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U ovom broju, imaćete prilike da se pobliže upoznate sa problematikom iz atletike, fudbala, plesa, sociologije sporta, korištenja vode u bazenima za kupanje i rekreaciju, inkluzivnog fizičkog vaspitanja i fizičkog razvoja djece (8 radova), od čega je 5 originalnih naučnih radova, 1 pregledni rad, 1 kratko saopštenje i 1 stručni rad.

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Pozivamo sve naučnike i stručnjake iz oblasti sportskih i zdravstvenih nauka, kao i njima komplementarnih disciplina, da svojim radovima doprinesu čovjeku i pomognu mu da se odupre hipokineziji, kao bolesti savremenog čovjeka.

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Razlike u vremenu startne reakcije i postignutom rezultatu u sprinterskim disciplinama u finalu olimpijskih igara u Londonu

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Sažetak: U sprinterskim disciplinama vrlo važno mjesto zauzimaju start i startno ubrzanje koje u velikoj mjeri generiše konačni rezultat. U zavisnosti od odgovarajućih individualnih morfoloških dimenzija, a naročito motoričkih i funkcionalnih sposobnosti takmičara mogućnost dobre realizacije ovih parametara je izvjesnija. Međutim, i pored vrhunskih rezultata koje ostvaruju, razlike u ova dva parametra su evidentne, što u pogledu na konačni rezultat ima određenog efekta. Cilj ovog istraživanja je bio da se utvrde razlike u vremenu startne reakcije i rezultata u sprinterskim disciplinama finalista Olimpijskih igara u Londonu 2012. godine. Analizirani su rezultati finalista (24 muška) i 24 (ženska) takmičara koji su nastupili u finalnim trkama na 100m, 200m i 400m. Evaluacija vremena startne reakcije (ms) i rezultata u sprintu (s) bazirala se na izvještajima koje je službeno objavila Međunarodna atletska federacija (IAAF). Rezultati analize T-testa su pokazali statistički značajne razlike u vremenu reakcije kod ženskih takmičara u disciplinama trčanja 100m i 400m (t= -3,220; p<0,01) kao i za discipline 200m i 400m (t=-2,550; p<0,01), za razliku od muških finalista gdje nisu zabilježene statistički značajne razlike. Takođe, u istim disciplinama između polova nisu zabilježene statistički značajne razlike, dok su evidentne u postignutim rezultatima u disciplinama 100m (t=-2,842; p<0,05), 200m (t=-11,526; p<0,01) i 400m (t=-27,019; p<0,01).

Ključne riječi: sprinterske discipline, Olimpijske igre, vrijeme startne reakcije, razlike

Differences in Time of Start Reaction and Achieved Result in the Sprint Disciplines in the Finals of The Olympic Games in London

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Abstract: In the sprint events, a very important place has the start and start acceleration which is largely generated by the final score. Depending on the appropriate individual morphological dimension, especially motor and functional abilities of competitors, good possibility to implement these parameters is certain. However, despite the excellent results they achieve, differences in these two parameters are evident, which in terms of the final result has a certain effect. The aim of this study was to determine the differences in the starting reaction time and results in the sprint events of the finalists at the Olympic Games in London in 2012. The results from the finalists (24 male) and 24 (women) that participated in the final races in the 100m, 200m and 400m were analyzed. The evaluation of starting reaction time (ms) and results in a sprint (s) were based on the reports that were officially published by the International Association of Athletics Federations (IAAF). The results of the analysis of t-test showed statistically significant differences in response time for female athletes in the disciplines of running 100m and 400m (t=-3.220; p<0,01) as well as for the 200m and 400m events (t =-2.550; p<0,05) unlike male finalists for which there were no statistically significant differences. Also, in the same disciplines between the sexes there were no statistically significant differences, while they are evident in the results achieved in the disciplines of 100m (t= -2.842; p<0,05), 200 (t= -11.526; p<0,01) and 400 (t= -27.019; p<0,01).

Key words: sprint events, the Olympic Games, the time of start reaction, differences

Uvod

Startno ubrzanje je relevantno u svim sprinterskim atletskim disciplinama, kao i u mnogim drugim sportskim granama u kojima je potrebno razviti brzinu na relativno kratkoj udaljenosti (tenis, odbojka, rukomet, košarka, fudbal, itd). Međutim, u sprinterskim disciplinama start i startno ubrzanje, kao dvije bitne komponente u velikoj mjeri generišu konačni rezultat u trčanju na 60m, 100m, 200m i 400m (Čoh & Tomažin, 2008). Kaže se da je startno ubrzanje jedan od najkompleksnijih segmenata sprinterskog trčanja, u kome se može racionalizovati sprinterski kapacitet koji će se manifestovati tek u segmentu trčanja maksimalnom brzinom. Najčešeća dužina startnog ubrzanja jeste od 25-30m, pri kojoj vrhunski sprinteri u prvih 10m razviju 50 do 55% svoje maksimalne brzine, u drugih 10 (do 20m) 70-80% i u trećih deset (do 30m) 85-95% (Čoh, 2001). Između 50 i 80m postižu maksimalnu brzinu, a nakon 80-90 metara brzina opada. Upravo zbog toga, nije slučajnost da su mnogi autori ušli u biomehaničku analizu ove dvije faze kako bi objasnili fenomen sprinterske brzine i startnog ubrzanja koje se temelji na vremenu startne reakcije (Coppenolle, Delecluse, Goris, Diels, & Kraayenhof, 1990; Guissard, Duchateau, & Hainaut, 1992; Mc Clements, Sanders, & Gander 1996, Harland & Steele, 1997, Čoh, Peharec, & Bačić, 2007; Bračić, Peharec, Bačić & Čoh, 2010). Početak sprinta i startnog ubrzanja su prva dva faktora sprinterske brzine kojima sportista pokušava postići maksimalnu brzinu. Svojevremeno istraživanje Tom Telleza, trenera legendarnog Carla Lewisa je pokazalo da ove dvije faze čine čak 64% učešća u rezultatu sprinta na 100m (Téllez & Doolittle, 1984). Istraživanja nekih autora (Schot & Knutzen 1992; Harland & Steele, 1997; Wang, 2006; Pain & Hibbs, 2007; Babić, 2008; Babić & Čoh, 2010) su saglasna u tome, da rezultat u sprintu zavisi od položaja u startnom bloku, tj. položaja težišta tijela, vremena startne reakcije i startnog ubrzanja.

Optimalna koherentnost između početka sprinta i startnog ubrzanja predstavljaju specifične motoričke probleme koje sportista mora integrisati u pogledu vremenskih i prostornih parametara u jednopolarni pokret cikličnog karaktera. Startno ubrzanje je složen ciklični pokret definisan pretežno progresijom frekvencije i dužine koraka, trajanjem faze kontakta i faze leta i položaja težišta tijela u trenutku dodira s podlogom, propulzijom u fazi leta i silama koje se savladavaju u prvom koraku (Hunter, Marshall, & McNair, 2005). Svi ovi navedeni parametri su uslovljeni funkcionisanjem CNS-a, motoričkih sposobnosti, energetskih procesa, morfoloških obilježja i stukture mišića (Locatelli & Arsac, 1995; Young, McLe-

Introduction

Starting acceleration is relevant in all sprint athletic disciplines, as in many other branches of sports which require developing the speed in relatively short distance (tennis, volleyball, handball, basketball, soccer, etc.). However, in the sprint events start and starting acceleration, as the two major components largely generate the final result of running the 60m, 100m, 200m and 400m (Čoh & Tomažin, 2008). It is said that the starting acceleration is of one of the most complex segments of the sprint, in which sprint capacity can be rationalized that will be manifested only in the segment of maximal running speed. The most common length in start accelerating is from 25-30m, at which the top sprinters in the first 10m develop 50 to 55% of their maximum speed, and in other 10 (up to 20m) 70-80% in the third 10 (up to 30m) 85-95% (Čoh, 2001). Between 50 and 80m they achieve maximum speed, and after 80-90 meters the speed decreases. It is therefore no coincidence that many of the authors included the biomechanical analysis of these two phases in order to explain the phenomenon of sprint speed and start acceleration based on the time of the start reaction (Coppenolle, Delecluse, Goris, Diels, & Kraayenhof, 1990; Guissard, Duchateau, & Hainaut, 1992; Mc Clements, Sanders, & Gander, 1996, Harland & Steele, 1997, Coh, Peharec & Bacic, 2007; Bračić, Peharec Bacic & Coh, 2010). The start of the sprint and start acceleration are the first two factors of sprint speed with which athlete tries to achieve maximum speed. Earlier Tom Tellez study, of the legendary coach of Carl Lewis showed that these two phases are as much as 64% of participation in the sprint result at 100 m (Téllez & Doolittle, 1984). Studies by some other authors (Schot & Knutzen 1992; Harland & Steele, 1997; Wang, 2006; Pain & Hibbs, 2007; Babic, 2008; Babic & Coh, 2010) have agreed that the result in the sprint depends from the position in the start block that from the center of gravity of the body, start reaction time and from start accelerating.

Optimal coherence between the start of the sprint start and start acceleration represents specific motor problems that athletes must integrate in terms of time and spatial parameters in the unipolar movement of cyclic character. Start acceleration is a complex cyclic motion defined mainly by progression of frequency and step length, duration of the contact phase and the phase of flight and the position of the center of gravity of the body at the moment of contact with the ground, the propulsion in phase of the flight and the forces that are handled in the first step (Hunter, Marshall, & McNair, 2005). All these parameters are conditioned by the operation of CNS, motor skills, energy processes, morphological characteristics and structure of

an, Ardagna, 1995; Muller & Hommel 1997; Čoh, et al. 1998; Čoh, Tomažin, and Štuhec, 2006; Mero, Kuitunen, Harland, Kyrolainen, & Komi, 2006).

U modernoj atletici, vrijeme startne raeakcije dobija sve više na značaju u rezultatskoj uspješnosti. Radi se o vrhunskim sprinterima sa izuzetnim rezultatima u obje konkurencije, koji svoj put do uspjeha upravo baziraju na dobroj realizaciji ovog faktora. Dobrom realizacijom oni nastoje da u prvim metrima nakon pucnja steknu određenu prednost koju nastoje zadržati do kraja trke. Često se na velikim takmičenjima (Olimpijske igare, Svjetska i Evropska prvenstava, Dijamantske lige) uočavaju određene razlike u pogledu vremena startne reakcije između disciplina i u zavisnosti od pola. Međutim, te razlike nekada nisu velike, pa na primjer, često se dešava da sprinteri na 100m ostvare vrijeme reakcije skoro identično vremenu reakcije na 400m ili da između vremena reakcije na 100m, 200m ili 400m nema značajnih razlika, iako se radi o izvjesnim razlikama u dužini staze. Ove konstatacije su u suprotnosti sa činjenicom da je značaj startnog ubrzanja i vremena reakcije važniji u kraćim (Moravec, 1988) nego u dužim sprinterskim disciplinama. To navodi na zaključak da se radi o vrhunskim sportistima koji angažuju maksimalno svoje psihofizičke kapacitete bez obzira na dužinu staze. Takođe, određena istraživanja su dokazala da su određene karakteristike sprintera i vrijeme reakcije izuzetno dobri prediktori rezultata u sprintu. (Susanaka et al. 1998). Takođe (Martin & Buonchristiani, 1995), smatraju da je za konačan rezultat u sprintu (100m i 200m) važniji, dužina ubrzanja, postignuta maksimalna brzina i brzinska izdržljivost. Moravec, Ružička, Susanka, et al. (1988) su analizirajući sprinterske discipline na II Svjetskom prvenstvu u Rimu potvrdili rezultate istraživanja iz 1982. godine (Dostal) te naveli vremena reakcije na većim takmičenjima za žene i muškarce. Takođe su potvrdili da se rezultati vremena reakcije na Svjetskom prvenstvu 1987. godine značajno razlikuju od rezultata postignutih na velikim tamičenjima održanim od 1978. do 1986. godine. Duffy 2004, prema Smajlović i Kozić, 2006, u svom istraživanju vremena reakcije na uzorku 16 vrhunskih sprintera učesnika mitinga Zlatne lige Rim 2003, navode da je prosječno vrijeme reakcije iznosilo 153ms (±28ms) te da se prosječna vremena reakcije u polufinalnim i finalnim trkama discipline 100m za muškarce na Svjetskim prvenstvima od 1997 do 2003 se kreću od 120ms do 160ms, dok korelacija vremena reakcije i rezultata u trci iznosi .05. Pojedini autori (Smajlović i Kozić, 2006) su nastojali da utvrde efekte promjene atletskih pravila na vrijeme

muscle (Locatelli & Arsac, 1995; Young, McLean, Ardagna, 1995; Muller & Hommel, 1997; Coh, et al. 1998; Coh, Tomažin, and Štuhec, 2006; Mero, Kuitunen, Harland, Kyrolainen, & Komi, 2006).

In modern athletics, the time of the start reaction becomes more and more important in the result success. It is about the top sprinters with outstanding results in both categories, that their path to success is based on good implementation of this factor. By the good realization they tend to in the first meters of shooting acquire certain advantage that they want to keep until the end of the race. Often at the major events (Olympic Games, World and European Championships, Diamond League) some differences in the time of the start reaction between disciplines and depending on gender are observed. However, sometimes these differences are not large, so for example, often, the 100m sprinters achieve almost the identical reaction time compared to reaction time at 400m or between the reaction time in the 100m, 200m or 400m where there is no significant difference, although it is about some differences in the length of the track. These findings are in contrast to the fact that the importance of start acceleration and reaction time is more important at shorter (Moravec, et al. 1988) than in the longer sprint events. This suggests that these are elite athletes who engage most of their mental and physical capacity, regardless of the length of the track. Also, some studies have shown that certain characteristics of a sprinter and the response time were extremely good predictors of results in the sprint (Susanaka et al. 1998). Also (Martin & Buonchristiani, 1995), believe that for the final result in the sprint (100m and 200m) more important are the length of acceleration, maximum speed achieved and speed-endurance. Moravec, Ruzicka, Susanka, et al. (1988) analyzed the sprint events at the II World Championships in Rome and confirmed the results of the research in 1982 (Dostal) and gave reaction times at larger competitions for men and women. They also confirmed that the results of the reaction time at the World Championship in 1987 were significantly different from the results obtained at large competitions held from 1978 to 1986. Duffy 2004 according to Smajlović and Kozic, 2006, in his study of reaction time in 16 top sprinters sample of top sprinter participants of the meeting of the Golden League Rome 2003, the average response time was 153ms (± 28ms) and the average response time in the semi-final and final races of men discipline 100m at the World Championships from 1997 to 2003 range from 120ms to 160ms, while the correlation of reaction and results in the race is .05. Some authors (Smajlović and Kozic 2006) tried to determine the effects of change in athletic rules on time of start reaction

startne reakcije u sprinterskim disciplinama. Na uzorku vrhunskih atletičara i atletičarki učesnika Svjetskog prvenstva u Edmontonu 2001 i Parizu 2003 su dobijeni rezultati koji su potvrdili razlike u startnom vremenu reakcije između ova dva Svjetska prvenstva u disciplinama, 100m, 200m, 110m i 100m prepone za muškarce i žene, dok razlike po polu nisu utvrđene. Autori (Colet, 2000; Babić, 2008; Babić & Čoh, 2010; Theophilos Pilianidis, Kasabalis, Mantzouranis, & al. 2012; Pavlović i sar. 2013) su proučavali ovaj parametar sa aspekta sprinterskih disciplina nastojeći da da analiziraju vrijeme startne reakcije i rezultat trčanja u sprinterskim disiplinama na velikim takmičenjima, poput evropskih prvenstava i olimpijskih igara. Upravo zbog važnosti startnog ubrzanja u atletskim sprinterskim disciplinama, koje se temelji na vremenu startne reakcije se baziralo se i ovo istraživanje. Osnovni cilj istraživanja je bio da se utvrde i analiziraju razlike u vremenu startne reakcije finalista olimpijskih igara u Londonu 2012. godine. u sprinterskim disciplinama.

Pored osnovnog cilja, parcijalni su ciljevi sadržani u:

- utvrđivanju razlike u vremenu startne reakcije atletičara u disciplinama 100m, 200m, 400m
- utvrđivanju razlike u vremenu startne reakcije atletičarki u disciplinama 100m, 200m, 400m
- utvrđivanju razlike u vremenu startne reakcije između muških i ženskih finalista u disciplinama 100m, 200m, 400m.
- utvrđivanju razlike u postignutom rezultatu između muških i ženskih finalista u disciplinama 100m, 200m, 400m

Metod rada

Populacija koja je definisana istraživanjem obuhvatila je vrhunske atletičare i atletičarke u sprinterskim disciplinama XXX Olimpijskih igara u Londonu 2012. godine. Uzorak je obuhvatio ukupno 48 finalista (24 muška i 24 ženska takmičara), koji su nastupili u finalnim trkama sprinterskih disciplina (100m, 200m, 400m). Vrijeme startne reakcije (ms) i postignuti rezultat (s) su preuzeti iz zvaničnog službenog izvještaja Olimpijskih igara 2012. godine, izdatih od strane IAAF. Podaci dobijeni istraživanjem su obrađeni standardnim deskriptivnim postupcima, a razlike između grupa ispitanika-finalista testirane su pomoću Studentovog-T-testa za nezavisne uzorke. Statistička obrada podataka je izvršena statističkom programu Statistica 6.0.

in sprint events. In a sample of top athletes participants in the World Championships in Edmonton in 2001 and Paris in 2003, results were obtained that confirmed the differences in the starting reaction time between the two World Championships in events, 100m, 200m, 110m and 100m hurdles for men and women. Authors (Colet 2000; Babic, 2008; Babic & Coh, 2010; Theophilos Pilianidis, Kasabalis, Mantzouranis, & al. 2012; Pavlović et al. 2013) have studied this parameter in terms of sprint discipline trying to analyze the response time of start reaction and running result in sprint disciplines at major events, such as the European Championships and Olympic Games. This study is based on reasons precisely because of the importance of starting acceleration in athletic sprint events, based on the starting time of the start reaction. The main objective of this study was to identify and analyze the differences in the time of starting reaction of the finalist of Olympic Games in London 2012 in sprint events. In addition to its primary objective, partial objectives are contained in:

- determining the difference of time of starting reaction of male athletes in the 100m, 200m, 400m
- determining the difference in time of starting reaction of female athletes in the disciplines of 100m, 200m, 400m
- determining the difference in time of the starting reaction between male and female finalists for events 100m, 200m, 400m.
- determining the difference in achieved results between male and female finalists for events 100m, 200m, 400m

Method

The population defined in the research has included top male and female athletes in the sprint events of XXX Olympic Games in London 2012. The sample included a total of 48 finalists (24 male and 24 female competitors), who participated in the final races of sprint events (100m, 200m, 400m). Starting reaction time (ms) and achieved result (s) are taken from the official report of the Olympic Games of 2012, issued by the IAAF. Data obtained in the survey were analyzed by standard descriptive methods, and the differences between groups of respondents-finalists were tested using Student's t-test for independent samples. Statistical analysis was done using the statistical program Statistica 6.0.

Tabela 1. Rezultati trčanja na 100m-finale

Men			
Wind: 1,5m/s		**Time Reaction**	**Result**
1.	Usain Bolt	0.165	9.63
2.	Yohan Blake	0.179	9.75
3.	Justin Gatlin	0.178	9.79
4.	Tyson Gay	0.145	9.80
5.	Ryan Bailey	0.176	9.88
6.	Churandy Martina	0.139	9.94
7.	Richard Thompson	0.160	9.98
8.	Asafa Powell	0.155	11.99

Table 1. The results of running the 100m-finals

Women			
Wind: 1,5m/s		**Time Reaction**	**Rezultata**
1.	Shelly-Ann Fraser-Pryce	0.153	10.75
2.	Carmelita Jeter	0.153	10.78
3.	Veronica Campbell-Brown	0.143	10.81
4.	Tianna Madison	0.171	10.85
5.	Allyson Felix	0.176	10.89
6.	Kelly-Ann Baptiste	0.128	10.94
7.	Murielle Ahoure	0.156	11.00
8.	Blessing Okagbare	0.165	11.01

Tabela 2. Rezultati trčanja na 200m-finale

Men			
Wind: 0,4m/s		**Time Reaction**	**Result**
1.	Usain Bolt	0.180	19.32
2.	Yohan Blake	0.172	19.44
3.	Warren Weir	0.162	19.84
4.	Wallace Spearmon	0.165	19.90
5.	Churandy Martina	0.157	20.00
6.	Christophe Lemaitre	0.153	20.19
7.	Alex Quinonez	0.185	20.57
8.	Anaso Jobodwana	0.216	20.69

Table 2. The results of running the 200m-finals

Women			
Wind: 0,2m/s		**Time Reaction**	**Result**
1.	Allyson Felix	0.174	21.88
2.	Shelly-Ann Fraser-Pryce	0.169	22.09
3.	Carmelita Jeter	0.167	22.14
4.	Veronica C. Brown	0.176	22.38
5.	Sanya Richards-Ross	0.171	22.39
6.	Murielle Ahoure	0.161	22.57
7.	Myriam Soumare	0.157	22.63
8.	Semoy Hackett	0.15	22.87

Tabela 3. Rezultati trčanja na 400m-finale

Men			
Vind:---		**Time Reaction**	**Result**
1.	Kirani James	0.163	43.94
2.	Luguelin Santos	0.185	44.46
3.	Lalonde Gordon	0.159	44.52
4.	Chris Brown	0.166	44.79
5.	Kevin Borlee	0.151	44.81
6.	Jonathan Borlee	0.173	44.83
7.	Demetrius Pinder	0.153	44.98
8.	Steven Solomon	0.143	45.14

Table 3. The results of running the 400m-finals

Women			
Vind:---		**Time Reaction**	**Result**
1.	Sanya Richards-Ross	0.189	49.55
2.	Christine Ohuruogu	0.174	49.70
3.	Deedee Trotter	0.167	49.72
4.	Amantle Montsho	0.198	49.75
5.	Novlene Williams-Mills	0.258	50.11
6.	Antonina Krivoshapka	0.175	50.17
7.	Francena Mccorory	0.196	50.33
8.	Rosemarie Whyte	0.184	50.79

Rezultati

Tabela 4. Osnovni statistički parametri vremena startne reakcije (RT) atletičara i atletičarki

Disciplines	N	Mean RT (s)	Min	Max	Rang	SD	Skew.	Kurt.
100m M	8	0,162	0,139	0,179	0,040	0,152	-,338	-1,343
100m W	8	0,155	0,128	0,176	0,048	0,015	-,525	,148
200m M	8	0,174	0,153	0,216	0,063	0,203	1,396	2,177
200m W	8	0,165	0,151	0,176	0,025	0,009	-,627	-,691
400m M	8	0,161	0,143	0,185	0,042	0,133	,487	,081
400m W	8	0,192	0,167	0,258	0,091	0,028	2,042	4,829

Results

Table 4. Basic statistical parameters of the starting reaction time (RT) of men and women athletes

Slika 1. Srednje vrijeme reakcije muških i ženskih finalista

Legend: *N (number of subject; Mean (average value reaction time); Min (minimal result); Max (maximal result); Rang (range result); SD (standard deviation); Skew. (skewness), Kurt. (kurtosis)*

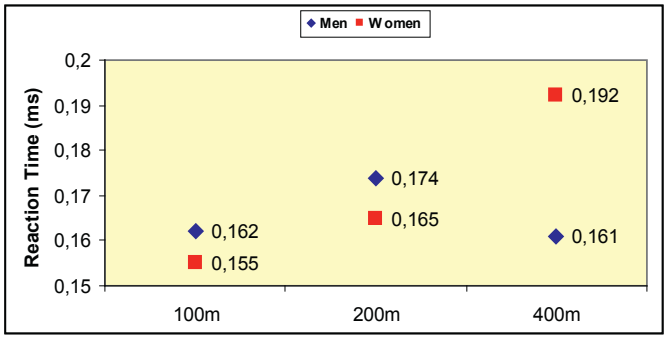


Figure 1. Mean reaction time of male and female finalists

Legend: *N (number of subject; Mean RT (average value reaction time); Min (minimal result); Max (maximal result); Rang (range result); SD (standard deviation); Skew. (skewness), Kurt. (kurtosis)*

U Tabeli 4. prikazani su osnovni statistički parametri vremena startne reakcije (RT) muških i ženskih finalista korištenih u ovom radu. Uvidom u Tabelu 4. uglavnom se uočava normalnost distribucije. Manja homogenost se manifestuje u disciplini 400m za žene, sa većom vrijednosti kurtosisa, pa se zaključuje da se radi o većem rasponu ostvarenog vremena reakcije u ovoj disciplini koje su zabilježili ženski finalisti. Takođe povećana vrijednost skjunisa je potvrda da se radi o većoj vrijednosti reakcionog vremena u istoj disciplini. U trčanju 200m za muškarce zabilježene su povećane mjere varijabilnosti u oba parametra ali ipak nešto manje od prethodnog slučaja. Inspekcijom Tabele 4. može se zaključiti da je srednje, (numerički najmanje) vrijeme reakcije u disciplini 100m kod žena (0,155s) sa najmanjim (najbržim) vremenom reakcije od 0,128s. od svih disciplina u obje konkurencije. Kao najslabije prosječno i pojedinačno startno reakciono vrijeme je takođe kod ženskih finalista u disciplini 400m (0,192sec.), odnosno (Max.=0,258sec.). Raspon od najboljeg vremena startne reakcije do najslabijeg vremena u obje konkurencije iznosi 0,130 sec. što i nije neka velika razlika ako se uzme u obzir različitost dužine staze (100mW:400mW). Da bi se utvrdile eventualne razlike u startnom vremenu reakcije po disciplinama za muške i ženske finaliste, te razlike vremena reakcije između polova primjenjen je T-test za nezavisne uzorke.

Table 4 presents the basic statistical parameters of the starting reaction time (RT) of male and female finalists used in this work. Looking at Table 4, normality of distribution can be mainly observed. Less homogeneity manifests itself in the discipline 400m for women, with higher values of kurtosis, and we conclude that it is about a greater range of achieved reaction time in this discipline that female finalists achieved. Also increased value of skewness confirms that it is a large value of reaction time in the same event. In the men's 200m running increased measures of variability in both parameters were observed, but slightly less than the previous case. By inspection of Table 4 it can be concluded that the medium, (the least numerically) reaction time in the discipline of women's 100m (0,155 s) with the lowest (fastest) reaction time of 0.128 s. from all disciplines in both categories. The lowest average and individually starting reaction time is also in the female finalists in the 400m discipline (0.192 sec.) that is (Max. = 0.258 sec.). The range of the best time of starting reaction to the weakest time in both competitions is 0.130 sec. which does not make a big difference if you take into account the different lengths of track. In order to identify any differences in the starting reaction time in each discipline for male and female finalists and differences of reaction time between the sexes t-test for independent samples has been applied.

Tabela 5. Razlike u vremenu startne reakcije ženskih finalista

Legend: Mean (average value), standard deviation (SD), coefficient of t-test value(T-value), significance level (Sig.**p<0,01; * p<0,05)

Disciplines	Reaction Time (s) Women (N=24)		
	Mean±SD	t-value	p-level
100m	0,155±0,015	-1,583	0,136
200m	0,165±0,009		
100m	0,155±0,015	-3,220	0,006**
400m	0,192±0,028		
200m	0,165±0,009	-2,550	0,023*
400m	0,192±0,028		

Table 5. Differences in the starting reaction time of female finalists

Legend: Mean (average value), standard deviation (SD), coefficient of t-test value(T-value), significance level (Sig.**p<0,01; * p<0,05)

U Tabeli 5. prezentovane su razlike u vremenu startne reakcije ženskih finalista u disciplinama 100m, 200m i 400m. Uvidom u Tabelu 5, razlike između disciplina su evidentne, međutim ostvarene razlike nisu i statistički značajne. Od ukupno tri discipline, utvrđene su značajne razlike u dvije. Statistički značajna razlika nije utvrđena između disciplina 100m i 200m (p<0,136). U preostale dvije discipline razlika je statistički značajna, i to između disciplina 200m i 400m (t= -2,550*) i između 100m i 400m (t=-3,220**).

Table 5 presents the differences in the starting reaction time of the finalist in the women's events: 100m, 200m and 400m. Looking at the Table 5, the differences between the disciplines are evident; however, realized differences are not statistically significant. Of the three disciplines, significant differences were found in two. A statistically significant difference was not found between 100m and 200m disciplines (p <0.136). In the other two disciplines difference is statistically significant, between 200m and 400m disciplines (t=-2,550*) and between 100m and 400m (t=-3,220**).

Tabela 6. Razlike u vremenu startne reakcije muških finalista

Legend: Mean (average value), standard deviation (SD), coefficient of t-test value(T-value), significance level (Sig.**p<0,01; * p<0,05)

Disciplines	Reaction Time (s) Men (24)		
	Mean±SD	t-value	p-level
100m	0,162±0,152	-1,297	0,216
200m	0,174±0,203		
100m	0,162±0,152	0,070	0,945
400m	0,161±0,133		
200m	0,174±0,203	1,414	0,179
400m	0,161±0,133		

Table 6. Differences in the starting reaction time of male finalists

Legend: Mean (average value), standard deviation (SD), coefficient of t-test value (T-value), significance level (Sig.**p<0,01; * p<0,05)

Tabela 6. sadrži numeričke parametre razlika u vremenu startne reakcije muških finalista u sprinterskim disciplinama. Uvidom u Tabelu 6. evidentirane su manje razlike u vremenu reakcije između disciplina ali, one nisu tolike da bi se pokazale statistički značajnim. Najveća razlika aritmetičkih sredina koja nije statistički značajna je između discipline 200m i 400m (p<0,179). Ovakva distribucija rezultata može se potvrditi velikim značajem startnog vremena reakcije, bez obzira o kojoj se dužini staze radi. Takođe ovi rezultati finalnih trka odbacuju ranije tvrdnje da je vrijeme reakcije sporije na kraćim stazama, a da sa dužinom staze gubi na značaju (Moravec, 1988), takođe i da sa dužinom staze linerano se povećava i vrijeme reakcije (Baumann, 1980; Babić & Delalija, 2009**).**

Table 6 contains numerical parameters of the differences in time of starting reaction of male finalists in the sprint events. Looking at Table 6 minor differences in reaction time between the disciplines are evident, but they are not so large to be statistically significant. The largest difference of arithmetic mean that is not statistically significant is between the 200m and 400m events (p<0.179). This distribution of results can be confirmed by the great importance of the starting reaction time, regardless of the length of the track work. Also, these results of final races dismiss earlier claims that the response time is slower in the short tracks, and that with the length of the track it loses its significance (Moravec, et al. 1988), also that with the length of tracks the reaction time also increases linearly (Baumann, 1980; Babic & Delalija, 2009).

Tabela 7. Razlike u vremenu startne reakcije između muških i ženskih finalista

Legend: Mean (average value), standard deviation (SD), coefficient of t-test value(T-value), significance level (Sig.**p<0,01; * p<0,05)

Disciplines	Reaction Time (s) Women-Men		
	Mean±SD	t-value	p-level
100m W 100m M	0,155±0,015 0,162±0,152	-1,297	0,838
200m W 200m M	0,165±0,009 0,174±0,203	-1,172	0,832
400m W 400m M	0,192±0,028 0,161±0,133	1,411	0,269

Table 7. The differences in the time of the starting reaction between male and female finalists

Razlike po polovima su uvijek zanimljive za analize bez obzira o kojim se disciplinama radi. U ovom slučaju je interesantno i značajno za praksu utvrditi razlike u vremenu startne reakcije istih disciplina između muškaraca i žena, finalista Olimpijskih igara. Inspekcijom Tabele 7. uočavaju se manje vrijednosti razlika aritmetičkih sredina vremena reakcije u disciplinama 100m (W155ms:M162ms) i 200m (W165ms:M174ms) u korist ženskih finalista. Razlika u korist muških finalista je ostvarena u disciplini 400m (161ms) u odnosu na žene (192ms). Međutim važno je istaći da ove razlike nisu toliko velike i nisu ostvarile statističku značajnost, tako da razlike po polovima nisu evidentirane.

Differences by gender are always interesting for analysis regardless of the disciplines. In this case it is interesting and important for the practice to determine the differences in the starting reaction time of the same disciplines between men and women finalists of the Olympics. By inspecting Table 7, lower values of differences of arithmetic means of reaction time were observed in the disciplines of 100m (W155ms: M162ms) and 200 (W165ms: M174ms) in favor of women's finalists. The difference in favor of male finalists was achieved in the discipline 400m (161ms) in relation to women (192ms). However, it is important that these differences are not as large and did not achieve statistical significance, so the differences by gender were not evident.

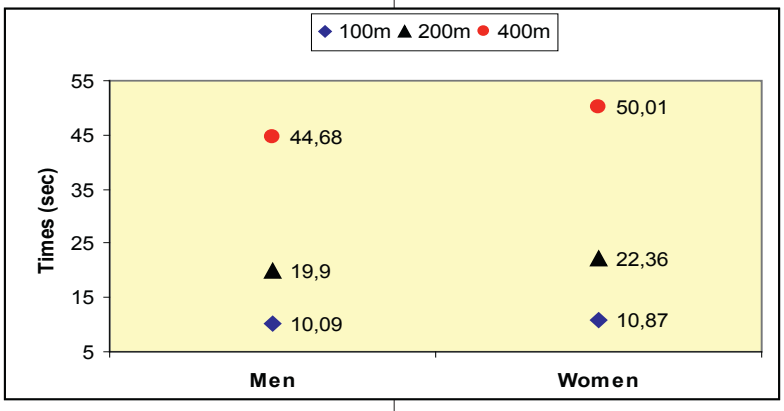
Tabela 8. Razlike u postignutom rezultatu muških i ženskih finalista

Legend: Mean (average value), standard deviation (SD), coefficient of t-test value(T-value), significance level (Sig.**p<0,01; * p<0,05)

Disciplines	Time (s) Mean±SD		t-value	p-level
100m	M	10,09±0,774	-2,842	0,013*
	W	10,87±0,989		
200m	M	19,99±0,485	-11,526	0,000**
	W	22,36±0,323		
400m	M	44,68±0,373	-27,019	0,000**
	W	50,01±0,415		

Table 8. The differences in achieved results of male and female finalists

Legend: Mean (average value), standard deviation (SD), coefficient of t-test value (T-value), significance level (Sig.**p<0,01; * p<0,05)



Slika 2. Srednje vrijednosti ostvarenih rezultata muških i ženskih finalista

Figure 2. Mean in achieved results of male and female finalists

Tabela 8. sadrži rezultate koji negativnim vrijednostima t-testa jasno diferenciraju muške i ženske finaliste po postignutom rezultatu. Najmanja razlika je ostvarena u disciplini 100m gdje su žene ostvarile srednju vrijednost postignutog rezultata od 10,87sec (±0,989) za razliku od muških finalista 10,09sec (±0,774). Dobijena razlika je potvrđena t-testom na nivou (p<0,013). Značajno veće razlike su ispoljene u disciplini 200m (t=-11,526; p<0,000) i 400m (t=-27,019; p<0,000). Ovi rezultati potvrđuju jasne polne razlike, koje su u sprinterskim disciplinama jasno izražene, ne toliko u 100m koliko u disciplinama 200m i 400m.

Table 8 contains the results that by negative values of t-test clearly differentiated male and female finalists by the results achieved. The smallest difference was achieved in the 100m discipline where women achieved the mean value of result of 10,87 sec (± 0,989) unlike the male finalists 10,09 sec (± 0,774). The achieved difference was confirmed by t-test at the level (p <0,013). Significantly larger differences are manifested in the 200m discipline (t=-11,526, p <0,000) and 400 (t= -27,019, p<0,000). These results confirm clear gender differences, in the sprint events clearly expressed, not so much in the 100m 200m and 400m events.

Diskusija

Startno ubrzanje je jedan od najkompleksnijih segmenata sprinterskog trčanja, u kome se može racionalizovati sprinterski kapacitet koji će se manifestovati tek u segmentu trčanja maksimalnom brzinom. Naime, izgubljeno vrijeme zbog loše startne reakcije, loše izvedenog starta, neefikasne startne progresije i kasnog dostizanja brzine, teško je ili nemoguće nadoknaditi u preostalom dijelu trke (Smajlović & Kozić, 2006). Međutim, u novije vrijeme dešava se i, da loše izveden start, sa slabijom startnom reakcijom, ne mora značiti i neuspjeh tokom trke, odnosno slabiji plasman. Ovoj konstataciji ide u prilog i najbrži čovjek planete, Usain Bolt, koji je u finalu Olimpijskih igara u Londonu ostvario peto vrijeme startne reakcije (160ms) na 100m i šesto vrijeme na 200m (180ms) a ipak zauzeo prva mjesta. Ovi navodi potvrđuju ranija istraživanja koja tvrde da su za konačan rezultat u sprintu (100m i 200m) važniji dužina ubrzanja, postignuta maksimalna brzina i brzinska izdržljivost (Martin & Buonchristiani, 1995). Smatra se da je izvršenje faze kontakta nakon starta i tokom trke jedan od najvažnijih generatora uspjeha u realizaciji sprinterske brzine (Lehmann & Voss, 1997). Kontaktna faza mora biti što je moguće kraća s optimalnim odnosom faze odraza i faze leta, dok frekvencija koraka zavisi od funcionisnja CNS-a i genetski je određena, veća frekvencija koraka, kraći korak i obrnuto (Mero, Komi, i Gregor, 1992). Vrhunske performanse sprintera su rezultat kompleksne mješavine mnogih faktora kao što su genetski potencijal, trening i zdravstveno stanje sportiste. Sa antropološke tačke gledišta, vrijeme reakcije je sposobnost da se brzo odgovori na nadražaj.Veća brzina reakcije daje i bolje vrijeme reakcije koje je samo jedan od nekoliko faktora koji utiču na uspjeh u modernoj atletici (Dick, 1987; Brüggemann & Glad, 1990; Pain & Hibbs, 2007). U sprinterskim disciplinama početak vremena reakcije je vremenski interval (ms) signala pištolja i pokreta sportiste kada će izvršiti pritisak na startne blokove. Steinbach i Tholl (1969) su svojevremeno objavili studiju u kojoj navode da elitni sportisti imaju bržu i stabilniju reakciju od početnika sportista. Osim toga, brzina reakcije pokazuje pad rezultata kad sportista nije trenirao (Doherty, 1985), tako da početno vrijeme reakcije utiče oko 1 do 2% na ukupan rezultat sprintera (Baumann, 1980; Helmick, 2003). Suprotno navedenome, vrijeme reakcije u sprintu ne može predvidjeti završno vrijeme na 200m, u odnosu na 100 i 110m prepone, zbog dužeg trčanja na ciljnoj ravnini (Collet, 2000, Komi, Ishikawa, & Jukka, 2009). Vrijeme od 200ms predstavlja samo 2% od 100m sprinta u trajanju 10,00s, ili 0,4% od 400m sprinta koji traje oko

Discussion

Starting acceleration is one of the most complex segments of the sprint, in which sprint capacity can be rationalized that will be manifested only in the segment of maximal running speed. The time lost due to poor start reaction, poor start and, ineffective start progression and late reaching speed is difficult or impossible to make up in the rest of the race (Smajlović and Kozić, 2006). However, recently it also happens that a poor start, starting with a lower reaction does not necessarily mean the failure of the race, and weaker result. This conclusion is supported by the planet's fastest man, Usain Bolt, who in the finals of the Olympic Games in London achieved the fifth time of starting reaction (160ms) in the 100m and sixth in the 200m (180ms) and still took first place. These remarks confirm earlier studies which claim that for the final score in the sprints (100m and 200m) length of acceleration, reached maximum speed and speed-endurance are more important (Martin & Buonchristiani, 1995). It is believed that the execution of the contact phase after the start and during the race are one of the most important generators of success in the implementation of sprint speed (Lehmann & Voss, 1997). Contact phase should be as short as possible with an optimal phase of reflection and phase of flight, while step frequency depends on the functioning of the CNS and is genetically determined, increased step frequency, shorter step and vice versa (Mero, Komi and Gregor, 1992). The high performance of sprinters is the result of a complex mixture of many factors such as genetic potential, training and health of athlete. From the anthropological point of view, the reaction time is the ability to quickly respond to stimulation. Higher reaction rate gives better response time, which is only one of several factors that influence the success of modern athletics (Dick, 1987; Brüggemann & Glad, 1990; Pain & Hibbs, 2007). In the sprint events, start reaction time is the time interval (ms) of pistol signal and movement of athlete when he will put pressure on the starting blocks. Steinbach and Tholl (1969) once published a study stating that elite athletes have a faster and more stable response from novice athletes. In addition, the reaction speed shows decreased result when athlete did not train (Doherty, 1985), so the initial reaction time affects about 1 to 2% of the total score of sprinter (Helmick, 2003). Contrary to the above, the reaction time in the sprint cannot predict the final time in the 200m, compared to the 100 and 110m hurdles, because of the long run at the finish line (Collet, 2000, Komi, Ishikawa, & Jukka, 2009). Time of 200ms represents only 2% of the 100m sprint in 10.00 s duration, or 0.4% of the 400m sprint, which takes about 45 seconds (Martin, & Buonchristiani 1995). However, re-

45sec. (Martin & Buoncristiani, 1995). Međutim, istraživanja (Stevenson, 1997, Michel, i Jarver, 2002; Henson, Cooper, i Perry, 2002) su dokazala da sportisti s boljim vremenom reakcije u početku sprinta su imali psihološku prednost nad svojim protivnicima, koja u mnogim trkama može biti važna na ciljnoj ravni.

