



# SPORTSKE NAUKE I ZDRAVLJE

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# SPORTSKE NAUKE I ZDRAVLJE

SPORTS SCIENCE AND HEALTH

Naučno-stručni časopis iz oblasti sportskih i medicinsko-rehabilitacionih nauka

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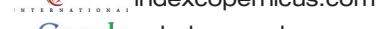
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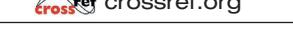
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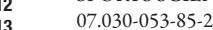
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# SPORTSKE NAUKE I ZDRAVLJE

## SPORTS SCIENCE AND HEALTH

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Ponosni smo na to što smo do sada uradili, svakako uz odličnu saradnju svih autora radova koji su svojim pisanim kvalitetnim prilozima omogućili Časopisu da dostigne taj nivo. Kako mi to u sportu obično kažemo, a kako je iskustvo pokazalo, teško se popeti na prvo mjesto na takmičenju, ali je još teže održati se na njemu. U nastojanju da održimo dostignutu visoku poziciju na listi referentnih naučnih časopisa, radićemo još više i bolje, naravno, u saradnji sa autorima radova, bez kojih je nemoguće ostvariti kvalitet Časopisa.

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We are proud of our work so far, certainly due to an excellent cooperation of all paper authors who have enabled, by means of their high-quality work, for the Journal to reach such level. There is a common saying in sport, and proven in practice, that it is hard to reach the first place in competition, and even harder to stay at the top. In an effort to maintain the achieved high position on the list of referent scientific journals, we will work even harder, of course in collaboration with the paper authors without whom it is impossible to accomplish the Journal quality.

WE THANK all the authors whose papers have been published in the Journal so far, as well as all authors whose papers will be published in the future! Additionally, THANK YOU for your trust in our Journal.

The Journal “SPORTS SCIENCE AND HEALTH” is of this year part of the Copernicus index (CI) database, meaning that it is a part of the international exchange of scientific journals and the Journal can be accessed by the public.

The Editorial Board invites all admirers of science, profession, critical thinking, all progressive people of knowledge and pen, to contribute to the further development of sports science, above all in the function of people’s health by means of their original work (scientific, professional, patents, critical reviews, theoretical discussions, analyses, polemics, etc.).

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## POVEZANOST MORFOLOŠKIH KARAKTERISTIKA SA BRZINOM TRČANJA KOD ATLETIČARA

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**Sažetak:** Istraživanjem su bili obuhvaćeni atletičari i atletičarke sa područja Beograda, uzrasta 18-19 godina ( $\pm 6$ meseci). Svi 32 ispitanika su aktivni atletičati i bile su zdrave osobe. Cilj rada bio je da se utvrde korelativni odnosi morfoloških karakteristika i brzine trčanja na 100 i 400 metara kod oba pola. Primenom regresione analize utvrđena je statistički značajana povezanost sistema antropometrijskih varijabli sa kriterijskom varijablom Trčanje 100 metara kod atletičara, gde se uočava i najveći procenat zajedničkog varijabiliteta od 72%. Od svih antropometrijskih karakteristika, samo Telesna visina pokazuje statistički značajanu povezanost sa kriterijskim varijablama kod atletičara. Sistem prediktora nije dalje bio povezan sa kriterijem kod atletičarki. Autori predlažu za dalja istraživanja merenje frekvence koraka, kao i tehnike trčanja u određivanju prediktivne vrednosti brzine trčanja, što bi moglo dati više informacija.

**Ključne reči:** antropometrijska merenja, relacije, sportisti, trčanje 100 i 400 metara.

## UVOD

Trčanje na kratke deonice može se podeliti na tri ravnopravna dela. Prvi deo (prva trećina staze) pripada eksplozivnoj snazi nogu, drugi (druga trećina staze) maksimalnoj brzini, a treći (trećina) sposobnošću da se maksimalna brzina održi sa najmanjim padom.

## RELATION BETWEEN MORPHOLOGICAL CHARACTERISTICS AND RUNNING SPEED IN ATHLETES

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**Abstract:** The research included male and female athletes from Belgrade, aged 18 and 19 ( $\pm 6$  months). All of the 32 subjects were actively exercising athletics and were in good health. The aim of the research was to establish the correlation between morphological characteristics and running speed on 100 and 400 meters tracks for both sexes. By regression analyses it was determined that there is a statistically significant link between anthropometric variables and criterion variable in 100 meters run in favor of the male athletes, but it is also where the highest percentage of commonly shared variability namely 72% was observed. Of all of the anthropometric characteristics only Body height has been proved to be statistically significantly linked to criterion variables in favor of the male athletes. The predictor system was not in no other way proved to be related to criterion in female athletes. In order to attain additional information the authors have suggested that further research into predictive running value and speed should include pace frequency measuring as well as considering running techniques.

**Key words:** anthropometric measuring, correlation, sportsmen, 100 and 400 meters run.

## INTRODUCTION

Short tracks run can be split into three equal phases. The first phase (the first third of the track) of the track belongs to the explosive power of the legs, the second (the second third of the track) to maximum speed and the third (the last third) to the ability to retain maximum speed with

Svaka od ovih navedenih vidova snage se može posebno povećavati ali i trenirati. Zbog toga treba istaći da se povećanjem bilo koje od njih može ostvariti poboljšanjem ostalih, što ukazuje na njihovu međusobnu korelaciju. U svetskoj atletici danas, dominiraju atletičari izuzetne telesne građe sa izraženom longitudinalnom dimenzionalnošću skeleta (Lees i sar., 1994). Utvrđeni su vrlo važni faktori uspeha u atletici: veličina tela i tip telesne konstitucije. Morfološke karakteristike sprintera na 100, 200 i 400 metara, ogledaju se u izuzetno širokim ramenima, velikim obimom grudnog koša, relativno širokom karlicom, izuzetno snažnim i velikim obimima mišića natkolenice, potkolenice, nadlaktice, podlaktice, te izuzetno razvijenom muskulaturom čitavog trupa sa naglaskom na velike grupe mišića. Sprinteri su izuzetno visoki, poseduju izuzetno malo potkožnog masnog tkiva. Ova pravila važe i za žene (DeGrayu, Levine, & Carter, 1974). Ustanovljeno je da veći postotak masti negativno utiče na atletske rezultate u trčanju (Wilmore, 1976; prema Mülleru, & Hommelu, 1997). To je pogotovo izraženo u disciplinama u kojima telo napušta podlogu (kod skokova), ili je u velikom ubrzavanju iznad zemlje, kao kod sprinta i trčanja preko prepona. Definisane su kinematičke i dinamičke karakteristike hodanja, trčanja i trčanja maksimalnom brzinom (na 100 i 200 metara), uz poseban osvrt na relaciju maksimalne brzine trčanja sa frekvencijom i dužinom trkačkog koraka, gde postoje specifični odnosi sa telesnom visinom, masnim tkivom, bezmasnom komponentom, masom ekstremiteta, obimom donjih ekstremiteta (Pajić, 1998). U rezultatima povezanosti pokazatelja mišićne sile i snage sa performansama trčanja maksimalnom brzinom, uočena su izvesna neslaganja, ali se izvodi generalni zaključak da je brzina trčanja u pozitivnim korelacijama sa morfološkim karakteristikama, a posebno sa telesnom visinom i telesnom težinom. Maksimalna brzina se izdvaja kao presudna za uspeh u sprintu (Hraski i Mejovšek, 1999). Brzina trčanja u velikoj meri zavisi od veličine obima muskulature nogu (Baker, Wilson, & Carlyon, 1994).

Cilj rada bio je da se utvrde korelativni odnosi morfoloških karakteristika i brzine trčanja na 100 i 400 metara kod atletičara i atletičarki, uzrasta 18-19 godina.

## METOD

Istraživanje je sprovedeno na uzorku od 17 atletičara i 15 atletičarki, uzrasta 18-19 godina ( $\pm 6$  meseci), članovima AK „Mladost“ iz Beograda. Od morfoloških karakteristika za procenu longitudinalne dimenzionalnosti skeleta mereni su: telesna visina, dužina natkolenice i

the least decline. Each of the aforementioned types of strength can be increased and trained individually. Therefore, it should be emphasized that enhancing any of them reflects on improvement of all which points to their mutual bond. The world's athletics today is dominated by athletes of exceptional body built and remarkable longitudinal skeleton dimension (Less, Graham-Smith, & Fowler, 1994). Very important factors for success in athletics have been determined as: size of body and physical profile. Morphological characteristics of sprinters running 100, 200 and 400 meters races can be illustrated as extremely broad shoulders, large chest volume, relatively broad pelvis, exceptionally strong, large volume muscles of lower leg, upper leg, upper and lower arm and remarkable musculature of upper body, especially large muscles. The sprinters are very tall, and have barely any subcutaneous fat tissue. The same applies for women (DeGrayu, Levine, & Carter, 1974). It had been established that higher percentage of fat negatively influences running results of the athletes (Wilmore, 1976; to Mülleru, & Hommelu, 1997). That is particularly true for athletic disciplines in which the body is released of the ground (jump), or requires velocity above the ground as in sprint or hurdle. The kinematics and dynamic characteristics of walking, running and running at maximum speed (100 and 400 meters) have been defined with special emphasis on the link between running at maximum speed and pace frequency and length where exist specific relation between body height, fat tissue, fat free tissue, limb mass, lower limbs volume (Pajic, 1998). The results regarding the connection between muscle strength and performance at maximum speed have shown some inconsistencies, still, the overall conclusion is that running speed is positively related to morphological characteristics, particularly so with body height and weight. The emphases have been laid on maximum speed as the key to success, especially for sprinters (Hraski, & Mejovsek, 1999). The running speed largely depends on leg's muscle volume (Baker, Wilson, & Carlyon, 1994).

The aim of the research was to determine the correlation between morphological characteristics and running speed on 100 and 400 meters tracks for male and female athletes aged 18 and 19 ( $\pm 6$  months).

## METHOD

The research was conducted on a sample of 17 male athletes and 15 female athletes, aged 18 and 19 ( $\pm 6$  months), all of whom were members of Athletic Club *Mladost* from Belgrade. The following morphological characteristics were used to estimate the longitudinal

dužina potkolenice; za procenu volumena i mase tela: telesna težina, obim natkolenice, obim potkolenice i obim trbuha. Merenja su realizovana pomoću antropometra po Martinu, medicinske decimalne vase i centimetarske trake po standardnim IBP-a (Internacionalnog Biološkog Programa).

Brzine trčanja na 100 i 400 m iz niskog starta merene su uz pomoć štoperice Polar 170 i prema standardnom postupku.

Obrada podataka podrazumevala je izračunavanje deskriptivnih statistika varijabli: aritmetička sredina (AS), standardna devijacija (S), minimalne (MIN) i maksimalne (MAX) vrednosti rezultata merenja. Za utvrđivanje povezanosti prediktoriskih (morphološke karakteristike) varijabli sa brzinom trčanja (kriteriji) koristio se set multiplih regresionih analiza.

## REZULTATI

U Tabeli 1 prikazani se deskriptivni statistici antropometrijskih i motoričkih varijabli za atletičare i atletičarke.

**Tabela 1.** Osnovni deskriptivni statistici

Varijabla/ Variable	Grupa	AS	S	Min	Max
Body Height (cm.)	Male	1852,20	42,53	1761	1912
	Female	1770,75	28,58	1711	1810
Body weight (kg.)	Male	722,30	80,27	502	852
	Female	626,50	54,11	507	695
Upper leg volume (cm.)	Male	598,65	8,05	588	612
	Female	569,50	8,70	552	587
Lower leg volume (cm.)	Male	389,05	3,17	385	395
	Female	360,65	8,37	333	375
Upper leg length (cm.)	Male	640,55	16,73	612	677
	Female	610,90	12,87	588	642
Lower leg length (cm.)	Male	426,70	15,19	399	458
	Female	396,00	9,74	379	424
Volume of abdomen (cm.)	Male	737,85	37,40	655	796
	Female	653,35	35,99	590	745
100 m run (sec.)	Male	12,87	0,37	10,49	14,81
	Female	13,72	0,53	11,34	15,51
400 m run (sec.)	Male	54,51	1,83	52,21	58,11
	Female	66,30	2,05	63,09	69,82

**Legenda:** AS – aritmetička sredina; S – standardna devijacija; Min – minimalne vrednosti rezultata; Max – maksimalne vrednosti rezultata.

skeletal dimension: body weight, upper and lower leg volume; body volume and mass: body weight, upper and lower leg volume and volume of abdomen. The measuring was conducted by anthropometry by Martin, medical decimal scale and centimeter tape measure standard for the IBP (International Biological Program).

The running speed on 100 and 400 meters tracks was recorded by stop-watch Polar 170 and in accordance with standard procedure.

The data processing included calculating descriptive statistics for variables: arithmetic mean (AS, standard deviation (S), minimum (MIN) and maximum (MAX) values of the results. A set of multiple regression analyses was used to determine possible correlation between predictor variables (morphological characteristics) and running speed (criterion).

## RESULTS

Table 1 shows descriptive statistics of anthropometric measures for male and female athletes.

**Table 1.** Basic Descriptive Statistic

**Key:** AS – arithmetic mean; S – standard deviation; MIN – minimum recorded result; MAX – maximum recorded result.

Posmatrajući rezultate iz tabele 2, zaključujemo da su atletičari prosečno viši (1852,20 mm prema 1770,75 mm) i teži (72,23 kg prema 62,65 kg) u odnosu na atletičarke istog kluba. Subuzorak atletičara je posedovao veće prosečne vrednosti obima natkolenice, potkolenice, dužine natkolenice i potkolenice i veći obim trbuha. U motoričkim varijablama za procenu brzine trčanja, atletičari su ostvarili prosečno bolje rezultate. Uzorak je izuzetno homogen kako u pogledu antropometrijskih dimenzija tako i u pogledu motoričkih sposobnosti brzine trčanja na 100 i 400 metara. Ovakvi rezultati se mogu pripisati uticajima selekcije u atletskom klubu i višegodišnjem treninšnom procesu.

U tabelama 2, 3, 4 i 5 prikazani su rezultati regresionih analiza svake kriterijske varijable u sistemu prediktorskih varijabli, posebno za atletičare i atletičarke, u vidu numeričkih informacija.

**Tabela 2. REGRESIONA ANALIZA Trčanja 100 m za atletičare**

Varijabla / Variable	r	p	r <sub>part.</sub>	p <sub>part</sub>	Beta	pbete
Telesna visina / Body height	-0,74	0,00	-0,66	0,01	-0,78	<b>0,01</b>
Telesna težina / Body weight	-0,05	0,42	-0,43	0,13	-0,30	0,13
Obim natkolenice / Upper leg volume	-0,52	0,01	-0,01	0,96	-0,01	0,96
Obim potkolenice / Lower leg volume	-0,12	0,30	0,34	0,23	0,24	0,23
Dužina natkolenice / Upper leg length	-0,32	0,09	0,16	0,59	0,13	0,59
Dužina potkolenice / Lower leg lenght	-0,44	0,03	-0,47	0,09	-0,45	0,09
Obim trbuha / Volume of abdomen	0,01	0,50	0,47	0,09	0,36	0,09

R=0,85      R<sup>2</sup>=0,72      P=0,01

**Legenda:** r - Pirsonov koeficijent korelacije; p - nivo značajnosti za r; r<sub>part.</sub> – vrednost koeficijenta parcijalne korelacije; Beta - regresijski koeficijent; pbete - nivo značajnosti regresijskog koeficijenta; P - značajnost koeficijenta multiple korelacije; R<sup>2</sup> - koeficijent determinacije; R - koeficijent multiple korelacije. p<sub>part.</sub> - nivo značajnosti za koeficijent parcijalne korelacije.

Regresionom analizom kriterijuma kod atletičara, utvđena je statistički značajana povezanost sistema prediktorskih varijabli na *Trčanje 100 metara*, jer je značajnost koeficijenta multiple korelacije P=0,01 pri vrednosti koeficijenta multiple korelacije R=0,85 što se objašnjava sa 72% zajedničkog varijabiliteta. Ovaj procenat je izuzetno visok što govori u prilog činjenici da su navedene antropometrijske dimenzije izuzetno odgovorne za ispoljavanje brzine trčanja. Preostali procenat se može pripisati nekim drugim činiocima koji nisu deo ovog istraživačkog rada kao što su to kognitivne sposobnosti i ko-

By examination of the results from Table 2, conclusion was reached that male athletes are in average taller (1852.20 mm versus 1770.75 mm) and heavier (72.23 kg versus 62.65 kg) than their female club colleagues. It was found that in average male athletes have higher values of upper leg volume, lower leg volume, length of upper and lower leg and abdominal volume. On average better result were achieved by male athletes in motor variables measuring the running speed. The sample subjects have proved to be exceptionally homogenous regarding anthropometric dimensions as well as motor ability for fast running on 100 and 400 meters tracks. Such results could be credited to the club selection influence and years of training process.

In tables 2, 3, 4 and 5 are shown results of regression analyses in a form of numeric data for each criterion variable within the predictor system for both male and female athletes.

**Table 2. REGRESSION ANALYSES Male athletes 100 meters running**

R=0,85      R<sup>2</sup>=0,72      P=0,01

**Key:** r – Pirson's correlation coefficient; p – level of statistical significance for r; r<sub>part.</sub> – value of partial correlation coefficient; Beta – regression coefficient ; pbete – level of significance of regression coefficient; P – significance of multiple coefficient correlation; R<sup>2</sup> – determination coefficient; R - multiple correlation coefficient.

The statistically significant correlation between predictor variable the *100 meters run* in male athletes was established by the regression analyses of criterion, for the significance of multiple correlation coefficient was found to be P=0.01 when the multiple correlation coefficient value was R=0.85, which can be explained by 72% of common variability. This is a very high percentage. It speaks for the fact that the above mentioned anthropometric dimensions are highly responsible for the exercised running speed. The remaining percentage can be assigned to other factors, such as cognitive abilities and cha-

nativne karakteristike, dužina koraka, frekvencija koraka te tehnika. Posmatrajući varijable pojedinačno, uočava se da samo longitudinalna dimenzionalnost skeleta u vidu *Telesne visine* pokazuje statistički značajnu povezanost sa kriterijem.

Na osnovu Pirsonovog koeficijenta korelacijske, zaključuje se da su: *Telesna visina*, *Obim natkolenice* i *Dužina potkolenice*, kao prediktori, statistički značajno povezani sa kriterijem. Postoji negativna korelacija antropometrijskih, prediktoriskih varijabli: *Telesne visine*, *Telesne težine*, *Obima natkolenice*, *Obima potkolenice*, *Dužine natkolenice* i *Dužine potkolenice* sa kriterijem, što daje za pravo da pretpostavimo da što su atletičari posedovali veće opisane antropometrijske dimenzije, postizali su i bolja vremena u trčanju na 100 metara iz niskog starta. Ovo se objašnjava činjenicom da atletičar dobija na svojoj brzini ako poseduje i određenu težinu (i težinu segmenta) koja mu pomaže da duže vreme zadrži najveću postignutu brzinu i ostvarenu silu ( $F=m \times a$ ) u sve tri etape deonice. Ako se uzme u obzir činjenica da je za postizanje određene sile ( $F$ ), potrebno određeno ubrzanje ( $a$ ) koje je direktno proporcionalno sprezi sa masom tela koja dominira u drugoj etapi deonice (maksimalnoj brzini). To ide u prilog činjenici: što je veći poprečni presek mišića (obim mišića), mišić je sposobniji za postizanje veće sile (snage) za dugotrajniji rad. Obim trbuha nije bio statistički značajno povezan sa kriterijumom.

Posmatrajući vrednosti koeficijenta linearne korelacijske i koeficijenta parcijalne korelacijske, uočavamo da su vrednosti negativne, ali logički pozitivne sem kod varija-

racteristics, length of pace, its frequency and technique, that are not a part of this research. By observing individual variables it is indicative that only the *Body height* as longitudinal skeletal dimension value has revealed statistically significant correlation with criterion.

Based on Pirson's correlation coefficient the following can be assumed: *Body height*, *Upper leg volume* and *Lower leg volume*, in a role of predictors, are statistically significantly correlated with criterions. There is a negative correlation between anthropometric predictor variables: *Body height*, *Body weight*, *Upper leg volume*, *Lower leg volume*, *Upper leg length* and *Lower leg length* with criterion all of which gives us the right to presume that the higher anthropometric dimension equals better time result in low-set 100 meters track run. This finding is explained by the fact that if an athlete is heavier (with heavier segments) he gains speed because it helps him retain the achieved maximum speed and force ( $F=m \times a$ ) for longer time during all three phases. If we take into consideration that in order to achieve certain force ( $F$ ) certain velocity ( $a$ ) is required, which is in a direct proportion with the mass of the body that dominates the second phase (maximum speed), it attests to the fact: higher the value of muscle cross section (volume of the muscle), the muscle is more capable of attaining greater force (strength) for longer function. No statistical significance was found between the criterion and Volume of the abdomen.

The values of linear correlation coefficient and partial correlation coefficient were observed to be negative, however, logically positive, except in the variable *Volume*

**Tabela 3. REGRESIONA ANALIZA** Trčanja 100 metara za atletičarke

Varijabla / Variable	r	p	r <sub>part.</sub>	p <sub>part</sub>	Beta	pbete
Telesna visina / Body height	-0,51	0,01	-0,20	0,49	-0,24	0,49
Telesna težina / Body weight	-0,67	0,00	-0,47	0,09	-0,58	0,09
Obim natkolenice / Upper leg volume	-0,42	0,03	0,05	0,87	0,05	0,87
Obim potkolenice / Lower leg volume	-0,31	0,09	-0,09	0,77	0,07	0,77
Dužina natkolenice / Upper leg length	-0,35	0,07	-0,03	0,93	-0,02	0,93
Dužina potkolenice / Lower leg length	-0,23	0,17	-0,19	0,53	-0,14	0,53
Obim trbuha / Volume of abdomen	-0,33	0,08	0,08	0,78	0,09	0,78

R=0,72      R<sup>2</sup>=0,51      P=0,17

**Legenda:** r - Pirsonov koeficijent korelacijske; p - nivo značajnosti za r; r<sub>part.</sub> - vrednost koeficijenta parcijalne korelacijske; Beta - regresijski koeficijent; pbete - nivo značajnosti regresijskog koeficijenta; P - značajnost koeficijenta multiple korelacijske; R<sup>2</sup> - koeficijent determinacije; R - koeficijent multiple korelacijske. p<sub>part.</sub> - nivo značajnosti za koeficijent parcijalne korelacijske.

R=0,72      R<sup>2</sup>=0,51      P=0,17

**Key:** r – Pirson's correlation coefficient; p – level of statistical significance for r; r<sub>part.</sub> – value of partial correlation coefficient; Beta – regression coefficient ; pbete – level of significance of regression coefficient; P – significance of multiple coefficient correlation; R<sup>2</sup> – determination coefficient; R – multiple correlation coefficient.

ble *Obim trbuha*. Statistička značajnost je konstatovana u varijabli *Telesna visina*. Na osnovu dobijenih rezultata parcijalizacije može se zaključiti, da je vrednost koeficijenta parcijalne korelacije opala u odnosu na Pirsonov koeficijent korelacije, odnosno da ostale prediktorske varijable umanjuju (negativno) deluju na vezu te dve varijable. Kod ostalih varijabli se statistički značajna korelacija ne uočava.

Regresionom analizom kriterija, kod atletičarki (tabela 3), utvrđeno je da povezanost sistema prediktorskih varijabli na *Trčanje 100 metara* nije bio statistički značajan, jer je značajnost koeficijenta multiple korelacijske P=0,17 pri vrednosti koeficijenta multiple korelacijske od R=0,72 što se objašnjava sa 51% zajedničkog varijabiliteta. Posmatrajući varijable pojedinačno, uočava se da ni jedna prediktorska varijabla ne pokazuje statistički značajnu povezanost sa kriterijem. Na osnovu Pirsonovog koeficijenta korelacije, možemo zaključiti da su sve antropometrijske varijable u negativnoj korelaciji sa datim kriterijem, ali su samo *Telesna visina*, *Telesna težina* i *Obim natkolenice* statistički značajno povezani sa kriterijem. Što su atletičarke posedovale veće antropometrijske mere, postizale su i bolja vremena u *Trčanju na 100 metara*. Ovo je i logično ako se zna da je snaga mišića direktno proporcionalna njegovom fiziološkom poprečnom preseku, odnosno da što je veća poluga za rad i ako ta poluga ima dovoljnu snagu (veća snaga odgovarajućih mišića na toj poluzi lakše pokreće veće poluge u prostoru), ona će se lakše kretati, pomerati u prostoru. Duže noge (duže kosti natkolenice (femur) i potkolenice (ti-

*of the abdomen*. Statistical significance was established in the variable *Body height*. Based on the results of partial derivation it can be concluded that the partial correlation coefficient value has dropped in relation to Pirson's correlation coefficient, that is, other predictor variables negatively influence (weaken) the link of these two variables. Such relation has not been noted in other variables.

No statistically significant correlation between the predictor variable *100 meters run* (Table 3) in female athletes was established by the regression analyses of criterion, for the significance of multiple correlation coefficient was found to be P=0.17 when the multiple correlation coefficient value was R=0.72, which can be explained by 51% of common variability. Individual observation of the variables indicated that none of the predictor variables demonstrated statistically significant link with the criterion. Based on Pirson's correlation coefficient it can be concluded that all of the anthropometric variables are negatively correlated to the criterion except for the variables *Body height*, *Body weight* and *Upper leg volume* which are statistically significantly correlated with the given criterion. Higher the values of the anthropometric measures the female athletes gained better timings in *100 meters run*. This seems to be logical since it is known that the muscle force is proportionally related to its cross section, to be precise longer the working lever and greater the applied force (greater the strength of the particular muscles on that lever it becomes easier to move bigger levers through the space), therefore, easier movement, progress in space. Longer legs (longer upper leg bones (femur) and lower leg bones

**Tabela 4. REGRESIONA ANALIZA** Trčanja 400 metara za atletičare

Varijabla / Variable	r	p	r <sub>part.</sub>	p <sub>part</sub>	Beta	pbete
Telesna visina / Body height	-0,46	0,02	-0,54	0,05	-0,87	0,05
Telesna težina / Body weight	0,17	0,24	0,05	0,86	-0,05	0,86
Obim natkolenice / Upper leg volume	-0,14	0,29	0,37	0,19	0,52	0,19
Obim potkolenice / Lower leg volume	-0,06	0,41	-0,04	0,88	-0,05	0,88
Dužina natkolenice / Upper leg length	-0,06	0,41	0,05	0,86	0,07	0,86
Dužina potkolenice / Lower leg lenght	-0,09	0,35	0,03	0,91	0,04	0,91
Obim trbuha / Volume of abdomen	0,01	0,48	-0,01	0,99	0,01	0,99

R=0,57      R<sup>2</sup>=0,33      P=0,58

**Legenda:** r - Pirsonov koeficijent korelacijske; p - nivo značajnosti za r; r<sub>part.</sub> - vrednost koeficijenta parcijalne korelacijske; Beta - regresijski koeficijent; pbete - nivo značajnosti regresijskog koeficijenta; P - značajnost koeficijenta multiple korelacijske; R<sup>2</sup> - koeficijent determinacije; R - koeficijent multiple korelacijske. p<sub>part.</sub> - nivo značajnosti za koeficijent parcijalne korelacijske.

R=0,57      R<sup>2</sup>=0,33      P=0,58

**Key:** r – Pirson's correlation coefficient; p – level of statistical significance for r; r<sub>part.</sub> – value of partial correlation coefficient; Beta – regression coefficient ; pbete – level of significance of regression coefficient; P – significance of multiple coefficient correlation; R<sup>2</sup> – determination coefficient; R – multiple correlation coefficient.

bie i fibule)), opet uz dovoljnu snagu mišića nogu (obim natkolenice i potkolenice) i mišića trbuha omogućavaju veće korake, a sa većim koracima, odnosno manjim brojem izvršenih koraka, lakše će se ostvariti cilj i preći određen put (Bubanj, 1997).

Regresionom analizom kriterija kod atletičara, utvrđeno je da povezanost sistema prediktorskih varijabli nije bila statistički značajana, jer je značajnost koeficijenta multiple korelacije iznosila ( $P=0,58$ ) što se objašnjava sa 33% zajedničkog varijabiliteta. Posmatrajući varijable pojedinačno, uočavamo da *Telesna visina* pokazuje statistički značajan uticaj na kriterijsku varijablu, dok ostale varijable to ne pokazuju. Na osnovu Pirsonovog koeficijenta korelacijske, od svih posmatranih antropometrijskih varijabli samo je prediktorska varijabla *Telesna visina* bila statistički značajno povezana sa kriterijumom. Ova pojava se može okarakterisati kao slučajna, jer ceo sistem nije bio statistički značajno povezan sa datim kriterijem.

**Tabela 5. REGRESIONA ANALIZA Trčanja 400 m za atletičarke**

Varijabla / Variable	r	p	r <sub>part.</sub>	p <sub>part</sub>	Beta	pbete
Telesna visina / Body height	0,07	0,38	0,01	0,98	0,01	0,98
Telesna težina / Body weight	-0,01	0,49	0,20	0,49	0,26	0,49
Obim natkolenice / Volume of upper leg	-0,29	0,11	-0,36	0,21	-0,47	0,21
Obim potkolenice / Volume of lower leg	0,03	0,45	0,16	0,59	0,15	0,59
Dužina natkolenice / Length of upper leg	0,34	0,07	0,32	0,26	0,37	0,26
Dužina potkolenice / Length of lower leg	-0,01	0,49	-0,11	0,71	-0,10	0,71
Obim trbuha / Volume of abdomen	-0,26	0,14	-0,17	0,56	-0,22	0,56

R=0,57      R<sup>2</sup>=0,32      P=0,59

**Legenda:** r - Pirsonov koeficijent korelacijske; p - nivo značajnosti za r; r<sub>part.</sub> - vrednost koeficijenta parcialne korelacijske; Beta - regresijski koeficijent; pbete - nivo značajnosti regresijskog koeficijenta; P - značajnost koeficijenta multiple korelacije; R<sup>2</sup> - koeficijent determinacije; R - koeficijent multiple korelacije.

p<sub>part</sub> - nivo značajnosti za koeficijent parcialne korelacijske.

Regresionom analizom atletičarki, utvrđeno je da sistem prediktorskih varijabli nije statistički značajno povezan sa kriterijem, jer je značajnost koeficijenta multiple korelacije iznosila ( $P=0,59$ ), što se objašnjava sa svega 32% zajedničkog varijabiliteta, dok se ostali procenat može pripisati nekim drugim karakteristikama i sposobnostima koje nisu bile obuhvaćene primjenjenim sistemom prediktora. Posmatrajući varijable pojedinačno, uočavamo da ni jedna prediktorska varijabla nije statistički značajno povezana sa datim kriterijem.

((tibia and fibula)), aided by sufficient leg muscle strength (upper and lower leg volume) and abdominal muscles enable the paces to be longer and fewer which facilitates easier achievement and passing the distance (Bubanj, 1997).

Based on the regression analyses of the criterion in male athletes in regard to the link between the predictor variables statistical significance is found to be of no particular substance since the multiple correlation coefficient was  $P=0.58$  which explains for 33% of common variability. By observing individual variables it has been noticed that the *Body height* exercised statistically significant influence on criterion variable whilst other variables have shown no such quality. Based on Pirson's correlation coefficient it can be concluded that out of all of the observed variables only the *Body height* has been statistically significantly related to the criterion. This result could be attributed to an utter chance since whole of the system has proved not to be significantly related to the criterion in statistic terms.

