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SPORTSKE NAUKE I ZDRAVLJE

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Naučna i stručna misao je nezaustavljiva!

Drugi broj Časopisa „Sportske nauke i zdravlje“ u 2020. godini, označava punih 10 godina kontinuiranog izlaženja Časopisa i njegov dvadeseti broj! Ponosni smo na ovaj mali jubilej našeg Časopisa i zahvalni svim autorima koji su u ovih dvadeset brojeva, svojim radovima doprinijeli da Časopis „Sportske nauke i zdravlje“, postane referantan i da se nalazi u Scopus citatnoj bazi.

Do sada, u proteklih deset godina, je objavljen 171 rad, od čega: originalnih naučnih radova 87, preglednih radova 24, kratkih saopštenja 46 i stručnih radova 14.

U radovima je učestvovalo 535 autora i koautora iz 21 države (Alžir, Bosna i Hercegovina, Brazil, Bugarska, Crna Gora, Grčka, Hrvatska, Indija, Indonezija, Irak, Island, Malezija, Mađarska, Njemačka, Poljska, Ruska Federacija, Sjeverna Makedonija, Sjedinjene Američke Države, Slovačka, Slovenija, Srbija), sa 5 kontinenata (Afrika, Azija, Evropa, Sjeverna Amerika, Južna Amerika).

I u vremenu kada se Covid-19 širi po cijelom svetu i kada je zdravlje ljudske populacije ugroženo, a svjetska ekonomika kriza na pomolu, Vi, drage koleginice i kolege iz Alžira, BIH, Crne Gore, Hrvatske, Malezije i Srbije, svojim naučnim i stručnim radovima, pokazujete da su nauka i znanje i u kriznim vremenima nosioci progresa i slobodnog mišljenja.

Scopus citatna baza, u kojoj je naš Časopis, takođe potvrđuje da znatiželju, kreativnost, znanje, nauku i slobodno mišljenje svjetska naučna i stručna javnost prati i vrednuje, bez obzira na teškoće u kojima se cijeli svijet danas nalazi.

Vaši radovi, upravo potvrđuju sve ranije rečeno, a oni su iz problematike: tehničko-taktičkih aktivnosti rukometašica; efikasnosti vibracionog treninga, e-sporta tokom pandemije Covid-19 i njegov uticaj na zdravlje djece; financiranja i finansijskih rizika profesionalnih sportskih klubova u Republici Hrvatskoj; karakteristika i efikasnosti servisa kod mladih stonoteniserki; tjelesne aktivnosti studenata u vrijeme pandemije bolseti Covid-19; uticaja demografskih faktora na rast i razvoj djevojčica mlađeg školskog uzrasta; analize obrazovnog procesa u obučavanju sportskih kolektivnih aktivnosti u srednješkolskom obrazovanju; utvrđivanja razlike između nivoa fizičkih sposobnosti učenika 4. i 5. razreda osnovne škole; odnosa izmedju motoričkih sposobnosti i tjelesne kompozicije kod djece i adolescenata.

Veliku zahvalnost dugujemo uvaženim recenzentima, koji su uvijek oštricom svojih kritičkih osvrta, doprinosili kvalitetu radova i na taj način dali značajan doprinos vrijednosti Časopisa, a time i njegovoj prepoznatljivosti u svijetu sportskih i medicinsko-rehabilitacionih nauka.

I na kraju, vodeći se, mnogim vodiljama istraživačkog duha, pomenućemo jednu afričku poslovicu koja glasi: „*Ako imaš cilj, naći ćeš i put.*“

Zaokružujući desetogodišnji ciklus u kome živi naš Časopis, pozivamo kolege stručnjake i istraživače da svoja znanja, dileme, iskustva, istraživanja, riječju svoje misli, i dalje iznose javno, publikujući svoje radove u Časopisu „Sportske nauke i zdravlje“.

Srećna 2021. godina i zdravi bili!

UREDNIŠTVO ČASOPISA

Scientific and professional thought is unstoppable!

The second issue of the Journal “Sports Science and Health” in 2020, marks a full 10 years of continuous publication of the Journal and its twentieth issue! We are proud of this small jubilee of our Journal and we are grateful to all the authors who, in these twenty issues, have contributed with their papers to the Journal “Sports Science and Health” becoming a reference listed in the Scopus citation database.

