indicates results improvement.

As at both subsamples there were statistical significant differences of motoric abilities, it may be claimed for sure that experimental process had positive impact on motoric abilities improvement of respondents.

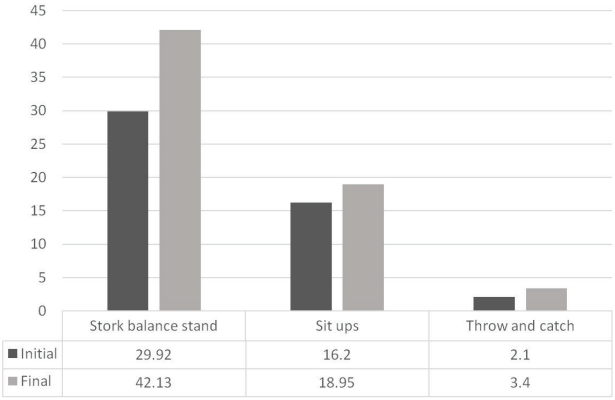


FIGURE 2. Statistically significant differences between time points at girls

Discussion

One of the aims of profession is to reveal the most purposeful programs for anthropological status improvement at children (Sindik et al., 2017). They would be used as base for further work, because at already developed motoric structure, later may be built more, of course if we maximum use sensitive periods of development of certain motoric abilities (Stijepic & Nicin, 2007). In this case, experimental treatment was conducted for 8 weeks, where directly before and after experimental treatment were conducted motoric abilities testing.

In part of this research which observed boys, it is clearly seen that at three examined variables (polygon backwards, sit and reach and throw and catch tests) was found statistically significant difference between two time points, while at seven variables (sprint 5m, sprint 10m, jump forward, bent arm hang, climbing and descending, Stork balance stand and sit ups tests) there was not visible statistically significant difference between initial and final state.

In part of this research which observed girls, it is visible that at three examined variables (Stork balance stand, sit ups and throw and catch tests) is found statistically significant difference between two time points, while at other seven variables (sprint 5m, sprint 10m, jump forward, polygon backwards, bent arm hang, sit and reach and climbing and descending tests) there was not found statistically significant difference between initial and final state at girls.

When it comes to individual certain motoric abilities, level of their improvement because of applied experimental program compared to initial state at boys and girls, it may be concluded that they are noticeable at results of test which examined coordination but are not noticeable in result of test for speed valuation. Out of this, it is concluded that there are indicators that this program has positive impact on coordination at childrens early school age, while it did not make a significant difference when it comes to speed.

Besides that, improvement of certain motoric abilities through usage of defined experimental program are noticeable at respondents of one gender while they are not noticeable at other gender. So for example at boys it is noticeable that there is improvement of results test for flexibility examination, while at girls it was not the case. The reason for this could be the higher initial level of flexibility that girls naturally possess (Trautner et al., 2005). Opposite of that, at girls there is improvement at examination of parameters of strength and balance, while there are not ones at boys. Which is no surprise, because previous research emphasizes that the increase in strength in boys is higher only after the age of 12 (Parker, Round, Sacco, & Jones, 1990), and that girls have a lower center of gravity than boys due to the specific body structure which can affect on balance (Bubanj, 1997).

With everything said so far, it may be concluded that the experimental program is quality and purposeful, given that statistically significant difference was found in motoric abilities indicators between initial and final state of motoric abilities of boys and girls of early school age through defined experimental process.

Recommendation for further researches is that training process could be further modified, or it could be added another training point during one week. Also this program was comprehensive with elements which hypothetically could impact at every motoric ability, but could be even better results if focus was at only one motoric ability. Anyways, this research should be useful as starting point for further research of this kind, especially in this part of children sports extracurricular engagement.

Significance of this research reflects in immediate application of results in practise, especially in planning and programing further training processes, as well as modification of current ones. This research determined how efficient this program is for motoric abilities development, at children of early school age. Especially this kind of research could improve working programs of sports schools through Montenegro, and could give adequate information to professors of physical education about transformation processes and trends of motoric abilities development, in order to adequate follow new dynamics of profession improvement. Of course, with research of this kind, could gain popularisation of this kind of extracurricular physical activities. This study results will for sure help for further development of plan and program as in this sports school as in private children sports and educational institutions.

Acknowledgments

The authors wish to thank the their attendants and their parents, and to colleagues from children's fitness centre Smart Gym from Podgorica for their cooperation,

Conflict of Interest

The authors declare that there is no conflict of interest.

Received: 1 October 2020 | **Accepted:** 15 December 2020 | **Published:** 18 January 2021

References

Arifi, F., Alaj, I., Metaj, Z., Sermaxhaj, S., & Nebiu, J. (2015). Canonic relations of anthropometric and motor space between students as football players and non football players. *Sport Mont, 13*(43-44-45), 256-261.

Bala, G. (2007). *Antropološke karakteristike i sposobnosti predškolske dece*. Novi Sad: Univerzitet u Novom Sadu, Fakultet sporta i fizičkog vaspitanja.

Bala, G. (2009). *Relationships between anthropological characteristics and abilities of preschool children*. Istraživačka monografija, Beograd: Old Commerce.

Banjevic, B. (2020). Differences in Some Morphological Characteristics between Students of Younger School Age from Niksic and Mojkovac. *Journal of Anthropology of Sport and Physical Education, 4*(2), 15-18.

Bjelica, D. (2005a). Osnovi antropomotorike teorija. *Sport Mont, 3*(5), 95-96.

Bjelica, D. (2005b). Razvoj tjelesnih sposobnosti mladih fudbalera mediteranske regije u crnoj gori uticajem sportskog treninga. *Sport Mont, 3*(6-7), 208-222.

Bubanj, R. (1997). *Osnovi primenjene biomehanike u sportu*. Niš: Filozofski fakultet.

Djoric, N., & Vukicevic, V. (2020). Nutritional Status of Young School Children in a Rural Environment in Srem District. *Journal of Anthropology of Sport and Physical Education, 4*(2), 19-21. doi: 10.26773/jaspe.200404

Gardasevic, J., Bjelica, D., Popovic, S., & Vasiljevic, I. (2015). Attitudes of parents of preschool children towards the frequency and aspects of the use of computers. *Journal of Physical Education and Sport, 15*(3), 479.

Gardašević, J., Georgiev, G., & Bjelica, D. (2012). Qualitative changes of basic motor abilities after completing a six-week training programme. *Acta Kinesiologica, 6*(1), 70-74.

Horvat, V. (2010). *Relacije između morfoloških i motoričkih dimenzija te spremnosti za školu djece predškolske dobi*. Neobjavljena doktorska disertacija, Zagreb: Kineziloški fakultet, Sveučilišta u Zagrebu.

Horvat, V., Babić, V., & Miholić, S. J. (2013). Gender Differences in Some Motor Abilities of Preschool Children. *Croatian Journal of Education, 15(*4), 959-980.

Katić, R., Pejčić, A., & Viskić-Štalec, N. (2004). The Mechanism of Morphological-Motor Funcioning in Elementary School Female First-to Fourth Graders. *Collegium antropologicu¸ 28*(1), 261-299

Likic, S., Bajramovic, I., & Vranesic-Hadzimehmedovic, D. (2018). Relationship between morphological characteristics and dynamic running parameters in the case of boys aged 10-12 years. *Journal of Anthropology of Sport and Physical Education, 2*(1), 27-30.

Masanovic, B. (2019). Gender and Age Differences in Attitudes of Serbian Pupils toward Physical Education Lessons and their Preferences Regarding Lesson Organisation. *Croatian Journal of Education, 21*(1), 213-231.

Masanovic, B. (2020). Prescribed Physical Education Syllabus vs. Modified Physical Education Syllabus Containing Proprioception Exercises: Comparative Study. *International Journal of Applied Exercise Physiology, 9*(1), 149-158.

Metikoš, D., Franjo, P., Hofman, E., Pintar, Ž., & Oreb, G. (1989). *Mjerenje baznih motoričkih dimenzija sportaša*. Zagreb: Fakultet za fizičku kulturu.

Parker, D.F., Round, J.M., Sacco, P., & Jones, D.A. (1990). A cross-sectional survey of upper and lower limb strength in boys and girls during childhood and adolescence. *Annals of human biology, 17*(3), 199-211.

Paušić, J. (2007). *Konststrukcija i vrednovanje mjernih postupaka za procjenu tjelesnog držanja u dječaka dobi od 10 do 13 godina*. Neobjavljena doktorska disertacija, Zagreb: Kineziološki fakultet, Sveučilišta u Zagrebu.

Sindik, J., Mandić, G., Zenić, N., Zovko, I., Stanković, V., Savić, Z., Djokić, Z., & Kondrič, M. (2017). Comparison of Psychological Skills, Athlete's Identity, and Habits of Physical Exercise of Students of Faculties of Sport in Four Balkan Countries. *Montenegrin Journal of Sports Science and Medicine*, *6*(1), 13-28.

Stijepic, R., & Nicin, D. (2007). Sensitive periods research in the precision with the elementary schoolboys. *Sport Mont, 5*(12-13-14), 204-215.

Šoše, H., & Rađo, I. (1998). *Mjerenje u kineziologiji*. Sarajevo: Fakultet sporta i tjelesnog odgoja.

Trautner, H.M., Ruble, D.N., Cyphers, L., Kirsten, B., Behrendt, R., & Hartmann, P. (2005). Rigidity and flexibility of gender stereotypes in childhood: Developmental or differential? *Infant and Child Development: An International Journal of Research and Practice, 14*(4), 365-381.

Vasiljevic, I., Bjelica, D., Popovic, S., & Gardasevic, J. (2015). A critical review of parents of preschool children related to computer use. *Journal of Physical Education and Sport, 15*(4), 692.

DOI 10.26773/jaspe.210102

JASPE Journal of Anthropology of Sport and Physical Education

ORIGINAL SCIENTIFIC PAPER

Changes in Nutritional Status of 5-6 year old Children in Podgorica between 2013 and 2020

Milica Vucerakovic[1], Milena Mitrovic[2]

[1]University of Montenegro, Faculty for Teacher Education, Niksic, Montenegro, [2]University of Montenegro, Faculty for Sport and Physical Education, Niksic, Montenegro

Abstract

The aim of this research was to analyze the level of nutrition of students enrolled in primary school in 2013 and students enrolled in primary school in 2020. The research includes data on the height and weight of children from the obligatory systematic examinations. These systematic examinations included a sample of 82 children. We divided them into four subsamples. The first subsample consists of 19 boys enrolled in school in 2013 (n = 19), and the second 18 girls enrolled in the same year (n = 18). The third subsample consists of 24 boys enrolled in 2020 (n = 24), and the fourth 21 girls enrolled in 2020 (n = 21). The measurement was performed by health workers at the PHI Health Center "Nova Varos" in Podgorica. Body mass and body height are determinated, and that was the basis for calculation of the body mass index (BMI). For all variables, were calculated the values of the measures of central and dispersion tendency. Differences in body parameters for assessing nutrition between children were determined using the t-test for small and independent samples and the Hi square test. The percentage of obese boys enrolled in 2013 was 28%, obese girls 0%, the percentage of obese boys enrolled in 2020 was 21%, and obese girls was 19%. There are statistically significant differences between boys measured in 2013 and 2020, in favor of boys measured in 2020. There are also statistically significant differences between girls measured in 2013 and 2020 (obese girls were measured in 2020). When it comes to comparing genders by age, there are statistically significant differences in favor of girls measured in 2013 and girls measured in 2020. It can be concluded that obesity is on the rise, given the fact that more obese children are enrolled in school in 2020.

Keywords: *Children, Obesity, Height, Weight, BMI*

Uvod

Još od svog nastanka čovjek je imao potrebu da bude fizički aktivan (kreće se, traži hranu, uređuje svoju okolinu i sl.). Međutim, industrijalizacija i razvoj tehnike i tehnologije dovele su do sve manje potrebe za ljudskim radom, pa time i stvarne potrebe za fizičkom aktivnošću čovjeka. I ishrana čovjeka se tokom evolucije značajno mijenjala. Nekad su ljudi išli u potragu za hranom i za jelo su imali samo to što nađu ili ulove. Kao posljedica toga, logične su i promjene u stepenu uhranjenosti kod ljudi. Danas nam je hrana značajno dostupnija. Ta dostupnost čovjeku pruža mogućnost da jede kad hoće i koliko hoće. Takođe, gotovo sva današnja hrana je industrijski prerađena (sadrži mnogo dodatog šećera, pojačivače ukusa, konzervanse i sl.), što je čini kaloričnijom i nezdravijom.

Stepen uhranjenosti je parametar koji služi za kvalifikaciju odstupanja stanja uhranjenosti od normale, a ona se može kretati od ekstremne pothranjenosti do patološke gojaznosti. Neuhranjenost, prekomjerna uhranjenost i gojaznost štetno utiču na metabolizam i, globalno posmatrano, predstavljaju značajne medicinske i socio-ekonomske probleme (Masanovic, Bavcevic, & Prskalo, 2019). Ipak, u posljednje vrijeme mnogo više zabrinjava prekomjerna uhranjenost ili gojaznost, koja nastaje upravo kao posljedica nedostatka fizičke aktivnosti i nezdrave ishrane. Svjetska zdravstvena organizacija gojaznost definiše kao abnormalno nakupljanje masti u tijelu koje predstavlja veliki rizik za zdravlje. To je hronično oboljenje koje karakteriše povećanje masne ma-

Correspondence:

Montenegro Sport

M. Vucerakovic
University of Montenegro, Faculty for Teacher Education, Danila Bojovica bb, 81400, Niksic, Montenegro
E-Mail: milicavucerakovic@gmail.com

se tijela, u mjeri koja dovodi do narušavanja zdravlja i razvoja niza komplikacija (Vukušić, Filipović i Milićev, 2015; Mitrovic & Dragutinovic, 2020). Gojaznost i fizička neaktivnost glavni su faktori rizika za brojne hronične bolesti, uključujući dijabetes tipa 2, osteoporozu, kardiovaskularne bolesti i rak (Ćirković, 2012.). Prema podacima Svjetske zdravstvene organizacije, 1.9 milijardi odraslih ljudi (18 godina i stariji) imalo je problema sa prekomjernom tjelesnom masom, dok je 462 miliona ljudi bilo neuhranjeno (WHO, 2016). Što se tiče djece, 14.3 miliona ima malu tjelesnu masu za svoju visinu (WHO, 2016). Čak 45% smrti djece do 5 godina je povezano sa neuhranjenošću (WHO, 2017). Neuhranjenost je veliki problem u zemljama sa niskim životnim dohotkom, posebno u Africi (izuzev par zemalja u njenom sjevernom i južnom regionu). Nekada smatrani problemom samo u zemljama sa visokim životnim standardom, prekomjerna uhranjenost i gojaznost sada dramatično bilježe porast u zemljama sa niskim i srednjim životnim standardom, posebno u urbanim sredinama (NCD Risk Factor Collaboration, 2014; Djoric & Vukicevic, 2020). Međutim, u novijem istraživanju koje je za prestižni svjetski časopis „Nature" sproveo tim naučnika, navodi se da je stepen gojaznosti veći u ruralnim nego u urbanim područjima (NCD Risk Factor Collaboration, 2019). Trend rasta gojaznosti je zabrinjavajući, iz razloga što gojaznost negativno utiče na zdravlje i skraćuje životni vijek (Mitrović & Dragutinović, 2020). Dosta istraživanja upućuje i na porast gojaznosti u Crnoj Gori (Vrevic 2019; Banjevic, 2019; Masanovic et al., 2020; Vasiljevic, 2020). Stoga, osnovni cilj ovog rada je utvrditi nivoe uhranjenosti djece prvog razreda generacije 2013. i 2020., kao i eventualne razlike među njima, kako bi se sagledao trend kretanja gojaznosti kod djece ovog uzrasta u Podgorici.