**Table 5. REGRESSION ANALYSES Female athletes 400 meters run**

R=0,57      R<sup>2</sup>=0,32      P=0,59

**Key:** r – Pirson's correlation coefficient; p – level of statistical significance for r; r<sub>part.</sub> – value of partial correlation coefficient; Beta – regression coefficient ; pbete – level of significance of regression coefficient; P – significance of multiple coefficient correlation; R<sup>2</sup> – determination coefficient; R - multiple correlation coefficient.

Based on the regression analyses in female athletes it was established that predictor variables system has had no statistically significant correlation with criterion since the multiple correlation coefficient was  $P=0.59$  which explains for 32% of common variability. At the same time the remaining percentage can be attained to some other characteristics and abilities which were not incorporated in the applied predictor system. Upon the examination of individual variables it has been noticed that none of the variables have been statistically significantly related to the given criterion.

## DISKUSIJA

Izvođenje i uspeh u atletskim disciplinama zavisi od genetske predispozicije, ostvarenja trenažnih ciljeva i zadatka, te uticaja faktora iz okoline, genetskih predispozicija. Istraživanjem je utvrđeno da određene antropometrijske dimenzije, pre svega odgovorne za longitudinalnost skeleta *Telesna visina* ima statistički značajnu povezanost na ispoljavanje brzine trčanja kod atletičara juniorskog uzrasta na 100 metara. Takođe je utvrđeno da su atletičari AK „Mladost“ iz Beograda prosečno viši, teži, poseduju veće obime natkolenice, potkolenice, duže kosti natkolenice i potkolenice, imaju veći obim trbuha i postižu bolje rezultate u trčanju na 100 i 400 metara u odnosu na atletičarke istog kluba. Ovaj rezultat je logičan ako se uzme u razmatranje činjenica, da se ispitanici nalaze u dugogodišnjem trenažnom procesu i da je selekcija jednim delom završena, tako da su ostali skoro najbolji, koji žele da se aktivno bave ovim sportom i koji postižu najbolje rezultate. Ako se pogledaju vrednosti rezultata na svim atletskim takmičenjima, lako se može uočiti da atletičari postižu bolje rezultate i bolja vremena. U dosadašnjim istraživanjima Jerkana (2009), dokazano je da su atletičari u konstituciji čitavog tela krupniji i poseduju razvijeniju muskulaturu u odnosu na atletičarke, što rezultira uočenim razlikama. Sagledavajući i aspekte svetskih rezultata na mitinzima i prvenstvima, kao i rezultate evropskih i svetskih rekorda, možemo konstatovati da su i u našem slučaju atletičari ostvarili očekivano bolje rezultate.

Od posmatranih povezanosti sistema prediktorskih varijabli na kriterijske varijable za atletičare, možemo objasniti zajednički varijabilitet kriterija i prediktorskih varijabli sa procentom koji se kreće u rasponu od 72% kod trčanja na 100 metara do 33% zajedničkog varijabiliteta kod trčanja na 400 metara. Kod atletičarki taj procenat je drugačiji: 51% kod trčanja 100 metara i 32% kod trčanja 400 metara. Regresionom analizom kriterija, utvrđeno je, da je povezanost sistema prediktorskih varijabli na *Trčanje 100 metara* statistički značajno samo kod atletičara, dok se kod ostalih sistema na isti kriterij ne zapaža. Značajnost sistema je statistički značajna jer je za brzinu trčanja 100 m karakteristična izrazita snaga mišića, koja mora biti podržana određenom konstitucijom, određenom visinom, težinom, obimima ekstremiteata, mišića (posmatrajući svetske trkače i trkačice na 100 m, 200 m i 400 m zapažamo da su svi izuzetno krupno građeni sa maksimalno izraženom muskulaturom, bez potkožne masti, izrazite snage i obima muskulature, jer snaga mišića zavisi od njegovog fiziološkog poprečnog preseka, odnosno, direktno je proporcionalna tom prese-

## DISCUSSION

The performance and the success in athletic disciplines depend on genetic disposition, completion of training aims and tasks, and environmental factors influence. The research has determined that some anthropometric dimensions, firstly those pertaining to longitudinal skeleton dimension such as the *Body height*, are, in statistical terms, significantly correlated with speed achieved by junior athletes in 100 meters run. It was also established that male athletes from AC *Mladost* from Belgrade are taller, heavier, with larger volume of upper and lower legs and abdomen, longer upper and lower leg bones and achieve better results in 100 and 400 meters runs than female athletes from the same club. If we take into consideration that the subjects have participated in training process for number of years and that the selection has been partially completed leaving just about the best, those who have chosen to actively perform and have been achieving the best results, this is a logical result. If all of the results are viewed together it is easy to note that male athletes accomplish better results and better time. Previous researches by Jerkan (2009) have proved that heavier and more muscular physique of the male athletes, compared to female, reflects in the noted result difference. Examination of world wide results accomplished in athletic events, world and European best recorded timings, we can verify that male athletes who have played part in our research have accomplished anticipated results.

Out of the considered correlations of the predictor and the criterion variables in male athletes we can explain the common variability of the criterion and predictor variables by means of percentage that ranges between 72% of common variability in 100 meters run and 33% in 400 meters run. In female athletes that percentage is different: 51% in 100 meters run and 32% in 400% meters run. By regression analyses of the criterion it was established that the correlation of predictor variables system in 100 meters run is statistically significant only in male athletes and it has not been noticed that the other systems have had influence on the criterion. The significance of the system is statistically significant since strength of muscles is a characteristic of running speed in 100 meters run but it must be supported by particular physique, height, weight, volume of legs and muscles (upon examination of world's both male and female 100, 200 and 400 meters runners we have noticed that all of them are of extremely heavy physique, of pronounced musculature, with no subcutaneous fat tissue), because the muscle strength depends on its physiological cross section, that is, it is in proportional relation with it. In our

ku). U našem slučaju statistička značajnost je izražena samo u trčanju na 100 metara kod atletičara.

Posmatrajući varijable pojedinačno, zaključuje se da samo varijabla za procenu longitudinalne dimenzionalnosti skeleta *Telesna visina* pokazuje statistički značajan uticaj na kriterijsku varijablu *Trčanje 100 metara* kod atletičara i 400 metara kod atletičarki, dok ostale varijable ne pokazuju statistički značajnu povezanost na date kriterije kod oba subuzorka. Ovo se može objasniti činjenicom, da što je atletičar viši, ima duže ekstremitete, duže kosti potkolenice, natkolenice (jer smo već zaključili da je dužina tih kostiju, pogotovo kostiju potkolenice, kao i obima natkolenice, koje su u matematički negativnoj, ali logički pozitivnoj statistički značajnoj korelaciji sa brzinom trčanja na 100 i 400 m kod atletičara), omogućava ostvarenje većih koraka, čime se smanjuje broj frekvence koraka na istoj dužini puta. Što su te duge poluge podržane odgovarajućom, kvalitetno izgrađenom muskulaturom mišića nogu pre svega, što se može prepostaviti iz vrednosti obima mišića, postići će se sigurno i dobri rezultati u brzini trčanja. Još jedno logično obrazloženje ove konstatacije leži u objašnjenju sa aspekta biomehanike: periferna brzina na krajevima dugačkih poluga, proporcionalna je dužini tih poluga, kod konstantne ugaone brzine koja se ostvaruje prilikom ostvarivanja odgovarajuće brzine trčanja koja se može zadržati relativno dugo i odgovarajuće količine mase mišića. Ovoj činjenici idu u prilog i konstatacije da je većina antropometrijskih dimenzija u matematički negativnoj, ali logički pozitivnoj korelaciji sa trčanjem na 100 i 400 metara kod atletičara i atletičarki. Ovo ukazuje na činjenicu da što su im vrednosti antropometrijskih dimenzija bile veće - izraženije, rezultati u trčanju su bili bolji. To važi za oba subuzorka sportista, a pre svega se odnosi na *Obim natkolenice* i *Telesnu visinu*. Rezultati istraživanja podržavaju činjenice izrazite morfološke građe današnjih sprintera u atletici i potkrepljuju nalaze Jovovića (2013), koji ukazuje da je krivulja brzine na kratke deonice trčanja direktno zavisna od motoričkih sposobnosti, tehničke umešnosti, morfoloških karakteristika i stanja specijalne pripremljenosti sprintera. Takođe ovaj rad potvrđuje deo istraživanja koji se odnosi na maksimalnu brzinu trčanja na kratke deonice koja prema Čohu, Bračiću i Smajloviću (2009) zavisi od različitih faktora koji su povezani sa morfološkim i fiziološkim karakteristikama sprintera.

## ZAKLJUČAK

Generalno se može istaći da se za postizanje odličnih rezultata u sprinterskim disciplinama u atletici, moraju posedovati i određene antropometrijske dimenzije

study we have found statistical significance to be considerable only in male athletes in 100 meters run.

Upon individual examination of the variables the conclusion has been reached that the only variable for assessment of longitudinal skeletal dimension, the *Body height*, has shown the statistically significant influence on the criterion variable in the *100 meters run* in male athletes and the *400 meters run* in female athletes. This can be explained in a way as taller the athlete longer the extremities, longer the upper and lower leg bones (since the conclusion is that length of bones, particularly lower leg bones, as well as the volume of the upper bone, which are mathematically negatively correlated but in a statistically significant positive logical correlation with running speed in 100 and 400 meters runs), enables longer pace, therefore, reducing their frequency. If these long levers have quality support, worthy leg muscles, the good running results are to be expected. Yet another explanation is due and in its essence pertains to biomechanics: periphery speed at the ends of a long lever is proportional to the length of the lever, at the constant diagonal speed achieved with proper running speed that can be maintained for relatively longer period and proper volume of muscle mass. This fact is supported by the fact that majority of anthropometric dimensions is in mathematically negative, but logically positive, correlation with speed of running in male and female athletes in 100 and 400 meters runs. This testifies to the fact that as higher the values of the anthropometric dimensions better the running results. In case of both subsamples it has been proved and, at first instance, applies to the *Upper leg volume* and the *Body height*.

The research results have confirmed that contemporary athletes, namely sprinters, have extraordinarily morphological build and support the findings by Jovović (2013) which point that the short track running pace is directly dependant on motor capabilities, technical skill, morphological characteristics and sprinter's readiness. Also, the findings by Čoh, Bračić, & Smajlović (2009) who claimed that short distance maximum speed depends on various factors which are related to morphological and physiological characteristics of sprinters have been verified.

## CONCLUSION

In general it can be argued that to achieve excellent results in sprint races the athletes must possess certain anthropometric dimensions which, in order to reach the maximum of functional potential, ought to be accompa-

koje moraju biti na pravi način praćenje i transformisane trenažnim sadržajima u maskimalne moguće iskoristive potencijale, radi postizanje vrhunskih rezultata. Sve ovo se postiže jedino pravilnom selekcijom dece. Za dalja istraživanja predlaže se određivanja frekvencije koraka, kao i tehnike trčanja u određivanju prediktivnosti brzine trčanja mlađih atletičara i atletičarski, pošto se njihova tehnika nije u potpunosti izgradila.

**Izjava autora**  
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**Konflikt interesa**  
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nied and transformed by the training process. This goal is achieved firstly by appropriate selection of children in sport. It is suggested that future research to determine predictability of running speed in young male and female athletes should consider pace frequency as well as running techniques since their technique has not yet been fully developed.

**Authorship statement**  
*The authors have contributed equally.*

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# ODNOS FUNKCIONALNO-MOTORIČKIH KAPACITETA I NJIHOV UTICAJ NA SPECIFIČNA KRETANJA U ELITNOM ŽENSKOM KADETSKOM FUDBALU

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**Sažetak:** Osnovni cilj ove studije je bio da se procijeni međusobni odnos, povezanost funkcionalno-motoričkih kapaciteta aerobna izdržljivost, brzinska izdržljivost, startno ubrzanje, maksimalna brzina trčanja, brzina trčanja, agilnost i eksplozivna snaga elitnih fudbalerki kadetkinja, kao i njihov uticaj na realizaciju specifičnih fudbalskih kretnih struktura.

Uzorak ispitanica za ovo istraživanje je bio sačinjen od 21 igračice U17 Fudbalske reprezentacije Crne Gore. Testiranje je sprovedeno tokom redovnog okupljanja reprezentativki u periodu zimske pauze u sezoni 2012/2013. godine. Navedene fiziološke karakteristike su testirane testovima: Yo Yo intermitentni test oporavka (nivo1), sprint 10 m iz stojećeg stava, sprint 20 m letiči start, sprint 30 m stojeći stav, slalom trčanje, 300 jardi, skok iz čučnja sa pripremom, i skok udalj s mesta, dok su specifična fudbalska kretanja, kao kriterijum, procjenjivana testom slalom sa loptom.

Ovom studijom je utvrđeno da rezultati svih primijenjenih testova međusobno značajno koreliraju, odnosno imaju statistički značajnu povezanost. Takav slučaj se nije desio samo kod korelacionih koeficijenata koji su izračunati za test skok iz čučnja sa pripremom, koji je značajnu povezanost imao samo sa testom 300 jardi ( $r=-.51$ ,  $p < .05$ ). Ovom studijom je takođe utvrđeno da ovakav sistem pokazatelja fizioloških potencijala ima statistički značajan uticaj na kvalitet realizacije specifičnih fudbalskih kretnih struktura ( $R^2=.73$ ,  $p < .05$ ), dok je od svih nezavisnih pokazatelja samo test slalom trčanje imao statistički značajnu predikciju kriterijumskog rezultata u testu slalom sa loptom ( $\beta=.65$ ,  $p < .05$ ).

# THE RELATIONSHIP BETWEEN FUNCTIONAL MOTOR CAPACITIES AND THEIR INFLUENCE ON THE SPECIFIC MOVEMENTS IN ELITE CADET FEMALE SOCCER

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**Abstract:** The basic goal of this study was to estimate the mutual relationship, correlation of functional motor capacities aerobic power, speed endurance, start acceleration, maximal running speed, running speed, agility and explosive strength of elite female cadet soccer players, and their impact on the execution of specific soccer movement structures.

The sample of female examinees for this research was made of 21 female players of U17 Montenegrin national team. The testing was carried out during a regular gathering of players of the national team in the period of winter pause in the season 2012/2013. The listed physiologic characteristics were tested by the following tests: Yo Yo intermittent recovery test (level 1), sprint 10 m from standing posture, sprint 20 m flying start, slalom running, 300 yards, countermovement jump and standing long jump, while the specific soccer movements, as the criterion were estimated by the test of slalom with a ball. This study served to prove that the results of all applied test mutually significantly correlate, namely they have a statistically important connection. Such a case did not obtain only for correlation coefficients which were calculated for a test squat jump with a preparing, which had an important link only with a test 300 yards ( $r=-.51$ ;  $p < .05$ ). This study also proved that such a system of indicators of physiologic potentials has a statistically important impact on a quality of execution of the specific soccer movement structures ( $R^2=.73$ ;  $p < .05$ ), while for all independent indicators, only a test slalom running had a statistically important prediction of a criterion result in a test slalom with a ball ( $\beta=.65$ ;  $p < .05$ ).

**Ključne riječi:** funkcionalno-motorički kapaciteti, specifična kretanja, ženski fudbal.

## UVOD

Fudbal je najpopularniji sport na svijetu i industrija vrijedna više od 400 milijardi američkih dolara širom svijeta. Od toga se 80% generiše u Evropi, ali njegova popularnost raste i u Sjedinjenim Američkim Državama. Procijenjeno je da je u ranim osamdesetim godinama dvadesetog vijeka bilo 22 miliona fudbalera na svijetu, a i taj broj je u stalnom porastu. U Sjedinjenim Američkim Državama fudbal je sada glavni sport na nivou srednje škole i koledž nivou (Mueller, Cantu i Van Camp, 1996). Fudbal je kao igra dovoljno složen da ne bude osmišljen od strane samom jedne kulture, ali i dovoljno jednostavan da postane najpopularniji timski sport na svijetu (Guttman, 1993). Tokom dvadesetog vijeka fudbal je postao najpopularniji timski sport na svijetu (Dunning, 1999).

S razvojem fudbala i njegove popularnosti, raslo je i naučno interesovanje za njega. Većina naučnih radova se ipak realizovala u prostoru muškog fudbala.

Tanović (2010) ističe da nedostaju naučne spoznaje koje pojašnjavaju antropološki status fudbalerki i povezanost istog sa uspjehom u ženskom fudbalu. Sigurno da je utjecaj pojedinih antropoloških dimenzija na uspjeh u ženskom fudbalu različit i da će bolje rezultate postići ona igračica kod koje su ti odnosi optimalni. Dalje isti autor navodi da razvoj ženskog fudbala ne može ići brže bez relevantnih informacija i spoznaja, koje bi sadašnje stanje unaprijedilo i rapidno pokrenulo naprijed.

Međutim i pored toga učešće u ženskom fudbalu se značajno povećalo u posljednjem periodu. Procjenjuje se da žene participiraju u fudbalu u 132 zemlje, sa više od 1,4 miliona samo u Velikoj Britaniji u različitim godištima i nivoima takmičenja (Rosenbloom i sar., 2006).

Danas, ženski fudbal je jedan od najbrže razvijajućih timskih sportova na svijetu: od 2000. do 2006. godine, broj žena koje igraju fudbal registrovan od strane FIFA, porastao je preko 50% (FIFA, 2006). Ženski fudbal broji preko 26 miliona učesnika širom svijeta, u 208 samostalnih asocijacija. (FIFA, 2012). Između ostalog, Njemačka ima preko 1 miliona registrovanih fudbalerki (Deutscher Fussbal-Bund, 2009), dok i Švedska i Danska imaju približno po 60000 registrovanih igračica (Dansk Boldspil-Union, 2009; Svenska Fotbollförbundet, 2008). Tokom 2004. godine odigrano je 448 međunarodnih utakmica u kojima je igralo 134 zemlje (FIFA, 2007, according to Andersson, 2010).

FIFA procjenjuje da je u 2010. godini bilo više fud-

**Key words:** functional motor capacities, specific movements, female soccer.

## INTRODUCTION

Soccer is the most popular sport in the world and is an industry worth over US\$400 billion world wide. 80% of this is generated in Europe, though its popularity is growing in the United States. It has been estimated that there were 22 million soccer players in the world in the early 1980s, and that number is increasing. In the United States soccer is now a major sport at both the high school and college levels (Mueller, Cantu and Van Camp, 1996). The soccer game is complex enough not to be invented independently by many preliterate cultures and yet simple enough to become the world's most popular team sport (Guttman, 1993). During the twentieth century, soccer emerged as the world's most popular team sport (Dunning, 1999).

With the development of soccer and its popularity is growing scientific interest in soccer science research. Most scientific papers are still realized in the area of men's soccer.

Tanovic (2010) argues that there are no scientific knowledge explaining the anthropologic status of female players and a connection of it with a success in women's soccer. It is obvious that the impact of certain anthropologic dimensions on the success in women's soccer is different and a better insight will attain a female player having these relation optimal. Furthermore, the same author argues that the development of women's soccer cannot advance faster without relevant information and knowledge, which would improve a present state and rapidly push it in advance.

However, beside that, a participation in women's soccer has increased significantly in recent times. It is estimated that women in 132 countries participate in soccer, with up to 1.4 million alone in the UK playing at various age groups and levels of competition (Rosenbloom i sar., 2006).

Today, women's soccer is one of the fastest growing team sports in the world: from 2000 to 2006 the number of female soccer players registered with FIFA, grew over 50% (FIFA, 2006). Female soccer has over 26 million participants around the world and 208 member associations (FIFA, 2012). Among other, Germany has over one million registered female soccer players (Deutscher Fussbal-Bund, 2009), while both Sweden and Denmark have approximately 60000 registered players (Dansk Boldspil-Union, 2009; Svenska Fotbollförbun-

balerki nego fudbalera (Davies, 2005).

Ženski fudbal je postao savremena i moderna igra sa svim svojim karakteristikama, kao što ga igraju i muškarci. Na našim prostorima ženski fudbal je na samom začetku. Ženski fudbal svakodnevno doživljava svoju ekspanziju, pa tako i kod nas on ima uvjete da postane masovni sport i da zadovolji veliki broj djevojaka za kretanjem i igrom (Tanović, 2010).

Međutim, ne može se potpuno opravdano reći da istraživanja u ženskom fudbalu imaju malo, preciznije je kazati da ih nema dovoljno i da ih je potrebno znatno više, kako bi se pokušale riješiti sve postojeće dileme i promjene do kojih dolazi skoro svakodnevno, sa razvojem ženskog fudbala.

Dosadašnja istraživanja govore da fudbalerke junioarke posjeduju značajno niži aerobni kapacitet od elitnih seniorki, što ukazuje na to, da se obrazac aktivnosti omladinskog fudbala donekle razlikuje od igre seniorki (Mujika i sar., 2009). Sa druge strane, Mohr i sar. (2008) ističu da dobre anaerobne sposobnosti i kvalitetno razvijen aerobni potencijal predstavljaju preuslov za uspešno bavljanje ženskim fudbalom na vrhunskom nivou, bez obzira na starost.

Na osnovu ranijih radova moguće je konstatovati da se u okviru naučnih istraživanja u ženskom fudbalu može uočiti jedan problem. Taj problem predstavlja nedostatak informacija koje se odnose na one funkcionalno-motoričke potencijale koji bi direktno, ili posredno mogli definisati fundamentalnu fiziološku osnovu, koja može u potpunosti odrediti uspješnu sportsku karijeru jedne mlađe fudbalerke. Vremenski prostor koji odvaja mlađe kategorije od seniorskog nivoa u ženskom fudbalu je značajno drugačiji od istog tog perioda u muškom fudbalu. Raniji process definisanja svih sposobnosti i karakteristika kod ženskog pola u odnosu na muški, čini period u kojem se mlađe fudbalerke sportski razvijaju, mnogo kraćim i zahtjevnijim u odnosu na isti taj period kod njihovih kolega u muškom fudbalu.

U svom istraživanju Idrizović (2013) ističe da se kao neminovan zaključak nameće činjenica da postoje značajne razlike u obliku homogenizacije manifestnih motoričkih pokazatelja kod momaka i djevojaka. Takvi rezultati omogućavaju zaključak da motorički potencijali muškog i ženskog pola ne funkcionišu na potpuno isti način. Iako ovako prezentirana informacija najčešće ne znači ništa novo, ako se uzmu u obzir trenažni programi, koji se svakodnevno realizuju sa pripadnicima i jednog i drugog pola, biće potpuno jasno da postoji ogroman prostor za direktnu primjenu ovakvih saznanja, koja govore da funkcionalno-motorički potencijal muškarca i žena ne

det, 2008). During 2006, 448 female international games were played in 134 countries (FIFA, 2007, according to Andersson, 2010).

FIFA estimates that in the year 2010, there will be more women playing football than men (Davies, 2005).

Woman's soccer has become a contemporary and modern sport with all its characteristics, as in case in men's game. However, in our areas, woman's soccer is at its very beginning. Women's soccer daily experiences its expansion, so it also has the conditions in our area to become a mass sport and to satisfy a big number of girls for movement and game (Tanovic, 2010).

However, it cannot be quite reasonably said that the researches in women's soccer are small in number, it is more precise to tell that there are insufficient number of them and it is necessary to carry out more of them, in order to attempt to solve all existing dilemmas and changes emerging almost daily with the development of women's soccer.

The former researches tell that that junior female players possess a significantly lower aerobic capacity than that of elite senior players, indicating that the activity pattern of youth soccer will differ somewhat from senior play (Mujika et al., 2009). On the other side Mohr et al. (2008) highlight that good anaerobic capabilities and welldeveloped aerobic fitness are pre-requisites to successful performance at elite level in women's soccer, regardless of age.

On the basis of previous works, it is possible to state that one problem can be observed within scientific researches in women's soccer. This problem represents a shortage of information related to those functional-motoricity potentials which would be able to directly, or indirectly define a fundamental physiologic basis, which entirely can determine a successful sport career of a young female soccer player. The time framework separating younger categories from a senior level in women's soccer is significantly different from this the same period in male soccer. The earlier process of defining of all abilities and characteristics in female soccer in relation to male soccer, whose time interval in which young female players develop in sport is much shorter and demanding in relation to the same period for their peers in men's soccer.

In his research, Idrizovic (2013) highlights that, as an unavoidable conclusion, emerges the fact that there are important differences in the shape of homogenization of manifest motoricity indicators for girls and boys. Such results enable the conclusion that a motoricity potential of male and female sex do not function in an exactly the

funkcioniše na identičan način. Sa druge strane, nalazi ovog i sličnih istraživanja, mogu označiti veoma bitna pomak u pristupu ukupnom sportskom treningu i jednog i drugog pola, posebno u njegovom kondicionom dijelu. Ukoliko se zaključci ovakvih istraživanja budu uzeli ozbiljno u obzir, što bi morao biti prioritet, relativno brzo bi se došlo do veoma značajnog napredka u ispravljanju svakodnevnih grešaka u treningu i dostizanju funkcionalno-motoričkih limita i jednog i drugog pola.

Kasnije, na seniorskom nivou, razlike koje postavlja sama fudbalska igra u ženskom i muškom fudbalu su veoma male. Krstrup i sar. (2005) ističu da su zahtjevi u elitnom ženskom fudbalu slični zahtjevima kod elitnog muškog fudbala, posebno u pogledu srednjih vrijednosti intenziteta utakmice (oko 85% od maksimalne srčane frekvencije), kao savladane distance tokom utakmice (oko 10 km).

Povezanost funkcionalno-motoričkih kapaciteta mladih fudbalerki još uvijek nije do kraja istražena. White (2009) objavljuje da su rezultati skoka u vis kod fudbalerki koledž lige povezani sa rezultatima u testovima 20 m sprint i 40 m sprint, ali ne statistički značajno. Pauole i sar. (2000) su pronašli statistički značajnu povezanost rezultata na testu brzine 40 m i agilnosti i kod fudbalera i kod fudbalerki.

Upravo je osnovni cilj ovog istraživanja bio da se procijeni međusobni odnos funkcionalno-motoričkih kapaciteta aerobna izdržljivost, brzinska izdržljivost, startno ubrzanje, maksimalna brzina trčanja, brzina trčanja, agilnost i eksplozivna snaga elitnih fudbalerki kadetkinja, kao i njihov uticaj na realizaciju specifičnih fudbalskih kretnih struktura.

## METOD RADA

Uzorak ispitanica za ovo istraživanje je bio sačinjen od 21 igračice U17 Fudbalske reprezentacije Crne Gore. Testiranje je sprovedeno tokom redovnog okupljanja reprezentativki u periodu zimske pauze u sezoni 2012/2013. godine.

Reprezentativke crnogorske nacionalne selekcije su testirane tokom dva dana. Prvog dana su realizovani testovi za procjenu startnog ubrzanja, maksimalne brzine trčanja, brzine trčanja, eksplozivne snage donjih ekstremiteta horizontalnog tipa i aerobnog potencijala, koji je procijenjivan sa Yo Yo intermittent testom oporavka (nivo1), testom koji se fokusira na sposobnost sprovođenja isprekidanog rada, koji dovođi do maksimalne aktivacije aerobnog sistema (Bangsbo, Iaia i Krstrup, 2008). Maksimalna potrošnja

same way. Although such presented information in most cases do not mean anything new, if consider training programs which are daily carried out with players of both sexes, it will be entirely obvious that there is a huge space for direct application of such knowledge telling that functional-motoricity potential of men and women do not function in an entirely the same way. If the conclusions of such researches are seriously taken into account, what must be a priority, a very important advancement in the correction of daily errors in trainings, attainment of functional-motor limit of both sexes, will emerge.

Latter, at the senior level, the differences that a game places in women's and men-s soccer are very small. Krstrup et al. (2005) highlight that the demands of elite women's soccer are reported to be similar to that of elite male soccer regarding the mean match intensity (about 85% of maximal heart rate), and distance covered (about 10 km).

Correlations of functional motor capacities of young female football players are still not fully investigated. White (2009) reported that high jump results of collegian female footballers are associated with 20 and 40 m sprint meters but not statistically significant. Pauole et al. (2000) found a significant correlation between the results of 40 m speed and agility of male and female football students.

The basic goal of this research is to estimate a mutual relationship of physiological characteristics of an aerobic power, speed endurance, start acceleration, maximal running speed, running speed, agility and an explosive strength of elite cadets in women's soccer, and their impact on the execution of specific soccer movement structures.

## METHODS

The sample of the examinees for this research was made of 21 female player of U17 Montenegrin national team. The testing was carried out during a regular gathering in the period of a winter break during the season 2012/13.

The female players of Montenegrin national team were tested for two days. In the first day, the tests for the estimation of a start acceleration, maximal running speed, running speed, explosive strength of lower limbs of a horizontal type and aerobic capacity were carried out. Aerobic capacity was estimated with Yo Yo intermittent recovery test (level 1). Test focuses on the capacity to carry out intermittent exercise leading to a maximal activation of the aerobic system (Bangsbo, Iaia and Krstrup, 2008). Maximal oxygen uptake, VO<sub>2max</sub> were

kiseonika, VO<sub>2max</sub> je statistički značajno povezana sa rezultatima u testu YYIRTL1 (Krstrup i sar., 2005; Castagna i sar., 2006). Drugog dana su realizovani testovi za procjenu kvaliteta specifičnih fudbalskih kretanja, agilnosti, eksplozivne snage donjih ekstremita vertikalnog tipa i brzinske izdržljivosti. Navedeni funkcionalno-motorički potencijali su procijenjivani testovima: sprint 10 m iz stojećeg stava, sprint 20 m leteći start, sprint 30 m stojeći stav, skok udalj s mesta i Yo Yo intermitentni test oporavka (nivo1) prvo dana i to upravom redoslijedom kako su i nabrojani, a drugog dana: slalom sa loptom, slalom trčanje, skok iz čučnja sa pripremom i 300 jardi, takođe redoslijedom kako su i navedeni u ovom tekstu.

Svi testovi su realizovani na otvorenom travnatom terenu uz korišćenje elektronskih instrumenata za precizno mjerjenje vremena.

Ispitanici su svaki test izveli dva puta, sa najmanje 3 minuta pauze između ponavljanja, izuzimajući testove YYIRTL1 i 300Y, koji su izvedeni samo jednom, nakon kompletognog oporavka koji je potreban kod fudbalerki detkinja. Bolji rezultat od dva mjerena je uzet za analizu. Svi testovi su sprovedeni više od 48 sati, nakon takmičenja ili teškog fizičkog treninga kako bi se minimizirao uticaj zamora na testiranje performansi.

Fudbalerke su bile u potpunosti informisane o svim testovnim procedurama, prije nego su dale svoju pismenu saglasnost o svom učeću u njima.

Sve statističke analize su sprovedene korišćenjem SPSS paketa verzija 21.0. Deskriptivna statistika je izračunata za sve korišćene varijable. Regresionom i koreacionom analizom su determinisane povezanost prediktorskih varijabli (10M, 20M, 30M, SLJ, CMJ, Zig Zag, YYIRTL1 and 300Y) i njihov uticaj na kriterijum (slalom sa loptom). Statistička značajnost je određena na nivou  $p<0.05$ .

## REZULTATI

U tabeli 1 su date numeričke vrijednosti osnovnih statističkih parametara za sve primjenjene varijable.