So far, in the past ten years, 171 papers have been published, of which: 87 original scientific papers, 24 review papers, 46 short presentations and 14 professional papers.

535 authors and co-authors from 21 countries participated in the articles (Algeria, Bosnia and Herzegovina, Brazil, Bulgaria, Montenegro, Greece, Croatia, India, Indonesia, Iraq, Iceland, Malaysia, Hungary, Germany, Poland, Russian Federation, North Macedonia, United States, Slovakia, Slovenia, Serbia), from 5 continents (Africa, Asia, Europe, North America, South America).

At a time when Covid-19 is spreading around the world and the health of the human population is endangered, with the global economic crisis on the horizon, you, dear colleagues from Algeria, Bosnia and Herzegovina, Montenegro, Croatia, Malaysia and Serbia, with your scientific and professional papers, show that science and knowledge are the bearers of progress and free opinion even in times of crisis.

The Scopus citation database, which includes our Journal, also confirms that curiosity, creativity, knowledge, science and free opinion are monitored and valued by the world's scientific and professional public, regardless of the difficulties in which the whole world finds itself today.

Your articles just confirm all that has been said before, and deal with the following issues: technical and tactical activities of handball players; the effectiveness of vibration training, e-sports during the Covid-19 pandemic and its impact on children's health; financing and financial risks of professional sports clubs in the Republic of Croatia; characteristics and efficiency of service in young table tennis players; physical activity of students during the Covid-19 pandemic; the influence of demographic factors on the growth and development of girls of younger school age; analysis of the educational process in the training of sports collective activities in secondary education; determining the difference between the levels of physical abilities of 4th and 5th grade elementary school students; relationships between motor skills and body composition in children and adolescents.

We owe a great deal of gratitude to the respected reviewers, who have always contributed to the quality of articles with their critical reviews and thus made a significant contribution to the value of the Journal and its recognizability in the world of sports and medical rehabilitation.

And finally, led by many guidelines of the research spirit, we will mention an African proverb which reads: **“If you have a goal, you will find a way.”**

Rounding off the ten-year cycle in which our Journal has been issued, we invite fellow experts and researchers to continue to present their knowledge, dilemmas, experiences, research and their words in public, by publishing their papers in the Journal “Sports Science and Health”.

Happy 2021 and stay healthy!

JOURNAL EDITORIAL

CHARACTERISTICS AND EFFICIENCY OF SERVICE IN YOUNG TABLE TENNIS PLAYERS

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Abstract: The aim of this study was to determine the characteristics and efficiency of service in the best young table tennis players, as well as the existence of differences in service between young players of different ages. The research sample consisted of 18 matches (10 juniors, 8 cadets) at international tournaments in 2018 (ETTU Youth Top 10 in Portugal, European Youth Championship in Romania). The results of the analysis of the Hi-square independence test showed the existence of a statistically significant difference in the number of performed Forhand (FH) and Backhand (BH) short services in table tennis players. By 4.3%, more BH short services were recorded among juniors, while cadets significantly more used FH short services (3.5%) compared to older teammates. The research also proved the existence of a statistically significant difference in certain indicators of service efficiency. By 6.9%, Service without advantage is significantly higher among female cadets, and Service with acquired advantage is 5.9% higher among juniors. There is a difference in other indicators of service efficiency, but it is not statistically significant. Out of a total of 1450 services, only 1% of services were performed incorrectly.

Keywords: table tennis, kick-off, differences, cadets, juniors.

INTRODUCTION

Table tennis is one of the most technically and tactically complex sports. The precondition for gaining points is the successful application of as many different blows as possible. Each of them has its own way of performing, its own role in the point, and in relation to the quality and quantity of their application, the competitive achievement is determined, ie the style and concept of the player's game.