Rezultati prezentovani u Tabeli 4. pokazuju da povećanjem dužine staze raste i prosječno vrijeme reakcije kod ženskih finalista, za razliku od muških finalista gdje ne važi ovo ‘’nazovimo’’ pravilo, pa je prosječno vrijeme reakcije na 100m slabije nego na 400m (0,162:0,161).

Poredeći rezultate ovog istraživanja sa rezultatima prethodnih (Moravec, et al. 1987; Colet, 2000; Duffy, 2004, Smajlović i Kozić, 2006; Babić, 2008) može se zaključiti da se radi o ostvarenim rezultatima skoro istog nivoa u svim disciplinama. U istraživanju Theopilos Pilianidis, et al. (2012), utvrđeno je da su i muškarci i žene bili značajno bolji u disciplini trčanje na 100m u Pekingu 2008. godine nego u Sydneyu 2000. godine. Isto tako, vremena startne reakcije u disciplinama trčanje na 100/110m s preponama bila su statistički značajno bolja u Atini 2004. godine nego u Sydneyu 2000. godine. I na kraju, u muškoj finalnoj trci na 100m u Pekingu 2008. godine i vrijeme startne reakcije i ukupan rezultat trčanja bili su bolji nego rezultati takmičara koji su nastupili u Atini 2004. i Sydneyu 2000. godine. Takođe rezultati ovog istraživanja u disciplini 100m su malo slabiji od rezultata mitinga Zlatne lige Rim 2003.godine. Prosječno vrijeme reakcije finalista u Rimu 2003. godine je iznosilo 153ms (±28ms) naspram 162ms (±0,152ms). Poredeći rezultate Olimpijskih igara u Londonu sa rezultatima Svjetskog prvenstva u Edmontonu 2001. i Parizu 2003. može se zaključiti da su dobijeni rezultati koji su potvrdili razlike u startnom vremenu reakcije između ovih takmičenja. Prosječno ostvareno vrijeme muških finalista u disciplini 100m na SP u Edmontonu 2001. godine je 10,19 sec, sa vremenom rekcije 145ms, a u finalu SP u Parizu 2003. 10,20 sec sa vremenom reakcije 159ms. Na Olimpijskim igrama u Londonu 2012. prosječno vrijeme u finalnoj trci bilo je 10,09 sec. sa vremenom rekacije 162 ms. U ženskoj konkurenciji SP Edmontonu ostvareno je srednje vrijeme 11,15 sec sa reakcionim vremenom od 146ms i SP Parizu 2003. 11,13sec sa vremenom reakcije 157ms. Žensko finale u Londonu je završeno sa prosječnim vremenom od 10,87 sec i vremenom reakcije 155ms.

Raniji rezultati su pokazali da na Olimpijskim igrama sa produžavanjem dionice, linearno se povećava i vrijeme startne reakcije u sprintera svjetske klase (Baumann, 1980; Babić & Delalija, 2009). Isto tako u pojedinim istraživanjima je potvrđeno da vrijeme reakcije

search (Stevenson, 1997, Michel and Järvere, 2002; Henson, Cooper, and Perry, 2002) has shown that athletes with better response time at the beginning of the sprint had the psychological edge over their opponents, which in many races may be important on the target plane.

The results presented in Table 4 show that increasing the length of track increases also the average response time in the female finalists unlike male finalists where this so called rule is not valid, and an average response time on 100m is weaker than on 400m (0,162:0,161).

Comparing the results of this study with previous one, (Colet 2000; Duffy, 2004 Smajlović and Kozić 2006; Babic, 2008) it can be concluded that these are the results achieved almost at the same level in all disciplines. The study Theopilos Pilianidis, et al. 2012 found that both men and women were significantly better in the discipline of running 100m in Beijing in 2008 than in Sydney in 2000. Similarly, the times of starting reaction in the disciplines of running 100/110m hurdles were significantly better in Athens in 2004 than in Sydney in 2000. Finally, in the men’s 100m final race at Beijing in 2008, both the time of start reaction and overall score of running’s were better than the results of competitors that participated in Athens in 2004 and in Sydney in 2000. Also the results of this research in the discipline of 100m are slightly weaker from the results of the Rome Golden League meeting in 2003.

Average response finalist time in Rome 2003 amounted to 153ms (± 28ms) versus 162ms (± 0.152 ms). Comparing the results of the London Olympics with the results of the World Championships in Edmonton in 2001 and Paris 2003 it can be concluded that the results obtained have confirmed the differences in starting reaction time between these competitions. Average achieved time during the men’s 100m finalists in the discipline at the World Championships in Edmonton in 2001 was 10.19 sec, with a response time 145ms, and in World Cup final in Paris in 2003 10.20 sec with a response time 159ms. At the Olympic Games in London in 2012, average time in the final race was 10.09 sec. with reaction time 162 ms. In the women’s World Cup in Edmonton the mean time was 11.15 sec with a reaction time of 146ms and at WC in Paris in 2003 11.13 sec with a response time 157ms. Female Finals in London has been completed with an average time of 10.87 seconds and response time 155ms.

Previous results have shown that the Olympics with extending tracks increase linearly also the time of the starting reaction in world-class sprinters (Baumann, 1980; Babic & Delalija, 2009). Also, in some studies it was confirmed that the time reaction of male sprinters is better than women. However, the results of this study are in contrast

muških sprintera bolje nego kod ženskih. Međutim, rezultati ovog istraživanja su u suprotnosti sa istraživanjima koja su potvrdila da nema razlike u vremenu startne reakcije između muških i ženskih sprinetra (Martin & Buonchristiani, 1995). Kada su u pitanju razlike vremena reakcije po polu, rezultati u ovom istraživanju to nisu potvrdili (Tabela 7). Skoro identične rezultate su dobili Smajlović i Kozić 2006. u svom istraživanju svjetskih prvenstva Edmonton 2001 i Pariz 2003. godine. Dobijeni rezultati upućuju na zaključak da se radi o vrhunskim atletičarima, dobrih performansi pa su razlike skoro i nemoguće ili minimalne. Razlike su evidentne ne samo u vremenu reakcije, već i u nekim psihofizičkim sposobnostima samo u slučajevima ako se radi o selekcionisanim i ne selekcionisanim kategorijama. Ovome ide u prilog da samo dobra selekcija, tehnologija trenažnog procesa uz naravno genetske predispozicije su garant upjeha (Meckel, Atterborm, Grodjinovsky, Ben-Sira, & Rotsteina, 1995). Značajan uticaj na vrijeme startne reakcije u sprintu i realizacija startnog ubrzanja je u zavisnosti od manifestacije sile izometrijske i izotoničke mišićne kontrakcije na startne blokove, položaja i uglova u koljenom zglobu, horizontalnog i vertikalnog impulsa (Young, McLean, & Ardagna 1995; Hunter, Marshall, & McNair, 2005). U svojoj studiji (Čoh, Tomažin, and Štuhec, 2006) analiziraju i identifikuju glavne kinematičke parametre u fazi sprinta i startnog ubrzanja koji utiču na ukupan rezultat. Istraživanje je pokazalo da su optimalna udaljenost blokova, brzina napuštanja startnih blokova, dužina prvog koraka, visina težišta tijela u prva tri metra ubrzanja, optimalan odnos između dužine i frekvencije koraka ključni faktori uspjeha u dvije faze sprinterskog trčanja.

Istraživanja (Dostal, 1982 prema Smajlović i Kozić, 2006; Moravec et al. 1988) su potvrdila, da startno vrijeme reakcije u sprintu nije u direktnoj korelaciji sa završnim rezultatom ni kod muških ni kod ženskih spintera. Slično istraživanje na deset vodećih sprintera su sproveli Paradisis et al. 2006 i dobili suprotne rezultate. Oni su utvrdili da je vrijeme početka reakcija usko povezano s rezultatom u sprintu. To je itekako značajno, s obzirom da su u finalnoj trci u Londonu 2012. muškarci ostvarili srednje vrijeme startne reakcije od 162ms i ukupni rezultat od 10,09 sec. Takođe, u finalu Olimpijskih igara u Pekingu 2008. godine, muški sprinteri su imali prosječno vrijeme startne reakcije (146ms) a ostvareni ukupni rezultat od 9,89 sec. i bili su bolji u odnosu na finalne trke OI-a u Atini 2004 i Sydney 2000. godine. Na svjetskom prvenstvu u Berlinu 2009. godine došlo, može se reći, do prave eksplozije rezultata. 2009. prosječno vrijeme reakcije muških finalista je bilo bolje nego i u Pekingu (138ms sa ostvarenim rezultatom

to studies that have confirmed that there is no difference in the time of the starting reaction between male and female sprinters. When it comes to response time differences by gender, the results in this study did not confirm that (Table 7). Almost identical results were obtained by Smajlović and Kozic in 2006 in their study of world championships in Edmonton in 2001 and in Paris in 2003. The results indicate that it is about superb athletes, with good performances and the differences are almost impossible or minimal. The differences are evident not only in the reaction time, but also in some mental and physical abilities only in cases if it is about selected and non-selected categories. Also with this goes that only a good selection, the technology of the training process, with of course natural predisposition there could be success (Meckel, Atterborm, Grodjinovsky, Ben-Sira, & Rotstein, 1995). Significant impact on the response time in sprint and the implementation of starting acceleration is in dependence of the force manifestation of isometric and isotonic muscle contraction on the starting blocks, the position and angle of the knee joint, the horizontal and vertical impulses (Young, McLean, & Ardagna 1995; Hunter, Marshall, & McNair, 2005). In their study, Coh, Tomažin, and Štuhec, 2006 analyze and identify the main kinematic parameters in the phase of the sprint and starting acceleration that affect the overall result. The research has shown that the optimum distance of blocks, the speed of leaving the starting blocks, the length of the first step, height of center of gravity of the body in the first three meters of acceleration, the optimal ratio between length and step frequency are key success factors in the two-stage sprint.

Researches (Dostal, 1982 by Smajlović and Kozić 2006; Moravec et al. 1988) have confirmed that the starting time of the reaction in the sprint is not directly correlated to the final result neither in male nor in female sprinters. Similar research in ten leading sprinters conducted Paradisis et al. in 2006 and obtained conflicting results. They found that the time of starting reaction is closely related to the results in the sprint. This is particularly important, given that in the final race in London in 2012 men achieved a mean time of starting reaction 162ms and a total score of 10.09 sec. Also, in the final of the Beijing Olympics in 2008, male sprinters had an average response time of starting reaction (146ms) and achieved a total score of 9.89 sec. and they were better than in the final race of the OG in Athens in 2004 and in Sydney in 2000. At the World Championship in Berlin in 2009 there has been, so to speak, an explosion of the results. In 2009, the average reaction time of male finalists was better than in Beijing (138ms with the achieved

9,91 sec.). Možda i prisutvo Jamajčanina, Usain Bolta, u svim finalima, s vremenima reakcije od 165ms i vrijeme svjetskog rekorda 9,69sec. u Pekingu, zatim 146ms i 9,58 sec. u Berlinu i najzad 165ms i 9,63 sec. u Londonu 2012. imao snažan uticaj u sve tri startne reakcije i performanse ovih finalnih trka. Takođe ista formula se može navesti i za ženske finaliste gdje je prvoplasirana S.A. Fraser-Pryce ostvarila vrijeme reakcije od 153ms i rezultat 10,75sec., a drugoplasirana C. Jeter 153ms i 10,78sec. Takođe, konstatacija da vrijeme reakcije linerano raste sa produžavanjem dionice (Baumann, 1980; Babić 2008; Babić & Delalija, 2009) se ne može u potpunosti prihvatiti. Kao protiv argument ovoj konstataciji jesu manje srednje vrijednosti vremena reakcije ostvarenih u finalu 400m u Londonu kod muškaraca (161ms) u odnosu na 100m (162ms) i 200m (174ms).

Rezultati ovog istraživanja pokazuju da su se u modernoj atletici, vrijeme startne reakcije i ukupno vrijeme trčanja jednako poboljšali, da nema razlike po polovima i da nisu evidentne statistički značajne razlike po disciplinama. Rezultati su u suprotnosti sa istraživanjem nekih autora koji navode da je vrijeme rakcije sprinterki sporije od sprintera, te da se ono povećava sa povećanjem dužine dionice. Takođe ovi rezultati istraživanja su u suprotnosti sa rezultatima Babić, (2008) koja je analizirala učesnike kvalifikacionih grupa, polufinalnih i finalnih na Olimpijskim igrama u Atini 2004. u sprinterskim i preponskim disciplinama za žene, gdje je dobila rezultate da je u skoro svim disciplinama ostverene statistički značajne razlike. Generalno, posmatrano ovi rezultati djelomično potvrđuju rezultate prethodnih istraživanja u sprinterskim disciplinama koja se tiču Svjetskih prvenstava u Rimu, 1987 (Susanaka et al.1988), u Štutgartu 1993 (Martin, & Buonchristiani, 1995), u Edmontonu, 2001. i Parizu, 2003 (Smajlović & Kozić, 2006) kao i Olimpijskih igara u Seulu 1988 (Brueggemann, & Glad, 1988) i Atini, 2004 (Smajlović i Kozić, 2006; Theophilos Pilianidis et al. 2012), Svjetskog prvenstva u Moskvi (Pavlović i sar. 2013).

Jedno od mogućih objašnjenja za ovakvu distribuciju rezultata ovog istraživanja jeste činjenica da su istraživanjem obuhvaćeni samo finalisti Olimpijskih igara u Londonu, koji su imali najbrže vrijeme reakcije i ukupni rezultat, odnosno bili su najbolji u tom momentu pa su tako negirali ranija istraživanja.

Ukratko ovo istraživanje je pokazalo da nema razlika između polova u vremenu startne reakcije, da ukoliko je vrijeme reakcije bolje, pretpostavka je da će i performanse trčanja biti bolje, te se potvrdilo da je reakciono vrijeme važan segment u postizanju ukupnog rezultata.

result 9.91 sec.). Perhaps the presence of Jamaican Usain Bolt in all the finals, with the reaction times of 165ms and a world record time of 9.69 sec. in Beijing, then 146ms and 9.58 sec. in Berlin, and finally 165ms and 9.63 sec. in London in 2012 had a strong influence in all three starting reactions and performances of these final races. Also, the same formula can be given for women's finalists, where the first-placed SA Fraser-Pryce made the response time of 153ms and the result of 10.75 sec. and second-placed C. Jeter 153ms and 10.78 sec. Also, the observation that the response time is linearly increasing with the lengthening of the section (Baumann, 1980; Babic 2008; Babic & Delalija, 2009) cannot be fully accepted. As an argument against this conclusion are less average values of response time achieved in the final 400m in London for men (161ms) compared to 100m (162ms) and 200 (174ms).

The results of this study indicate that in the modern track and field, the time of starting reaction and total running time are equally improved, that there is no difference by gender and there are no evident statistically significant differences by the disciplines. The results are in contrast to research of some authors who state that the time of reaction in female sprinters response is slower than in male sprinters, and that it increases with the length of the section. Also research findings are inconsistent with the results of Babic (2008) who analyzed the participants of qualification groups, the semi-final and final at the Athens Olympics in 2004 in sprint events and hurdles for women, where she received the results that in almost all disciplines had statistically significant differences. In general, these results partially confirm the results of previous researches in the sprint events related to the World Championships in Rome, 1987 (Susanaka et al.1988), Stuttgart, 1993 (Martin & Buonchristiani, 1995), in Edmonton, 2001 and Paris 2003 (Smajlović & Kozic, 2006) and the Olympic Games in Seoul in 1988 (Brueggemann, & Glad, 1988) and Athens 2004 (Smajlović and Kozic 2006; Theophilos Pilianidis et al. 2012), World Championship in Moscow 2013 (Pavlović et al. 2013).

One possible explanation for this distribution of results of this research is the fact that the survey covers only the finalists of the Olympic Games in London, who had the fastest response time and overall score, i.e. they were the best at the moment and so they denied earlier research.

In short, this study showed that there is no difference between the sexes in the time of starting reaction, that if the reaction time is better, the assumption is that the running performances will be better, and it was confirmed that the reaction time is an important segment in achieving the overall results.

Zaključak

Uzorak je obuhvatio ukupno 48 (24 muških i 24 ženskih) atletičara koji su nastupili u finalu Olimpijskih igara u disciplinama 100m, 200m, 400m. Istraživanje je imalo za cilj da utvrdi eventualne statistički značajne razlike u startnom vremenu reakcije i postignutom rezultatu sprinterskih disciplina na Olimpijskim igarama u Londonu 2012. Rezultati vremena reakcije i rezultatskog ostvarenja koja su postigli finalisti su na istom i na većem nivou rezultata dosadašnjih istraživanja na vrhunskim atletičarima. Vjerovatnost distribucije nešto boljih rezultata ovog istraživanja je u činjenici da se radi o finalnom takmičenju gdje su nastupili samo najbolji u obje konkurencije.

U skladu sa rezultatima istraživanja može se zaključiti da su utvrđene i da postoje statistički značajne razlike u vremenu reakcije kod ženskih finalista u disciplinama trčanja 100m i 400m (t=-3,220; p<0,006) kao i za discipline 200m i 400m (t=-2,550; p<0,023). Takođe ostvarene su statistički značajne razlike između polova u disciplinama 100m (t=-2,842; p<0,013), 200m (t=-11,526; p<0,000) i 400m (t=-27,019; p<0,000).

Rezultati istraživanja nisu potvrdili postojanje statistički značajnih razlika u vremenu reakcije kod muških finalista po disciplinama i razlika u istim disciplinama između polova.

Dobijeni rezultati su potvrdili ranija istraživanja kada su u pitanju razlike u postignutom rezultatu između suprotnih polova, što je i očekivano. Potvrđena su neka istraživanja koja nisu zabilježila značajne razlike u vremenu startne reakcije između polova. Takođe i brže vrijeme reakcije u kraćim distancama je potvrđeno kod ženskih za razliku od muških finalista.

Rezultati su pokazali da je trenažna tehnologija na visokom nivou, da su potencijali vrhunskih sprintera sve bolji, da su sve manje ili da uopšte ne postoje razlike u vremenu reakcije bez obzira na dužinu staze. To se pokazalo i u ovom istraživanju gdje su muški finalisti na 100m imali sporije vrijeme reakcije nego u disicplini 400m. Rezultati ovog istraživanja mogu poslužiti kao realna osnova za buduća istraživanja sa ovom problematikom ali npr. samo na finalnim takmičenjima Svjetskih i Evropskih prvenstava ili Olimpijskih igara.

Izjava autora
Autori pridonijeli jednako.

Konflikt interesa
Mi izjavljujemo da nemamo konflikt interesa.

Conclusion

The sample included a total of 48 (24 male and 24 female) athletes who took part in the final of the Olympic Games in the disciplines of 100m, 200m and 400m. The study was aimed to determine possible statistically significant differences in the starting time of the reaction and in the results achieved in the Olympic sprint disciplines of the Games in London in 2012. The results of reaction time and the result achievement that they have achieved are at the same or at a higher level of previous studies in the case of superb athletes. The probability of distribution of lightly better results of this research lies in the fact that it is a final competition where only the best in both categories were analyzed.

In accordance with the results of this research it can be concluded that the research showed that there were statistically significant differences in reaction time in female finalist in the disciplines of running 100m and 400m (t = -3.220; p<0.006) as well as for the 200m and 400m events (t=-2.550; p<0.023). Also there have been statistically significant differences between the sexes in the disciplines of 100m (t=-2.842; p<0.013), 200 (t=-11.526; p<0.000) and 400 (t = -27.019; p<0.000).

The research results did not confirm the existence of statistically significant differences in reaction time in male finalists by disciplines and differences in the same disciplines between sexes. The results obtained confirmed earlier studies in terms of the difference in the result achieved between the sexes, as expected. Some studies have confirmed no significant differences in time of starting reaction between the sexes. Also, the faster response time for short distances was confirmed in female as opposed to male finalists.

The results showed that the training technology is at a high level, that the potentials of top sprinters are getting better, that they are getting smaller or even there are no differences in response time regardless of the length of the track. In this study, it was also demonstrated that the male finalists in the 100m had slower reaction time than in the discipline of 400m. The results of this study can serve as a realistic basis for future research of these issues but, for example, only in the final competitions of the World and European Championships or Olympic Games.

Authorship statement
The authors have contributed equally.

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Selektivna baterija motoričkih testova atletske discipline skok udalj

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Sažetak: Osnovni cilj ove studije je bio identifikacija selektivne baterija motoričkih testova za skok udalj. Na taj način bi se u budućnosti omogućilo trenerima da na jednostavniji način određuju takmičarske potencijale, kao i da preciznije usmjeravaju organizaciju trenažnog procesa.
Uzorak ispitanika za ovu studiju je bio sačinjen od 1200 dječaka osnovnih i srednjih škola. Osnovni uzorak je bio podijeljen na osam subuzoraka od po 150 dječaka od petog razreda osnovne škole (11 godina ± 6 mjeseci) do četvrtog razreda srednje škole (18 godina ± 6 mjeseci). Polje motoričkih pokazatelja iz kojeg je trebalo odrediti selektivnu bateriju je bio strukturiran od pokazatelja onih motoričkih sposobnosti, koje su presudne za kvalitetan rezultat u skoku udalj (brzina, eksplozivna snaga gornjih ekstremiteta, eksplozivna snaga donjih ekstremiteta i gipkost).
Ovim istraživanjem je utvrđeno da najveći nivo selektivnog kvaliteta imaju testovi za procjenu eksplozivne snage donjih ekstremiteta horizontalnog tipa: skok uvis s mjesta i troskok s mjesta, testovi za procjenu brzine trčanja: trčanje 20 metara leteći start i trčanje 30 metara visoki start, kao i test za procjenu eksplozivne snage gornjih ekstremiteta, bacanje medicinke iz ležanja. To su testovi koji se moraju naći u svakoj bateriji testova, koja za cilj ima selekciju mladih atletičara za skok udalj.

Ključne riječi: atletika, skok udalj, predikcija, selekcija.

Uvod

U atletici postoje četiri skakačke discipline, skok udalj, troskok, skok uvis i skok motkom. Skokovi su kretne strukture koje prema svojem karakteru spadaju u osnovna biotička motorička znanja. Predstavljaju kretanje koje se zasniva na prelazu tijela iz položaja opiranja o čvrstu podlogu u bespotporni položaj posredstvom produkcije sila vlastitim mišićima. Prema osnovnoj definiciji skakanja, odnosno skokova, samo dvije atletske

The Selective Battery of Motor Tests For a Track and Field Event Long Jump

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Abstract: The basic goal of this study was identification of the selection battery of motor tests for long jump. In this way, coaches would be enabled in the future to determine their competitive potentials more simply, and to direct the organization of a training process more precisely.
The sample of the examinees for this research composed of 1200 boys from primary and secondary schools. The basic sample was divided into eight subsamples with 150 boys from the fifth class of primary school (12 years ± 6 months) to the fourth class of secondary school (18 years ± 6 months). The area of the motor indicators, on the basis of which it should be determined the selection battery, was structured from the indicators of those motor abilities, that were decisive for the quality result in long jump (speed, explosive strength of upper extremities, explosive strength of lower extremities and flexibility).
This research proved that the biggest level of selective quality, is related to the tests for the estimation of explosive strength of lower extremities: vertical jump test and standing triple jump, tests for the estimation of running speed: running 20 m flying start and running 30 m standing start, and test for the estimation of explosive strength of upper extremities, lying medicine ball throw. These are tests which must be in each battery of tests which, as an aim, have the talent identification of young jumpers for long jump.

Key words: track and field, long jump, selection.

Introduction

There are four jumping disciplines in athletics, long jump, triple jump, high jump and pole vault. Jumps are movement structures which belong to the basic biotic motor skills by their own character. They represent a movement based on the body transition from the position of resistance to a solid foundation into a resistance-free position through the production of forces by its own muscles. According to a basic definition of jump, namely jumping only two track and field events entirely fulfill the set prin-

skakačke discipline u potpunosti ispunjavaju postavljene principe. To su skok udalj i skok uvis, dok su troskok i skok motkom modifikovani oblici skakanja u kojem se jedan skok ponavlja više puta, a kod skoka motkom koristi se i motka kao vanjsko tijelo.

Atletski skokovi su veoma složena kretanja sačinjena od segmenta zaleta koji predstavlja ciklično kretanje i segmenta leta koji je aciklično kretanje. Kod svih atletskih skokova podizanje tijela u fazu leta se postiže pomoću zaleta i odraza i upravo od načina zaleta i njegovog jedinstva sa odrazom let u svakoj od disciplina dobija svoj karakter. Kod skoka motkom, zaletu i odrazu je neophodna i motka kako bi karakter te discipline bio potpun.

Prema svojim osnovnim karakteristikama sve četiri atletske discipline se dijele u dvije grupe: horizontalni ili daljinski skokovi (skok udalj i troskok), gdje atletičar i atletičarka imaju zadatak postići što veću daljinu svoga skoka i vertikalni ili visinski skokovi (skok uvis i skok motkom), gdje atletičari imaju zadatak postići što veću visinu svoga skoka.

Od sve četiri skakačke discipline koje su danas u atletskom programu, skok udalj je najstarija, a ujedno spada i u najstarije atletske discipline uopšte. Na antičkim Olimpijskim igrama skok udalj je bio u sastavu pentatlona-petoboja. Za razvoj skoka udalj posebno je bitna 1896. godina kada se u upotrebu uvodi odrazna daska, koja će omogućiti veliki napredak u rezultatima.

Analizirajući biomehaničke karakteristike, skok udalj spada u grupu složenih prostornih gibanja, a po tipu motoričke aktivnosti u grupu prirodnih kretanja bez korišćenja tehničkih pomagala. Struktura cjelokupnog kretanja discipline skok udalj se dijeli na ciklični dio (zalet) i aciklični dio (skok), koji se dijeli na tri segmenta: odraz, let i doskok. Na kvalitet rezultata od mehaničkih faktora, najznačajnije utiču brzina zaleta, intenzitet odraznog impulsa i ugao odraza (Idrizović, 2010).

Veliki broj naučnih istraživanja u okviru discipline skoka udalj ukazuju da on predstavlja disciplinu kod koje globalno posmatrajući, na rezultat, najviše utiču funkcionalno-motorička svojstva skakača, i to brzina i snaga najviše. Ove dvije motoričke sposobnosti, odnosno njihova sinergija, determiniše skakački kvalitet. Razvijanje ovih sposobnosti je, pored visokog nivoa njihove genetske predisponiranosti, stvar koja se tiče dugogodišnjeg trenažnog procesa.

Stručnjacima u oblasti fizičke kulture podaci o brzinsko-kontrakcionim svojstvima mišića nogu mogu da služe za izbor sportske orijentacije, za testiranje funkcionalnog stanja nervno-mišićnog aparata i za rukovođenje treningom prema unaprijed zadatom cilju, što znači da

ciples. These are long jump and high jump, while triple jump and pole vault are modified shapes of jumping where one jump is repeated several times, and in a pole vault a pole is used as an external body.

The track and field jumps are very complex movements made of segments of approach representing a cyclic movement and segments of a flying which is acyclic movement. For all track and field jumps, the hoisting of a body in the flying phase is accomplished by an approach and a takeoff and just on the way of approach and its unity with takeoff, flying in all discipline obtains its character. For the pole vault, an approach and takeoff demand a pole in order to fulfill the entire character of this discipline.

According to its basic characteristics, all four disciplines are divided into two groups; horizontal or distance jumps (long jump and triple jump), where male and female athletes have a task to obtain the biggest possible length of their jumps, and vertical or height jumps (high jump and pole vault), where athletes have a task to obtain the biggest possible height of their jumps.

Of all four athletic disciplines which are today present in an athletic program, a standing jump is the oldest and it also belongs to the oldest disciplines in total. At the antique Olympic Games, a long jump was in the framework of a pentathlon. The year 1896 is especially important for the development of a long jump when a takeoff board which enabled a great advancement in results was introduced.

Analyzing biomechanical characteristics, one can see that a long jump belongs to the group of spatially complex motion, and by a type of motor activity in the group of natural movements without the use of technical tools. The structure of entire movement in a standing jump is divided into a cyclic part (approach) and acyclic part (jump), which is divided into three elements: takeoff, flying and landing. The speed of approach, the intensity of takeoff impulse and the angle of takeoff most importantly influence the quality of results of all motor factors (Idrizovic, 2010).

A plenty of scientific researches within the discipline of a long jump indicate that it represents a discipline in which, globally seeing, functionally-motor traits of a jumper influence the results, and where a speed and strength have the biggest impact. These two motor abilities, namely their synergy, determine a jumping quality. The development of these abilities is, beside the high level of their genetic predisposition, the thing which is related to a multiannual training process.

The experts from the area of physical culture use the data about the speed-contractive traits of leg muscles which can serve for the choice of sport orientation, for the testing of a functional condition of neural-muscle

tamo gdje brzinska svojstva mišića mogu da utiču na postizanje određene brzine u kretanju čovječijeg tijela ili djelova tijela (sprint, skokovi i sl.) (Nićin, 1977).

Upravo sportska orijentacija i usmjeravanje (identifikacija talenata) predstavlja jedan od najznačajnijih zadataka budućeg razvoja atletske discipline skok udalj.

Veliki broj autora ističe bazične motoričke i morfološke pokazatelje u selekciji talenata za individualne sportove kakav je atletika (Aule i Loko, 1982; Schroter i Voss, 1990; Johnes, 1989, 1993 i 1997; Henson i sar. 1993; Suslov i Kulakov, 2004).

Siris (1982) opisuje dva nivoa programa za identifikaciju talenata u skoku udalj. On sugeriše da su najvažniji faktori uspješnosti u skoku udalj brzina i sposobnost ubrzanja. U prvoj fazi se mladi atletičari, koji imaju bolje rezultate od prosječnih u seriji testova, i koji imaju odgovarajuće antropometrijske mjere, selektiraju za specifični trenažni program. Kao zaključak osamnaestomjesečnog trenažnog programa se smatra druga faza selekcije kada se biraju pojedinci sa prihvatljivim napretkom.

Jarver (1983) prezentuje generalnu bateriju testova koju su koristile Sovjetske sportske škole za selekciju skakača. Ta baterija je uključivala testove 30m i 60m sprint, skok udalj s mjesta, troskok s mjesta, zgibovi i sklekovi.

Da sve nije nimalo jednostavno naglašavaju Werner i Emrich (1997), koji ističu da se u znatnom broju atletskih klubova, proces selekcije budućih vrhunskih atletičara dešava sasvim slučajno, jer jedan, dosta veliki broj trenera, smatra da talentovani pojedinci uvijek pronalaze put do uspjeha.

Sa druge strane, postavlja se veoma značajno pitanje, koji su to testovi, kojima se procjenjuju najbitnija funkcionalno-motorička svojstva (brzina, eksplozivna snaga) za skok udalj, a čiji rezultati najbolje mogu predvidjeti individualni potencijal za ovu disciplinu.

Sve prethodno navedeno je uticalo na postavljanje osnovnog cilja ovog istraživanja, koji je definisan kao utvrđivanje prediktivno-selektivne baterije testova za atletsku disciplinu skok udalj.

Metod rada

Uzorak ispitanika za ovo istraživanje je bio sačinjen od 1200 učenika osnovnih i srednjih škola. Osnovni uzorak je bio podijeljen na osam subuzoraka od po 150 učenika petog razreda osnovne škole (dob: 11 godina ± 6 mjeseci; visina: 150,18cm ± 6,87; masa: 41,75kg ± 7,62), 150 učenika šestog razreda osnovne škole (dob: 12 godina ± 6 mjeseci; visina: 157,20cm ± 8,63; masa: 48,68kg ± 10,68), 150 učenika sedmog razreda osnovne

system and for the training management according to previous determined set goals, what means that the speed traits of muscle can impact on the achievement of a particular speed in the human body movement or body parts (sprint, jumps, etc) (Nicin, 1977).

Athletic orientation and directing (identification of talents) actually represents one of the most important tasks of future development of a track and field discipline of a long jump.

Many authors highlight the basic motor and morphological tests in the selections of talents for the individual sports as track and field is (Aule and Loko, 1982; Shroter and Voss; 1990, Johnes 1989, 1993 and 1997; Henson et al., 1993; Suslov and Kulakov, 2004).

Siris (1982) describes two levels of programs for the identification of talents in a long jump. He suggests that the most important factors of successfulness in a long jump are the speed and ability of acceleration. In the first phase, young athletes having the results better than average in a series of tests, and those having the corresponding anthropometric measures, are chosen for a specific training program. The second phase of selection, when individuals with acceptable advancement are chosen, is considered to be a conclusion of an 18-month-long training program.

Jarver (1983) presents the general battery of tests used in Soviet sport school for the selection of jumpers. This battery used tests are 30 m and 60 m sprint, standing long jump, standing triple jump, pull-ups and push-ups.

This is not simple at all, as proven by Werner and Emrich (1997) who highlight that, for given number of track and field clubs, the process of selection of future top athletes occurs quite randomly, because a fairly big number of coaches considers that talented individuals always find their paths to success.

On the other side, the important question emerges, which tests are those by which most important functional motor abilities are estimated (speed, explosive strength) for a long jump, and whose results can best predict an individual potential for this discipline.

All the previously mentioned influence represent the setting of basic part of this research, which is defined as the determining of a selective battery of tests for an track and field event long jump.

Methods

The sample for this research consisted of 1200 boys of primary and secondary schools. The basic sample was divided into eight subsamples of 150 boys of the fifth class of primary school. (age: 11 years ± 6 months; height: 150,18cm ± 6,87; mass: 41,75kg ± 7,62), 150 boys of the sixth class of

škole (dob: 13 godina ± 6 mjeseci; visina: 163,70cm ± 8,41; masa: 54,70kg ± 12,07), 150 učenika osmog razreda osnovne škole (dob: 14 godina ± 6 mjeseci; visina: 171,00cm ± 7,83; masa: 57,80kg ± 9,38), 150 učenika prvog razreda srednje škole (dob: 15 godina ± 6 mjeseci; visina: 174,60cm ± 7,84; masa: 65,80kg ± 11,82), 150 učenika drugog razreda srednje škole (dob: 16 godina ± 6 mjeseci; visina: 179,00cm ± 7,70; masa: 70,50kg ± 12,69), 150 učenika trećeg razreda srednje škole (dob: 17 godina ± 6 mjeseci; visina: 184,44cm ± 6,26; masa: 77,94kg ± 13,02) i 150 učenika četvrtog razreda srednje škole (dob: 18 godina ± 6 mjeseci; visina: 183,97cm ± 5,69; masa: 76,81kg ± 10,14).

Prostor motoričkih pokazatelja iz kojeg je trebalo definisati prediktivno-selektivnu bateriju testova je bio strukturiran od pokazatelja onih motoričkih sposobnosti, koje su presudne za kvalitetan rezultat u atletskoj disciplini skok udalj (brzina, eksplozivna snaga ruku i ramenog pojasa, eksplozivna snaga donjih ekstremiteta i gipkost).

Za procjenu brzinskih sposobnosti primijenjeni su testovi: taping rukom (MBTAPR), trčanje 20m leteći start (TRČ20), trčanje 30m visoki start (TRČ30).

Za procjenu eksplozivno-snažnih sposobnosti ruku i ramenog pojasa i donjih ekstremiteta su primijenjeni testovi: bacanje medicinke iz sjeda (MFEBMS), bacanje medicinke iz ležanja (MFEBML), bacanje medicinke nazad preko glave (MFEBMN), skok udalj iz mjesta (MFEDM), troskok iz mjesta (MFETM), skok uvis s mjesta-Sargent (MFEVM).

Za procjenu gipkosti pojedinih djelova tijela su primijenjeni sljedeći testovi: iskret sa palicom (MISK), duboki pretklon na klupici (MDPK), špagat (MSPA).

Kriterijumski motorički test u ovom istraživanju je bio atletska disciplina skok udalj (MFFEDZ).