Ukupan broj izračunatih koeficijenata korelaciije u ovom radu je 36 (tabela 2). Od tog broja 24 koreaciona koeficijenta, ili 66,66% su statistički značajna. Najveću vrijednost  $r=.97$ , među statistički značajnim koeficijentima ima onaj koji pokazuje povezanost rezultata na testovima 20M – sprint 20 m leteći start, 30M – sprint 30 m stojeći stav, a najmanju  $r=.45$ , koeficijent koji označava povezanost rezultata na testovima ZIG – slalom trčanje i SLJ – skok udalj s mjesta.

significantly related to YYIRTL1 (Krstrup et al., 2005; Castagna et al., 2006). In the second day the tests for the estimation of a quality of specific soccer movements, agility, explosive strength, explosive strength of lower limbs of vertical type and speed stamina were carried out. The mentioned physiologic characteristics are tested by the following tests: sprint 10 m from standing position, sprint 20 m flying start, sprint 30 m standing position, standing jump and Yo Yo intermittent recovery test (level 1) during the first day and in an order as listed, and during the other day: slalom with a ball, slalom running, squat jump wit a preparing and 300 yards, also in order as listed in this text.

All tests were performed on an outdoor grass pitch, and electronic timing gates were used to record completion times.

Subjects performed two trials of each test, with at least 3 minutes of rest between all trials, except for YYIRTL1 and 300Y tests which were realized once, and the realization of which required a complete recovery of female soccer players. The best performances in each test were used for analysis. All tests were conducted more than 48 hours following a competition or hard physical training to minimize the influence of fatigue on test performance.

The players were fully-informed of all the experimental procedures before giving their written informed consent to participate.

All statistical analyses were conducted using version 21.0 of the Statistical Package for the Social Sciences (SPSS, 2012). Descriptive statistics were calculated for all experimental data. Linear regression and Pearson product movement coefficient of correlation was used to determinate relationship between criterion variable (Zig zag with ball) and prediction variables (10M, 20M, 30M, SLJ, CMJ, Zig Zag, YYIRTL1 and 300Y ), and between the predictor variables separately. Statistical significance was set at  $p<0.05$ .

## RESULTS

The numerical values of basic statistical parameters for all applied variables are given in table 1.

The total number of correlation coefficients in this work is 36 (table 2). Twenty-four correlation coefficients, or 66,66% of this number are statistically significant. The highest values  $r=.97$ , among the statistically significant coefficients has the one which shows the connections of results in tests 20M and 30M, and the lowest values of coefficients,  $r=.45$ , is for the one marking the connection of results in tests ZIG and SLJ.

**Table 1.** Deskriptivna statistika procijenjenih varijabli

Var/Parametar / Var/Parameter	Min	Max	Mean	SD
YYIRTL1 (m)	240.00	880.00	552.38	206.15
10M (s)	1.96	2.38	2.16	.11
20M (s)	2.88	3.50	3.11	.20
30M (s)	4.87	5.86	5.27	.30
ZIG (s)	5.63	6.75	6.19	.31
ZIGB (s)	8.07	10.84	9.34	.83
CMJ (cm)	20.40	44.30	26.70	5.17
300Y (s)	61.92	92.05	77.11	8.40
SLJ (cm)	157.00	215.00	187.76	16.72

**YYIRTL1** – Yo-Yo intermittent recovery test (level 1), 10M – 10 m sprint from a stationary start position, 20M – 20 m “flying” sprint, 30M – 30 m sprint from a stationary start position, ZIG – Zig-Zag test, ZIGB – Zig-Zag with ball, CMJ – countermovement jump, 300Y – 300 yards shuttle, SLJ – standing long jump

**Table 1.** Basic Descriptive Parameters of Tested Variables

**YYIRTL1** – Yo Yo intermitentni test oporavka (nivo1), 10M – sprint 10 m iz stojećeg stava, 20M – sprint 20 m leteći start, 30M – sprint 30 m stojeći stav, ZIG – slalom trčanje, ZIGB – slalom sa loptom, CMJ – skok iz čučnja sa pripremom, 300Y – 300 jardi, SLJ – skok udalj s mjesta

**Table 2.** koreaciona analiza procijenjenih varijabli

Varijable	YYIRTL1	10M	20M	30M	ZIG	ZIGB	CMJ	300Y	SLJ
YYIRTL1	1.00								
10M #	-.61* p=.00	1.00							
20M #	-.51* p=.01	.80* p=.00	1.00						
30M #	-.59* p=.00	.92* p=.00	.97* p=.00	1.00					
ZIG #	-.47* p=.03	.57* p=.00	.77* p=.00	.73* p=.00	1.00				
ZIGB #	-.23 p=.32	.33 p=.15	.50* p=.02	-.46* p=.04	.73* p=.00	1.00			
CMJ	.40 p=.07	-.30 p=.18	-.27 p=.23	-.33 p=.14	-.42 p=.05	-.23 p=.31	1.00		
300Y #	-.69* p=.00	.67* p=.00	.62* p=.00	.68* p=.00	.50* p=.02	.07 p=.76	-.51* p=.02	1.00	
SLJ	.28 p=.22	-.68* p=.00	-.77* p=.00	-.78* p=.00	-.45* p=.04	-.10 p=.66	.27 p=.23	-.54* p=.01	1.00

**YYIRTL1** – Yo Yo intermitentni test oporavka (nivo1), 10M – sprint 10 m iz stojećeg stava, 20M – sprint 20 m leteći start, 30M – sprint 30 m stojeći stav, ZIG – slalom trčanje, ZIGB – slalom sa loptom, CMJ – skok iz čučnja sa pripremom, 300Y – 300 jardi, SLJ – skok udalj s mjesta, \*p<0.05, #- inversno skalirana varijabla

Kriterijumska varijabla u ovom istraživanju (ZIGB) slalom sa loptom od osma prediktorskih varijabli ostvarila je statistički značajnu korelaciju samo sa tri, i to 20M, 30M, i slalom trčanje.

**Table 2.** Correlation Between Variables

**YYIRTL1** – Yo-Yo intermittent recovery test (level 1), 10M – 10 m sprint from a stationary start position, 20M – 20 m “flying” sprint, 30M – 30 m sprint from a stationary start position, ZIG – Zig-Zag test, ZIGB – Zig-Zag with ball, CMJ – countermovement jump, 300Y – 300 yards shuttle, SLJ – standing long jump, \*p<0.05, # – inversely scaled variables

The criterion variable in this research (ZIGB) Zig-Zag with ball of eight predictor variables has accomplished statistically significant correlation with only three, 20M, 30M and Zig-Zag running respectively.

**Table 3.** Regresiona analiza

	<b>BETA</b>	<b>St. Err. of BETA</b>	<b>B</b>	<b>St. Err. of B</b>	<b>t(12)</b>	<b>p-level</b>
Intercept			-11.92	7.63	-1.56	.14
YYIRTL1	.07	.24	.00	.00	.31	.76
10M	-1.10	2.39	-8.21	17.73	-.46	.65
20M	-1.70	3.98	-6.83	16.02	-.42	.67
30M	3.37	6.23	9.14	16.87	.54	.59
ZIG*	.65	.27	1.76	.74	2.37	.03*
CMJ	-.05	.26	-.00	.04	-.18	.85
300Y	-.46	.25	-.04	.02	-1.79	.09
SLJ	.50	.30	.02	.01	1.64	.12

**YYIRTL1** – Yo Yo intermitentni test oporavka (nivo1), 10M – sprint 10 m iz stojećeg stava, 20M – sprint 20 m leteći start, 30M – sprint 30 m stojeći stav, ZIG – slalom trčanje, CMJ – skok iz čučnja sa pripremom, 300Y – 300 jardi, SLJ – skok udalj s mjesta, \* - značajan na nivou p<0.05

Rezultati regresione analize su dati u tabeli 4. Cjelokupan sistem primijenjenih prediktorskih varijabli je pokazao statistički značajan uticaj na kriterijum ( $R=.85$ ;  $R^2=.73$ ;  $p=.01$ ), dok je od svih primijenjenih prediktorskih varijabli samo slalom trčanje ( $BETA=.74$ ;  $p=.03$ ) pokazao statistički značajan uticaj na rezultate u kriterijumskom testu slalom sa loptom.

**Table 4.** Parcijalna korelacija

	<b>Tolerance</b>	<b>R<sup>2</sup></b>	<b>Parcijalna korelacija</b>	<b>p-level</b>
YYIRTL1	.37	.62	.08	.76
10M	.00	.99	-.13	.65
20M	.00	.99	-.12	.67
30M	.00	.99	.15	.59
ZIG*	.29	.70	.56	.03*
CMJ	.31	.68	-.05	.85
300Y	.33	.66	-.46	.09
SLJ	.24	.75	.42	.12

**YYIRTL1** – Yo Yo intermitentni test oporavka (nivo1), 10M – sprint 10 m iz stojećeg stava, 20M – sprint 20 m leteći start, 30M – sprint 30 m stojeći stav, ZIG – slalom trčanje, CMJ – skok iz čučnja sa pripremom, 300Y – 300 jardi, SLJ – skok udalj s mjesta, \* - značajan na nivou p<0.05

**Table 3.** Multiple Regression Analysis

**YYIRTL1** – Yo-Yo intermittent recovery test (level 1), 10M – 10 m sprint from a stationary start position, 20M – 20 m “flying” sprint, 30M – 30 m sprint from a stationary start position, ZIG – Zig-Zag test, ZIGB – Zig-Zag with ball, CMJ – countermovement jump, 300Y – 300 yards shuttle, SLJ – standing long jump, \* - significant on level p<0.05

The results of regression analysis are given in table 4. The entire system of applied predictor variables has shown statistically significant impact on a criterion ( $R=.85$ ;  $R^2=.73$ ;  $p=.01$ ), and of all applied predictor variables only slalom running ( $BETA=.74$ ;  $p=.03$ ) has shown a statistically significant impact on the results in the criterion test a Zig-Zag with ball.

**Table 4.** Partial Correlation

**YYIRTL1** – Yo-Yo intermittent recovery test (level 1), 10M – 10 m sprint from a stationary start position, 20M – 20 m “flying” sprint, 30M – 30 m sprint from a stationary start position, ZIG – Zig-Zag test, ZIGB – Zig-Zag with ball, CMJ – countermovement jump, 300Y – 300 yards shuttle, SLJ – standing long jump, \* - significant on level p<0.05

## DISKUSIJA

Za fudbalerke crnogorske reprezentacije uzrasta U17 se na osnovu rezultat ovog istraživanja može reći da su ostvarile bolje rezultate u testu 20M, odnosno da su brže, od svojih nešto mlađih koleginica (U13 i U15) u radu Taylor i sar. (2012), što je i potpuno razumljivo s obzirom na razliku u starosnoj dobi.

Takođe, fudbalerke iz ovog rada su ostvarile bolji prosječni rezultat na Yo Yo intermitentnom testu oporavka (nivo 1) od svojih brazilskih kolega iste starosne dobi iz istraživanja Lollo i sar. (2007). Kako se YYIRTL1 test koristi za procjenu fizičkih meč-performansi (Bangsbo et al., 2008), to se može zaključiti da su fudbalerke u ovoj uzrasnoj dobi sa većim nivoom performansi od njihovih muških kolega. Takav podatak se nalazi u polju fiziološki razumljivih, posebno kada se u obzir uzme činjenica, da se djevojčice u odnosu na dječake, u intervalu maksimalno ubrzanog tjelesnog razvoja, nalaze više od dvije godine ranije (Hauspie i Wachholder, 1986) i da generalno biološki razvoj, pa samim tim i prirodno definisanje svojih funkcionalno-motoričkih potencijala završavaju u periodu koji se u odnosu na muški pol događa znatno ranije. Upravo se VO<sub>2</sub>max kao osnovni pokazatelj aerobnog potencijala brže razvija kod ženskog pola, dok postiže veći stepen kod muškog pola (Geithner, 2004). Test YYIRTL1 se upravo i koristi za procjenu aerobnih kapaciteta (Milanović i sar., 2012).

Ovakav podatak, mora se konstatovati ne omogućava zaključak da su djevojke u ovom uzrastu funkcionalno-motorički na većem nivou od njihovih muških kolega, iz razloga što su ostali kapaciteti, prije svega snaga i brzina prednost muškog pola. Prema tome, ukupne fizičke meč-performanse ipak idu na stranu fudbalera. Dio, koji je zbog rezultat ovog istraživanja, potrebno svakako nglasiti, jeste da na testu na kojem se procjenjuju takvi kvaliteti, fudbalerke ove uzrasne dobi nerijetko ostvaruju bolje rezultate. Potvrda za ovakve tvrdnje se može naći u velikom broju dosadašnjih radova, a kao potpuno odgovarajuće, specifično fudbalsko istraživanje Neto i sar. (2007) pokazuje da mladi brazilski fudbaleri uzrsta U15, postižu bolje rezultate na testovima CMJ i 30M, nego njihove crnogorske koleginice.

Sa druge strane, jedan broj istraživanja kao Castagna i sar. (2009) donosi rezultate u kojima su fudbaleri uzrasta U15, na testu YYIRTL1 postigli značajno bolje rezultate od ispitanica iz ovog istraživanja.

Korelacioni koeficijenti, odnosno njihova statistička značajnost, koja je utvrđena ovim radom, govore o dvije veoma bitne stvari. Prva je da su rezultati u svim primjenjenim testovima međusobno značajno povezani,

## DISCUSSION

On the basis of the results of this research it can be said that female players of Montenegrin national team U17 attained better results in test 20M, namely they are faster than their a little younger peers (U13 and U15) in research Taylor et al. (2012), what is absolutely understandable in regard of their age.

Also, the female soccer players from this work have accomplished a better result in Yo Yo intermittent test of recovery (level 1) than their Brazilian peers of the same age from the research by Lollo et al. (2007). Since YYIRTL1 tests used for the estimation of the physical match performance (Bangsbo et al., 2008), it can be concluded that the female soccer players of these age show bigger level of performances than their male peers. Such a fact can be found in the area of a physiologic understandable space, especially when considering the fact that the girls, in comparison to the boys, are for more than two years longer in the interval of maximally accelerated body development, (Hauspie and Wachholder, 1986) and, generally, a biological development and physical shaping of their functional-motoricity potentials end in a time interval which, in relation to male sex, finishes fairly earlier. The VO<sub>2</sub>max, as a basic indicator of an aerobic potential, actually faster develops in female, while it accomplishes a better level for male (Geither, 2004). The YYIRTL1 test is actually used for the estimation of aerobic capacities (Milanovic et al., 2012).

It must be stated that such a procedure do not disable the conclusion that the girls in this age are functionally-motoricity at the higher level than their male colleagues, because the other capacities, firstly strength and speed, are the advantage of male. Therefore, the total physical match performance goes to the side of male soccer players. The part, which belongs to this research, which needs to be highlighted is that, in the test where such qualities are estimated, the female soccer players of this age infrequently accomplish better results. The proof for this can be found in a big number of former researches, and as a quite suitable, in a specific soccer research by Neto et al. (2007) shows that younger Brazilian soccer players of age U15, accomplish better results in tests CMJ and 30M than their Montenegrin colleagues.

On the other side, a certain number of researches such as Castagna et al. (2009) bring the results in which the soccer players of age U15, in YYIRTL1 test, accomplished better results than the examinees from this research.

The correlation coefficients, namely their statistic significance proven by this work, tell about two very important things. The first is that the results in all applied tests are mutually significantly related, and the other

a druga da se po svojoj specifičnosti izdvaja test skok iz čučnja sa pripremom (CMJ), koji je pokazao veoma visok nivo samostalnosti. Posebno interesantan podatak odnosi se na koeficijent korelacije između testa CMJ i skok udalj s mjeta (SLJ), koji nije statistički značajan, a što je suprotno od dosadašnjih zaključaka (Markovic i sar., 2004). Oba ova testa uobičajeno se koriste za procjenu eksplozivne snage donjih ekstremiteta, dok su u ovom istraživanju međusobno pokazali visok nivo differentnosti. Osnovni razlog za ovakav odnos testa CMJ prema SLJ testu, prije svega je u karakterističnostima njihovih kretnih struktura. U realnim okolnostima se ne izvode često i nezavisne su jedna od druge, tako da tehnika izvođenja igra veoma značajnu ulogu, posebno kod ispitanica koje ranije nisu imale iskustva sa ovim testovima. Kada kažemo tehnika, mislimo na sposobnost eksploracije mišićnih potencijala. U prilog ovoj konstataciji su i vrijednosti koeficijenata korelacije između testa SLJ i sva tri testa za procjenu brzinskih kvaliteta trčanja, i koja imaju visok nivo značajnosti, dok sa druge strane rezultati testa CMJ nisu značajno povezani ni sa jednim od ovih testova.

Jedinu značajnu korelaciju test CMJ je postigao sa testom za procjenu brzinske izdržljivosti 300Y. Ukoliko se analizira kretanje ispitanika tokom testa 300Y, može se uočiti da tokom trajanja tog testa ispitanica mora 11 puta promijeniti smjer kretanja, tokom kojih fleksija i ekstenzija u zglobu koljena ima bitne sličnosti sa takvim kretanjima u testu CMJ. Drugačije rečeno, eksplozivni potencijal, koji se procjenjuje testom CMJ, direktno utiče na rezultat u testu 300Y.

Veoma značajan podatak, koji donosi koreaciona matrica, a koji zapravo predstavlja suštinu funkcionalno-motoričkih potencijala crnogorskih fudbalerki, koji su bili predmet ovog istraživanja, jesu koreacioni koeficijenti koje je ostvario test 300Y. Osim sa kriterijumskim testom ZIGB, ovaj test ima statistički značajnu povezanost sa svim preostalim testovima. Kako se radi o kretnim strukturama koje procjenjuju veoma različite fiziološke potencijale, jedini zaključak koji se na osnovu ovog podatka može izvesti jeste da su ispitanice iz ovog istraživanja pokazale izuzetno ujednačen nivo kondicionih kvaliteta. U istraživanju Lundin (2012) test 300Y je ostvario statistički značajnu povezanost sa testom YYIRTL1 i testom 40 yardi. Sa druge strane test YYIRTL1 nije ostvario statistički značajnu povezanost sa testovima za procjenu eksplozivne snage donjih ekstremiteta SLJ i CMJ, što je rezultat, koji je u dijelu testa CMJ identičan sa rezultatima u radu Hunter (2009).

is that a test squat jump with a preparing (CMJ) which has shown a very high level of independence, especially differs for its specificity. Especially interesting data is related to the correlation coefficient among a test CMJ and standing long jump (SLJ), which is not statistically significant, and it is opposite to the previous conclusions (Markovic et al., 2004). Both these tests are usually used for the estimation of an explosive strength of lower limbs, while in this research, they show a high mutual lever of difference. The basic reason for such relation of a CMJ test toward SLJ test is, first of all, in the characteristics of their mutual structures. In real contexts they are not performed frequently and are independent from each other, therefore the technique of performing plays a very important role, especially for the examinees which earlier had not had an experience with these tests. When we mention a technique, we think about an ability of a muscle potential exploitation. The values of correlation coefficients between SLJ test and all three tests for the estimation of speed qualities of running, and which have a high significance levels speak in favor of this statement, while, on the other side, the results of CMJ tests are not significantly related to any of these tests.

The CMJ tests accomplished the only significant correlation with the test for the estimation of speed endurance 300Y. If the movement of the examinees during the tests 300Y is analyzed, it can be seen that, during the test duration, an examinee must change movement direction 11 times, during which the flexion and extension in a knee chuckle have important similarities with such movements in test CMJ. In other words, the explosive potential, estimated by CMJ test, directly influences the result in 300Y test.

The very important data, brought by a correlation matrix, and which actually represent the basis of the functioning of function-motoricity potentials of Montenegrin female soccer players, which were the topic of this research, are correlation coefficients accomplished by 300Y. Except for the criterion test ZIGB, this test has a statistically significant connection with all other tests. Since these are movement structures which estimate very different physiologic potentials, the only conclusion which can be drawn from this is that the examinees from this research show an exceptionally equalised level of physical conditioning qualities. In Lundin's (2012) study, test 300Y achieved a statistically significant correlation with the test YYIRTL1 and the test 40 yards. On the other side YYIRTL1 test did not achieve a statistically significant association with tests to assess lower limb explosive strength SLJ and CMJ, as a result, which is part of the CMJ test, identical to the results of the study of Hunter (2009).

Kriterijumski test u ovom radu „slalom sa loptom“, značajno je korelirao sa rezultatima testova brzine trčanja 20M i 30M, dok je značajno viši nivo povezanosti ostvario sa testom za procjenu agilnosti ZIG.

Na osnovu dobijenih rezultata ovog istraživanja može se reći da ovakav prediktorski sistem funkcionalno-motoričkih potencijala ima veoma veliki uticaj na rezultate u kriterijumskom testu slalom sa loptom ( $R^2=.73$ ). Međutim na individualnom nivou statistički značajan uticaj je ostvario samo test slalom trčanje. To znači, da se na individualnom nivou, samo na osnovu rezultata testa ZIG mogu predviđati rezultati u kriterijumskom testu ZIGB.

Uzimajući u obzir činjenicu da su testovi koji nisu ostvarili statistički značajan uticaj procijenivali aerobnu izdržljivost, brzinsku izdržljivost, startno ubrzanje i brznu trčanja, kao i eksplozivnu snagu donjih ekstremiteta, postaje značajnije izdvajanje testa za procjenu agilnosti, kao jedinog sa statistički značajnom predikcijom rezultata u testu za procjenu kvaliteta specifičnih fudbalskih kretnih struktura. Na osnovu takvih rezultata se može konstatovati da su ispitanice sa kvalitetnijom agilnošću ujedno vladale kvalitetnijom fudbalskom tehnikom. Kako agilnost kao sposobnost predstavlja jedinstvo brzinskih i koordinacionih sposobnosti, što su pokazali i rezultati korelace analize, a uzimajući u obzir statističku značajnost regresionih koeficijenata u ovom istraživanju, može se zaključiti da kvalitet specifičnih fudbalskih kretnih struktura zavisi od funkcionalno-motoričkih kvaliteta kakvi su agilnost, brzina i koordinacija.

## ZAKLJUČAK

Na osnovu svih rezultata do kojih se došlo ovim istraživanjem, može se konstatovati da su crnogorske reprezentativke uzrasne dobi U17 determinisane kao uzorak koji ima visok nivo poduarnosti između primijenjenih funkcionalno-motoričkih pokazatelja. Takav podatak govori o visokom stepenu homogenosti uzorka ispitanica, kada su njihovi kondicioni potencijali u pitanju.

Visoka specifičnost testa CMJ, koja je detektovana ovim radom, može poslužiti kao kvalitetna informacija u svim budućim istraživanjima, koja budu tretirala mlađe uzrasne kategorije u ženskom fudbalu. Nezavisnost rezultata ovog testa je posebno značajna u odnosu na rezultate testova SLJ, 10M, 20M i 30M, sa kojima bi se po prirodi, odnosno karakteru mišićne kontrakcije trebao podudarati. Može se pretpostaviti da je takvim rezultatima doprinijelo kretanje ruku, kao veoma bitan element u ovakvim testovima, a koje se ne pojavljuje kod CMJ.

The criterion test in this work Zig-Zag with ball, significantly correlated with results of tests speed of running 20M and 30M, while, it accomplished significantly higher level of a connection with a test for the estimation of an agility.

On the basis of the obtained results of this research, it can be said that such a predictor system of functional-motoricity potential has a big impact on the results in a criterion test Zig-Zag with a ball ( $R^2=.73$ ). However, only test slalom running accomplished statistically significant result on an individual level. This means that, on an individual level, the results in a criterion test ZIGB can be predicted only on the basis of ZIG test.

Having in mind the fact that the tests which have not accomplished statistically significant impact estimated aerobic power, speed endurance, start acceleration and running speed, and an explosive strength of lower limbs, the extraction of a tests for the estimation of agility becomes more significant, and it is the only one with a statistically significant prediction of results in the test for the estimation of qualities of specific soccer movement structures. On the basis of such results, it can be stated that the examinees with a more quality agility also dominated with a more quality soccer techniques. Since an agility as ability represents the unity of speed and coordination abilities, what was shown by the results of correlation analyse and taking into account statistically significance of regression coefficients in this research, it can be concluded that a quality of specific soccer movement structures depends on functional-motoricity qualities such as agility, speed and coordination.

## CONCLUSION

On the basis of results obtained in this research, it can be stated that the female members of Montenegrin national soccer team U17 determined as a sample having a high level of coincidence among the applied functional-motoricity indicators.

The high specificity of CMJ test, detected in this work, can serve as a quality information in every future researches which will treat the young age categories in women's soccer. The independence of results of this type is especially important in relation to the results of tests SLJ, 10M, 20M ad 30M, with which would by nature, namely by the character of a muscle contraction should coincide. It can be assumed that the hand movement contributed to such results, as a very important element in such tests which doesn't in CMJ test.

The main conclusion of this work, based on its main goal, would be that, beside also mentioned high level of

Glavni zaključak ovog rada, zasnovan na njegovom glavnem cilju, bi bio, da pored već navedenog visokog nivoa povezanosti funkcionalno-motoričkih kvaliteta, koji su bili predmet ovog rada, specifične fudbalske kretne strukture fudbalerki uzrasta U17 direktno zavise od kvaliteta njihove agilnosti.

**Izjava autora**  
Autori pridonijeli jednakо.

**Konflikt interesa**  
Mi izjavljujemo da nemamo konflikt interesa.

connection of functional-motoricity quality, which were the issue of this work, specific soccer structures of female soccer players age U17, directly depend of the quality of their agility.

#### **Authorship statement**

The authors have contributed equally.

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## STAVOVI I MOTIVACIONE DETERMINANTE STUDENTKINJA KAO FAKTOR OPREDELJENJA PREMA UNIVERZITETSKOM SPORTU

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**Apstrakt:** Glavno obeležje vremena u kome danas mlađi žive jeste deficit fizičke aktivnosti u svim društvenim slojevima. Drastično smanjenje kretanja i telesne aktivnosti direktno se odražava i na njihov zdravstveni status. Studentska populacija, takođe, nije izuzeta iz ovakvih trendova.

Uočavajući relevantne probleme daljeg funkcionisanja i razvoja univerzitetskog sporta u Srbiji, gde posebnu pažnju privlači determinizam ka stvaranju uslova za zadovoljenje potreba i interesovanja studenata za fizičkom aktivnošću i unapređenju zdravlja, identifikovana je neophodnost utvrđivanja osnovnih parametara za pravilno organizovanje i usmerenje studentskog sporta. U tom kontekstu posebno se naglašava položaj ženske studentske populacije za koju su vezani izrazito negativni pokazatelji o njihovom učešću u fizičkim i sportskim aktivnostima. Kako na Univerzitetu, tako i u svakodnevnom životu

Ovakve tendencije povod za akcentiranje značaja i potrebe prepoznavanja optimalne strategije razvoja Univerzitetskog sporta, kako u Republici Srbiji, tako i na području AP Vojvodine, ali i pojedinačnih Univerziteta kao osnovne "mikro celine" gde sportske aktivnosti studenata mogu da imaju određene specifičnosti i karakteristike.

Na uzorku od 197 ispitanika, koji su sačinjavale studentkinje Univerziteta Educons iz Sremske Kamenice, primenom tehnike skaliranja, izvršeno je istraživanje o stavovima i motivima prema sportu na Univerzitetu.

**Ključne reči:** stavovi, motivi, studentkinje, univerzitetski sport

## ATTITUDES AND MOTIVATIONAL DETERMINANTS OF FEMALE STUDENTS AS A FACTOR OF CHOICE ABOUT UNIVERSITY SPORT

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**Abstract:** The main characteristic of modern times, in which youth live, is the deficiency of physical activity throughout all social layers. Radical decrease in physical movement and activity is directly reflected in their health. Student population is not exempt from these trends.

Noting the relevant problems of further functioning and development of university sport in Serbia, where determination to create conditions necessary to meet students' needs and interests in the realm of physical activity and improvement of health is drawing a special attention, the necessity to determine basic parameters for a proper organization and orientation of student sport was discovered. In that context, the emphasis is placed on the female student population which is associated with extremely low participation in physical and sports activities at the University, as well as in everyday life. These tendencies are the reason to call the attention to the significance and need for recognition of optimum development strategy of university sport in the Republic of Serbia, and on the territory of AP (Autonomous Province) of Vojvodina, including individual universities as basic "micro units" where students' sports activities can have their own peculiarity and characteristics. The research sample consisted of 197 female students from the University of Educons in Sremska Kamenica. The scaling technique was used to research the attitudes and motives in relation to sport at the University.

**Key words:** attitudes, motives, female students, university sport

## UVOD

Fizička aktivnost u celini, a posebno sport, u procesu obrazovanja mladih treba da predstavlja značajan faktor u izgrađivanju, očuvanju i unapređenju njihovih bio-psihosocijalnih karakteristika. Ideja reafirmacije i povratka sporta na univerzitete treba da se oslanja, u prvom redu, na njegovu izvornu profilisanost. Ona je dimenzionirana kroz tri osnovna aspekta: 1) doprinosa u stvaranju svestrane ličnosti mladih, 2) razvijanja i širenja opštih sportskih vrednosti među studentskom populacijom (posebno kroz aktivno podsticanje na prijateljstvo, saradnju, fer igru, istrajnlost, samosvojnost, itd.) i 3) podsticanja takmičarskog duha, posebno kroz akcentovanje motiva postignuća, s obzirom da je ovde reč o visoko obrazovanim mladim ljudima, koji će se jednoga dana naći na ključnim položajima u društvu gde će biti okruženi svim mogućim vrstama „utakmica i nadmetanja“.

Razmatranja različitih aspekata savremenih tendencija u sportu ne mogu se sveobuhvatno sagledavati ukoliko se ne obrati pažnja i na najvažnije tekovine starogrčkog filozofskog uma. One su veoma značajne za apostrofiranje težnji za očuvanje olimpijskog duha u sportu i sprečavanje deformisanja njegovih izvornih principa, među kojima valja pomenuti i sledeće: negovanje autentičnih svojstava igre, uspostavljanje harmonije tela i duha, kao i očuvanje estetskih i moralnih principa u sportu. Tako je i u današnjoj, modernoj sintagmi „univerzitetski sport“, ustvari, utemeljena stara Platonova ideja *kalokagatije*<sup>1</sup>, koja upućuje na potrebu uspostavljanja skladnog i harmoničnog jedinstva čovekovih telesnih i duhovnih sposobnosti. Doduše, ona je u praksi vremenom ustuknula pred ideologizacijom i komercijalizacijom sporta i sportskih događaja, gde dominira prevaga politike, šou biznisa, profitnih faktora, zabave i sl. (Radoš, Nešić, 2010).

U novom vremenu, u kome su na scenu stupile neke druge životne vrednosti, naši univerziteti izgleda više nisu ona mesta na kojima se, osim sticanja naučnih znanja, estetskih, moralnih i kulturnih vrednosti, posvećuje relevantna pažnja i fizičkom vežbanju, odnosno sportu, kao važnim faktorima u formiranju celovite čovekove ličnosti. Sintagma „univerzitetski sport“ već, sama po sebi, upućuje (i u ontološkom i u aksiološkom smislu) na potrebu negovanja harmoničnog jedinstva između čovekovih telesnih i duhovnih sposobnosti (Nešić i sar., 2010).