KARAKTERISTIKE I EFIKASNOST SERVISA KOD MLADIH STONOTENISERKI

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Sažetak: Cilj rada je bio da se utvrde karakteristike i efikasnost servisa kod najboljih mladih stonoteniserki, kao i postojanje razlika u servisu između mladih igračica različitog uzrasta. Uzorak istraživanja je činilo 18 mečeva (10 juniorke, 8 kadetkinje) na međunarodnim turnirima u 2018. godini (ETTU Youth Top 10 u Portugalu, Evropsko prvenstvo za mlađe u Rumuniji). Rezultati analize Hi-kvadrat testa su pokazali postojanje statistički značajne razlike u broju izvedenih Forhend (FH) i Bekhend (BH) kratkih servisa kod stonoteniserki. Za 4,3% je zabeleženo više BH kratkih servisa kod juniorki, dok su kadetkinje značajno više koristile FH kratke servise (3,5%) u odnosu na starije saigrачice. Istraživanjem je dokazano i postojanje statistički značajne razlike u pojedinim indikatorima efikasnosti servisa. Za 6,9% Servis bez prednosti je veća od kadetkinja, a Servis sa stečenom prednosti je 5,9% više zabeležena kod juniorki. Razlika postoji i u ostalim indikatorima efikasnosti servisa, ali nije statistički značajna. Od ukupno 1450 servisa, samo 1% servisa je pogrešno izvedeno.

Ključne reči: stoni tenis, početni udarac, razlike, kadetkinje, juniorke.

UVOD

Stoni tenis spada u tehnički i taktički najsloženije sportove. Pretpostavka za dobijanje poena je uspešna primena što većeg broja različitih udaraca. Svaki od njih ima svoj način izvođenja, svoju ulogu u poenu, te u odnosu na kvalitet i kvantitet njihove primene determiniše se takmičarsko postignuće, odnosno stil i koncept igre igrača.

Determining the technical and tactical characteristics in competitive table tennis is important for improving all the performances necessary for a successful performance of the player, while respecting those elements of the game that are most used in the match and on whose efficiency the result largely depends.

Table tennis has a reputation for being the fastest ball game. The speed of a ball in table tennis depends on the type of stroke and the energy invested in the stroke itself. Thus, speeds range from 20-160km/h. Racket arm speed reaches 50-70km/h (Kondrić, Hudetz, & Furjan-Mandić, 2010).

Table tennis belongs to the group of polystructural acyclic sports and sports games, so it is clear that technical-tactical efficiency is the basis of table tennis success. In other words, the technical-tactical assumptions and requirements are extremely high and directly determine the final competitive success. The order of influence of certain technical and tactical variables on success in table tennis is as follows: Service efficiency, Efficiency in disabling the opponent and preparing your own attack, Efficiency of movement in the game, safety and efficiency in attacking game above the table and efficiency in active defense (Ivanek, 2015).

The result in table tennis is determined by the quality and quantity of motor knowledge and those anthropological features that are most important for this sport. Knowing the hierarchy of significant factors in the success of the table tennis game is the first prerequisite that sports experts and players should know in order for sports training to be adequate (Đukić, Ivanek, Vujanović, Glamočić, 2018).

Experts and researchers from around the world believe and agree that table tennis is a sport of aerobic metabolism that requires significant endurance, with frequent intense anaerobic metabolism required in short exchange of strokes when playing points (Pradas et al., 2010; Zagatto et al., 2010; 2011; Zagatto and Gobatto, 2012).

Different criteria for the division of basic strokes can be found in the table tennis literature.

According to Hudetz (2000) in relation to the type of rotation that the blow produces, the basic blows are divided into: direct attacking blows (attack without rotation), spin blows (attack with rotation), block (stop) blows, cut defense, pimple, flip, balloon defense, service. Techniques derived from basic strokes are receiving service, returning attacking spin shots and short balls are very important elements of a modern table tennis game. All of these shots are performed in two basic ways: forehand and backhand.

In any sports situation, especially in table tennis, it is difficult, if not impossible, for a coach to notice and

Utvrdjivanje tehničko-taktičkih karakteristika u takmičarskom stonom tenisu je značajno za unapređenje svih performansi neophodnih za uspešni nastup igrača pri tome uvažavajući one elemente igre koji se u meču najviše primenjuju i od čije efikasnosti u najvećoj meri zavisi rezultat.

Stoni tenis ima reputaciju najbrže igre s loptom. Brzina loptice u stonom tenisu zavisi od vrste udarca i energije uložene u sam udarac. Tako se brzine kreću od 20-160km/h. Brzina ruke s reketom dostižu od 50-70km/h (Kondrić, Hudetz, & Furjan-Mandić, 2010).