Metod

Mjerenja pomoću kojih su dobijeni podaci o visini i masi djece sprovedena su od strane zdravstvenih radnika u JZU Dom zdravlja "Nova Varoš". Budući da se radilo o sistematskom pregledu, roditelji i njihova djeca su upućeni u svrhu mjerenja. Sistematskim pregledom prikupljeni su podaci o postojanju ili nepostojanju deformiteta kičmenog stuba, ličnoj higijeni djeteta kao i neki podaci koji ukazuju na opšte zdravstveno stanje djeteta, a za ovo istraživanje uzeti su podaci o tjelesnoj visini, tjelesnoj masi i uzrastu ispitanika. Na osnovu podataka o uzrastu, tjelesnoj visini i tjelesnoj masi djece, izračunat je pomoću standardne formule (Williamson et al., 2020). Ispitanici su mjereni u medicinskoj ambulanti, odjeveni u donji veš i bosi. Za ovo mjerenje korišćena je Medicinska vaga sa pomičnim tegovima i stadiometrom, a dobijeni rezultati su evidantirani u kartonima svakog učenika ponaosob kao i na zajedničkom dokumentu - evidenciji o radu. Ovim istraživanjem obuhvaćen je uzorak od 82 djeteta, od kojih je 42 mjereno u periodu april-maj 2013. godine, a 40 u periodu april-maj 2020. godine. Uzorak je podijeljen na četiri subuzorka. Prvi subuzorak čine 24 dječaka upisana u školu 2013. godine (n=24) prosječnog uzrasta 5 godina i 8 mjeseci, a drugi 18 djevojčica upisanih iste godine (n=18) prosječnog uzrasta 5 godina i 6 mjeseci, treći subuzorak sačinjava 19 dječaka upisanih u školu 2020. godine (n=19) prosječnog uzrasta 5 godina i 9 mjeseci, a četvrti 21 djevojčica upisana 2020. godine (n=21) prosječnog uzrasta 5 godina i 8 mjeseci. Podaci dobijeni u istraživanju obrađeni su pomoću programa specijalizovanog za statističku obradu podataka - IBM SPSS Statistics 20. Korišćeni su postupci deskriptivne statističke procedure - aritmetička sredina i standardna devijacija. Analiza stepena uhranjenosti urađena je na osnovu Indeksa tjelesne mase (BMI), klasifikujući ispitanike u jednu od sljedećih kategorija: preko 95 percentila – gojazni, od 85 do 95 percentila – prekomjerno uhranjeni, od 5 do 85 percentila - normalno uhranjeni i od 0 do 5 percentila - pothranjeni. Od komparativne statistike, korišćen je Hi kvadrat test sa statističkom značajnošću od 0,01, da bi se uporedile razlike u nivoima uhranjenosti između dječaka mjerenih 2013. i 2020. godine i između djevojčica mjerenih 2013. i 2020. godine.

Rezultati

U Tabeli 1 prikazani su osnovni deskriptivni parameri dječaka i djevojčica mjerenih 2013. i 2020. godine: tjelesna visina, tjelesna masa, minimalni rezultat, maksimalni rezultat, aritmetička sredina, standardna devijacija, mjera asimetričnosti Skjunis i mjera zakrivljenosti Kurtozis.

Tabela 1. Deskriptivna statistika dječaka i djevojčica upisanih 2013. i 2020. godine

Subuzorak	Varijable	Min	Max	Mean	SD	Skew.	Kurt.
Dječaci mjereni 2013.	Tjelesna visina	105.0	128.0	117.56	6.21	-.088	-.241
	Tjelesna masa	17.0	34.0	23.88	4.81	.343	-.974
Dječaci mjereni 2020.	Tjelesna visina	111.0	127.0	118.42	4.18	.254	.053
	Tjelesna masa	18.0	39.0	24.68	5.59	1.039	1.027
Djevojčice mjerene 2013.	Tjelesna visina	105.0	126.0	116.09	6.22	-298	-.920
	Tjelesna masa	26.0	28.0	21.53	3.20	.228	-.376
Djevojčice mjerene 2020.	Tjelesna visina	106.0	138.0	120.38	6.96	.558	1.290
	Tjelesna masa	18.0	38.0	24.57	5.11	1.095	1.135

Legenda: Min- minimalna vrijednost, Max- maksimalna vrijednost, Mean- aritmetička sredina, SD- standardna devijacija, Skew.- skjunis, Kurt.- kurtozis

Prosječne vrijednosti tjelesne mase dječaka i djevojčica mjerenih 2020. godine veće su nego kod onih mjerenih 2013. godine. Prosječna tjelesna masa povećala se za nešto manje od 1 kg kod dječaka, a za nešto više od 3 kg kod djevojčica. Trend povećanja prosječne tjelesne mase, prati i povećanje prosječne tjelesne visine. Prosječna tjelesna visina dječaka mjerenih 2020. veća je za skoro 1 cm od prosječne tjelesne visine dječaka mjerenih 2013. godine, dok je kod djevojčica mjerenih 2020. veća za čak preko 4 centimetra nego kod djevojčica mjerenih 2013. godine. Ako uporedimo srednje vrijednosti tjelesne mase dječaka i djevojčica za obije godine, vidjećemo da su nešto veće kod dječaka. Ono što iznenađuje jeste podatak da djevojčice mjerene 2020. imaju veću maksimalnu i prosječnu tjelesnu visinu od dječaka mjerenih iste godine, dok 2013. to nije bio slučaj.

U Tabeli 2 prikazane su frekvencije i kumulativne frekvencije za sva četiri subuzorka.

Kada su u pitanju dječaci mjereni 2013. godine, 2 (11%) su neuhranjena, 8 (42%) ima normalnu tjelesnu masu, 5 (21%) prekomjernu tjelesnu masu i 4 (21%) su gojazna. Kod dječaka mjerenih 2020. godine, neuhranjenih nije bilo (0%), normalnu tjelesnu

Tabela 2. Frekvencije i kumulativne frekvencije nivoa uhranjenosti dječaka i djevojčica mjerenih 2013. i 2020. godine

Kategorije	Dječaci – 2013.		Dječaci – 2020.		Djevojčice – 2013.		Djevojčice – 2020.	
	N	%	N	%	N	%	N	%
Neuhranjenost	2	11	0	0	0	0	1	5
Normalna masa	8	42	11	44	14	82	13	62
Prekomjerna masa	5	26	7	28	3	18	3	14
Gojaznost	4	21	7	28	0	0	4	19
Ukupno	19	100	25	100	17	100	21	100

Legenda: N - broj; % - procenat

masu imalo je 11 (44%) dječaka, dok je prekomjerno uhranjenih i gojaznih bilo po 7 (28%). Kod djevojčica mjerenih 2013. godine nema neuhranjenih i gojaznih (0%), njih 14 (82%) ima normalnu tjelesnu masu, dok su 3 (18%) prekomjerno uhranjene. Što se tiče djevojčica mjerenih 2020. godine, jedna (5%) je neuhranjena, 13 (62%) ima normalnu tjelesnu masu, 3 (14%) su prekomjerno uhranjene, a 4 (19%) gojazne.

U Tabeli 3 prikazane su razlike u kumulativnim frekvencijama kojima su izraženi nivoi uhranjenosti između ispitanika oba pola mjerenih u 2013. i 2020. godini.

Iz Tabele 3 možemo zaključiti da se procentualna zastupljenost neuhranjenih, uhranjenih, prekomjerno uhranjenih i gojaznih razlikuje po polovima i godinama. I kod dječaka i kod djevojčica, gojazniji su oni koji su mjereni 2020. nego oni mjereni 2013. godine.

Tabela 3. Hi kvadrat test za utvrđivanje razlika u nivoima uhranjenosti između dječaka mjerenih 2013. i 2020. godine i između djevojčica mjerenih 2013. i 2020. godine

Pol	Df	Sig.
Dječaci (2013-2020)	1	.000
Djevojčice (2013-2020)	1	.000

Legenda: df – stepeni slobode, Sig. – nivo značajnosti

Diskusija

S obzirom da se problemi sa prekomjernom uhranjenošću i gojaznošću povećavaju iz godine u godinu, kako kod nas tako i širom svijeta, cilj ovog istraživanja bio je da se utvrdi stepen uhranjenosti učenika i učenica prvog razreda upisanih u školu 2013. i 2020. godine. Procenat gojaznih dječaka upisanih 2013. godine iznosi 28%, a procenat gojaznih dječaka upisanih 2020. godine iznosi 21%. Procenat gojaznih djevojčica upisanih 2020. godine iznosi 0%, a gojaznih djevojčica mjerenih 2020. godine 19%. Može se zaključiti da je više gojazne djece upisano 2020. godine, što je i očekivano, s obzirom da je globalna studija, koja je obuhvatila više od 130 miliona i djece, pokazala da se broj gojazne djece i adolescenata povećao 10 puta za 40 godina, kao i da svakodnevno raste (NCD Risk Colaboration, 2017).

Kada je riječ o tjelesnoj visini učenika prvog razreda, nije karakteristično da su djevojčice visočije od dječaka. Prema većini istraživanja, bez obzira da li su starijeg ili novijeg datuma, dječaci su nešto visočiji (Bala, 1981; Pavlović, 1985; Gajević, 2009; Doder, 2010). Međutim, postoje istraživanja koja pokazuju suprotno - veću prosječnu tjelesnu visinu djevojčica. Jedno od starijih istraživanja sprovedenih nad učenicima upisanim u prvi razred pokazuje da su vrijednosti prosječne tjelesne visine djevojčica bile veće za oko 3 cm nego kod dječaka istog uzrasta (Ahmetović i sar., 1990). Trideset godina kasnije, Pelemiš i sar. (2020) su upoređujući nivoe uhranjenosti dječaka i djevojčica starijeg predškolskog uzrasta došli do statistički značajne razlike u korist djevojčica, što su objasnili sve ranijim polnim sazrijevanjem djevojčica, tj. ulaskom u pubertet, a opšte poznato je da se u tom periodu kod djevojčica povećava sakupljanje masnog tkiva, što je pokazano i ovim istraživanjem.

Ovo istraživanje takođe ukazuje da je danas, u našoj zemlji, gojaznost značajno veći problem od pothranjenosti. Međutim, osnovni nedostatak ovog rada je mali uzorak ispitanika, pa je potrebno nastaviti sa daljim istraživanjima, kako bi se dobila što potpunija i preciznija slika o stanju uhranjenosti djece u Crnoj Gori i sproveli adekvatni postupci za njeno sprječavanje i širenje. Vrlo je važno da profesori razredne nastave ili fizičkog vaspitanja preventivno reaguju i redovno prate i provjeravaju stepen uhranjenosti djece. Ako primijete da ima gojaznih, taj problem će rješavati adekvatnim planiranjem i programiranjem rada u nastavi fizičkog vaspitanja, a bilo bi dobro i obavijestiti roditelje, kako bi se povelo računa o ishrani djeteta i eventualno ih upututi na neke dodatne vidove fizičkih aktivnosti (školice sporta, sportski klubovi, sekcije i sl.). Samo uz takav, pravilan pristup, nesmetanu i kvalitetnu saradnju i sa djetetom i roditeljima i nesebično pružanje podrške, može se doći do pozitivnih promjena u ishrani, fizičkoj aktivnosti, a vremenom i u izgledu i zdravlju djeteta.

Acknowledgments
There are no acknowledgements.

Conflict of Interest
The authors declare that there is no conflict of interest.

Received: 13 July 2020 | **Accepted:** 15 November 2020 | **Published:** 18 January 2021

References

Ahmetović, Z., Pavlović, Đ. i Popmihajlov, D. (1990). *Fizički razvoj i fizičke sposobnosti stanovništva SAP Vojvodine*. Novi Sad: Zavod za fizičku kulturu Vojvodine.

Bala, G. (1981). *Struktura i razvoj morfoloških i motoričkih dimenzija dece SAP Vojvodine*. Novi Sad: Fakultet fizičke kulture.

Bala, G. (2007). *Morfološke karakteristike predškolske dece*. Novi Sad: Fakultet sporta i fizičkog vaspitanja.

Banjevic, B. (2019). Differences in some morphological characteristics and body mass index in children of younger school age with reference to their gender. *Journal of Anthropology of Sport and Physical Education, 3*(3), 37-41.

Ćirković, V. (2012). *Uticaj fizičke aktivnosti na gojaznost kod dece*. Neobjavljeni diplomski rad, Beograd: Fakultet sporta i fizičkog vaspitanja.

Djoric, N., & Vukicevic, V. (2020). Nutritional Status of Young School Children in a Rural Environment in Srem District. *Journal of Anthropology of Sport and Physical Education, 4*(2), 19-21.

Doder, D. (2010). *Fizička razvijenost i fizičke sposobnosti dece osnovnoškolskog uzrasta*. Novi Sad: Pokrajinski zavod za sport.

Gajević, A. (2010). *Fizička razvijenost i fizičke sposobnosti dece osnovnoškolskog*

uzrasta. Beograd: Republički zavod za sport.

Kavarić, N. *Gojaznost kao faktor rizika od nastanka kardiovaskularnih poremećaja u dece školskog uzrasta*. Neobjavljena doktorska disertacija, Podgorica: Medicinski fakultet.

Masanovic, B., Bavcevic, T., & Prskalo, I. (2019). Comparative Study of Anthropometric Measurement and Body Composition between Junior Handball and Basketball Players from the Serbian National League, *Pedagogics, psychology, medical-biological problems of physical training and sports*, *23*(2), 90–95.

Masanovic, B., Martinovic, S., Zoric, G., Bacovic, D., Mitrovic, M., & Vukotic, M. (2020). Trends in Body Height, Body Weight, and Body Mass Index from 1979 to 1987: An Analysis of the Young Male Population from the Municipality of Cetinje, *Journal of Antropology of Sport and Physycal Education, 4*(2), 3-7.

Mitrovic, M., & Dragutinovic, K. (2020). Comparative Analysis of Anthropometric Parameters as Obesity Indicators for 7-8 Years-old Children of Different Resident Status, *Journal of Antropology of Sport and Physical Education*, *4*(1), 43–46.