Glavno obeležje vremena u kome danas mladi žive jeste deficit fizičke aktivnosti u svim društvenim slojevima.

<sup>1</sup> (grč. *kalos*= lep i *agatos* = dobar)

## INTRODUCTION

Physical activity in general, and especially sport, should represent a significant factor in youth education, that is, in development, maintenance, and improvement of their bio-psychosocial characteristics. The idea of reintroduction and return of sport to universities should primarily rely on its original orientation, which can be viewed through three basic aspects: 1) contribution to creation of versatile youth personality 2) development and expansion of general sports values among student population (especially through active encouragement of friendship, cooperation, fair play, endurance, individuality, etc.), and 3) encouragement of sporting spirit, especially through emphasis on the achievement motive, taking into account the fact that these are highly educated young people, which will once find themselves occupying key positions in society where they will be surrounded with all kinds of “games and competitions”.

The examination of different aspects of contemporary tendencies in sport cannot be comprehensive unless one pays attention to the most important legacies of the Ancient Greek philosophy. These are very significant as they emphasize aspirations to preserve the Olympic spirit in sport and to prevent deterioration of its original principles, among which it is worthy to mention the following: cultivation of authentic attributes of the game, establishment of harmony between the body and spirit, as well as preservation of aesthetical and moral principles in sport. Thus, in today's modern scheme “the university sport” is the embodiment of the old Platonic idea called *kalokaghatia*<sup>1</sup>, which is about the need for establishment of concordant and harmonic unity of man's bodily and spiritual faculties. Although, the reality has seen this idea diminishing in time, as the sport and sporting events became ideologized and commercialized, and with politics, show business, profit, entertainment and such, dominating the arena (Radoš & Nešić, 2010).

In modern times, which foster different life values, it seems that our universities are not any longer the places where aside from gaining knowledge, aesthetical, moral and cultural values, sufficient attention is dedicated to physical exercise, that is, to sport as an important factor of holistic personality development. The phrase “university sport” in itself (in ontological and axiological sense) indicates the necessity of cultivation of harmonious unity between man's bodily and spiritual faculties (Nešić et al., 2010).

The main characteristic of modern times, in which youth live, is the deficiency of physical activity thro-

<sup>1</sup> (Greek. *kalos*= beautiful i *agatos* = good)

vima. Drastično smanjenje kretanja i telesne aktivnosti direktno se odražava i na zdravstveni status mladih. Studentska populacija, takođe, nije izuzeta iz ovakvih tren-dova. Svetska zdravstvena organizacije je još sredinom prošlog veka definisala da zdravlje nije samo odsustvo bolesti već i potpuno fizičko, psihičko i društveno blagostanje (WHO, 1946). Poslednjih godina definicija je proširena da bi uključila i sposobnost da se vodi „društveno i ekonomski produktivan život“. Takođe, savremena nauka kvantitativno definiše zdravlje kao sumu „rezervnih kapaciteta“ osnovnih funkcionalnih sistema. U tom smislu danas je neophodno sve više isticati da svaki pojedinc, a posebno mladi, treba da razmišljaju da li svojim načinom života troše i smanjuju rezerve zdravlja (Nešić i sar., 2011).

## ISTRAŽIVAČKO POLAZIŠTE

Fizičkom vaspitanju, a time i sportu, nekada je u akademskom prostoru bivše zajedničke države Jugoslavije pridavan izuzetan značaj, što je bilo prepoznatljivo po aktivnostima i vrednostima univerzitetskog sportskog stvaralaštva. Međutim, u Srbiji su nakon 1998. godine i tada donešenog Zakona o univerzitetima, sportske aktivnosti na akademskom prostoru ove zemlje gotovo zamrle. Malobrojne sportske sekcijske i udruženja, koja su se i nakon ovog perioda zadržala, bila su više izraz stihije i rutine, odnosno, pojedinačnog pregalaštva aktivista-entuzijasta, nego osmišljen i svrshishodan deo sistema visokoškolskog obrazovanja.

Nacionalna strategija razvoja sporta u Republici Srbiji je kao prioriteten strategijski cilj definisala: „... jačanje školskog i univerzitetskog sporta i uspostavljanje funkcionalnog sistema školskih i univerzitetskih sportskih takmičenja“. Međutim, još uvek ne postoji jasna i vremenski determinisana koncepcija razvoja ovog sportskog područja, što za posledicu ima spontanu i stihiju egzistenciju nekih oblika sporta na Univerzitetu. Sadašnji uspesi na takmičenjima studentskog sporta su više rezultat drugih sportskih organizacija, nego li organizovanog sportskog života unutar Univerziteta. Studenti, pored ostalog, nemaju svoje objekte za vežbanje i takmičenje na fakultetima, jasno i stručno uobičaćen sistem upražnjava sportskih aktivnosti primeren njihovim interesovanjima i potrebama (Nešić, 2003), a posebno problemsko pitanje je nemogućnost korišćenja javnih sportskih objekata u neposrednom okruženju. Navedene činjenice su povod za akcentiranje značaja i potrebe prepoznavanja optimalne strategije razvoja univerzitetskog sporta, kako u Republici Srbiji, tako i na području AP Vojvodine, ali

ugrhout all social layers. Radical decrease in physical movement and activity is directly reflected in their health. Student population is not exempt from these trends. The World Health Organization defined health not only as the absence of sickness, but as the total physical, psychological, and social wellbeing (WHO, 1946). In the recent years, this definition has been extended to include the ability to lead “socially and economically productive life”. Additionally, contemporary science defines health quantitatively as the sum of “reserve capacities” of the basic functional systems. In this sense, it is necessary to emphasize the need for each individual, and especially for the young, to think whether or not they decrease their health reserves by their way of life (Nešić et al., 2011).

## RESEARCH POSTULATES

Physical education, and therefore sport as well, used to be regarded as highly significant in the academic environment of the former Yugoslavia. This was evident in the activities and values of the university sport creativity. However, after 1998 and the Law on universities which was then passed, sports activities in the academic environment of this country almost vanished. Few sports clubs and associations which remained after this period were more expressions of randomness and routine, that is, of individual efforts of activists-enthusiasts, rather than a designed and intentional part of the higher education system.

The national strategy of sports development in the Republic of Serbia defined its priority strategic goal as: „...strengthening of school and university sport and establishment of functional system of school and university competitions“. Nevertheless, there is still no clearly defined plan of development of this aspect of sport or the time frame of its execution, which consequently leads to spontaneous and random existence of some forms of sport at universities. Present success in university competitions comes more due to other sports organizations, rather than due to organized sports activities at universities. Students, among the rest, do not have their own facilities for exercising and competing at colleges, or clearly and professionally designed program for practicing sports activities which would be suitable to their interests and needs (Nešić, 2003), and there is the problem of not being able to use public sports objects in their immediate surroundings. The aforementioned facts are the reason to emphasize the importance and need for recognition of optimum development strategy of university sport both

i pojedinačnih univerziteta kao osnovne "mikro celine" gde fizičko vežbanje studenata treba da ispoljava određene specifičnosti (Fratrić, Ilić, 2010).

Uočavajući relevantne probleme daljeg funkcionisanja i razvoja univerzitetskog sporta, gde posebna pažnja treba da bude usmerena ka stvaranju uslova za zadovoljenje potreba i interesovanja studentske populacije za fizičkom aktivnošću i unapređenju zdravlja, neophodno je utvrditi osnovne parametre za njegovo pravilno organizovanje i usmerenje. U tom kontekstu neophodno je posebno naglasiti položaj ženske studentske populacije, za koju se povezuju izrazito negativni pokazatelji o njihovom učeštu u fizičkim i sportskim aktivnostima. Kako na Univerzitetu, tako i u svakodnevnom životu uopšte. Utvrđivanje njihovih stavova prema ideji o reafirmaciji sporta na Univerzitetima (Nešić, Kuburović, 2011), kao i motivacionih determinanti (Mitić, 1992) za uključivanje u programe fizičkog vežbanja, kako na Univerzitetu, tako i u slobodnom vremenu (Campbell i Willis, 1992) predstavljaju prvi korak u definisanju mogućih pravaca poboljšanja društvenog i ličnog položaja ovog dela studentske populacije.

## METOD RADA

Istraživanje koje je realizovano u okviru šireg istraživačkog projekta na Univerzitetu Educons tokom školske 2011/2012. godine, kao transverzalna studija, uz primenu Servej metoda, imalo je za cilj, između ostalog, detekciju stavova prema univerzitetском sportu, kao i njihovih motivacionih dispozicija za uključivanje u aktivnosti fizičkog vežbanja na Univerzitetu.

Uzorak ispitanika sačinjavalo je 197 studentkinja Univerziteta Educons iz Sremske Kamenice. U pogledu uzrasnih karakteristika bio je segmentiran kroz pet kategorija, a utvrđene su sledeće frekvencije: 18-20 godina (31%), 21-25 godina (23,9%), 26-30 godina (11,7%), 31-35 godina (8,6%) i preko 35 godina (24,9%).

Kao osnovni instrument istraživanja korišćen je anketni upitnik. Za ispitivanje stavova studentkinja prema nekim aspektima sporta na Univerzitetu primenjena je petostepena skala Likertovog tipa. Skala za procenu stavova bila je konstruisana od ukupno 15 indikatora koji su obuhvatili sledeće tvrdnje: (1) Sportske aktivnosti na fakultetima predstavljaju nepotrebno opterećenje za studente, (2) Fakultet nije mesto za upražnjavanje sportskih aktivnosti, (3) Sportske aktivnosti studenata doprinose boljem društvenom zbližavanju mlađih, (4) Bavljenje sportom povoljno utiče na psihofizički razvoj mlađih, (5) Bavljenje sportom je ometajući faktor u vreme ispitnog

in the Republic of Serbia and on the territory of AP of Vojvodina, including the individual universities as basic "micro units" where students' physical exercising should express peculiar characteristics (Fratrić & Ilić, 2010).

Noting the relevant problems of further functioning and development of university sport, where special attention needs to be focused on creation of conditions that are required for meeting students' needs and interests in the realm of physical activity and improvement of health, it is necessary to determine basic parameters for its proper organization and orientation. In that context, one needs to emphasize the position of female student population, which is associated with extremely low participation in physical and sports activities at universities and outside it. Identification of their attitudes toward the idea of sports' reintroduction at universities (Nešić & Kuburović, 2011), as well of motivational determinants (Mitić, 1992) necessary for participation in the exercising programs, both at universities and in their free time (Campbell & Willis, 1992), represents a first step in defining the possible ways to improve the social and personal position of female student population.

## RESEARCH METHOD

The research, which was undertaken through a larger joint project at the University of Educons, during the 2011/2012 school year, as a cross-sectional study, via the application of the survey method, had a goal, among the rest, to identify attitudes toward university sport as well as the motivational dispositions that determine participation in physical exercises at the University.

The sample consisted of 197 female students of the University of Educons from Sremska Kamenica. The sample was divided into five age categories with the following frequencies of occurrence: 18-20 year olds (31%), 21-25 year olds (23.9%), 26-30 year olds (11.7%), 31-35 year olds (8.6%) and over 35 years old (24.9%).

The main instrument of the research was the survey. In order to examine female students' attitudes toward some aspects of sport at the University, a five point Likert-type of scale was utilized. The scale was constructed of 15 indicator statements which are encompassed in the following claims: 1) sports activities at colleges are a needless burden for students, 2) college is not a place for practicing sports activities, 3) sports activities foster closer social relationships among students, 4) doing sports has a beneficial effect on psycho-physical development of the young, 5) doing sports is a hindrance during exams, 6) sports competitions at uni-

roka, (6) Sportska takmičenja na Univerzitetima su samo uzaludno "bacanje" vremena i novca, (7) Univerzitetski sport u Vojvodini je dobro razvijen, (8) Sportska takmičenja između fakulteta treba što češće organizovati, (9) Na fakultete bi trebalo uvesti obavezne časove sportskih aktivnosti, (10) Sportske aktivnosti na fakultetu treba da budu isključivo stvar ličnog opredeljenja studenata, (11) Organizovano upražnjavanje sportskih aktivnosti na fakultetu bi trebalo da "ulazi" u sistem ECTS bodovanja, (12) Fakultet bi trebao da organizuje najmanje dva puta nedeljno sportske aktivnosti za svoje studente, (13) Sportskim i sportsko-rekreativnim aktivnostima na fakultetu bi trebalo da se bave i profesori, (14) Vrhunski sportisti bi trebali da imaju povlašćen tretman prilikom upisa na fakultete, i (15) Vrhunski sportisti bi trebali da imaju određene povlastice tokom studiranja. Odgovori su davani na petostepenoj skali, gde je vrednost 1 (jedan) izražavala najmanju važnost tvrdnje, dok je vrednost 5 (pet) određivala najviši nivo tvrdnje.

Za detekciju motivacionog prostora primjenjen je Campbellov upitnik motivacije (Campbell i sar., 2001), koji je za ovu priliku modifikovan i prilagođen potrebama i ciljevima istraživanja. Originalan upitnik, koji obuhvata 13 motiva za vežbanje, ovom prilikom je kondenzovan na ukupno 9 socijalnih motiva koji se najčešće pojavljuju kao pokretači za upražnjavanje fizičkih aktivnosti. Ispitanicima je postavljeno pitanje "Koliko bi Vam prilikom upražnjavanja sportskih aktivnosti na Univerzitetu bilo važno": (1) Održavanje ili poboljšanje zdravlja, (2) Druženje i upoznavanje novih prijatelja, (3) Dobar izgled, (4) Opuštanje i zaboravljanje na svakodnevne brige, (5) Zabava i razonoda, (6) Smanjenje telesne težine, (7) Osećaj živahnosti i raspoloženja, (8) Biti u trendu; dokazati se "pred drugima", i (9) Dokazati se "kod sebe samoga". Odgovori su davani na petostepenoj skali Likertovog tipa, gde je vrednost 1 (jedan) izražavala najmanju važnost motiva, a vrednost 5 (pet) je određivala najveći nivo značajnosti svakog motiva.

Rezultati su obrađeni postupcima deskriptivne i komparativne statistike. Manifestni prostor stavova i motivacije obrađen je tehnikom skaliranja, dok je njihov latentni prostor detektovan primenom faktorske analize.

## REZULTATI I DISKUSIJA

Karakter istraživanja uslovio je opservaciju određenih karakteristika ispitanika koje su bile usmerene na pojedine aspekte njihovog ranijeg kontakta sa sportom. Utvrđeno je da je većina studenatkinja ranije upražnjavala neki oblik sportske aktivnosti, odnosno bavljenje sportom je bilo zastupljeno u njihovom životu pre dolaska na

versities are a waste of time and money, 7) university sport in Vojvodina is well developed, 8) inter-college sports competitions should be organized as frequently as possible, 9) colleges should introduce compulsive classes of sports activities, 10) sports activities at colleges should be entirely a matter of students' personal choice, 11) organized sports activities at colleges should count in the ECTS credit point system, 12) colleges should organize sports activities for their students at least twice a week, 13) professors should also do sports and recreational activities, 14) top athletes should be privileged when entering a college, and 15) top athletes should have certain privileges during their studies. The responses were given on a 5 point scale, where the value of number 1 (one) expressed the least importance of the claim, while the value of number 5 (five) expressed the highest importance of the claim.

Campbell's survey of motivation was used for identification of motivational factors (Campbell et al., 2001), which was modified and adapted for this occasion to the needs and aims of this research. The original survey which contains 13 motives for exercising was condensed here to 9 social motives which appear the most frequently as driving force behind one's engagement in physical exercises. The examinees were asked, "How important would this be to you while doing sports activities at the University?": 1) health maintenance and improvement, 2) socializing and making new friends, 3) good looks, 4) relaxing and forgetting of everyday worries, 5) fun and recreation, 6) losing weight, 7) feeling lively and spirited, 8) following trends; showing off in front of others, and 9) proving yourself to you. The responses were marked on a five point Likert-type scale, where the value of 1 (one) expressed the least importance of a motive, and the value of 5 (five) expressed the highest importance of a motive.

Descriptive and comparative statistics was used for analysis of the results. Manifested space of attitudes and motivation was analyzed through the scaling technique, while their latent space was identified through the factor analysis.

## RESULTS AND DISCUSSION

The nature of this research prompted observation of examinees' characteristics which have to do with specific aspects of their previous contact with sport. It was found that most of the female students had done some kind of sports activities, that is, doing sports had been a part of their life before starting a college. However,

fakultet. Međutim, samo manji broj njih je bio uključen u sport kroz takmičarski oblik, dok je većina sport "konzumirala" kroz neki od vidova rekreacije (Tabela 1).

Kada je reč o trenutnom angažovanju ispitanika u sportu mogu se uočiti mnogo nepovoljniji rezultati. Najveći broj njih se više uopšte ne bavi sportom (79,7%), dok je broj aktivnih sportistkinja (takmičarki) gotovo zanemarljiv (Tabela 2).

**Tabela 1.** Prethodno bavljenje sportom

	Ranije bavljenje sportom	f	%	Način bavljenja	f	%
Da		132	67,0	rekreativno	83	42,13
				amaterski	36	18,27
				takmičarski	13	6,59
Ne		65	32,99			
Σ		197	100,0			

**Tabela 2.** Sadašnje bavljenje sportom

Bavi se sportom	f	%
Rekreativno	27	13,7
Amaterski	7	3,6
Takmičarski	6	3,0
Ne	157	79,7
Σ	197	100,0

Ovakvi rezultati se mogu smatrati i očekivanim, kako sa aspekta karaktera samog Univerziteta (preovlađuju fakulteti društvenih nauka, gde nema studijskih programa kineziološkog karaktera), tako i sa stanovišta opštih karakteristika populacije kojoj studentkinje Univerziteta Edukons pripadaju (Grupa autora, 2008; Stepanović i sar., 2009). Drugim rečima, ispitanici obuhvaćeni istraživanjem mogu se smatrati autentičnim predstavnicima prosečne ženske studentske populacije u Vojvodini i Novom Sadu.

Pojam stava kao psihološke kategorije veoma je važan faktor u proučavanju neke društvene pojave. Stavovi kao motivaciona podloga čovekovog angažovanja u određenoj oblasti značajni su za utvrđivanje pojedinih karaktera same aktivnosti, posebno u pravcu vođenja računa o, npr: njegovim doživljajima u oceni i shvatanju određene situacije, emocijama kojima reaguje na spoljašnje i unutrašnje faktore aktivnosti, akcijama kojima menja situacije, itd. Zbog toga stav, kao stečena dispozicija, poseduje snagu spremnosti da se na određeni način opaža, misli, emocionalno reaguje i deluje, te pred-

only a small number of them competed in sport, while the majority engaged in sport as a form of recreational activity (Table 1).

When it comes to the current sports engagement of examinees, the results are very unfavorable. Most of them do not engage in sports at all (79.7%), while the number of active students who compete is almost negligible (Table 2).

**Table 1.** Previous sports experience

Previous sports experience	f	%	Type of engagement	f	%
Yes	132	67.0	Recreational	83	42.13
			Non-professional	36	18.27
			Professional	13	6.59
No	65	32.99			
Σ	197	100.0			

**Table 2.** Present sports experience

Does sports	f	%
Recreationally	27	13.7
Non-professionally	7	3.6
Professionally	6	3.0
No	157	79.7
Σ	197	100.0

These results were to be expected, both due to the configuration of the University itself (with the majority of social sciences colleges, without programs of kinesiological nature), and due to the population structure of the female students at the University of Educons (Group of authors, 2008; Stepanović et al., 2009). In other words, the examinees included in the research can be considered authentic representatives of an average female student population in Vojvodina and Novi Sad.

The notion of attitude as a psychological category is a very important factor in studying certain social phenomena. Attitudes as motivational background of man's engagement in specific activities are significant for determining the quality of the activity itself, especially when it comes to, for example: one's experiences related to assessment and understanding of a certain situation, emotional responses to external and internal factors of an activity, actions undertaken to change situations, etc. Therefore, attitude, as an acquired disposition, exists as a strong inclination to observe matters in a certain way, to think, to react emotionally and act; it also appears as a

stavlja tendenciju da se pozitivno ili negativno reaguje prema određenim situacijama, pojavama, objektima ili, pak, osobinama. U zavisnosti od smera stava i njegovog intenziteta, u ovom slučaju od pozitivnog ili negativnog stava prema pojavama i aktivnostima univerzitetskog sporta, moguće je utemeljiti pretpostavke o uspešnosti u njegovoju budućoj organizacionoj reaffirmaciji.

U mnogobrojnim istraživanjima koja su tretirala problematiku stavova, većina psihologa i sociologa, nai-me, kao metodološki limit za određivanje smera stava uzima vrednost 3, što znači da svaka prosečna vrednost koja prevaziđa ovaj numerus određuje pozitivan stav. Na osnovu primjenjenog instrumenta istraživanja kojim su izraženi indikatori stava o pojedinim aspektima univerzitetskog sporta, utvrđeno je da ispitanici, generalno, izražavaju pozitivan stav o ovom problemu. Međutim, uočljivo je da se njegov intenzitet kreće na nivou umerene pozitivnosti ( $Sv = 3,60$ ), što jasno govori o kompleksnosti ove tematike (Tabela 3).

tendency to positively or negatively react to certain situations, phenomena, objects or characteristics. Depending on the orientation and intensity of an attitude, in this case whether it is a positive or negative attitude toward affairs and activities related to university sport, it is possible to form a hypothesis about its success in some future organizational reinstatement.

In numerous researches which dealt with attitudes, majority of psychologists and sociologists use the value of number 3 as the methodological limit that indicates the average value, which means that all the values beyond this limit are denoting a positive attitude. When it comes to the instrument which was used in this research to indicate attitudes about specific aspects of university sport, it was found that examinees, in general, have a positive attitude about this issue. Nevertheless, it is evident that its intensity ranges around moderate positivity ( $Sv = 3,60$ ), which clearly speaks about the complexity of this matter (Table 3).

**Tabela 3.** Skalne vrednosti stavova ispitanika**Table 3.** Scale values of examinees' attitudes

Tvrđnje/ Claims	Uopšte se ne slažem / I strongly disagree	Uglavnom se ne slažem / I mostly disagree	I slažem se i neslažem se / I both agree and disagree	Uglavnom se slažem / I mostly agree	Potpuno se slažem / I strongly agree	SV
IS1	76 38,8%	36 18,4%	55 28,1%	15 7,7%	14 7,1%	<b>3,74</b>
IS2	87 44,4%	38 19,4%	38 19,4%	18 9,2%	15 7,7%	<b>3,83</b>
IS3	2 1,0%	7 3,6%	21 10,8%	77 39,5%	88 45,1%	<b>4,24</b>
IS4	2 1,0%	2 1,0%	5 2,6%	43 22,1%	143 73,3%	4,65
IS5	63 32,0%	39 19,9%	53 27,0%	25 12,7%	16 8,2%	<b>3,55</b>
IS6	88 45,1%	48 24,6%	39 20,0%	13 6,7%	7 3,6%	<b>4,01</b>
IS7	29 15,1%	52 27,1%	91 47,4%	16 8,3%	4 2,1%	<b>3,44</b>
IS8	11 5,7%	13 6,7%	38 19,6%	79 40,7%	53 27,3%	<b>3,77</b>
IS9	42 21,6%	26 13,4%	55 28,4%	44 22,7%	27 13,9%	<b>2,93</b>
IS10	10 5,1%	7 3,6%	23 11,8%	55 28,2%	100 51,3%	<b>4,16</b>
IS11	66 33,7%	31 15,8%	44 22,4%	33 16,8%	22 11,2%	<b>2,56</b>
IS12	21 10,7%	22 11,2%	61 31,1%	50 25,5%	42 21,4%	<b>3,35</b>
IS13	8 4,1%	13 6,7%	48 24,7%	54 27,8%	71 36,6%	<b>3,86</b>
IS14	39 19,9%	25 12,8%	61 31,1%	40 20,4%	31 15,8%	<b>2,99</b>
IS15	45 23,2%	28 14,4%	47 24,2%	41 21,1%	33 17,0%	<b>2,94</b>
<b>SV</b>						<b>3,60</b>

Mada se uočavaju određene razlike u intenzitetu stava kod većine indikatora koji su pozitivno distribuirani, potrebno je ukazati na pojedine indikatore (koji se, uslovno, mogu tretirati i kao samostalni stavovi). Prvenstveno iz razloga što se odnose na određena krucijalna pitanja koja traže razjašnjenja, kao i svoje mesto u koncepcijskoj osnovi budućeg razvoja univerzitskog sporta. U ovom istraživanju ona su detektovana kroz mišljenja studenata o: 1) organizaciji sportskih takmičenja unutar i između Univerziteta (IS8), 2) uvođenju obaveznih časova sportskih aktivnosti tokom studiranja (IS9), 3) obaveznog upražnjavanja sportskih aktivnosti kao segmenta ECTS bodovanja (IS11), 4) nedeljnog fonda časova sportskih aktivnosti kao sadržaja života na Univerzitetu (IS12), 5) problematike sportskih aktivnosti kao mogućeg ometajućeg faktora tokom pripreme ispita (IS5), itd. Može se konstatovati da većina studentkinja iskazuje pozitivan stav prema navedenim pitanjima, osim u delu koji se odnosi na eventualnu obaveznost sportskih aktivnosti na Univerzitetu (2,93), odnosno implementiranost sportskih sadržaja u sistem ECTS bodova (2,56). Drugim rečima, studentkinje sport smatraju korisnom i poželjnom aktivnošću, ali koja ima isključivo individualno opredeljujući karakter. S toga se organizaciji sportskih aktivnosti na univerzitetima, kao i njihovom koncepcijском etabliranju, mora poći prvenstveno sa pozicija razvoja motivacije, a ne obavezujućim pristupom (eventualnom administrativnom regulativom).

Istraživanjem su detektovana i pojedina specifična pitanja koja imaju karakter stava. U pogledi mišljenja ispitanika o korisnosti organizovanja sportskih aktivnosti na Univerzitetu najveći broj je iskazao pozitivan stav (89,3%). Međutim, u pogledu izjašnjavanja o eventual-

Even though differences are noticeable when it comes to the strength of an attitude throughout most of the positively rated claims, certain indicators must be pointed out (which may, conditionally, be treated as independent claims). The reason for this is primarily because they refer to crucial issues which need to be understood and given a place in the conceptual foundation of the future university sport development. In this research those were identified through students' opinions about: 1) organization of sports competitions among universities (IS8), 2) introduction of compulsory classes of sports activities during studies (IS9), 3) compulsory sports activities as a part of ECTS credit system (IS11), 4) weekly classes involving sports activities as a part of the University life and experience (IS12), 5) the issue of sports activities being a possible hindrance during exams (IS5), etc. It can be concluded that the majority of female students expressed themselves positively about the aforementioned points, except about the possibility of having the compulsory sports activities at the University (2.93), that is, of it being a part of the ECTS credit system (2.56). In other words, female students consider sport to be a useful and attractive activity, but which has to be chosen freely by an individual. Thus, the organization of sports activities at universities and its conceptual foundation has to start, above all, with the development of motivation, and not with a mandatory approach (with a possible administrative regulation).

The research identified specific questions which have a quality of an attitude. Regarding the examinees' opinions in relation to the usefulness of organizing sports activities at the University, the majority had a positive attitude about it (89.3%). Nevertheless, when it comes to

**Tabela 4.** Stavovi o korisnosti sporta na Univerzitetu

Korisnost sporta na Univerzitetu / Usefulness of sport at the University	Učestvovanje u sportskim aktivnostima na Univerzitetu / Participation in sports activities at the University			Total
	Da / Yes	Možda / Perhaps	Ne / No	
Da / Yes	119 60,4%	52 26,4%	5 2,5%	176 89,3%
Nisam sigurna / I am not certain	0 0,0%	12 6,1%	7 3,6%	19 9,6%
Ne / No	0 ,0%	0 ,0%	2 1,0%	2 1,0%
Σ	119 60,4%	64 32,5%	14 7,1%	197 100,0%

$\chi^2=57,357$

Sig.=,000

nom aktivnom uključivanju u "sportski život" na Univerzitetu uočava se nešto manji broj studentkinja koje bi to i realizovale (Tabela 4).

Bez obzira na uočene statistički značajne razlike u odnosima navedenih indikatora može se, u principu, govoriti o pozitivnoj podršci za intenziviranje ideje o reafirmaciji sporta na Univerzitetu. Bilo bi korisno, u ovom kontekstu, nastaviti dalja istraživanja i detektovati osnovne uzroke koji dovode do uočene sportsko-rekreativne neaktivnosti većine studentkinja na Univerzitetu Educons. Jer, pozitivan odnos prema ponovnom "ulasku" sporta na Univerzitet i većinska podrška moguće konceptu njegovog implementiranja na Univerzitete ne bi smeо biti ignorisan. U suštini, ovakvi rezultati predstavljaju vrlo stabilno uporište za afirmaciju i realizaciju ove ideje kod menadžmenta Univerziteta.

Na osnovu detektovanog manifestnog prosta stavlja studentkinja, identifikovan je i latentni prostor kojim dominiraju dva relativno nezavisna faktora. Prvi, koji objašnjava 33,15% varijanse i koji je, na osnovu indikatora koji ga sačinjavaju, moguće imenovati kao faktor **Društvene opravdanosti** univerzitetskog sporta. Drugi, koji objašnjava 12,14% varijanse, u skladu sa indikatorima koji ga sačinjavaju, moguće je imenovati kao faktor **Nepoželjnosti administrativnog nametanja** (Tabela 5).

**Tabela 5.** Matrica sklopa faktora

Stav / Attitude	IS6	IS1	IS2	IS5	IS3	IS8	IS9	IS12	IS4	IS7	IS10	IS14	IS15	IS11	IS13
F1	,749	,741	,719	,697	,683	,634	,628	,581	,572	,440	-,333			,344	
F2								,379	-,315			,843	,817	,477	,306

**Extraction Method:** Principal Component Analysis. **Rotation Method:** Oblimin with Kaiser Normalization.

Od devet praćenih motiva za uključivanje studentkinja u aktivnosti fizičkog vežbanja na Univerzitetu najviše pozicioniran u sistemu vrednosti ispitanika bio je motiv označen kao poboljšanje (očuvanje) zdravlja (4,69), što potvrđuje rezultate većeg broja dosadašnjih istraživanja sprovedenih na sličnim uzorcima. Sledeću vrednosnu grupu, čije su prosečne skalarne pozicije bile između 3 i 4, sačinjavalo je pet motiva, uslovno označenih kao druženje (3,87), želja za boljim izgledom (3,84), relaksacija (3,68), zabava (3,38) i dobro raspoloženje (3,09). Dva motiva, čije su se prosečne skalarne vrednosti kretale između 2 i 3, bili su potreba da se održi optimalna telesna masa (2,75) i da se dokaže samome sebi (motiv postignuća-2,57). Kao najslabije rangiran bio je motiv uslovno označen kao „biti u trendu“ i jedini je imao prosečnu skalarnu vrednost manju od dva (1,95).

a potential participation in "sports life" at the University, the results show that a lesser number of female students would actually do sports (Table 4).

Regardless of the observed statistically significant differences among the mentioned indicators, it can be concluded that the idea of reintroduction of sport at the University is generally well supported. It would be useful to continue further research in this area and identify essential causes of physical inactivity of most of the female students from the University of Educons, because positive attitude toward the reintroduction of sport to the University and support from the majority for the concept of its possible implementation at the University should not be ignored. Essentially, these results represent a very solid foundation for affirmation and realization of this idea with the management of the University.