Stoni tenis spada u grupu polistrukturalnih acikličnih sportova i sportskih igara, pa je jasno kako tehničko-taktička efikasnost predstavlja osnovu stonoteniske uspešnosti. Drugim rečima, tehničko-taktičke pretpostavke i zahtevi su izuzetno visoki i direktno određuju konačnu takmičarsku uspešnost. Redosled uticaja pojedinih tehničko-taktičkih varijabli na uspeh u stonom tenisu je sledeći: efikasnost servisa, efikasnost u one-mogućavanju protivničkog i pripremi vlastitog napada, efikasnost kretanja u igri, sigurnost i efikasnost u napadačkoj igri iznad stola i efikasnost u aktivnoj odbrani (Ivanek, 2015).

Rezultat u stonom tenisu determinišu kvalitet i kvantitet motoričkih znanja i onih antropoloških obeležja najznačajnijih za ovu sportsku granu. Poznavanje hierarhije žnačajnih činilaca uspešnosti stonoteniske igre je prvi preduslov koji sportski stručnjaci i igrači treba da znaju da bi sportski trening bio adekvatan (Đukić, Ivanek, Vujanović, Glamočić, 2018).

Stručnjaci i istraživači iz čitavog sveta smatraju i saglasni su da je stoni tenis sport aerobnog metabolizma koji zahteva značajnu izdržljivost, sa čestim intenzivnim anaerobnim metabolizmom potrebnim u kratkim razmehama udaraca prilikom odigravanja poena (Pradas et al., 2010; Zagatto et al., 2010; 2011; Zagatto and Gobatto, 2012).

U stonoteniskoj literaturi se mogu pronaći različiti kriterijumi za podelu osnovnih udaraca.

Prema Hudetu (2000) u odnosu na vrstu rotacije koju udarac proizvodi, osnovni udarci se dele na: direktnе napadačke udarce (napad bez rotacije), spin udarce (napad s rotacijom), blok (stop) udarce, rezana odbrana, pimpl, flip, balon odbrana, servis. Tehnike izvedene iz osnovnih udaraca su: prijem servisa, vraćanje napadačkih spin udaraca i kratke lopte i oni su veoma važni elementi savremene stonoteniske igre. Svi ovi udarci se izvode sa dva osnovna načina: forhendom i bekhendom.

U svakoj sportskoj situaciji, naročito u stonom tenisu, treneru je teško, ako ne i nemoguće, uočiti i zapamtitи

remember all the key events that occur within a training or match, if he relies exclusively on his knowledge of the sport and his own observation skills. Nevertheless, analysis based on accurate observations and recollections is a key tool for improving the future game of table tennis. In table tennis, notation analysis is an objective way of recording a player's game, so that critical events in that performance can be quantified in a consistent and reliable way. Table tennis is one of the fastest ball games in the world, so it is difficult for a coach to spot and remember all the key elements that occur within a game or training (Sindik, Ochiana, & Kondrić, 2012).

Each part of the points is characterized by certain blows, ie technical and tactical knowledge. The start of the point is reserved for service and service reception. No point can start without an initial kick, ie. service. He is the only kick in table tennis that does not depend directly on the opponent. Service is the initial shot in which the player directs the ball to his own, and then to the opponent's field of the table. In modern game, a large number of services are applied, which differ from each other in rotation, length, the part of the table where the ball is directed, as well as from other criteria. Receipt of service, ie return of service is carried out with the help of various strokes that are applied as a technical-tactical means of playing the match.

The importance of the service is evidenced by the interest of many authors in various research services (Đokić, 2003; Wang, 2019; Kocić, 2016, Ivanek, 2015).

Research Wang (2019) tried to determine the differences in service and service reception at the 2012 and 2016 Olympics and found that at the last Olympics significantly less efficient service and service reception, as well as fewer backhand receptions.

Service is the starting point in table tennis, as well as in many other sports (tennis, volleyball). That is why it is so important. Players who serve well, after a well-executed serve, can easily win a point or come to such a position to take the initiative. A table tennis player can have a strong kick, he can have a great spin, but all this cannot be expressed due to the fact that the opponent's serve returns poorly or that he serves poorly (Talović, Kazazović, Žifko, Hadžiahmetović, 2011).