Svaka od manifestnih varijabli motoričkih sposobnosti bila je mjerena tri puta, a da bi se dobio što precizniji rezultat za svaki pojedinačni entitet, konačna vrijednost testa je bila izračunata kao prosječna vrijednost sva tri mjerenja.

Testiranje je realizovano u tri odvojena dana. Prvog dana su sprovedeni testovi za procjenu brzinskih potencijala i eksplozivne snage ruku i ramenog pojasa. Drugog dana su realizovani testovi za procjenu eksplozivne snage donjih ekstremiteta i gipkosti, dok je trećeg dana sproveden kriterijumski test skok udalj.

Cjelokupna statistička procedura je sprovedena korišćenjem SPSS paketa verzija 21.0. Regresionom analizom je izračunat uticaj prediktorskih varijabli na

primary school (age: 12 years ± 6 months; height: 157,20cm ± 8,63; mass: 48,68kg ± 10,68), 150 boys of the seventh class of primary school (age: 13 years ± 6 months; height: 163,70cm ± 8,41; mass: 54,70kg ± 12,07), 150 boys of the eight class of primary school (age: 14 years ± 6 months; height: 171,00cm ± 7,83; mass: 57,80kg ± 9,38), 150 boys of the first class of secondary school (age: 15 years ± 6 ; months; height: 174,60cm ± 7,84; mass: 65,80kg ± 11,82), 150 boys of the second class of secondary school (age: 16 years ± 6 months; height: 179,00cm ± 7,70; mass: 70,50kg ± 12,69), 150 boys of the third class of secondary schools (age: 17 years ± 6 months; height: 184,44cm ± 6,26; mass: 77,94kg ± 13,02) and 150 boys of the fourth class of secondary school (age: 18 years ± 6 months; height: 183,97cm ± 5,69; mass: 76,81kg ± 10,14).

The area of motor indicators, from which the selection battery of tests should be created, consisted of the indicators of those motor abilities that were decisive for a quality result in a track and field event of a long jump (speed, explosive strength of upper extremities, explosive strength of lower extremities and flexibility).

The tests: hand taping (MBTAPR), running 20m flying start (TRC20), running 30m standing start (TRC30) were applied for the estimation of speed abilities.

The tests: medical ball throwing from sitting position (MFEMBS), medical ball throwing from lying position (MFEBML), medical ball throwing backward overhead (MFEBMN), standing long jump (MFEDM), standing triple jump (MFETM), vertical jump test (Sargent) (MDPK), were applied for the estimation of the explosive strength of upper extremities and explosive strength of lower extremities.

The following tests; side bend with a stick (MISK), deep forward bend on a bench (MDPK) and spagat (MSPA) were applied for the estimation of the suppleness of some body parts.

The criterion motor test in this research was a track and field event long jump (SKD).

Each of manifest variables of motor abilities was measured three times, and, in order to get the results for each individual entity as precise as possible, the final value was calculated as an average value of all three measurements.

The testing was carried out during three separated days. The tests for the estimation of speed potentials and explosive strength of upper extremities were carried out during the first day. The tests for the estimation of explosive strength of lower extremities and flexibility were carried out during the second day while the criterion test of long jump was carried out during the third day.

The total statistical procedure was carried out using the SPSS packet version 21.0. The impact of predictor variables

kriterijumom. Statistička značajnost je određena na nivou p<0.05.

Rezultati

U tabeli 1 su dati rezultati regresione analize za uzrast jedanaestogodišnjih dječaka. Zajednički varijabilitet prediktorskog sistema varijabli i kriterijumskog testa je 41%, što označava da ovakav prediktorski sitem objašnjava u ovom uzrastu toliki nivo ukupne varijanse kriterijuma. Statistički značajan uticaj su ostvarili testovi trčanje na 20 metara iz letećeg starta i skok uvis s mjesta.

on the criteria was calculated by the regression analysis. The statistical significance was determined at the level of p<0.05.

Results

Table 1 gives the results of the regression analysis for the eleven-year-old boys. The common variability of a predictor system and criterion test is 41%, which means that such a system explains the level of the total criterion variance at this age. The statistically significant impact was attained by tests 20 m running from flying start and vertical jump test.

Tabela 1. Regresiona analiza varijable SKD (V razred osnovne škole)

DELTA=.41 RO=.64 Q=.00

Varijable/ Variable	r	PART-r	BETA	P	Q-BETA
TRČ20	-.44	-.18	-.20	9.34	.03
TRČ30	-.40	-.06	-.07	2.92	.44
MFEBMS	.25	.11	.11	3.03	.19
MFEBML	.21	-.00	-.00	0.17	.92
MFEBMN	.26	.05	.05	1.36	.51
MFEDM	.43	.00	.00	0.25	.94
MFETM	.47	.13	.14	6.84	.10
MFEVM	.51	.28	.29	15.16	.00
MBTAPR	.24	.10	.09	2.18	.20
MISK	-.08	-.07	-.05	0.49	.40
MDPK	.11	.04	.03	0.44	.60
MSPA	.11	-.01	-.01	0.20	.81

Table 1. Multiple Regression Analysis (V class of primary school)

Rezultati regresione analize za uzrast dvanaestogodišnjih dječaka dati su u tabeli 2. Zajednički varijabilitet prediktorskog sistema varijabli i kriterijumskog testa je 66%. Statistički značajan uticaj su ostvarili testovi trčanje 20 metara leteći start, troskok s mjesta i motorički test taping rukom.

The results of the regression analysis for 12-year-old boys are given in Table 2. The common variability of a predictor system and criterion test is 66%. The statistically significant impact was attained by the following tests: running 20 m flying start, standing triple jump and a motor test hand tapping.

Tabela 2. Regresiona analiza varijable MFEDZ (VI razred osnovne škole)

DELTA=.66 RO=.82 Q=.00

Varijable/ Variable	r	PART-r	BETA	P	Q-BETA
TRČ20	-.49	-.21	-.16	7.84	.01
TRČ30	-.52	-.10	-.08	4.16	.24
MFEBMS	.28	-.08	-.08	2.24	.34
MFEBML	.19	-.11	-.11	2.09	.16
MFEBMN	.32	.08	.09	2.88	.32
MFEDM	.66	.15	.17	11.22	.08
MFETM	.74	.43	.44	32.56	.00
MFEVM	.60	.03	.03	1.80	.75
MBTAPR	.41	.22	.15	6.15	.00
MISK	-.03	-.04	-.02	.06	.65
MDPK	.13	-.03	-.02	.26	.68
MSPA	.31	.19	.13	4.03	.02

Table 2. Multiple Regression Analysis (VI class of primary school)

DELTA=.66 RO=.82 Q=.00

Rezultati regresione analize za uzrast trinaestogodišnjih dječaka dati su u tabeli 3. U ovom uzrastu ovakav

The results of the regression analysis for 13-year-old boys are given in Table 3. At this age, such a predic-

prediktorski sitem motoričkih varijabli determiniše 64% ukupne varijanse kriterijuma. Statistički značajan uticaj su ostvarili testovi trčanje 20 metara leteći start, trčanje 30 metara visoki start i troskok s mjesta, dok je na granici statističke značajnosti utvrđen uticaj testa skok uvis s mjesta.

tor system of motor variables determines 64% of the total criterion variance. The statistically important impact was attained by the tests: running 20 m flying start, running 30m standing start and standing triple jump, while the impact of a vertical jump test was determined at the verge of a statistical significance.

Tabela 3. Regresiona analiza varijable MFEDZ (VII razred osnovne škole)

Varijable/ Variable	r	PART-r	BETA	P	Q-BETA
TRČ 20	-.66	-.11	-.20	13.26	.03
TRČ 30	-.64	-.16	-.18	11.59	.04
MFEBMS	.34	-.05	-.05	2.04	.53
MFEBML	.36	-.05	-.06	2.38	.48
MFEBMN	.45	.15	.15	7.14	.07
MFEDM	.64	.12	.13	8.92	.14
MFETM	.68	.26	.24	16.78	.00
MFEVM	.67	.16	.18	12.73	.05
MBTAPR	.20	-.11	-.07	1.59	.18
MISK	-.08	.00	.00	0.01	.96
MDPK	.16	-.14	-.09	1.58	.09
MSPA	.29	.08	.05	1.69	.33

DELTA=.64 RO=.80 Q=.00

Table 3. Multiple Regression Analysis (VII class of primary school)

DELTA=.64 RO=.80 Q=.00

U tabeli 4 su dati rezultati regresione analize za uzrast četrnaestogodišnjih dječaka. Zajednički varijabilitet prediktorskog sistema varijabli i kreiterijumskog testa je 56%, što označava primijenjeni prediktorski sitem objašnjava u ovom uzrastu toliko polje ukupne varijanse atletske discipline skok udalj. Statistički značajan uticaj na rezultate u atletskoj disciplini skok udalj pojedinačno, ostvarili su testovi troskok s mjesta, skok uvis s mjesta i duboki pretklon na klupici.

Table 4 gives the results of the regression analysis for 14-year-old boys. The common variability of a predictor system and criterion test is 56%, which means that the applied predictor system explains at this age such a field of total variance of track and field discipline long jump. The statistically significant impact on the results in a track and field discipline long jump, individually, was attained by tests: standing triple jump, vertical jump test and a deep forward bend on a bench.

Tabela 4. Regresiona analiza varijable MFEDZ (VIII razred osnovne škole)

Varijable/ Variable	r	PART-r	BETA	P	Q-BETA
TRČ 20	-.52	-.11	-.11	6.18	.19
TRČ 30	-.45	-.09	-.09	4.14	.29
MFEBMS	.44	.00	.01	0.48	.91
MFEBML	.36	-.11	-.13	4.80	.19
MFEBMN	.52	.12	.16	8.46	.13
MFEDM	.61	-.08	-.12	7.78	.31
MFETM	.63	.20	.22	13.97	.01
MFEVM	.65	.30	.42	28.07	.00
MBTAPR	.34	-.04	-.03	1.26	.60
MISK	-.08	-.04	-.02	0.24	.63
MDPK	.30	.22	.16	4.99	.00
MSPA	.37	.12	.10	3.97	.13

DELTA=.56 RO=.75 Q=.00

Table 4. Multiple Regression Analysis (VIII class of primary school)

DELTA=.56 RO=.75 Q=.00

Rezultati regresione analize atletske discipline skok udalj u motoričkom prostoru, za uzrast petnaestogodišnjih dječaka, dati su u tabeli 5. Zajednički varijabilitet prediktorskog sistema varijabli i kriterijumskog testa je 64%. Statistički značajan uticaj su ostvarili testovi trča-

The results of the regression analysis of track and field event long jump in a motor area, for the 15-year-old boys, are given in Table 5. The common variability of a predictor system of variables and criterion tests is 64%. The statistically significant impact was obtained by

nje 20 metara leteći start, trčanje 30 metara visoki start, troskok s mjesta i skok uvis s mjesta.

the tests: running 20m flying start, running 30m standing start, standing triple jump and vertical jump test.

Tabela 5. Regresiona analiza varijable MFEDZ (I razred srednje škole)

Varijable/ Variable	r	PART-r	BETA	P	Q-BETA
TRČ 20	-.60	-.17	-.23	13.80	.04
TRČ 30	-.69	-.21	-.29	20.01	.01
MFEBMS	.44	-.04	-.03	1.32	.62
MFEBML	.42	-.03	-.02	0.84	.70
MFEBMN	.43	.12	.10	4.30	.13
MFEDM	.61	.08	.10	6.10	.33
MFETM	.48	-.16	-.16	7.68	.04
MFEVM	.66	.41	.46	30.36	.00
MBTAPR	.42	-.06	-.06	2.52	.45
MISK	-.23	-.09	-.06	1.38	.28
MDPK	.24	.03	.02	0.48	.67
MSPA	.28	-.09	-.07	1.96	.75

DELTA=.64 RO=.80 Q=.00

Table 5. Multiple Regression Analysis (I class of secondary school)

DELTA=.64 RO=.80 Q=.00

Zajednički varijabilitet prediktorskog sistema varijabli i kriterijumskog testa za uzorak šesnaestogodinšnjih dječaka je 67%, što označava da ovakav prediktorski sitem objašnjava u ovom uzrastu veoma visok nivo ukupne varijanse kriterijuma (tabela 6). Statistički značajan uticaj su ostvarili testovi trčanje 30 metara visoki start i skok uvis s mjesta.

The common variability of the predictor system of variables and criterion tests for the sample of 16-year – old boys is 67%, which means that such a predictor system explains, at this age, a very high level of the total variance of a criterion (table 6). The statistically significant impact was attained by the tests: running 30m high start and vertical jump test.

Tabela 6. Regresiona analiza varijable MFEDZ (II razred srednje škole)

Varijable/ Variable	r	PART-r	BETA	P	Q-BETA
TRČ 20	-.54	.10	.10	5.40	.23
TRČ 30	-.66	-.40	-.51	33.66	.00
MFEBMS	.49	-.04	-.03	1.47	.63
MFEBML	.43	.12	.11	4.73	.12
MFEBMN	.51	-.04	-.03	1.53	.59
MFEDM	.65	.04	.05	3.25	.58
MFETM	.62	-.00	.00	0.00	.95
MFEVM	.74	.38	.46	34.04	.00
MBTAPR	.58	.05	.04	2.32	.53
MISK	-.26	.08	.06	1.56	.30
MDPK	.40	.06	.05	2.00	.43
MSPA	.20	-.01	-.00	0.00	.88

DELTA=.67 RO=.83 Q=.00

Table 6. Multiple Regression Analysis (II class of secondary school)

DELTA=.67 RO=.83 Q=.00

U tabeli 7 su dati rezultati regresione analize za uzrast sedamnaestogodišnjih dječaka. Zajednički varijabilitet prediktorskog sistema varijabli i kriterijumskog testa je 52%, što označava da primijenjeni prediktorski sitem objašnjava u ovom uzrastu toliki dio ukupne varijanse atletske discipline skok udalj. Statistički značajan uticaj na rezultate u atletskoj disciplini skok udalj pojedinačno, ostvarili su testovi trčanje 20 metara leteći start, trčanje 30 metara visoki start, bacanje medicinke iz sjeda, bacanje medicinke iz ležanja, bacanje medicinke nazad preko glave, skok uvis s mjesta i taping rukom.

Table 7 gives the results of the regression analysis for the age of 17-year-old boys. The common variability of the predictor system of variables and criterion test is 52%, which means that the applied predictor system explains, at this age, such a part of the total variance of track and field discipline long jump. The statistically significant impact on the results in long jump individually was obtained by the tests: running 20 m flying start, running 30 m standing start, medical ball throwing from sitting position, medical ball throwing from lying position, medical ball throwing backward overhead, vertical jump test and a hand tapping.

Tabela 7. Regresiona analiza varijable MFEDZ (III razred srednje škole)

Varijable/ Variable	r	PART-r	BETA	P	Q-BETA
TRČ 20	-.33	-.23	-.22	7.26	.00
TRČ 30	-.42	-.17	-.16	6.72	.03
MFEBMS	.27	-.18	-.24	6.48	.02
MFEBML	.34	.17	.23	7.82	.04
MFEBMN	.43	.21	.20	8.60	.01
MFEDM	.48	-.05	-.06	2.88	.52
MFETM	.50	.12	.14	7.00	.12
MFEVM	.56	.31	.39	21.84	.00
MBTAPR	.12	-.18	-.15	1.80	.03
MISK	-.20	-.00	-.00	0.00	.06
MDPK	.27	.11	.10	2.70	.17
MSPA	.15	.06	.00	0.00	.43

DELTA=.52 RO=.72 Q=.00

Table 7. Multiple Regression Analysis (III class of secondary school)

DELTA=.52 RO=.72 Q=.00

Regresiona analiza za uzrast osamnaestogodišnjih dječaka (tabela 8) pokazuje da je zajednički varijabilitet prediktorskog sistema varijabli i kriterijumskog testa 49%, što pokazuje da primijenjeni prediktorski motorički sitem objašnjava u ovom uzrastu polovičan prostor ukupnog varijabiliteta atletske discipline skok udalj. Statistički značajni regresioni koeficijenti, odnosno statistički značajan uticaj na rezultate u atletskoj disciplini skok udalj pojedinačno, ostvarili su testovi bacanje medicinke iz ležanja, skok uvis s mjesta i test špagat.

The regression analysis for the age of 18-year-old boys (Table 8) shows that the common variability of the predictor system variables and criterion tests is 49%, which shows that the applied predictor motor system explains, at this age, halved space of the total variability of long jump. The statistically significant regression coefficients, namely the statistically significant impact on the results in long jump individually was accomplished by the tests: medical ball throwing from lying position, vertical jump test and a spagat test.

Tabela 8. Regresiona analiza varijable MFEDZ (IV razred srednje škole)

Varijable/ Variable	r	PART-r	BETA	P	Q-BETA
TRČ 20	-.47	-.09	-.12	5.64	.25
TRČ 30	-.52	-.11	-.15	7.80	.18
MFEBMS	.36	-.07	-.08	2.88	.37
MFEBML	.50	.22	.27	13.50	.00
MFEBMN	.37	.09	.08	2.96	.28
MFEDM	.53	-.02	-.04	2.12	.73
MFETM	.51	.05	.06	3.06	.52
MFEVM	.57	.27	.37	21.09	.00
MBTAPR	.22	-.08	-.07	1.54	.29
MISK	-.13	-.07	-.05	0.65	.37
MDPK	.07	.03	.03	0.21	.66
MSPA	.00	-.18	-.15	0.00	.03

DELTA=.49 RO=.70 Q=.00

Table 8. Multiple Regression Analysis (IV class of secondary school)

DELTA=.49 RO=.70 Q=.00

Diskusija

Atletske discipline nude mogućnosti za sportski uspjeh veoma različitim ličnostima, tjelesnim konstitucijama i prirodnim sportskim talentima, više nego bilo koji drugi sport (Sultana i Pandi, 2013).

Kruger (2006) navodi da je sproveden veoma mali broj istraživanja koja se odnose na identifikaciju i razvoj talenata u atletskom sprintu i skoku udalj, a posebno ona koja se odnose na mlade atletičare, bilo djevojčice ili dječake.

Discussion

Track and field events more than any other sport offer the opportunities for the sport success to very different persons, body structures and natural sport talents, (Sultana and Pandi, 2013).

Kruger (2006) argues that a very small number of researches related to the identification and development of talents in an athletic sprint and a long jump, especially those related to young male or female athletes, was carried out by that moment.

Selekcija u sportu podrazumijeva višestepeni proces koji započinje identifikacijom sportskog talenta (odabir, rani izbor), a nastavlja se karakterizacijom sportskog talenta (usmjeravanje, određivanje sportske osobenosti). Preostale aktivnosti, koje se ponekad pripisuju selekciji, su njena nadgradnja i ne zadovoljavaju osnovni princip selekcije u sportu, otkrivanje, prepoznavanje i usmjeravanje novih sportskih talenata. Čak, šta više, nekada predstavljaju ispravljanje grešaka napravljenih u toku identifikacije i karakterizacije (Idrizović, 2010).

Foreman (1989) ističe da se u području atletike, prirodna brzina, eksplozivna snaga, koračni ritam, snaga, koordinacija i nizak procenat masti smatraju veoma važnim. Istraživači Univerziteta u Indijani su prepoznali potencijal mladih sportista i predvidjeli njihov učinak u pojedinim atletskim disciplinama. Kao osnovne za to su definisali testove skok udalj s mjesta, skok uvis s mjesta, petoskok i trčanje na 30 metara iz stojećeg stava, za muške atletičare.

Sa druge strane Taylor i Beith (2000) ističu da iako nijedan test ne može sa potpunom preciznošću da predvidi vrhunska ostvarenja u skoku udalj, određeni rezultati u nekim testovima itekako mogu poslužiti kao pokazatelj uspjeha.

Sve prethodno navedeno uz veliki broj veoma sličnih istraživanja inicirao je strukturiranje prediktorskog sistema motoričkih varijabli za ovo istraživanje. Zapravo, cilj je bio da se u prostoru motoričkih sposobnosti, koje su najodgovornije za vrhunskih rezultat u skoku udalj, utvrde oni motorički testovi, koji imaju najveći nivo projekcije krajnjeg rezultata, a samim tim i najveću selektivnu vrijednost.

Sistem motoričkih testova, koji je primijenjen u ovom radu, sa rasponom od 27%, odnosno od 41% kod jedanaestogodišnjaka do 67% kod šesnaestogodišnjaka, u prosjeku objašnjava ukupnu varijansu atletske discipline skok udalj sa 57,37%. Veoma slične podatke u svom radu su dobili Sultana i Pandi (2013). Iako se radi o relativno velikom prostoru ukupnog varijabiliteta jedne atletske discipline, može se reći da preostali dio sposobnosti i karakteristika antropološkog sistema ima značajan udio u uticaju na rezultat u atletskoj disciplini skok udalj, posebno onih specifičnog karaktera. Takvu tvrdnju u svom radu iznose i Li-min i sar. (2009).

Iako se u istraživanjima najčešće ističe da rezultat u atletskoj disciplini skok udalj, prije svega određuje ostvarena brzina trčanja zaleta (Locatelli, 1993), na osnovu rezultata ovog rada se može vidjeti da veoma veliki nivo uticaja imaju i druge antropološke sposobnosti i karakteristike, koje nisu iz prostora dominantnih prediktora, koji su kao takvi do sada označavani.

The selection in sport means a multi-level process starting by the identification of a sport talent (selection, early choice), and continues with the characterization of a sport talent (orientation, determining of sport specialty). The remaining activities that are sometimes ascribed to a selection are its superstructure not satisfying the basic principle of a sport selection, discovering, recognizing and orienting of new sport talents. Moreover, they sometimes represent the error correction made during the identification and characterization (Idrizovic, 2010).

Foreman (1989) highlights that, in the area of athletics, natural speed, explosive strength, step rhythm, strength, coordination and a low level of fats are considered to be very important. The researchers from the University in Indiana recognized the potential of young sportsmen and predicted their accomplishment in some athletic disciplines. The defined tests standing long jump, vertical jump test, five bounds and running 30 m from standing position as basic for male athletes in this area.

On the other side, Taylor and Beith (2000) highlight that although no test can predict the top achievements in a long jump with a total accuracy, some results in particular tests really can serve as the indicators of a success.

All previously mentioned, with a big number of very similar researches initiated the structuring of the predictor system of motor variable for this research. Actually, the goal was to determine those motor tests having the biggest projection level of a final result and also the biggest selective value as the most responsible for the top result in a long jump.

The system of motor tests, prepared in this work, with a span from 27%, accordingly of 41% for eleven-year-olds to 67% for sixteen-year-olds, in average explain the total variance of an athletic discipline long jump of 57,3 %. Very similar data like those of this work were obtained by Sultana and Pandi (2013). Although, it is a relatively big space of the total variability of one track and field discipline, it can be said that the remaining part of abilities and characteristics of anthropological system have an important part in the impact on the results in long jump, especially for those with a specific character. Li-min et al. (2009) give such an argument in their work.

Although it is most frequently highlighted, at the competitions, that a result in a track and field discipline long jump, first of all, is determined by the accomplished approach speed (Locatelli, 1993), on the basis of such a result it can be seen that other anthropological abilities and characteristics which have not been designated as such so far have a very high level of influence.

In this research, of twelve applied motor tests, as the most important and dominantly before all others, a test

U ovom istraživanju, od dvanaest primijenjenih motoričkih testova, kao najznačajniji prediktor se izdvojio, dominantno prije svi ostalih, test skok uvis s mjesta, koji je statistički značajan uticaj na rezultat u atletskoj disciplini skok udalj ostvario u šest uzrasnih subuzoraka, a u jednom je bio na samoj granici statističke značajnosti. Sa druge strane, od dvanaest motoričkih testova, koji su u ovom radu predstavljali prediktorski sistem varijabli, samo dva testa niti u jednom uzrasnom subuzorku nisu imali statistički značajan nivo predikcije rezultata u skoku udalj. Prvo, to je test za procjenu gipkosti ramenskog dijela tijela, iskret palicom, a drugo, mnogo interesantnije i bitnije za podatke koji se dobijaju ovim istraživanjem, to je test skok udalj s mjesta. Dakle, na osnovu rezultata, koji su dobijeni ovim radom, motorički test skok udalj s mjesta se ne bi trebao koristiti kao selektivni test za atletsku disciplinu skok udalj. U odnosu na sve ostale motoričke testove koji su korišteni u ovom istraživanju, njegova prediktivno-selektivna vrijednost je neuporedivo manja. Može se reći da ne postoji. Skok uvis s mjesta, i troskok s mjesta je imaju. Ovakvi podaci dobijaju na značaju kada se uporede sa nalazima Siang (2006), koji dobija identičan nalaz, da skok udalj s mjesta nema statistički značajan uticaj na rezultat u atletskoj disciplini skok udalj, već da to prvenstveno ima test skok uvis s mjesta.

Kruger (2006) u svom radu takođe ne dolazi do sazananja da skok udalj s mjesta ima statistički značajan uticaj na atletsku disciplinu skok udalj, već da to ima brzina trčanja.

Poslije testa skok uvis s mjesta, najveći broj puta se kao statistički značajan prediktor pojavljivao test trčanje 20 metara leteći start sa pet takvih statusa, a potom troskok s mjesta i trčanje na 30 metara iz stojećeg stava sa po četiri takva statusa. Testovi koji procjenjuju sposobnost brzine trčanja samo u dva subuzorka nisu ostvarili statistički značajan uticaj. Uzimajući u obzir da je brzina trčanja, odnosno njena iskorištenost glavni faktor rezultata u skoku udalj (Strishak i sar., 1989; Locatelli, 1993; Nixdorf i sar., 2010), ovaj rezultat je potpuno očekivan. U atletskoj disciplini skok udalj bitniji je zapravo nivo iskorištenosti brzine trčanja, gdje su svakako u prednosti skakači koji mogu postići veću maksimlanu brzinu trčanja.

Brzina trčanja kojom skakači dolaze na odraznu dasku se u zavisnosti od njihovih karakteristika kreće između 90 i 95% od njihove maksimalne sprinterske brzine trčanja. Maksimalna brzina trčanja tokom zaleta za skok udalj se kod vrhunskih skakača nalazi između 10,50m/s do 11, 23m/s (Nixdorf i Brüggemann, 1990; Ariel, 1992).

of a vertical jump test come to a prominence and this test accomplished a statistically significant impact on a result in a track and field discipline long jump accomplished in six age subsamples, and in one of them it was at the very border of a statistical significance.

On the other side, of twelve motor tests which represented the predictor system of variables in this work, only two tests in no one age subsample had a statistically significant level of the prediction of results in a long jump. Firstly, this is a test for the estimation of flexibility of shoulder body part, side bend with a stick, and, secondly, the test of a standing long jump is much more interesting and important for data obtained in this research. Therefore, on the basis of the results obtained in this works, the motor test of a standing long jump should not be used as a selective test for a track and field discipline long jump. In comparison to all other motor tests used in this research, its predicative –selection value is incomparably smaller. It can be said that it does not exist. A vertical jump test and standing triple jump have this one. Such data get their significance when compared with the findings by Siang (2006), which gets an identical finding, that a standing long jump have no a statistical impact on a result in a track and field discipline long jump, but it firstly is related to a vertical jump test.

Kruger (2006) in his work also does not find that a standing jump has a statistically significant impact on the result of an athletic discipline standing jump, but a running speed has this significance.

After the vertical jump test, a test of running 20 m flying start in most situations emerged as a statistically significant predictor with five such statuses, followed by the test of standing triple jump and running 30 m from standing position with four such statuses. The tests estimating the ability of a running speed only in two subsamples did not accomplish a statistically significant impact. Taking into account that the running speed, namely its usability is a crucial factor for the results in a long jump (Strishak et al., 1989; Locatelli, 1993; Nixdorf et al., 2010), this result is absolutely expected. In a track and field discipline long jump, the level of running speed usability is more significant, and the jumpers which can attain a higher maximal running speed are advantageous.

The running speed by which jumpers come to takeoff board, depending on their characteristics and on a maximal running speed, ranges between 90 and 95% of maximal running speed. The maximal running speed during the approach for a long jump is, for top jumpers, between 10,50 m/s and 11,23 m/s (Nixdorf and Brugermann, 1990; Ariel, 1992).

Locatelli (1993) ističe izvanredan nivo iskorištenosti brzine trčanja zaleta kod dvojice skakača udalj. Carl Lewis je u Tokiju 1991. godine prilikom skoka od 8,91m, deset metara, od 11-tog do jednog metra prije odraza, prešao za 0,89s, što predstavlja brzinu od 11,235m/s, a što je 95,3% njegove maksimalne brzine trčanja. Giovanni Evangelisti je prilikom skoka od 8,08m, istih deset metara savladao za 0,93s, što je brzina od 10,75m/s, koja je 97,5% njegove maksimalne brzine trčanja. Značaj brzine zaleta za dužinu skoka udalj najbolje objašanjavaju podaci većeg broja istraživanja koje prezentira Homenkov (1977), i ističe, da povećanje brzine zaleta sa 9,1 na 10,7m/s dovodi do poboljšanja rezultata od 690 do 890cm. Strishak i sar. (1989) ističu da dužina skoka direktno zavisi od brzine trčanja prije faze odraza i predstavljaju prediktivni model brzine trčanja zaleta u odnosu na dužinu skoka udalj.

Prediktivni značaj motoričkog testa troskok s mjesta je bitan prije svega u svijetlu činjenice da test skok udalj s mjesta nije imao status statistički značajnog prediktora, dok je ovaj test to postigao četiri puta. Glavni faktor ovakvog rezultata je specifičnost kretne strukture troskoka s mjesta, koja je mnogo sličnija kriterijumskom testu u ovom istraživanju nego je to kretna struktura skoka udalj s mjesta. Skok udalj s mjesta i troskok s mjesta imaju početni odraz sa dvije noge, a kod troskoka se izvode još dva skoka sa odrazom sa jedne noge, što je podudarno sa odrazom u kriterijumskom testu. Podudarnsot kretnih struktura, odnosno dinamička korespodencija, dovodi do podudarnog angažmana aktivirane muskulature, a svemu tome je rezultat, statistički značajan prediktivni potencijal testa troskok s mjesta u odnosu na atletsku disciplinu skok udalj.

Statistički značajan uticaj preostalih motoričkih testova, koji se pojavio u jednom do dva subuzorka ovog istraživanja, generalno ukazuje još na dvije činjenice. Prvo, da je veliki broj funkcionalno-motoričkih potencijala, koji sinergijski djeluju sa onim potencijalima koje nazivamo osnovnim, i da njih ima u dosta velikom broju u okviru oni motoričkih potencijala, koji nisu bili predmet ovog istraživanja. To je i razlog zašto je ukupan zajednički varijabilitet prediktorskog sistema i kriterijuma relativno mali. Drugo, da je specifičnost svakog subuzorka, faktor koji uvijek može dovesti do rezultata, koji djelimično odudaraju od do tada standardnih vrijednosti.

Zaključak

Iako postoji relativno mali broj istraživanja kojima se utvrđuju prediktivno-selektivne vrijednosti motorički-

Locatelli (1993) highlights an extraordinary level of usage of an approach running speed of two jumpers. Carl Lewis in Tokyo in 1991 during the approach for the jump of 8,91 m, 10 meters, from 11-th to one meter before the takeoff ran for 0.89s, which represents a speed of 11,23 m/s and it is 95,3% of his maximal speed. Giovanni Evangelisti, during the jump of 8.08m, the same ten meters run for 0.93s which is the speed of 10,75 m/s and 97,5% of his maximal running speed. The significance of approach for the length of a long jump is best explained by the data from a big number of researches presented by Homenkov (1977), and he highlights that the increment of approach running speed from 9,1 to 10,7 m/s leads to the increment of a result from 690 to 890 cm. Sthrishak et al. (1989) highlight that the jump length immediately depends on the running speed before a takeoff phase and represent a predictive model of an approach running speed in comparison to length of long jump.

The predictive significance of a motor test a standing triple jump is important, first of all, in sense of the fact that the test of a standing long jump had not a status of a statistically significant predictor, while this test accomplished it four times. The main factor of such a result is a specialty of a movement structure of a standing triple jump, which is much more similar to a criterion test in this research than the movement structure of a standing long jump. A standing long jump and standing triple jump have a starting takeoff with two legs, and for a standing triple jump there are two more jumps with a takeoff on one leg, which overlaps with the takeoff in the criterion test. The overlapping of movement structures, namely dynamic correspondence, lead to the same engagement of activated muscles, and all this produces a result that is a statistically significant predictive potential of test of standing triple jump in comparison to a track and field discipline long jump.

The statistically significant impact of remaining motor tests, which emerged in one to two subsamples of this research, generally indicates to two more facts. Firstly, a big number of functional-motor potentials which synergistically work with those so-called basic potentials, and there are a plenty of them within those motor potentials that were not a topic of this research. This is the reason why the total common variability of a predictor system and criteria is relatively small. Secondly, the specialty of each subsample is a factor which can always lead to a result which partly deflects from previous standard values.

Conclusion

Although there is a relatively small number of researches that determine the selection values of motor

ih testova za pojedine atletske discipline, a najčešće korišteni testovi su rezultat dugogodišnjeg trenerskog iskustva, ovaj rad je potvrdio da se većina tih testova opravdano koristi u takve svrhe. Pored toga, ovim radom se došlo do veoma bitnog saznanja, da motorički test skok udalj s mjesta nema selektivnu vrijednost za atletsku disciplinu skok udalj.

Baterija testova koja je strukturirana ovim istraživanjem i koja se kao takva može koristiti u selekciji skakača udalj, sastavljena je od testova skok uvis s mjesta, troskok s mjesta, trčanje 20 metara leteći start, trčanje 30 metara visoki start i bacanje medicinke iz ležanja.

Na kraju, nasljeđe kao samostalan preduslov, čak i u najuspješnijim selekcionim sistemima, nije garancija uspjeha. Mnogi talentovani mladi sportisti ne uspijevaju iskoristiti svoje stvarne potencijale zbog neodgovarajućih trening metoda. Ovo se posebno odnosi na metode koje se koriste tokom godina biološkog razvoja. Poznati sovjetski trener sprinta, Valentin Petrovski, potvrđuje da je gubljenje talenata, najčešće izazvano trenerskim nemilosrdnim grešakama i varvarskim pogledom na brzi uspjeh. Oni uništavaju mlade atletičare, u pokušaju da za dvije do tri godine, proizvedu od dječaka vrhunskog sportistu (Kutsar, 1991).

tests for some athletic disciplines, and the most frequently used tests are the results of long-range experience of coaches, this work ascertained that the majority of these tests is reasonably used for such purposes. Beside this, this work helps in discovering one very important finding, that a motor test standing long jump has no selective value for a track and field event long jump.

The motor test battery, structured within this research and which as such can be used in the selection of long jumpers, consists of tests of vertical jump test, standing triple jump, running 20m flying start, running 30m standing start and medical ball throwing from lying position.

Finally, the heritage as an independent precondition, even in most successful selection systems, is not a warrant for a success. Many talented young sportsmen do not succeed to use their real potentials because of inadequate training methods. This is especially related to those methods used during the years of a biological development. Well-known Soviet sprint coach, Valentine Petrovski, proves that the loss of a talent is most frequently caused by merciless errors of coaches and barbarian view at the fast success. They destroy young athletes, trying to produce a top athlete from a small boy in two to three years (Kutsar, 1991).

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Stavovi učitelja seoskih i gradskih škola prema inkluzivnom fizičkom vaspitanju[1]

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Apstrakt: Uvođenjem inkluzivnog modela obrazovanja u Republici Srbiji, školske 2010/11. godine, u središtu stručnog i naučnog interesovanja našli su se nastavnici kao neposredni realizatori inkluzivne nastave. S obzirom da stavovi nastavnika prema inkluzivnoj nastavi fizičkog vaspitanja predstavljaju jedan od ključnih faktora efektivnosti inkluzivne nastave, kao i da 70% teritorije Srbije čine ruralne regije, sprovedeno je istraživanje sa ciljem da se ispitaju razlike u stavovima prema inkluzivnom fizičkom vaspitanju učitelja seoskih i gradskih škola. Na uzorku od ukupno 84 učitelja (80 žena, 4 muškarca) primenjen je upitnik ATIPE (Hutzler, Zach, & Gafni, 2005) za procenu stavova prema inkluzivnom fizičkom vaspitanju. Dobijeni rezultati pokazuju da učitelji iz seoske i gradske sredine imaju slična obeležja socio-profesionalnog statusa. Učitelji naginju umereno pozitivnim stavovima prema inkluzivnom fizičkom vaspitanju. Razlike između subuzoraka su na granici značajnosti (p = .06), pri čemu su u proseku nešto pozitivnije stavove iskazali seoski učitelji.

Ključne reči: inkluzivno fizičko vaspitanje, učitelji, selo, grad

Uvod

Primena inkluzivnog modela obrazovanja u Republici Srbiji, školske 2010/11. godine, podstakla je naučno interesovanje za problematiku inkluzivnog fizičkog vaspitanja. U sklopu višegodišnjeg naučnog projekta Fakulteta sporta i fizičkog vaspitanja u Novom Sadu, „Inkluzivno fizičko vaspitanje u vojvođanskim škola-

[1] U radu su predstavljeni rezultati dobijeni u okviru naučnoistraživačkog projekta "Inkluzivna nastava fizičkog vaspitanja u vojvođanskim školama: Izazovi i persperktive" koji se realizuje na Fakultetu sporta i fizičkog vaspitanja Univerziteta u Novom Sadu (nosilac projekta je prof. dr Višnja Đorđić), a koji finansira Pokrajinski sekretarijat za nauku i tehnološki razvoj AP Vojvodine (2011-2014).

Attitudes of teachers in rural and urban schools on inclusive physical education[1]

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Abstract: Implementation of inclusive educational model in the Republic of Serbia in 2010 has put teachers as key figures in the focus of professional and scientific interest. Since teachers' attitudes towards inclusive teaching is one of the main factors of the inclusion efficacy, and since Serbia is mostly rural region (70% of the territory), the study was conducted in order to analyze rural and urban schools teachers' attitudes towards inclusive physical education. Total sample of participants comprised of 84 primary teachers (80 females, 4 males). The ATIPE questionnaire (Hutzler, Zach, & Gafni, 2005) was applied for the assessment of teachers' attitudes towards inclusive physical education. The results indicated that teachers from rural and urban areas shared similar socio-professional status. Teachers reported moderately positive attitudes toward inclusive physical education. Differences between subsamples were near the level of significance (p = .06), with rural school teachers expressing slightly more positive attitudes.