NCD Risk Factor Collaboration (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: A systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*, 384 (9945) 766–781.

NCD Risk Factor Collaboration (2017). Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults, *The Lancet*, 390 (10113), 2627-264(2).

NCD Risk Factor Collaboration (2019). Rising rural body-mass index is the main driver of the global obesity epidemic in adults, *Nature*, *569*(2019) 260–264.

Pavlović, Đ. (1985). *Fizička razvijenost i fizičke sposobnosti stanovnika SAP Vojvodine.* Novi Sad: Zavod za fizičku kulturu Vojvodine.

Pelemiš, V., Pavlović, S., Nikolić, I.,& Ujsasi, D. (2020). Body Mass Index and Motor Status of Preschool Children, *Sports Science and Health*, *10*(1), 17-25.

Stupar, D., Popović, B., & Vujović, P. (2012).Stanje uhranjenosti predškolske dece Novog Sada, *Journal of the Anthropological Society of Serbia*, *49*(5), 51-55.

Vasiljević, I. (2020). *Antropometrijski parametri kao indikatori gojaznosti kod adolescenata u Crnoj Gori*. Neobjavljena doktorska disertacija, Nikšić: Fakultet za sport i fizičko vaspitanje.

Vrević, E. (2019). *Stepen uhranjenosti učenika drugog i trećeg razreda osnovnih škola u Herceg Novom.* Neobjavljeni diplomski rad, Nikšić: Fakultet za sport i fizičko vaspitanje.

Williamson, K., Nimegeer, A., & Lean, M. (2020). Rising prevalence of BMI≥40kg/m^2 : A high demand epidemic needing better documentation, *Obesity reviews*, *21*(4), 1-12.

World Health Organization. (2017). *Guideline: assessing and managing children at primary health-care facilities to prevent overweight and obesity in the context of the double burden of malnutrition. Updates for the integrated management of childhood illness (IMCI).* Geneva: World Health Organization.

DOI 10.26773/jaspe.210103

Journal of Anthropology of Sport and Physical Education

ORIGINAL SCIENTIFIC PAPER

Difference in Motor Skills between Active and Inactive Children

Aleksandar Stojmenovic[1], Nikola Prvulovic[1], Borko Katanic[1]

[1]University of Nis, Faculty of Sports and Physical Education, Nis, Serbia

Abstract

This research aimed to determine the differences in motor skills between active and inactive children at the age of 9 using the tests of motor skills BOT-2 and the tests of gross motor skills TGMD-2. The total number of respondents 40 (20 active and 20 inactive) was made up of students from the 3rd grade of elementary school Mika Antić, Niš. The age of the respondents is 9±0.5 years for both sexes. Motor status was assessed by standard tests of motor skills. Motor skills were assessed with a battery of BOT-2 tests was used to assess motor skills, subtests of speed and agility, and upper limb coordination. A battery test of gross motor development (TGMD-2), subtests for the assessment of locomotor skills, manipulative skills, and the overall result on the test of gross motor skills. A statistically significant difference was found in favor of active children versus inactive in two variables total score on gross motor test-TGM (p=0.036) and level of physical activity-TOTPA (p=0.00) while the other variables were not statistically significant (p>0.05). The general conclusion is that there are no differences in motor skills between active and inactive children.

Keywords: *Motor Skills, Motor Abilities, Gross Motor Skills, School children, TGMD2, BOT-2*

Introduction

A motor skill is the possibility to provoke a predetermined outcome of movement with maximum certainty (Santrock, 2008). Motor learning is a relatively permanent change in the ability to perform a skill as a result of exercise or experience (Kozomara et al., 2019). The goal of motor skills is to optimize the ability to exercise with the speed of success, precision, and reduce the energy consumption required for performance. Continuous practice of a certain motor skill will result in significantly improved performance, but not all motor skill movements (Santrock, 2008).

Motor skills are usually classified into two groups: gross motor skills and fine motor skills. Gross motor skills include the skills needed to control large muscle groups for walking, running, sitting, crawling, and other activities. The muscles needed to perform gross motor skills are mainly found in the arms, legs, back, abdomen, and torso (Needleman, 2000). Fine motor skills include the skills needed to control smaller muscle groups for writing, playing an instrument, artistic expression, and craftwork. The muscles needed to perform fine motor skills are mainly found in the arms, legs, and head (Payne, & Larry, 1998). Researchers use many tests for diagnostic, the most common or the most effective tests for motor skills are the BOT-2 test of motor efficiency and the TGMD-2 test of gross motor skills (Zuvela, Males, & Miletic, 2011; Franjko, Zuvela, Kuna, & Kezic, 2013; Baranasic, 2019; Barnett, Salmon, & Hesketh, 2016; Akbari et al., 2009; Top & Kallkavan, 2014).

This research aimed to determine the differences in motor skills between active and inactive children at the age of 9 to assess the importance of exercise in children of this age.

Methods

Sample of respondents

The total number of respondents 40 (20 active and 20 inactive) was made up of students from the 3rd grade of the elementary school "Mika Antić", from Niš. The age of the respondents is 9±0.5 years for both sexes. Before the start of the study, the consent of the parents was obtained for the participation of their

Correspondence:

B. Katanic
University of Nis, Faculty of Sports and Physical Education, Carnojevica 10a, 18000, Nis, Serbia
E-mail: borkokatanic@gmail.com

children in the research. Parents also filled out a questionnaire on children's physical activity and about those results, children were classified. The study was conducted in accordance with the Declaration of Helsinki, approved by the Ethics Committee of the Faculty of Sports and Physical Education in Niš.

The sample of variables

Motor skills such a running speed and agility and upper limb coordination were assessed with two subtests of BOT-2, Bruinkins-Oseretcky test for motor efficiency (Bruininks, 2005). This test is used in children 4-21 years (Deitz, Kartin, & Kopp, 2007). These skills are represented by variables TULC - total scale score on the subtest of upper limb coordination and TSAT - total scale score on the subtest of agility and speed. TULC contains five items and TSAT subtest contains seven test items, and all items were given a scale score based on performance and all items scores were totaled for an overall subtest score.

The second test used is the gross motor skills test (TGMD-2) which consists of subtests for the assessment of locomotor skills, manipulative skills, and the overall result on the test of gross motor skills. This test is designed to assess the skills of large muscle groups for children between the ages of 3-10 (Simons et al., 2008). These skills are represented by variables LOC - locomotor skills, MAN - manipulative skills, and TGM - total result on the test of gross motor skills. LOC and MAN contain 6 items each and all items were given a numerical score based on performance and the sum of all items from each subscale makes up an overall subtest score. TGM represents the total test score.

Measuring the level of children's physical activity performed by the questionnaire, and that questionnaire was filled out by parents. The questionnaire for physical activity (PAQ) is designed for children aged 4-17 has 4 sections concerning: sports activities, leisure activities, school activities, and other activities (Corder et al., 2009). Physical activity is represented by a variable TOTPA and it refers to the total result of the physical activity questionnaire.

Study protocol

The transversal research was conducted in the elementary school "Mika Antic", in Niš. Testing of children was conducted in four terms (November 26, 2019, November 27, 2019, December 3, 2019 and December 13, 2019). Five doctoral students from the Faculty of Sport and Physical Education Nis administered the BOT-2 and TGMD-2 tests. Every day the testing started at 11:00 am and lasted 1 hour and 30 minutes in the duration of two school hours. The temperature of the hall was in the range of 22° to 26°. Each student had a repeated oral explanation of the test in order to better concentrate. The measuring instruments used in this research are a digital scale, meter, stopwatch, and tennis ball.

Statistical analysis

Data processing was performed using the statistical program SPSS 19. Descriptive analysis was used to distribute data on the number of respondents, mean, and standard deviation. After performing the Kolmogorov-Smirnov and the Shapiro-Wilk data normality tests, a significant deviation from the normal data distribution was found, indicating that a non-parametric technique should be implemented, in this case, the Mann-Whitney U test. This test was used to determine differences between active and inactive children in motor skills.

Results

Table 1 shows the descriptive statistics data. When looking at the descriptive statistics in Table 1, it is noticeable that the active group (group 2) has on average numerically higher values than the inactive group (group 1) in all variables. The average values of the active group in the BOT-2, upper limb coordination (TULC) subtest are 38.70 versus 35.05 as achieved by the inactive group, also in the speed and agility subtest (TSAT), the result is on the active side in relation to the inactive group (42.80 vs. 41.45). When it comes to TGMD-2 tests, the active group also achieved higher values than the inactive group in the test of locomotor skills (LOC) 40.05 versus 37.05, manipulative skills (MAN) 42.65 versus 40.55, and the total TGM score 82.70 versus 77.60. Also, the result of the variable TOTPA assessment of physical activities shows a higher average in the active group compared to the inactive group (3.57 vs. 2.62).

Table 1. Descriptive parameters of results on tests of motor abilities active and inactive children

		BOT-2		TGMD-2			PAQ
Group		TULC	TSAT	LOC	MAN	TGM	TOTPA
1	Mean	35.05	41.45	37.05	40.55	77.60	2.62
	SD	7.22	2.98	5.13	4.62	8.44	.53
	Min	18	35	28	31	59	1.20
	Max	45	46	46	46	92	3.50
2	Mean	38.70	42.80	40.05	42.65	82.70	3.57
	SD	4.14	2.14	3.50	3.08	5.41	.39
	Min	28	39	34	34	70	3.10
	Max	44	47	46	46	92	4.40

Note: BOT-2 - Bruininks-Oseretcky test, TGMD-2 - test of gross motor skills, PAQ - physical activity questionnaire, TULC - total score on the subtest of upper limb coordination, TSAT - total score on the subtest of agility and speed, LOC - locomotor skills, MAN - manipulative skills, TGM - total result on the test of gross motor skills, TOTPA - total result of the physical activity questionnaire.

Table 2 presents data of the normality on the distribution of results. The results of the Kolmogorov-Smirnov test showed a deviation from the normal distribution for the two variables TULC (p=0.37) and MAN (p=0.00), while the remaining four variables had the normal distribution (p>0.05). Similar results were achieved on the Shapiro-Wilk test. Based on the given tests on the normality of data distribution, it was decided to approach the Mann-Whitney U test.

Table 3 shows the differences between groups a calculated by Mann-Whitney U Test. Between active and inactive groups a significant difference was found in two of the six variables, namely TGM (p=0.036) and TOTPA (p=0.00) while in the other variables there were no significant differences. No significant difference was found

Table 2. Normality of the distribution of results

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
TULC	.144	40	.037	.884	40	.001
TSAT	.131	40	.080	.953	40	.096
LOC	.102	40	.200*	.962	40	.201
MAN	.240	40	.000	.867	40	.000
TGM	.092	40	.200*	.960	40	.172
TOTPA	.130	40	.087	.969	40	.341

Note: TULC-total score on the subtest of upper limb coordination, TSAT-total score on the subtest of agility and speed, LOC-locomotor skills, MAN-manipulative skills, TGM-total result on the test of gross motor skills, TOTPA-result of the physical activity questionnaire.

in the BOT-2 scales of upper extremity coordination (p=0.09), and speed and agility (p=0.236). Also, no significant difference was found in the TGMD-2 subtests of locomotor (p=0.08), and manipulative skills (p=0.2).

Table 3. Differences between active and inactive children

	BOT-2		TGMD-2			PAQ
	TULC	TSAT	LOC	MAN	TGM	TOTPA
Mann-Whitney U	137.500	159.000	135.500	153.000	122.500	10.000
Wilcoxon W	347.500	369.000	345.500	363.000	332.500	220.000
Z	-1.695	-1.120	-1.751	-1.283	-2.100	-5.150
Asymp. Sig. (2-tailed)	.090	.263	.080	.200	.036	.000

Note: BOT-2-Bruininks-Oseretcky test, TGMD-2-test of gross motor skills, PAQ-physical activity questionnaire, TULC-total score on the subtest of upper limb coordination, TSAT-total score on the subtest of agility and speed, LOC-locomotor skills, MAN-manipulative skills, TGM-total result on the test of gross motor skills, TOTPA-total result of the physical activity questionnaire, Asymp. Sig. (2-tailed)-two-tailed p-value.

Table 4 shows the effect size (r), and according to the Cohen, criterion sorted to small influence (0.1), medium influence (0.3), and large impact (0.5). The value of the variable TOTPA is 0.66 and represents a large impact, which means the difference between the active and inactive groups in the TOTPA test is large, while the value of the variable TGM is 0.11 and represents a small impact or small difference between the active and inactive group.

Table 4. Effect size

The magnitude of the impact $r = Z/\sqrt{N}$	
TGM	**0.11**
TOTPA	**0.66**

Note: r-effect size, Z-z value, N-observation number, TGM-total result on the test of gross motor skills, TOTPA-result of the physical activity questionnaire.

Discussion

Motor development has been identified as an extremely important area in the overall growth and development of school children (Cairney et al., 2005; Goodway, Ozmun, & Gallahue, 2019; Acar & Ozer, 2020). That is why many authors deal with children's motor skills (Akbari et al., 2009; Baranasic, 2019; Barnett, Salmon, & Hesketh, 2016; Goodway et al., 2019; Katanic et al., 2020; Veljkovic, Katanic, & Ilic, 2020).

The results of these studies show that the difference between active and inactive children was found in two variables, and its TGM total score of gross motor skills (p=0.036) and a level of physical activity (p=0.00). These results correspond to the other findings that the level of motor skills is positively related to the level of physical activity, so children with the best results on motor tests had the highest level of physical activity (Cairney et al., 2005; Goodway et al., 2019;). Also, the level of motor skills is inversely related to the sedentary lifestyle in children. So children who have poor results on motor skills tests feel insecure and avoid physical activities and have more sedentary activities (Cairney et al., 2005; Goodway et al., 2019).

On the other hand, no significant difference was found in the BOT-2 scales of upper extremity coordination (p=0.09), and speed and agility (p=0.236). Also, no significant difference was found in the TGMD-2 subtests of locomotor (p=0.08), and manipulative skills (p=0.2). However, it should be mentioned that more active children had on average higher values on all tests than inactive children, but this difference is not statistically significant. In order to obtain complete results, the research on large samples should be investigated, as well as the complete motor space should be covered with measuring instruments.

With this transversal study, we obtained data that indicate that there are no complete differences between active and inactive children in motor skills at the age of 9 years. Out of a total of 6 applied tests, two tests showed that there are differences between active and inactive children that the statistical significance is below 0.05. In the TOTPA test, the result of the level of physical activity was 0.66 and represents a large impact, which means the difference between the active and inactive groups in the TOTPA test is large. In the TGM total score on gross motor test, the effect size was 0.11 and implies a small impact or small differences between groups.

One of the possible shortcomings of this research may be the

small sample of respondents (40 children), accordingly opens the question of the real differences between the mentioned group, and also creating space for further research by future researchers. Also, this study has a local character, so it cannot be generalized to the whole of Serbia, and that we recommend that the next survey is on a larger sample and that all regions be covered to get a real picture.