Based on the identified manifested space of attitudes of female students, there was also recognition of the latent space with two relatively independent factors domineering in it. The first one, which explains 33.15% of variance, is possible to name **Social justification** of university sport based on its constituting indicator statements. The second one, which explains 12.14% of variance, is possible to name **Undesirable administrative imposition** according to the indicator statements encompassed by it (Table 5).

**Table 5.** A set of factors - matrix

Out of nine examined motives for physical activation of female students at the University, the highest rated one in the value system of examinees was the motive marked as "improvement (maintenance) of health" (4.69); this confirms the results of a larger number of previous researches done with a similar research sample. The next value group with the average between 3 and 4 on the scale, consisted of five motives, provisionally marked as: socializing (3.87), desire for a better look (3.84), relaxation (3.68), fun (3.38), and good moods (3.09). Two motives with the average value on a scale between 2 and 3 were: need to maintain optimum body weight (2.75) and to prove yourself to you (the achievement motivation – 2.57). The lowest rated motive was marked as "following trends" and it was the only one with the scale value below two (1.95).

Na osnovu interkorelacija opserviranih varijabli formirana je inicijalna korelaciona matrica na osnovu koje je definisana hijerarhijska struktura devet inicijalnih vektora u posmatranom prostoru motivacije. Karakteristični korenovi veći od jedinice zabeleženi su samo kod prva četiri vektora koja su ušla u dalju proceduru i od kojih su kasnije formirana četiri faktora motivacije (objašnjavaju 59,71% zajedničke varijanse).

Numeričke vrednosti faktorskih skorova, dobijenih ortogonalnom i kosom projekcijom glavnih komponenti četiri ekstrahovana faktora, bili su veoma slični što ukazuje na dosta stabilnu strukturu latentnog motivacionog prostora kod ispitanika obuhvaćenih ovim istraživanjem. Varimax postupkom su dobijene kose solucije koje su formirale veoma interpretabilnu matricu sklopa sa četiri faktora u prostoru motivacije (Tabela 6).

**Tabela 6.** Rotirane matrice strukture ekstrahovanih faktora motivacije (Varimax metodom kosih projekcija glavnih komponenti)

Motiv / Motive	Faktor 1 / Factor 1	Faktor 2 / Factor 2	Faktor 3 / Factor 3	Faktor 4 / Factor 4
Zdravlje / Health	,243	-,300	-,297	-,678
Druženje / Socializing	,741	,217	,001	-,120
Izgled / Looks	,170	,027	,684	,145
Relaksacija / Relaxation	,137	-,218	-,247	,791
Zabava / Fun	,052	,012	-,598	,163
Raspoloženje / Good mood	-,059	-,627	,495	,028
Mršavljenje / Losing weight	-,726	-,068	-,145	-,038
Postignuće / Achievement	,085	,770	,088	,009
Biti u trendu / Following trends	-,641	,418	,119	-,081

Prvi faktor, kojim je objašnjen najveći deo ukupnog varijabiliteta, saturiran je dominantno sa tri motiva, uslovno označena kao: "druženje", "mršavljenje" (briga o telesnoj masi) i „biti u trendu“ (dokazati se pred drugima). Polazeći od logičkih sadržaja ova tri motiva, kao i njihove osnovne semantike, prvi hijerarhijski faktor u analiziranom latentnom motivacionom prostoru, definisan je kao **Socijalna poželjnost**. To pokazuje da navedena tri motiva, u suštini, predstavljaju glavne pokretne studentkinja za upražnjanje sportskih aktivnosti na Univerzitetu. Ovakav rezultat je i saglasan uočenim opštim trednovima mlađih, posebno žena, da se kroz sportske aktivnosti realizuju prvenstveno potrebe socijalne interakcije sa okruženjem.

Najznačajnije projekcije na drugi ekstrahovani faktor imala su dva motiva, u primjenom istraživačkom

Based on the inter-correlations of variables, the initial correlational matrix was formed which was used to show a hierarchical structure of nine initial vectors in the observed space of motivation. Only the first four vectors had distinctive square roots larger than one and they were further analyzed and combined together as four factors of motivation (explaining 59.71% of common variance).

Numerical values of factor scores, produced via orthogonal and oblique projections of the main components of four extracted factors, were very similar, which implies a very stable structure of latent motivational space related to the research examinees. The Varimax method produced oblique solutions which formed a highly interpretable matrix with four factors in the space of motivation (Table 6).

**Table 6.** Rotated matrices of extracted motivational factors structure (The Varimax method of oblique projections of the main components)

The first factor, which explains most of the total variability, is composed of three motives, conditionally marked as: "socialization", "losing weight" (body weight concern) and "following trends" (proving oneself in front of others). Starting with the logical content of these three motives, and with their basic semantics, the first hierarchical factor in the analyzed latent space of motivation was defined as **Social desirability**. This shows that the aforementioned three motives, in essence, represent the driving force that can move female students to do sports activities at the University. This result is in agreement with the observed general youth trend, especially women trend, which is to use sports activities as a means for realization of the need for social interaction with the environment.

The most significant projection on the second extracted factor came from two motives, defined in the applied

upitniku definisana kao: „osećaj prijatnosti i raspoloženja (uslovno, motiv raspoloženja) i „biti u trendu i dokazati se pred drugima“ (uslovno, motiv postignuća). Analizirajući sadržaj i semantičku poruku ovih formulacija drugi hijerarhijski faktor bilo je moguće definisati kao **Prestiž**. On ukazuje na značajnost sportskih sadržaja u životu mladih, s obzirom da ovo životno doba obiluje različitim vrstama nadmetanja, upoređivanja, traženja „svog mesta“ u društvu, što kroz adekvatnu realizaciju stvara osećaj prijatnosti, zadovoljstva, te stvara energiju za svakodnevne životne i radne aktivnosti.

Treći faktor najviše su saturirala dva motiva, upitnikom formulisana kao: „dobar izgled“ i „zabava i raznooda“. Polazeći od socijalne poruke koju u sebi sadrže navedeni motivi, ovaj faktor je moguće okarakterisati kao **Životni stil**. Motivi koji formiraju ovaj faktor mogu se posmatrati u svetlu savremenog životnog okruženja mladih. Dobar izgled, briga za „dobru figuru“, negovanje tela, kao i aktuelni modni trendovima sve više zaokupljuju mlade. Sportske aktivnosti su jedan od „alata“ koji se mladima nudi, posebno posredstvom medija. U tom kontekstu oni vide i različite oblike zabave, kako direktno kroz sportske sadržaje, tako i kroz efekte fizičkog vežbanja (lep izgled) u drugim vrstama zabavnih aktivnosti koje mladi upražnjavaju u slobodnom vremenu.

Četvrti faktor, kojim je objašnjena najmanja količina varijabiliteta u posmatranom motivacionom prostoru, formirala su dva motiva koja su u istraživačkom upitniku formulisana kao: „održavanje i poboljšavanje zdravlja“ (motiv zdravlja), odnosno „opuštanje i zaboravljanje na svakodnevne brige“ (uslovno, motiv relaksacije). Kako je prvi motiv eksplisitno ukazivao na važnost brige za opšte fizičko zdravlje, a drugi implicitno na potrebu da se zaštiti psihičko zdravlje ljudi, otuda se kao logičan naziv četvrtog faktora nametnuo: **Briga o psihofizičkom zdravlju**.

Za razliku od koeficijenata determinacije, koeficijenti proste linearne i parcijalne korelacije (Tabela 7) imali su izrazito niske vrednosti, pri čemu su bili numerički dosta bliski. Tako niske vrednosti korelacionih koeficijenata ukazuju na odsustvo signifikantne povezanosti između ekstrahovanih faktora, što jasno ukazuje na to da je ostvarena gotovo idealna parsimonija. Na osnovu ovih podataka može se, sa dosta pouzdanosti, tvrditi da u latentnoj motivacionoj strukturi ispitanika obuhvaćenih ovim istraživanjem, egzistiraju četiri relativno stabilna faktora koja otkrivaju osnovne razloge za učešće u sportskim sadržajima u okviru Univerziteta. Oni se uslovno mogu označiti kao: (1) faktor socijalne poželjnosti, (2) faktor prestiža, (3) sklonost ka posebnom životnom stilu i (4) briga za psihofizičko zdravlje.

research survey as: “the pleasant feelings and good mood (conditionally, the good mood motive) and “following trends and proving yourself in front of others” (conditionally, the achievement motive). Analyzing the content and a semantic message of these formulations, the second factor in the hierarchy was possible to define as **Prestige**. It indicates the importance of sporting activities in life of the young, as this life age is full of competing, comparing, and searching for “own place” in the society, which upon adequate realization creates a pleasant feeling, satisfaction, and energy for everyday life and work activities.

The third factor was dominated by two motives, which were formulated as: “good looks” and “fun and recreation” in the survey. Starting with the social message contained by the mentioned motives, this factor is possible to name **Lifestyle**. Motives forming this factor can be viewed through the perspective of modern life surroundings of the youth. Good looks, concerns about “being in shape”, having a well-cared-for body, as well as the current fashion trends are growing preoccupation of the youth. Sports activities are offered to them as one of “tools”, especially in the media. In this context they view different types of entertainment, directly through sports activities, and through the effects of physical exercise (good looks) in other types of entertaining activities which young people do in their free time.

The fourth factor, which explains the least amount of variability in the observed space of motivation, consists of two motives which were labeled in the survey as: “maintenance and improvement of health” (the health motive), and “relaxing and forgetting of everyday worries” (conditionally, the relaxation motive). Since the first motive explicitly denotes the importance of caring for general physical health and the second one implicitly denotes the need to protect one’s mental health, the logical name for the forth factor ensued: **Care for the psycho-physical health**.

Unlike the coefficient of determination, the coefficients of simple linear and partial correlation (Table 7) had distinctly low values, in which they were very close numerically. The low values of correlational coefficients indicate the absence of significant connection between the extracted factors, which clearly demonstrates the realization of an almost ideal parsimony. According to these data, it can be claimed with a high degree of certainty that in the latent motivational structure of examinees involved in the research, there are four relatively stable factors which reveal the basic reasons for participation in sports activities at the University. They can be conditionally labeled as: 1) factor of social desirability, 2) factor of prestige, 3) inclination toward a certain lifestyle, and 4) care for the psycho-physical health.

**Tabela 7.** Korelaciona matrica ekstrahovanih faktora ( koef. determinacije)

Komponente / Components	Faktor 1 / Factor 1	Faktor 2 / Factor 2	Faktor 3 / Factor 3	Faktor 4 / Factor 4
Faktor 1 / Factor 1	<b>-,981</b>	,184	,023	,058
Faktor 2 / Factor 2	,151	<b>,910</b>	-,333	-,195
Faktor 3 / Factor 3	,087	,336	<b>,937</b>	,040
Faktor 4 / Factor 4	,085	,156	-,106	<b>,978</b>

## ZAKLJUČAK

Studentsku populaciju, kao važan deo svakog društva, takođe ne zaobilaze aktuelne pojave savremenog načina života. Pored uobičajenih životnih navika koje obeležavaju sadašnju mladu generaciju, dodatne obaveze koje su prisutne u okviru programa studija ("sedalačkog" tipa), s jedne strane, kao i nedostatak organizovanih oblika nastave fizičkog vežbanja, s druge strane, u velikoj meri doprinose kompleksnosti problema koje sa sobom nosi fizička neaktivnost.

Rezultati istraživanja su generalno pokazali da studentkinje Univerziteta Educons imaju pozitivno orijentisane stavove kada su u pitanju pojedini aspekti inicijative koja ide u pravcu reafirmacije sporta na univerzitetima. Ispitanice su iskazale stabilno determinisane pozitivne stavove o značaju i potencijalnoj korisnosti organizovanog fizičkog vežbanja, odnosno "sportske ponude", kao moguće alternative života tokom studiranja na "svom" Univerzitetu, što je, u ovom slučaju, iskazano skalom vrednošću od 3,60.

Može se konstatovati da studentkinje jasno sagledavaju moguću poziciju i ulogu sporta na Univerzitetu, pre svega kroz njegovu društvenu ulogu (zbližavanje mlađih, upoznavanje, socijalizacija, i sl.), kao i doprinosa psihofizičkom razvoju čoveka. S druge strane veoma čvrsto su na poziciji da sportske aktivnosti trebaju biti stvar ličnog opredeljenja svakog pojedinca, te da nije poželjno da one budu nametnute nekim administrativnim odrednicama. Posebno pozitivno vrednuju ideju o među fakultetskim sportskim takmičenjima, gde smatraju da sportske aktivnosti ne bi predstavljale ometajući faktor u procesu savladavanja nastavnog gradiva tokom studiranja, pa ni u vreme ispitnih rokova.

Ovako iskazani stavovi omogućili su i definisanje njihovog latentnog prostora. U skladu sa indikatorima koji ih formiraju identifikovana su dva relativno nezavisna faktora koji se mogu označiti kao: društvena opravdanost univerzitetskog sporta i nepoželjnost administrativnog nametanja sporta na Univerzitetu.

Rezultati istraživanja motivacije su generalno pokazali da u latentnom prostoru kod studentkinja Uni-

**Table 7.** Correlational matrix of extracted factors (coef. of determination)

## CONCLUSION

Student population, as an important part of every society, is not exempt from the current trends of modern life. Aside from the common life habits which characterize the present youth generation, additional obligations which are a part of the ("sedentary type of") study program, on one side, and the lack of organized physical exercises classes, on another side, contribute greatly to the complexity of the problem related to physical inactivity.

The results of the research showed that generally female students from the University of Educons have positive attitude when it comes to the some aspects of the initiative to reintroduce sport at universities. The examines also expressed themselves positively about the significance and potential usefulness of organized physical exercising, that is, "sports offering", as a possible choice during studying at "their" University, which in this case is indicated by the scale value of 3.60.

It can be concluded that the female students clearly see a possible position and role of sport at the University, primarily through its social role (closer relationships among the young, meeting others, socializing, and such), as well as its contribution to one's psycho-physical development. On the other hand, they hold a firm opinion that sports activities should be a matter of personal choice of each individual, and that it is not desirable for them to be imposed by some administrative regulation. The idea about inter-college sports competitions was especially well received, and in this case they didn't see sports activities as a hindrance during studying or exams.

Attitudes expressed in this way enabled us to define their latent space. In accordance with the indicator statements which formed them, two relatively independent factors were identified which can be labeled as: social justification of university sport and undesirable administrative imposition of sport at the University.

The results of the motivation research generally showed that the latent space of female students from the University of Educons contains four motivational factors which indicate their possible tendencies to choose to do

verziteta Educons egzistiraju četiri motivaciona faktora koji ukazuju na moguće tendencije u njihovim opredeljenjima za upravljavanje sportskih aktivnosti u okviru Univerziteta. S obzirom da se radi o populaciji koja nije izrazito "sportska", odnosno oko 80% anketiranih se ne bavi sportskim aktivnostima, uočene motivacione tendencije mogu biti dobar putokaz u kreiranju fizionomije vežbovnih aktivnosti u razvojnim planovima Univerziteta Educons. Ovome u prilog ide i podatak da je svoje pozitivno mišljenje o korisnosti fizičkog vežbanja dalo 89,3% ispitanika, a da je njih 60,4% decidno odgovorilo da bi se aktivno uključilo u organizovane sportske aktivnosti ukoliko bi bile organizovane na Univerzitetu. Oko 32% ispitanika je po ovom indikatoru bilo neodlučno, te se uslovno i oni mogu smatrati potencijalnim učesnicima u sportskim programima. Samo je 7,1% ispitanika decidno izjavilo da se ne bi bavilo nikakvim oblicima sportskih aktivnosti.

Iz navedenog se uočava i mogući pravac kreiranja sportskih, odnosno sportsko-rekreativnih programa na Univerzitetu Educons. Pre svega, oni bi trebali biti usmereni na zadovoljavanje potreba za socijalnim kontaktima i druženjima studentkinja. Sportske aktivnosti na Univerzitetu bi trebale omogućavati brže socijalno zblžavanje i upoznavanje među studentskom populacijom, odnosno postati mesto njihove društvene interakcije. Na to ukazuje i izolovani prvi faktor (Socijalna poželjnost).

S obzirom da se radi, uglavnom, o mlađoj populaciji (oko 55% je uzrasta 19-27 godina) vrsta i oblici sportskih aktivnosti u okviru Univerziteta bi trebale da imaju i dovoljnu "dozu" atraktivnost kako bi privukle mlade da se u njih uključe. S obzirom na inače prisutno obeležje ovog uzrasta, a to je da u većini svakodnevnih aktivnosti (pa time i sportskih) teže ka dokazivanju, upoređivanju i akcentovanju generacijskog prestiža, zadovoljenje potreba kroz prizmu drugog faktora (Prestiž) je, takođe, značajna odrednica za kreatore sportskih programa na Univerzitetu Educons. U ovom kontekstu može se razmatrati i treći ekstrahovani faktor (Životni stil).

Naravno, uvek aktuelna zdravstvena komponenta fizičkog vežbanja i u ovom slučaju može da proizilazi iz sve većeg akcentovanja zdravog načina života. Posebno je kod mlađih ovaj trend poslednjih godina izrazito prisutan. Ovom prilikom se zapaža da se kod ispitanika, u prvom redu, misli na uticaj sportskih aktivnosti kroz preventivno-kompensatorni aspekt fizičkog vežbanja na nervno-emocionalna naprezanja, s obzirom da se u ovom uzrastu još uvek ne pojavljuju u izraženijem i masovnijem obliku druge zdravstvene tegobe. Dakle, vežbanje na Univerzitetu može da predstavlja aktivnost zdravstveno-

sports activities at the University. Considering the fact that this population is not particularly "sporty", that is, around 80% of the examinees don't engage in any sports activities, the observed motivational tendencies can be a good signpost when it comes to the creation of a blueprint with exercising activities as a part of the University of Educons' plan of development. This is additionally supported by the fact that 89.3% of the examinees expressed themselves positively about the usefulness of the physical exercise and that 60.4% of them decidedly stated that they would participate in the sports activities if they were to be organized at the University. Around 32% of the examinees were indecisive about this issue, and, with some reservations, they can be considered potential participants of sports programs. Only 7.1% of the examinees decidedly stated that they would never participate in any kind of sports activities.

From the above mentioned one can notice a possible direction of sports development, that is, recreational sports program at the University of Educons. First and foremost, it should be focused on satisfaction of the students' needs to socialize and interact with others. Sports activities at the University should bring students closer together enabling them to meet each other faster, thus becoming a place of their social interaction. This is also indicated by the isolated first factor (Social desirability).

Considering that the examinees mostly belong to younger population (about 55% were between 19 – 27 years old), the type and form of sports activities at the University should possess a certain attractiveness to draw the young to participate in them. Considering the traits of their age, meaning that most of their everyday activities (including sports ones) are in the service of proving oneself, comparing oneself to others, and emphasizing generational prestige, the satisfaction of these needs through the perspective of the second factor (Prestige) is also a significant determinant to be considered when creating a sports program at the University of Educons. In this context, one can also observe the third extracted factor (Lifestyle).

Of course, there is always a popular health component of the physical exercising and in this case it might be originating from all the greater emphasis on the healthy lifestyle. This trend has been especially spread among the young in the recent years. In this research, it is observed that the examinees mainly think about the influence of sports activities on neuro-emotional exertions through preventive and compensation aspect of the physical exercising, considering that at their age major health problems are still mostly absent. Thus, exercising

preventivnog karaktera, te ga je u tom smislu i neophodno tretirati. Odnosno, kreirati programe fizičkog vežbanja usmerene ka ovom cilju. Na to ukazuje i četvrti faktor u latentnom prostoru motivacije (Briga o psiho-fizičkom zdravlju).

Dakle, rezultati istraživanja mogu da se smatraju adekvatnim prilogom za opšte determinisanu tezu da u obrazovanju mladih fizička aktivnost u celini, a posebno sport, moraju predstavljati značajane odrednice izgradње, očuvanja i unapređenja njihovih bio-psihosocijalnih kapaciteta.

**Izjava autora**  
Autori pridonijeli jednakom

**Konflikt interesa**  
Mi izjavljujemo da nemamo konflikt interesa.

at the University can be an activity that promotes health and prevention, so it should be treated with that in mind and programs of physical exercise focused on that goal should be created. This is indicated by the fourth factor in the latent space of motivation (Care about the psycho-physical health).

Hence, the results of the research can be used to support the generally determined thesis that physical activity and especially sport should be a significant part of the education of the young, that is, in the formation, maintenance, and advancement of their bio-psychosocial capacities.

**Authorship statement**  
The authors have contributed equally.

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# PUTNIČKE AGENCIJE KAO ČINILAC RAZVOJA BICIKLISTIČKOG TURIZMA NA VRŠAČKIM PLANINAMA

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**Sažetak:** Biciklizam je danas veoma atraktivna sportsko-rekreativna aktivnost koja zaokuplja milione neposrednih učesnika. Bilo da je reč o takmičarskom sportu (profesionalnom ili amaterskom), ekstremnom ili rekreativnom biciklizmu, njegova uloga u turizmu može biti od izuzetnog značaja. Sagledavajući biciklizam u kontekstu zdravog načina života, aktivnog odmora i rekreativije, uočava se širok programski obuhvat koji doprinosi razvoju turizma i turističkih destinacija. Vršačke planine predstavljaju veoma interesantno područje za razvoj biciklističkog turizma na području Vojvodine, posebno sa aspekta kreiranja tematskih biciklističkih staza (vinska biciklistička staza, etno biciklistička staza, i drugo). Za sada ne postoji jasno definisana ponuda biciklističkog turizma na ovom prostoru kao deo ukupnog turističkog proizvoda Vojvodine. Empirijsko istraživanje koje je sprovedeno na uzorku od 10 putničkih agencija u Vršcu imalo je za cilj da detektuje osnovne uzroke nepostojanja ponude za biciklistički turizam na području Vršačkih planina. Primenom Survay metoda došlo se do podataka o organizacionim činiocima koji utiču na razvoj i funkcionišanje ovog vida selektivnih oblika turizma.

**Ključne reči:** biciklistički turizam, Vršačke planine, putničke agencije

# TRAVEL AGENCIES AS A FACTOR OF CYCLING TOURISM DEVELOPMENT ON THE MOUNTAIN OF VRŠAC

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**Abstract:** Cycling is very attractive sport activity that attracts millions of direct participants. Whether it comes to competitive sports (professional or amateur), or extreme recreational cycling, its role in tourism can be of great importance. Taking cycling in the context of a healthy lifestyle, active rest and recreation, sees the wide coverage program that contributes to the development of tourism and tourist destinations. Mountain of Vršac is a very interesting area for the development of cycling tourism in the region of Vojvodina, especially with regards to creating themed cycle paths (wine paths by bike, etc.). For now, there is no clearly defined cycle tourism offer in the region as part of the total tourist product of Vojvodina. Empirical research was conducted on a sample of 10 travel agencies from Vršac. It was aimed to detect the basic causes of the lack of offers for cycling tourism in the Mountain of Vršac area. Survey application methods led to data on the organizational factors that influence the development and operation of this type of selective forms of tourism.

**Keywords:** cycling tourism, Mountain of Vršac, tourist agencies

## UVOD

Prednosti bicikla nad drugim prevoznim sredstvima su višestruke. Bicikl je potpuno ekološko prevozno sredstvo koje ne zagađuje okolinu, a unapređuje celokupno zdravlje čoveka. Vožnja bicikla može znatno da utiče na poboljšanje različitih funkcionalnih i motoričkih sistema čoveka, a brojna istraživanja su pokazala da je životni vek ljudi koji voze bicikl znatno duži. (Simonsen, P., & Jorgenson, B., 1998; Ritchie, B.W., & Hall, C.M., 1999; Hayward, 2001; Hudson, 2003; Weed, M., & Bull, C, 2004; Torkildsen, 2005; Weed, 2008; Matthew, 2009; Paul, D. and other, 2009, Vujko, Plavša, 2010; Vujko, 2011). Dakle, trasiranje biciklističkih staza u Srbiji trebalo bi da bude jedan od strateških ciljeva, pogotovo kada se zna da se biciklistički turizam danas smatra tržištem u intenzivnom porastu u okviru turizma kao privredne grane. Kada je reč o Vršačkim planinama postoji znatan broj resursa koji zasluzuju odgovarajuću pažnju unutar razmatranja pitanja o definisanju potencijalnih biciklističkih staza. Vršačke planine predstavlja jedan od dva planinska predela u Vojvodini i jedan od atraktivnijih rekreativnih prostora za veliki emitivni centar u Srbiji, Beograd. Vršačke planine se prostiru između  $21^{\circ}30'$  i  $21^{\circ}58'$  istočne geografske dužine i između  $45^{\circ}10'$  i  $45^{\circ}22'$  severne geografske širine i predstavljaju izolovano pobrđe u jugoistočnom Banatu, pružajući se u pravcu zapad – istok u dužini od oko 20 km. Planine su izolovane horstovske planine, a čine ih četiri jasno izdefencirana oblika Vršačka kula (399 m), Vršački vrh (590 m), Gudurički vrh (641 m) i Donji Veršišor (463 m), (Bukurov, 1950; Zeremski, 1985; Vujko, 2011). Individualnost planine uslovljena je sa tri prostrane i relativno duboke preseline Prevale, Kulmea i Korkan što znači da se na relativno kratkom i asimetričnom uzdužnom profilu javljaju izrazite denivelacije, zbog kojih su Vršačke planine upravo i prozvane „planinama“. Imajući sve to u vidu, može se zaključiti da su sportsko-rekreativnim turistima na Vršačkim planinama na raspolaganju dve mikroreljefne celine: centralni masiv i podgorina. Obe ove celine su relativno pristupačne tako da je na njima moguće trasirati staze za bicikлизам ali i punktove za druge oblike sportsko-rekreativnog turizma: planinarenje, terensko jahanje i drugo. Međutim, za sada ne postoji jasno definisana ponuda biciklističkog turizma na ovom području kao dela ukupnog turističkog proizvoda Vojvodine. U tom smislu za cilj rada je postavljeno da se prikaže direktni uticaj putničkih agencija na ponudu biciklističkog turizma, a svrha rada je da se uočeni negativni uticaji u najskorijoj budućnosti pokušaju sanirati.

## INTRODUCTION

Benefits of bicycle over the other means of transport are manifold. The bicycle is completely environmentally friendly means of transportation that does not pollute the environment, and improve the overall health of a human. Cycling can significantly affect the improvement of various functional and motor system of human, a number of studies have shown that the lifetime significantly longer in people who ride bicycles (Simonsen, P., & Jorgenson, B., 1998; Ritchie, B.W., & Hall, C.M., 1999; Hayward, 2001; Hudson, 2003; Weed, M., & Bull, C, 2004; Torkildsen, 2005; Weed, 2008; Matthew, 2009; Paul, D. and other, 2009, Vujko, Plavša, 2010; Vujko, 2011). So, bike trails in Serbia should be one of the strategic objectives, especially when we know that cycling tourism today is considered a growing market within the Tourism Industry. Kada je reč o Vršačkim planinama postoji znatan broj resursa koji zasluzuju odgovarajuću pažnju unutar razmatranja pitanja o definisanju potencijalnih biciklističkih staza. When it comes to the Mountain of Vršac there is a considerable number of resources that deserve proper attention within the review questions on the definition of potential bike paths. Mountain of Vršac is one of two mountainous regions in Vojvodina and one of the most attractive recreational area for large emissive center in Serbia, Belgrade. Mountain of Vršac extending between  $21^{\circ} 30'$  and  $21^{\circ} 58'$  east longitude and between  $45^{\circ} 10'$  and  $45^{\circ} 22'$  north latitude and are isolated hills in the south-eastern Banat, extending in the direction west - east, a distance of about 20 km. The Mountains are isolated mountain, and consist of four distinctly different forms: Vršac tower (399 m), Vršački vrh (590 m), Gudurički vrh (641 m) and lower Veršišor (463 m), (Bukurov 1950; Zeremski, 1985; Vujko, 2011). Individuality of mountains conditioned with three large and relatively deep rifts: Prevala, Kulmea and Korkan which means that the relatively short and asymmetric longitudinal profile of the slanting occur, for which the Mountain of Vršac just named the “mountains”. Bearing all this in mind, it can be concluded that the sports and recreational tourists in Mountain of Vršac available microrelief two parts: the central massif and piedmont. Both of these units are relatively affordable so that they can be traced to the cycling routes and points for other forms of sports and recreational tourism: hiking, horseback riding and more. However, so far there is no clearly defined offer of cycling tourism in the area as part of the overall tourism product of Vojvodina. In this sense, the aim of the paper is to show the direct impact of travel agencies on the cycling tourism supply and the purpose of this paper is that the observed negative effects try to repair.

## METODOLOGIJA

Podaci prikupljeni ovim istraživanjem dobijeni su direktnim ispitivanjem, primenom Survey metoda i deo su šireg istraživačkog projekta koji je sproveden od strane jednog od autora rada (Vukko, 2011). Na uzorku koji je sačinjavalo 10 putničkih agencija sa prostora Vršca, primenom odgovarajućih istraživačkih instrumenata, obuhvaćene su četiri osnovne grupe varijabli: prirodno-geografske karakteristike Vršačkih planina za biciklistički turizam, ponuda aranžmana biciklističkog turizma u turističkoj ponudi vršačkih agencija, ponuda aranžmana biciklističkog turizma u ukupnoj turističkoj ponudi Vojvodine i marketing aktivnosti turističkih agencija. Dobijeni podaci su obrađeni odgovarajućim statističkim metodama deskriptivnog karaktera, čime je omogućena eksplikacija rezultata istraživanja i izvođenje određenih zaključaka.

## REZULTATI I DISKUSIJA

Biciklizam se na Vršačkim planinama, u skladu sa osnovnim karakteristikama reljefa, klimatskim karakteristikama, hidrografskom mrežom i biodiverzitetom može razvijati u različitim vidovima. Kao turističko-rekreativni biciklizam (sve staze unutar biciklističke rute Vršačkih planina), preko manifestacionog biciklizma (bilo koji deo staza unutar biciklističke rute Vršačkih planina), pa do ekstremnog biciklizma s obzirom da unutar biciklističke rute Vršačkih planina postoje delovi terena koji su po svojim karakteristikama fizički veoma zahtevni (gotovo svaka staza unutar biciklističke rute Vršačkih planina ima i svojih napornijih delova, u zavisnosti od toga da li se ide u jednom ili drugom smeru), (Vukko, 2011). Iako ne podleže sezonalnosti, jer se bicikl može voziti u bilo koje doba godine, moglo bi se istaći da je, sa aspekta turizma, najinteresantniji i ekonomski isplativiji period od marta do oktobra. S druge strane i interesantne prirodne vrednosti doprineli bi dužini i bogatstvu boravka ciklo turista. Imajući sve to u vidu može se konstatovati da je prva grupa dobijenih podataka iz istraživanja u putničkim agencijama bila u skladu sa evidentnim potencijalima kojima ova planina raspolaže. Svi deset putničkih agencija (100%) su saglasne sa stavom da su Vršačke planine pogodno područje za vožnju bicikla.