Key Words: inclusive physical education, primary school teachers, rural areas, urban areas

Introduction

Implementation of inclusive model of physical education in the Republic of Serbia, in school year 2010/11, raised scientific interest in problems of inclusive physical education. Within the multi-year scientific project of the Faculty of Sport and Physical Education in Novi Sad, "Inclusive classes of physical education in schools of Vojvodina: chal-

[1] The study presents results obtained within the scientific research project named "Inclusive classes of physical education in schools of Vojvodina: challenges and perspectives" and which is realized at the Faculty of Sport and Physical Education (project owner is Prof PhD Višnja Đorđić) and financed by the Provincial Secretariat for Science and Technological Research of AP Vojvodina (2011-2014).

ma: izazovi i perspektive“, koji sufinansira Pokrajinski sekretarijat za nauku i tehnološki razvoj, značajna pažnja posvećena je identifikovanju mogućih prepreka za kvalitetno fizičko vaspitanje svih učenika i analizu mogućih načina za njihovo prevazilaženje, te razvoj inkluzivne kulture i prakse u fizičkom vaspitanju u vojvođanskim školama.

S obzirom da stavovi nastavnika predstavljaju jedan od najvažnijih faktora uspešnog inkluzivnog fizičkog vaspitanja (Folsom-Meek & Rizzo, 2002), kao i da 70% teritorije Republike Srbije čine ruralne oblasti (Plan strategije ruralnog razvoja, 2009), postavlja se pitanje da li nastavnici koji rade u sredinama različitog nivoa urbanosti iskazuju i različite stavove prema inkluzivnom fizičkom vaspitanju.

Prethodna istraživanja ne nude jednoznačan odgovor. U istraživanju Bulgrena i saradnika (2002; prema Stauble, 2009) nastavnici iz gradskih škola imaju manje pouzdanja kada je reč o dostupnosti neophodnih nastavnih sredstava, manje se angažuju u procesu izrade individualnog obrazovnog plana (IOP) i ne prilagođavaju nastavne planove na osnovu IOP. Takođe, manje su bili skloni da koriste tehnologiju u radu sa učenicima sa posebnim potrebama. Nastavnici iz seoskih sredina su bili manje spremni da upute učenike na dodatne usluge specijalnog obrazovanja, smatraju da su te usluge nedelotvorne i takođe nisu pravili modifikacije svojih nastavnih planova u skladu sa IOP. U isto vreme, više od polovine nastavnika iz seoskih sredina (52%) nije želelo da učestvuje u bilo kakvim obukama u vezi sa inkluzivnom nastavom, dok je to je bio slučaj sa samo 27% nastavnika iz grada.

Stauble (2009) je ispitujući efekte sredine u kojoj se škola nalazi na stavove nastavnika prema inkluziji utvrdila da ne postoji statistički značajan uticaj. Iako razlike nisu značajne, Stauble konstatuje da su nastavnici iz seoskih škola ispoljili negativnije stavove prema inkluziji.

Chopra (2008) je analizirala faktore koji utiču na stavove nastavnika osnovne škole prema inkluzivnom obrazovanju. Utvrdila je da postoje statistički značajne razlike između nastavnika sa sela i iz grada, pri čemu su nastavnici iz gradskih škola imali pozitivnije stavove prema inkluzivnom obrazovanju nego nastavnici seoskih škola. Chopra (2008) razlike tumači činjenicom da je kod nastavnika iz gradskih sredina izraženija svest o inkluzivnom obrazovanju, jer u školama imaju više pogodnosti za inkluzivno obrazovanje, svi nastavnici koriste internet i savremene medije.

Istraživanje Denga (Deng, 2000) bavilo se stavovima nastavnika osnovnih škola iz izabranih ruralnih i urlenges and perspectives” and which is realized at the Faculty of Sport and Physical Education and financed by the Provincial Secretariat for Science and Technological Research, significant attention was dedicated to identification of possible obstacles which prevent quality physical education of all pupils and analysis of methods for their overcoming, and development of inclusive culture and practice in physical education in schools of Vojvodina.

Since the primary teachers represent one of the key factors of successful inclusive physical education (Folsom-Meek & Rizzo, 2002), and since 70% of the territory of the Republic of Serbia consists of rural areas (Strategy Plan for Rural Development, 2009), there is an issue concerning whether the teachers working in areas which include various levels of urban development also express various attitudes towards inclusive physical development.

The research activities conducted so far do not provide unambiguous solution. In the research of Bulgren *at all* (2002; according to Stauble, 2009) primary teachers from urban schools have less confidence in terms of availability of required teaching aids, they are less involved in the process of production of Individualized Education Plan (IEP) and do not adapt their teaching plans to IEP. Also, they less relied on the use of technology in work with pupils with special needs. Teachers from rural areas were less prepared to send their pupils to additional services of special education, as they find such services inefficient, and also, they were not modifying their education plans in accordance the IEP. At the same time, more than a half of the teachers from rural areas (52%) did not want to participate in any kind of training relating inclusive teaching, and in urban areas, the figure was only 27%.

Stauble (2009), when testing effects of the environment where schools are located, established no significant statistic influence. Although there was no significant difference, Stauble confirmed that the rural primary school teachers expressed more negative attitude towards inclusion.

Chopra (2008) analyzed factors influencing attitudes of primary teachers on inclusive education. She established that there are statistically significant differences among the teachers from rural and urban areas, where the teachers from urban schools expressed more positive attitudes towards inclusive education as compared to rural schools. Chopra (2008) explains such differences with the fact that the teachers in urban areas have stronger conscientiousness for inclusive education; all of them use internet and modern media.

The research conducted by Deng (Deng, 2000) concerned the attitudes towards inclusive education in primary schools from selected rural and urban areas in China. The

banih područja u Kini prema inkluzivnom obrazovanju. Dobijeni rezultati pokazuju da seoski i gradski nastavnici imaju značajno različite stavove prema inkluziji, a nastavnici iz urbanih sredina su imali negativniji stav prema inkluziji nego nastavnici iz ruralnih sredina. Pritom, dostupnost nastavnih sredstava, nastavna godina ili relevantna obuka za specijalno vaspitanje nisu značajno uticali na stavove nastavnika (Deng, 2008). Nastavnici iz grada su iskazali negativan stav prema inkluziji, bili su skloniji da se opredele za odvojeno specijalno obrazovanje ukoliko za to postoje uslovi, iako gradske škole raspolažu boljim resursima. Deng (2008) tumači dobijene rezultate činjenicom da u urbanim sredinama ima više specijalnih škola nego u ruralnim sredinama, pri čemu je za seosku decu sa smetnjama u razvoju teško da idu u specijalnu školu u gradu, zbog siromaštva i problema sa transportom. U tom slučaju, uključivanje u obližnje redovne škole predstavlja uobičajenu praksu. Takođe, gradske škole su pod većim pritiskom da poboljšaju školsko postignuće učenika, kako bi uspeli da se upišu na prestižne fakultete.

Sa ciljem da se ispitaju razlike u stavovima prema inkluzivnom fizičkom vaspitanju učitelja seoskih i gradskih škola u našoj sredini, sprovedeno je istraživanje na uzorku učitelja iz zapadnobačkog okruga.

Metod

Ispitanici. Uzorak ispitanika činilo je 84 učitelja iz seoskih i gradskih škola zapadnobačkog okruga (80 žena, 4 muškarca). Uzorak ispitanika podeljen je na dva subuzorka: 1) učitelji koji rade u gradskim školama (42 ispitanika) i b) učitelji koji rade u seoskim školama (42 ispitanika).

Merni instrumenti. U istraživanju je korišćen upitnik koji se sastojao iz dve celine: 1) Pitanja koja se odnose na prethodno iskustvo učitelja, stručnu obuku i samoefikasnost učitelja i 2) Stavovi prema inkluzivnom fizičkom vaspitanju.

Stavovi prema inkluzivnom fizičkom vaspitanju ispitani su pomoću skale ATIPE (*Atitude Toward Inclusive Physical Education*; Hutzler, Zach, & Gafni, 2005). Ova četvorostepena skala Likertovog tipa (nema neutralnog stava) sastoji se iz 15 ajtema, od kojih je 11 tvrdnji negativno formulisano (npr. „Deca sa smetnjama/ invaliditetom često izazivaju disciplinske probleme na času fizičkog vaspitanja“), a 4 pozitivno (npr. „Deca sa smetnjama/invaliditetom mogu mnogo dobiti učestvovanjem u fizičkom vaspitanju sa drugom decom“). Skor ispitanika na skali predstavlja prosečan skor (suma skorova na

obtained results indicate to the fact that rural and urban teachers express significantly different attitudes towards inclusion, and the teachers from urban areas expressed more negative attitude towards inclusion as compared to teachers from rural areas. At the same time, availability of teaching aids, school year or relevant training for special education did not significantly influence the attitudes of teachers (Deng, 2008). Urban teachers expressed negative attitude towards inclusion, they were more in favor of separated special education providing that there are conditions for that, although urban schools have better resources on their disposal. Deng (2008) interprets the obtained results with the fact that in urban areas, there are more special schools as compared to rural areas, where the children from rural areas find it difficult to attend special schools in urban areas, due to poverty and transport problems. In that case, inclusion into nearby regular schools represents usual practice. Also, urban schools are under stronger pressure in terms of orders to improve the school achievement of pupils, in order to adequately prepare them to enter prestigious faculties.

With the aim to investigate differences in attitudes towards inclusive physical education and teaching of rural and urban school teachers in our environment, the research was conducted at the sample of teachers from the West Bačka District.

Methods

Participants. The sample of participants comprised of 84 teachers from rural and urban areas of the West Bačka District (80 female, 4 male participants). The sample of participants was divided into two subsamples: 1) teachers employed in urban schools (42 participants) and b) teachers employed in rural schools (42 participants).

Measuring instruments. The research used the questionnaire composed of two chapters: 1) Questions referring to previous experience of teachers, professional trainings and self-efficiency of teachers and 2) Attitudes towards inclusive physical education.

Attitudes towards inclusive physical education were tested by means of the ATIPE scale (*Attitude Toward Inclusive Physical Education*; Hutzler, Zach, & Gafni, 2005). This four-degree Likert-type scale (no neutral attitude) comprises of 15 items, of which 11 statements are negatively formulated (for e.g. “Children with disorders / disability often provoke disciplinary problems at the classes of physical education”), and 4 positively (for e.g. “Children with disorders / disability may receive a lot through participation in physical education with other children”). The

pojedinačnim ajtemima/15), tako da rezultat ispitanika može da se kreće u rasponu od 1 do 4.

Obrada podataka. Za obradu podataka korišćena je deskriptivna statistika, a razlike između dve grupe u stavovima prema inkluzivnom fizičkom vaspitanju ispitane su korišćenjem t- testa za male nezavisne uzorke. Imajući u vidu rezultate prethodnih istraživanja na sličnim uzorcima, rezultati parametrijske statistike biće dopunjeni rezultatima hi-kvadrat testa i Fišerovog testa tačne verovatnoće.

Rezultati

Karakteristike uzorka. U uzorku dominiraju učitelji sa 16 do 25 godina radnog staža (39%), slede učitelji sa radnim stažom do 15 godina (36%), dok je najmanje učitelja sa radnim stažom dužim od 25 godina (25%). Učitelji iz seoskih i gradskih škola se ne razlikuju značajno u pogledu radnog staža ($\chi^2(2, N = 84) = 0.97, p = .96$).

Na nivou celog uzorka 72% ispitanika se izjasnilo da je dosada imalo prilike da bliže upozna osobe sa smetnjama/invaliditetom, a 28% nije imalo takvih iskustava. Između učitelja iz seoske i gradske sredine ne postoje značajne razlike u pogledu ličnog iskustva sa osobama sa invaliditetom ($\chi^2(1, N = 84) = 0.24, p = .62$).

Što se tiče profesionalnog iskustva sa inkluzivnom nastavom, tri petine ispitanika (58%) ima takvog iskustva, a preostalih 41.67% nije dosada predavalo u inkluzivnom odeljenju. Testiranje hi-kvadrat testom pokazalo je da se subuzorci učitelja koji rade u gradskim i seoskim školama ne razlikuju statistički značajno u pogledu nastavnog iskustva sa inkluzijom ($\chi^2(1, N = 84) = 0.20, p = .67$).

Oko 2/3 učitelja (68%) pohađalo je stručne seminare iz inkluzivne nastave. Iako je nešto veći procenat učitelja iz grada pohađao ove seminare, razlike između subuzoraka učitelja iz gradskih i seoskih škola nisu statistički značajne ($\chi^2(1, N = 84) = 0.24, p = .27$).

U isto vreme, beznačajan je procenat učitelja koji su pohađali seminare iz inkluzivnog fizičkog vaspitanja. Od ukupno 84 ispitanika, samo jedan se izjasnio da je pohađao takav seminar, dok preostalih 83 ispitanika nisu dosada učestvovali u seminaru iz inkluzivnog fizičkog vaspitanja.

Sa tvrdnjom „Imam poverenja u sebe kada je reč o podučavanju dece sa smetnjama/invaliditetom“ slaže se nešto više od polovine učitelja u uzorku (55%), dok se preostali učitelji ne slažu sa tvrdnjom koja se odnosi na njihovu samoefikasnost kada je reč o poučavanje učenika sa smetnjama/invaliditetom. Distribucija odgovora ne ra-

score of participants at the scale represents an average score (the sum of scores at individual items /15), so that the result of participants can move within the range from 1 to 4.

Data processing. Data processing was executed by means of descriptive statistics, and the differences between two groups in attitudes towards inclusive physical education were tested with t- test for small independent samples. Having in mind the results of previous research activities conducted on similar samples, the results of parameter statistics will be supplemented with the results of hi-quadrant test and Fisher's test of accurate probability.

The results

Sample characteristics. The sample is dominated by teachers having 16 to 25 years of service (39%), which is followed by teachers with the length of service up to 15 years (36%), while the lowest figure refers to teachers with the service longer than 25 years (25%). There is no significant difference between teachers from rural and urban schools in terms of years of service ($\chi^2(2, N = 84) = 0.97, p = .96$).

At the level of the total sample, 72% participants said that they had the opportunity to get to know persons with disorders / disability, and 28% had no such experience. There is no statistically significant difference in terms of personal experience with the disabled between teachers from rural and urban areas ($\chi^2(1, N = 84) = 0.24, p = .62$).

As for the professional experience in inclusive teaching, 3/5 of participants (58%) have such experience and the rest of 41.67% do not have experience in teaching in inclusive classes. Testing with hi-quadrant test indicates that there is no statistically significant difference in terms of teaching experience in inclusion between subsamples of teachers working in urban and rural schools ($\chi^2(1, N = 84) = 0.20, p = .67$).

Approximately 2/3 of teachers (68%) attended expert Inclusive Teaching Seminars. Although such seminars were slightly better attended by teachers from urban schools, the difference between subsamples of teachers from urban and rural schools was not statistically significant ($\chi^2(1, N = 84) = 0.24, p = .27$).

At the same time, the percentage of teachers attending inclusive physical education seminars is insignificant. Out of 84 participants, only one said to have attended such seminars, while the rest of 83 have not participated in inclusive physical education seminars.

Slightly more than one half of teachers included in the sample (55%) agrees with the statement "I trust myself when it comes to teaching of children with disorders / disability",

zlikuje se statistički značajno između subuzoraka, odnosno, učitelji iz seoske i gradske sredine se ne razlikuju u pogledu samoefikasnosti ($\chi^2(1, N = 84) = 1.20, p = .27$).

*Stavovi prema inkluzivnom fizičkom vaspitanju***.** Stavovi ispitanika prema inkluzivnom fizičkom vaspitanju ispitivani su pomoću skale ATIPE (*Atitude Toward Inclusive Physical Education*; Hutzler, Zach, & Gafni, 2005). Rezultati deskriptivne statistike za subuzorke učitelja iz seoskih i gradskih škola, kao i t-testa za testiranje značajnosti razlika, prikazani su u tabeli 1.

Tabela 1. Stavovi prema inkluzivnom fizičkom vaspitanju učitelja iz seoskih i gradskih škola

Table 1. Attitudes of teachers from rural and urban schools towards inclusive physical education

Stav prema inkluzivnoj nastavnoj praksi / Attitude towards inclusive teaching practice	N	AS	SD	Min	Max	KV%
Učitelji iz seoskih škola / Rural school teachers	42	2.77	0.38	1.67	3.73	13.71
Učitelji iz gradskih škola / Urban schools teachers	42	2.59	0.49	1.60	3.73	18.92
t(82) = 1.89; p = .06						

Legenda: broj ispitanika(N); aritmetička sredina (AS); standardna devijacija (SD); nivo značajnosti (p)

Legend: number of participants (N); arithmetic mean (AS); standard deviation (SD); level of significance (p)

Učitelji iz seoskih i gradskih škola naginju umereno pozitivnim stavovima prema inkluzivnom fizičkom vaspitanju, s obzirom da su ostvarili prosečni rezultat 2.77 (učitelji iz seoskih škola), odnosno, 2.59 (učitelji iz gradskih škola), na skali čiji je raspon od 1 do 4. Testiranje značajnosti razlika u skorovima na skali za procenu stavova prema inkluzivnom fizičkom vaspitanju pomoću t-testa za male nezavisne uzorke, pokazalo je da su dobijene razlike na granici značajnosti (p = .06). Numerički više vrednosti ostvarili su učitelji iz seoskih škola, što sugeriše da su ispoljili nešto pozitivniji stav prema inkluzivnom fizičkom vaspitanju, u poređenju sa učiteljima iz gradskih škola.

Radi dobijanja potpunije slike, testirane su i razlike između subuzoraka na pojedinačnim ajtemima (tabela 2). Testiranje značajnosti razlika u prosečnim skorovima, pokazuje da između učitelja iz seoskih i gradskih škola nema statistički značajnih razlika u 12 od ukupno 15 ajtema skale ATIPE. Značajne razlike konstatovane su na sledećim tvrdnjama: „Uključivanje deteta sa smetnjama/invaliditetom u odeljenju stvara frustraciju i neprijatnost“ (p = .00), „Nije u redu traziti od nastavnika fizičkog vaspitanja koji treba da radi sa celim odeljenjem, da posveti posebnu pažnju deci sa smetnjama/invaliditetom i njihovim roditeljima“ (p = .01) i „Uključivanje deteta sa smetnjama/invalidite-tom može doprineti razvijanju

while the rest of teachers do not agree with the statement referring to their self-efficiency when it comes to teaching of pupils with disorders / disability. Distribution of responds is not statistically significant between the subsamples, that is, teachers from rural and urban areas do not differ in terms of self-efficiency ($\chi^2(1, N = 84) = 1.20, p = .27$).

*Attitudes towards inclusive physical education***.** The attitudes of participants on inclusive physical education were tested by means of ATIPE scale (*Attitude Toward Inclusive Physical Education*; Hutzler, Zach, & Gafni, 2005). The results of descriptive statistics for subsamples of teachers from rural and urban schools, as well as t-test for testing of significance of differences are presented in Table 1.

Teachers from rural and urban schools incline to moderately positive attitudes towards inclusive physical education, as they achieved average results of 2.77 (rural school teachers), that is, 2.59 (urban school teachers), at the scale with the range from 1 to 4. Testing significance of differences in scores at the scale for estimation of attitudes towards physical education by means of t-test for small independent samples indicates that the obtained differences are at the limit of significance (p = .06). Numerically higher values were achieved by rural school teachers, and which indicates that they expressed slightly more positive attitude towards inclusive physical education, as compared to urban school teachers.

In order to provide the complete picture, differences between subsamples were tested at individual items (table 2). Testing of significance of differences in average scores, indicate that there are statistically significant differences between teachers from urban and rural schools, in 12 out of 15 items of the ATIPE scale. Significant differences were confirmed in the following statements: “Inclusion of children with disorders / disability into classes provokes frustration and unpleasantness” (p = .00), “It is not in a line to ask from physical education teacher who should work with the entire class to dedicate extra attention to children with disorders/disability and their parents” (p = .01) and “Inclusion of children with disorders/disability, can contribute to

pozitivnih vrednosti“ (p = .05), i u sva tri slučaja, učitelji iz seoskih škola iskazali su pozitivniji stav nego učitelji iz gradskih škola.

Najviši skorovi (od 3.50 do 2.95) ostvareni su na ajtemima 2, 3, 4 i 12, koji se odnose na tvrdnje da ne bi trebalo uključivati učenike sa invaliditetom u redovna odeljenja, zbog njihovog izgleda, zatim, da inkluzija predstavlja smetnju efektivnosti nastave; kao i efekte inkluzije na odeljenje u celini. Najniži skorovi dobijeni su na ajtemu 11 (učitelji iz seoskih škola – 2.05, učitelji iz gradskih škola – 1.79) koji se odnosi na veću izloženost nastavnika stresu u inkluzivnom odeljenju. Slede ajtemi 1 i 6 sa prosečnim skorovima između 2.05 i 2.2, a radi se o stavovima prema osposobljenosti učitelja za inkluzivnu nastavu i smanjenom vremenu za rad sa učenicima tipičnog razvoja.

development of positive values” (p = .05), and in all three cases, teachers from rural schools expressed more positive attitude as compared to teachers from urban schools.

The highest scores (from 3.50 to 2.95) were achieved in items 2, 3, 4 and 12, and which refer to statements that the children with disability should not be included into regular classes, because of their appearance, then, that inclusion represents an obstacle in effectiveness of schooling; as well as effects of inclusion on the entire class. The lowest scores were achieved in item 11 (rural school teachers – 2.05, urban school teachers – 1.79) and which refer to higher degree of stress that the teachers in inclusive classes are exposed to. There are items 1 and 6 with average scores between 2.05 and 2.2, and it concerns the attitudes towards the level of competence of teachers in terms of inclusive teaching and reduced time for work with the pupils with normal development.

Tabela 2. Ajtem analiza stavova učitelja prema inkluzivnom fizičkom vaspitanju

Table 2. Item analysis of attitudes of teachers on inclusive physical education

Stavke / Items		AS	SD	t-test	p
Učitelj fizičkog vaspitanja nema znanja i veština da podučava učenike sa senzomotornim smetnjama. *Physical education teachers do not have knowledge and skills to teach children with sensorimotor disorders.*	Selo/ Rural	2.19	0.67	1.08	0.29
	Grad/ Urban	2.05	0.54		
Ne bi trebalo uključivati učenike sa invaliditetom u redovna odeljenja, zbog njihovog izgleda. *Children with disability should not be included into regular classes, because of their appearance.*	Selo/ Rural	3.50	0.71	1.72	0.90
	Grad/ Urban	3.24	0.69		
Pošto je kvalitet i efikasnost nastave fiz.vasp. prioritet, važno je izbegavati moguća ometanja, uključujući i inkluziju dece sa smetnjama/invaliditetom. / *Since the quality and efficiency of physical education classes is priority, it is important to avoid possible distractions, including inclusion of children with disorders / disability.*	Selo/ Rural	3.24	0.69	1.57	0.12
	Grad/ Urban	3.00	0.70		
Deca sa smetnjama/invaliditetom mogu mnogo dobiti učestvovanjem u fiz.vasp. sa drugom decom. *Children with disorders/disability can benefit a lot from attending physical education with other children.*	Selo/ Rural	3.19	0.63	1.64	0.11
	Grad/ Urban	2.98	0.56		
Deca sa smetnjama/invaliditetom često izazivaju disciplinske probleme na času fizičkog. *Children with disorders/disability often provoke disciplinary problems at the classes of physical education.*	Selo/ Rural	2.86	0.65	0.60	0.55
	Grad/ Urban	2.76	0.79		
Učitelj koji uključuje dete sa smetnjom/invaliditetom u redovni čas fizičkog vaspitanja, smanjuje vreme koje može da posveti drugim učenicima. / *Teachers that include children with disorders / disability into regular classes of physical education reduce, the time they could dedicate to other pupils.*	Selo/ Rural	2.14	0.61	-0.65	0.52
	Grad/ Urban	2.24	0.73		
Dete sa smetnjama/invaliditetom može usporiti učenje druge dece na času fizičkog. *Children with disorders/disability may slow down the studying of other children at the physical education classes.*	Selo/ Rural	2.50	0.71	0.00	1.00
	Grad/ Urban	2.50	0.80		
Dete sa smetnjama/invaliditetom ometa nastavnika fizičkog vaspitanja. *Children with disorders/disability distract teachers of physical education.*	Selo/ Rural	2.86	0.72	0.47	0.64
	Grad/ Urban	2.79	0.68		
Deca sa smetnjama/invaliditetom treba da pohađaju specijalna odeljenja. *Children with disorders/disability should attend special classes.*	Selo/ Rural	2.48	0.77	0.66	0.51
	Grad/ Urban	2.36	0.88		
Uključivanje dece sa smetnjama/invaliditetom predstavlja lični izazov za učitelja. *Inclusion of children with disorders/disability represents a personal challenge for each teacher.*	Selo/ Rural	2.93	0.68	0.92	0.36
	Grad/ Urban	2.79	0.75		
Učitelj koji uključi dete sa smetnjama/invaliditetom je izložen riziku većeg stresa. *Teachers that include children with disorders /disability are exposed to risk of stronger stress.*	Selo/ Rural	2.05	0.76	1.42	0.16
	Grad/ Urban	1.79	0.93		
Uključivanje deteta sa smetnjama/invaliditetom može doprineti razvijanju pozitivnih vrednosti. *Inclusion of children with disorders/disability can contribute to development of positive values.*	Selo/ Rural	3.24	0.53	2.71	0.00
	Grad/ Urban	2.93	0.51		
Uključivanje deteta sa smetnjama/invaliditetom u odeljenju stvara frustraciju i neprijatnost. *Inclusion of children with disorders / disability into classes provokes frustration and unpleasantness.*	Selo/ Rural	2.95	0.58	2.00	0.05
	Grad/ Urban	2.67	0.72		
Redovno odeljenje može imati koristi od inkluzije deteta sa smetnjama/invaliditetom. *Regular class can benefit from inclusion of children with disorders /disability.*	Selo/ Rural	2.71	0.67	1.27	0.21
	Grad/ Urban	2.52	0.71		
Nije u redu traziti od učitelja koji treba da radi sa celim odeljenjem, da posveti posebnu pažnju deci sa smetnjama/invaliditetom i njihovim roditeljima. / *It is not in a line to ask from physical education teacher who should work with the entire class to dedicate extra attention to children with disorders/disability and their parents.*	Selo/ Rural	2.67	0.75	2.64	0.01
	Grad/ Urban	2.19	0.89		

Diskusija sa zaključcima

Cilj istraživanja je bio da se ispitaju stavovi učitelja iz seoskih i gradskih škola o inkluzivnoj nastavnoj praksi i inkluzivnom fizičkom vaspitanju. Sva seoska naselja obuhvaćena istraživanjem imaju do 5000 stanovnika, a osnovna privredna delatnost je poljoprivreda. Sombor, kao gradsko naselje, sedište Grada Sombora i Zapadnobačkog okruga, ima ukupno skoro skoro 48.000 stanovnika (bez okolnih seoskih naselja).

Učitelji iz seoskih i gradskih škola *ne razlikuju se* značajno po radnom stažu, ličnom i profesionalnom iskustvu sa osobama sa smetnjama/invaliditetom, pohađanju seminara iz inkluzivne nastave, kao i poverenju u sebe kada je reč o inkluzivnoj nastavi (procenjena samoefikasnost). „Tipičan“ učitelj u našem uzorku ima 16 do 26 godina radnog staža, ima lično i profesionalno iskustvo sa osobama sa smetnjama/invaliditetom, pohađao je seminar iz inkluzivne nastave, ali ne i iz inkluzivnog fizičkog vaspitanja, i ima poverenja u svoje sposobnosti da realizuje nastavu fizičkog vaspitanja. Ovim sličnostima u socijalnom i profesionalnom statustu, verovatno se mogu objasniti i sličnosti u stavovima prema inkluzivnom fizičkom vaspitanju.

Učitelji iz seoske i gradske sredine naginju umereno pozitivnim stavovima prema inkluzivnom fizičkom vaspitanju. Razlike između subuzoraka su na granici značajnosti, pri čemu su u proseku viši skor postigli učitelji iz seoskih škola. Oni su, osim toga, imali značajno više skorove na tri pojedinačna ajtema, što sugeriše da postoji tendencija pozitivnijih stavova prema inkluzivnom fizičkom vaspitanju kod učitelja iz seoskih škola. Učitelji iz seoskih škola iskazali su pozitivnije stavove prema efektima inkluzije na odeljenje u celini i posvećivanju dodatne pažnje od strane učitelja. Ovi rezultati koresponidraju sa rezultatima Denga (2008), koji je takođe konstatovao da nastavnici iz seoskih škola imaju pozitivnije stavove prema inkluziji u poređenju sa nastavnicima iz gradske sredine. Deng smatra da se razlike mogu tumačiti većom dostupnošću specijalnih škola u urbanim nego u ruralnim sredinama, preprekama za uključivanje seoske dece u specijalne škole u gradu (transport, troškovi) što uključivanje u obližnje seoske redovne škole čini uobičajenom praksom. Knoblauch i Hoy (2008; prema Stauble, 2009) ističu da iako seoski nastavnici mogu imati problema sa resursima jer rade u veoma malim školama, često imaju prednosti snažnijeg osećanja zajedništva u lokalnoj zajednici i podrške porodice. Negativnije stavove nastavnika iz seoskih škola konstatovali su Stauble (2009) i Chopra (2008).

Discussion and conclusions

The aim of the research was to investigate attitudes of teachers from urban and rural schools in terms of inclusive teaching practice and inclusive physical education. All rural villages included into research have up to 5000 inhabitants, and the basic business activity is agriculture. Sombor, as a town, the capital of the City of Sombor and the West Bačka District, count, in total, almost 48,000 inhabitants (without surrounding villages).

There are *no significant differences* between teachers from rural and urban schools, in terms of age of service, personal and professional experience with children with disorders/disability (they attend inclusive teaching seminars), and the trust they have in themselves when it comes to inclusive teaching (estimated self-efficiency). “Typical” teacher in our sample has 16 to 26 years of service, they have personal and professional experience with children with disorders/disability, they have attended seminars from field of inclusive teaching, but not inclusive physical education, they trust in their abilities to realize the classes of physical education. These similarities in professional status can probably explain similarities in attitudes towards inclusive physical education.

Teachers from rural and urban areas have slight tendencies towards moderate attitudes to inclusive physical education. Differences between subsamples are at the limit of significance, and higher score, on average, was achieved by rural school teachers. Besides, they had significantly higher scores in three individual items, which indicates to the fact that there is a tendency towards more positive attitudes on inclusive physical education in rural school teachers. Rural school teachers expressed more positive attitudes towards the effects of inclusion on the entire class, and dedication of extra attention by teachers. The said results correspond to results of Deng (2008), and who also confirmed that rural school teachers have more positive attitudes towards inclusion as compared to urban school. Deng is of the opinion that such differences can be interpreted by higher availability of special schools in urban as compared to rural environments, obstacles for inclusion of rural children into urban special schools (transport, costs) which results in general practice of inclusion into regular rural schools. Knoblauch and Hoy (2008; according to Stauble, 2009) point out to the fact that, although those teachers can have problems with resources, as they work in very small schools, they will often have stronger feelings of togetherness in local community, as well as the family support.

More negative attitudes of teachers in rural schools were confirmed by Stauble (2009) and Chopra (2008).

Generalno gledano, učitelji iz našeg istraživanja iskazali su najpozitivnije stavove kada je reč o prihvatanju fizičkog izgleda učenika sa invaliditetom, uticaju inkluzije na kvalitet nastave fizičkog vaspitanja i efektima inkluzije na odeljenje u celini. Najnegativniji stavovi odnose se na percepciju da su učitelji u inkluzivnom odeljenju izloženi većem stresu, da nisu dovoljno osposobljeni za inkluzivnu nastavu i da ostaje manje vremena za rad sa ostalim učenicima.

Razlike između učitelja iz seoskih i gradskih škola, iako tek naznačene, zaslužuju dalju pažnju, posebno sa aspekta specifičnih profesionalnih izazova i potreba samih učitelja, ali i specifičnih potreba učenika sa smetnjama/invaliditetom u manjim sredinama, gde su mnogi specijalizovani servisi i podrške nedostupni.

Generally speaking, teachers that participated in our research expressed the most positive attitudes in terms of acceptance of physical appearance of children with disability, the effects of inclusion on the quality of classes of physical education and the effects of inclusion on the entire class.

The most negative attitudes refer to perception that all teachers in inclusive classes are exposed to higher degree of stress, that they are not enough trained for inclusive schooling which leaves them less time to work with other pupils.

Differences between rural and urban school teachers, although just pointed out, deserve further attention, especially from the aspect of specific professional challenges and the needs of teachers, but also specific needs of children with disorders/disability in rural environments, where many specialized services and support centers are not available.

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Komparativna analiza sposobnosti motoričkog izražavanja ritmičkih struktura plesača

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Abstrakt: Cilj ovog istraživanja je bio da se utvrde razlike u motoričkom izvođenju ritmičkih strukura između plesača društvenih plesova salsa i argentinski tango. Istraživanje je sprovedeno na uzorku od 50 ispitanika uzrasta od 19 do 25 godina ± šest meseci. Ispitanici su usvajali plesne strukture navedenih plesova tokom 12 meseci. Motoričko izražavanje ritmičkih struktura plesača je procenjeno baterijom koja se sastojala od 5 testova. Razlika između grupa je procenjivana T-testom za male nezavisne uzorke. Rezultati istraživanja su pokazali da statistički značajna razlika postoji samo kod izražavanja rimičkih struktura nogama u korist salsa plesača.

Ključne reči: društveni plesovi, ritmička sposobnost, plesači, komparativna razlika

Uvod

Danas u svetu postoje brojne plesne forme, koje se međusobno razlikuju po načinu izvođenja, po poreklu nastanka, karakteru plesa i drugim obeležjima. Međutim, ono što je zajedničko za sve plesove je da se svi izvode uz određenu vrstu muzike ili na zadati ili proizvoljni ritam. Kao što svaka vrsta muzike poseduje određeni ritam, tako i svaki plesač svoje pokrete izvodi ritmično u prostoru i vremenu u skladu sa muzikom, tako da možemo reći da je spona koja povezuje muziku i ples upravo ritam.

"Od svih elemenata u umetnosti plesa, ritam je najubedljiviji i najmoćniji element…" (Humphrey, 1980, str. 104)

Ritam kao sastavni deo svakog pokreta, karakteriše kvalitet tog pokreta. Iako svi poseduju osećaj za ritam, stepen osećaja za ritam se razlikuje od osobe do osobe. Taj osećaj za ritam se može razviti i poboljšati odgovarajućim ritmičkim aktivnostima. Kada osoba poboljša

Comparative Analysis of Rhytmic Structures Motor Performance Abilities in Dancers

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Abstract: The aim of this study was to determine the differences in motor performance of rhythmic structures between dancers of social dances Salsa and Argentine Tango. The research was conducted on 50 subjects aged 19 to 25 years ± six months. Subjects were learning social dances Salsa and Argentine Tango during 12 months. Motor performance of rhythmic structures in dancers was estimated with battery of tests comprising of five tests. The difference between groups was determined with t-test for small independent samples. The results showed that significant differences exist only in expressing rhythmic structures with feet in favor of Salsa dancers.

Keywords: social dances, rhythmic ability, dancers, comparative differences

Introduction

In today's world there are many dance forms which differ in the manner of performance, the origin of creation, character of dance and other features. However, common to all of the dances is that they are all performed with a certain type of music or on a given or arbitrary rhythm. Any kind of music has rhythm, and each dancer performs his or her moves rhythmically in space and time with the music, so it could be said that rhythm is a link that connects music and dance.

"Of all the elements in the art of dance, rhythm is the most persuasive and most powerful element …" (Humphrey, 1980, p. 104)

Rhythm is an integral part of any movement and characterizes quality of that movement. Although everybody has a sense of rhythm, its degree varies from person to person. This sense of rhythm can be developed and improved by performing appropriate rhythmic activities.

ša osećaj za ritam, kvalitet njegovih pokreta reflektuje tu promenu. (Winnick, 2005). Ritam je tradicionalno smatran kao specijalna vrsta tajminga koja čini osnovu izvođenja motornih veština (Derri, Tsapalidou, Zachopolou, & Kioumourtzoglou, 2001). Ritmička sposobnost se smatra unutrašnjom sposobnošću koja utiče na način izvođenja motornih veština (Mastrokalou & Hatziharistos, 2007). Ona takođe predstavlja i sposobnost da se konstantno izvode kontrolisani pokreti sa spacijalnom i temporalnom preciznošću (Derri, Tsapalidou, Zachopolou, & Gini, 2001) sa integrisanom sposobnošću percepcije ritmičkih stimulusa. (Mastrokalou & Hatziharistos, 2007). Martin, Carl, & Lehnertz (1991) su definisali ritmičku sposobnost kao naslednu, koordinisanu ljudsku sposobnost koja se odnosi na rezonovanje, memorisanje i prezentaciju temporalno – dinamičkih struktura pokreta, čime utiče na način motoričkog izvođenja.

Ritmička sposobnost je tesno povezana sa koordinacijom. Prema Blume (1983) sposobnost ritmiziranja je jedan od faktora koji čini strukturu koordinacije, dok Stojiljković (2003) svrstava tajming (pravovremenost), tempo i koordinaciju u ritmu u okvir koordinacije kao višedimenzionalne bazične motoričke sposobnosti. Kostić (1994) je na uzorku od 202 učenika i 184 devojčice uzrasta 9-10 godina utvrdila postojanje statistički značajne korelacije između koordinacije i osnovnih muzičkih sposobnosti kako kod dečaka tako i kod devojčica dok je Derri et al. (2001) utvrdila da se različiti ritmički pokreti gornjim i donjim ekstremitetima razvijaju različitom brzinom u toku telesnog razvoja predškolske dece. Izvođenje veštih pokreta podrazumeva da pokreti ruku i nogu budu precizno koordinisani, pri čemu su ritam i tajming bazične karakteristike dobre koordinacije i važni faktori u razvoju, učenju i izvođenju motornih veština. (Mastrokalou & Hatziharistos, 2007; Derri et al., 2001). Busch & Strauss (2005) su identifikovali koordinacione sposobnosti kao glavne determinante postignuća u motornom području i upravo zbog toga je važan razvoj koordinacionih sposobnosti u detinjstvu (Getchell, 2006) i ritmičkih sposobnosti kao jednog od faktora koordinacije.