Acknowledgments
There are no acknowledgements.

Conflict of Interest
The authors declare that there is no conflict of interest.

Received: 1 August 2020 | **Accepted:** 10 November 2020 | **Published:** 18 January 2021

References

Acar, S., & Ozer, B.K. (2020). Assessment of the relationships between physical and motor features of young wrestlers from turkey. *Journal of Anthropology of Sport and Physical Education, 4*(1), 15-24.

Akbari, H., Abdoli, B., Shafizadeh, M., Khalaji, H., Haji, H. S., & Ziaei, V. (2009). The effect of traditional games in fundamental motor skill development in 7-9 year-old boys. *Iranian Journal of Pediatrics, 19*(2), 123-129.

Baranasic, M. (2019). *Relationship between body mass index and motor skills of preschool children.* Unpublished Doctoral Dissertation. Zagreb, Croatia: University of Zagreb.

Barnett, L.M., Salmon, J., & Hesketh, K.D. (2016). More active pre-school children have better motor competence at school starting age: an observational cohort study. *BMC Public Health*, *16*(1), 1068.

Bastik, C., Kalkavan, A., Yamaner, F., Sahin, S., & Gullu, A. (2012). Investigation of basic motor skills according to the TGMD-2 test on male athletes of 10 ages group who participated to competitions in different sports branches. *Procedia-Social and Behavioral Sciences*, *46*, 4741-4745.

Bruininks, R.H. (2005). *Bruininks-Oseretsky test of motor proficiency: BOT-2*. Minneapolis, MN: NCS Pearson/AGS.

Cairney, J., Hay, J.A., Faught, B.E., Wade, T.J., Corna, L., & Flouris, A. (2005). Developmental coordination disorder, generalized self-efficacy toward physical activity, and participation in organized and free play activities. *The Journal of pediatrics, 147*(4), 515-520.

Corder, K., van Sluijs, E.M., Wright, A., Whincup, P., Wareham, N. J., & Ekelund, U. (2009). Is it possible to assess free-living physical activity and energy expenditure in young people by self-report?. *The American journal of clinical nutrition, 89*(3), 862-870.

Deitz, J.C., Kartin, D., & Kopp, K. (2007). Review of the Bruininks-Oseretsky test of motor proficiency, (BOT-2). *Physical & occupational therapy in pediatrics, 27*(4), 87-102.

Duger, T., Bumin, G., Uyanik, M., Aki, E., & Kayihan, H. (1999). The assessment of the Bruininks-Oseretsky test of motor proficiency in children. *Pediatric rehabilitation, 3*(3), 125-131.

Franjko, I., Zuvela, F., Kuna, D., & Kezic, A. (2013). Relations between Some Anthropometric Characteristics and Fundamental Movement Skills in Eight Year Old Children. *Croatian Journal of Education: 15*(Sp. Ed. 4), 195-209.

Gallahue, D.L., Ozmun, J.C., & Goodway, J. (2006). *Understanding motor development: Infants, children, adolescents, adults* (248-270). Boston, MA: Mcgrawhill.

Katanic B., Ilic P., Stojmenovic A., Kostic L., & Vitasovic M. (2020). Differences in bilateral coordination between boys and girls of the first grade of primary school. *Sports science and practice 10*(2) 23-32.

Kozomara, G., Petrovic, P., Nikolic, G., Jorgic, B., Kocic, M., & Aleksandrovic, M. (2019). The effects of preparation period on motor skills of wheelchair basketball players: a pilot study. *Journal of Anthropology of Sport and Physical Education, 3*(4), 11-14.

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.

Needleman, R.D. (2000). Growth and Development. In RE Behrman, RM Kliegman & HB Jenson (Eds). *Nelson Textbook of Paediatrics* (23-65). Philadelphia, PA: Saunders.

Payne, V.G., & Larry D.I. (1998). *Human Motor Development: A Lifespan Approach*. NY: Mayfield Publishing.

Santrock, J. W. (2008). *A Topical Approach to Lifespan Development*. New York: McGraw-Hill.

Simons, J., Daly D., Theodorou, F., Caron, C., Simons, J., Andoniadou, E. (2008) Validity and reliability of the TGMD-2 in 7-10-year-old flemish children with intellectual disability. *Adapted Physical Activity Quarterly*; 25: 71-82.

Top, E., & Kallkavan, A. (2014). The Investigation of Motor Development Levels in 8-12 Year Old Groups of Girls and Boys who Study in Primary School. *Annals of Dunarea de Jos, 15*(1), 192-196.

Veljkovic, A.A., Katanic, B., & Ilic, P. (2020). Differences in Coordination Between Normal and Over-Weight Children Aged 7 Years. *Journal of Athletic Performance and Nutrition, 7*(1), 1-10.

Zuvela, F., Males, B., & Miletic, D. (2011). *Relationship between qualitative and quantitative assessment of biotic motor knowledge.* Paper presented at the 6th FIEP European Congress in Split, Croatia.

DOI 10.26773/jaspe.210104

Journal of Anthropology of Sport and Physical Education

REVIEW PAPER

Effects of Core Stability Exercises, Lumbar Lordosis and Low-Back Pain: A Systematic Review

Gojko Skundric[1], Veljko Vukicevic[1], Nikola Lukic[1]

[1]University of Novi Sad, Faculty of Sport and Physical Education, Novi Sad, Serbia

Abstract

Core stability has a very positive effect on the prevention of lumbar lordosis and lower back pain. The main focus of this paper was on a review of the available literature on the influence of trunk stability on lower back pain and lumbar lordosis. The two electronic databases researched for collecting articles are PubMed and ScienceDirect. A search was conducted by title, taking a predefined combination of the following keywords into account: low back pain, core stability, training, sports. Screening processes are summarized through a PRISMA flow chart. 408 studies were identified, of which 20 met the inclusion criteria. It was concluded that exercise on the stability of the pelvic nucleus and muscles is recommended as the simplest and most favorable prevention of lower back pain and lumbar lordosis. The stability of the nucleus helps to overcome the main causes and deprive the body of functional disorders and pain.

Keywords: *Low Back Pain, Core Stability, Training, Sports*

Introduction

Lower back pain (LBP) is a growing problem among people around the world, especially in underdeveloped countries, resulting in a very large impact on people's quality of life (Buchbinder et al., 2013; Haryono, Kawilarang, & Prastowo, 2019). The increase in the impact left by LBP, observed in recent research, shows that LBP is among the ten most significant causes of disability (Collaborators, 2015). It has been noted that the prevalence of LBP by the end of life is found in about 84%, and almost 23% suffer from constant pain (Airaksinen et al., 2015), but this is very variable and depends on the specifics of the population under study. The economic issue of early retirement and loss of productivity, related to LBP, is alarming due to the high costs for individuals and the state (Buchbinder et al., 2013). Etiology of LBP multiple factor with previous LBP, frequent bending and twisting, prolonged static positions, anxiety, depression and somatization associated with the development of the condition (McIntosh & Hall, 2008; van Middelkoop et al., 2010) Musculoskeletal risk factors are also associated with LBP and they can be identified and addressed through the potential discovery of a mechanism by which LBP can be successfully cured. Also, the right identification of risk factors of the musculoskeletal system can indicate the mechanism by which the occurrence of LBP can be prevented, as well as lead to a reduction in socio-economic costs.

It has been shown that lumbopelvic-hip muscle dysfunction (muscle core) increases the load on the spine and reduces the stability of the spine with altered patterns of recruitment of basic muscles, which is a sign of LBP, especially in the chronic form (Hodges & Richardson, 1998). Therefore, abnormal lower limb function is not recommended in order to mitigate the impact force and affect the spinal load with proximal and distal dysfunction in the lower limbs, which contributes to the increase in LBP. Feet that are in increased pronation (Botte, 1981; Builder & Marr, 1980; Cibulka, 1999) and shortened hind leg muscles (Mierau, Cassidy, & Yong-Hing, 1989; Kujala, Salminen, Taimela, Oksanen, & Jaakkola, 1992) affect a high risk of getting LBP. Feet that are in great pronation cause the tibia and femur to rotate inward and lead to APT (anterior pelvic tilt) (Kujala et al., 1992; Khamis & Yizhar, 2007). When the pelvis is in an altered position, sciatic nerve entrapment can very often occur, because the piriformis muscle is overloaded (Botte, 1981; Cibulka et al., 2010). In addition, it is suggested that the changed position of the pelvis should load the intervertebral discs, increasing the pain (Gurney, 2002; Tateuchi, Wada, & Ichihashi, 2011). Tight tendon muscles can reduce lumbar lordosis, potentially reducing force absorption and thus increasing the chances of LBP (Alston, Carlson, Feldman, Grimm, & Gerontinos, 1966).

If there are changes in the curvature of the spine, very often there

Correspondence:

Montenegro Sport

V. Vukicevic
University of Novi Sad, Faculty of Sport and Physical Education, 16 Lovcenska str, 21000 Novi Sad, Serbia
E-mail: vukicevicveljko9@gmail.com

are pains in certain parts of the back. Lumbar lordosis is one of the most important parts of the spinal pillar that has special importance due to the unique position and having direct contact with the pelvis. It should be paid special attention to the spine in order to have a good physical condition (Kendall, McCreary, Provance, Rodgers, & Romani, 2005). In addition to the bones, ligaments, muscles, and disks vertebra have also a key role in lordosis formation. Without muscle action, pelvic girdle performance hasn't sufficient stability (Hodges & Moseley, 2003). The Central stabilization of the vertebral column is supported by special muscles such as multifidus, transversus abdominis, and internal muscles in trunk. These muscles act late in patients who suffered from hyper lordosis (Wagner, Liebetrau, Schinowski, Wulf, & de Lussanet, 2012). The muscles provide stability of vertebrae in a focal form (Hodges & Moseley, 2003). Decreased strength of one of the muscles of the lumbar-pelvic region affects the change in the position of the pelvis, which disturbs the balance of this part of the body (Norris, 2008) and thus a person can be prone to musculoskeletal disorders (Bouchard & Tetreault, 2000). Biomechanical and clinical studies have shown that muscles can provide stabilization of segments by controlling movement in the neutral zone, and physiological boundaries can be re-established with adequate muscle control (Danneels et al., 2001). Increased lumbar lordosis, if viewed from the mechanical side, is closely related to increased pain in the lower back (von Lackum, 1924; El-Hamalawy, 2011). There are very different factors that cause lumbar lordosis. Some studies have shown that the range of lumbar lordosis is affected by age and sex, movement in the center of mass such as pregnancy or obesity (El-Hamalawy, 2011; Lee, Jung, & Lee, 2013). Exercise is accepted increasingly popular to correct and refine such deformities. Stabilization of the lumbar-pelvic region is improved by exercise, which affects the correct posture and at the same time improves muscle function (Lee et al., 2013; Kofotolis & Kellis, 2006). Some studies suggest that people with low back pain should refrain from certain back exercises, instead of focusing on non-specific physical activities that would improve the psychological state and largely eliminate the pain (Hurwitz, Morgenstern, & Chiao, 2005). This systematic review aimed to identify and point out exercise models that can be applied preventively in a population that may be or is already exposed to problems with lumbar lordosis and lower back pain.

Method

Literature Search Strategy

To ensure a transparent and complete report, the Preferred Reporting Items For Systematic Reviews (PRISMA) guidelines were followed for conducting a systematic review (Moher et al., 2009). Two electronic databases explored for article collection were PubMed and ScienceDirect. In each database, a search was conducted by title, taking a predefined combination of the following keywords into account: low back pain, core stability, training, sport. The presentation of the articles was carried out in three steps: reading the title, reading the abstracts, and then reading the entire text. Screening processes are summarized through the PRISMA flow chart shown below in Figure 1.

Inclusion and Exclusion criteria

Only original articles written in English and published in peer-reviewed journals are considered for inclusion in this review. The publication date limit was from 2011 and is closed until December 2019 in Figure 2.

Various formats of publications such as reviews, abstracts, citations, abstracts of scientific conferences, books, book reviews, editorials, articles, and comments that have not been reviewed, are

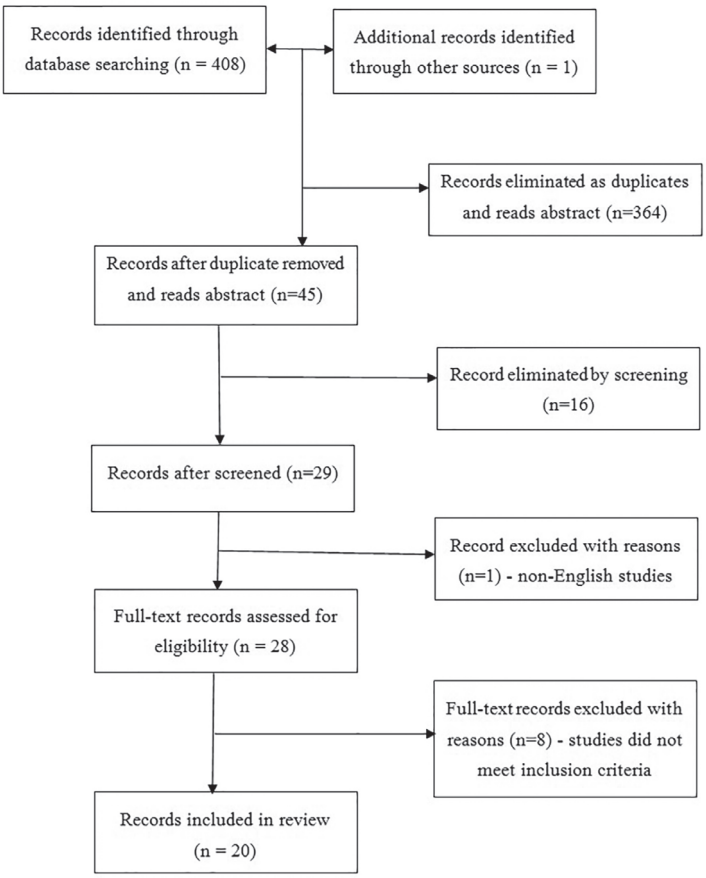


FIGURE 1. PRISMA flow diagram (Moher, et al., 2009).

excluded. Only the effects of core stability exercises, lumbar lordosis, and lower back pain can be included in the examination. Eligible articles should be conducted with people of all ages. Both qualitative and quantitative articles were taken into account.

