

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

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

KEMAL IDRIZOVIĆ

Fakultet za sport i fizičko vaspitanje, Nikšić, Crna Gora

RATKO PAVLOVIĆ

Fakultet fizičkog vaspitanja i sporta, Istočno Sarajevo, Bosna i Hercegovina

IVAN VASILJEVIĆ

Fakultet za sport i fizičko vaspitanje, Nikšić, Crna Gora

ŽELJKO PEJOVIĆ

Outdoor Club Highlander, Crna Gora

KEMAL IDRIZOVIĆ

Faculty for Sport and Physical Education, Niksic, Montenegro

RATKO PAVLOVIĆ

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

IVAN VASILJEVIĆ

Faculty for Sport and Physical Education, Niksic, Montenegro

ŽELJKO PEJOVIĆ

Outdoor Club Highlander, Montenegro

Korespondencija:

Prof. dr Kemal Idrizović,

Fakultet sporta i fizičkog vaspitanja,

Univerzitet u Podgorici, Crna Gora

Džordža Vašingtona 6/176, 81000 Podgorica, Crna Gora

kemo@t-com.me

Correspondence:

Kemal Idrizović, PhD, Assoc. prof.

Faculty of sport and physical education, University of

Montenegro, Podgorica, Montenegro

Džordža Vašingtona 6/176, 81000 Podgorica, Montenegro

kemo@t-com.me

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 leteći start, sprint 30 m stojeći stav, slalom trčanje, 300 jardi, skok iz čučnja sa pripremom, i skok udalj s mjesta, 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 ($\beta=.65$, $p < .05$).

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 obtained 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.

Key words; functional motor capacities, specific movements, female soccer.

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).

Sa 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 učesnica 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-

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 registred 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 ima 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 juniorkorke 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 preduslov za uspješno 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 mlade fudbalerke. Vremenski prostor koji odvaja mlade kategorije od seniorskog nivoa u ženskom fudbalu je značajno drugačiji od istog tog perioda u muškom fudbalu. Raniji proces definisanja svih sposobnosti i karakteristika kod ženskog pola u odnosu na muški, čini period u kojem se mlade 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 trenazni 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 frekvence), 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 uvis 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 intermitentnim testom oporavka (nivo1), testom koji se fokusira na sposobnost sprovođenja isprekidanog rada, koji dovodi 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 intermitent 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, VO₂max were

kiseonika, VO₂max je statistički značajno povezana sa rezultatima u testu YYIRTL1 (Krustrup et al., 2005; Castagna et al., 2006). Drugog dana su realizovani testovi za procjenu kvaliteta specifičnih fudbalskih kretanja, agilnosti, eksplozivne snage donjih ekstremiteta 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 mjesta i Yo Yo intermitentni test oporavka (nivo1) prvog 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 mjerenje 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 kompletnog oporavka koji je potreban kod fudbalerki kadetkinja. Bolji rezultat od dva mjerenja 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 korelacionom 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 primijenjene varijable.

Ukupan broj izračunatih koeficijenata korelacije u ovom radu je 36 (tabela 2). Od tog broja 24 korelaciona 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 (Krustrup 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 with 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 2. korelaciona 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, #- inverzno 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 1. Basic Descriptive Parameters of Tested Variables

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 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. Correlation Between Variables

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 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

	BETA	St. Err. of BETA	B	St. Err. of B	t(12)	p-level
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

Table 3. Multiple Regression Analysis

YYIRTL1 – Yo Yo intermitentni test oporavka (nivo1), 10M – sprint 10 m iz stojećeg stava, 20M – sprint 20 m leteći start, 30M – sprint 30 m stojećí 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

	Tolerance	R ²	Parcijalna korelacija	p-level
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 stojećí stav, ZIG – slalom trčanje, CMJ – skok iz čučnja sa pripremom, 300Y – 300 jardi, SLJ – skok udalj s mjesta, * - značajan na nivou $p < 0.05$

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 VO₂max 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 naglasiti, 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 uzrasta 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 primijenjenim 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 VO₂max, as a basic indicator of an aerobic potential, actually faster develops in female, while it accomplishes a better level for male (Geithner, 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 diferentnosti. 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 eksploatacije 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 zglobo 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 korelaciona matrica, a koji zapravo predstavlja suštinu funkcionisanja funkcionalno-motoričkih potencijala crnogorskih fudbalerki, koji su bili predmet ovog istraživanja, jesu korelacioni 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 level 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 rezultat 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 brzinu 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 korelacione 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 are 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 glavnom 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 jednako.

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.

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The authors have contributed equally.

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