Rezultati dosadašnjih istraživanja ukazuju na postojanje pozitivne korelacije motoričkog izražavanja ritmičkih struktura i uspešnosti u plesu. (Žgajnjer, 1978; Oreb, 1984; Kostić, 1992; Kostić, 1994. prema Kostić, 1996). Kostić (1996) je na uzorku od 37 studentkinja utvrdila da uspeh u folk, jazz i društvenim plesovima zavisi od sposobnosti izražavanja ritma, sposobnosti memorisanja strukturnih sekvenci, sposobnosti pravilno izvedenog postavljenog zadatka u ritmu, sposobnosti za brzo učenje određene strukture, brze adaptacije na promenu

When a person improves sense of rhythm, the quality of his or her movements reflects this change (Winnick, 2005). Rhythm is traditionally considered as a special kind of timing that represents the basis of motor skills performance (Derry, Tsapalidou, Zachopolou, & Kioumourtzoglou, 2001). Rhythmic ability is considered to be an internal ability that influences the way of motor skills performing (Mastrokalou & Hatziharistos, 2007). It also represents the ability to consistently perform controlled movements with spatial and temporal precision (Derry, Tsapalidou, Zachopolou, & Gini, 2001), with an integrated capability of the rhythmic stimuli perception (Mastrokalou & Hatziharistos, 2007). Martin, Carl & Lehnertz (1991) define rhythmic ability as hereditary, coordinated human capability related to reasoning, memorizing and presentation of the temporal - dynamic structure of the movement, which affects the way of motor performance.

Rhythmic ability is closely related to coordination. According to Blume (1983) rhythmic ability is one of the factors that make the structure of coordination and Stojiljkovic (2003) classifies the timing, tempo and coordination in rhythm in the framework of coordination as a multidimensional basic motor skill. Kostic (1994) on a sample of 202 students and 184 girls, aged 9-10 years, found a statistically significant correlation between coordination and basic musical skills, both in boys and girls, while Derry et al. (2001) found that different rhythmic movements of the upper and lower limbs develop at different rates during the physical development of preschool children. In order to perform skilled movement, it is necessary to properly coordinate movement of arms and legs, whereby rhythm and timing are basic characteristics of good coordination and important factors in the development, learning and performance of motor skills (Mastrokalou & Hatziharistos, 2007; Derry et al., 2001). Busch & Strauss (2005) identified coordination abilities as a major determinant of achievement in the motor area thus making development of coordination skills and rhythmic ability in childhood very important (Getchell, 2006).

The results of previous studies indicate positive correlation between motor performance of rhythmic structure and performance of dance (Žgajnjer, 1978; Oreb, 1984; Kostic, 1992; Kostic, 1994, according to Kostic, 1996). Kostic (1996) on a sample of 37 female students found that success in folk, jazz and social dance depends on the ability to express rhythm, ability to memorize the structural sequence, ability to correctly perform tasks set to the rhythm, ability to quickly learn certain structures, rapid adaptation to changing speed performance, good concentration and co-ordination, flexibility and bal-

brzine izvođenja, dobre koncentracije i koordinacije, fleksibilnosti i ravnoteže. Slični rezultati su dobijeni u istraživanju Kostić (1995a) gde je utvrđeno da motoričko izražavanje ritmičkih struktura, zajedno sa kognitivnim sposobnostima i konatavnim karakteristikama značajno utiče na predikciju uspeha kod društvenih plesova i jazz plesa na populaciji studenata, i u istraživanju Srhoj (2008) gde je faktor koordinacije u ritmu izdvojen kao najbolji prediktor uspeha u trbušnom plesu kod učenica 3. i 4. razreda srednje škole. Relativno visoku korelaciju ritmičkih sposobnosti i uspešnosti u plesu kod studenata, uz pokrivenost od 32% zajedničkog varijabiliteta utvrdili su Oreb i Kilibarda (1996), dok kod studentkinja nije utvrđena značajna povezanost ritmičkih sposobnosti i uspešnosti u plesu.

Mandarić (1999) je istraživala uticaj nastave plesa na razvoj osećaja za ritam, koordinaciju i frekvenciju pokreta donjih ekstremiteta. Ona je na uzorku od 178 studenata utvrdila da je program nastave plesova uticao na promenu motoričkih sposobnosti koordinacije, brzine i osećaja za ritam.

Cilj ovog istraživanja je da se utvrde razlike u motoričkom izražavanju ritmičkih struktura plesača društvenih plesova Argentinskog tanga i Salse uzrasta od 19 do 25 godina.

Metode

Uzorak ispitanika

Uzorak ispitanika činilo je 50 ispitanika uzrasta od 19 do 25 godina ± šest meseci koji su članovi plesnog kluba Swing iz Niša i koji su se dobrovoljno prijavili za testiranje. Uzorak ispitanika je podeljen na dva subuzorka. Prvi subuzorak činilo je 25 ispitanika koji se aktivno bave društvenim plesom Argentinski tango oko godinu dana. Drugi subuzorak ispitanika činilo je 25 ispitanika koji se aktivno bave društvenim plesom Salsa. Ispitanici su sproveli plesne programe tanga i salse u trajanju od 12 meseci.

Uzorak varijabli

Primenjena je baterija od 5 testova za procenu sposobnosti motoričkog izražavanja ritmičkih struktura i to: Bubnjanje nogama sedeći na stolici (RIT1); Poskoci u tri kvadrata (RIT2); Okreti u šest kvadrata (RIT3); Koraci i okreti u pet kvadrata (RIT4) i Topoti i koraci u kretanju napred (RIT5).

Navedene merne instrumente konstruisali su Kostić, R. i Mutavdžić, V. (Kostić, 1995b; Mutavdžić, 1995).

ance. Similar results were obtained in the study of Kostic (1995) determining that motor performance of rhythmic structures, along with cognitive abilities and conative characteristics significantly influences the prediction of success in social dance and jazz dance in student population, as well as in research of Srhoj (2008), where the factor coordination in rhythm is singled out as the best predictor of success in belly dance, in girls in 3rd and 4th grade of high school. Relatively high correlation of rhythmic ability and success in dance in students, with coverage of 32% of the common variance was determined by Oreb and Kilibarda (1996), while there was no significant correlation of rhythmic ability and success in dance in female student subjects.

Mandaric (1999) investigated the impact of dance curriculum on development of sense of rhythm, coordination and frequency of movement of the lower limbs. On a sample of 178 students she found that dance curriculum influenced changes in motor skills of coordination, speed and sense of rhythm.

The aim of this study was to determine the differences in motor performance of rhythmic structures in dancers of social dances Argentine Tango and Salsa, aged 19 to 25 years.

Method

The sample

The sample consisted of 50 subjects aged 19 to 25 years ± six months, members of "Swing" dance studio from Nis who volunteered for testing. The sample was divided into two sub-samples. The first subsample consisted of 25 subjects actively engaged in social dance Argentine Tango for about a year. The second sub-sample consisted of 25 subjects actively engaged in social dance Salsa for about a year. Subject conducted dance curricula of Argentine Tango and Salsa for a period of 12 months.

The sample of variables

To determine motor performance of rhythmic structures, battery of five tests was used: Feet drumming while sitting on a chair (RIT1); Jump into three squares (RIT2); Turns into six squares (RIT3); Steps and turns into five squares (RIT4) Tapping and stepping in moving forward (RIT5).

Specific measuring instruments were constructed by Kostic, R. and Mutavdžić, V. (Kostic, 1995b; Mutavdžić, 1995).

Program rada društvenih plesova Salse i Argentinskog tanga

Struktura časova društvenih plesova salse i argentinskog tanga je bila ista. Časovi su imali trodelnu strukturu koja se sastojala iz uvodnog, glavnog i završenog dela časa. Svaki čas je imao istu strukturu, ali sadržaj časova je prilagođavan kako pojedinačnim ciljevima časova tako i opštem cilju da polaznici savladaju ritam, osnovne korake i dostignu određeni nivo plesne improvizacije. Sadržaji časova su prilagođavani i predviđenom plesnom programu koji je trebalo savladati za određeni vremenski period. Tokom časova, i Salse i Argentinskog tanga, plesači su igrali u parovima ali su takođe u nekim slučajevima i vežbali sami (najčešće u uvodnom delu časa, tokom učenja novih plesnih figura i tokom ritmičkih vežbi). Plesnim programom predviđene su sve figure i njihovo obnavljanje za jednu plesnu sezonu u trajanju od 12 meseci, dok je jedan mesec bio sačinjen od 8 časova, odnosno dva puta nedeljno po sat vremena.Plesni program je sprovođen kontinuirano i nije bilo pauza dužih od deset dana. Svi plesači su redovno prisustvovali treninzima osim tokom praznika i odmora, nakon čega su nastavili sa redovnim dolascima i primenom programa.

Uvodni deo časa salse činile su vežbe zagrevanja koje su podrazumevale izolacije ramena, grudnog koša i karlice. Ove vežbe imaju za cilj da opuste mišiće trupa i karlice i da telo naviknu na specifična kretanja koja odražavaju karakter plesa. Na svakom času se u uvodnom delu posvećivala pažnja i izražavanju osnovnog ritma salse. Ritmičke vežbe koje su primenjivane podrazumevale su koračanje po prostoru u različitim ritmičkim šablonima (QuickQuickSlow; QuickQuickQuickQuick). Na pojedinim treninzima se pažnja u potpunosti posvećivala ritmičkoj interpretaciji određenih muzičkih šablona, nogama (eng. Footwork). Motoričko izražavanje ritmičkih struktura se najpre izvodilo po tačno definisanim plesnim figurama koje su se poklapale sa muzičkim šablonima, dok se na određenim treninzima radila isključivo slobodna interpretacija na različite muzičke celine. Plesači su najpre nekoliko puta preslušali zadatu muzičku celinu kako bi je zapamtili i nakon toga imali zadatak da je interpretiraju u slobodnoj formi naglašavajući akcente i pauze.

Uvodni deo časa argentinskog tanga bio je sačinjen od dva tipa vežbi. Prvi tip činile su tehničke vežbe koje su imale za cilj savladavanje specifične tango tehnike kako pojedinačno tako i u paru, kako bi olakšale izvođenje određenih tango figura, za čiju je uspešnu realizaciju neophodno posedovati određeni nivo tehnike , dok su

Dance curriculum of social dances Salsa and Argentine Tango

Structure of the Salsa and Argentine Tango classes were the same. Classes had a three-part structure consisting of introductory, main and final part of the class. Each class had the same structure but the content of lessons was adapted to the individual objectives of the lessons and general objective envisaging students to master rhythm, basic steps and reach certain level of dance improvisation. Classes were adjusted to a dance curriculum that subjects were supposed to learn (overcome) in a certain period of time. During classes, both Salsa and Argentine tango, dancers danced in couples, but they also practiced solo dancing in some cases (mostly during introductory part of the classes, during learning new steps and during rhythmical exercises). Dance curriculum consisted of all the figures and their renewal for one dance season for a period of 12 months. In one month there were 8 classes, two times a week. There was no pause for longer than 10 days during the application of dance curriculum. All dancers attended regularly, except during holidays and vacations, after which they have returned and continued with the dance curriculum.

The introductory part of the Salsa class consisted of warm-up exercises involving isolation of the shoulders, chest and pelvis. These exercises are designed to relax the muscles of the trunk and pelvis so the body can get used to the specific movements reflecting character of the dance. In each class in the introductory part attention was paid to the expressing the basic rhythm of Salsa. Rhythmic exercises that were applied consisted of walking in space in different rhythmic patterns (QuickQuickSlow; QuickQuickQuickQuick). During some classes attention was fully paid to the interpretation of certain rhythmic musical patterns with feet (Footwork). Motor performance of rhythmic structures was first performed by well-defined dance figures that coincided with the musical patterns, while in some classes subjects performed free interpretation of different musical parts. Dancers first listened few times to a given music scheme in order to remember it, and then were set a task of interpreting it in a free form, highlighting the accents and pauses.

The introductory part of the Argentine Tango consisted of the two types of exercises. The first type consisted of technical exercises aiming at helping subject to overcome specific tango techniques, both individually and in a couple, to facilitate the execution of certain tango figures, for whose successful implementation certain level of technique is necessary, while the other type consisted of rhythmic exercis-

drugi tip činile ritmičke vežbe. Ritmičke vežbe podrazumevale su ponavljanje određenog plesnog obrasca u ritmovima karakterističnim za Argentinski tango (SSSS, SSQQ,QQS,QQQQ).

Glavni delovi časova salsa i argentinski tango činile su plesne figure predviđene plesnim programom za jednu plesnu sezonu, kao i obnavljanje svih naučenih figura na svakom 4. i 8. času u mesecu. Osnovni cilj glavnog dela časa jeste usvajanje novih plesnih figura i kreiranje novih motoričkih navika, dostizanje određenog nivoa tehnike u izvođenju tih figura i izvođenje plesnih figura u ritmu muzike.

Završni delovi časova činila su isplesavanja i plesna improvizacija, što je podrazumevalo da polaznici sami povezuju plesne figure po sopstvenom logičkom redosledu i da ih kombinuju sa već naučenim figurama sa prethodnih časova. Ovaj deo ima za cilj da polaznici utvrde plesne figure i dovedu ih do određenog stepena automatizma kako bi se u potpunosti prepustili uživanju u plesu i kako bi se psihički relaksirali i zabavili. Na časovima salse i argentinskog tanga polaznici su isplesavali samo figure koje su radili na svojim časovima odnosno samo salsu i argentinski tango, a ne i ostale plesove.

Metode obrade podataka

Svi dobijeni rezultati su statistički obrađeni u programu „SPSS 17“ pri čemu su izračunati osnovni statistički parametri za sve varijable i to : Aritmetička sredina (Mean), Standardna devijacija (SD), Minimalna vrednost (Min), Maksimalna vrednost (Max)

Za utvrđivanje normalne distribucije rezultata korišćeni su sledeći koeficijenti: Koeficijent zakrivljenosti (Skewness) i Koeficijent zaobljenosti (Kurtosis)

Za utvrđivanje statistički značajnih razlika između grupa korišćen je t-test za male nezavisne uzorke.

Rezultati istraživanja

Deskriptivni statistički pokazatelji

Tabela 1. Osnovni statistički pokazatelji za salsa grupu

Varijable/Variable	N	Min	Max	AS/Mean	SD	Skjunis/Skew.	Kurtosis/Kurt.
RIT 1	25	8	19	13.72	3.062	-1.28	-.869
RIT 2	25	29	45	36.72	4.392	.342	-.528
RIT 3	25	2	8	4.12	1.563	.639	.280
RIT 4	25	2	6	3.56	1.193	.166	-.949
RIT 5	25	3	12	6.40	2.345	.527	-.300

Na tabeli 1 prikazani su rezultati ispitanika salsa grupe. Dobijene vrednosti pokazuju da nema značajnijih

es included repetition of a particular dance form in the rhythms characteristic for the Argentine Tango (SSSS, SSQQ, QQS, QQQQ).

The main parts of the Salsa and Argentine Tango classes consisted of dance figures which were part of dance curriculum for one dance season, as well as the renewal of all learned dance figures in every 4th and 8th class of the month. The main objective of the main part of the class is the adoption of new dance figures and establishment of new motor habit, reaching a certain level of technique in performing these figures and performing dance figures to the music.

The final parts of the classes consisted of dancing and dance improvisation, meaning subjects had to link dance figures in their own logical order and combine them with the figures that they had already learned in previous classes. The aim of this section is to help subjects to better memorize dance figures and bring them to a certain level of automatization in order to fully enjoy the dance and to psychologically help them to relax and have fun. In the Salsa and Argentine Tango classes subjects danced only figures that they had taught in their classes, and not the other dances.

Methods of data processing

All the results were statistically analyzed in the "SPSS 17" where the basic statistical parameters were calculated for all variables: Arithmetic mean (Mean), Standard deviation (SD), Minimum value (Min), Maximum value (Max)

To determine the normal distribution of the results following coefficients were used: Skewness (Skew) and Kurtosis (Kurt).

For the determination of statistically significant differences between the groups t-test for small independent samples was used.

Results

Descriptive statistics

Table 1. Descriptive parameters and distribution result of the Salsa group

Table 1 shows the results for the Salsa group subjects. The obtained values show that there is no signifi-

odstupanja rezultata od normalne distribucije s obzirom da vrednosti koeficijenta zakrivljenosti ne prelaze 1.00. Rezultati koeficijenta zaobljenosti se kreću ispod normalne vrednosti distribucije od 2.75.

Tabela 2. Osnovni statistički pokazatelji za tango grupu

Varijable/Variable	N	Min	Max	AS/Mean	SD	Skjunis/Skew.	Kurtosis/Kurt.
RIT 1	25	7	18	12.08	2.676	.333	.519
RIT 2	25	27	48	37	4.416	.050	-.711
RIT 3	25	1	7	4.04	1.567	.437	-.875
RIT 4	25	1	6	3.36	1.411	.165	-.676
RIT 5	25	3	11	6.36	2.039	.524	-.244

Na tabeli 2 prikazani su rezultati ispitanika tango grupe. Dobijene vrednosti pokazuju da nema značajnijih odstupanja rezultata od normalne distribucije s obzirom da vrednosti koeficijenta zakrivljenosti ne prelaze 1.00. Rezultati koeficijenta zaobljenosti se kreću ispod normalne vrednosti distribucije 2.75.

Tabela 3. Značajnost razlika aritmetičkih sredina salsa i tango grupe

Varijable/Variable	T – test	p
RIT 1	2.016	**.049**
RIT 2	-2.225	.823
RIT 3	.181	.857
RIT 4	.541	.591
RIT 5	.064	.949

Na tabeli 3 predstavljeni su rezultati t-testa. Analizom razlika aritmetičkih sredina rezultata plesača salse i plesača tanga uviđa se da nema statistički značajne razlike na testovima RIT 2, RIT3, RIT4 i RIT5. Statistički značajna razlika je jedino evidentirana na testu RIT 1 i to na nivou od .049.

Diskusija

Primenom odgovarajućeg plesnog programa u određenom vremenskom periodu može se uticati na poboljšanje koordincije u ritmu, odnosno ritmičnosti koja je zapravo reprezent koordinaciono-ritmičkih sposobnosti. Oreb (1992) je u svom istraživanju, u kojem je primenio plesni program u trajanju od dva semestra, zabeležio pozitivne kvantitativne promene u tranzicionom stanju i finalnom stanju u varijablama za procenu koordinacije u ritmu, dok je Uzunović (2010) primenom dva različita programa modernog sportskog plesa zabeležio promene u koordinaciji. Do sličnih rezultata došla je i Mandarić

cant difference between the results of the normal distribution, since the value of skewness coefficient does not exceed 1.00. Results of kurtosis coefficient range below the normal value distribution of 2.75.

Table 2. Descriptive parameters and distribution result of the Tango group

Table 2 shows results for the Tango group subjects. The obtained values show that there is no significant difference between the results of the normal distribution, since the value of the skewness coefficient does not exceed 1.00. Results of kurtosis coefficient range below the normal value distribution of 2.75.

Table 3. Significance of mean differences between the Salsa and Tango groups

Table 3 presents the t-test results. The analysis of mean differences shows that there are no statistically significant differences on the tests of RIT 2, RIT3, RIT4 and RIT5 between these two groups. A statistically significant difference was only recorded in the test RIT 1, at the level of significance of .049.

Discussion

By applying the appropriate dance curriculum over a certain period of time coordination in rhythm and rhythm, which is actually representative of the coordinating-rhythmic skills can be improved. Oreb (1992) in his study, where he applied dance curriculum for two semesters, recorded positive quantitative changes in the transition and final state of the variables for the evaluation of coordination in rhythm, while Uzunović (2010), using two different programs of the modern Dance Sport, recorded changes in coordination. Similar results were also noticed in the research of Mandarić (1999) who investigated the

(1999) koja je istraživala uticaj nastave plesova na razvoj osećaja za ritam, koordinaciju i frekvenciju pokreta donjih ekstremiteta. Program nastave plesova je uticao na promenu motoričkih sposobnosti koordinacije, brzine i osećaja za ritam.

Evidentno je da primena određenog plesnog programa dovodi do promena u varijablama vezanih za izražavanje ritmičkih struktura, ali stepen promene zavisi i od dužine primene programa, vrste plesa, specifičnosti plesnih treninga i ritmičkih struktura plesova. Iako dosadašnja istraživanja pokazuju da primena plesnog programa može dovesti do poboljšanja motoričke realizacije ritmičkih struktura kod ispitanika, moraju se uzeti u obzir i drugi faktori od kojih će zavisiti njihove promene. To se pre svega odnosi na kognitivne sposobnosti ispitanika, koje su povezane sa motoričkim izražavanjem ritmičkih struktura. Istraživanje Kostić, Popović, Popović i Anastasijević (1987) uvrdilo je postojanje osrednje statistički značajne povezanosti između muzičkih i kognitivnih sposobnosti sa motoričkom realizacijom ritmičkih struktura.Takođe konativne karakteristike kao i bazične muzičke sposobnosti ispitanika su usko povezane sa motoričkim izražavanjem ritmičkih struktura i na osnovu njih je moguće predvideti uspeh u izvođenju određenih plesnih struktura, narodnih, društvenih i džez plesova. (Kostić, 1992; Kostić, 1993; Kostić, 1994; Kostić, Jocić i Uzunović, 1999). Moguće da je upravo zbog razlika u kognitivnim sposobnostima i konativnim karakteristikama, kod nekih ispitanika motoričko izražavanje ritmičkih sposobnosti manje izraženo, ili se manifestuje tek posle duže primene plesnog programa.

Osim ovih varijabli veoma veliku značajnost imaju i koordinacija i koordinacija u ritmu koje su se pokazale kao značajni faktor na osnovu kojih se može predvideti uspeh takmičara u spotskom plesu. One su zajedno sa brzinom frekvencije pokreta varijable koje su najviše doprinele mogućnosti predikcije uspešnosti u latino-američkim i standardnim plesovima i kao takve imaju veoma veliki značaj u selekciji plesača. (Uzunović, 2004; Uzunović, 2009;Uzunović i Kostić, 2005; Uzunović, Kostić, Zagorc,Oreb i Jocić, 2006;Kostić, Uzunović, Oreb, Zagorc i Jocić, 2006, Uzunović, Kostić i Miletić, 2009).

Statistički značajne razlike u motoričkom izražavanju ritmičkih struktura kod plesača društvenih plesova salsa i argentinski tango su utvrđene samo na testu Bubnjanje nogama sedeći na stolici (RIT 1 = .049) dok kod ostalih varijabli nije utvrđena statistički značajna razlika između ispitivanih grupa. Razlog postojanja statistički značajne razlike samo kod varijable RIT1 može biti različitost specifične vrsta treninga salse u odnosu

impact of dance curriculum on the development of a sense of rhythm, coordination and frequency of movement of the lower limbs. Dance curriculum influenced changes in motor skills of coordination, speed and sense of rhythm.

It is evident that the application of dance curriculum leads to changes in variables related to the performance of rhythmic structures, but the degree of change depends on the length of curriculum application, types of dance, specific dance training and rhythmic structure of dance. Although previous studies have shown that the use of dance curriculum can lead to improvements in motor performance of rhythmic structure in subjects, other factors must be taken into account as well, because they too can influence changes in motor performance. This primarily refers to the cognitive abilities of the subjects, which are correlated with motor performance of rhythmic structures. Research of Kostic, Popovic, Popovic and Anastasijević (1987) determined the existence of a moderately significant correlation between music and cognitive skills with motor performance of rhythmic structure. Also conative characteristics, together with the basic musical skills of the subjects are closely related to the motor performance of rhythmic structures and based on them it is possible to predict success in performing some dance structures, national, social and jazz dances. (Kostic, 1992; Kostic, 1993; Kostic, 1994; Kostic, Jocic and Uzunović, 1999). This is possible because of the differences in cognitive and conative characteristics of some subjects, motor performance of rhythmic structures is less pronounced, or it is manifested only after prolonged application of the dance curriculum.

In addition to these variables, coordination and coordination in rhythm have large significance, and they are proved to be significant factor by which one can predict the success of competitors in the Sports dance. Along with the frequency of movement they are the variables contributing most to the prediction of success in the Latin-American and ballroom dances and as such have very important role in the selection of dancers. (Uzunović 2004; Uzunović 2009; Uzunović and Kostic, 2005; Uzunović, Kostic, Zagorc, Oreb and Jocic, 2006; Kostic, Uzunović, Oreb, and Zagorc Jocic, 2006 Uzunović, Kostic and Miletic, 2009).

Statistically significant differences in motor performance of rhythmic structures with dancers of social dances Salsa and Argentine Tango were determined only on a Feet drumming while sitting on a chair test (RIT 1 = .049), whereas for other variables, there were no significant differences between the groups. Reason for the existence of statistically significant differences only for the variable RIT1 can be ascribed to a variety of specific types of Salsa

na argentinski tango. Salsa i argentinski tango su plesovi koji se odlikuju improvizacijom koja podrazumeva da se ples ne igra na unapred pripremljenu koreografiju već se figure povezuju u jednu plesnu celinu u toku plesa. Ove figure plesači treba da izvode u ritmu muzike, odgovarajućeg tempa, pri čemu plesači prate muzičke promene koje se dešavaju u toku pesme i uskladjuju ih sa svojim plesom. Sastavni delovi treninga salse i argentinskog tanga predstavljaju specifične ritmičke vežbe koje plesačima pomažu da muzičke akcente i specifične ritmičke strukture izraze svojim plesnim koracima. Za razliku od argentinskog tanga gde se figure uvek igraju u paru i interpretacija muzike se vrši u paru, u salsi se interpetacija muzike može vršiti i odvojeno od partnera. Interpretacija muzike u Salsi se mahom zasniva na izražavanju ritmičkih struktura nogama pa se upravo zbog toga posebna pažnja na treninzima posvećuje učenju jednostavnijih i složenijih plesnih struktura koje se intepretiraju u različitim muzičkim ritmovima. Plesnim programom koji su autori primenjivali predviđen je određeni fond časova u salsi gde se radi isključivo na izražavanju ritmičkih struktura nogama (Footwork), dok je u argentinskom tangu više pažnje posvećeno parovnom delu i vođenju partnerke koje se vrši rotacijama grudnog koša i pomeranjem tela u prostoru. S obzirom da u toku plesa partneri moraju da razmišljaju o vođenju partnerke i o figurama koje plešu, veći deo pažnje plesača je usmeren upravo na to, dok je muzička interpretacija u drugom planu. Takođe zbog karakteristika plesnog hvata koji je u argentinskom tangu malo prisniji i zatvoreniji, plesačice nemaju toliko slobode u muzičkoj interpretaciji pa su samim tim usmerene više na praćenje partnera uz povremene trenutke pauze kada im partner dozvoljava da interpretiraju muziku plesnim ukrasima. Upravo zbog toga što se u salsi više posvećuje pažnja ritmičkoj interpretaciji nogama i pritom se to radi kao zasebna celina na času, kao i razlike u plesnom hvatu koji u salsi dozvoljava više slobode kretanja i pokreta, možemo pretpostaviti da je to i glavni faktor koji je uticao na postojanje statistički značajne razlike u varijabli RIT1, dok kod ostalih varijabli nije bilo statistički značajne razlike zbog mogućih sličnih efekata koji specifični trening Argentinskog tanga ima na ritmičke sposobnosti.

Na osnovu dobijenih rezultata iz ovog istraživanja se ne može zaključiti da li specifičan trening salse i argentinskog tanga ima efekat na poboljšanje ritmičkih sposobnosti plesača i u kojoj meri, i s toga autori preporučuju primenu dugotrajnog eksperimentalnog programa kako bi se došlo do podrobnijih zaključaka. Dodatna

training in relation to the Argentine Tango. Salsa and Argentine Tango are dances characterized by improvisation, which means that dance is not performed to the prepared choreography but rather linking the figures together in one whole dance during one song. These dance figures dancers must perform to the music, at appropriate pace, while they are following the music changes occurring during the song and harmonizing them with their dance. Integral parts of training Salsa and Tango are specific rhythmic exercises that help dancers to express musical accents and specific rhythmic structures with dance steps. Unlike Tango, where a figure is danced in pairs and interpretation of the music is done in pairs, in Salsa, music interpretation can be done separately from a partner. Interpretation of Salsa music is mainly based on the dancing of some rhythmic structures with feet, and that is why special attention in some classes is paid to teaching simple and complex dance structures interpreted in a variety of musical rhythms. Dance curriculum applied by the authors consisted of certain number of classes in Salsa, where the performance of rhythmic structures were done only with feet (Footwork), while in the Argentine Tango classes more attention was dedicated to couple dancing and leading the partner performed by the rotation of chest and moving the body in space. Given that during dancing partners need to think about leading the partners and figures they are performing, most of their attention is focused just on that and musical interpretation is sidetracked. Also, due to the characteristics of the embrace (dance hold) in the Argentine Tango where partners are little closer to each other, female dancers do not have so much freedom in musical interpretation, therefore they are more focused on following the partner, with occasional moments of pauses when their partner allows them to interpret the music with some dance embellishments. Just because in Salsa more attention is paid to the rhythmic interpretation of music with feet, and because it is done as a separate lesson, as well as due to the differences in holds where Salsa allows more freedom of movement and motion, it can be assumed that this is the main factor influencing the existence of statistically significant differences in the variable RIT1, while other variables do not have statistically significant differences due to possible similar effects that specific training of Argentine Tango has on the rhythmic abilities.

Based on the results of this study it cannot be established whether a specific training of Salsa and Argentine Tango improves rhythmic abilities of dancers and to what extent, therefore the authors recommend application of a long-term experimental program to draw more detailed conclusions. Additional research is needed to answer that

istraživanja bi trebala dati odgovor na to pitanje kao i na to da li uspeh u izvođenju tih plesova zavisi od ritmičkih sposobnosti plesača.

Zaključak

Istraživanje je sprovedeno na uzorku od 50 ispitanika uzrasta od 19-25 godina podeljenih na dva subuzorka (salsa grupa i grupa argentinski tango) pri čemu je primenjeno 5 testova za procenu motoričkog izražavanja ritmičkih struktura. Cilj istraživanja je bio da se utvrde razlike u motoričkom izražavanju ritmičkih struktura kod plesača društvenog plesa salsa i argentinskog tanga. Za utvrđivanje razlika između subuzoraka primenjen je T-test za male nezavisne uzorke. Rezultati su pokazali da plesači salse imaju bolju sposobnost izražavanja ritmičkih struktura nogama, dok u ostalim varijablama nije utvrđena statistički značajna razlika.

Izjava autora
Autori pridonijeli jednako.

Konflikt interesa
Mi izjavljujemo da nemamo konflikt interesa.

question and also to clarify whether the success in performing these dances depends on the rhythmic abilities of dancers.

Conclusion

The survey was conducted on a sample of 50 subjects aged 19-25 years divided into two subgroups (the Salsa group and the Argentine Tango group) where 5 tests of the motor performance of rhythmic structure were applied. The aim of this study was to determine the differences in motor performance of rhythmic structures between dancers of social dances Salsa and Tango. In order to determine the difference between subsamples, t-test for small independent samples was used. The results showed that Salsa dancers have better ability to express rhythmic structure with feet, while in other variables there were no statistically significant differences.

Authorship statement
The authors have contributed equally.

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We declare that we have no confl icts of interest.

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Социолошки приступ и научно посредовање у спорту

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Резиме: Са социолошког становишта, поготово у ситуацијама кад се живот повлачи на све ужи понтон око кога хуманист треба да се бори у „води до кољена“, идеја да се наука и на подручју спорта примијени у хуманитарне сврхе добија све више присталица. Наглашавању овакве оријентације допринијело је сазнање и околност да је наука доведена у ситуацију да недостојно служи туђем користољубљу, да се претвара у средство против хуманитета и вриједности и да се све више преобраћа у увјежбаност, некритичну послушност и институционалну моћ. У односу на раније, традиционално схватање спорта, чини се да је потребно рећи шта се подразумјева под савременим спортом. У питању је један еластични епитет који више говори о ономе ко га употребљава, него о појави о којој је ријеч. Зато би увијек требало разграничити о којој врсти спорта се говори, шта се подразумијева под спортом итд. Социлогија у својим анализама узима у обзир ове специфичности покушавајући да одговори на питања зашто је спорт тако популаран. Као начин призводње друштвеног живота, спорт производи побједнике и поражене, а све то произлази из репродукције супарништва и такмичарског духа. Он поприма одређене садржаје, карактер, правце и вриједности у зависности од конкретно историјских услова, структуре друштва у чијим се оквирима развија. Спортска такмичења, на различите начине, изражавају вриједности и односе који реално постоје у друштву и међу људима.

Кључне ријечи: спорт, социолошки приступ, научно посредовање, друштво, такмичење.

Увод

Сужавања подручја игре и губљење играчког елемената јесте највећа замка и загонетка у спорту и садржана је у питању: Јесу ли спортисти они који се, тек с времена на вријеме презирући сваки напор, препуштају некој игри на отвореном, они који се баве њиме само ако су приморани, или они који су само посматрачи?

Најприје се морамо запитати да ли је спорт благослов или проклетство, трагикомедија или драма,

Sociological Approach and Scientific Mediation in Sports

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Summary: From a sociological point of view, especially in situations when life pulls in all the narrow pontoon around which humanist should fight the “leading up to the knee,” the idea that science in the field of sports should be applied for the humanitarian purposes gets more and more supporters. Highlighting this orientation has contributed to the knowledge and the fact that science has brought the situation to serve other unworthy greed, it turns into a tool against humanity and values that increasingly transform the level of training, uncritical obedience and institutional power. Compared to before, the traditional understanding of sport, it seems that it is necessary to say what is meant by the modern sport. It is a flexible label that says more about who is using it, than it does about the phenomenon in the question. Therefore, it should always distinguish what kind of sport it is about, what is meant by the sports and so on. Sociology in our analysis takes into account the specifics of trying to answer the question of why the sport is so popular. It is understood as a method of production of social life, sport products, winners and losers, and all that comes from playing, rivalry and competitive spirit. It takes a certain content, character, direction and values, depending on the specific historical conditions, the structure of society in whose framework it develops. Sports competitions in various ways, express the values and relationships that actually exist in society and mankind.

Keywords: sport, sociological approach, a scientific commission, company, competition.

Introduction

Narrowing the field of play and losing of the gaming elements is the biggest trap and riddle in the sport and is contained in the question: Are the athletes that they are, just from time to time despising every effort, giving in to a game in the open, those who deal with it if they are forced, or those who are just observers?

First, we must ask whether the sport is a blessing or a curse, a tragic comedy or drama, prestige and performance for mass, athletes and heroes or victims.

престиж или представа за масе, а спортисти хероји или жртве. Експерти, научници, спортски менаџери, спортисти, предагози, социолози, психолози у други учесници у спорту имају различита гледишта.

Неопходно је извршити одређену редефиницију неких циљева спорта и чак једно сематичко преструктуирање појма спорта. Спорт је безкомпромисна борба за побједу, за рекорд – говоре спортисти додајући при том да је то, коначно борба за част земље која се представља. Спорт није само такмичење него и систематска припрема (тренинг), својеврсни начин живота подређен достигнућима спорта – говоре тренери. Спорт – то је публика, маса која ишчекује драму, неизвјесност исхода борбе између супарника – говори публика. Спорт је средство задовољавања потреба у спортској борби, могућност да се реализују и испоље агресивни инстикти, да се испусти вишак енергије и негативних емоција – мишљења социлога и социјалних психолога.

Данас се за спорт, кроз праћење и навијање, занима више од половине човјечанства на земаљској кугли. Међу онима који се интересују налазе се људи различитог пола, узраста, културног и интелектуалног нивоа, различитих политичких и религиозних убјеђења итд. Одговорити на питање, зашто је спорт тако полпуларан представља анализу мнобројних функција које он данас поприма и потребе које задовољава (средство физичког усавршавања, али и задовољавања државног престижа, средство рекламе, простор слободног времена итд.).

Социолошко одређење спорта

Дуго је проблематика спорта и спортске праксе била „запуштена“ и теоријски необрађена. У дефинисању се полазило од најразноврснијих критеријума. Тај распон кретао се од одређења спорта као шале, забаве, игре, „култа интензивног мишићног напора“, борбе, страсти, нагона, па све до схватања спорта као институционалне сфере, која се уобличила са настанком индустријско – урбанистичке цивилизације, гдје спорт постаје најразвијенији институционални облик физичке активности.

Постоје многобројне дефиниције спорта, најчешће противрјечне и парадоксалне. Томе нарочито доприноси неодређени појам „спортска игра“ и тврдње да је спорт игра. Једна група истраживача истиче да је спорт борба човјека са самим собом, другим човјеком и природним препрекама (силама природе). Други наглашавају да је спорт васпитна друштвена институција прожета игром, а чији је циљ физичко и ду-

Experts, scientists, sports managers, athletes, sociologists, psychologists, other participants in the sport have different views.

It is necessary to make certain redefinition of some of the objectives of sport and even a semantic notion of restructuring the sport. Sport is uncompromising fight to win, for the record - mostly athletes, adding at the same time that it finally fight for the honor of the country that it represents. Sport is not only a competition but also a systematic preparation (training), a kind of way of life that is subordinated to the achievements of sport - mostly coaches. Sport - to the audience, the crowd that waits for the drama, suspense outcome of the struggle between the rival - speaking audience. Sport is a means of meeting the needs of combat sports, the ability to realize and express their aggressive instincts, to drain excess energy and negative emotions - reviews of sociology and social psychologists.

Today, in the sport, through the monitoring and winding, more than half of humanity on Earth is interested in. Among those who are interested, there are people of different gender, age, cultural and intellectual level, different political and religious beliefs and so on. To answer the question, why the sport is so popular represents the analysis of many functions that takes on today and that meets the needs (physical training tool, but also meeting the state prestige, advertising agent, area of leisure time, etc…).

Sociological determination of sports

Long the issue of sport and sports practice was “abandoned” and theoretically unprocessed. In defining it, the starting point was the most diverse criteria. The range was from the definition of sport as a joke, fun, games, “the cult of intense muscular effort,” struggle, passion, drive, and all the understanding of sport as an institutional sphere, which shaped the emergence of industrial - urban civilization, where the sport is becoming the most developed institutionalized form of physical activity.

There are many definitions of sport, usually contradictory and paradoxical. That particularly contributes to an indefinite term “sports game” and claims that it is a sport game. One group of researchers pointed out that the sport is a struggle of man with himself, another man and natural barriers (forces of nature). Others point out that sport is an educational social institution imbued with the game, and for physical and spiritual development of personality. The third define sport as rational activity, the totality of achievement in a particular area

ховно усавршавање личности. Трећи спорт посматрају као рационалну дјелатност, свеукупност достигнућа у одређеном подручју друштвеног живота и сл.