FIGURE 2. Distribution of researches from scientific journals on effects of core stability exercises, lumbar lordosis, and low-back pain

Results

Preliminary title and the abstract search revealed 408 articles both through PubMed and through ScienceDirect. After reviewing the abstract, 364 duplicates were removed and 45 articles were considered acceptable for further examination. In addition, an article was added to the entire text that was not found during my initial search, but which was considered relevant. This one article was suggested by another researcher, who found them in the appropriate bibliography. Moreover, one other article was removed due to the use of non-English language and without translation. Of the 28 articles analyzed, 8 were excluded from the review due to the insignificance or unavailability of relevant data. Therefore,

Table 2. Study design and characteristics

Author	Number participants	Effects of core stability exercises, lumbar lordosis, and low-back pain	
		Procedure	Conclusion
Marshall et al. (2011)	20	In this paper, they measured the activity of trunk muscles in people who had pain and in people who did not have pain in the lower back. Muscle activity was measured during the most commonly used exercises. Abdominal breathing was also examined as a possibility of achieving muscle stimulation. Muscle activity was measured by paired surface electrodes.	Reduced symptoms of worsening in the test group indicated that the exercises presented in this study could be successfully applied in the recovery of patients with LBP.
Taanila et al. (2012)	982	In this study, the predictions of LBP in young soldiers from Finland were investigated, in relation to their physical preparation. Four studies were done and monitored over a period of six months, in soldiers aged 18-28.	Soldiers who had reduced strength levels, reduced levels of aerobic capacity, and those who had lower levels of education were at higher risk for LBP.
Micheo et al. (2012)	n.d.	In this paper, it was shown that programmed work on static flexibility can improve the amplitude of movements in the joints, but injuries of the musculoskeletal system cannot be reduced and muscle performance can be damaged after stretching. In contrast, dynamic flexibility has the effect of improving physical performance and increasing strength.	It has been determined that training for torso stability increases neuromuscular control and balance, reduces injuries to the joints of the lower extremities and pain in the lower back.
Teyhen et al. (2013)	340	The aim of this study was to analyze two programs of work with exercises for body stabilization. The program was realized in a military base and lasted for a period of 12 weeks. One exercise program consisted of motor control exercises (low number of repetitions and low load) and the other exercise program was traditional (high number of repetitions and high load).	A greater increase in trunk muscle endurance was observed in the first group, but they could not predict the occurrence of back pain on that basis.

(*continued on next page*)

(*continued from previous page)*

Author	Number participants	Effects of core stability exercises, lumbar lordosis, and low-back pain	
		Procedure	Conclusion
Kline et al. (2013)	5	This paper investigates the effect of a dynamic sling training system at home, which increases strength and reduces back pain and disability.	It has been shown that the stretching of the back extensor muscles and the stabilization of the torso muscles can have a preventive effect on back pain. It has also been noticed that with this method of work, dancers can increase the strength of this part of the body without irritating the sciatic nerve and reducing pain.
Nevison et al. (2013)	60	In this study, they examined how physiotherapy intervention improves pelvic stability in experienced riders when sitting for more than 30 seconds.	They found that moving the pelvic region can reduce pelvic floor muscle asymmetry and increase rider stability. Also, this work helps in further work on improving the physiotherapeutic intervention (training) for the benefit of riders and horses.
Yan et al. (2014)	89	This study investigated the effect of Pilates ball exercise in women in late pregnancy (second and third trimesters) who have lumbar back pain. Trainings were held three times a week, lasting 25 to 30 minutes, and a total of twelve weeks.	The effects of exercise gave positive results and reduced pain in the lumbar back. Also, this exercise model has been tested on the basis of evidence and can be successfully applied.
Trampas et al. (2015)	10	In this study, individuals with chronic lumbar back pain and an unstable lumbar region were tested. The effect of trunk stability exercises and myofascial trigger point (MTrP) therapy was compared with exercises to stabilize the trunk on dynamic-balance performance and the cross-sectional area of activated muscles and the pain threshold	Body stabilization exercises immediately increase the pain threshold and, together with myofascial therapy, reduce asymmetry in the pelvic region to a minimum.
Kliziene et al. (2015)	28	In this study, the effects of body stabilization exercises in women with back pain and in healthy women were analyzed.	The exercise program was supposed to increase neuromuscular control and neutralize multifidus dysfunction. This program also increased the volume of multifidus muscles.
Calatayud et al. (2015)	30	The aim of this study was to investigate muscle activation in balance exercises at various levels, using elastic resistance. The initial positions for balance exercises were sitting, and then the position was changed to standing on both legs. After that, the position changed to one leg. After that, unstable substrates were inserted. Finally, elastic resistance was added to increase the level of activation.	It was observed that the level of activation increased with aggravating balance positions.
Shamsi et al. (2016)	43	The aim of this study was based on a comparison of special trunk stabilization exercises and basic exercises. The differences were monitored using ultrasound imaging to measure the thickness of the deep stabilizer muscles. The program was realized three times a week, and there were a total of 16 trainings. Muscle thickness was measured before and after treatment.	After the intervention, muscle hypertrophy was noticed in the group that did the basic exercises, and a significant difference in hypertrophy was noticed only in the right side in relation to the other group. Pain also decreased in both groups and disability, but no significant differences were observed.
Cruz-Diaz et al. (2017)	98	The aim of this study was to determine which Pilates method gives better results in relieving back pain. The second goal was to activate the transversus abdominis by exercising, because it is very important in the rehabilitation process. One group applied the program for 6 weeks and the other for 12 weeks.	Improvement and reduction of pain were observed in both groups.

(*continued on next page)*

(*continued from previous page)*

Author	Number participants	Effects of core stability exercises, lumbar lordosis, and low-back pain	
		Procedure	Conclusion
Lopes et al. (2017)	46	In this study, the effects of Pilates exercise on the dynamic balance of young people with back pain and on their postural stability were determined. The training lasted 20 minutes a day, for a period of 30 days. The training consisted of 4 exercises: swimming, stretching the legs, pelvic pressure and kneeling in the opposite legal arm with the legs.	This method of work has given positive results in young people with nonspecific pain in the lumbar back.
Kuszewski et al. (2018)	30	In this study, hypotheses were investigated that motor torso control training in subjects with a rigid tendon leads to anterior pelvic tilt and that there is a relationship between anterior pelvic tilt and tendon stiffness. The experimental group had muscle control treatment for two weeks and the other group did not train. The measurement was performed three times.	Within the experimental group, the level of pelvic stiffness and inclination decreased.
Behennah et al. (2018)	64	The aim of this study was to investigate the relationship between strength, balance and endurance of lumbar extensors in persons with lumbar back pain and in persons without pain in this region.	The results indicate that with impaired motor control of the muscles in the lumbar region, pain appears. Thus, strengthening the muscles of this region reduces the dysfunction and relieves pain.
Mazloum et al. (2018)	47	The study examined the relationship between selective Pilates exercises and stretching exercises, how they affect lumbar back pain, lumbar angle and disability. The treatment lasted six weeks. Improvement was observed in groups that did selective Pilates.	Therefore, it was concluded that muscle activation in the lumbar region plays a significant role in eliminating pain and reducing disability.
Paris-Alemani et al. (2018)	22	In this study, the task was to compare motor control and stability of the lumbar-pelvic region in professional dancers and non-dancers.	It was found that the dancers had better dynamic stability and a greater range of motion by automatic activation of the torso muscles, and thus better motor control.
Liu et al. (2019)	43	This study examined the effect of Tai Chi on the treatment of lower back pain in people older than 50 years. The program lasted 12 weeks, three times a week for 60 minutes.	It was concluded that this training method reduces pain in the lumbar part of the back, but does not affect the proprioception of the lower extremities.
Goeverden et al. (2019)	44	The aim of this study was to determine whether athletes with a groin injury in relation to the injured side have an anterior tilt of the pelvis.	The research determined that the lower anterior inclination of the pelvis was on the injured side in relation to the healthy side. This information can play an important role in the rehabilitation process.

a total of 20 studies were included in this review (Marshall, Desai, & Robbins, 2011; Taanila et al., 2012; Micheo, Baerga, & Miranda, 2012; Teyhen et al., 2013; Kline, Krauss, Maher, & Qu, 2013; Nevison & Timmis, 2013; Yan, Hung, Gau, & Lin, 2014; Trampas, Mpeneka, Malliou, Godolias, & Vlachakis, 2015; Kliziene, Sipaviciene, Klizas, & Imbrasiene, 2015; Calatayud et al., 2015; Shamsi, Sarrafzadeh, Jamshidi, Zarabi, & Pourahmadi, 2016; Cruz-Díaz, Bergamin, Gobbo, & Martínez-Amat, 2017; Lopes, et al. 2017; Kuszewski, Gnat, & Gogola, 2018; Behennah, Conway, Fisher, Osborne, & Steele, 2018; Mazloum, Sahebozamani, Barati, Nakhaee, & Rabiei, 2018; Paris-Alemany et al., 2018; Zou et al., 2019; Liu et al., 2019; Van Goeverden, Langhout, Barendrecht, & Tak, 2019).

In total, data obtained more than 2044 a person on the effects of core stability exercises, lumbar lordosis, and low-back pain that met our inclusion criteria were analyzed shown in Table 2.

Discussion

Trainers or therapists for all populations suggest basic stability exercises. This model is most often used in torso stability training. For the type of population where torso stability training is the main goal of training (people with chronic LBP), there is still a lack of information on the exercise model to solve the problem. This paper provides information on what training or exercise therapy looks like in groups of people with lower back pain compared to those groups of people who are healthy. There was generally a difference in muscle activity between groups that had problems compared to groups of healthy people, but no identical irregular pattern of movement was observed. These changes may reflect a nervous system strategy to modify the spinal load while maintaining a similar technique to healthy controls. Abdominal breathing very successfully increases the activity of the trunk muscles and reduces their imbalance, through various exercises (Shamsi et al., 2016).

Exercise can also be used as a therapy to reduce pain, reduce the percentage of disability and to restore amnesic muscle function. (Brumitt, Matheson, & Meira, 2013; Kosmas, Georgiou, Marmara, & Fotiou, 2019). Decreased endurance and strength of

the torso muscles indicate impaired or reduced neuromuscular control of the body, indicating inhibition of the lower body muscles, which together affect an increased risk of lower back pain (Huxel Bliven & Anderson, 2013).

Reduced perception of rapid activation of trunk muscles during certain movements, negatively affects the control of movements, which increases the mobility of the joints of the lower extremities in an increased volume, in order to maintain adequate stability of the body. Increased chances of injury are given by the muscles that connect the mentioned joints and which are delayed with activation (Wilkerson, Giles, & Seibel, 2012). These results clearly support the core stability concept as an important consideration for preventing core and lower extremity injuries in people.

By reviewing the above research, which determines the impact of the effects of basic stability exercises, lumbar lordosis and lower back pain, we can group several results. First group of researchers analyzed the effects of basic stability exercises and prevention of lower back pain and lumbar lordosis using the Pilates program and additional elastic resistance (Yan et al., 2014; Calatayud et al., 2015; Cruz-Diaz et al., 2017; Lopes et al., 2017; Behennah et al., 2018). Based on the results, they were able to plan new projects to prevent LPB and improve the quality of life. Second group of authors dealt with the analysis of programmed training, which was realized over a longer period of time (several months) in the army. Very positive results have appeared after the implemented programs and this type of health prevention in soldiers can be recommended as a cheap way to improve physical fitness Micheo et al., 2012; Teyhen et al., 2013). Third group of authors analyzed the influence of Chinese methods of practicing Tai Chi Chuan and Tai Chi on the prevention of lower back pain (Zou et al., 2019; Liu et al., 2019). Based on core stability testing and APT, a group of authors analyzed lower back pain and lumbar lordosis (Marshall et al., 2011; Trampas et al., 2015; Kliziene et al., 2015; Shamsi et al., 2016; Kuszewski et al., 2018; Behennah et al., 2018; Liu et al., 2019). Fourth group of researchers analyzed the effects of basic stability exercises and prevention of lower back pain and lumbar lordosis in dancers and horse riders (Kline et al., 2013; Nevison & Timmis, 2013; Paris-Alemany et al., 2018). Other works refer to the classical research of the relationship between the stability of the nucleus and pain in the lower part.

Conclusion

The paper identifies the evaluation of the effectiveness of including the effects of basic core stability exercises in the prevention of lumbar lordosis and lower back pain. Different analyzes were compared between people who have lower back pain and people who are painless. It has been determined that by improving the stability of the core and pelvic muscles, regular exercise can improve and eliminate pain in the lower back. The main reasons for the mentioned problems and pains are muscular inactivity in certain parts of the body, which could have arisen in various ways. This was shown not only by the results and analyzes when the intervention and control groups were compared, but also by different professions of people.

These results provide an opportunity to recommend exercise on the stability of the pelvic nucleus and muscles as the simplest and most favorable prevention for lower back pain and lumbar lordosis. The stability of the nucleus helps to overcome the main causes and deprive the body of functional disabilities and pain. Prevention programs based on regular physical activities related to strengthening the stability of the nucleus and pelvic muscles are one of the most effective ways to improve and maintain quality of life, which results in diagnosing activities, mobility, ability to function normally without pain.

Acknowledgments
There are no acknowledgements.

Conflict of Interest
The authors declare that there is no conflict of interest.

Received: 19 July 2020 | **Accepted:** 14 November 2020 | **Published:** 18 January 2021

References

Airaksinen, O., Brox, J.I., Cedraschi, C., Hildebrandt, J., Klaber-Moffett, J., … Kovacs, F. (2006). Chapter 4 European guidelines for the management of chronic nonspecific low back pain. *European Spine Journal, 15*(S2), s192–s300. doi:10.1007/s00586-006-1072-1

Alston, W., Carlson, C.E., Feldman, D.J., Grimm, Z., & Gerontinos, E. (1966). A quantitative study of muscle factors in the chronic low back syndrome. *Journal of the American Geriatrics Society, 14*(10), 1041-1047.

Barwick, A., Smith, J., & Chuter, V. (2012). The relationship between foot motion and lumbopelvic-hip function: a review of the literature. *The Foot, 22*(3), 224-231.

Behennah, J., Conway, R., Fisher, J., Osborne, N., & Steele, J. (2018). The relationship between balance performance, lumbar extension strength, trunk extension endurance, and pain in participants with chronic low back pain, and those without. *Clinical Biomechanics, 53*, 22-30.

Botte, R.R. (1981). An interpretation of the pronation syndrome and foot types of patients with low back pain. *Journal of the American Podiatry Association, 71*(5), 243-253.

Bouchard, S., & Tetreault, M. (2000). The Motor development of blind people. *The Journal of Visual Impairment & Blindness, 105*, 8-10.

Brumitt, J., Matheson, J.W., & Meira, E.P. (2013). Core stabilization exercise prescription, part I: current concepts in assessment and intervention. *Sports Health, 5*(6), 504-509.

Buchbinder, R., Blyth, F.M., March, M.L., Brooks, P., Woolf, A.D., & Hoy, D.G. (2013). Placing the global burden of low back pain in context. *Best Practice & Research Clinical Rheumatology, 27*(5), 575-589.

Builder, M.A., & Marr , S.J. (1980). Case history of a patient with low back pain and cavus feet. *Journal of the American Podiatry Association, 70*(6), 299-301.

Calatayud, J., Borreani, S., Martin, J., Martin, F., Flandez, J., & Colado, J.C. (2015). Core muscle activity in a series of balance exercises with different stability conditions. *Gait & Posture, 42*(2), 186-192.