In their research, Wu, X., Zhen, Z., (1996) found that in most cases, after services performed without rotation, points end after the first ball, while after variants of cut and side serves, the second and third balls are played, that is, scoring.

A good serve in table tennis is more than just bringing the ball into play. If you have quality service, you will be able to constantly prepare for the attack and control the

sve ključne događaje koji se javljaju unutar treninga ili meča, ako se oslanja isključivo na svoje znanje o sportu i vlastitu veštinu posmatranja. Ipak, analiza na temelju tačnih zapažanja i prisećanja je ključni alat za poboljšanje buduće igre stonotenisera. U stonom tenisu notacijska analiza je objektivan način snimanja igre igrača, tako da se kritični događaji u toj performansi mogu kvantifikovati na dosledan i pouzdan način. Stoni tenis je jedna od najbržih igara s loptom na svetu, pa je za trenera teško uočiti i zapamtiti sve ključne elemente koji se javljaju unutar igre ili treninga (Sindik, Ochiana, & Kondrić, 2012).

Svaki deo poena karakterišu određeni udarci, odnosno tehničko-taktička znanja. Početak poena je rezervisan za servis i prijem servisa. Nijedan poen ne može da počne bez početnog udarca, tj. servisa. On je jedini udarac u stonom tenisu koji ne zavisi direktno od protivnika. Servis je početni udarac u kojem igrač upućuje lopticu u svoje, pa u protivnikovo polje stola. U savremenoj igri se primenjuje veliki broj servisa koji se međusobno razlikuju po rotaciji, dužini, delu stola gde se loptica upućuje, kao i od drugih kriterijuma. Prijem servisa, odnosno vraćanje servisa se sprovodi uz pomoć različitih udaraca koji se primenjuju kao tehničko-taktičko sredstvo odigravanja meča.

O značajnosti servisa govori interesovanje mnogih autora za različitim istraživanjima servisa (Đokić, 2003; Wang, 2019; Kocić, 2016, Ivanek, 2015).

Wanga (2019) je pokušao da utvrdi razlike u servisu i prijemu servisa na OI 2012. i 2016. godine i ustanovio je da su na poslednjim OI značajno manje efikasni servis i prijem servisa, kao i manji broj prijema bekhendom.

Servis je početni udarac u stonom tenisu, kao i u mnogim drugim sportovima (tenis, odbojka). Upravo zato ima veliki značaj. Igrači koji dobro serviraju, nakon dobro izvedenog servisa, mogu lako osvojiti poen ili doći u takvu poziciju da preuzmu inicijativu. Igrač stonog tenisa može imati snažan udarac, može imati odličan spin, ali sve to ne može doći do izražaja iz razloga što se loše vraća protivnikov servis ili što sam loše servira (Talović, Kazazović, Žifko, Hadžiahmetović, 2011).

Wu, X., Zhen, Z., (1996) su u svom istraživanju utvrdili da u većini slučajeva nakon servisa izvedenih bez rotacije poen završavaju već nakon prve odigrane lopte, dok posle varijanti rezanih i postraničnih servisa dolazi do odigravanja druge i treće lopte, odnosno poentiranja.

Dobar servis u stonom tenisu je više od pukog uvođenja loptice u igru. Ako imate kvalitetan servis, moći ćete konstantno pripremati napad i kontrolisati tok igre,

course of the game, throwing the opponent off balance. Often, if you have good service, you can win with less effort and weaker shots (Seemiller, Holowchak, 2000).

The efficiency of the service enables the attacker to realize technical-tactical activities and most often gain initiative in the game, and by receiving the service the opponent is prevented or at least hindered by the next offensive action or takes the initiative to organize the attack (Ivanek et al., 2018).

METHODS

The sample of entities consists of 18 international matches of table tennis players of cadet and junior age, which are in the top 60 on the ETTU ranking list. The research included 10 matches, 39 sets, 737 points, ie services in the competition of juniors (16-18 years) and 8 matches, 40 sets, 713 points, ie services in the competition of cadets (11-15 years).