Феномен спорта, привукао је пажњу многих мислиоца. Они су покушали у социолошким термина објаснити бар неке аспекте те појаве. Тако је Спенсер у спорту прије свега видио лични механизам апсорпције и трошења вишкова животних енергија људи. Мекдагл је спорт посматрао као облик изражавања једног од темељнијих људских нагона, укорињеног у структури људске свијести, тј. нагона супарништва. Други тврде да је спорт у условима савременог друштва прије свега друштвено условљен и одобрен начин изражавања и задовољавања потребе развијања физичке снаге и способности људи, које се иначе све више потискују и ограничавају у савременом индустријализованим свијету.[1]

Свака темељнија и цјеловитија социолошка перцепција и аналитика спорта, мора имати у виду чињеницу да спорт (као и други друштвени феномени) представља једно живо и динамично подручје које се развија и мјења, односно доживљава мање или веће промјене. Социолошко одређење спорта представља један од фундаменталних критеријума у ваљаном просуђивању спортске праксе и њених развојних тенденција.[2]

Спорт је друштвена појава, која по много чему постаје уносна дјелатност и то не само за извођаче (врхунске спортисте), већ и за све остале који га окружују. Он паралелно постаје и облик друштвене девијације, али на парадоксалан начин друштвено прихваћене.

Спорт као игра

Игра се схвата као дјелатност која подразумјева задовољство и остваривање суштине човјека. Одређење спорта помоћу игре значи да се пажња не усредсређује на објективне параметре, него на субјективне моменте који су повезани са процесом спорта. Може се рећи да се спорт не одређује кроз оно што значи за публику него кроз оно шта значи за спортисте, појединце који се активно баве спортом. Може се закључити: спорт се не може одредити кроз игру као неку непродуктивну дјелатност зато што се оквирима таквог одређења покушавају супроставити различите ствари – постојећа објективирана друштвена дјелатност са субјективним смислом који та дјелатност поприма у одређеној ситуацији. За спортисту спорт

[1] Врцан, С. *Спорт и насиље данас у нас*. Напријед, Загреб (1990). стр. 13

[2] Радош, Ј. *Филозофија спорта*. Каирос, Сремски Карловци (2010). стр. 70

of social life and so on.

The phenomenon of sport has attracted the attention of many thinkers. They tried to explain in the sociological term at least some aspects of this phenomenon. That is how Spenser in sport, primarily, saw personal mechanism of absorption and spending of surplus of vital energies of people. Mekdagl observed the sport as a form of expression of one of the more fundamental human impulse, rooted in the structure of human consciousness, i.e. impulse of rivalry. Others argue that the sport in contemporary society is primarily socially conditioned and approved way of expressing and serving the needs of developing physical strength and people skills, which are normally more suppressed and limited in the modern industrialized world.

Any thorough and more comprehensive sociological perception and analytics sport, must take into account the fact that the sport (as well as other social phenomena) is a lively and dynamic area that is evolving and changing, and experiencing minor or major changes. The sociological definition of sport is one of the fundamental criteria for a valid judgment of sports practice and its development trend.

Sport is a social phenomenon, which in many ways is becoming a lucrative business not only for the performers (athletes), but for all others who surround it. It simultaneously becomes a form of social deviation, but in a paradoxical way socially acceptable.

Sport as a game

The game is seen as an activity that involves pleasure and the realization of the essence of man. Definition of sport with the game means that the attention is not focused on objective parameters, rather than on subjective elements which were linked to the sport. It can be said that the sport is not determined by what it means for the audience but through what it means for the athletes, individuals who are actively involved in sports. It can be concluded: sport cannot be determined through the game as a non-productive activity because within such determinations it is being tried to confront a variety of things - existing objectified social activity with a subjective sense that this activity takes on a particular situation. For athletes sport is not a game, not a preparation for life; For them, the sport is life. Top sport is a passion, drama, stress, and productive activity. Elements of the toy business, sport is lost its foundation. In today's time define the sport with the game, it seems, as the attempt which does not lead to consideration of its essence.

није игра, није припрема за живот; за њега је спорт живот. Врхунски спорт је страст, драма, стрес, али и производна дјелатност. Елементе играчке дјелатности, спорт је изгубио као свој темељ. У данашњем времену дефинисати спорт помоћу игре, чини се, да је покушај који не води сагледавању његове суштине.

Спорт као физичко вјежбање

Физичко вјежбање (физичка активност) се често узима као суштинска одредница спорта. Не треба заборавити да спорт и физичко вјежбање имају различито упориште. Физичко вјежбање проистекло је, прије свега, из радне дјелатности, као дјелатност која се искључиво користи за васпитне циљеве. Спорт своје почетке и своје начело заснива на имитацији основних кинезиолошких радњи на обрасцу култа, иницијацији и најранијим светковинама. Не може се прихватити да је физичко вјежбање одлучујући квалитет у дефиницији спорта; па има мишљења да га је могуће изоставити као одредницу спорта. Физички напор и вјежбање у дефинисању спорта не може бити значајна детерминанта за његову типолошку специфичност, јер и друге дјелатности (привредне, војне) претпостављају наведене карактеристике.

Спорт као васпитна дјелатност

Друштво организује активности да би појединца припремало за друге дјелатности. Спорту се придаје значајно мјесто у тим процесима. Васпитање значи његовање, гајење, то је цјелокупност утицаја свих друштвених институција и социјаних група на формирање личности. Друштво користи спорт као средство васпитања човјека – конкретније физичко васпитање. Физичко и духовно усавршавање као активност сама по себи, није одлика, спортске дјелатности. Савремени спорт и његов развој свједоче да се физичко савршенство занемарује и редукује у корист огољеног резултата.

Спорт као такмичарска дјелатност

Најкарактеристичнија специфичност савременог спорта је такмичење. Спорт производи побједнике и побјеђене. Уколико би изгубио такмичарски смисао, спорт би, у ствари, негирао своју темељну карактеристику. Језгро врхунског спорта представља хијерархизовани систем такмичења. Спорт најчешће подразумјева извјестан период стицања вјештина, умијећа, снаге, издржљивости, окретности, умјешности, смијелости, што може ићи до ризика. Спорт је махом укључивао и побједничко афирмисање над противником, самим собом, временом, простором итд.

Sport as physical exercise

Physical exercise (physical activity) is often taken as the essential element of sports. We should not forget that sport and physical exercise have a different footing. Physical exercise has come primarily from operating activities, an activity that is used solely for educational purposes. Sport its beginnings and its principle based on imitation of basic kinesiology actions on the form of the cult, initiation and the earliest celebrations. Unable to accept that physical exercise is decisive quality in the definition of sport; and is of the opinion that it is possible to omit a determinant of sports. Physical exertion and exercise in defining sports can be an important determinant of its typological specificity, as well as other activities (economic, military) assume the following characteristics.

Sport as an educational activity

The company organizes activities in order to prepare individuals for other activities. Sport is given an important place in this process. Education means the cultivation, growing it, the totality of the impact of social institutions and social group on the formation of personality. The Company uses sport as a means of educating a man - specifically physical education. Physical and spiritual development is an activity in itself, not to feature sports activities. Modern sport and its development witnessed that physical perfection is ignored and reduced in favor of bare results.

Sport as a competitive activity

The most characteristic specificity of modern sport is a competition. Sport produces winners and the conquered. If we lose the meaning of competitive, sport would, in fact, deny its fundamental characteristics. The core of professional sport is a hierarchical system of competition. Sport usually involves a certain period of acquisition of skills, skills, strength, endurance, agility, assuming risks. Sport is mainly included in the affirmation of winning over the opponent, yourself, time, space, and so on.

Scientific and mediation in Sport

Science is a coherent system of knowledge of objective reality which is primarily a function of meeting the specific needs and solving practical problems. It often does not show its use; that wisdom lies beyond, and is provided by observation. It is a common observation that science is more “penetrating” the sport. Here we have in mind the so-called Applied Sciences; its “bare”

Научно посредовање и спорт

Наука је кохерентни систем знања о објективној стварности који је, прије свега, у функцији задовољавања одређених потреба и рјешавања практичних проблема. Она често не показује своју употребу; та мудрост лежи изван ње, а добија се посматрањем. Уобичајена је констатација да наука све више „продире“ у спорт. Овдје се има у виду тзв. примјењена наука; њена „огољена“ примјењеност може довести (и доводи) до опасног заборава да се наука заснива на људским вриједностима, тј. да је и сама одређени систем вриједности.

Наука није вриједносно неутрална; научник је свјестан да у вриједносна становишта улазе заједничке основне вриједности наше културе, као што су нпр. поштење, хуманост, поштовање јединки, социјалне службе, демократско поштовање права јединке да сама доноси одлуке макар оне биле погрешне, очување живота и здравља, ублажавање бола, одавање признања кад признање треба одати, спортско понашање, „честитост“ итд.[3]

Разумљиво је да су „објективност“ и „непристрасно посматрање“ фразе које треба поново дефинисати. Подјела рада и ужа специјализација утицале су на науку да се све више вриједносно ангажује, да све више постаје позитивистичка и да се бави истраживањем циљева које су други дефинисали.

Уски оквири струке успјели су да опасно спутају интересовање научника, да их учине индиферентним према свим друштвеним циљевима, створивши тако читав слој малограђана који своју вјештину продају оном ко више понуди. С друге стране, наука не успијева да понуди поуздан одговор о судбини сопствених достигнућа, о правцима њихових отијелотворења; она, другим ријечима, не успјева да назре тренутак у коме њена жељена употреба постаје злоупотреба, тренутак у коме процес њене употребе постаје реверзибилан. Не треба заборавити да је наука једно од средстава сазнавања природне и друштвене стварности. Она је повезана са подјелом рада која изискује различите врсте људи, различите укусе, различите моћи и умјећа. Постоји неколико важних принципа науке који се манифестују на свим подручјима истраживања:

- не смије постојати једнодимензионални и монистички притисак, јер је то стварна опасност за науку; просто речено, научници разних профила потребни су једни другима, без обзира што имају различите приступе и афинитете;

can lead (and leads) to hazardous forgetting that science is based on human values. That is a certain value system.

Science is not value-neutral; scientist is aware that the point of the securities included common core values of our culture, such as. honesty, humanity, respect for individuals, social services, democratic respect for the rights of individuals to make their own decisions even if they are wrong, the preservation of life and health, relieve pain, acknowledging your note should be made, sportsmanship, “honesty” and so on.

It is understood that the “objective” and “unbiased observation” phrases should be redefined. Division of labor and sub-specialization influenced the science that is increasingly engaged in values, that is increasingly becoming a positivist and examines the goals that others have defined.

The narrow frames of the profession have managed to restrain dangerous interest of scientists, to make them indifferent to all social goals, thus creating a layer of parvenus who sell their skills to the highest offer. On the other hand, science fails to provide a reliable answer about the fate of their own achievements, their directions; it, in other words, fails to glimpse a moment in which its intended use becomes abuse, the moment in which the process of its use becomes reversible. We should not forget that science is one of the means of knowing the natural and social reality. It is associated with the division of labor that requires different types of people, different tastes, different powers and the art. There are several important principles of science, which are manifested in all areas of research:

- must not exist one-dimensional and monistic pressure, because it is a real danger to science; simply put, scientists of various profiles need each other, no matter what are the different approaches and preferences;
- Science in its broadest sense allows differences in preferences; these differences perceive science as a symphony, a bare one-dimensional is converted into monotony and exclusivity;
- For science there is a great danger to the segment of reality that is being studied, subjectivity it applies, prejudices, interests and expectations; physicist, biologist, sociologist, psychologist, by virtue of their choice, according to substantially differ in important points of consideration of the same problem;
- It is reasonable to expect that science should be defined differently, its methods, goals and values;

Human integrity of scientists, the power of the

[3] Cox, R.H. *Sport psychology: concepts and applications*. McGraw Hill (2002). стр. 91

• науку у њеном најширем смислу омогућују разлике у афинитетима; те разлике сагледавају науку као симфонију, а огољена једнодимензионалност је претвара у монотонију и искључивост;

• за науку је велика опасност да се на сегмент стварности који се изучава пројектују сопствени укуси, предрасуде, интереси и очекивања; физичар, биолог, социолог, психолог, већ самим својим избором, показују да се суштински разликују у важним тачкама сагледавања истог проблема;

• оправдано је очекивати да различито дефинишу науку, њен метод, циљеве и вриједности;[4]

Људски интегритет научника, снага моралног чина, стваралачка аутономија, требало би да створе простор у коме би научник могао да се одупре свакоме ко жели да га злоупотреби, тј. да га оријентише према нежељеним вриједностима, према моралној неосјетљивости. Сви ови захтјеви не могу се посматрати независно од друштвеног контекста, конкретних друштвених односа, начина производње, живота, хегемоније и доминације у одређеном друштву.

Данас се у спорту говори о људима израђеним по наруџбини; питање је да ли је то само морални преступ науке или њена некритичка примјена која није могла да узмакне духу профита, да од врхунског спортисте створи машину која ће стално побиједивати и која ће бити везана за систем. Ако наука не зна за границе сопствене неупотребљивости и примјене, ризикује да се искористи за циљеве, а научник који не контролише своју стваралачку моћ може лако да се људски и стваралачки изгуби у њој. И сувише се често превиђа да су први теоретичари науке наглашавали да она мора дјеловати у складу са основним хуманистичким визијама.

Спорт је у основи контролисана агресија. То је посебно карактеристично за колективне спортове, гдје се екипе све више организују по систему војних формација. Ипак, спорт и поред свих тих бесомучних ударања током утакмица се може назвати борбом, али никако ратом. Спорт се чини рјешењем за многе неспоразуме у друштву, али и у подродици. Најзад, спорт је питање престижа саме личности. Без обзира на сва искушења, спорт постаје и питање државе и друштвених система.[5]

За савремени тренутак то је од посебног значаја, јер научна етика прожима све области људске свакодневице. Расправе о научним проблемима на подручју

[4] Жугић, З. *Увод у социологију спорта*. Свеучилиште у Загребу, Загреб (1996). стр. 190-191

[5] Стојковић, С. *Убија ли спорт*. Филип Вишњић, Београд (1989). стр. 17

moral act, creative autonomy, a space should be created in which a scientist could not resist anyone who wants to abuse, i.e. to be oriented toward unwanted values, according to the moral insensitivity. All these requirements cannot be considered independently of the social context of specific social relations, modes of production, life, hegemony and dominance in a particular society.

Today, the sport is about people made to order; the question is whether this is only a moral offense of science or its uncritical application that could not retreat spirit of profit, to the top athletes as a machine that will constantly winning and that will be attached to the system. If science does not know the limits of its own uselessness and applications, risk used for the objectives, a scientist who does not control his creative power can easily be human and creatively be lost in it. I too often overlooked that the first theorists of science emphasized that it must act in accordance with the basic humanistic vision.

Sport is basically controlled aggression. This is particularly the case for team sports, where the teams are increasingly organized according to the system of military formations. However, sport in spite of all these, possessed people hitting during games can be called a battle, but not war. Sport appears to be a solution to many misunderstandings in society, but also in family. Finally, sport is a matter of prestige of figures. Despite all the temptations, sport becomes a question of state and social systems.

In recent times it is of particular importance, because the scientific ethic pervades all areas of everyday human life. Discussions of scientific problems in the field of sport must be based on the human being as a whole, its needs and value orientations. The sudden development of science and its application in sport show how it aims to:

• serve the purpose of achieving top results, winning medals;

• allow athletes to submit and survive the efforts to which their bodies are exposed;

• athletes wishing injury that could hinder them in achieving the expected results.

Science is, in short, instrumental and focused on results. Understanding and determination of the science of the sport only in terms of efficiency cannot ignore its humanistic dimension in the fight against the abuse of sport and athletes.

It has not been sufficiently brought into question that the entire system of relations is built of one's own

спорта морају полазити од човјека као цјеловитог бића, његових потреба и вриједносних оријентација. Нагли развој науке и њена примјена у спорту показују како она има за циљ да:

- буде у функцији постизање врхунских резултата, побједа освајањем медаља;
- да омогући спортисти да поднесе и преживи напоре којима је његов организам изложен;
- да жалећи повреде спортисте које могу да га омету у постизању очекиваних резултата.

Наука је, укратко, инструментализована и усмјерена ка резултату. Схватање и одређивање науке о спорту само са аспекта ефикасности може занемарити њену хуманистичку димензију у борби против злоупотребе спорта и спортиста.

Она још није у довољној мјери довела у сумњу тај комплетан систем односа, није изградила ни један сопствени критеријум одређивања граница могућности људског организма, граница резултата који се постижу људским напором, имајући у виду све оне аномалије које при одређеним напорима настају и које могу бити извор сталних здравствених проблема спортисте у току и послије завршене каријере.

Умјесто да устане против препарата, анаболика свих врста, наука се бави проблемом како да се ови препарати боље растворе у организму, како да се повећа њихово дејство, а да, истовремено, измакну допинг – контроли која је установљена да би, за јавност, све било „регуларно“.

Оваква организација науке имала је за посљедицу да она у своју организациону структуру интегрише биологију, психологију и медицину спорта, док социологију, као критику злоупотребе спорта, дуго времена није уважавала. Нагли развој науке на пољу спорта, које је заиста непрегледно, створио је велики раскорак између научних открића и оних који то треба да примјене у пракси.

Такмичарски спорт уопште, не само професионални него и полупрофесионални, па донекле и аматерски, одступа у различитим елементима од првих својстава игре као спонтано креативне самодјелатности.[6]

Тренери су све више „бомбардовани” великим бројем неповезаних информација, разноликих и специфичних, које не могу да синтетизују и примјене у својој практичној дјелатности. Истовремено они нису вјешти у коришћењу научних података, свјесни су само тога да им треба права, тачна, благовремена, практична информација коју могу примјенити у тре-

criteria for determining the limit possibilities of the human body, the limit results that are achieved by human effort, bearing in mind all those anomalies that occur in some effort and that can be a source of permanent health problems in athletes during and after the completion of their career.

Rather than stand up against preparations, anabolic of all kinds, science deals with the problem of how to get these products be better solutions for the body, how to increase their influence, and, at the same time, get out doping – for which control has been established that, for the public, all considered “regular”.

This kind of organization of science has had the consequence that those who in their organizational structure integrate biology, psychology and sports medicine, and sociology, as well as criticism of abuse of sport for a long time, failed to acknowledge. The sudden development of science in the field of sports, which is really messy, has created a large gap between scientific discoveries and those which need to be applied in practice.

Competitive sport in general, not only professional but also semi-professional, is amateur and somewhat deviates in various elements from the first game properties as spontaneous creative activity.

Coaches are more “bombed” with a large number of unrelated information, diverse and specific, that they cannot synthesize and use in their practical activities. At the same time they are not skilled in the use of scientific data, they are aware only that they have the right, correct, timely, practical information that can be applied in the training process. Now there is a problem of the systematization and use of what was other already found (in physiology, biochemistry, psychology, sports) but in the search for a new one.

Errors in training are often a result of ignorance of still quite basic biological principles. With the lack of biological factors, other factors should be emphasized (psychological, educational, social). Science, the one about the sport, must be in the service of emancipation, starting and operation of a new understanding of physical and sports education.

The ethics of scientists, whose consciousness is most active in the world today, comes to the fore. It is dangerous now that the background of our lives, discoveries in medicine, mental health, psychology, and sociology changed in ways that have the greatest impact on the relations between human beings. Our habits, especially our habits of thought are deeply changed.

In every field of human activity and ways of life, from economics to sports, it is important to learn how to

[6] Божовић, Р. *Социологија и спорт*. Универзитет Црне Горе, Подгорица (2009). стр. 82

нажном процесу. Сада проблем постоји више у систематизовању и коришћењу онога што је већ изнађено (у физиологији, биохемији, психологији спорта) него у тражењу новог.

Грешке у тренингу често су још увијек посљедица непознавања сасвим основних биолошких законитости. Уз непознавање биолошких чинилаца, треба истаћи и друге (психолошке, педагошке, социолошке). Наука, па и она о спорту, мора бити у служби еманципације, функцији новог започињања и разумјевања физичког и спортског образовања.

Етика научника, чија је свијест најактивнија у данашњем свијету, долази до пуног изражаја. То је најопасније сада кад се позадина наших живота, открићима у медицини, менталном здрављу, психологији и социологији мјења на начине који највише утичу на односе између људских бића. Наше навике, посебно наше навике мишљења дубоко се мјењају.[7]

У сваком подручју људске дјелатности и начина живота, од економије па до спорта, учимо како да правилно процијенимо дјеловање других, само ако између осталог разумијемо њихове мотиве. Научна достигнућа у спортској пракси морају се разумијевати и вриједновати. Увођење научних резултата у спортску праксу могуће је само тјесном узајамном везом научних истраживања и праксе, јер улажење у праксу научног резултата није мање сложен задатак од његовог добијања кроз научна истраживања, при чему се откривене чињенице не смију бркати са активношћу која их открива. Њихова примјена ствар је савјести и људског хуманизма.

Социолошки приступ спорту

свака људска дјелатност има за циљ задовољавања одређене потребе. У друштву приватне својине и робне производње и спорт постаје капитал, односно, професионализује се, поприма комерцијалне наносе и ту се морају сви устроити и прилагодити у будућности.

Тражећи одговоре на постављање питања, социолози констатују да се привлачност спорта огледа у сљедећем:

- Спорт као физичка активност је плодотворан због развоја индививуалних физичких снага и као такав привлачан је за цјелокупну популацију, посебно за младе људе;
- Као игра и забава, спорт испуњава слободно вријеме младих, ствара задовољство и подиже радост живљења;

properly judge the performance of others, if among other things, understand their motives. Scientific achievements in sports practice must be understood and valued.

Sociological approach to Sports

Every human activity aims at meeting the specific needs. In a society of private property and commodity production, the sport too becomes capital and acquires commercial cause and for that reason all should adapt in the future.

Searching for answers to questions, sociologists recognize that the attraction of sport is reflected in the following:

- Sport as physical activity is fruitful for the development of individual physical strength and, as such, is appealing to the whole population, especially for young people;
- The fun and games, sport meets youth leisure, creating pleasure and joy of living increases;
- Sport is an activity that is tested and confirmed by our own opportunities, facing new challenges and adventures of life. It is a kind of laboratory experiment with new life experiences;
- Sport is voluntary and non-inciting socializing; it achieves specific team individuality and togetherness (willingness to cooperate, the ability to sacrifice);
- For some individuals and groups, sport is attractive as a business, profession, and trade that got its important place in the social division of labor;
- Sport attracts young as business and form of business that makes a significant and sometimes above-average income; function of sport manifests itself in the status consumption;
- Sport as a spectacle attracts a large number of people; thanks to the spectacle that is consumed like any other commodity, has developed sports tourism as a new "traveling mankind";
- Sport attracts young people because of their ritual, which is repeated in sports arenas, producing its heroes and victims;
- Sport is a form of verbal communication through which one can send and receive messages (symbols, movements, body language, facial expression, etc.)
- Sport is the channel of social mobility and recognition; becomes even more important when other institutional channels are closed for social promotion of youth;
- Sport creates its own idols, stars of sport with which many identify; produced idols have a rapid wear and are short-lived;
- Sport is attractive because it is seen as something extraordinary, unusual and non-routine;
- Sport is "involved in a particular social situation" of economics, politics, culture, propaganda, etc.

[7] Coalter, F. *A wider social role for sport*. Taylor&Francis (2007). стр. 148

• Спорт је активност која искушава и потврђује властите могућности, суочава с новим изазовима и животним авантурама, тј. он је својеврсна лабораторија у експериментирању новим животним искуствима;

• Спорт је добровољно и ненаметнуто дружење; у њему се остварује специфична спрега индивидуалности и заједништва (спремност за сарадњу, способност да се жртвује);

• За неке појединце и групе, спорт је привлачан као посао, професија, као обрт који је добио своје значајно мјесто у друштвеној подјели рада;

• Спорт привлачи младе као бизнис и облик привређивања који доноси значајно, а понекад и надпросјечне приходе; ова функција спорта манифестује се и кроз статусну потрошњу;

• Спорт као спектакл привлачи велики број људи; захваљујући спектаклу који се троши као свака друга роба, развио се спортски туризам у облику новог „путујућег човјечанства“;

• Спорт младе људе привлачи због свог ритуала, који се понавља на спортским борилиштима производећи своје јунаке и жртве;

• Спорт је облик вербалне и невербалне комуникације путем које се шаљу и примају поруке (симболи, покрети, говор тијела, израз лица итд.);

• Спорт је канал друштвене покретљивости и афирмације; нарочито добија на значају када су други институционални канали затворени за друштвену промоцију младих;

• Спорт ствара своје идоле, звијезде спорта са којима се многи идентификују; идоли се призводе тако да се брзо троше и кратко трају;

• Спорт је привлачан јер се доживљава као нешто изузетно, несвакидашње и нерутински;

• Спорт је „уплетен у одређену друштвену ситуацију“ економије, политике, културе, пропаганде, релкаме итд.

Социологија спорта покушава наћи одговор на питања контекста и друштвене условљености спорта. Њен развој није проста посљедица развоја савремене социологије, као ни њеног распростирања на све новије појаве. Тај развој није, како неки мисле, израз моде у односу на друга социолошка истраживања. Социологија спорта је одговор на најреалније потребе спортског покрета, непосредни резултат тих потреба; она указује на уску зависност између развоја спорта и развоја одређених подручја друштвног живота, одређених појава културе и цивилизације.

Спорт је алтернатива и истовремено одраз савременог доба. Потиче из тмине нашег инстинктивног commercial.

Sociology of sport is trying to find an answer to questions of context and the social character of sport. Its development is not a simple consequence of the development of modern sociology, as well as its distribution to all recent. This development is not, as some think, an expression of fashion in relation to other sociological research. Sociology of Sport is a realistic response to the needs of the sports movement, the immediate result of these needs; it indicates a close correlation between the development of sport and the development of certain areas of social life, certain phenomena of culture and civilization.

Sport is an alternative and also a reflection of the modern era. It comes from the darkness of our instinctive life, but the form of it today, is managing the modern society. The modern sport should not be regarded as a product of industrial capitalism, as it is talked about in the early parts of the Marxist or term “Protestant ethic”, but slowly developed empirical, experimental and mathematical understanding of the world.

A particularly interesting aspect is the impact of sports on mass culture and vice versa. Mutual rapport sports and politics, sports and religion - issues that are of an explanation must take into account the social framework of contemporary trends dominated by the industrialization and urbanization.

Following the study of sport, it was found that there was “upset” balance of the area between work and psychological and biological sciences and the study of social sciences (sociology, anthropology and social psychology), which leads to the complete knowledge of the sport, these new social facts.

The sociological approach to the sport is much more specific. Elements for a theoretical approach to the sociology of sport would consist of:

• Man as an actor and holder of certain activities;

• Role as expected behavior;

• Sporting event or game that brings together actors.

Considering the sociology of sport socialization is concerned with, in the foreground of its research is a sporting event. Sporting events are the players (actors), agents and supporters. The players are certainly the most important in the foremost, because without them there is no game and the competition. In the sociological study participations (players), what is interesting is primarily their relationship, relationship elderly towards younger players, the attitude towards the audience, judges, coaches, management, officials and support staff.

Agents in sports are physical education teachers, coaches, referees, officials, sports reporters, and lately, more and more sponsors. Educators of physical education were mediators between future athletes and clubs. They

живота, али за облик који данас има, одговорно је савремено друштво. Савремени спорт не треба сматрати ни производом индустријског капитализма, како се о њему говори у првим марксистичким дијелима, нити закаснијелим изразом „протестантске етике“, већ споро развијеним емпиријским, експерименталним и математичким поимањем свијета.[8]

Посебно занимљив аспект, јесте утицај спорта на масовну културу и обрнуто. Узајамни односи спорта и политике, спорта и религије – питања су која за своје објашњење морају узимати у обзир друштвени оквир, савремене токове у којима доминира индустријализација и урбанизација.

Пратећи истраживања спорта, увидјело се да постоји „поремећена“ равнотежа у овом подручју између радова биолошких и психобиолошких наука и студија друштвених наука (социологија, антропологија и друштвена психологија), што доводи у питање потпуно познавање спорта, ове нове друштвене чињенице.

Социолошки приступ спорту је умногоме специфичан. Елементе за теоријски приступ социологији спорта чинили би:

- Човјек као актер и носитељ одређених активности;
- Улога као очекивано понашање;
- Спортски догађај или утакмица која окупља актере.

С обзиром да социологију спорта занима цјелина друштвености, у првом плану њених истраживања налази се спортски догађај. Спортски догађај чине играчи (актери), посредници и навијачи. Играчи су свакако најважнији у најистакнутији, јер без њих нема утакмица и такмичења. За социолошко истраживање актера (играча), занимљив је прије свега њихов међусобни однос, однос старијих према млађим играчима, однос према публици, судијама, тренерима, управи, функционерима и помоћном особљу.

Посредници у спорту су: педагози физичке културе, тренери, судије, функционери, спортски новинари и у посљедње вријеме, све чешће, спонзори. Педагози физичке културе су посредници између будућих спортиста и клубова. Они нарочито треба да познају начин успјешног селектовања спортских талената. Њихов однос, начин комуницирања с младима, може утицати на њихово привлачење или одбијање од спорта. Тренери имају двоструко понашење према спорту; они су стручњаци и педагози. Нажалост, најчешће се истиче

especially need to know the way of selecting successful sporting talents. Their attitude, a way of communicating with young people can affect their attraction or rejection of the sport. Coaches have doubled the role in the sport; they are professionals and educators. Unfortunately, the most common is a professional dimension, which is undoubtedly important, but often remains bare, without the necessary pedagogical dimensions of true human contact and activity. On the other hand, it should be noted that it is not enough just to have the knowledge, it is necessary to know and to convey it.

Training of trainers requires greater pedagogical and professional attention, because they are very important mediators and role models in sports. Officials or “standing outside participants in the sport,” used to work on an amateur basis. Today, they are usually paid officials in different sport clubs and federations. They are important because they convey the social values of sport. As a special category of mediation, sports bureaucracy that imposes its patterns of behavior and communication in sport should be noted. It is required as a structured sporting life, but often appears as its brakes.

Judges and their calls are routs to many misunderstandings. Communication between players and referees is disturbed due to the win at all costs. Although there are standards setting and controlling trials in the sport, we are witnessing frequent accidents due to the bare commercial sport. Misunderstandings arise due to the fact that athletes are usually professionals and amateur judge or semi-professional. Maybe it is out in the creation of professional organization.

Sport is used as a means of social integration group, the means of awakening the patriotic and national feeling and inciting mass psychosis. In the process, the viewers not only identify with the group and team, but also with the ethnic community and the wider global society. Therefore, it can be a means of connecting and separating nations, classes and races.

Sports journalists are among the most important mediators, because they influence public opinion and relations in sport. Sports journalism is a form of communication that can expand or narrow dimension of sporting success, or failure. Journalists assert social values and can decisively influenced their reporting on the popularity of certain sports. They create idols, culture and sports stars. Sports journalists also affect inciting the passions of fans and all those who are interested in the sport.

Content analysis showed that the prevalence of sports space in the newspaper that is not specialized in sport is over twenty percent. Using quantitative and qual-

[8] Скемблер, Г. *Спорт и друштво*. Клио, Београд (2007). стр. 244

само стручна димензија, која је несумњиво важна, али врло често остаје огољена, без нужне педагошке димензије, истинског људског сусрета и дјеловања. С друге стране, треба истаћи да није довољно само посједовати знање, него је потребно и знати пренијети га.[9]

Школовање тренера захтјева већу педагошку и стручну пажњу, јер су они веома значајни посредници и узори у спорту. Функционери или „споља стојећи учесници у спорту“ раније су радили на аматерској основи. Данас су то најчешће плаћени функционери у разлитичим спортским клубовима и савезима. Они су значајни јер преносе друштвене вриједности у спорт. Као посебну категорију посредовања, треба споменути спортску бирократију, која намеће своје обрасце понашања и комуницирања у спорту. Она је потребна као организована структура спортског живота, али се врло често јавља и као његова кочница.

Судије и њихово суђење је узок многих неспоразума. Комуникација између играча и судије поремећена је због побједе по сваку цијену. Иако постоји велика нормираност и контрола суђења у спорту, свједоци смо честих инцидената због огољене комеријализације спорта. Неспоразуми настају и због тога што су спортисти најчешће и професионалци, а судије аматери или поупрофесилоналци. Можда је излаз у стварању професионалних судиских организација.

Спорт се користи као средство социјално-групне интеграције, средство буђења патриотских и националних осјећања и подстицање масовних психоза. Он је и начин да се гледаоци идентификују не само са групом и екипом, већ и са етничком заједницом или ширим глобалним друштвом. Зато он може бити средство спајања и раздвајања народа, класа, слојева и раса.[10]

Спортски новинари су међу најзначајнијим посредницима, јер утичу на јавно мњење и односе у спорту. Спортско новинарство је вид комуникације које може ширити или сужавати димензију спортског успијеха, односно неуспијеха. Новинари афирмишу друштвене вриједности и могу пресудно утицати, својим извјештавањем, на популарност одређених спортова. Они стварају идоле, култове и спортске звијезде. Спортски новинари такође утичу на распиривање страсти код навијача и свих оних који се занимају за спорт.

Анализа садржаја је показала да је заступљеност спортског простора у новинама које нису специјалитative analysis of sports reporting, interesting information about the presence of not only an individual sport, but the team as well as interesting information about the gaming values required in a particular sport may be disclosed. One should distinguish between professional reporting of sensationalism. This is particularly important because of sports journalism directs the sports audience. Sports journalists can propagate a mass sport or just excellent and competitive sport. Advocating mass of practicing a sport means to take care of its basis: the sport as physical culture movement.

Sponsors are still dominating agents in sports. This is marketing - the commercial relationship and communication between sponsors and sport clubs. For us, it is still in its infancy, a kind of “primer for beginners.” Sponsorship in sport is still not clearly defined. As if sponsors do not realize that their only place is in the “lobby” of sports. Unauthorized interference in professional work, can only lead to counterproductive effects.

Sport becomes a profession, because there is specialization and the resulting pleasure is not at all commensurate to the invested energy. Just because sport becomes a way to achieve some goal beyond it, it is more likely that it will continue to be manipulated.

Sport turned into a spectacle, so that the public is becoming increasingly important. Due to the size and bullying, winding becomes more important as the social phenomenon as well as from the scientific point of view. Cheerleading has two meanings. One is to express devotion to a particular club, the heightened emotional exchange of spectators and actors in the field. This commitment can range from disappointment, despair and anger, to rejoicing and euphoria.

On the other hand, the apparent bias is irrational character and irrational sociability. Within each sport spectators can distinguish direct spectators of sporting events, fans and fan nucleus (gang). In the center (core supporters) are the most loyal, most dedicated and most fanatical supporters. They often feel enthusiastic or “wacky” guy fans. In contrast, there are “cool” type of fans and spectators of sports events. Fans are different from sports audience on a firmer and form. Sociological research is interested in primarily social background crowd, social status, educational level, etc..

The crowd on one side and players on the other side are no longer “indissoluble unity”. Great fan groups, organized with the aim to help the team like that, are gradually evolving. Make it parallel with the understanding that the game, despite their clear intention to attend the spectacle, always has the background music.

[9] Фиск, Ц. *Популарна култура*. Клио, Београд (1991). стр. 211

[10] Латиновић, Б. *Магистарски рад*. Универзитет у Бањој Луци, Бања Лука (2011). стр. 70

зоване за спорт преко двадесет процената. Користећи квантитативну и квалитативну анализу спортског извјештавања, могу се открити занимљиви подаци о заступљености не само појединог спорта, већ и клуба, као и занимљиви подаци о играчким вриједностима које се траже у поједином спорту. Такође треба разликовати професионално извјештавање од сензационализма. То је нарочито значајно, јер спортско новинарство усмјерава спортску публику. Спортски новинари могу пропагирати масовни спорт или само врхунски и такмичарски спорт. Заговарање масовног бављења неким спортом значи да се води рачуна о његовој основи, тј. о спорту као покрету физичке културе.

Спонзори су данас доминантни посредници у спорту. То је маркетиншко – комерцијални однос и новопрорађена комуникација између спонзора и спортских клубова. Код нас је то још увијек у зачетку, нека врста „буквара за почетнике“. Спонзорство у спорту још увијек није јасно дефинисано. Спонзори као да не схватају да је њихово мјесто само у „предворју“ спорта. Неовлашћено мјешању у стручни рад, може довести само до контрапродуктивних ефеката.[11]

Спорт постаје професија, јер у њему постоје специјализације и подспецијализације, а добијени ужитак уопште није сразмјеран уложеној енергији. Управо зато што спорт постаје начин да се оствари неки циљ изван њега, све је више шанси да ће се њиме и даље манипулисати.[12]

Спорт се претворио у спектакл, тако да публика све више добија на значају. Због бројности и насилничког понашања, навијање постаје све важнија појава како с друштвеног, тако и са научног становишта. Навијање има два значења. Једном је то исказивање привржености према одређеном клубу, кроз појачану емоционалну размјену навијача и актера на терену. Та привржености може се кретати од разочарења, очајања и бијеса, па све до радовања и еуфорије.

С друге стране, видљива је пристрасност, ирационални карактер и ирационална друштвеност. Унутар сваке спортске публике могу се издвојити непосредни гледаоци спортских догађаја, навијачи и навијачко језгро (гангови). У центру (језгру навијача) налазе се најоданији, најфанатичнији и најупућенији навијачи. Њих често сматрају занесеним или „ћакнутим“ типом навијача. Насупрот њима, стоји „хладни“ тип навијача и посматрача спортских догађаја. Навијачи се разли-

That, however, departs from the foundations of sport (game) and they are very well recognized. The game is for them to become a sideshow and it is no wonder that modern sport in recent decades launches new phenomena.

Here we come to a final conclusion, that the escape into the sport, is an escape from social reality.

Conclusion

Sport is a social phenomenon, which in many ways is becoming a lucrative business not only for the performers (athletes), but for all others who surround it. It simultaneously becomes a form of social deviation, but in a paradoxical way socially acceptable. Sociology of sport is trying to find an answer to questions of context and the social character of sport. Sociology of Sport is a realistic response to the needs of the sports movement, the immediate result of these needs; tt indicates a close correlation between the development of sport and the development of certain areas of social life, certain phenomena of culture and civilization. Top sport is a passion, drama, stress, and productive activity. In today's time define the sport as the game, it seems, as an attempt which does not lead to consideration of its essence. Sport is basically controlled aggression. This is particularly the case for team sports, where the teams are increasingly organized according to the system of military formations. However, sport in spite of all this possessed people hitting during games can be called a battle, but not war. Sport appears to be a solution to many misunderstandings in society. Finally, sport is a matter of prestige of the figures. Despite all the temptations, sport becomes a question of state and social systems. Sport turned into a spectacle, so that the public is becoming increasingly important. Sport becomes a profession, because there is a specialization and the resulting pleasure is not at all commensurate invested energy. Just because sport becomes a way to achieve some goal beyond it, it is more likely that it will continue to be manipulated.

Authorship statement
The authors have contributed equally.

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We declare that we have no confl icts of interest.