Cibulka, M.T. (1999). Low back pain and its relation to the hip and foot. *The Journal of orthopaedic sports physical therapy, 29*(10), 595-601.

Cibulka, M.T., Strube, M.J., Meier, D., Selsor, M., Wheatley, C., Wilson, N.G., & Irrgang, J.J. (2010). Symmetrical and asymmetrical hip rotation and its relationship to hip rotator muscle strength. *Clinical Biomechanics (Bristol, Avon), 25*(1), 56-62.

Collaborators, G.B. (2015). Global, regional, and national incidence, prevalence, and years lived with disability for 301 acute and chronic diseases and injuries in 188 countries, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet, 386*(9995), 743-800.

Cruz-Díaz, D., Bergamin, M., Gobbo, S., & Martínez-Amat, A. (2017). Comparative effects of 12 weeks of equipment based and mat Pilates in patients with Chronic Low Back Pain on pain, function and transversus abdominis activation. A randomized controlled trial. *Complementary Therapies in Medicine, 33*, 72–77.

Danneels, L., Vanderstraeten, G., Cambier, D., Witvrouw, E., Bourgois, J., Dankaerts, W., & De Cuyper, H. J. (2001). Effects of three different training modalities on the cross sectional area of the lumbar multifidus muscle in patients with chronic low back pain. *British Journal of Sports Medicine, 35*(3), 186–191.

El-Hamalawy, F.A. (2011). A Newly Developed Exercise Program for Treatment of Mechanical Low Back Pain Associated with Accentuated Lumbar Lordosis. *Journal of American Science, 7*(8), 58-70.

Gurney, B. (2002). Leg length discrepancy. *Gait & Posture, 15*(2), 195-206.

Haryono, I. R., Kawilarang, M., & Prastowo, N. A. (2019). Leg length discrepancy in college students and its association with low back pain: a preliminary study. *Journal of Anthropology of Sport and Physical Education, 3*(2), 15-18.

Hodges, P.W., & Moseley, G.L. (2003). Pain and motor control of the lumbopelvic region: effect and possible mechanisms. *Journal of Electromyography and Kinesiology, 13*(4), 361-370.

Hodges, P.W., & Richardson, C.A. (1998). Delayed postural contraction of transversus abdominis in low back pain associated with movement of the lower limb. *Journal of spinal disorders, 11*(1), 46-56.

Hurwitz, E.L., Morgenstern, H., & Chiao, C. (2005). Effects of Recreational Physical Activity and Back Exercises on Low Back Pain and Psychological Distress: Findings From the UCLA Low Back Pain Study. *American journal*

of public health, 95(10), 1817–1824.

Huxel Bliven, K.C., & Anderson, B.E. (2013). Core Stability Training for Injury Prevention. *Sports Health, 5*(6), 514–522.

Kendall, F.P., McCreary, E.K., Provance, P.G., Rodgers, M.M., & Romani, W.A. (2005). *Muscles Testing and Function with Posture and Pain. 5th Edition.* Baltimore, MD: Lippincott Williams & Wilkins.

Khamis, S., & Yizhar, Z. (2007). Effect of feet hyperpronation on pelvic alignment in a standing position. *Gait & Posture, 25*(1), 127-134.

Kline, J.B., Krauss, J.R., Maher, S.F., & Qu, X. (2013). Core strength training using a combination of home exercises and a dynamic sling system for the management of low back pain in pre-professional ballet dancers: a case series. *Journal of dance medicine & science, 17*(1), 24-33.

Kliziene, I., Sipaviciene, S., Klizas, S., & Imbrasiene, D. (2015). Effects of core stability exercises on multifidus muscles in healthy women and women with chronic low-back pain. *Journal of Back and Musculoskeletal Rehabilitation, 28*(4), 841-847.

Kofotolis, N., & Kellis, E. (2006). Effects of two 4-week proprioceptive neuromuscular facilitation programs on muscle endurance, flexibility, and functional performance in women with chronic low back pain. *Physical therapy, 86*(7), 1001-1012.

Kosmas, J., Georgiou, Y., Marmara, E., & Fotiou, A. (2019). Evaluation of municipal fitness programs for women with low back pain. *Journal of Anthropology of Sport and Physical Education, 3*(4), 33-39.

Kujala, U.M., Salminen , J.J., Taimela , S., Oksanen , A., & Jaakkola, L. (1992). Subject characteristics and low back pain in young athletes and non-athletes. *Medicine & Science in Sports & Exercise, 24*(6), 627–632.

Kuszewski, M.T., Gnat, R., & Gogola, A. (2018). The impact of core muscles training on the range of anterior pelvic tilt in subjects with increased stiffness of the hamstrings. *Human movement science, 57*, 32-39.

Lee, S.-K., Jung, J.-M., & Lee, S.-Y. (2013). Gluteus medius muscle activation on stance phase according to various vertical load. *Journal of Back and Musculoskeletal Rehabilitation, 26*(2), 159-161.

Liu, J., Yeung, A., Xiao, T., Tian, X., Kong, Z., Zou, L., & Wang, X. (2019). Chen-Style Tai Chi for Individuals (Aged 50 Years Old or Above) with Chronic Non-Specific Low Back Pain: A Randomized Controlled Trial. *International Journal of Environmental Research and Public Health, 16*(3), 517.

Lopes, S., Correia, C., Félix, G., Lopes, M., Cruz, A., & Ribeiro, F. (2017). Immediate effects of Pilates based therapeutic exercise on postural control of young individuals with non-specific low back pain: A randomized controlled trial. *Complementary Therapies in Medicine, 34*, 104-110.

Marshall, P.W., Desai, I., & Robbins, D.W. (2011). Core stability exercises in individuals with and without chronic nonspecific low back pain. *Journal of strength and conditioning research, 25*(12), 3404-3411.

Mazloum, V., Sahebozamani, M., Barati, A., Nakhaee, N., & Rabiei, P. (2018). The effects of selective Pilates versus extension-based exercises on rehabilitation of low back pain. *Journal of bodywork and movement therapies, 22*(4), 999-1003.

McIntosh, G., & Hall, H. (2008). Low back pain (chronic). *BMJ clinical evidence*, 1116.

Micheo, W., Baerga, L., & Miranda, G. (2012). Basic principles regarding strength, flexibility, and stability exercises. *PM&R: The Journal of Injury, Function and Rehabilitation, 4*(11), 805-811.

Mierau, D., Cassidy, J.D., & Yong-Hing, K. (1989). Low-back pain and straight leg raising in children and adolescents. *Spine (Phila Pa 1976), 14*(5), 526-528.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G., & PRISMA Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Annals of internal medicine, 151*(4), 264-269.

Nevison, C.M., & Timmis, M.A. (2013). The effect of physiotherapy intervention to the pelvic region of experienced riders on seated postural stability and the symmetry of pressure distribution to the saddle: A preliminary study. *Journal of Veterinary Behavior: Clinical Applications and Research, 8*(4), 261-264.

Norris, C.M. (2008). *Back Stability: Integrating Science and Therapy.* Champaign, Il: Human Kinetics.

Paris-Alemany, A., Torres-Palomino, A., Marino, L., Calvo-Lobo, C., Gadea-Mateos, L., & La Touche, R. (2018). Comparison of lumbopelvic and dynamic stability between dancers and non-dancers. *Physical Therapy in Sport, 33*, 33-39.

Shamsi, M., Sarrafzadeh, J., Jamshidi, A., Zarabi, V., & Pourahmadi, M.R. (2016). The effect of core stability and general exercise on abdominal muscle thickness in non-specific chronic low back pain using ultrasound imaging. *Physiotherapy theory and practice, 32*(4), 277-283.

Shirado, O., Doi, T., Akai, M., Hoshino, Y., Fujino, K., Hayashi, K., … Iwaya, T. (2010). Multicenter Randomized Controlled Trial to Evaluate the Effect of Home-Based Exercise on Patients With Chronic Low Back Pain. *Spine, 35*(17), E811–E819. doi:10.1097/brs.0b013e3181d7a4d2

Taanila, H.P., Suni, J.H., Pihlajamäki, H.K., Mattila, V.M., Ohrankämmen, O., Vuorinen, P., & Parkkari, J.P. (2012). Predictors of low back pain in physically active conscripts with special emphasis on muscular fitness. *The Spine journal, 12*(9), 737-748.

Tateuchi, H., Wada, O., & Ichihashi, N. (2011). Effects of calcaneal eversion on three-dimensional kinematics of the hip, pelvis and thorax in unilateral weight bearing. *Human Movement Science, 30*(3), 566-573.

Teyhen, D.S., Childs, J.D., Dugan, J.L., Wright, A.C., Sorge, J.A., Mello, J.L., . . . George, S.Z. (2013). Effect of Two Different Exercise Regimens on Trunk Muscle Morphometry and Endurance in Soldiers in Training. *Physical Therapy, 93*(9), 1211–1224.

Trampas, A., Mpeneka, A., Malliou, V., Godolias, G., & Vlachakis, P. (2015). Immediate Effects of Core-Stability Exercises and Clinical Massage on Dynamic-Balance Performance of Patients With Chronic Specific Low Back Pain. *journal of sport rehabilitation, 24*(4), 373-383.

Van Goeverden, W., Langhout, R.H., Barendrecht, M., & Tak, I.R. (2019). Active pelvic tilt is reduced in athletes with groin injury; a case-controlled study. *Physical Therapy in Sport, 36*, 14-21.

van Middelkoop, M., Rubinstein, S.M., Verhagen, A.P., Ostelo, R.W., Koes, B.W., & van Tulder, M.W. (2010). Exercise therapy for chronic nonspecific low-back pain. *Best Practice & Research Clinical Rheumatology, 24*(2), 193-204.

von Lackum, H.L. (1924). The lumbosacral region. *Journal of American Medical Association, 82*, 1109.

Wagner, H., Liebetrau, A., Schinowski, D., Wulf, T., & de Lussanet, M.H. (2012). Spinal lordosis optimizes the requirements for a stable erect posture. *Theoretical biology & medical modelling, 9*, 13.

Wilkerson, G.B., Giles, J.L., & Seibel, D.K. (2012). Prediction of core and lower extremity strains and sprains in collegiate football players: a preliminary study. *Journal of atletic training, 47*(3), 264-272.

Yan, C.-F., Hung, Y.-C., Gau, M.-L., & Lin, K.-C. (2014). Effects of a stability ball exercise programme on low back pain and daily life interference during pregnancy. *Midwifery, 30*(4), 412-419.

Zou, L., Zhang, Y., Liu, Y., Tian, X., Xiao, T., Liu, X., . . . Yang, Q. (2019). The Effects of Tai Chi Chuan Versus Core Stability Training on Lower-Limb Neuromuscular Function in Aging Individuals with Non-Specific Chronic Lower Back Pain. *Medicina (Kaunas), 55*(3), 60.

DOI 10.26773/jaspe.210105

JASPE Journal of Anthropology of Sport and Physical Education

Short Report

Anthropometric Measurements of Athletes Performed by Teachers of the Faculty for Sport and Physical Education, University of Montenegro in 2017

Svetlana Mandic[1]

[1]University of Montenegro, Faculty for Sport and Physical Education, Niksic, Montenegro

Abstract

The Center for Diagnostics in Sport, which is an integral part of the Faculty for Sport and Physical Education University of Montenegro, was established in 2017. It was accredited by the Ministry of Science and systematized by the University of Montenegro. The main function of the Center is to conduct research that will contribute to the improvement of scientific work in the field of sports sciences, as well as scientific branches and disciplines that are directly or indirectly related to sport and sports science. During the first year of its work, the Center justified its purpose and from May 20 to October 27 teachers of the Faculty for Sport and Physical Education, carried out 40 anthropometric measurements having tested individuals, clubs and national teams of different age groups from the country and abroad. In this paper, we classified the performed tests according to the countries where the athletes come from, as well as according to sports; separately for national teams, clubs and individuals. It was determined that the majority of the tested athletes were from Montenegro; even 22 national teams passed the tests. It was also determined from which sports there was the largest number of tested participants, as well as who the tested individuals were. Further research, which will include anthropometric measurements from 2018, can be based on this research. In addition, this research is significant because it gives an overview of all tests performed during the first year of work of the Center for Diagnostics in Sport.

Keywords: *The Center for Diagnostics, Sport, Anthropometric Measurements, Athletes*

Uvod

Fakultet za sport i fizičko vaspitanje je jedna od organizacionih jedinica Univerziteta Crne Gore koja se značajno ističe kada je primijenjeni i razvojni naučno-istraživački rad u pitanju, svjesni činjenice da uspješno primijenjeni naučni rezultati u sportu značajno doprinose podizanju kvaliteta rada i postizanju dobrih sportskih rezultata. Zbog toga se na Fakultetu nastoji uspostaviti respektabilna naučna baza podataka koja će pomoći sportistima i sportskim stručnjacima da rezultati budu što bolji, a naučnim radnicima služiti kao osnova za brojna istraživanja.

Antropometrija je važan faktor u selekciji sportista (G. Moreno, L. Moreno, & Jaramillo, 2011), a od poznavanja strukture pojedinih antropoloških sposobnosti i karakteristika, kao i njihovog razvoja, zavisi i kvalitetno upravljanje procesom sportskog treninga (Bjelica, 2005; Bjelica, 2013). Informacije o kvalitetu izvršenja trenažnih zadataka se u velikoj mjeri ogledaju kroz antropometrijske karakteristike (Ramos-Campo et al., 2014; Masanovic & Vukasevic, 2009), koje opet, s druge strane, zajedno sa tjelesnom kompozicijom i konstitucijom sportista,

Correspondence:

Montenegro Sport

University of Montenegro,
Faculty for Sport and Physical Education, Narodne omladine bb, 81400 Niksic, Montenegro
E-mail: bsz@t-com.me

imaju za cilj prilagođavanje sportskog treninga individualnim sposobnostima i mogućnost prognoziranja krajnjih dometa (Mašanović, 2009).

Sportski stručnjaci spoznali su da je dijagnostika u sportu postala neophodna, dok naučnici iz sfere sportskih nauka nastoje da relevantnim podacima i istraživanjima pomognu sportistima i sportskim radnicima da stignu do vrhunskih rezultata. Zajedničko djelovanje sporta i nauke rezultiralo je antropometrijskim mjerenjima koja su realizovana u Centru za dijagnostiku u sportu, formiranom 2017. godine, koji je sastavni dio Fakulteta za sport i fizičko vaspitanje.

Centar je za samo pola godine (od 20. maja do 27. oktobra 2017. godine) realizovao čak 40 mjerenja, što je više od šest mjerenja mjesečno, i time najavio kvalitetan i produktivan rad u godinama koje slijede, ali i stvaranje impozantne naučne baze podataka koja će pomoći sportistima i sportskim stručnjacima da rezultati budu što bolji, a nastavnicima sa Fakulteta za sport i fizičko vaspitanje poslužiće kao osnova za brojna istraživanja, kao i za naučne radove (Faculty for Sport and Physical Education, 2020).