Sledeća grupa varijabli odnosila se na identifikaciju prisutnosti aranžmana biciklističkog turizma u turističkoj ponudi agencija. Dobijeni rezultati ukazuju na dijagonalno suprotnu situaciju, u odnosu na iskazan stav o pogodnosti Vršačkih planina za biciklistički turizam. Ni jedna od agencija obuhvaćenih istraživanjem nikada nije imala, niti u skorijoj budućnosti planira da ima, turističke aranžmane za biciklistički turizam u svojoj ponudi.

## METHODOLOGY

The data collected in this study were obtained by direct examination using the Survey methods and are part of a wider research project that was conducted by one of the paper's authors (Vukko, 2011). In a sample of 10 travel agencies from the area of Vršac, applying appropriate research instruments, includes four main groups of variables: the natural and geographical characteristics of the Vršac mountains for cycling tourism, cycling tourism supply in the tourist offer of Vršac agencies, supply of cycling tourism in total tourism offer of Vojvodina and marketing activities of travel agencies. Data were analyzed by appropriate statistical methods of descriptive character, enabling the explication of the research results and the performance of certain conclusions.

## RESULTS AND DISCUSSION

The cycling in the Mountains of Vršac, in accordance with the basic characteristics of the relief, climate characteristics, hydrographic network and biodiversity can be developed in various forms. As a recreational cycling (all paths within biking distance of the Mountains of Vršac), manifestation cycling (any part of the trail within biking distance of the Mountains of Vršac), and the extreme cycling (almost every track within biking distance of the Mountains of Vršac has its extreme parts), (Vukko, 2011). Although cycling is not the subject of seasonality, because the bike can be ride at any time of year, it might be noted that, in terms of tourism, the most interesting and economically profitable period is from March to October. On the other hand, interesting natural values contributed to the length and richness stay cyclo tourists. Bearing all this in mind, it can be concluded that the first group of data obtained from the survey of travel agencies to comply with evident potential that this area offers. All ten travel agencies (100%) agree with the statement that the Mountains of Vršac are perfect area for cycling.

The next group of variables related to the identification of the presence of a package of cycling tourism in the travel agency offer. The results suggest a diametrically opposite situation, in relation to the stated position on the benefits of the Mountains of Vršac for cycling tourism. Ni jedna od agencija obuhvaćenih istraživanjem nikada nije imala, niti u skorijoj budućnosti planira da ima, turističke aranžmane za biciklistički turizam u svojoj ponudi. None of the agencies surveyed never had, nor in the near future they plan to have, travel arrangements for cycling tourism in their offer.

Varijable koje su obuhvatile indikatore ponude aranžmana biciklističkog turizma u ukupnoj turističkoj ponudi Vojvodine, takođe su iskazale veoma interesantne tendencije. Sve opservirane agencije smatraju da je Srbija zemlja koja nema uopšte, a time ni adekvatnu ponudu biciklističkog turizma, mada za to postoje brojni povoljni resursi (Fruška gora, Vršačke planine, i drugo.). Takođe, smatra se da postoji i odgovarajući nivo interesovanja za sportsko-rekreativni turizam od strane građana Vršca, ali i Beograđana. Pokušavajući otkriti šta su uzroci nepoštovanja aranžmana za biciklistički turizam, putničkim agencijama je postavljena grupa pitanja u vezi sa marketing aktivnostima koje preduzimaju, odnosno koje bi preduzeli u cilju promocije biciklističkog turizma u Srbiji. Pored toga, postavljen je kao indikator i pitanje o uviđanju važnosti marketinških aktivnosti. Interesantno je da većina ispitanih agencija potvrđuje da je marketing nastup Srbije, kada je biciklistički turizam u pitanju, na veoma niskom nivou. O tome svedoči i prosečna skalna vrednost odgovora ispitnika (1,70), što ukazuje na izrazito negativan stav (tabela 1). Mada smatraju da primena savremenih tehnika i koncepata marketinga predstavlja jedini način za prevazilaženje postojećih problema. Dakle, isticanje važnosti promocije biciklističkog turizma od strane putničkih agencija se nametnulo kao jedna od najznačajnijih aktivnosti putničkih agencija kada je budućnost biciklističkog turizma u pitanju.

**Tabela 1.** Ocena marketing aktivnosti (1-5) za biciklistički turizam na Vršačkim planinama od strane putničkih agencija

Ocena	f	%	s.v.
1	4	40,0	
2	6	60,0	<b>1,70</b>
$\Sigma$	10	100,0	

Mada se prilikom istraživanja došlo do podataka koji ukazuju na to da nijedna od ispitanih putničkih agencija trenutno ne koristi nijedan od elemenata promocije (tabela 2) kada je biciklistički turizam u pitanju, ipak se može uočiti da pojedine agencije već sada shvataju važnost promotivnih aktivnosti.

**Tabela 2.** Postojanje marketing aktivnosti za promociju biciklizma u putničkim agencijama

Odgovori	f	%
Da	3	30,0
Ne	7	70,0
$\Sigma$	10	100,0

Variables that included the supply side arrangement of bicycle tourism in the overall tourism offer of Vojvodina, also expressed a very interesting trend. All observable agencies believe that Serbia is a country that does not have at all, and thus no adequate supply of cycle tourism, although there are numerous resources (Fruška Gora, Vršac mountains, etc.). Also, it is considered that there is an appropriate level of interest in sports and recreational tourism by citizens of Vršac, and Belgrade. Trying to figure out what are the causes of lack of arrangements for cycling tourism, to the travel agencies are set up a group of questions related to undertaken marketing activities, and that would have taken to promote cycling tourism in Serbia. Furthermore, as an indicator the question was raised about the importance of the recognition of marketing activities. It is interesting that most of the respondents confirmed that the marketing performance of Serbia, where cycling tourism is concerned, is on very low level. This is confirmed by the average value (1.70), indicating an extremely negative attitude (Table 1). Although we believe that the application of modern techniques and concepts of marketing is the only way to overcome the existing problems. Thus, highlighting the importance of promoting bicycle tourism by travel agency has established itself as one of the most important activities of travel agencies when the future of cycling tourism is concerned.

**Table 1.** Assessment of marketing activities (1-5) for cycling tourism in Mountain of Vršac by travel agency

Mark	f	%	s.v.
1	4	40,0	
2	6	60,0	<b>1,70</b>
$\Sigma$	10	100,0	

The study obtained data which indicate that none of the respondents travel agencies do not currently use any of the elements of promotion (Table 2) when cycling tourism is concerned, it can be seen that some agencies now recognize the importance of promotional activities.

**Table 2.** Existence of marketing activities to promote cycling in travel agencies

Answers	f	%
Yes	3	30,0
No	7	70,0
$\Sigma$	10	100,0

Od ukupnog broja ispitanih putničkih agencija, tri su bile saglasne da budućnost biciklističkog turizma na Fruškoj gori dobrom delom zavisi i od adekvatne promocije, kako pojedinačnih resursa (Vršačke planine), tako i Vojvodine, Srbije kao buduće biciklističke destinacije. Elementi promocije u ovom istraživanju obuhvatili su ukupno šest elemenata koji su se kao indikatori koristili u pojedinim agencijama (tabela 3). Uočljivo je da su samo tri agencije bile usmerene na neke oblike promotivnih aktivnosti biciklističkog turizma na Vršačkim planinama, što je od ukupnog broja agencija obuhvaćenih istraživanjem svega 30%. Uglavnom su se oblici promocije pojavljivali kroz odnose sa javnošću (PR), a samo u slučaju jedne agencije je to bilo kroz oglašavanje ili u direktnom marketingu, odnosno u ličnoj prodaji.

**Tabela 3.** Korišćeni elementi promocije

Ponuđeni elementi promocije / Offered elements of promotions	Putničke agencije / Travel agencies		
	Agencija 1 / Agency 1	Agencija 2 / Agency 2	Agencija 3 / Agency 3
Oglašavanje / Advertising	+	+	
Unapređenje prodaje / Personal sales			
Lična prodaja / Promotion with direct marketing			+
Ekonomski publicitet / Public Relations			
Promocija direktnim marketingom	+		
Odnosi sa javnošću	+	+	+

Pod promotivnim aktivnostima ove tri agencije su podrazumevale pružanje određenih informacija eventualnim interesentima, najčešće strancima prilikom posete njihovim sajtovima ili pri direktnom kontaktu u agencijama. Sasvim je jasno da putničke agencije treba da predstavljaju jedan od glavnih faktora promocije i aktualizacije biciklističkog turizma. Neke su već shvatile značaj promotivnih aktivnosti, kao i to da se većina domaćih turista koji se žele baviti biciklističkim turizmom, ali i stranaca koji su u propovojanju kroz našu zemlju, pre svega oslanja na putničke agencije. To znači da veliku ulogu u promovisanju planina u Srbiji, imaju i moraju imati upravo putničke agencije, a da je promotivna aktivnost jedan od osnovnih koraka pri afirmaciji Vršačkih planina za biciklistički turizam.

## ZAKLJUČAK

Putničke agencije locirane su na mestima gde je najjača i najgušća frekvencija potencijalnih potrošača. To su uglavnom lokacije u centru grada, na železničkim i autobuskim stanicama, aerodromima, a u novije vreme i u okviru

Of the total number of travel agencies, three were agreed that the future of cycling tourism in Fruska Gora largely depends on the proper promotion, as individual resources (Mountain of Vršac) and Vojvodina, Serbia as a future cycling destination. Elements of promotion in this study included a total of six elements that are used as indicators of individual agencies (Table 3). It is notable that only three agencies were directed to some forms of promotion of cycling tourism in Mountain of Vršac, which is the total number of agencies surveyed, only 30%. Basically the forms of promotion appeared in public relations (PR), and only in the case of an agency that was through advertising or direct marketing, or in personal sales.

**Table 3.** Used promotions components

Ponuđeni elementi promocije / Offered elements of promotions	Putničke agencije / Travel agencies		
	Agencija 1 / Agency 1	Agencija 2 / Agency 2	Agencija 3 / Agency 3
Oglašavanje / Advertising	+	+	
Unapređenje prodaje / Personal sales			
Lična prodaja / Promotion with direct marketing			+
Ekonomski publicitet / Public Relations			
Promocija direktnim marketingom	+		
Odnosi sa javnošću	+	+	+

Under the promotional activities, these three agencies have entailed the provision of certain information to the possible stakeholders, mostly foreigners, when visiting their sites or in direct contact at the agency. It is clear that travel agents should represent one of the major factors promoting and actualization of cycling tourism. Some have already realized the importance of promotional activities, and that the majority of domestic tourists who wish to engage in cycling tourism and foreigners who are traveling through our country, primarily relies on travel agents. This means that a major role in promoting the mountains in Serbia, has and must have just the travel agency, and promotional activities is one of the basic steps for promotion of Mountains of Vršac for cycling tourism.

## CONCLUSION

Travel agencies are located in places where is the strongest and densest frequency of potential consumers. These are generally the location in the city center, the railway and bus stations, airports, and more

velikih šoping centara. Prvi kontakti turista koji žele da se bave biciklizmom na nekoj destinaciji, upravo se odigravaju u agencijama i veoma je važno da agencije pružaju adekvatne informacije o mogućnostima upražnjavanja ovakvog oblika turizma, pa čak iako se direktno, one same ne bave biciklističkim turizmom. Biciklistička putovanja, gde je biciklizam glavni motiv putovanja i osnovni oblik transporta, 2010. godine su činila čak 2-4% od ukupnih putovanja u nekim evropskim zemljama, a predviđeno je da se taj broj udvostruči i utrostruči u narednim decenijama (Cope, Doxford, 1998; [www.sustrans.co.uk](http://www.sustrans.co.uk); [www.adventurecycling.org](http://www.adventurecycling.org)). Biciklisti tragaju za novim turističkim destinacijama na kojima će moći voziti svoje bicikle ali i iznajmljivati bicikl gde bi vožnja bila jedan od komplementarnih aktivnosti na destinaciji. Međutim, sve dok se aktuelni nosioci turističke privrede u Srbiji ne ujedine i udruženim snagama zajedno ne počnu da deluju, ne možemo govoriti o napretku. To, pre svega, znači da putničke agencije moraju shvatiti važnost biciklističkog turizma i promotivnih aktivnosti. Samo zajedničkim zalaganjima i objedinjenom promotivnom aktivnošću može se doći do pozitivnih promena, što direktno apostrofira ljudski faktor kao osnovni uzrok nepostojanja ponude za biciklistički turizam na području Vršačkih planina, Vojvodine i Srbije.

**Izjava autora**  
Autori pridonijeli jednakо.

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Mi izjavljujemo da nemamo konflikt interesa.

recently in the framework of large shopping centers. The first contact of tourists who want to engage in a cycling destination, just happen in agencies, and it is important that agencies provide adequate information about the possibilities of practicing this form of tourism, even though they directly, are not involved in cycling tourism. Bicycle travel, where cycling is the main motivation for travel and the main form of transportation, 2010th year they did even 2-4% of the total trips in some European countries, (Cope, Doxford, 1998; [www.sustrans.co.uk](http://www.sustrans.co.uk); [www.adventurecycling.org](http://www.adventurecycling.org)). Cyclists looking for new tourist destinations where they can ride their bikes and rented a bike where the cycling was one of the complementary activities of the destination. However, until the current holders of the tourism industry in Serbia unite and join forces together they begin to act, we can not talk about progress. This primarily means that the travel agency must understand the importance of cycling tourism and promotional activities. Only joint efforts and unified promotional activity can lead to positive change, which directly emphasizes the human factor as the main cause of the lack of offers for cycling tourism in the Mountain of Vršac, Vojvodina and Serbia.

**Authorship statement**  
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## FIZIČKA AKTIVNOST UČENIKA OSLOBOĐENIH OD NASTAVE FIZIČKOG VASPITANJA

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**Apstrakt:** Problem oslobođanja učenika od nastave fizičkog vaspitanja i dalje predstavlja aktuelan problem svakodnevne prakse fizičkog vaspitanja u školama. Istraživanje na uzorku učenika osnovne i srednje škole (N=254), oslobođenih nastave fizičkog vaspitanja, pokazalo je da je fizička aktivnost veoma zastupljena u slobodnom vremenu ovih učenika. Oko 68% ispitanika se u slobodno vreme bavi nekom fizičkom aktivnošću, a najpopularnije aktivnosti su vožnja bicikla i roller-a. Pored fizičke aktivnosti umerenog intenziteta, kod većine ispitanika je zastupljena i fizička aktivnost visokog intenziteta. Oko 24% ispitanika se bavi organizovano rekreacijom u klubu, a najzastupljenije rekreativne aktivnosti su ples (devojčice) i vežbanje u teretani (dečaci). Više od 40% ispitanika volelo bi da se uključi u odgovarajuću sportsku sekciju u školi.

**Ključne reči:** fizičko vaspitanje, oslobođanje od nastave fizičkog vaspitanja, fizička aktivnost

## UVOD

Problem oslobođanja učenika od nastave fizičkog vaspitanja odavno pobuđuje pažnju stručne javnosti (Konstantinović, 1969; Medved, 1969; Stojanović i Vučo, 1969; Ivanić, 1974 i dr.). Iako je postupak oslobođanja učenika od obavezne nastave fizičkog vaspitanja zakonski regulisan (Zakon o srednjoj školi, 2005), u praksi provejava mišljenje da među oslobođenim učenicima ima onih koji su se oslobodili iz nemedicinskih razloga. Procenat oslobođenih učenika najčešće iznosi 3 - 10%, međutim, činjenica da taj procenat značajno varira u zavisnosti od nastavnika fizičkog vaspitanja, škole, pola i

## PHYSICAL ACTIVITY OF STUDENTS MEDICALLY EXEMPTED FROM PHYSICAL EDUCATION CLASSES

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**Abstract:** The problem of students' medical exemption from physical education classes is still a current problem of everyday practice of physical education in schools. A study of the sample of students of primary and secondary schools (N=254), who were medically exempted from classes of physical education, has shown that physical activity is largely present in the free time of such students. About 68% subjects do a kind of leisure-time physical activity, the most popular of which are cycling and inline skating. In addition to moderate physical activity, most subjects practice vigorous physical activity. Approximately 24% subjects are engaged in an organized recreation in a club, whereas the most frequent recreation activities are dance (girls) and gym exercises (boys). More than 40% subjects would like to be engaged in a proper extracurricular sport activities in school.

**Keywords:** physical education, medical exemption from classes of physical education, physical activity

## INTRODUCTION

The problem of medical exemption of students from physical education classes has aroused attention of professional public since long ago (Konstantinović, 1969; Medved, 1969; Stojanović & Vučo, 1969; Ivanić et al, 1974). Even though the procedure of medical exemption of a student from compulsory classes of physical education is regulated by law (The Law on secondary schools, 2005), there is an opinion in practice that there are students excused from classes of physical education for non-medical reasons. The percentage of exempted students most frequently ranges from 3% to 10%, however, the fact is

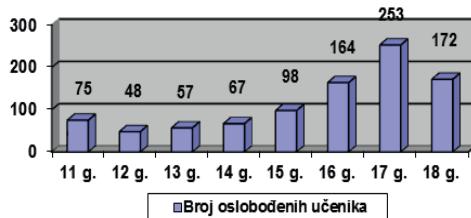
uzrasta učenika, sugerije da pored medicinskih razloga, postoje i neki drugi, subjektivni razlozi za oslobođanje od nastave fizičkog vaspitanja (Radovanović, Todorović i Đordić, 1995).

Razvoj inkluzivnog fizičkog vaspitanja, čija pretpostavka je prilagođavanje nastavnih sadržaja, metoda i ishoda potrebama i mogućnostima svih učenika, aktuelizuje problem oslobođanja učenika od nastave fizičkog vaspitanja. Sa ciljem da se ispitaju pojedini aspekti oslobođanja učenika od nastave fizičkog vaspitanja, posebno kada je reč o fizičkoj aktivnosti ovih učenika u slobodno vreme, sprovedeno je istraživanje na uzorku učenika oslobođenih nastave fizičkog vaspitanja.

## METOD

Za potrebe istraživanja korišćen je uzorak učenika osnovnih i srednjih gradskih škola u Zrenjaninu (Republika Srbija), oslobođenih nastave fizičkog vaspitanja. Uzorkom su obuhvaćena ukupno 254 ispitanika, od čega je 179 ženskog pola (70.47%), a 75 muškog pola (29.53%). Posmatrano po uzrastu, izuzev najmladeg i najstarijeg godišta, procenat oslobođenih učenika sa uzrastom raste (slika 1). U odnosu na dvanestogodišnjake, broj sedamnaestogodišnjaka oslobođenih od nastave fizičkog vaspitanja je petostruko veći (253 prema 48).

Slika 1 Uzrast oslobođenih učenika



Podaci o fizičkoj aktivnosti dobijeni su korišćenjem anketnog upitnika, a potom obrađeni korišćenjem dekskriptivne statistike.

## REZULTATI

*Bavljenje fizičkom aktivnošću u slobodno vreme.* U tabeli 1 je prikazana distribucija odgovora na pitanje „Da li se u slobodno vreme baviš nekom fizičkom aktivnošću?“. Kao što se vidi iz tabele, više od dve trećine ispitanika je dalo potvrđan odgovor (cc68%). Između devojčica i dečaka ne postoji statistički značajna razlika kad je reč o bavljenju fizičkom aktivnošću u slobodno vreme ( $\chi^2(1)=0.03$ ;  $p=0.86$ ).

that this percentage varies significantly depending on the PE teacher, school, gender and age of a student. This indicates that, apart from medical reasons, there are also other subjective reasons for being released from classes of physical education (Radovanović, Todorović, & Đordić, 1995).

The development of inclusive physical education which assumes adaptation of teaching contents, methods and competences according to the requirements and possibilities of all students raises the question of medical exemption of students from physical education classes. Aiming at analysis of various aspects of students' exemption from physical education classes, especially in terms of leisure-time physical activity of these students, a study has been carried out on the sample of students medically excused from physical education classes.

## METHOD

A sample of primary and secondary school students from the town Zrenjanin (Republic of Serbia) was used. The participants were medically exempted from physical education classes. The sample includes 254 participants of which 179 were females (70.47%) and 75 males (29.53%). With age, provided the youngest and the oldest ages are excluded, the percentage of medically exempted students increases (Figure 1). In relation to the twelve-year olds, the number of seventeen-year olds that were medically exempted from physical education classes is five times higher (253 towards 48).

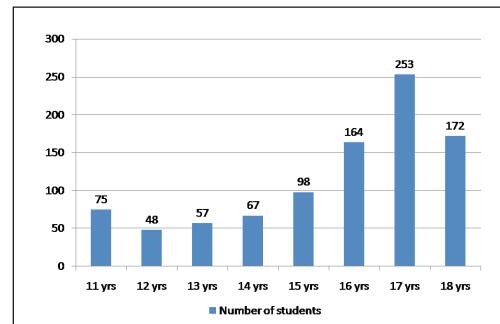


Figure 1. Age of medically exempted students

Data on physical activity were obtained by questionnaire and then analyzed by descriptive statistics procedures.

## RESULTS

*Leisure-time physical activity.* Table 1 shows distribution of answers to the question “Do you practice any sports activity in your free time?”. As can be seen from the Table, over two thirds of subjects give positive

**Tabela 1.** Bavljenje oslobođenih učenika fizičkom aktivnošću u slobodno vreme

Pol	Da	Ne	Ukupno
Muški	52 (69,33%)	23 (30,67%)	75 (100%)
Ženski	122 (68,16%)	57 (31,84%)	179 (100%)
Ukupno	174 (68,50%)	80 (31,50%)	254 (100%)

$\chi^2(1)=0.03$ ;  $p=0.86$

*Izbor fizičke aktivnosti.* Najveći procenat oslobođenih učenika odlučuje za vožnju bicikla/rolera (73 ili 28.7%), sledi vežbanje kod kuće (27; 10.6%), u teretani (18; 7.1%) i terapeutsko vežbanje (13; 5.1%). Plesom se bavi 11 učenika (4.3%), a plivanjem 8 učenika (3.2%). Sa manjim procentom su zastupljeni još i stoni tenis, fudbal, košarka i odbojka.

*Uobičajeni obrazac fizičke aktivnosti.* Na pitanje „U slobodno vreme, koliko često se baviš fizičkom aktivnošću najmanje umerenog intenziteta (kao kada žuštro hodaš) u trajanju od minimum 30 minuta (može i 2 puta po 15 minuta)“ više od trećine anketiranih učenika (93 učenik, odnosno, 36.61%) je odgovorilo da se svaki dan bavi takvom fizičkom aktivnošću, 62 učenika (24.41%) je aktivno 2-3 puta nedeljno, 33 učenika (12.99%) je aktivno 4-6 puta nedeljno, a 29 učenika (11.42%) je aktivno jedanput nedeljno. Samo 37 učenika (14.57%) se izjasnilo da je aktivno jedanput mesečno ili nikada. Vrednost hi-kvadrat testa pokazuje da između ispitanika muškog i ženskog pola ne postoji statistički značajne razlike u pogledu nivoa fizičke aktivnosti ( $\chi^2(4)=3.29$ ;  $p=0.51$ ).

*Intenzivna fizička aktivnost.* Najveći broj ispitanika (96 ili 37.50%) izjasnio se da nije fizički aktivni toliko da se umori ili preznoji, što odgovara intenzivnoj fizičkoj aktivnosti. Slede odgovori: 1 sat nedeljno (52; 20.47%), 2-3 sata nedeljno (42; 16.54%), 30 minuta nedeljno (33; 12.99%) i 4 i više sata nedeljno (31; 12.20%). Vrednosti hi-kvadrat testa pokazuju da između učenika i učenica ne postoje značajne razlike ( $\chi^2(4)=2.41$ ;  $p=0.66$ ).

*Organizovano bavljenje rekreacijom u klubu.* U tabeli 2 prikazani su odgovori na pitanje u vezi sa organizovanim bavljenjem rekreacijom u klubu. Skoro petina ispitanika je odgovorila da se bavi rekreacijom u nekom klubu (24%). Iz tabele 2 se može zaključiti da između učenika muškog i ženskog pola ne postoje značajne razlike u organizovanom bavljenju rekreacijom ( $\chi^2(1)=2.09$ ;  $p=0.15$ ).

ve answer (cc68%). There is no statistically significant difference in leisure-time physical activity between girls and boys ( $\chi^2(1)=0.03$ ;  $p=0.86$ ).

**Table 1.** Leisure-time physical activity of medically exempted students in their free time

Gender	Yes	No	Total
Male	52 (69,33%)	23 (30,67%)	75 (100%)
Female	122 (68,16%)	57 (31,84%)	179 (100%)
Total	174 (68,50%)	80 (31,50%)	254 (100%)

$\chi^2(1)=0.03$ ;  $p=0.86$

*Selection of physical activities.* The highest percentage of medically exempted students decides for cycling/inline skating (73 or 28.7%), which is followed by exercising at home (27; or 10.6%), exercising in the gym (18 or 7.1%) and therapeutic exercising (13 or 5.1%). 11 students practice dancing (4.3%) and 8 are engaged in swimming (3.2%). There is also a lower percentage of those practicing table tennis, football, basketball and volleyball.

*The usual pattern of physical activity.* The question “In your free time, how often do you practice physical activity of at least moderate intensity (as if when you walk at a brisk pace) lasting for at least 30 minutes (or two times for 15 minutes)” is answered as follows: over one third of surveyed students (93 students i.e. 36.61%) answer that they do physical activity every day, 62 students (24.41%) are active 2-3 times a week, 33 students (12.99%) are active 4-6 times a week, whereas 29% students (11.42%) are active once a week. Only 37 students (14.57%) answer that they are active once a month or not at all. The value of chi-square test indicate that there are no statistically significant differences between male and female subjects concerning the extent of physical activity ( $\chi^2(4)=3.29$ ;  $p=0.51$ ).

*Vigorous physical activity.* The highest number of subjects (96 or 37.50%) say that they are not physically active to such an extent that they get tired or sweated, which corresponds to an vigorous physical activity. The answers are as follows: 1 hour a week (52 or 20.47%), 2-3 hours per week (42 or 16.54%), 30 minutes a week (33 or 12.99%) and 4 and more hours per week (31 or 12.20%). The values of chi-square test indicate that there are no statistically significant differences between boys and girls ( $\chi^2(4)=2.41$ ;  $p=0.66$ ).

*Organized engagement in recreation in a club.* Table 2 shows answers to the question related to an organized engagement in recreation in a club. Almost one fifth of subjects answer that they practice recreation in a club

**Tabela 2.** Organizovano bavljenje rekreacijom oslobođenih učenika

Pol	Da	Ne	Ukupno
Muški	23 (30.67%)	52 (69.33%)	75 (100%)
Ženski	38 (21.22%)	141 (78.77%)	179 (100%)
Ukupno	61 (24.02%)	193 (75.98%)	254 (100%)

$\chi^2(1)=2.47$ ; p=0.12

*Izbor rekreativne aktivnosti.* Među oslobođenim učenicima koji se organizovano bave sportskom aktivnošću, najveći broj odlazi na časove plesa (moderan, latino i folklor), njih ukupno 21 (8.23%), a potom na treninge u teretani (17; 6.69%). Pritom, devojcice se više bave plesom nego dečaci (14 devojčica, 7 dečaka), dok je vežbanje u teretani tipična aktivnost dečaka (15 dečaka, 2 devojcice).

*Stavovi ispitanika prema nastavi fizičkog vaspitanja.* Skoro polovina ispitanika (126, odnosno, 49.61%) smatra da je za učenike oslobođene nastave fizičkog vaspitanja postojeće rešenje najbolje, 66 ispitanika (25.98%) bi želelo da se uključi u nastavu, 39 ispitanika (15.35%) je neodlučno, dok se 23 ispitanika (9.06%) zalaže za posebnu nastavu fizičkog vaspitanja. Između ispitanika muškog i ženskog pola ne postoje značajne razlike u viđenju optimalnog rešenja za učenike oslobođene od nastave fizičkog vaspitanja ( $\chi^2(3)=2.28$ ; p=0.52).

*Stavovi ispitanika prema školskim sportskim sekcijsima* prikazani su u tabeli 3.

**Tabela 3.** „Kada bi postojala odgovarajuća sekcija u školi, da li bi voleo/la da se uključiš u njen rad?“

Pol	Da	Ne	Nisam siguran	Ukupno
Muški	36 (48.00%)	18 (24.00%)	21 (28.00%)	75 (100%)
Ženski	76 (42.46%)	33 (18.44%)	70 (39.10%)	179 (100%)
Ukupno	112 (44.09%)	51 (20.08%)	91 (35.83%)	254 (100%)

$\chi^2(2)=3.00$ ; p=0.22

Iz tabele 3 se vidi da je najviše ispitanika (112 ili 44.09%) iskazalo nameru da se uključi u rad sportske sekcijs u školi, koja bi odgovarala njihovom zdravstvenom stanju. Procenat neodlučnih učenika dostiže skoro 36%, a najmanje je onih koji ne bi želeli da se uključe u takvu sekcijs (cc20%). Vrednosti hi-kvadrat testa pokazuju da između učenika i učenica ne postoje značajne razlike.

(24%). According to the Table 2, a conclusion can be drawn that there are no statistically significant differences between male and female subjects concerning an organized engagement in recreation ( $\chi^2(1)=2.09$ ; p=0.15).

**Table 2.** Organized engagement of medically exempted students in recreation

Gender	Yes	No	Total
Male	23 (30.67%)	52 (69.33%)	75 (100%)
Female	38 (21.22%)	141 (78.77%)	179 (100%)
Total	61 (24.02%)	193 (75.98%)	254 (100%)

$\chi^2(1)=2.47$ ; p=0.12

*Selection of recreation activity.* Among medically exempted students engaged in an organized recreation activity, most take dance classes (modern, Latino, folklore) i.e. 21 subjects (8.23%), which is followed by gym training sessions (17; 6.69%). In so doing, girls are engaged in dancing to a higher extent than boys (14 girls, 7 boys), whereas gym exercising is a typical boys' activity (15 boys, 2 girls).

*Attitudes towards physical education classes.* Almost one half of subjects (126, i.e. 49.61%) believe that the existing solution for the students medically exempted from PE classes is the best, 66 participants (25.98%) would like to be included in the class activities, 39 participants (15.35%) are irresolute while 23 participants (9.06%) support a special form of physical education. There are no significant differences between male and female participants in regard to an optimal solution for students exempted from PE classes ( $\chi^2(3)=2.28$ ; p=0.52).

*Attitudes towards extracurricular sport activities in school* are shown in Table 3.

**Table 3.** If there was an appropriate extracurricular sport activity at school, would you like to join in?”

Gender	Yes	No	I'm not sure	Total
Male	36 (48.00%)	18 (24.00%)	21 (28.00%)	75 (100%)
Female	76 (42.46%)	33 (18.44%)	70 (39.10%)	179 (100%)
Total	112 (44.09%)	51 (20.08%)	91 (35.83%)	254 (100%)

$\chi^2(2)=3.00$ ; p=0.22

Table 3 indicates that most subjects (112 or 44.09%) express their intention to join in extracurricular sport activities in school, which corresponds to their medical condition. The percentage of indecisive students is almost 36%, whereas the smallest number accounts for

## ZAKLJUČAK

Istraživanje sprovedeno na uzorku učenika osnovne i srednje škole, oslobođenih nastave fizičkog vaspitanja, potvrdilo je da su među oslobođenim učenicima više zastupljene devojčice i da procenat oslobođenih učenika raste sa uzrastom.