[11] Фоер, Ф. *Како фудбал објашњава свет*. Моћ књиге, Београд (2006). стр. 117

[12] Коковић, Д. *Наличје такмичења*. Прометеј, Нови Сад (2008). стр. 80

кују од спортске публике по чвршћој и сталнијој форми. Социолошко истраживање интересује, прије свега, социјално поријекло навијача, друштвени положај, образовни ниво итд.

Публика са једне и играчи са друге стране, данас више нису „нераскидива цјелина". Велике навијачке групе, организоване са основним циљем да помогну тиму који воле, постепено еволуирају. Чине то паралелно са схватањем да игра, упркос њиховој чистој намјери да присуствују спектаклу, увијек има „пратећу музику".[13]

То их међутим удаљава од соновног темеља спорта (игре) и они то веома добро препознају. Игра је за њих постала споредна ствар и зато није ни чудно што савремени спорт посљедњих деценија лансира нове феномене.

Ту долазимо до коначног закључка, да је бјекство у спорт, бјекство од друштвене стварности.

Закључак

Спорт је друштвена појава, која по много чему постаје уносна дјелатност и то не само за извођаче (врхунске спортисте), већ и за све остале који га окружују. Он паралелно постаје и облик друштвене девијације, али на парадоксалан начин друштвено прихваћене. Социологија спорта покушава наћи одговор на питања контекста и друштвене условљености спорта. Социологија спорта је одговор на најреалније потребе спортског покрета, непосредни резултат тих потреба; она указује на уску зависност између развоја спорта и развоја одређених подручја друштвног живота, одређених појава културе и цивилизације. Врхунски спорт је страст, драма, стрес, али и производна дјелатност. У данашњем времену дефинисати спорт помоћу игре, чини се, да је покушај који не води сагледавању његове суштине. Спорт је у основи контролисана агресија. То је посебно карактеристично за колективне спортове, гдје се екипе све више организују по систему војних формација. Ипак, спорт и поред свих тих бесомучних ударања током утакмица се може назвати борбом, али никако ратом. Спорт се чини рјешењем за многе неспоразуме у друштву, али и у подродици. Најзад, спорт је питање престижа саме личности. Без обзира на сва искушења, спорт постаје и питање државе и друштвених система. Спорт се претворио у спектакл, тако да публика све више добија на значају. Спорт постаје професија, јер у њему постоје специјализације и подспецијализације, а добијени ужитак уопште није сразмјеран уложеној енергији. Управо зато што спорт постаје начин да се оствари неки циљ изван њега, све је више шанси да ће се њиме и даље манипулисати.

[13] Јокић, М. *Шта је луђе, спорт или свет*. Прометеј, Нови Сад (2011). стр. 94

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Review Paper

Razlike u posedima lopte, kontaktima sa loptom i kontakt indeksima osvajača medalja na svetskom fudbalskom prvenstvu 2010. godine

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Sažetak: Istraživačka pažnja je usmerena na evidentiranje poseda lopte, kontakata sa loptom i kontakt indeksa u igri osvajača medalja na Svetskom fudbalskom prvenstvu 2010. godine. Očekuje se s obzirom na plasman reprezentacija da nema statistički **značajne** razlike u posmatranim karakteristikama fudbalske igre. Posmatrana je ukupno 21 utakmica. Na osnovu rezultata dobijenih statističkom obradom prikupljenih podataka primenom Kruskall Wallis testa može se zaključiti da postoje statistički značajne razlike u zastupljenosti poseda lopte (p=0,005) i kontakata sa loptom (p=0,005), a da kod kontakt indeksa (p=0,129) nisu utvrđene statistički značajne razlike u igri posmatranih reprezentacija. Testiranjem razlika između parova reprezentacija Mann Whitny testom utvrđeno je da između reprezentacija Španije i Holandije postoji statistički značajna razlika u sve tri varijable (p<0.05), a između reprezentacija Holandije i Nemačke nisu utvrđene statistički značajne razlike (p>0,05). Između reprezentacija Španije i Nemačke utvrđene su statistički značajne razlike u posedima lopte i kontaktima sa loptom, a kod kontakt indeksa nije utvrđena statistički značajna razlika.

Ključne reči: Svetsko fudbalsko prvenstvo 2010. godine, kontakt indeks fudbalera.

Uvod

Fudbalska igra je analizirana po raznim kriterijumima i u ranijem periodu primenom istraživačke tehnike posmatranja, a naročito su izvršene duboke i sveobuhvatne analize otkada se primenjuje savremena tehnologija u praćenju tehničko-taktičke i fizičke aktivnosti fudbalera u toku takmičarske aktivnosti. Poznati su tehnički, taktički i fizički zahtevi koji očekuju fudbalere na utakmicama

Differances in Ball Possessions, Contacts With the Ball and Contact Index of the Medal Winners on the World Championship 2010

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Abstract: Research attention has been focused on the recording of ball possession, contact with the ball and contact index in the game of medal winners on the World Championship 2010. It was expected due to the placement of the teams, that there are no statistically significant differences in the observed characteristics of the football game. A total of 21 matches were observed. Based on the results obtained by statistical analysis of the data collected using the Kruskal Wallis test, it can be concluded that there are significant differences in the representation of ball possession (p=0.005) and by contact with the ball (p=0.005), but in contact index (p=0,129) were no statistically significant differences observed in the game of the observed national teams . Testing of differences between pairs of teams Mann Whitney test showed that between the teams of Spain and the Netherlands, there was no statistically significant difference in all three variables (p <0.05), and between the national teams of the Netherlands and Germany, there were no statistically significant differences (p > 0.05). Between teams of Spain and Germany were found statistically significant differences in ball possession and ball contact.

Key Words: World Championship 2010, contact index of the football players.

Introduction

Football game has been analyzed by different criteria in the previous period by applying research techniques of observation, and in particular has been made deep and comprehensive analysis since it applies modern technology in monitoring technical - tactical and physical activities of football players during competitive activity. There are known technical, tactical and physical

vrhunskog nivoa takmičenja (Marković i Bradić 2008). Analizom 60 utakmica sa Svetskog fudbalskog prvenstva 2010. godine utvrđeno je da su posed lopte. ukupan broj dodavanja i ukupan broj tačnih dodavanja značajan faktor u ostvarivanju boljeg rezultata (Janković i sar. 2011). Kontakt indeks reprezentacije Španije na utakmicama Svetskog fudbalskog prvenstva 2010. godine iznosi 2,25 reprezentacije Holandije 2,10 i reprezentacije Nemačke 2,16 (Đošić 2012, 2013a, 2013b). Analiza fudbalske igre daje informacije o zahtevima sa kojima su fudbaleri suočeni tokom takmičarske aktivnosti (Lolić i Bajrić, 2013). Između reprezentacija Španije, Holandije, Nemačke i Urugvaja postoje statistički značajne razlike i u zastupljenosti pojedinih načina izvođenja slobodnih udaraca i kornera u njihovoj igri na utakmicama Svetskog fudbalskog prvenstva 2010. godine (Đošić 2013c, 2013d). U današnjem fudbalu je malo toga novog, ali mnogo starog za glačanje, koje čeka kreativne stručne duhove (Aleksić i Janković, 2006). Reprezentacije Španije i Holandije se razlikuju i po zastupljenosti u njihovoj igri povratnih lopti odigranih sa jednim dodirom lopte istom igraču od koga je lopta i dobijena u zoni organizacije i zoni završnice napada, a u zoni odbrane nisu utvrđene statistički značajne razlike između ovih reprezentacija, kao i u sve tri zone terena prilikom odigravanja povratnih lopti trećem igraču (Đošić,2013e).

U ovom radu su testirane razlike u brojčano izraženim posedima lopte, kontaktima sa loptom i kontakt indeksima tri prvoplasirane reprezentacije na Svetskom fudbalskom prvenstvu 2010. godine. Igrači međunarodne klase su u posedu lopte 60-65 puta u toku utakmice, što vremenski izraženo iznosi 125-135 sekundi, a sovjetski igrači su u proseku u posedu lopte 40 puta (Stručni bilten br.3 Fudbalski savez Srbije,1970). Cilj rada je de se utvrdi da li postoje statistički značajne razlike u posmatranim karakteristikama igre kod tri prvoplasirane reprezentacije na Svetskom fudbalskom prvenstvu 2010. godine. Očekuje se s obzirom na plasman da nema statistički značajnih razlika u posedima lopte, kontaktima sa loptom i kontakt indeksima između osvajača medalja na Svetskom fudbalskom prvenstvu 2010.godine.

Metod rada

Posmatrani su dvd snimci po sedam utakmica koliko su reprezentacije Španije, Holandije i Nemačke odigrale na prvenstvu sveta u Južnoafričkoj Republici. Ukupno 21 utakmica. U posmatračkom listu su evidentirani posedi lopte i kontakti sa loptom u smislenim akcijama.

Kontakt indeks se izračunava matematičkom operacijom deljenja ukupnog broja kontakata sa loptom pri-

demands that football players are expected to match at the highest levels of competition, (Marković and Bradić 2008) . Analyzing 60 matches on the World Championship 2010, it was found that ball possession total number of ball passing and total number of correct passing are significant factors in achieving better results (Jankovic et al. 2011). The contact index of National team of Spain on the World Championship 2010 is 2,25, for the Netherlands 2,10 and for Germany 2,16 (Đošić 2012, 2013. 2013b). The analysis of the football game provides information about the requirements with which players are faced in competitive activities (Lolić and Bajrić, 2013) .

Between the National teams of Spain, the Netherlands, Germany and Uruguay, there are significant differences in the presence of certain ways of performing free kicks and corners in their game on the World Championship 2010. (Đošić 2013c, 2013d). In today's football is not much new, but a lot of the old board, waiting for the creative professional ghosts (Aleksic and Jankovic, 2006). National teams of Spain and the Netherlands also differ in their representation in playing reversal balls with one touch to the same player from whom the ball is received in the organization zone and attack zone, and in the zone defense there were no statistically significant differences between these National teams., as well as in the all three field zones by playing reversal balls to the third player (Đošić, 2013e).

In this paper, the differences in the numerically quantified possession of the ball, ball contact and contact indices of the three best ranked National teams on World Chamionship 2010 were tested. The players of international class are in ball possession 60-65 times during the game, i.e. 125-135 seconds, Soviet player is in average in ball possession 40 times (Professional Bulletin No.3 Football Association of Serbia, 1970). The aim is to determine whether there are statistically significant differences in the observed characteristics of the game by the three first ranked National teams on the World Championship 2010. Due to the placement, we can expect that there are no statistically significant differences in ball possession, ball contact and contact between the medalists on the World Championship 2010.

Method

DVD recordings of seven games of the National team of Spain, the Netherlands and Germany played on the World Championship in South Africa were observed. In total 21 matches in the watch-list registered the ball possessions and the ball contacts in meaningful actions.

Contact index is calculated by a mathematical operation dividing the total number of contacts with the ball

likom odigravanja loptom sa ukupnim brojem poseda lopte na utakmici.

Posed lopte brojčano izražen daje informaciju koliko su puta u toku utakmice igrači jedne ekipe dobijali loptu (dolazili u njen posed) saradnjom sa saigračima ili greškom u predaji lopte igrača protivničke ekipe.

Kontakti (dodiri) sa loptom su evidentirani u toku svakog pojedinačnog poseda lopte svih igrača jedne ekipe u smislenim akcijama. Nisu evidentirani ni kao posedi lopte ni kao kontakt sa loptom situacije izvođenja prekida igre zato što je pravilima igre određeno da se oni izvode jednim dodirom lopte i igrači nemaju slobodu odlučivanja sa koliko dodira lopte će izvesti prekid igre (korner, slobodni i kazneni udarac). Isto tako nisu evidentirani ni kao posed lopte ni kao kontakt sa loptom situacije koje se povremeno dešavaju na fudbalskim utakmicama tzv.“napucane lopte“ u kojima takođe ne zavisi od volje i ideje fudbalera gde će lopta otići.

Kontakt indeks se definiše kao aritmetička sredina broja dodira lopte prilikom odigravanja loptom po jednom posedu lopte. Može se definisati i kao odstupanje od teoretski najjednostavnije igre što se tiče broja dodira lopte prilikom odigravanja loptom u toku saradnje igrača jedne ekipe. U tom slučaju se primenjuje K.i.=K/P-1. K predstavlja kontakte sa loptom, P su posedi lopte, a od njihovog količnika se oduzima jedan koliko iznosi kontakt indeks u teoretski najjednostavnijoj igri što se tiče broja dodira prilikom odigravanja tzv.“prvom loptom“.

Prilikom obrade prikupljenih podataka primenjen je statistički softver SPSS 20. Za utvrđivanje eventualnih razlika između osvajača medalja na prvestvu sveta 2010. godine u posedima lopte, kontaktima sa loptom i kontakt indeksima primenjen je Kruskall Wallis test, a za testiranje razlika između pojedinih parova reprezentacija Mann Whitney U test.

Rezultati

Na posmatranim utakmicama evidentirano je ukupno 11456 poseda lopte i 24891 kontakt sa loptom u smislenim akcijama u kojima su fudbaleri imali slobodu odlučivanja šta će uraditi sa loptom i na koji način odnosno sa koliko kontakta sa loptom će svoju ideju realizovati.

U tabeli jedan se vidi na osnovu vrednosti nivoa statističke značajnosti da kod dve od ukupno tri posmatrane karakteristike fudbalske igre postoje statistički značajne razlike između reprezentacija osvajača medalja na Svetskom fudbalskom prvenstvu 2010. godine.

when playing the ball with the total number of ball possessions on the match.

The ball possession quantified gives the information about how many times the player of one team get the ball (came into its possession) cooperating with teammates or by mistake in ball passing to the opposing team.

Contacts (touching) with the ball were recorded during each ball possession of all the players in one team in meaningful actions. The situations of game interruptions are not even recorded as possession neither as ball contact because the rules of the game stipulate that they have to be performed with one ball touch and the players do not have the freedom to decide with how many ball touches they will perform the game interruption (corner, free kick and penalty) . The situations that occasionally occur on football matches so called ’’cracker balls’’, in which the will and the ideas of the players do not determine were the ball will go, were also not recorded as ball possession neither as ball contact.

Contact index is defined as the arithmetic mean of the number of ball touches when playing the ball with one ball possession. It can be defined as a deviation from the theoretically simplest game in the number of touches of the ball when playing the ball during the cooperation of a team player. In this case, is applied K.i. = K/P-1. K represents contact with the ball, P the ball possession, and of their quotient is subtracted one which is the contact index in theoretically the simplest game in the number of touches when is played the so-called “first ball”.

In the analysis of the data statistical software SPSS 20 was applied.To determine possible differences between the medalists on the World championship 2010 concerning the ball possession, the ball contact and contact index Kruskall Wallis test was applied, and for testing the differences between pairs of teams Mann Whitney U test was applied.

Results

On the observed matches there were a total of 11.456 ball possessions and 24.891 contacts with the ball in meaningful actions in which the players had the freedom to decide what to do with the ball and in what way or with how many ball contacts they will implement their ideas.

Table 1 shows, based on the value level of statistical significance, that in two of three observed football game characteristics, there are statistically significant differences between the National teams medalists on the World Championship 2010.

Za posede lopte nivo statističke značajnosti iznosi p=0,005 i na osnovu toga se može zaključiti da postoje statistički značajne razlike između posmatranih reprezentacija u toj varijabli. Za kontakte sa loptom nivo statističke značajnosti iznosi p=0,005 a to znači da i kod ove karakteristike igre postoje statistički značajne razlike između posmatranih reprezentacija. Za varijablu kontakt indeks nivo statističke značajnosti iznosi p=0,129 i zato što je ta vrednost veća od granične vrednosti koja iznosi p=0,05 to znači da između posmatranih reprezentacija ne postoji statistički značajna razlika u toj karakteristici igre.

Vrednost x^2 testa za posede lopte i kontakte sa loptom je iznad tabelarne vrednosti koja iznosi 5,99 za dva stepena slobode i nivo značajnosti p=0,05. Za kontakt indekse vrednost x^2 testa je ispod tabelarne vrednosti.

For ball possession, the level of statistical significance was p = 0.005 and according to this we can conclude that there are significant differences between the observed National teams in this variable . For ball contacts, the level of statistical significance was p = 0.005 which means that by this game characteristic there are statistically significant differences between the observed National teams. For the variable contact index, the level of statistical significance was p = 0.129. Taking into consideration that this level is greater than the limit level which is p = 0.05, this means that between the observed National teams there are no statistically significant differences in this game characteristic.

The value of x^2 test for ball possessions and ball contacts is above the spreadsheet value which is 5.99 for two degrees of freedom and with significance level of p = 0.05. The contact index value x^2 test was below the tabular values.

Tabela 1. Posedi lopte, kontakti sa loptom i kontakt indeksi (Kruskall Wallis test)

Table 1. Ball possessions, ball contacts and contact indices (Kruskall Wallis test)

Varijabla/ Variable	Reprezentacija/ National team	X^2	Srednji rang / middle rank	p	df
Posedi lopte *Ball possession*	Španija / *Spain*		17,00		
	Holandija / *The Netherlands*	10,716	6,43	,005	2
	Nemačka / *Germany*		9,57		
Kontakti sa loptom *Ball contact*	Španija / *Spain*		16,86		
	Holandija / *The Netherlands*	10,709	6,14	.005	2
	Nemačka / *Germany*		10,00		
Kontakt indeks *Contact Index*	Španija / *Spain*		14,64		
	Holandija / *The Netherlands*	4,089	8,07	,129	2
	Nemačka / *Germany*		10,29		

U tabeli dva se vidi da je prosečno na posmatranim utakmicama ostvareno 546,48 poseda lopte, 1187,33 kontakata sa loptom i da prosečan kontakt indeks iznosi 2,17. Minimalna vrednost poseda lopte po utakmici iznosi 325, a maksimalna vrednost 698. Za kontakte sa loptom minimalna vrednost je 716, a maksimalna 1722. Minimalna vrednost za kontakt indekse je 1,91 a maksimalna 2,46.

Table 2 shows the average on the observed matches with 546.48 ball possessions, 1187.33 contacts with the ball and that the average contact index is 2.17. The minimum value of possession per game is 325, and the maximum value is 698. For contact with the ball, the minimum value is 716 and the maximum is 1722. The minimum value for the contact index is 1.91 and the maximum 2.46.

Tabela 2. Deskriptivene karakteristike posmatranih varijabli

Table 2. Descriptive characteristics of the observed variables

	N	Min.	Max.	Mean	Std. Deviation
Posedi lopte / *Ball possession*	21	325	698	546,48	99,8
Kontakti sa loptom / *Ball contact*	21	716	1722	1187,33	259,3
Kontakt indeksi / *Contact Index*	21	1,91	2,46	2,17	,1

U grafikonu 1 se vidi da je kod sve tri reprezentacije najzastupljenije odigravanje jednim dodirom lopte tzv.“prvom loptom“. Kod reprezentacije Španije takav način odigravanja loptom je zastupljen sa 37,14% u odnosu na ukupna odigravanja loptom igrača ove repre-

Chart 1 shows that by all three National teams, the most common playing is one ball touch so-called “First ball”. In the National team of Spain, this way of playing the ball is represented by 37.14% compared to the overall play of the ball players of this team. In the National team of the

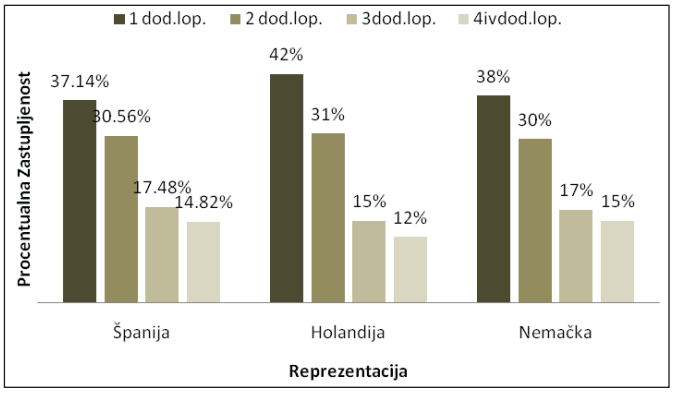
zentacije. Kod reprezentacije Holandije je zastupljen sa 42%, a kod reprezentacije Nemačke sa 38%.

Odigravanje loptom sa dva dodira je u igri reprezentacije Španije zastupljeno sa 30,56%, reprezentacije Holandije 31% i reprezentacije Nemačke 30%.

Odigravanje loptom sa tri dodira lopte je u igri reprezentacije Španije zastupljeno sa 17,48%, reprezentacije Holandije 15% i u igri reprezentacije nemačke 17%.

Četri i više dodira lopte prilikom odigravanja loptom je u igri reprezentacije Španije zastupljeno sa 14,82%, reprezentacije Holandije 12% a reprezentacije Nemačke 15%.

Grafikon 1. Procentualna zastupljenost odigravanja loptom sa različitim brojem dodira lopte u igri osvajača medalja na Svetskom fudbalskom prvenstvu 2010. godine.



Legenda: 1 dod.lop.-odigravanje loptom sa jednim dodirom lopte tzv.“prvom loptom“; 2 dod.lop.-odigravanje sa dva dodira lopte; 3 dod.lop.-odigravanje sa tri dodira lopte; 4 i v.d.lop.-odigravanje loptom sa četri i više dodira lopte.

U tabeli tri se vidi na osnovu vrednosti nivoa statističke značajnosti p<0.05 da između reprezentacija Španije i Holandije postoji statistički značajna razlika u sve tri posmatrane varijable. Na osnovu vrednosti srednjeg ranga vidi se da je razlika u korist reprezentacije Španije kod sve tri posmatrane varijable.

Tabela 3. Posedi lopte, kontakti sa loptom i kontakt indeksi Španije i Holandije (Mann Whitney test)

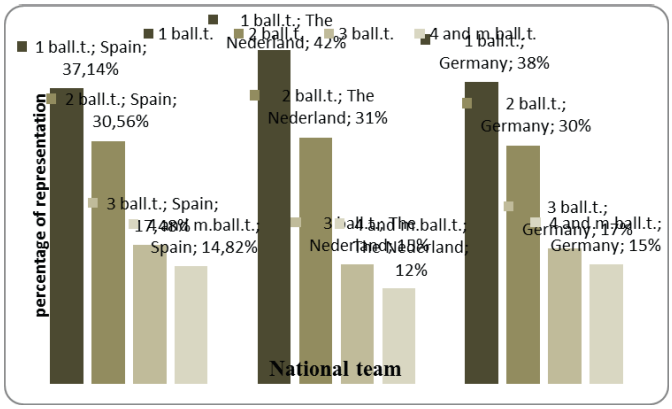
Netherlands it was represented by 42%, and by the National team of Germany with 38%.

Playing the ball with two touches was represented in the game of the National team of Spain with 30.56%, in the National team of the Netherlands with 31% and in the National team of Germany with 30%.

Playing the ball with three touches was represented in the game of the National team of Spain with 17.48%, in the National team of the Netherlands with 15% and in the National team of Germany with 17%.

Playing the ball with four or more touches was represented in the game of the National team of Spain with 14.82%, in the National team of the Netherlands with 12% and in the National team of Germany with 15%.

Figure 1. Percentage of playing the ball with a different number of ball touches in the game of the medalists on the World Championship 2010.



Legend: 1 ball t. -team hit with one ball touch so-called “First ball”; 2 ball. t.-enactment with two ball touches. 3 ball. t.-enactment with three ball touches. 4 and m.ball.t. -team hit with four or more ball touches.

Table 3 shows the value of the level of statistical significance of p <0.05, so there were no statistically significant differences in all three observed variables between the National teams of Spain and the Netherlands. Based on the mean rank we can see that the difference is in favor of the Spanish national team in all three observed variables.

Table 3. Ball possessions, ball contacts and contact indices (Mann Whitney test)

Varijabla / Varijable	Reprezentacija / National team	Z	Srednji rang / middle rank	p
Posedi lopte *Ball possession*	Španija / *Spain*	-2,875	10,71	**,004**
	Holandija / *The Netherlands*		4,29	
Kontakti sa loptom *Ball Contact*	Španija / *Spain*	-3,130	11,00	**,002**
	Holandija / *The Netherlands*		4,00	
Kontakt indeks *Contact Index*	Španija / *Spain*	-2,056	9,79	**,040**
	Holandija / *The Netherlands*		5,21	

U tabeli četri se vidi na osnovu vrednosti nivoa statističke značajnosti p<0,05 da između reprezentacija Španije i Nemačke postoje statistički značajne razlike u posedima lopte i u kontaktima sa loptom. Za posede lopte nivo statističke značajnosti iznosi p=0,013, a za kontakte sa loptom p=0,035. Za obe varijable razlika je u korist reprezentacije Španije što se zaključuje na osnovu vrednosti srednjeg ranga. Između ove dve reprezentacije ne postoji statistički značajna razlika u kontakt indeksima što se zaključuje na osnovu vrednosti nivoa statističke značajnosti koji je veći od granične vrednosti 0,05 i iznosi p=0,225.

Tabela 4. Posedi lopte, kontakti sa loptom i kontakt indeksi Španije i Nemačke (Mann Whitney test)

Table 4 shows the value of statistical level significance of p <0.05 between the National teams of Spain and Germany; there were statistically significant differences in the ball possession and contacts with the ball. For the ball possession, the statistical level significance was p = 0,013, and for the contact with the ball p = 0.035. For both variables the difference was in favor of the Spanish National team which is made based on the values of the average range. Between the two teams there were no statistically significant differences in the contact indices that are made based on the value of the statistical level significance that is greater than the limit value 0,05 and is p = 0,225.

Table 4. Ball possessions, ball contacts and contact indices of Spain and Germany (Mann Whitney test)

Varijabla / Variable	Reprezentacija / National team	Z	Srednji rang / middle rank	p
Posedi lopte *Ball possession*	Španija / *Spain*	-2,492	10,29	,013
	Nemačka / *Germany*		4,71	
Kontakti sa loptom *Ball contact*	Španija / *Spain*		9,86	
	Nemačka / *Germany*	-2,108	5,14	,035
Kontakt indeks *Contact Index*	Španija / *Spain*	-1,215	8,86	,224
	Nemačka / *Germany*		6,14	

U tabeli pet se vidi na osnovu vrednosti nivoa statističke značajnosti p>0,05 da između reprezentacija Holandije i Nemačke ne postoje statistički značajne razlike u nijednoj od tri posmatrane varijable.

Tabela 5. Posedi lopte, kontakti sa loptom i kontakt indeksi Holandije i Nemačke (Mann Whitney test)

Table five shows the value of statistical level significance of p <0.05 between the National teams of the Nethelands and Germany, there are no statistically significant differences in any of the three observed variables.

Table 5. Ball possessions, ball contacts and contact indices of the Netherlands and Germany (Mann Whitney test)

Varijabla / Variable	Reprezentacija / National team	Z	Srednji rang / middle rank	p
Posedi lopte *Ball possession*	Holandija / *The Netherlands*	-1,214	6,14	,225
	Nemačka / *Germany*		8,86	
Kontakti sa loptom *Ball contact*	Holandija / *The Netherlands*	-1,214	6,14	,225
	Nemačka / *Germany*		8,86	
Kontakt indeks *Contact Index*	Holandija / *The Netherlands*	-,578	6,86	,564
	Nemačka / *Germany*		8,14	

Diskusija

U igri posmatranih reprezentacija najzastupljenije je odigravanje loptom sa jednim dodirom lopte tzv.“prvom loptom“ i kreće se u rasponu od 37,14 % koliko iznosi kod reprezentacije Španije do 42 % koliko iznosi kod reprezentacije Holandije. Primećuje se u grafikonu da se smanjenje procentualno izražena zastupljenost pojedinih načina odigravanja loptom kako se povećava broj dodira lopte prilikom odigravanja loptom. To je i logično i očekivano. Na drugom mestu po zastupljenosi u igri osvajača medalja na ovom prvenstvu sveta je odigravanje loptom sa dva dodira lopte i kreće se u rasponu od 30 % kod reprezentacije Nemačke do 31 % kod reprezentacije Holandije. Odigravanje loptom sa tri dodira lopte je na trećem mestu prema zastu-

Discussion

In the game of the observed National teams the most common was playing the ball with one touch so-called “ First ball “ and is in the range of 37.14 % by the National team of Spain and 42 % by the National team of the Netherlands. In the chart, we can see that with the percentage reduction the representation of certain ways of ball playing we have the increase of the number of ball touches when playing the ball. It is logical and expected. The second largest representation in the game of the medalist on the World Championship is playing the ball with two touches and is in the range of 30 % for the National team of Germany and 31 % for the National team of the Netherlands. Playing the ball with three touches is at the third

pljenosti i kreće se u rasponu od 15% kod reprezentacije Holandije do 17,48% koliko iznosi kod reprezentacije Španije. Najmanje je zastupljeno kod posmatranih reprezentacija odigravanje loptom sa četri i više dodira lopte i kreće se u rasponu od 12% koliko iznosi kod reprezentacije Holandije do 16% kod reprezentacije Nemačke.

Između reprezentacija Holandije i Nemačke nije utvrđena statistički značajna razlika u nijednoj od tri posmatrane karakteristike fudbalske igre. Između reprezentacija Španije i Holandije postoji statistički značajna razlika kod sve tri varijable, a između reprezentacija Španije i Nemačke statistički značajna razlika postoji kod poseda lopte i kontakata sa loptom, a kod kontakt indeksa nije utvrđena statistički značajna razlika. Izračunavanje kontakt indeksa za kompletnu ekipu je prvi nivo istraživanja ove karakteristike fudbalske igre. Drugi, dublji nivo je izračunavanje kontakt indeksa za pojedine linije u timu ili zone terena. U igri reprezentacije Nemačke u zoni odbrane kontakt indeks iznosi 1,62 u zoni organizacije napada 2,29 i u zoni završnice napada 2,63 (Đošić, 2013 f). Treći i najdublji nivo u istraživanju ove karakteristike fudbalske igre je izračunavanje kontakt indeksa sa svakog pojedinog igrača u timu. Fudbaler Barselone Mesi je na utakmicama Lige šampiona u sezoni 2008/09. godine imao kontakt indeks 3,10 (Đošić,2010).

Dobijene statistički značajne razlike u zastupljenosti poseda lopte, kontakata sa loptom i kontakt indeksa u igri osvajača medalja na Svetskom fudbalskom prvenstvu 2010. godine ukazuju na različite pristupe u rešavanju istih tehničko-taktičkih zadataka u toku takmičarske aktivnosti fudbalskih timova. Realno je očekivati da će i u budućnosti kao što se dešavalo i u prošlosti fudbalske igre doći do promena pravila ili sistema igre. Poznato je da su u početku primene sistema u igri u T-e sistemu prevashodno bile zastupljene individualne ofanzivne akcije igrača. Može se samo pretvostaviti koliko je tada bilo konrakta sa loptom u jednom posedu lopte i koliki je bio kontakt indeks. Rezultati dobijeni ovim istraživanjem mogu poslužiti u budućnosti kada dođe do promena pravila ili sistema igre da se uporede sa rezultatima do kojih bi se došlo istražujući iste karakteristike igre ali po novim pravilima igre ili u novom sistemu igre.

Zaključak

Na osnovu rezultata dobijenih statističkom obradom prikupljenih podataka može se zaključiti da postoje statistički značajne razlike u zastupljenosti poseda lopte p=0,005 i kontakata sa loptom p=0,005, a da kod kontakt indeksa p=0,129 nisu utvrđene statistički značajne razlike u igri posmatranih reprezentacija. Vrednost x^2 Kruskall

place according to the distribution and ranges from 15 % for the National team of the Netherlands and 17.48 % for the National team of Spain . The least represented by the observed National teams with four or more touches is in the range from 12 % for the National team of the Netherlands and 16 % for the National team of Germany.

Between the National teams of the Netherlands and Germany there were no significant differences in any of the three observed football characteristics. Between the National teams of Spain and the Netherlands there is a statistically significant difference in all three variables, and between the teams of Spain and Germany a statistically significant difference was found in possession of the ball and contact with the ball, but in the contact index there were no statistically significant differences . Calculation of contact indexes for the entire team is the first level of investigation of this football game features. The second, deeper level is to calculate an index for each contact line on the field or area of the field. In the game of the National team of Germany in the contact defense zone the index is 1,62, in the attack zone of organization 2,29 and in the finale attack zone 2,63 (Đošić. 2013 f) . The third and deepest level in the study of the characteristics of the football game is the calculation of the index contact for each player of the team. The football player of Barcelona Messi on the Champions League season 2008 / 09 had an index contact of 3.10 (Đošić. 2010) .

Statistically significant differences in the ball representation; contacts with the ball and contact indices in the game of the medalists on the World Championship 2010 indicate the different approaches to solving the same technical and tactical tasks during the racing activities of football teams. It is realistic to expect that in the future, as has happened in the past football games change the rules of the game or system. It is known that in the beginning of the implementation of the system in play in these systems were primarily represented individual offensive player's actions. One can only assume how many times there were ball contacts with one ball possession and what was the contact index. The results obtained in this study can be used in the future when the rules of playing will be changed or changes in the game system, so we could compare the results obtained by exploring the same characteristics of the game, but under the new rules of the game or in a new game system.

Conclusion

Based on the results obtained by statistical analysis of the data collected, it can be concluded that there are significant differences in the prevalence of the ball p = 0.005 and contacts with the ball p = 0.005, and that by the contact index p = 0.129 there were no statistically sig-

Wallis testa je za dve varijable kod kojih je utvrđena statistički značajna razlika iznad tabelarne vrednosti koja za dva stepena slobode i nivo značajnosti 0,05 iznosi 5,99.

Ispitivanjem postojanja razlika između parova reprezentacija utvrđeno je da:

- Između reprezentacija Španije i Holandije postoji statistički značajna razlika u sve tri analizirane karakteristike fudbalske igre. Za posede lopte p=0,004, kontakte sa loptom p=0,002 i za kontakt indekse p=0,040.
- Između reprezentacija Španije i Nemačke utvrđene su statistički značajne razlike u posedima lopte p=0,013 i kontaktima sa loptom p=0,035, a kod kontakt indeksa nisu utvrđene statistički značajne razlike p=2,224.
- Izneđu reprezentacija Holandije i Nemačke nisu utvrđene statistički značajne razlike u nijednoj od tri posmatrane varijable. Za posede lopte p=0,225, za kontakte sa loptom p=0,225 i za kontakt indekse 0,564.

Na osnovu rezultata dobijenih ovim istraživanjem može se reći da su posmatrane reprezentacije samo po plasmanu bliske. Ovakvi rezultati daju za pravo da se govori i o različitim pravcima i školama fudbala koje su u savremenom fudbalu prisutne i rezultatski dominiraju. Na jednoj strani je reprezentacija Španije čiji igrači ostvaruju znatno veći broj poseda lopte i kontakata sa loptom u okviru tih poseda pri rešavanju tehničko taktičkih zadataka u toku utakmice, a na drugoj strani su reprezentacije Holandije i Nemačke čiji fudbaleri iste tehničko taktičke zadatke u toku utakmice rešavaju sa znatno manje i poseda lopte i kontakata sa loptom u okviru tih poseda.

Bilo bi interesantno i značajno za teoriju i praksu fudbalske igre pratiti ove karakteristike fudbalske igre i u dužem vremenskom periodu što nauka definiše kao longitudinalno istraživanje i upoređivati dobijene rezultate sa postojećim i na osnovu toga donositi pouzdane zaključke o razvoju i eventualnim promenama fudbalske igre i po ovim pitanjima. Tako dobijeni rezultati bi se mogli primeniti i u trenažnoj tehnologiji sa ciljem približavanja načina treniranja zahtevima koji su prisutni na vrhunskim takmičenjima, a jedno o njih su i Svetska prvenstva.

nificant differences observed in the game of the National teams. The value of x^2 Kruskall Wallis test showed, for two variables, that they have found a statistically significant difference over the tabular values of the two degrees of freedom and the significance level of 0.05 is 5.99.

The existence of differences between pairs team found that:

- Among the National teams of Spain and the Netherlands, there was no statistically significant difference in all three analyzed characteristics of the football game. For ball possession p = 0.004, ball contact p = 0.002 and for contact index p = 0.040.
- Among the National teams of Spain and Germany were found statistically significant differences in ball possession p = 0.013 and ball contact p = 0.035, and the contact index showed no statistically significant difference p = 2.224.
- Between the National temas of the Netherlands and Germany were no statistically significant differences in any of the three observed variables. For ball possession p = 0.225, for contact with the ball p = 0.225 and for contact index p=0.564.

Based on the obtained results in this study can be said that the observed National teams are only close in their ranking. These results entitle to talk about different ways and football schools that are present in modern football and outcome- dominated . On one side we have the Spanish National team whose players achieve significantly greater number of ball possessions and ball contacts in the framework of the possession resolving technical and tactical tasks during the game. and on the other side we have the National teams of the Netherlands and Germany. whose players othe same technical and tactical instructions during the game solved with much less ball possessions and contacts with the ball under those holdings.

It would be interesting and important for the theory and practice of football games to track these features of football game over a longer period of time which science defined as a longitudinal study and compare the results with existing and on that basis make reliable conclusions about the development and possible changes in the football game on these issues . So achieved results could be applied in training technology with the aim of making the way of training requirements that are present in the top competitions, and one of them is the World Championship.

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Short Notice

The Level of General Physical Performance and Physical Development of 7-Years Old Pupils in Banská Bystrica

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Nivo opštih fizičkih performansi i fizičkog razvoja učenika uzrasta od 7 godina u Banskoj Bistrici (Banská Bystrica)

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Abstract: This study presents the level of general physical performance and physical development of 7 years old pupils from all public primary schools in Banská Bystrica (n = 492, boys n = 252, age = 7.39, ± 0.43 years, girls n = 240, age = 7.24, ± 0.34) and findings about the after-school physical activity of pupils. The following indicators of physical development were monitored: body height, body weight and BMI. The following indicators of general physical performance were monitored: sit-and-reach test, standing long jump, sit-ups, flexed arm hang, shuttle run 4 x 10 m and endurance shuttle run. Body height and body weight of the boys was higher ($p < 0.05$) than those of the girls. The boys reached higher BMI, but the difference was not significant ($p > 0.05$). Statistical analysis of the results of the level of physical performance showed that the boys reached higher level ($p < 0.05$) in the tests of standing long jump, sit-ups and shuttle run 4 x 10 m to compare them with the girls. We noticed that the boys reached higher level in the tests of flexed arm hang and endurance shuttle run, but the difference was not significant ($p > 0.05$). The girls reached higher level ($p < 0.05$) in the sit-and-reach test. Achieved results of this study are diverse in confrontation with the results of other authors. 63.1 % of the boys stated the after-school physical activity within 1-3 times in a week. 56.7 % of the girls stated the after-school physical activity within 1-3 times in a week.

Key words: physical education, primary schools, first-grade pupils, general physical performance, somatic characteristics.