Osnovni cilj ovog istraživanja je da se prezentovanjem mjerenja koja su obavljena tokom 2017. godine javnost upozna sa postojanjem Centra za dijagnostiku, njegovim radom i značajem, kako za nauku, tako i za sportiste. Cilj nam je takođe da javnosti prikažemo ko su sportisti, sportski klubovi i reprezentacije koje su te godine testirane, iz kojih zemalja dolaze i kojim sportovima se bave, kao i koji su to naučni radovi nastali zahvaljujući rezultatima dobijenim tokom obavljenih mjerenja i daljim istraživanjem.

Metod

Uzorak ovog istraživanja čini 40 antropometrijskih mjerenja koje su nastavnici Fakulteta za sport i fizičko vaspitanje tokom 2017. godine sproveli, a testirani su kako pojedinci, tako i klubovi i reprezentativne selekcije iz zemlje i inostranstva i to različite životne dobi, ali i različitih sportskih disciplina. Testiranja su obavljena kako u Centru za dijagnostiku, tako i u klubovima, na sportskim bazenima, i to u Crnoj Gori i u regionu.

Kompletna antropometrijska mjerenja realizovana su uz poštovanje osnovnih pravila i principa, vezanih za izbor standardizovanih mjernih instrumenata i tehnike mjerenja, prema uputstvima Internacionalnog biološkog programa.

Antropometrijska mjerenja realizovana su antropometrom, kaliperom i centimetarskom trakom, a izmjereno je sedam antropometrijskih mjera: visina i težina tijela, obim struka i kožni nabori tricepsa, bicepsa, leđa i trbuha. Za procjenu sastava tijela korišćena je inovativna tanita vaga, model BC-418MA, koja radi na principu bioelektrične impedanse. Zahvaljujući atletskom modu koji posjeduje, omogućava sportistima detaljno praćenje tjelesne težine, zdravstvenog stanja i kondicije, sa svim relevantnim parametrima. Dobijeni su podaci za četiri varijable: indeks tjelesne mase, procenat masti (kako u strukturi tijela, tako i u ekstremitetima, kao i vrijednosti visceralnih masti), mišićna i koštana masa.

SLIKA 1. Tanita vaga

Podaci dobijeni ovim istraživanjem, a odnose se na to koje reprezentacije, klubovi i pojedinci, i iz kojih sportskih disciplina, su prošli antropometrijska mjerenja, obrađeni su deskriptivnom i komparativnom statističkom procedurom.

Rezultati

Mjerenjima su bili obuhvaćeni sportisti iz 12 zemalja: Crne Gore, Srbije, Hrvatske, Bosne i Hercegovine, Kosova, Francuske, Rusije, Grčke, Australije, Izraela, Mađarske i Španije. Ukupno su testirane 22 reprezentativne selekcije, deset klubova i osam pojedinaca.

U Tabeli 1 prikazano je iz kojih zemalja su sportisti koji su testirani tokom 2017. godine, kao i iz kojih država su testirane reprezentativne selekcije, klubovi i pojedinci.

Testirani sportisti bili su iz različitih sportova: fudbala, košarke, rukometa, odbojke, vaterpola, džudoa, karatea, atletike i boksa (Tabela 2). Najviše reprezentacija testirano je iz vaterpola, devet, i košarke, osam. Zatim slijede tri reprezentacije iz rukometa i po jedna iz odbojke i boksa. Kada su sportski klubovi u pitanju, tokom 2017. godine testirano je osam fudbalskih klubova (po tri iz Crne Gore i Kosova i dva iz BiH) i dva iz rukometa (po jedan iz Crne Gore i BiH). Svi testirani pojedinci, njih osmoro, bili su iz Crne Gore: džudisti, Danilo Pantić, Nikola Gardašević i Jovana Peković; atletičarke, Marija Vuković, Slađana Perunović i Kristina Rakočević; i karatisti, Marina Raković i Mario Hodžić.

Tabela 1. Mjerenja koja su obavljena u toku 2017. godine

Države:	Reprezentacije:	Klubovi:	Pojedinci:
Crna Gora	12	4	8
Bosna i Hercegovina	-	3	-
Kosovo	-	3	-
Rusija	2	-	-
Srbija	1	-	-
Hrvatska	1	-	-
Francuska	1	-	-
Grčka	1	-	-
Australija	1	-	-
Izrael	1	-	-
Mađarska	1	-	-
Španija	1	-	-
Ukupno	22	10	8

Tabela 2. Mjerenjem su bili obuhvaćeni sportisti iz devet sportova

Sport:	Reprezentacija:	Klub:	Pojedinci:
Fudbal	-	8	
Košarka	8	-	-
Rukomet	3	2	-
Odbojka	1	-	-
Vaterpolo	9	-	-
Džudo	-	-	3
Atletika	-	-	3
Karate	-	-	2
Boks	1	-	-
Ukupno	22	10	8

Prvo testiranje u 2017. godini realizovano je 20. maja, kada su nastavnici i saradnici Fakulteta za sport i fizičko vaspitanje Univerziteta Crne Gore, na bazenu Sportsko-rekreativnog centra u Nikšiću, izvršili antropometrijsko mjerenje seniorske vaterpolo reprezentacije Crne Gore.

Zatim su uslijedila mjerenja fudbalera FK Mladost iz Podgo-

SLIKA 2. Seniorska vaterpolo reprezentacija Crne Gore i nastavnici Fakulteta koji su obavili mjerenje

rice, koji su u sezoni 2016/17. osvojili isti broj bodova kao i prvak Budućnost, ali su zbog lošijeg međusobnog skora morali da se zadovolje drugim mjestom, ženske seniorske i kadetske rukometne reprezentacije Crne Gore, mlade košarkaške reprezentacije Crne Gore, fudbalera FK Sutjeska iz Nikšića, osvajača Kupa Crne Gore u sezoni 2016/17, i FK Budućnost iz Podgorice, šampiona Crne Gore u toj istoj sezoni. Antropometrijska mjerenja realizovana su i kod juniorske košarkaške reprezentacije Crne Gore.

Prva mjerenja sportista iz regiona sprovedena su kod fudbalera NK Široki Brijeg, osvajača Kupa Bosne i Hercegovine u sezoni 2016/17, i HŠK Zrinjski, koji je odbranio titulu najboljeg kluba u Premijer ligi te iste sezone.

SLIKA 3. Tokom mjerenja u Širokom i Mostaru

Antropometrijska testiranja prošli su i članovi ekipe mlade bokserske reprezentacije Crne Gore, kao i stipendisti Crnogorskog olimpijskog komiteta – karatisti, Marina Raković i Mario Hodžić, i atletičarke, Marija Vuković i Slađana Perunović. Detaljno antropometrijsko mjerenje, sa svim relevantnim parametrima, kao i mjerenje funkcionalnih sposobnosti, obavljeno je i kod ženske kadetske i muške seniorske košarkaške reprezentacije Crne Gore, muških kadetskih reprezentacija Crne Gore u odbojci i košarci, muških kadetskih košarkaških reprezentacija Francuske, Izraela i Rusije, zatim muških kadetskih vaterpolo reprezentacija Grčke, Australije, Rusije, Crne Gore, Hrvatske, Srbije, Mađarske i Španije. Testirani su i fudbaleri najboljih klubova Superlige Kosova: Trepča 89 iz Kosovske Mitrovice, šampion u sezoni 2016/17. i učesnik kvalifikacija za Ligu šampiona, Priština iz Prištine, vicešampion (sezona 2016/17) i učesnik kvalifikacija za Ligu Evrope i Besa iz Peći, osvajač kupa Kosova (2016/17). Tokom septembra, testirane su rukometašice ŽRK Lavalea iz Nikšića, vicešampionke Prve lige Crne Gore za sezonu 2016/17, i stipendisti Crnogorskog olimpijskog komiteta, atletičarka Kristina Rakočević, juniorska prvakinja svijeta u atletici i najbolja mlada sportistkinja Crne Gore i to 2013, 2015 i 2016. godine, džudisti, Danilo Pantić i Nikola Gardašević, koji su prije toga na Balkanskom seniorskom prvenstvu osvojili zlato, i Jovana Peković, najuspješnija crnogorska džudistkinja

SLIKA 4. Juniorska muška rukometna reprezentacija Crne Gore i nastavnici Fakulteta koji su obavili mjerenje

u 2016. godini, koja je godinu ranije osvojila bronzanu medalju na Svjetskom kadetskom prvenstvu. Još jedna ekipa iz Bosne i Hercegovine je prošla antropometrijsko testiranje – riječ je o ženskom rukometnom klubu Grude, iz istoimenog grada, šampionkama rukometne Premijer lige BiH u sezoni 2016/17. Posljednje mjerenje 2017. godine obavljeno je 27. oktobra na Žabljaku, gdje se, na mini pripremi, nalazila muška juniorska rukometna reprezentacija Crne Gore.

Diskusija

Razvoj savremenog sporta danas je gotovo nezamisliv bez nauke. Fakultet za sport i fizičko vaspitanje Univerziteta Crne Gore po tom pitanju prati trendove i svojim djelovanjem i teoretski i praktično pokazuje i dokazuje vezu nauke i sporta. Upravo je Centar za dijagnostiku u sportu jedan od bitnih činilaca te sveze. Kao naučno-istraživačka institucija, Centar je akreditovan od strane Ministarstva nauke i sistematizovan od strane Univerziteta Crne Gore. Njegova osnovna funkcija je istraživanje i prikupljanje rezultata koji će doprinijeti unapređenju naučnog rada iz domena sportskih nauka, kao i naučnih grana i disciplina koje su posredno ili neposredno povezane sa sportom i sportskom naukom.

Sport je odavno postao multidisciplinaran i za postizanje sportskih rezultata nije više najvažnije samo biti brz ili izdržljiv, već se dobri sportski rezultati grade na bazi više naučnih disciplina (Bjelica, 2013). Osnovna mjerna jedinica uspjeha je sportski rezultat (Havelka & Lazarević, 1981; Bjelica i Krivokapic, 2010; Bjelica i Krivokapic, 2012). Dok sport nosi multidisciplinarno obilježje (Bjelica, 2013), sportski trening je kompleksan pedagoški proces (Bjelica, 2006). Upravo od treninga i njegovog kvaliteta zavise sportski rezultati, a u sportskim aktivnostima, tokom treninga i takmičenja, veliku važnost imaju opšte i osnovne antropološke karakteristike (Bjelica, Georgijev, & Muratović, 2012).

Bez dijagnostike, razvoj sportista, i sporta uopšte, nemoguć je, a samim tim i postizanje najvećih sportskih uspjeha. Zbog toga Centar ima vrlo važnu ulogu u pripremi sportista i praćenju njihovog razvoja, ali i rezultata tokom treninga. Ne manji značaj Centar ima i za nauku, jer zahvaljujući rezultatima koji su dobijeni tokom obavljenih testiranja sprovedena su brojna istraživanja i objavljeni naučni radovi. Tako je, samo na osnovu rezultata dobijenih antropometrijskim mjerenjima sportista tokom 2017. godine, u časopisu Journal of Anthropology of Sport and Physical Education (JASPE), od 2018. do danas objavljeno 13 naučnih radova: Differences in the Morphological Characteristics and Body Composition of Football Players in Montenegro (Corluka & Vasiljevic, 2018); Differences in the Morphological Characteristics and Body Composition of Football Players FC Buducnost and FC Mladost in Montenegro (Gardasevic, Bjelica, Popovic, Vasiljevic, & Milosevic, 2018); Differences in the Morphological Characteristics and Body Composition of Football Players FC Sutjeska and FC Mladost in Montenegro (Bjelica, Gardasevic, & Vasiljevic, 2018); Differences in the Morphological Characteristics and Body Composition of Handball Players WHC Levalea in Montenegro and WHC Grude in Bosnia and Herzegovina (Vukotić, Corluka, Vasiljević, & Bubanja, 2018); Differences in the Morphological Characteristics and Body Composition of Football Players FC Trepca´89 and FC Prishtina in Kosovo (Gardasevic, Bjelica, Vasiljevic, Sermaxhaj, & Arifi, 2018); Body Composition and Anthropometric Measures of Footballers, Cup Winners of Montenegro and Bosnia and Herzegovina (Bjelica, Gardasevic, Vasiljevic, & Corluka, 2018); Differences in Anthropometric Measures of Footballers, Cup Winners of Montenegro and Kosovo (Gardasevic, Bjelica, Vasiljevic, Arifi, & Sermaxhaj, 2019); Anthropometric Measures and Body Composition of Soccer Players of Montenegro and Kosovo (Bjelica, Gardasevic, Vasiljevic, Arifi, & Sermaxhaj, 2019); Anthropometric Characteristics of Elite Soccer Players from Bosnia and Herzegovina and Montenegro (Corluka, Bjelica, Gardasevic, & Vasiljevic, 2019); Differences in Body Composition of Football Players of Two Top Football Clubs (Gardasevic, Bjelica, Vasiljevic, & Corluka, 2019); Body Composition of Soccer Players of Montenegro and Bosnia and Herzegovina (Gardasevic, Bjelica, Vasiljevic, & Corluka, 2020); Elite Football Players of Bosnia and Herzegovinian and Kosovian Clubs and Differences in the Morphological Characteristics and Body Composition among them (Vasiljevic et al., 2020); Soccer Players of Winner of the Cup of Bosnia and Herzegovina and Kosovo Champion in Season 2016/17 and their Morphological Characteristics (Gardasevic, Bjelica, Vasiljevic, Corluka, Arifi, & Sermaxhaj, 2020).

Imajući u vidu činjenicu da su sportisti u pojedinim sportovima često međusobno izjednačeni u mnogim relevantnim parametrima za sport povezanih karakteristika i sposobnosti (Rogulj, Nazor, Srhoj, & Božin, 2006), rezultati koji su dobijeni tokom antropometrijskih mjerenja u Centru za dijagnostiku, a stručno sagledani od strane naučnih radnika sa Fakulteta za sport i fizičko vaspitanje, poslužiće sportistima i sportskim stručnjacima za što bolja dostignuća, a testirani sportisti, klubovi i savezi će, na osnovu njih, dobiti smjernice za dalji rad.

Acknowledgments
There are no acknowledgements.

Conflict of Interest
The authors declare that there is no conflict of interest.

Received: 5 November 2020 | **Accepted:** 6 December 2020 | **Published:** 18 January 2021

References

Bjelica, D. (2005). *Sistematizacija sportskih disciplina i sportski trening.* Podgorica: Crnogorska sportska akademija.

Bjelica, D. (2006). *Sportski trening.* Podgorica: Crnogorska sportska akademija.

Bjelica, D. (2013). *Teorija sportskog treninga.* Podgorica: Univerzitet Crne Gore

Bjelica, D., Georgiev, G.,& Muratović, A. (2012). *Basic motor abilities of young handball players* from Montenegro Sport Science,5(1), 71-76.