Iako su svi ispitanici obuhvaćeni istraživanjem oslobođeni nastave fizičkog vaspitanja na način predviđen odgovarajućom zakonskom regulativom, što znači da postoji lekarsko uverenje o zdravstvenom stanju za koje je pohađanje redovne nastave fizičkog vaspitanja kontraindikovano, dobijeni rezultati pokazuju da je fizička aktivnost veoma zastupljena u slobodnom vremenu oslobođenih učenika.

Naime, dve trećine ispitanika se u slobodno vreme bavi nekom fizičkom aktivnošću, a najpopularnije aktivnosti su vožnja bicikla i rolera. Pored fizičke aktivnosti umerenog intenziteta, kod većine ispitanika je zastupljena i fizička aktivnost visokog intenziteta. Osim toga, jedna četvrtina oslobođenih učenika bavi se organizovano rekreacijom u klubu, a najzastupljenije rekreativne aktivnosti su ples (devojčice) i vežbanje u teretani (dečaci).

Dobijeni rezultati mogu se dvojako tumačiti: 1) u kontekstu realnih potreba oslobođenih učenika za odgovarajućim vidom fizičke aktivnosti i 2) u kontekstu ne-realnih, odnosno, nemedicinskih oslobođanja učenika od nastave fizičkog vaspitanja.

U prilog prvom tumačenju govore pozitivni stavovi većine ispitanika prema učestvovanju u školskim sportskim sekcijama, koje bi bile bezbedne i prihvatljive sa aspekta njihovog zdravstvenog stanja.

Naravno, problem oslobođanja učenika od nastave fizičkog vaspitanja mora se posmatrati i iz ugla motivacije učenika za učestvovanje u nastavi fizičkog vaspitanja, jer obaveznost pohađanja nastave, onda kada je praćena niskim kvalitetom same nastave, može doprineti amotivaciji učenika. Neregularno oslobođanje od nastave fizičkog vaspitanja, uz izostajanje sa nastave, nedonošenje opreme za čas ili neaktivnost na času, u tom slučaju, mogu predstavljati svojevrsno isključivanje učenika iz nastave fizičkog vaspitanja (Đordić i Tubić, 2010). Zato je unapredavanje kvaliteta fizičkog vaspitanja i stvaranje pozitivnog ambijenta za učenje i napredovanje svih učenika, uporedo sa daljim razvijanjem inkluzivne kulture i prakse, jedan od načina za rešavanje problema oslobođanja učenika od nastave fizičkog vaspitanja.

those that would not like to join such an activity (cc20%). The values of chi-square test indicate that there are no significant differences between boys and girls.

## CONCLUSION

The study carried out on the sample of students of primary and secondary schools, who were medically exempted from classes of physical education, has confirmed that the exempted students were mostly girls and that the percentage of exempted students increases with age.

Even though all students, that were included in this study, were medically exempted from PE classes in compliance with the relevant legal regulations, which means that they had a medical certificate testifying that the PE classes were counter-indicated, the results show that physical activity is present to a high extent in the leisure time of medically exempted students.

Namely, two thirds of students practice a kind of physical activity among which the most popular is cycling and inline skating. In addition to moderate physical activity, most students are engaged in physical activity of high intensity. Besides, one third of medically exempted students are engaged in an organized recreation, the most frequent of which are dancing (girls) and gym exercises (boys).

The obtained results can be interpreted in two ways: 1) within the context of real needs of exempted students for proper form of physical activities and 2) within the context of unreal i.e. non-medical exemption of students from classes of physical education. The former is supported by positive attitudes of most surveyed students towards participation in sport-related extracurricular sports activities, that would be safe and acceptable from the aspect of their health condition.

Naturally, the problem of medical exemption of students from PE classes must also be considered from the aspect of students' motivation for participation in the PE classes since compulsory presence on these classes can lead to students' amotivation. Irregular exemption from classes of physical education including absence from the classes, failure to bring required PE uniform or inactivity during classes, can also be a kind of students' exclusion from PE classes (Đordić & Tubić, 2010). This is why improvement of the quality of physical education and creation of a positive environment for learning and advancement of all students, as well as further development of inclusive culture and practice, is one of the ways of solving the problem of medical exemption of students from PE classes.

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## RAZVOJ AGILNOSTI I FLEKSIBILNOSTI U SKIJANJU

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**Sažetak:** Populaciju iz koje je uzet uzorak od 40 ispitanika, čine učenici osnovnih škola, muškog pola, uzrasta 13 i 14 godina  $\pm$  6 mjeseci, podjeljenih na grupu od 20 polaznika škole smučanja (eksperimentalna grupa) i grupu od 20 učenika obuhvaćenih samo redovnom nastavom fizičkog vaspitanja (kontrolna grupa). Cilj istraživanja je bio da se utvrde efekti posebno programiranog vježbanja na razvoj agilnosti i fleksibilnosti u okviru škole skijanja kod ispitanika eksperimentalne grupe. Za procjenu motoričkih sposobnosti primjenjeno je 10 testova koji definišu: 1. agilnost ( koverta test, koraci u stranu, osmica sa savijanjem, poligon natraške i okrenutost ) i 2. fleksibilnost ( pretklon desno, pretklon, zasuk dodir, pretklon raskoračno, duboki pretklon na klupici i čeona špaga ). Rezultati multivarijantne analize kovarijanse su pokazali da se ispitanici eksperimentalne grupe statistički značajno razlikuju većim nivoom agilnosti i fleksibilnosti od ispitanika kontrolne grupe.

**Ključne riječi:** agilnost, fleksibilnost, eksperimentalna i kontrolna grupa, skijanje.

## UVOD

Skijanje spada u grupu anaerobno-aerobnih sportova. Učestale promjene pravca kretanja u skijanju, skokovi, otklizavanja, različita prizemljenja i neposredni kontakt sa snijegom, zahtjevaju od skijaša visok nivo motoričkih i funkcionalnih sposobnosti, potrebne psihomoralne osobine i raznovrsnost savladanih tehničko-taktičkih elemenata (Krsmanović i Lukman 1993). Ove karakteristike skijanja pozitivno utiču na razvoj motoričkih dimenzija agilnosti, fleksibilnosti i koordinacije kod djece i odraslih, te se i definišu kao dominantne sposobnosti neophodne za uspješno bavljanjem skijanjem.

## DEVELOPMENT OF AGILITY AND FLEXIBILITY IN SKIING

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**Summary:** Population from which a sample of 40 examinees has been taken is consisted of primary school pupils, of male sex, age 13 and 14 year  $\pm$  6 months, divided into a group of 20 attendants of school of skiing (experimental group) and a group of 20 pupils who only attend a regular schooling of physical education (control group). The aim of investigation was to determine effects of specially programmed training intended for improving agility and flexibility within the school of skiing at the examinees of experimental group. Ten tests were applied in estimate of motor abilities which define: 1. agility ( envelope test, side steps, eight with bending, polygon backwards and dexterity ) and 2. flexibility ( bend to the right, bend, roll touch, bend astride, deep bend on bench and lateral split ). Results of the multivariate analysis of covariance proved that experimental group of examinees are statistically significantly different in their higher level of agility and flexibility from the control group examinees.

**Key words:** agility, flexibility, experimental and control group, skiing.

## INTRODUCTION

SpSkiing falls into the group of anaerobic-aerobic sports. Frequent changes of direction of movement in skiing, jumps, skating, various landings and direct contacts with snow, require from the skier a high level of motor and functional abilities, necessary psycho-**morale** characteristics and diversity of learned technical-tactical elements ( Krsmanović and Lukman 1993 ). These characteristics of skiing have a favorable influence on development of motor dimensions of agility, flexibility and coordination of children and grown-ups and are defined as dominant abilities necessary for successful skiing performance.

Agilnost predstavlja veoma kompleksnu motoričku sposobnost koju nije tako lako definisati. Ona se najčešće definiše kako sposobnost sportiste da brzo odreaguje na nadražaj, da izvede brz i efikasan start, da se kreće u željenom pravcu i da bude spreman da izvede brzu promenu pravca kretanja. Agilnost je motorička sposobnost koja je zasnovana na ranom početku usavršavanja. Višedimenzionalnost i relativno visoka genetska uslovljenost ove motoričke dimenzije određuje potrebu za treningom agilnosti skijaša u najranijim fazama sportskog usavršavanja. Najpovoljnije senzibilne faze za razvoj agilnosti su godine neposredno prije puberteta i one koje slijede nakon faze ubrzanog rasta i razvoja. Prema ovim saznanjima, zakonitosti razvoja agilnosti ne poklapaju se u potpunosti sa zakonitostima razvoja ostalih koordinacionih svojstava. Osnovna razlika je što se agilnost može u znatnoj mjeri unaprijediti u završnim fazama rasta i razvoja – u kadetskom i juniorskom dobu skijaša. Razlog tome vjerovatno je u zahtjevima motoričkih struktura kao manifestacija agilnosti. One su usmjerene prema kvalitetu mišićnog, ali i vezivnog tkiva, s obzirom da je jedan od osnovnih uslova za efikasno i brzo izvođenje promjena smjera kretanja u skijanju upravo kvalitet ligamentarno-tetivnog aparata (*Lanc 1998; Milanović 2007*).

Fleksibilnost je sposobnost izvođenja pokreta sa velikom amplitudom. Najčešća mjeru ove sposobnosti je maksimalna amplituda pokreta djelova tijela u pojedinim zglobnim sistemima. U skijanju je važno da se postigne veća fleksibilnost u svim djelovima loko-motornog sistema, dok u drugim sportovima zahtjevi za fleksibilnost nisu naročito izraženi. U osnovi ove sposobnosti sadržane su strukturalne osobenosti mišića i ligamenata i njihova elastičnost i, što je još važnije, struktura i oblik zglobnih tijela u kojima se pokret izvodi. Povećanjem fleksibilnosti značajno se smanjuje opasnost od povreda ligamenata i mišića, poboljšava se ukupna motorička efikasnost i na viši nivo se podiže stabilnost lokomotornog sistema.

## METOD RADA

Cilj istraživanja je bio utvrđivanje efekata programiranog vježbanja na razvoj agilnosti i fleksibilnosti u okviru škole skijanja kod ispitanika eksperimentalne grupe. Populaciju iz koje je izведен uzorak od 40 ispitanika, činili su učenici osnovnih škola, muškog pola, uzrasta 13 i 14 godina  $\pm$  6 mjeseci, podjeljenih na grupu od 20 polaznika škole skijanja (eksperimentalna grupa) i grupu od 20 učenika obuhvaćenih samo redovnom nastavom fizič-

Agility is a very complex motor ability which cannot be easily defined. It is most frequently defined as a sportsman's ability to react quickly to stimulation, to perform a quick and efficient start, to move into a desired direction and to be ready to perform a quick change of direction of movement. Agility is a motor ability which is based on the early start of specialization. Multidimensionality and a relatively high conditionality of this motor dimension determine necessity of training of the skiers' agility in the earliest phases of the sports specialization. The most favorable receptive phases for development of agility are the years immediately before puberty and those that follow after the phase of accelerated growth and development. According to these cognitions, laws of development of agility do not match completely with the laws of development of other characteristics of coordination. The main difference is that agility can be significantly advanced in the final phases of growth and development – in the cadet and junior age of skiers. The reason of this is probably in demands of motor structures as manifestation of agility. They are directed towards quality of both muscular and connective tissue regarding the fact that one of the main conditions of efficient and quick performance of directions of movement in skiing is just the quality of ligament-sinew apparatus (*Lanc 1998; Milanović 2007*).

Flexibility is ability of performance of movements with a large amplitude. The most frequent measure of this ability is the maximum amplitude of movements of the parts of the body in certain joint systems. What matters in skiing is to reach a larger flexibility in all parts of the locomotor system while in other sports demands of flexibility are not particularly expressed. Structural singularity of muscles and connective tissues and its elasticity are contained in the basis of this ability and, more important, structure and shape of joint organs where a movement is performed. By increasing flexibility a danger of connective tissue and muscles injury is significantly diminishing, overall motor efficiency is increasing and locomotor system stability is lifting on a higher level.

## METHOD OF WORK

The aim of the research was to determine effects of the programmed training on development of agility and flexibility within the school of skiing of examinees of experimental group. Population out of which a sample of 49 examinees was derived was consisted of the pupils of primary schools, of male sex, 13 and 14 years of age  $\pm$  6 months, divided in a group of 20 attendants of the school of skiing (experimental group) and a group of 20 pupils who only attend a regular teaching of physical education

kog vaspitanja (kontrolna grupa). Za procjenu dimenzijske agilnosti primjenjeni su slijedeći testovi: koverta test (MKOT), koraci u stranu (MKUS), osmica sa savijanjem (MOSS), poligon natraške (MPON) i okretnost (MOKNT). Procjenu dimenzije fleksibilnosti činili su testovi: pretklon desno (MPRD), pretklon, zasuk dodir (MPZD), pretklon raskoračno (MPRČ), duboki pretklon na klupici (MDPK) i čeona špaga (MČŠP).

Za izračunavanje efekata programiranog vježbanja korišćena je multivariatantna analiza kovarijanse.

### **Eksperimentalni tretman**

Eksperiment je sproveden u drugom polugodištu školske 2010/11 godine sa učenicima osnovnih škola u regionu Banja Luke. Ispitanici eksperimentalne grupe, obuhvaćeni istraživanjem, pored redovne nastave fizičkog vaspitanja bili su uključeni u programirano vježbanje za razvoj agilnosti i fleksibilnosti u okviru škole skijanja sa tri časa nedjeljno, u trajanju sedam nedjelja u školskoj sekciji za fizičku kulturu. Primjena programa vježbi za razvoj agilnosti i fleksibilnosti (modifikovano prema Metikoš i sar. 2003, Nakić 2003, Kršmanović 2009) bila je individualizovana na osnovu sposobnosti i osobina ispitanika, radi povećanja efektivnog vremena vježbanja.

### **Vježbe agilnosti**

- pokretljivost trupa stojeći kruženje kukovima u lijevu i desnu stranu, otklon trupom, kruženje kukovima u osmici;
- vježbe u paru – vučenje lopte, guranje lopte, poskoci i vučenje noge, naskoci;
- učenje trčanja iz raznih položaja – iz ležanja na trbuhi, iz ležanja na leđima – naprijed, iz ležanja na trbuhi – naprijed, okret za 90°;
- učenje trčanja sa promjenom smjera – trčanje oko motke u obliku slova T, trčanje oko motke iz sredine prema spolja, trčanje po poligonom, trčanje oko i iznad prepreke;
- učenje reaktivnog odraza u tri smjera – poskoci u poligonom sunožno, poskoci u poligonom lijevom nogom, poskoci u poligonom desnog nogom, poskoci u poligonom sunožno;
- razvoj agilnosti u sali – lagano trčanje u mjestu oslođjeni na ripstol, zanoženje i podizanje koljena, trčanje naprijed – skip rad ruku, trčanje nazad – skip pod ruku, trčanje bočno – skip rad ruku, abdukcija u mjestu;
- trčanje iz raznih položaja (start iz raznih položaja tri koraka naprijed): iz ležanja na leđima – naprijed, iz

( control group ). The following tests were applied for the estimate of dimension of agility: envelope test (MKOT), aside steps (MKUS), eight with bending (MOSS), polygon backwards (MPON) and agility (MOKNT). The following tests were comprised by Estimate of flexibility dimension: bend to the right (MPRD), bend, roll-up touch (MPZD), straddle forward bend (MPRČ), deep forward bend on the bench (MDPK) and front split (MČŠP).

Multi-variant analysis of covariance has been used for calculation of effects of the programmed training.

### **Experimental treatment**

Experiment has been carried out in the second semester of 2010/11 school year with pupils of primary schools in the Banja Luka region. Examinees of experimental group, comprised by research, apart from regular teaching of physical education, were involved in the programmed training intended for development of agility and flexibility within the school of skiing for three classes a week in duration of seven weeks in the school section of physical culture. Application of the program of exercises intended for development of agility and flexibility (modified according to Metikoš and co-workers 2003., Nakić 2003, Kršmanović 2009 ) has been individualized on the basis of abilities and characteristics of examinees for the sake of increase of effective time of training.

### **Exercises of agility**

- mobility of body while standing, circling hips left and right, deflection of the body, circling hips in Eight;
- exercises in pair – pulling the ball, pushing the ball, hops and pulling leg, leaps;
- learning of running from various positions – from lying on the stomach, from lying on the back – forward, from lying on the stomach – forward, turn of 90°;
- learning of running with change of direction - running around the pole in the shape of letter T, running around the pole from the middle towards outside, running across the polygon, running around and above over the obstacles;
- learning the reactive reflection in three directions – hops in the polygon with both legs, hops in the polygon with left leg, hops in the polygon with right leg, hops in the polygon with both legs;
- development of agility in the hall – easy running in the place leant on the rip table, leaving one leg behind and lifting the knees, running forward – skip work of arms, running backwards – skip under arm, running laterally – skip work of arms, abduction in the place;
- running from various positions ( start from various positions three steps forward ): from lying on the back –

ležanja na trbu - naprijed - okret za 90°, iz ležanja na leđima - naprijed - okret za 90°, iz ležanja bočno, okret za 270° - naprijed - okret za 90°.

### Vježbe fleksibilnosti

- pretklon u sjedu sunožnom i raznožnom – istezanje mišića glutealne regije i mišića unutrašnje lože natkoljenice, zadnje lože natkoljenice i potkoljenice;
- istezanje zadnje lože natkoljenice;
- istezanje mišića ramenog pojasa u "mačjoj poziciji";
- preponski sjed – istezanje mišića prednje, unutrašnje i zadnje lože natkoljenice, istezanje mišića lumbalne regije;
- istezanje mišića zadnje lože potkoljenice;
- zanoženje i uzručenje u klečećem položaju – istezanje mišića ramenog pojasa pretklon trupa – istezanje mišića glutealne regije i zadnje lože natkoljenice;
- stojeći istezanje mišića ramenog pojasa i grudnih mišića
- zanoženja u stojećem stavu – istezanje kvadricepsa, i mišića pregibača u zglobovu kuka;
- istezanje zadnje strane natkoljenice sa partnerom – istezanje mišića zadnje lože natkoljenice i mišića opružača u zglobovu kuka.

## REZULTATI ISTRAŽIVANJA

**Tabela 1.** Multivariantna analiza kovarijanse u prostoru agilnosti

<b>WILK'S LAMBDA TEST</b>	.258
<b>RAO-va F-aproksimacija</b>	7.97
<b>Q</b>	.000

**Tabela 2.** Univariantna analiza kovarijanse u prostoru agilnosti

<b>Testovi / Tests</b>	<b>Adj.Mean (E)</b>	<b>Adj.Mean (K)</b>	<b>F-odnos</b>	<b>P-Level</b>
<b>MKOT</b>	16.08	18.70	4.46	.000
<b>MKUS</b>	11.37	14.02	3.91	.000
<b>MOSS</b>	10.05	13.30	6.62	.000
<b>MPON</b>	11.90	13.95	7.01	.000
<b>MOKNT</b>	8.54	10.80	6.38	.000

U tabeli 1 prikazani su rezultati testiranja značajnosti razlika nivoa aritmetičkih sredina svih testova agilnosti u finalnom mjerenu sa neutralizacijom poda-

forward, from lying on the stomach – forward – turn of 90°, from lying on the back – forward – turn of 90°, from lying laterally, turn of 270° – forward – turn of 90°.

### Exercises of flexibility

- bend at the seat with both legs and straddle – stretching the muscles of the **gluteal** region and muscles of the inner thigh, hamstrings thigh and lower leg;
- stretching the hamstrings thigh;
- stretching the muscles of the shoulder belt in "feline position"
- inguinal seat – stretching the muscles of the front, inner and hamstring thigh, stretching the muscles of the lumbar region
- stretching the the hamstrings lower leg
- leaving one leg behind and arms up at kneeling position – stretching the muscles of the shoulder belt
- bend of the trunk – stretching the muscles of the gluteal region and hamstrings thigh;
- stretching the muscles of the shoulder belt and pectoral muscles at standing
- leaving one leg at standing position – stretching the quadriceps, and flexor muscle of the hip joint;
- stretching the back of the thigh with a partner – stretching the muscles of the hamstring thigh and the extensor muscle of the hip joint.

## RESULTS OF RESEARCH

**Table 1.** Multi-varient analysis of covariance in the space of agility

<b>WILK'S LAMBDA TEST</b>	.258
<b>RAO's F-approximation</b>	7.97
<b>Q</b>	.000

**Table 2.** Mono-variant analysis of the covariance in the space of agility

<b>Testovi / Tests</b>	<b>Adj.Mean (E)</b>	<b>Adj.Mean (K)</b>	<b>F-odnos</b>	<b>P-Level</b>
<b>MKOT</b>	16.08	18.70	4.46	.000
<b>MKUS</b>	11.37	14.02	3.91	.000
<b>MOSS</b>	10.05	13.30	6.62	.000
<b>MPON</b>	11.90	13.95	7.01	.000
<b>MOKNT</b>	8.54	10.80	6.38	.000

In the table 1 there follows the results of testing the significance of differences of level of the arithmetic means of all tests of agility in the final measurement with

taka na inicijalnom mjerenu između eksperimentalne i kontrolne grupe. Na osnovu vrijednosti Wilk's Lambda testa (.258) i Raove F-aproksimacijom (7.97), utvrđeno je da se ispitanici eksperimentalne grupe statistički značajno razlikuju u nivou agilnosti od ispitanika kontrolne grupe ( $Q=.000$ ). Pojedinačnom analizom testova agilnosti (tabela 2), može se konstatovati da su utvrđene statistički značajne razlike u svim primjenjenim testovima (koverta test (MKOT .000), koraci u stranu (MKUS .000), osmica sa savijanjem (MOSS .000), poligon natraške (MPON .000) i okretnost na tlu (MOKNT .000)).

**Tabela 3.** Multivariantna analiza kovarijanse u prostoru fleksibilnosti

<b>WILK'S LAMBDA TEST</b>	.422
<b>RAO-va F-aproksimacija</b>	5.69
<b>Q</b>	<b>.000</b>

**Tabela 4.** Univarijantna analiza kovarijanse u prostoru fleksibilnosti

Testovi / Tests	Adj.Mean (E)	Adj.Mean (K)	F-odnos	P-Level
<b>MPRD</b>	38.05	35.06	10.87	<b>.000</b>
<b>MPZD</b>	20.32	17.35	8.89	<b>.000</b>
<b>MSRČ</b>	34.23	32.36	9.36	<b>.000</b>
<b>MDPK</b>	43.36	35.36	5.10	<b>.000</b>
<b>MČŠP</b>	34.64	26.70	6.45	<b>.000</b>

U Tabeli 3 prikazani su rezultati testiranja značajnosti razlika nivoa aritmetičkih sredina svih testova fleksibilnosti u finalnom mjerenu sa neutralizacijom podataka na inicijalnom testiranju između eksperimentalne i kontrolne grupe. Na osnovu vrijednosti Wilk's Lambda testa (.422) i Raove F-aproksimacijom (5.69), utvrđeno je da se ispitanici eksperimentalne grupe statistički značajno razlikuju u nivou agilnosti od ispitanika kontrolne grupe ( $Q=.000$ ). Pojedinačnom analizom testova agilnosti (tabela 4), može se konstatovati da su utvrđene statistički značajne razlike u svim primjenjenim testovima (pretklon desno (MPRD .000); pretklon, zasuk, dodir (MPZD .000); sjed raskoračni (MSRČ .000); duboki pretklon na klupi (MDPK .000) i čeona špaga (MČŠP .000)).

## DISKUSIJA I ZAKLJUČAK

Svaka sportska aktivnost u koju spada i skijanje, zahtijeva specifičnu tehničko-taktičku pripremu, što implicira uvid u tendencije njenog razvoja u svijetu, kao i naučni razvoj metoda modeliranja, kako bi se

neutralizacijom podataka na inicijalnom testiranju između eksperimentalne i kontrolne grupe. Na osnovu vrijednosti Wilk's Lambda testa (.258) i Raove F-aproksimacijom (7.97), utvrđeno je da se ispitanici eksperimentalne grupe statistički značajno razlikuju u nivou agilnosti od ispitanika kontrolne grupe ( $Q=.000$ ). Pojedinačnom analizom testova agilnosti (tabela 2), može se konstatovati da su utvrđene statistički značajne razlike u svim primjenjenim testovima (koverta test (MKOT .000), koraci u stranu (MKUS .000), osmica sa savijanjem (MOSS .000), poligon natraške (MPON .000) i okretnost na tlu (MOKNT .000)).

**Tabela 3.** Multi-variant analysis of the covariance in the space of flexibility

<b>WILK'S LAMBDA TEST</b>	.422
<b>RAO's F-approximation</b>	5.69
<b>Q</b>	<b>.000</b>

**Tabela 4.** Mono-variant analysis of the covariance in the place of flexibility

Testovi / Tests	Adj.Mean (E)	Adj.Mean (K)	F-odnos	P-Level
<b>MPRD</b>	38.05	35.06	10.87	<b>.000</b>
<b>MPZD</b>	20.32	17.35	8.89	<b>.000</b>
<b>MSRČ</b>	34.23	32.36	9.36	<b>.000</b>
<b>MDPK</b>	43.36	35.36	5.10	<b>.000</b>
<b>MČŠP</b>	34.64	26.70	6.45	<b>.000</b>

In the table 3 there follows the results of significance of differences of levels of arithmetic means of all the tests of flexibility in the final measurement with neutralization of data at the initial testing between experimental and control group. On the basis of values of Wilk's Lambda test (.422) and Rao's F- approximation (5.69), it has been established that the examinees of the experimental group statistically significantly differ on the level of agility from examinees of the control group ( $Q=.000$ ). By use of individual tests of agility ( table 4 ), it can be ascertained that statistically significant differences have been determined in all applied tests ( bend to the right (MPRD .000; bend, roll-up touch (MPZD .000); seat straddle (MSRČ .000); deep forward bend on the bench (MDPK .000) and front split (MČŠP .000)).

## DISCUSSION AND CONCLUSION

Any sport activity where skiing also belongs, requires a specific technical-tactical preparation which implies insight into tendencies of its development in the world as well as a scientific development by use of

zajednički identifikovao model sportske aktivnosti, a zatim i orijentacija procesa selekcije, rane specijalizacije i svi oblici priprema na odgovarajućim vrijednostima budućeg modela. Takvi generalni zahtjevi podrazumijevaju visoko kvalifikovani trenerski kadar, i kvalitetnu organizaciju rada, posebno sa mladim uzrastnim kategorijama, zajedničku saradnju i programiranje (Vongrinec, 1982; Krsmanović, 2006).

Opredjeljenje djece i omladine za skijanje uslovljeno je njihovim sopstvenim izborom za ovaj sport, ili selekcijom od strane kompetentnih skijaških stručnjaka. Tek nakon toga procesa počinje proces vježbanja, njihovo vaspitanje u kolektivu i adaptacija na uslove života i rada u klubu (Lanc, 1988). Postoje mnogo-brojna istraživanja koja tretiraju razvoj pomenutih, ali i ostalih motoričkih sposobnosti u skijanju (Krsmanović, 2008; Kuna, Franko i Lozančić, 2010).

Osnovni cilj sportskog treninga u skijanju je potpuni razvoj sportista, usmjeren na postizanju najviših mogućih sportskih dostignuća na svakom razvojnom stepenu dugoročne sportske pripreme. To ukazuje da je trenažni proces skijaša usmjeren na razvoj i održavanje svih važnih komponenata treniranosti i sportske forme za optimalni nastup na takmičenjima i postizanje visokih sportskih rezultata. Osim toga, posljednjih godina povećava se i sistemski pristup procesu sportskog usavršavanja ne samo složene strukture spoljašnjih uticaja, već i dinamike procesa zamora i oporavka skijaša.

Na osnovu sprovedenog istraživanja možemo zaključiti da je program treninga za poboljšanje agilnosti i fleksibilnosti u trajanju od sedam nedjelja sa tri treninga nedjeljno ostvario pozitivne efekte kod učenika. Utvrđene statistički značajne razlike između inicijalnog i finalnog mjerjenja u svim varijablama govore u prilog uspešnosti primjenjenog trenažnog programa. Dobijeni rezultati su od velikog značaja za trenažnu praksu u skijanju, jer navedene motoričke sposobnosti predstavljaju veoma važne determinante uspeha.

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methods of modeling in order to collectively identify a model of sport activity and then also an orientation of the process of selection, early specialization and all forms of preparation of adequate values of the future model. Such general requirements mean highly skilled trainer personnel and a good organization of work, especially with young population, common cooperation and programming (Vongrinec, 1982; Krsmanović, 2006 ).

Children's and youth's option for skiing has resulted from their own option for this sport or selection from the competent experts of skiing. Only after that process there begins a process of training, their education in the collective and adaptation to the conditions of life and work in the club ( Lanc, 1988 ). There are numerous researches which treat development of the above-mentioned as well as other motor abilities in skiing (Krsmanović, 2008; Kuna, Franko and Lozančić, 2010 ).

The basic aim of the sport training in skiing is a complete development of sportsmen aimed at performance of the highest possible sport results at every degree of development of a long-lasting sport preparation. It suggests that a training process of skiers aimed at development and maintenance of all important components of being trained and a sport fitness for optimal performance at competitions and accomplishment of high sport results. Besides, in recent years there has been an increase of systematic approach to the process of the sport specialization of the complex structure of the outer impacts as well as dynamics of the process of the process of fatigue and recovery of the skiers.

On the basis of the carried out research we can conclude that the program of training intended for improvement of agility and flexibility in duration of seven weeks with three trainings a week has achieved positive effects at pupils. The determined statistically significant differences between initial and final measurement in all variables speak in favor of success of the applied training program. Achieved results are of a great importance for the training practice of skiing since the mentioned motor abilities present very important determinants of success.

**Authorship statement**  
The authors have contributed equally.

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We declare that we have no conflicts of interest.

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# UTJECAJ BAZIČNO-MOTORIČKIH SPOSOBNOSTI NOGOMETĀŠA NA SITUACIONO-MOTORIČKE SPOSOBNOSTI

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**Sažetak:** Glavni cilj ovog istraživanja je utvrđivanje utjecaja motoričkih sposobnosti nogometāša/fudbalera (kao prediktorskog skupa varijabli) na situaciono-motoričku spremnost nogometāša/fudbalera (kao kriterijskog skupa varijabli). Problem koji se tretira u ovom istraživanju odnosi se na utvrđivanje utjecaja nekih latentnih antropoloških dimenzija bazično-motoričkih sposobnosti (brzine, eksplozivne snage i agilnosti) na situaciono-motoričke sposobnosti nogometāša (baratanje loptom, brzina vođenja lopte i snaga udarca po lopti).