Apstrakt: Ova studija predstavlja analizu nivoa opštih fizičkih performansi i fizičkog razvoja učenika uzrasta od 7 godina iz svih javnih osnovnih škola u Banskoj Bistrici (n = 492, dječaci n = 252, uzrast = 7.39, ± 0.43 godina, djevojčice n = 240, uzrast = 7.24, ± 0.34), te rezultate o vanškolskim fizičkim aktivnostima učenika. Praćeni su sljedeći pokazatelji fizičkog razvoja: visina, težina i BMI. Pokazatelji opštih fizičkih performansi bili su: test gipkosti dubokim pretklonom sjedeći, skok u dalj iz mjesta, trbušnjaci, izdržaj u zgibu, test agilnosti 4x10m i test izdržljivosti. Visina i težina dječaka je bila veća ($p < 0.05$) u odnosu na djevojčice. Dječaci su pokazali veći BMI, ali razlika nije bila statistički značajna ($p > 0.05$). Statistička analiza rezultata nivoa fizičkih performansi je pokazala da su dječaci dostigli viši nivo ($p < 0.05$) u testovima skoka u dalj iz mjesta, trbušnjacima i testovima agilnosti 4x10m u odnosu na djevojčice. Primijećeno je da su dječaci dostigli viši nivo i u testovima izdržaja u zgibu i testovima izdržljivosti, ali razlika nije bila statistički značajna ($p > 0.05$). Djevojčice su dostigle viši nivo ($p < 0.05$) u testovima gipkosti dubokim pretklonom sjedeći. Dobijeni rezultati ove studije se razlikuju od rezultata drugih autora. 63,1% dječaka je izjavilo da imaju vanškolske fizičke aktivnosti 1-3 puta sedmično. 56,7% djevojčica je izjavilo da ima isto toliko vanškolskih fizičkih aktivnosti.

Ključne riječi: fizičko vaspitanje, osnovne škole, učenici prvog razreda, opšte fizičke performanse, somatske karakteristike.

Introduction

Generally, an unsatisfactory level of physical activities, general physical performance as well as the health of children is evident during the last period. In the past, but not long ago a number of measurements and testing of the level of general physical performance of school population was performed. For evaluation of physical performance of school population are currently used mainly 3 standardized test batteries: the European Test EUROFIT (Council of Europe, 1988), Czech Test UNIFIT (Měkota, Kovář and others, 1995; Chytráčková, 2002) and test batteries for the selection of talented individuals in sport, e.g. Brown (2001). The author Šimonek (2012) mentions other test batteries as well. These mentioned test batteries are, by their nature and normative way to evaluate results of test, focused on the performance component of a physical fitness.

Based on the findings of the previous reviews of a physical fitness and physical performance of children, we conclude that the innovation of motor tests and its verification should lead to a simplification of diagnosis and increase the overall motivation of teachers and pupils for the physical activity. Our work is at the beginning of this process which is focused on a group of children from Banská Bystrica. The aim of this study is to find out and compare the level of general physical performance, the level of physical development and to find out the after-school activity of first-grade pupils in Banská Bystrica. The project is an agreement on cooperation between the town Banská Bystrica and Matej Bel University. This project was organized by Department of Physical Education and Sports, Faculty of Humanities. This contribution was written with the support of grant project VEGA 1/1158/12.

Method

The sample of respondents

Overall, we tested 492 pupils out of 572 first-grade pupils in Banská Bystrica and this is 86 %. Remaining 14 % were not tested because of the absence on teaching process or they could not exercise mainly because of the health reasons. One of the school is without a gym, therefore these pupils were not tested as well (10). Tested pupils were from eleven public schools. They were from all classes of first grades of public schools in the number of 252 boys and 240 girls. During the measuring the average age of tested boys was 7.39 decimal years, ± 0.43 years and the average age of tested girls was 7.24 decimal years, ± 0.34 years. So, the group of tested boys was older about 0.14 years.

A sample of measuring instruments

Measurements were made by teachers and PhD students, students of Master and Bachelor degree in April-June 2013. These measurements were always performed, in accordance with daily biorhythms (Jančoková, 2000), in the morning from 8 o'clock to 12 o'clock under the standard conditions of a gym. As a rule, one class was tested during one lesson.

Measuring process:

1. After arriving to the gym pupils received race numbers and they became familiar with the aim of the research.
2. Basic identification data were provided by classroom teachers: name, date of birth, the information about the after-school physical activity.
3. Warming-up 3 + 5 min.
4. Measuring of the level of physical development: body height, body weight. BMI was calculated on the basis of body height and body weight.

Body height – measuring according to the methodology Moravec, Kampmiller, Sedláček and others (2002) with the accuracy of 0.5 cm.

Body weight – measuring using a digital scale, with the accuracy of 0.1 kg.

5. Measuring of the level general physical performance: sit-and-reach, standing long jump, sit-ups, flexed arm hang, shuttle run 4 x 10 meters, and endurance shuttle run.

1. ***Sit-and-reach test (SRT)*** - measuring according to the methodology Moravec, Kampmiller, Sedláček and others (2002). Better of two attempts is counted with the accuracy of 1cm.

2. ***Standing long jump (SLJ)*** - measuring according to the methodology Moravec, Kampmiller, Sedláček and others (2002). The best attempt out of three is counted with the accuracy of 1cm.

3. ***Sit-ups in 30 s (SUT)*** - measuring according to the methodology Moravec, Kampmiller, Sedláček and others (2002). The number of correctly performed exercises during 30 s is recorded.

4. ***Flexed arm hang (FAH)*** - measuring according to the methodology Moravec, Kampmiller, Sedláček and others (2002). Flexed arm hang is measured with the accuracy of 0.1 s.

5. Shuttle run 4 x 10 meters (4 x 10) – the task was always to cross the opposite or starting line by one foot. The time required to overcome four 10 m sections with the accuracy of 0.1s is measured.

6. ***Endurance shuttle run (ESR)*** - measuring according to the methodology Moravec, Kampmiller, Sedláček and others (2002). The number of overcame 20 m sections is recorded.

The order of the tests was not strictly followed due to time, but endurance shuttle run was always performed as the last one.

We used a parametric unpaired T-test for statistical evaluation of the results. Statistical analysis was processed in the software IMB SPSS Statistic 17. We used a parametric unpaired T-test as the test of significance of the difference between medium values of the group of boys and the group of girls. Significance was detected at the standardly used 5% level of significance. For evaluation of the results we used basic statistical characteristics of central tendency and dispersion such as: average (x), standard deviation (SD), minimum measured values (min) and maximum measured values (max) and percentage (%). We used basic logical methods to evaluate and interpret the results.

Results

Results show a different level of monitored parameters considering boys and girls (Table 1, 2). The girls achieve on average better level of a trunk flexibility which was determined using a sit-and-reach test. Contrary, boys achieve better average values in explosive power of lower limbs (standing long jump), in dynamic endurance strength of abdominal and hip-thigh muscles (sit-ups), running speed with changes of direction (shuttle run 4 x 10 meters) and running endurance capacity (endurance shuttle run). We recorded statistically significant difference ($p < 0.05$) in the following tests: standing long jump, sit-ups and shuttle run 4 x 10 m in favor of boys and in the sit-and-reach test in favor of girls.

Referring to the level of minimum and maximum performance, differences in used tests are not as clear as the average values. The girls achieved the highest level in the sit-and-reach test, flexed arm hang and endurance shuttle run (Table 1, 2). The boys achieved the best performance in the following tests: standing long jump, sit-ups and shuttle run 4 x 10 m. The girls achieved the worst performance in the standing long jump. The worst level achieved boys in the sit-and-reach test and shuttle run 4 x10 m. There are three tests in which the girls and boys achieved the same worst performance: sit-ups, flexed arm hang and endurance shuttle run. In two of these tests, sit-ups and flexed arm hang, we recorded zero values. It means, in both groups were individuals who had not done one cycle in the sit-ups test and did not maintain the desired position in the flexed arm hang test.

Table 1 Monitored indicators of general physical performance and physical development in group of boys (Boys)

Boys	Age	SRT (cm)	SLJ (cm)	SUT (n)	FAH (s)	4 x 10 (s)	ESR (n)	Height (cm)	Weight (kg)	BMI (i)
X	7.39	17.57	121.27	15.23	16.88	14.13	21.47	127.33	26.84	16.38
SD	0.43	5.81	18.95	4.90	17.07	1.29	11.79	5.82	5.30	2.22
Min	6.68	2	68	0	0	11.4	3	111.00	17.90	12.40
Max	9.28	31	179	31	89	19.7	66	143.50	48.00	26.30

Table 2 Monitored indicators of general physical performance and physical development in group of girls (Girls)

Girls	Age	SRT (cm)	SLJ (cm)	SUT (n)	FAH (s)	4 x 10 (s)	ESR (n)	Height (cm)	Weight (kg)	BMI (i)
X	7.25	20.83	111.49	13.07	16	14.54	19.87	125.62	25.72	16.16
SD	0.34	5.08	18.39	5.59	14.43	1.14	10.2	6.22	5.81	2.57
Min	6.14	5	57	0	0	12.0	3	111.50	14.30	11.60
Max	8.45	35	165	29	90	18.7	67	143.00	55.90	33.10

We also recorded higher average of somatic indicators in the group of boys – body height (boys were on average higher about 1.71 cm), body weight (boys were on average heavier about 1.12 kg) and in BMI about 0.22. Statisti-

cally significant difference ($p < 0.05$) was found in body height and weight in favor of boys. Statistically significant difference ($p < 0.05$) was not recorded in BMI.

Disscussion

We compare the results of our groups with the group from Slovakia (1993) according to Moravec, Kampmiller, Sedláček and others (2002) and with the group of children from eastern Slovakia according to Turek (1999) and Ružbarská & Turek (2007).

When comparing the group of boys from Banská Bystrica (2013) with the group from Slovakia (1993), we conclude lower level in all the tests, except the flexed arm hang test (Table 3). The boys from Banská Bystrica mostly lag behind in explosive power of lower limbs and in running endurance capacity. The comparison of our group with the boys from eastern Slovakia (Turek, 1999; Ružbarská & Turek 2007) shows bigger equality of groups. The boys from Banská Bystrica are better in the following tests: standing long jump, flexed arm hang and endurance shuttle run. The boys from eastern Slovakia are better in the following tests: the sit-and-reach test and one group is better in the sit-up test (Turek, 1999) and one of them is worse (Ružbarská & Turek 2007) than our group.

Table 3 Comparison of average results of our group with other researches – boys

Boys	Age	SRT (cm)	SLJ (cm)	SUT (n)	FAH (s)	4 x 10 (s)	ESR (n)	Height (cm)	Weight (kg)	BMI (i)
BB (2013) n = 252	7.39	17.57	121.27	15.23	16.88	14.13	21.47	127.33	26.84	16.38
SR (1993) n =73	7.37	19.85	132.52	19.01	9.90	-	31.70	127.67	26.29	-
East SR (1999) n = 446	7	20.56	115.13	15.60	12.66	-	20.80	126.11	25.39	18.20
East SR (2007) n = 195	7	20.75	116.37	11.67	16.36	-	20.83	125.23	24.84	-

Comparison in the group of girls from Banská Bystrica (2013) and the group of girls from Slovakia (1993) shows to be in favor of the girls of Slovak population in three indicators: standing long jump, sit-ups and endurance shuttle run (Table 4). The girls from Banská Bystrica are better in the flexed arm hang and in the indicator sit-and-reach are the same average values in both groups. In comparison with the group of girls from eastern Slovakia (Turek, 1999; Ružbarská & Turek 2007) our girls are worse in a trunk flexibility, dynamic and endurance strength of abdominal and hip-thigh muscles. They are better in the following tests: standing long jump, flexed arm hang and endurance shuttle run.

Referring to the explosive power of lower limbs and the results of Slovak population of boys and girls at the age of 7years, our groups lag behind as mentioned by Zapletalová (2002).

In comparison with the group from east (1999) we have recorded significantly lower BMI of our groups of boys and girls to compare them with the group of children from eastern Slovakia. However, recorded data are higher than national standards stated by Medeková & Šelingerová (2007) for Slovak children who do a sport and the one who do not.

Table 4 Comparison of average results of our group with other researches – girls

Girls	Age	SRT (cm)	SLJ (cm)	SUT (n)	FAH (n)	4 x 10 (s)	ESR (n)	Height (cm)	Weight (kg)	BMI (i)
BB (2013) n = 240	7.25	20.83	111.49	13.07	16	14.54	19.87	125.62	25.72	16.16
SR (1993) n =71	7.29	20.83	123.46	17.61	8.92	-	27.31	125.83	25.40	-
East SR (1999) n = 452	7	21.65	108.73	14.59	10.12	-	18.91	125.02	24.82	18.91
East SR (2007) n = 195	7	21.68	104.69	13.12	11.50	-	17.93	124.77	24.11	-

When selecting a test battery, we used two test batteries – EUROFIT and UNIFIT. Based on analysis of numerically limited files, it was concluded that the diagnosis of motor skills of children younger school age is characteri-

zed by excessive width of "diagnostic coverage", e.g. Turek (1996, 1999). Therefore, we had applied a battery that covered the whole range of general physical performance, but through a reducing of the number of test items when comparing it with the mentioned test batteries. We have omitted the test "flamingo" because of its lack of validity and questionable implementation in younger school age as the author Turek (1999) claims. Whereas speed capabilities were investigated using another test (Shuttle run 4 x 10 m), we omitted plate tapping which is used to measure frequency speed of arm. We also omitted a hand dynamometer because we used the flexed arm hang test to find out a static strength of upper limbs. Instead of 10 x 5 m we used shuttle run test 4 x 10 m, considering its duration and easier implementation. Although, the test 4 x 10 m can be found in the battery UNIFIT, we simplified it considering the age of children. Our test battery is nearly identical to Brown's battery (2001) for talent identification.

The organized after-school physical activity of the boys and girls is not very different. 63.1 % of the boys at the age of 7 stated the after-school physical activity within 1-3 times in a week. 56.7 % of the girls stated the after-school physical activity within 1-3 times in a week. Differences in the after-school physical activity are increasing with age in favor of boys and generally, mainly the interest of girls decreases (e.g. Antala et al. 2012).

The organized after-school physical activity of children from Banská Bystrica is at the average level because only just over half of the surveyed children state participation in any of them.

During the performance of all the tests for 7years old children, it is necessary to give the correct demonstration and to teach children basic forms of test implementation. Otherwise, at a low level of coordination abilities, the items are not sufficiently valid and their implementation is questionable.

Taking the level of abilities of 7 years old children into consideration, the flexed arm hang test and endurance shuttle run test are not valid enough, in which values of the standard deviation reach average values or more than half of the average.

Conclusion

Seven year old boys from Banská Bystrica achieve better level in five tests of general physical performance than girls: standing long jump, sit-ups, flexed arm hang, shuttle run 4 x 10 m and endurance shuttle run. In three of them there are statistically significant differences ($p < 0.05$). The girls achieve statistically better level of trunk flexibility ($p < 0.05$). Referring to a general physical performance, the group of boys from Banská Bystrica lag behind the group of boys of Slovak population in all the tests, except the flexed arm hang test. The comparison of the boys from eastern Slovakia shows bigger equality of both groups. What refers to a general physical performance, the group of girls from Banská Bystrica lag behind the group of girls of Slovak population in three tests, in one indicator they are at the same level and they are the best in one of them. The comparison of the girls from eastern Slovakia shows bigger equality of both groups, three times in favor of our group and two times in favor of the group of girls from eastern Slovakia. Both our groups are significantly better in the flexed arm hang test when comparing them with a group of Slovak population and eastern Slovak population. In indicators of physical development has been recorded statistically significant difference ($p < 0.05$) in body height and weight in favor of boys. Then, BMI of boys is also slightly higher but not statistically significant ($p < 0.05$). In the comparison of the group from eastern Slovakia (1999), we recorded significantly lower BMI of our groups of boys and girls to compare it with the group of children from eastern Slovakia.

Authorship statement
The authors have contributed equally.

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We declare that we have no confl icts of interest.

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Upravljanje zdravstvenim rizicima od mikrobioloških opasnosti pri korištenju voda bazena za kupanje i rekreaciju

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Korisnici bazena izloženi su različitim opasnostima od kojih je rizik obolijevanja prouzrokovan mikrobiološkom kontaminacijom vode bazena najveći. Rizik bolesti ili infekcija zbog korištenja bazena povezan je, u prvom redu, sa fekalnom kontaminacijom vode zbog fecesa kupača ili fekalnom kontaminacijom vode sa kojom se puni bazen. Patogeni mikroorganizmi predstavljaju najčešći i najrašireniji zdravstveni rizik vezan za vodu kao sredinu zbog pojava infektivnih bolesti izazvanih bakterijama, virusima i parazitskim protozoama.
Prećišćavanje vode smanjuje dijelom taj rizik, ali se najveća mjera sigurnosti korisnika može ostvariti tek dezinfekcijom vode u bazenu. Kulatura i samodisciplina kupača su doprinosni činioci njenoj bezbijednosti.
Razmatranje problema upravljanja mikrobiološkim kvalitetom vode u bazenima, izloženo u ovom radu, bazira se najvećim dijelom na odgovarajućim Preporukama Svjetske zdravstvene organizacije (WHO, 2000).

Ključne riječi: bazeni, voda, mikroorganizmi, opasnosti, rizici

Uvod

Korištenje voda za rekreaciju ili liječenje veoma mnogo znači u održavanju zdravlja i radne sposobno-

The Management of Health Risks From Microbiological Dangers While Using Swimming Pool Water for Swimming and Recreation

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Summary: The need for recreation as one of the ways of maintaining psychophysical health and work ability is an important need of modern man. Significant number of people, periodically or continually, uses swimming pools for those purposes. On the other hand, recreational activities at the swimming pools, as well as using swimming pools for the purposes of healing and recovery, can jeopardize health, therefore an adequate swimming pool management is necessary in order to decrease that influence to the minimum.
Users of swimming pools are exposed to various dangers, of which the risk of becoming ill by microbiological contamination of the swimming pool water is the greatest. The risk of illness or infection because of using a swimming pool is primarily connected to faecal contamination of the water because of swimmers' faeces or faecal contamination of the water used for filling a swimming pool. Pathogen microorganisms represent a most common and widespread health risk related to water as an environment because of infective disease occurrences caused by bacteria, viruses and parasite protozoa.
Water purification partially decreases that risk, but the greatest safety measure for users can be achieved only by disinfection of the water in the swimming pool. Swimmers' culture and self-discipline are factors that contribute to water's safety.
Consideration of the swimming pool water microbiological quality management problem, presented in this work, is based on the correspondent Recommendations of the World Health Organization (WHO, 2000).

Keywords: swimming pools, microorganisms, dangers, risks

Introduction

Using water for recreation and healing means very much for maintaining health and work ability of a popula-

sti stanovništva. Značajan broj ljudi, povremeno ili stalno, koristi u te svrhe bazene. Međutim, rekreativne aktivnosti na bazenima, ali i korištenje bazena u svrhu liječenja ili oporavka, mogu da ugroze zdravlje, tako da je neophodno odgovarajuće upravljanje bazenima kako bi se taj uticaj sveo na što manju mjeru.

Upravljanje bazenima je relativno složena problematika i ovdje neće biti obuhvaćena u cjelosti, već će težište ovih razmatranja biti na, svakako, najvažnijem dijelu te problematike, a to je upravljanje kvalitetom vode u bazenima, tačnije upravljanje mikrobiološkim kvalitetom vode.

Razmatranje problema upravljanja mikrobiološkim kvalitetom vode u bazenima, izloženo u ovom radu, bazira se najvećim dijelom na odgovarajućim Preporukama Svjetske zdravstvene organizacije (WHO, 2000).

Rizici od mikrobioloških opasnosti

Korisnici bazena izloženi su različitim opasnostima od kojih je rizik obolijevanja prouzrokovan mikrobiološkom kontaminacijom vode bazena najveći. Potencijalni rizici po zdravlje usljed prisustva različitih hemikalija su znatno manji nego što je to rizik koji nosi prisustvo mikroorganizama. Prećišćavanje vode, ako se uopšte izvodi, smanjuje dijelom taj rizik, ali se najveća mjera sigurnosti korisnika može ostvariti tek dezinfekcijom vode u bazenu.

Pošto se voda, često, javlja kao sredstvo transmisije različitih infektivnih agenasa, mikrobiološke karakteristike predstavljaju značajan parametar kvaliteta svake vode. U najširem smislu, voda je uvijek bila u osnovi pojave raznih infekcija kod čovjeka, bilo preko: digestivnog trakta (feko-oralna transmisija ingestijom kontaminirane vode) ili preko muko-kutane barijere (transmisija kontaktom se kontaminiranom vodom)$_1$.

Patogeni mikroorganizmi predstavljaju najčešći i najrašireniji zdravstveni rizik vezan za vodu kao sredinu zbog pojava infektivnih bolesti izazvanih bakterijama, virusima i parazitskim protozoama. Sem fekalnih patogena, brojni ostali infektivni mikroorganizmi mogu biti prenijeti sa bolesnih korisnika bazena na ostale korisnike. Isto tako, oprema bazena i sama voda u bazenu, kao i ventilacioni sistem ili sistem za kondicioniranje vazduha, mogu biti stanište pojedinih akvatičnih bakterija i ameba koje mogu izazvati razne infekcije i bolesti respiratornog sistema, kože pa i CNS. Pogotovo su kao stanište pogodni bazeni za terapiju sa svojom, po pravilu, toplom vodom, često, bogatom solima i ostalim nutrijentima.

tion. Significant number of people, occasionally or permanently, uses swimming pools for that purpose. On the other hand, recreational activities in swimming pools, as well as using pools with a purpose of healing or recovery, can jeopardize health so it is necessary to adequately manage swimming pools in order to decrease the bad influence as much as possible.

The pool management is a relatively complex problem and will not be included here entirely, but the focus of this consideration will be, of course, on the most important aspect of the problem, that is on the swimming pool water quality management, or more precisely, on the water's microbiological quality management.

Consideration of the swimming pool water microbiological quality management problem, presented in this work, is based on the correspondent Recommendations of the World Health Organization (WHO, 2000).

Risks of Microbiological Dangers

Users of swimming pools are exposed to various dangers, of which the risk of becoming ill by microbiological contamination of the swimming pool water is the greatest. Potential health risks because of the presence of various chemicals are significantly lesser than risk caused by the presence of microorganisms. The water purification, if it is performed at all, decreases that risk, but the greatest safety measure for users can be achieved only by disinfection of the swimming pools water.

Since water often appears as a means of transmission of various infective agents, microbiological characteristics represent a significant parameter of any water. In its broadest sense, water has always been in the centre of occurrences of various human infections, whether through digestive tract (feco-oral transmission by ingestion of contaminated water) or through muco-cutaneous barrier (transmission by contact with contaminated water)$_1$.

Pathogen microorganisms represent most common and widespread health risk related to water as an environment because of occurrences of infective diseases caused by bacteria, viruses and parasite protozoa. Besides faecal pathogens, numerous other infective microorganisms can be transferred from ill swimming pool users to other users. In the same way, swimming pool equipment and the water in the swimming pool itself, as well as ventilation system or air conditioning system, can be a habitat of certain aquatic bacteria and amoebas which can cause various infections and respiratory system, skin and even CNS illnesses. Especially suitable as a habitat are swimming pools with their, normally, warm water, often rich with salts and other nutrients.

Osnovna mjera smanjenja rizika je izbjegavanje uslova i situacija koje vode povećanoj pojavi opasnosti, a jedna od najvažnijih preventivnih mjera je, svakako, upoznavanje osoba sa smanjenim imunitetom da izbjegavaju bazene zbog povećanog rizika za svoje zdravlje.

Najveća opasnost po zdravlje ljudi predstavlja kontaminacija vode humanim ili animalnim ekskretima, odnosno direktna ili indirektna fekalna kontaminacija[5]. Rizik pojave bolesti ili infekcije vodom iz bazena u suštini je najviše povezan sa: fekalnim zagađenjem od samih kupača ili sadržanim u samoj vodi izvorišta kojom se bazen napaja. Mnoge bolesti dobijene u bazenu, posljedica su slabog izvođenja dezinfekcije ili njenog potpunog izostanka[1].

Mnogi mikroorganizmi u vodi bazena vode porijeklo od samih kupača, odnosno korisnika (sa kože, sekreta iz nosa ili grla). Inficirani korisnici bazena mogu direktno da kontaminiraju vodu cijelog bazena, kao i površine objekta i materijala koje time neposredno postaju izvor zaraze za druge osobe koje dolaze u kontakt sa zagađenom sredinom.

Za pojave nekih epidemija sa sigurnošću je utvrđeno da vode porijeklo iz bazena, pri čemu se kao najveći krivci smatraju navike ljudi da koriste bazene i onda kada su bolesni, pa često ovi objekti za osvježenje i rekreaciju postaju leglo različitih bolesti i infekcije. Najčešće se kao uzročnici epidemija navode virusi, iako se u posljednje vrijeme incidenti dešavaju zbog prisustva bakterija i protozoa. Određene vrste gljiva takođe predstavljaju vrlo ozbiljne agense i uzročnike mnogih površinskih infekcija kože, kose, prstiju kupača.

Ukratko korištenje bazena (bilo otvorenog ili zatvorenog tipa) nosi sa sobom i određeni zdravstveni rizik povezan sa mikrobiološkim kvalitetom vode[1].

Dva su osnovna razloga mikrobiološke neispravnosti vode u bazenima i rizika koji se time javlja, a to su: neadekvatan tretman vode (prije svega neadekvatna dezinfekcija) i prisusvo samih korisnika (bilo bolesnih, bilo onih sa deficitarnom ličnom higijenom i nedovoljno edukovanih za ponašanje u takvim vodama), pa je u bazenskim vodama moguća identifikacija mikroorganizama u osnovi fekalnog i nefekalnog porijekla, kao što su virusi, bakterije gljive, parazitske protozoe.

Mikroorganizmi fekalnog porijekla

Kao najveći uzročnici pojave **virusnih infekcija** vezanih za vode navode se Adenovirusi, iako se često idetifikuju i virus Hepatitis A, Norwalk virus i Ecshvirus 30. Izvori ovih infektivnih agenasa su većinom nepoznati, dok se za neke pretpostavlja da su vezani za

The basic measure for risk reduction is avoiding conditions and situations that lead towards increased occurrence of dangers, and one of the most important preventive measures is, of course, informing people with lower immunity to avoid swimming pools because of increased risk for their health.

The greatest danger for people's health is water contamination by human or animal excretions, i.e. direct or indirect faecal contamination. The risk of occurrence of disease or infection by swimming pool water is essentially mostly connected to faecal pollution by swimmers themselves or present in the source of water by which the swimming pool is supplied. Many diseases caught in a swimming pool are a consequence of poorly performed disinfection or its total omission [1].

Many microorganisms in swimming pool water have origin from swimmers – that is users themselves (from their skin, nose secretion or throat). Infected users of a swimming pool can directly contaminate water of the whole swimming pool, as well as the surface of the object and materials which then become the source of infection for other people who come into contact with the polluted environment.

It is identified with certainty that some epidemics originated from swimming pools, whereby the habits of people who use swimming pools even when they are sick are recognized as main culprits, so these objects for refreshment and recreation become hotbed of disease and infection. Viruses are most often mentioned as the cause of epidemics, although recently there has been incidents caused by bacteria and protozoa. Certain types of fungi also represent the serious agents and a cause of many surface infections of swimmers' skin, hair or fingers.

In short, using swimming pools (whether open or indoor type) carries a certain health risk related to water's microbiological quality [1].

There are two main reasons for the microbiological contamination of swimming pool water and the correspondent risk, and these are: inadequate water treatment (primarily inadequate disinfection) and presence of users themselves (whether sick, with deficient personal hygiene or undereducated about how to behave in the water), so it is possible to identify microorganisms of faecal and non-faecal origin, such as viruses, bacteria, fungi and parasitic protozoa in swimming pool waters.

Microorganisms of Faecal Origin

Adenoviruses are mentioned as the greatest cause of **virus infection** occurrences, though there is also a frequent identification of the Hepatitis A virus, Norwalk virus and

fekalno zagađenje ili sekrete iz očiju i grla, odnosno vezani su za same korisnike bazena. U većini slučajeva, kod pojave virusnih infekcija, dokazano je da nivo hlorisanja nije bio djelotvoran, ili da sam sistem nije dobro funkcionisao[5].

Adenovirusi, najčešće će dati kod kupača groznicu, faringitis i konjuktivitis, ponekad glavobolju i anoreksiju.

Kontrola virusa u bazenima za kupanje uobičajeno se sprovodi ispravnom aplikacijom hlora ili drugiuh dezinfektanata, održavanjem koncentracije rezidualnog hlora od 0,4 mg/l. Uprkos tome što je ovaj nivo hlora efektivan, veće koncentracije organskih materija, koje dospijevaju u vodu bazena sa kože velikog broja kupača, mogu povećati potrebu za hlorom, što smanjuje ili sprečava dezinfekciono djelovanje. Slučajevi jakog zagađenja vode u bazenu, nastalog iznenadnom fekalnom kontaminacijom (izlučivanjem fecesa) od strane kupača ili povraćanjem se takođe ne može uspješno držati pod kontrolom sa normalnom koncentracijom hlora. Ako se voda bazena, inače, ne dezinfikuje (čest slučaj kod bazena i kada za terapiju) tada iznenadno fekalno zagađenje ili povraćanje, predstavlja još veći problem.

Jedini siguran pristup očuvanju sigurnog korištenja bazena u slučaju iznenadnog fekalnog zagađenja ili povraćanja je zabrana korištenja bazena, sve dok se kontantaminacija ne savlada.

Edukacija roditelja male djece kao i ostalih rekreativaca, je takođe od značaja, s obzirom da dobro higijensko okruženja bazena znači prevenciju u zaštiti i redukciju pojave akcidentalnih situacija vezanih za fekalno zagađenje.

Korisnici bazena, tebalo bi da se uzdrže od boravka u bazenu ukolko su oboljeli od infektivnih bolesti, pošto virusni patogeni mogu da se putem vode iz bazena prenesu na druge korisnike.

Bakterije fekalnog porijekla

Kao uzročnici raznih infekcija i akcidentnih situacija u bazenskim vodama bakterijske etiologije, najčešće, se spomnju dvije bakterije (Shigela spp i E. Coli) koje se uspješno kontrolišu hlorisanjem i drugim dezinficijensima pod normalnim uslovima rada bazena. Najveća opasnost potiče od iznenadnog fekalnog zagađenja, tako da je osnovna mjera odgovarajuća edukacija korisnika bazena. Međutim, ako do iznenadnog fekalnog zagađenja dođe, osnovna mjera je prekid korištenja bazena i pojačanje dezinfekcije. Problem je međutim kod bazena koji se ne dezinfikuju. Tu je zabrana korištenja jedina sigurna mjera, te pražnjenje bazena i njegova dezinfekcija.

Echovirus 30. The sources of these infective agents are mostly unknown, while for some it has been presumed to be related to fecal pollution or eye and throat secretions, i.e. are related to swimming pool users themselves. In most cases, when virus infection occurs, it has been proved that the level of chlorination was not effective, or that the system itself was not functioning well [5].

Adenoviruses will most commonly give users a fever, laryngitis and conjunctivitis, sometimes a headache and anorexia.

Virus control in swimming pools is usually conducted by correct application of chlorine or other disinfectants, by maintaining residual chlorine concentration at 0.4 mg/l. Despite the fact that this level of chlorine is effective; greater concentration of organic matter, which come off from the swimmers' skin into the swimming pool water, may increase the need for chlorine. Cases of severe pollution of swimming pool water, caused by sudden faecal contamination (faeces excretion) by swimmers or by vomiting, cannot be held under control by normal concentration of chlorine. If the swimming pool water is not disinfected (frequent case with swimming pools and therapy baths) then faecal pollution or vomiting represent even greater problem.

The only safe approach to preserve a safe use of swimming pools in the case of a sudden faecal pollution or vomiting is to ban the use of a swimming pool, as long as the contamination is not overcome.

Education of little children's parents as well as other recreational swimmers is also of importance, considering that good hygiene of a swimming pool means prevention and reduction of accidental situations related to faecal pollution.

Swimming pool users should abstain from staying in a swimming pool if they are sick from infective disease, since virus pathogens can be transferred by water to other users.

Bacteria of Faecal Origin

As a cause of various infections and accidental situations in swimming pool waters of bacteria aetiology, two bacteria are mentioned most frequently (Shigela spp and E. coli) which are successfully controlled by chlorination and other disinfectors under normal work conditions of a swimming pool. The greatest danger comes from a sudden faecal pollution, so that the basic measure is an adequate education of swimming pool users. However, if a sudden faecal pollution occurs, the basic measure is to stop using a swimming pool and increase disinfection. But the problem is swimming pools which are not disinfected. In such case, the ban of use is the only safety

Epidemije diareje među kupačima su nerijetka pojava, pri čemu su upravo sami oboljeli kupači izvori zaraze. Prema procjeni epidemiologa, samo jedan oboljeli korisnik bazena može da kontaminira cijeli bazen i to na duži period. Iz tih razloga ljudi ne bi smjeli da koriste bazene bar dvije nedjelje pošto budu izliječeni od diareje[5]. Jedna od primarnih intervencija za smanjenje rizika je redukcija akcidentalnih fekalnih zagađenja, pri čemu je na prvom mjestu edukacija korisnika bazena. U svakom slučaju, na bilo koji način da se javi fekalno zagađenje, jasno je da ovi organizmi ne mogu biti trenutno eliminisani, i da je potrebno vrijeme za siguran dezinfekcioni efekat. Zaštita zdravlja pod ovim okolnostima uključuje zabranu korištenja bazena i edukaciju korisnika[1].

Rizik od bolesti u bazenima, povezan sa **patogenim protozoama** feklanog porijekla, najčešće, uključuje dva parazita Giardia i Cryptosporidium. Ova dva organizma slična su u mnogim pogledima: imaju nisku infektivnu dozu i prisutne su u velikoj gustini u individuama koje su oboljele od gardizitisa i kriptosporidiazisa. Posjeduju ciste ili oociste koje su visokorezistentne na prirodne stresove i na dezinficijsense, tako da se mora koristiti mnogo jače dezinfekciono sredstvo, kao što je ozon. Međutim, pošto ozon nema rezidualnog djelovanja na vodu u bazenu, mora se obezbijediti poslije ozonizacije neko dezinfekciono sredstvo sa rezidualnim djelovanjem.

Najsigurniji način borbe protiv protozoa je preventivno djelovanje, da do iznenadnog fekalnog zagađenja ne dođe, tako što će se korisnici upoznati sa posljedicama nepridržavanja dobrih higijenskih navika.

- Patogene protozoe kao što su Giardia nalaze se intrastinalnom traktu ljudi i nekih životinja u trofozoičnom stadijumu. Kada se ovi organizmi izbace u prirodnu sredinu, kao što je npr. voda, prelaze u stadijum ciste (4-12μdezinfekcijom u cilju uklanjanja ili uništenja infektivnih mikroorganizama, tako da u bazenu ne bude prenosioca bolesti;
- odgovarajućom hidroulikom bazena koja će u prvom redu obezbijediti optimalnu distribuciju dezinficijensa po cijelom bazenu;
- odgovarajućim prečišćavanjem vode u cilju uklanjanja polutanata;
- čestim dodavanjem svježe vode kako bi se razblažile materije koje ne mogu da se uklone uobičajenom obradom vode.

U zatvorenim (pokrivenim) bazenima, održavanje kvaliteta vazduha je isto tako važno, kako se pojedini mikroorganizmi (kao Legionela) i isparljivi sporedni proizvodi dezinfekcije ne bi nakupljali u vazduhu iznad samog bazena[4].

measure, followed by emptying the swimming pool and its disinfection.

Epidemic of diarrhoea among swimmers is not a rare occurrence, where the swimmers themselves are the source of the epidemic. According to epidemiologists' estimation, only one diseased swimming pool user can contaminate the whole swimming pool and that for a longer period. For those reasons some people should not use swimming pools at least two weeks after they have been cured from diarrhoea [5].

One of the primary risk mitigation interventions is the reduction of accidental faecal pollution, where the education of swimming pool users stands in the first place. Anyway, whatever the way of occurrence of faecal pollution is, it is clear that these organisms cannot be eliminated instantaneously, and that time is needed for a safe disinfection effect. Protection of health in these conditions includes the ban of using swimming pools and education of their users [1].

The risk of disease in swimming pools, connected to pathogenic protozoa of faecal origin most commonly includes two parasites Giardia and Cryptosporidium. These two organisms are similar in many ways: they have low infective dose and are present in great density in individuals who are diseased with Giardiasis and Cryptosporidiosis. They possess cysts or oocysts which are highly resistant to natural stresses and disinfectors; therefore, much stronger disinfector has to be used, such as ozone. However, since ozone does not have residual action on the swimming pool water, some disinfector with stronger residual action has to be provided.

The safest way of fighting against the protozoa is preventive action, so the sudden faecal pollution would never occur, in a way that users would be notified with consequences of the failure to comply with good hygiene habits.

- Pathogenic protozoa such as Giardia are found in people's and some animals' intestinal tract in trophozoite stadium. When these organisms are released into the environment, such as water, they cross to the stadium of cyst (4-12μDisinfection with a purpose of removing or destroying infective microorganisms, so there would not be any disease carriers in a swimming pool
- Appropriate hydraulics of a swimming pool which would primarily achieve optimal distribution of disinfectors in all swimming pool
- Appropriate cleaning of water in order to remove pollutants
- Frequent adding of fresh water in order to dis-

Zaključak:
Korištenje bazena, otvorenog ili zatvorenog tipa, nosi sa sobom i određeni zdravstveni rizik povezan sa mikrobiološkim kvalitetom vode. Prećišćavanje vode smanjuje dijelom taj rizik, ali se najveća mjera sigurnosti korisnika može ostvariti tek dezinfekcijom vode u bazenu i stalnim održavanjem rezidualne koncentracije dezinfikcionog sredstva. Kulatura i samodisciplina kupača su doprinosni činioci njenoj bezbijednosti.

solute matters that cannot be removed by usual treatment of the water.

In closed (roofed) swimming pools, maintaining air quality is also important, so that certain microorganisms (like Legionella) and evaporable by-products of disinfection would not accumulate in the air above the swimming pool itself[4].

Conclusion:

Using a swimming pool, indoor or open type carries a certain health risk connected to microbiological quality of the water. Cleaning the water partially decreases that risk, but the greatest safety measure can be achieved only by disinfection of swimming pool water and by constantly maintaining residual concentration of disinfector. The culture and self-discipline of swimmers are contributing factors to the water's safety.

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NASLOV RADA (U NAJVIŠE DVA REDA)

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