Bjelica, D., i Krivokapić, D. (2010). *Teorijske osnove fizičke kulture.* Nikšić: Fakultet za sport i fizičko vaspitanje Univerziteta Crne Gore.

Bjelica, D., i Krivokapić D. (2012). *Uticaj fizičkog vježbanja na ps homotorne funkcije starijih osoba.* Zbornik radova Druge međunarodne konferencije Sportske nauke i zdravlje, Banja Luka: Panaevropski univerzitet APEIRON, 191-196.

Bjelica, D., Gardasevic, J., & Vasiljevic, I., (2018). Differences in the Morphological Characteristics and Body Composition of Football Players FC Sutjeska and FC Mladost in Montenegro. *Journal of Anthropology of Sport and Physical Education, 2*(2), 31-35

Bjelica, D., Gardasevic, J., Vasiljevic, I., & Corluka, M. (2018). Body Composition and Anthropometric Measures of Footballers, Cup Winners of Montenegro and Bosnia and Herzegovina. *Journal of Anthropology of Sport and Physical Education, 2*(4), 3-7

Bjelica, D., Gardasevic, J., Vasiljevic, I., Arifi, F., & Sermaxhaj, S. (2019). Anthropometric Measures and Body Composition of Soccer Players of Montenegro and Kosovo. *Journal of Anthropology of Sport and Physical Education, 3*(2), 29-34

Corluka, M., & Vasiljevic, I. (2018). Differences in the Morphological Characteristics and Body Composition of Football Players in Montenegro. *Journal of Anthropology of Sport and Physical Education, 2*(1), 3-7.

Corluka, M., Bjelica, D., Gardasevic, J., & Vasiljevic, I. (2019). Anthropometric Characteristics of Elite Soccer Players from Bosnia and Herzegovina and Montenegro. *Journal of Anthropology of Sport and Physical Education, 3*(3), 11–15.

Faculty for Sport and Physical Education. (2020, September 10). *All Anthropometric Tests Conducted at the University of Montenegro starting from 20.05.2017 - athletes, clubs and national teams from Montenegro, France, Great Britain, Serbia, Bosnia and Herzegovina, Slovenia, Croatia, Norway, Bulgaria, Ukraine, Kosovo, Albania, Estonia, Russia, Portugal, Northern Macedonia and Israel*. Retrieved from University of Montenegro website: https://www.ucg.ac.me/objava/blog/1259/objava/81294

Gardasevic, J., Bjelica, D., Popovic, S., Vasiljevic, I., & Milosevic, Z. (2018).

Differences in the Morphological Characteristics and Body Composition of Football Players FC Buducnost and FC Mladost in Montenegro. *Journal of Anthropology of Sport and Physical Education, 2*(1), 51-55 ,

Gardasevic, J., Bjelica, D., Vasiljevic, I., Sermaxhaj, S., & Arifi, F. (2018). Differences in the Morphological Characteristics and Body Composition of Football Players FC Trepca 89 and FC Prishtina in Kosovo. *Journal of Anthropology of Sport and Physical Education, 2*(3), 105-109.

Gardasevic, J., Bjelica, D., Vasiljevic, I., Arifi, F., & Sermaxhaj, S. (2019). Differences in Anthropometric Measures of Footballers, Cup Winners of Montenegro and Kosovo. *Journal of Anthropology of Sport and Physical Education, 3*(21), 23-27.

Gardasevic, J., Bjelica, D., Vasiljevic, I., & Corluka, M. (2019). Differences in Body Composition of Football Players of Two Top Football Clubs. *Journal of Anthropology of Sport and Physical Education, 3*(4), 15–19.

Gardasevic, J., Bjelica, D., Vasiljevic, I., & Corluka, M. (2020). Body Composition of Soccer Players of Montenegro and Bosnia and Herzegovina. *Journal of Anthropology of Sport and Physical Education, 4*(1), 33–38.

Gardasevic, J., Bjelica, D., Vasiljevic, I., Corluka, M., Arifi, F., & Sermaxhaj, S. (2020). Soccer Players of Winner of the Cup of Bosnia and Herzegovina and Kosovo Champion in Season 2016/17 and their Morphological Characteristics. *Journal of Anthropology of Sport and Physical Education, 4*(3), 29–31.

Havelka, N., & Lazarevic, Lj. (1981). *Sport i ličnosti*. Beograd: Sportska knjiga

Masanovic, B. (2009). *Razlike antropometrijskog statusa vrhunskih rukometaša i nesportista*. *Sport Mont, 6*(18-19-20), 569-575.

Moreno, G.A., Moreno, L.E.A., & Jaramillo, P.C.A. (2011). Characterization of karate athletes and college basketball: body composition and anthropometry stability. *Revista Edu-Fisica., 3*(8), 1-20.

Popovic, S. (2017). Local Geographical Differences in Adult Body Height in Montenegro. *Montenegrin Journal of Sports Science and Medicine, 6*(1), 81-87.

Ramos-Campo, D.J., Martinez-Sanchez, F., Esteban-Garcia, P., Rubio-Arias, J.A., Bores, C.A., Clemente-Suarez, V.J., & Jimenez-Diaz, J.F. (2014). Body Composition Features in Different Playing Position of Professional Team Indoor Players: Basketball, Handball and Futsal. *International Journal of Morphology, 32*(4), 1316-1324.

Rogulj, N., Nazor, M., Srhoj, V., & Božin, D. (2006). Differences between competitively effi cient and less effi cient junior handball players according to their personality traits. *Kinesiology, 38*(2), 158-163.

Vasiljevic, I., Bjelica, D., Gardasevic, J., Bubanja, M., Corluka, M., Arifi, F., & Sermaxhaj, S. (2020). Elite Football Players of Bosnia and Herzegovinian and Kosovian Clubs and Differences in the Morphological Characteristics and Body Composition among them. *Journal of Anthropology of Sport and Physical Education, 4*(2), 9–13.

Vukotic, M., Corluka, M., Vasiljević, I., & Bubanja, M. (2018). *Differences in the Morphological Characteristics and Body Composition of Handball Players WHC Levalea in Montenegro and WHC Grude in Bosnia and Herzegovina. Journal of Anthropology of Sport and Physical Education, 2*(2), 49–53 .

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: **jaspe@ac.me**.

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@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

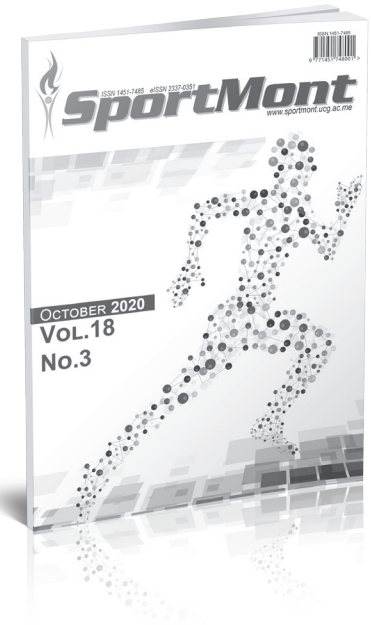
2.8. Latin Names

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@ac.me or contact following Editors:

Dusko BJELICA, Editor-in Chief – dbjelica@ucg.ac.me
Zoran MILOSEVIC, Editor-in Chief – zoranais@eunet.rs
Jovan GARDASEVIC, Managing Editor – jovan@ucg.ac.me

Publication date: Winter issue – February 2021
Summer issue – June 2021
Autumn issue – October 2021

EVROPSKA GRAĐANSKA PERSPEKTIVA

www.egp2020.me

CRNOGORSKA SPORTSKA AKADEMIJA • MONTENEGRIN SPORTS ACADEMY

USEFUL CONTACTS

Editorial enquiries and journal proposals:
Dusko Bjelica
Stevo Popovic
Editors-in-Chief
Email: **office@mjssm.me**

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

Marketing enquiries:
Jovan Gardasevic
Marketing Manager
Email: **administration@mjssm.me**

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: **Jovan Gardasevic**, Montenegro

Volume 18, 2020, 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; **Stevo Popovic**, Montenegro
Executive Editor: **Selçuk Akpınar**, Turkey
Associate Editors: **Mehmet Uygur**, USA; **Catalina Casaru**, USA; and **Predrag Bozic**, Serbia

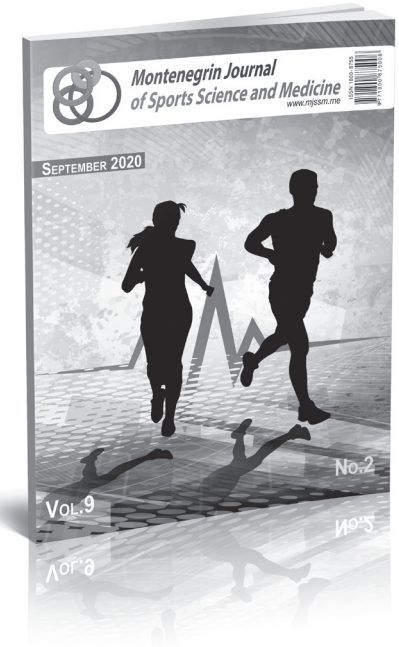
Volume 9, 2020, 2 issues per year; Print ISSN: 1800-8755, Online ISSN: 1800-8763

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

MONTENEGRIN JOURNAL OF SPORTS SCIENCE AND MEDICINE



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 – dbjelica@ucg.ac.me
Stevo POPOVIC, Editor-in Chief – stevop@ucg.ac.me
Selçuk AKPINAR, Executive Editor – sakpinar@nevsehir.edu.tr

Publication date: Spring issue – March 2021
Autumn issue – September 2021

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.

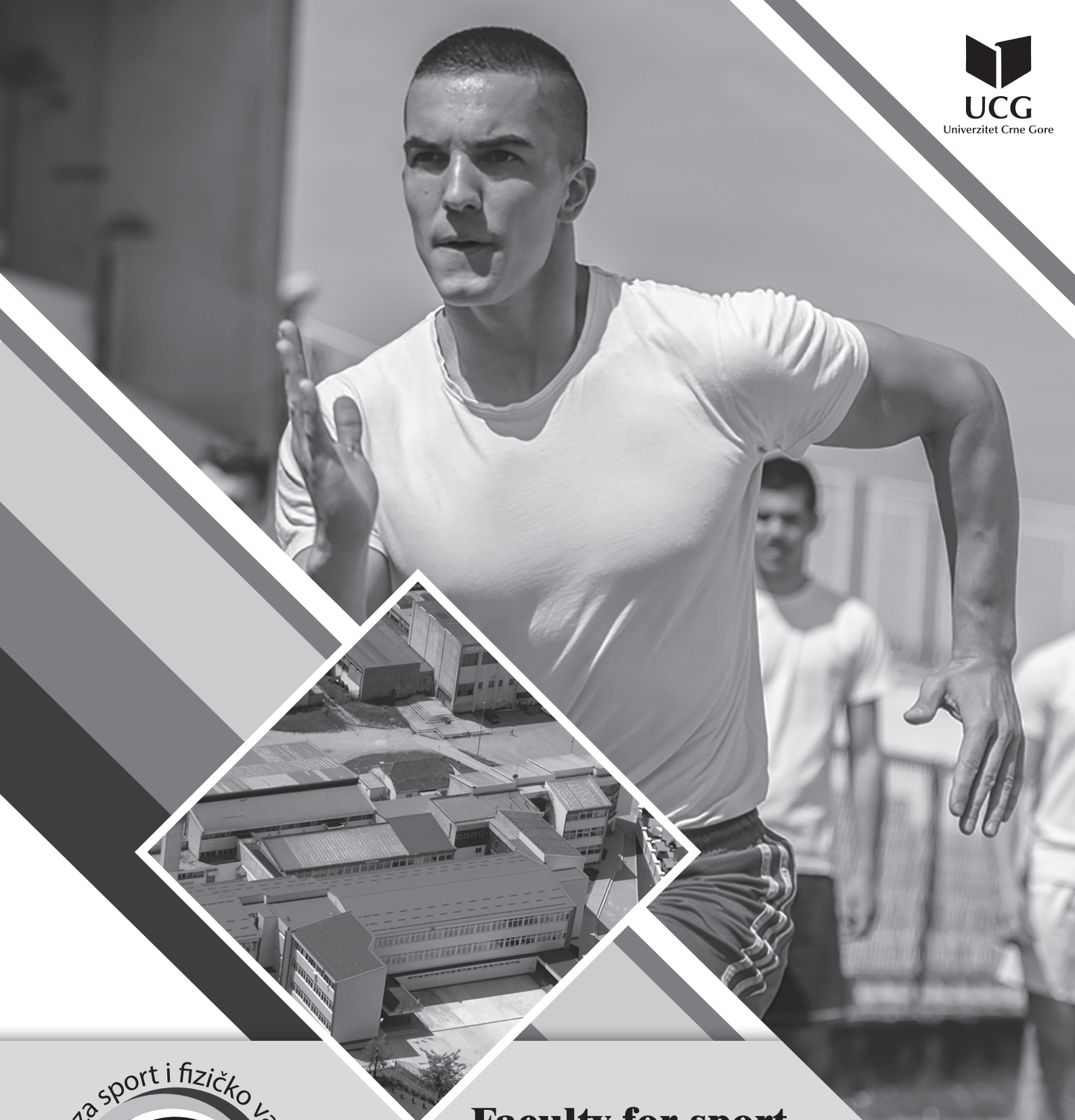
It is our great pleasure to announce the upcoming 18th Annual Scientific Conference of Montenegrin Sports Academy "Sport, Physical Activity and Health: Contemporary Perspectives" to be held in Dubrovnik, Croatia, from 8 to 11 April, 2021. It is planned to be once again organized by the Montenegrin Sports Academy, in cooperation with the Faculty of Sport and Physical Education, University of Montenegro and other international partner institutions (specified in the partner section).

FIEP Congress

MSA Conference 2021

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.



UCG
Univerzitet Crne Gore

Fakultet za sport i fizičko vaspitanje
Univerzitet Crne Gore

Faculty for sport and physical education
N I K Š I Ć

Phone: + 382 40 235 204; Fax: + 382 40 235 207, +382 40 235 200
E-mail: fakultetzasportnk@ac.me; Web: www.ucg.ac.me/sport

Znanje i zdravlje!

Montenegrin Journal of Sports Science and Medicine

www.mjssm.me

ISSN 1800-8755

SEPTEMBER 2020

VOL.9

No.2

CRNOGORSKI OLIMPIJSKI KOMITET
MONTENEGRIN OLYMPIC COMMITTEE

CIP – Каталогизација у публикацији
Национална библиотека Црне Горе, Цетиње

ISSN 2536-569X
COBISS.CG-ID 33826832

FIEP Congress

MSA Conference 2021

18th Annual Scientific Conference and 16th FIEP European Congress

Sport, Physical Education, Physical Activity and Health: Contemporary perspectives

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

CRNOGORSKA SPORTSKA AKADEMIJA • MONTENEGRIN SPORTS ACADEMY

8th - 11th April 2021,
Dubrovnik - Croatia