Istraživanje je sprovedeno na uzorku od 64 nogometāša iz četiri nogometna kluba sa područja Tuzlanskog kantona koji se takmiče u Drugoj ligi FBiH, grupa „Sjever“. Za utvrđivanje utjecaja sistema bazično-motoričkih sposobnosti na rezultate situaciono-motoričkih sposobnosti nogometāša primjenjena je multipla regresiona analiza. Rezultati istraživanja govore: Na osnovu prikazanih rezultata vidimo da su se kao značajni prediktori pokazale varijable MBFTAP – taping rukom, MAGOSS – osmica sa sagibanjem i MFE20V – trčanje na 20 m visokim startom. Varijable segmentarne brzine i agilnosti su pokazale značajan utjecaj. Ti prostori čine i osnovu motorike, i ovi prostori motorike su vrlo bitni za adekvatno izvođenje bilo kakvih kretnih struktura kako u nogometu tako i u ostalim kineziološkim aktivnostima. Varijabla MFE20V – trčanje na 20 m visokim startom, koja se također pokazala kao značajan prediktor, a u kriterijskom skupu varijabli imamo varijable za procjenu snage udarca po lopti, i za ostvarenje boljih rezultata u ovim situaciono-motoričkim sposobnostima je bitna eksplozivna snaga. Na osnovu rezultata dobivenih primjenjenim statističkim metodama za multivarijantnu analizu podataka (regresiona analiza), možemo konstatovati da je utjecaj osnovnih bazično-motoričkih sposobnosti (brzine, eksplozivne snage i agilnosti) na situaciono-motoričke sposobnosti

# INFLUENCE OF BASIC- KINESTHETIC ABILITIES FOOTBAL PLAYERS ON SITUATIONAL- KINESTHETIC ABILITIES

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**Summary:** The main objective of this research is to determine the impact of motor skills players (as predictor variables) on situational-motor readiness players (such criterion set of variables). The problem to be treated in this study was to determine the influence of some latent anthropological dimensions of basic - motor abilities (speed, explosive strength and agility) to situational-motor skills players (handling the ball, keeping the ball speed and power hitting through the ball).

The research was conducted on a sample of 64 players from four football club from the Tuzla Canton, which compete in the second division of the FBiH, the “North”. To determine the impact of the system of basic - motor abilities on the results of situational-motor abilities of the players used multiple regression analysis .

The survey findings: Based on these results, we see that as significant predictors showed variable MBFTAP - hand tapping, MAGOSS - eight with bending and MFE20V - running at 20 m high start. Variables segment speed and agility have shown a significant impact. These areas form the basis of motor control, motor control, and these areas are very important for the proper performance of any movement structures both in football and in other kinesiology activities. Variable MFE20V - running at 20 m high start, which also proved to be a significant predictor, and criterion set of variables we have variables to estimate power hitting through the ball, and to achieve better results in the situational-motor skills is essential explosive power. Based on the results obtained by the applied statistical methods for multivariate data analysis (regression analysis), we can conclude that the impact of basic - basic motor skills (speed, explosive strength and agility) to situational - motor skills (handling the

(baratanje loptom, brzina vođenja lopte i snaga udarca po lopti) značajan.

**Ključne riječi:** nogomet, bazično-motoričke sposobnosti, situaciono-motoričke sposobnosti nogometāša, varijable, regresiona analiza.

## UVOD

Nogomet je jedna od najpopularnijih igara današnjice. Prema kriterijumu strukturalne složenosti nogomet spada u grupu polistrukturalnih kompleksnih situacionih modela, koga karakterišu raznovrsne, složene i dinamičke aktivnosti u kojima ima cikličnih i acikličnih kretanja koja se izvode sa i bez lopte, u uslovima neposrednog i posrednog ometanja od strane protivničkih igrača i međusobne kooperacije sa igrača (Gabrijelić, M. 1972).

Savremeni, totalni nogomet, traži mnogo bržu igru, kraće vrijeme reakcije, sa manje razmišljanja a težim zahtjevima, sa razvijenim kognitivnim, funkcionalnim i motoričkim sposobnostima (Marković i Bradić, 2008). Dodatna fizička aktivnost u obliku organizovanog treninga, prema većini dosadašnjih istraživanja (Nićin, 2000) povećava pozitivne efekte kako fizičkog razvoja tako i bazičnih motoričkih sposobnosti.

Motoričko izvođenje bilo koje strukturne jedinice je kompleks djelatnosti sastavljenih od intelektualnih i motoričkih sposobnosti i tehničkih umijenja; ono je rezultat misaonih napora povezanih sa optimalnim angažovanjem motoričkih sposobnosti.

Tokom nogometne utakmice elitni nogometāši pretrče oko 10 km sa velikim brojem eksplozivnih kretanja koja uključuju: skakanje, šutiranje, sprintanje, okretanje, promjene pravca, kao i snažne mišićne kontrakcije sa ciljem održavanja ravnoteže, te kontrolu lopte protiv agresivnih odbrambenih igrača (Stolen, Chamara, Castagna i Wisloff, 2005). Reilly, Bangsbo i Franks, (2000) da je za uspješna izvođenja aktivnosti nogometāša neophodan adekvatan nivo brzinsko-snažnih sposobnosti koje su značajne za izvođenje skokova, šutiranja, okretanja i dr.

Uspješna realizacija tokom nogometne igre značajno je povezana sa sposobnošću igrača da izvode kretanje velikim brzinama (Arnason i saradnici, 2004; Bangsbo, 2000).

Izbor varijabli izvršen je na osnovu dosadašnjih istraživanja problematike slične ovoj, a imajući u vidu značaj tih varijabli za uspješnost u nogometnoj igri (Gabrijelić, M., Jerković, S., Aubrecht, V., Elsner, B. 1983). Prilikom izbora varijabli posebno se vodilo računa da one zadovoljavaju osnovne metrijske karakteristike, a isto tako da budu prikladne u odnosu na uzrast ispita-

ball, keeping the ball speed and power at impact balls) significant.

**Keywords:** football, basic-kinesthetic abilities, situational-kinesthetic abilities of football players, variables, regression analysis.

## INTRODUCTION

Football is one of most popular games of today. Based on criteria of structural complexity, football fits into group of polistructural, complex situational models, which is characterised by diversity, complex and dynamical activity, with cyclic and acyclic movements patterns with or without ball, within conditions of direct and indirect distraction of opponent players and cooperation of team players (Gabrijelic, M. 1972).

Contemporary, total football, the game requires a lot faster, shorter reaction time, with less thinking and more severe requirements, with advanced cognitive, functional and motor abilities (Markovic and Bradic, 2008). Additional physical activity in the form of organized training, according to most previous studies (Nićin, 2000) to increase the positive effects of physical development and basic motor abilities.

Motor conduct of any structural units is complex activity, consisted of intellectual, motor abilities and technical expertise; It's a result of psychological efforts connected with motor abilities engagement.

During football matches elite players run the 10 km long with a large number of explosive movements that include jumping, kicking, sprinting, turning, changing direction, and strong muscle contractions in order to maintain balance and control of the ball against aggressive defenders (Stolen, Chamara, Castagna and Wisloff, 2005). Reilly, Bangsbo and Franks (2000) that for the successful execution of activities of players required an adequate level of speed-powerful abilities that are important for jumping, kicking, turning, etc.

Successful realization during football games is significantly associated with the ability of players to perform movements at high speeds (Arnason et al, 2004; Bangsbo, 2000).

The variables were selected on the basis of past researches of similar issues, having in mind the importance of those variables for success in football (Gabrijelic, M., Jerkovic, S., Aubrecht, V., Elsner, B. 1983). During the selection of the variables it was particularly taken into account that they meet basic metric requirements, as well as that they are suitable in terms of examinees' age, material and other conditions that might influence the objec-

tanika, materijalne i druge uslove, koji bi mogli utjecati na objektivnost provedene procedure (Bala, G., Malacko, J., Momirović, K. 1982).

Najveći broj istraživanja bavio se sposobnostima nogometnika uzrasta 17-18 godina i seniorskog uzrasta (Chamari i saradnici, 2004; Strudwick i saradnici, 2002).

Problem koji se tretira u ovom istraživanju odnosi se na utvrđivanje utjecaja nekih latentnih antropoloških dimenzija motoričkih sposobnosti (brzine, eksplozivne snage i agilnosti) na situaciono-motoričke sposobnosti nogometnika (baratanje loptom, brzina vođenja lopte i snaga udarca po lopti).

Glavni cilj ovog istraživanja je utvrđivanje utjecaja motoričkih sposobnosti nogometnika/fudbalera na situaciono-motoričku spremnost nogometnika/fudbalera, odnosno dolaženje do onih faktora koji su značajni za poboljšanje situaciono-motoričkih sposobnosti.

Proces testiranja, odnosno procjene motoričkih sposobnosti i situacione motoričke spremnosti nogometnika obavljen je kroz 19 varijabli, i to 9 varijabli za procjenu motoričkih sposobnosti i 10 varijabli za procjenu situaciono-motoričke spremnosti nogometnika. U ovoj analizi kao prediktorski skup varijabli korišteno je 9 manifestnih varijabli bazično-motoričkih sposobnosti. Prvi faktor smo definisali kao generalni situaciono-motorički faktor, drugi kao faktor brzine vođenja lopte, treći kao faktor opće sposobnosti kretanja igrača sa loptom i četvrti kao faktor snaga udarca po lopti i baratanje loptom (Elsner, B. 1974; Hadžić, E. 2007).

Na osnovu rezultata, koja su dobijena unutar regresione analize, vidimo da bolje rezultate u ovoj kriterijskoj varijabli, postižu ispitanici sa izraženim specifičnim koordinacijskim sposobnostima karakterističnim za nogometnu igru (Kapidžić, A. 2007).

## METODE ISTRAŽIVANJA

### *Uzorak ispitanika*

Ispitivanje je sprovedeno na uzorku od 64 nogometnika iz četiri nogometna kluba sa područja Tuzlanskog kantona koji se takmiče u Drugoj ligi FBiH grupa „Sjever“. Istraživanjem su obuhvaćeni nogometnici uzrasta od 19 do 26 godina starosti. Osnovni kriterij za selekciju uzorka za istraživanje je bio taj da se nogometnik bavio nogometom minimalno 10 godina, tako da u dovoljnoj mjeri poznaje i da je usvojio nogometnu tehniku.

### *Uzorak varijabli*

Tokom ovog istraživanja upotrijebljeno je **9 motoričkih varijabli** koje su bile namijenjene za procjenu

tivity of the procedure conducted (Bala, G., Malacko, J., Momirović, K. 1982).

The largest number of studies have dealt with the capabilities of players aged 17-18 years and senior age (Chamara et al, 2004; Strudwick et al, 2002).

The problem to be treated in this study was to determine the influence of some latent anthropological dimensions of motor skills (speed, explosive strength and agility) to situational-motor abilities players (handling the ball, keeping the ball speed and power hitting through the ball).

The main objective of this research is to determine the impact of motor skills footballers / soccer players on situational-motor readiness players/footballers, or arriving at those factors that are important for improving the situational-motor abilities.

The process of testing, i.e. assessing the motor abilities and situational motor readiness of the football players was carried out using 19 variables for assessing the situational motor readiness of football players. It's used 9 variables for motor abilities assessment and 10 variables for situational-motor abilities assessment. In this analysis as variable predictor set, it's used 9 manifest variables of basic – motor abilities. First factor was define by general situational – motor factor, second as ball dribbling speed, third as players main movement ability with ball and fourth as force of a ball kick and ball handling (Elsner, B. 1974; Hadžić, E. 2007).

Based on the results, which were obtained in the regression analysis, we see better results in this criteri variables, obtained from respondents expressed specific coordination abilities characteristic of a football game (Kapidžić, A. 2007).

## RESEARCH METHODOLOGY

### *The sample of examinees*

The research was conducted with a sample comprising 64 football players of four football clubs from the Tuzla Canton competing in the Second League of the Federation of Bosnia and Herzegovina, the *North Group*. The research included football players aged between 19 and 26. The basic criterion for the selection of the research sample was that a football player had been playing football for at least 10 years, so that he was sufficiently familiar with the football technique and that he had adopted it.

### *The sample of variables*

During this research it's used 9 motor variables, which purpose was motor space latent dimension asse-

latentnih dimenzija motoričkog prostora. Sve bazično-motoričke sposobnosti testirane su s tri testa. Testovi su standardizirani i objavljeni u publikacijama (Gredelj, M., Metikoš, D., Hošek, A., Momirović, K. 1975).

#### **Procjena dimenzije – faktora eksplozivne snage:**

- |                                    |          |
|------------------------------------|----------|
| 1. Skok u vis s mjesta – sargent   | (MFESVM) |
| 2. Skok u dalj s mjesta            | (MFESDM) |
| 3. Trčanje na 20 m visokim startom | (MFE20V) |

#### **Procjena dimenzije – faktora frekvencije pokreta (segmentarna brzina):**

- |                       |          |
|-----------------------|----------|
| 1. Taping rukom       | (MBFTAP) |
| 2. Taping nogom       | (MBFTAN) |
| 3. Taping nogom o zid | (MBFTAZ) |

#### **Procjena dimenzije – faktora agilnosti:**

- |   |          |
|---|----------|
| 1. Trčanje u pravokutniku – koverta test (MAGTUP) |          |
| 2. Koraci u stranu                                | (MAGKUS) |
| 3. Osmica sa sagibanjem                           | (MAGOSS) |

U odabiru testova za procjenu situaciono-motoričkih sposobnosti opredijeli smo se za testove: baratanje loptom, testove za procjenu brzine vođenja lopte i snage udarca po lopti.

Sve situaciono-motoričke sposobnosti testirane su s tri testa, osim snage udarca po lopti koja je testirana s četiri testa. Svi testovi su standardizirani i objavljeni u publikacijama.

Za utvrđivanje situaciono-motoričke spremnosti nogometāša primjenjene su sljedeće varijable (**10 varijabli**):

#### **Za procjenu dimenzije – faktora baratanje loptom:**

- |   |          |
|---|----------|
| 1. Horizontalno odbijanje lopte od zida za 20 sekundi | (SNKOST) |
| 2. Udarci u zid poslije odbijene lopte od podloge     | (SNKUPO) |
| 3. Brzina vođenja lopte (slalom)                      | (SNKSLA) |

#### **Za procjenu dimenzije – faktora brzina vođenja lopte:**

- |   |          |
|---|----------|
| 1. Brzina vođenja lopte po polukrugu                          | (SNBUPO) |
| 2. Brzina vođenja lopte sa promjenama pravca pod pravim uglom | (SNBUPP) |
| 3. Brzina vođenja lopte na 20 metara sa startom iz mjesta     | (SNBV20) |

ssment. All basic-motor abilities were tested with three different tests. Tests are standardised and have been published (Gredelj, M., Metikos, D., Hosek, A., Momirovic, K. 1975).

#### **For assessing the dimension-factor power explosion:**

- |                           |          |
|---------------------------|----------|
| 1. High jump              | (MFESVM) |
| 2. Long jump              | (MFESDM) |
| 3. 20m high start running | (MFE20V) |

#### **For assessing the dimension-factor – frequency of movement factor (segment speed):**

- |                     |          |
|---------------------|----------|
| Hand taping         | (MBFTAP) |
| Foot taping         | (MBFTAN) |
| Foot to wall taping | (MBFTAZ) |

#### **For assessing the dimension-factor – agility factor:**

- |                                     |          |
|-------------------------------------|----------|
| 1. Rectangle running – koverta test | (MAGTUP) |
| 2. Side steps                       | (MAGKUS) |
| 3. Eight with bending               | (MAGOSS) |

With regard to the selection of tests for assessing the situational-motor abilities we chose the following: ball handling tests, tests for assessing ball dribbling speed and tests for assessing the force of a ball kick.

Three tests were used for testing each of the situational-motor abilities, except for the force of a ball kick, which was tested by means of four tests. All the tests are standardised and have been published.

The following variables (**10 variables**) were used to define the situational-motor readiness of the football players:

#### **For assessing the dimension-factor of ball handling:**

- |  |          |
|--|----------|
| 1. Kicking the ball against a wall horizontally for 20 seconds | (SNKOST) |
| 2. Kicks against a wall after the ball bounces off the ground  | (SNKUPO) |
| 3. Speed of ball dribbling (slalom)                            | (SNKSLA) |

#### **For assessing the dimension-factor of ball dribbling speed:**

- |   |          |
|---|----------|
| 1. Speed of ball dribbling in a semicircle                            | (SNBUPO) |
| 2. Speed of ball dribbling with changes of direction at a right angle | (SNBUPP) |
| 3. Speed of 20-meter ball dribbling from a stationary position        | (SNBV20) |

**Za procjenu dimenzije – faktora snaga udarca po lopti:**

1. Snaga udarca po lopti nogom (SNESNO)
2. Snaga udarca po lopti glavom u skoku iz zaleta (SNESGS)
3. Snaga udarca po lopti nogom u skoku iz zaleta (SNESNS)
4. Snaga udarca po lopti glavom sa tla (SNESGL)

## REZULTATI I DISKUSIJA

Iz rezultata u tabelama 1. i 2. vidimo da multipla korelacija prediktorskog sistema (bazično-motoričke sposobnosti) sa kriterijem (situaciono-motoričke sposobnosti) koje su predstavljene kao generalni situaciono-motorički faktor iznosi ( $R = .62$ ) sa objašnjениm ukupnim varijabilitetom ( $R^2 = .39$ ), na statistički značajnom nivou (Sig.  $.001$ ). Ovo nam govori o tome da je čitav sistem prediktorskih varijabli značajan za predikciju rezultata u testovima situacione motorike nogometnika.

**Tabela 1.** Multipla korelacija prediktorskog sistema (bazično-motoričke sposobnosti) sa kriterijem (situaciono-motoričke sposobnosti)

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,623(a)	,388	,286	,84484568

**a Predictors:** (Constant), MAGOSS, MFESVM, MBFTAZ, MAGKUS, MBFTAP, MBFTAN, MAGTUP, MFESDM, MFE20V

**Legend/Legenda:** **R** – Multiple corelation coefficient (Višestruki koeficijent korelacije); **R Square** – Determination coefficient (Koeficijent determinacije); **Adjusted R Square** – Adjusted determination coefficient (Prilagođeni koeficijent determinacije); **Std. Error of the Estimate** (Standardna greška u procjeni).

**Tabela 2.** Analiza variance

**ANOVA(b)**

Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24,457	9	2,717	3,807 ,001(a)
	Residual	38,543	54	,714	
	Total	63,000	63		

**a Predictors:** (Constant), MAGOSS, MFESVM, MBFTAZ, MAGKUS, MBFTAP, MBFTAN, MAGTUP, MFESDM, MFE20V

**b Dependent Variable:** REGR factor score 1 for analysis 1

**For assessing the dimension-factor of the force of a ball kick:**

1. Force of a foot ball kick (SNESNO)
2. Force of a diving header (SNESGS)
3. Force of a foot ball kick in the running jump (SNESNS)
4. Force of a glancing header (SNESGL)

## RESULTS AND DISCUSSION

The values in Table 1 and 2 show multiple correlation of prediction system ( basic- motor abilities) with criteria (situational-motor abilities) which are presented as general situational-motor factor ( $R = .62$ ) The total variability explained ( $R^2 = .39$ ), on statisticly significant level (Sig.  $.001$ ). This theach us that whole system of predictor variables is important for the prediction of results in football players situational-motor tests.

**Tabela 1.** Multiple correlation of prediction system ( basic-motor abilities) with criteria (situational-motor abilities)

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,623(a)	,388	,286	,84484568

**a Predictors:** (Constant), MAGOSS, MFESVM, MBFTAZ, MAGKUS, MBFTAP, MBFTAN, MAGTUP, MFESDM, MFE20V

**Legend/Legenda:** **R** – Multiple corelation coefficient (Višestruki koeficijent korelacije); **R Square** – Determination coefficient (Koeficijent determinacije); **Adjusted R Square** – Adjusted determination coefficient (Prilagođeni koeficijent determinacije); **Std. Error of the Estimate** (Standardna greška u procjeni).

**Table 2.** Analysis variance

**ANOVA(b)**

Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	24,457	9	2,717	3,807 ,001(a)
	Residual	38,543	54	,714	
	Total	63,000	63		

**a Predictors:** (Constant), MAGOSS, MFESVM, MBFTAZ, MAGKUS, MBFTAP, MBFTAN, MAGTUP, MFESDM, MFE20V

**b Dependent Variable:** REGR factor score 1 for analysis 1

**Legend/Legenda: Sum of Squares** (Suma kvadratnih vrijednosti); **df** – Degrees of freedom (Stepeni slobode); **Mean Square** (Srednja kvadratna vrijednost); **F** – Fisher's test for statistically significance determination (Fišerov test za utvrđivanje statističke značajnosti); **Sig.** – Significance (Nivo statističke značajnosti multivarijantnog testa).

Analizom utjecaja pojedinačnih varijabli (tabela 3.) u prostoru bazične motorike može se zaključiti da tri varijable imaju utjecaj na statistički značajnom nivou. To su: varijabla MBFTAP – taping rukom (.34 Beta), a što je značajno na nivou (.012 Sig.); druga varijabla je MAGOSS – osmica sa sagibanjem (.35 Beta) sa nivoom signifikantnosti (značajnosti) (.015 Sig.); treća varijabla je MFE20V – trčanje na 20 m visokim startom (.29 Beta), a što je značajno na nivou (.050 Sig.).

**Tabela 3.** Regresiona analiza bazično-motoričkih sposobnosti

**Coefficients(a)**

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1	(Constant)	-10,022	2,753	-3,640	,001
	MFESVM	-,022	,022	-,137	,318
	MFEsdM	,008	,007	,157	,269
	MFE20V	1,221	,609	,294	,050
	MBFTAP	,079	,030	,340	,012
	MBFTAN	-,015	,031	-,060	,635
	MBFTAZ	,027	,048	,074	,578
	MAGTUP	-,091	,085	-,152	,289
	MAGKUS	-,075	,095	-,095	,436
	MAGOSS	,293	,116	,349	,015

**a Dependent Variable:** REGR factor score 1 for analysis 1

**Legend/Legenda:**  $\beta$  - Beta (Beta standardize partial contribution); **Std. Error** – Standard error of the estimate (Standartna greška u procjeni); **T** – T-test (T-test); **Sig** - Significance (Nivo statističke značajnosti); **Unstandardized Coefficients** (Nestandardizovani koeficijenti); **Standardized Coefficients** (Standardizovani koeficijenti).

Na osnovu prikazanih rezultata vidimo da su se kao značajni prediktori pokazale varijable MBFTAP – taping rukom, MAGOSS – osmica sa sagibanjem i MFE20V – trčanje na 20 m visokim startom. S obzirom da nam je kriterij u ovoj analizi predstavljao prvi izolovani faktor

**Legend/Legenda: Sum of Squares** (Suma kvadratnih vrijednosti); **df** – Degrees of freedom (Stepeni slobode); **Mean Square** (Srednja kvadratna vrijednost); **F** – Fisher's test for statistically significance determination (Fišerov test za utvrđivanje statističke značajnosti); **Sig.** – Significance (Nivo statističke značajnosti multivarijantnog testa).

Using analysis of single variable factors (table 3.) in area of basic motor skills , we can conclude that three variables have influance on statisticly significant level. These are : variable MBFTAP -hand taping (.34 Beta), it's significant on level (.012 Sig.); second variable is MAGOSS – eight whit bending (.35 Beta) with significant level (.015 Sig.); third variable is MFE20V – 20m high start runing (.29 Beta) with significant level (.050 Sig.).

**Tabela 3.** Regresional analysis basic- motor abilities

**Coefficients(a)**

**a Dependent Variable:** REGR factor score 1 for analysis 1

**Legend/Legenda:**  $\beta$  - Beta (Beta standardize partial contribution); **Std. Error** – Standard error of the estimate (Standartna greška u procjeni); **T** – T-test (T-test); **Sig** - Significance (Nivo statističke značajnosti); **Unstandardized Coefficients** (Nestandardizovani koeficijenti); **Standardized Coefficients** (Standardizovani koeficijenti).

Based on results we can see , as significant predictor variables were MFTAP – hand taping, MAGOSS – eight with bending and MFE20V – 20m high start runing. Considering criteria we were using, was first isolated factor in area of situational-motor abilities, defined as general

u prostoru situaciono-motoričkih sposobnosti koji smo definisali kao generalni faktor, a varijable segmentarne brzine i agilnosti su pokazale značajan utjecaj. Ti prostori čine i osnovu motorike, i ovi prostori motorike su vrlo bitni za adekvatno izvođenje bilo kakvih kretnih struktura kako u nogometu tako i u ostalim kinezioškim aktivnostima (Elsner, B., Metikoš, D. 1983). Varijabla MFE20V – trčanje na 20 m visokim startom, koja se također pokazala kao značajan prediktor, a u kriterijskom skupu varijabli imamo varijable za procjenu snage udara po lopti, i za ostvarenje boljih rezultata u ovim situaciono-motoričkim sposobnostima je bitna eksplozivna snaga. Smatramo da su ovo, vjerovatno, glavni razlozi ovakvih veza koje smo dobili u ovoj regresionej analizi.

## ZAKLJUČAK

Na osnovu rezultata dobivenih primjenjenim statističkim metodama za multivarijantnu analizu podataka (regresiona analiza), možemo konstatovati da je utjecaj osnovnih bazično-motoričkih sposobnosti (brzine, eksplozivne snage i agilnosti) na situaciono-motoričke sposobnosti značajan. Rezultati istraživanja govore:

1. Da se na osnovu primjenjenih prediktorskih varijabli može izvršiti predikcija u postizanju boljih rezultata u situaciono-motoričkim sposobnostima nogometnika.
2. Bazično-motoričke sposobnosti (prediktorski sistem) ukazuju na znatno potencijalnu prognostičku snagu ovih sposobnosti jer segmentarna brzina, eksplozivna snaga i agilnost pokrivaju širok prostor motorike i daju relativno nezavisne informacije.
3. Situaciono-motorički faktori su relativno homogen sistem dimenzija, što ukazuje na pretpostavku da postoji zajednička osnova za većinu faktora, iako većina njihovih veza potvrđuje relativnu samostalnost pojedinih faktora.
4. Smatramo da smo u ovom radu odabrali adekvatne mjerne instrumente koji pokrivaju one latentne prostore koji su od velikog značaja za uspjeh u nogometnoj igri. Upotrijebljeni sastav prediktorskog skupa varijabli nije pokrio čitav prostor ovih dimenzija. Upotpunjavanjem prediktorskog skupa varijabli iz drugih prostora predikcija u poboljšanju rezultata bi bila, naravno, još značajnija.

Dakle, možemo konstatovati, da bazično-motoričke sposobnosti, prije svega, frekvencija pokreta, odnosno segmentarna brzina, eksplozivna snaga i agilnost utječu na situaciono-motoričke sposobnosti nogometnika.

Na ovaj način dobijeni podaci o bazično-motoričkom i situaciono-motoričkom prostoru mogu se koristiti

factor, segmetary speed and agility variables also shown significant influence. Those areas present motor basics, and these motor areas are very important for adecvat conduct of any movemnt structures for football and other kinetic activites (Elsner, B., Metikos, D. 1983). Variable MFE20V - 20m high start runing was significant predictor, in variable criteria set we have variables for Force of football kick assessment, and for achiving higher results in these situational-motor abilites.

## CONCLUSION

On the basis of the results obtained by application of statistical methods for multi-varient data analysis (regression analysis), we may construe that the influence of the basic-kinesthetic abilities (speed, explosiveness and agility) on situational-kinesthetic abilities is significant. The research findings are as follows:

1. On the basis of the applied predictor variables it is possible to make prediction in achieving better results in situational-kinesthetic abilities of the football players.
2. Basic-kinesthetic abilities (predictor system) show considerable potential prognostic potency of these abilities, because the fragmentary speed, explosiveness and agility cover wide range of kinesthesia and provide for relatively independent information.
3. Situational-kinesthetic factors are relatively homogeneous system of dimensions, which leads to presumption that there is the common basis for majority of factors, although the greater number of their relations confirms the relative independence of respective factors.
4. We consider that in this paper we selected the adequate measuring instruments to cover those latent areas that are of the great importance for success in the game of football. The utilized contexture of the predictor assemblage of variables could not cover all the space of these dimensions. By fulfilling the predictor assemblage of variables from other areas of prediction in enhancing the results would be even better, indeed.

Thus, we can conclude that the basic-motor skills, first of all, the frequency of motion, or segmentary speed, explosive power and agility affect situational-motor abilities of players.

By doing so, the results obtained regarding basic-kinesthetic and situational-kinesthetic area may be used for various purposes, before all in importance of evaluation of the targeted segments of kinesthetic area, which

u razne svrhe, prije svega u značajnosti procjenjivanja željenih segmenata motoričkih prostora, što ima za cilj unaprjeđivanje planiranja i programiranja koje će što uspješnije doprinijeti željenim transformacijama u treningu nogometnika.

**Izjava autora**  
Autori pridonijeli jednakno.

**Konflikt interesa**  
Mi izjavljujemo da nemamo konflikt interesa.

is aiming to upgrading planning and programming, all of which will contribute to transformations wanted in training process of football players.

#### **Authorship statement**

The authors have contributed equally.

#### **Financial disclosure**

We declare that we have no conflicts of interest.

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# UPUTSTVO AUTORIMA ZA IZRADU RADA

## NASLOV RADA (U NAJVIŠE DVA REDA)

Ime Prezime<sup>1</sup>, Ime Prezime<sup>2</sup>

<sup>1</sup>Naziv organizacije, <sup>2</sup>Naziv organizacije

**Apstrakt:** Svaki rad mora da sadrži apstrakt. U apstraktu treba ukratko izložiti osnovnu ideju i postignute rezultate. Rad napisati po ugledu na tekst iz ovog uputstva. Apstrakt može da sadrži do 150 riječi.

**Ključne riječi:** Navesti do pet ključnih riječi odvojene zarezima.

Rad treba da ima jasno dat uvod, postavku problema, način njegovog rješavanja, rezultate, zaključak i korištenu literaturu, na ne više od 8 strana B5 formata (16,8 x 24,0 cm) uključujući slike, tabele, reference. Na stranicama rada margine moraju biti: gornja i donja 2,5cm, unutrašnja 2,5cm i vanjska 2cm. Stranice nije potrebno numerisati.

Naslov rada (Times New Roman, veličina 12pt, **bold**) treba da se nalazi na sredini prve stranice pomjeren dva proređa veličine 10pt ispod gornje margine. Nakon naslova ostaviti jednu praznu liniju veličine 10pt. Rad se elektronskom poštom dostavlja Naučnom odboru skupa u PDF i DOC formatu na e-mail adresu [siz@siz-au.com](mailto:siz@siz-au.com).

Iznad tabele treba da stoji natpis, npr. „Tabela 1. Matrica interkorelacija“. Ispod slike treba da stoji broj slike i legenda, npr. „Slika 3. Rad sa predškolcima“.

## LITERATURA

Obavezno je navođenje svih bibliografskih izvora koji su korišteni za pripremu i pisanje rada. Preporučuje se *APA* standard indeksiranja literature, *APA Harvard* reference system.

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**Abstract:** Each paper must include an abstract. The abstract should outline the basic idea and its results. The paper should be written according to the text in these instructions. The abstract may contain up to 150 words.

**Keywords:** Specify up to five keywords or phrases separated by commas.

The paper must contain clear introduction, problem statement, method of resolving the problem, results, conclusion, and references. It shoud not contain more than 8 pages of B5 format (16,8 x 24,0 cm) including figures, tables, references. Paper margins must be: top and bottom 2,5 cm, inside 2,5 cm and outside 2 cm. Pages are not ought to be numbered.

The paper title (use 12 point Times New Roman type of text; the title must be highlighted with **Bold** option) should be positioned in the middle of the first page, shifted two spaces, font size 10pt, below top margin. After the title, one should leave one space, font size 10 pt. The paper must be sent to the Congress Programme Board in electronic form (PDF or DOC) as an email attachment to [siz@siz-au.com](mailto:siz@siz-au.com).

There should be a caption above the table, which says, for example „Table 1. Intercorrelation matrix“. Below the figure, there should be the figure number and legend, for example “Figure 3: Work with preschoolers”.

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