Observed and analyzed matches were played in 2018 at international tournaments organized by ETTU (Youth Top 10 in Portugal, European Youth Championship in Romania).

izbacujući protivnika iz ravnoteže. Često, ako imate dobre servise, možete pobedjavati sa manje napora i slabijim udarcima (Seemiller, Holowchak, 2000).

Efikasnost servisa omogućuje napadaču realizaciju tehničko-taktičkih aktivnosti i najčešće sticanje inicijative u igri, a prijemom servisa se protivniku one mogućava ili barem otežava naredna napadačka akcija ili preuzima inicijativu organizovanja napada (Ivanek i sar., 2018).

METOD RADA

Uzorak entiteta čine 18 međunarodnih mečeva stonotenisera kadetskog i juniorskog uzrasta, koji se nalaze u prvih 60 na rang listi ETTU. Istraživanjem je obuhvaćeno 10 mečeva, 39 setova, 737 poena, odnosno servisa u konkurenciji juniorki (16-18 godina) i 8 mečeva, 40 setova, 713 poena, odnosno servisa u konkurenciji kadetkinja (11-15 godina).

Posmatrani i analizirani mečevi su odigrani 2018. godine na međunarodnim turnirima u organizaciji ETTU (Youth Top 10 u Portugalu, Evropsko prvenstvo za mlađe u Rumuniji).

Table 1. Overview of the research sample / Tabela 1. Pregled uzorka istraživanja

VARIABLES / VARIJABLE	AGE CATEGORIES / UZRASNE KATEGORIJE		
	juniors girls / juniorke	cadets girls / kadetkinje	total / ukupno
matches / mečevi	10	8	18
sets / setovi	39	40	79
points / poeni	737	713	1450
service / servis	737	713	1450

The significance of the differences between the characteristics and success of the service was tested by applying the Chi square test and the method of crustabulation between the table tennis players of the junior and cadet age categories.

RESULTS AND DISCUSSION

Testing the differences in the frequencies of characteristics and service efficiency in juniors and cadets (Table 2) shows that there are statistically significant differences in the two variables. In the analysis of services classified by length (short, semi-long and long service) and in relation to the stroke with which it is performed (FH/BH service), no significant differences were obtained. In relation to the effect of the difference, with the indicator Type of service VRSER, the effect of the observed differences is small (9%), below 10%. The variable EFISER had a medium-high effect with a 12% share of this indicator in defining the difference in service efficiency among cadets and juniors.

Značajnost razlika između karakteristika i uspešnosti servisa testirana je primenom Hi kvadrat testa i metodom krostabulacije između stonotenisera juniorske i kadetske uzrasne kategorije.

REZULTATI I DISKUSIJA

Testiranje razlika u frekvencijama karakteristika i efikasnosti servisa kod juniorki i kadetkinja (Tabela 2.) pokazuje da postoje statistički značajne razlike u dve varijable. Kod analize servisa razvrstanih po dužini (kratki, poludugi i dugački servis) i u odnosu na udarac kojim se izvodi (FH/BH servis) nisu dobijene značajne razlike. U odnosu na efekat razlike, kod indikatora Vrsta servisa VRSER je efekat uočenih razlika mali (9%). Kod varijable EFISER zabeležen je srednje visoki efekat sa 12% učešća ovog indikatora u definisanju razlike u efikasnosti servisa kod kadetkinja i juniorki.

Table 2. Test results of differences in frequencies, characteristics and efficiency of services for juniors and cadets girls

Variables / Varijable	Code / Šifra	χ^2	p	Cramer's V
Type of service* / Vrsta servisa*	VRSSEN	11.198	0.048	0.09
Division of service by length / Podela servisa prema dužini	DUZSER	0.53	0.768	0.02
Type of service (FH service/BH service) / Tip servisa (FH servis/BH servis)	TIPSER	1.30	0.229	- 0.03(f)
Service efficiency** / Efikasnost servisa**	EFISER	20.94	0.000	0.12

Legend: χ^2 – The value of the chi square of the test, the p-level of statistical significance of the chi square of the test, the V-value of the Cramer's V, the fi-value of the phi coefficient; * significant at $p \leq 0.05$; ** significant at $p \leq 0.01$

The entire sample included in this research is 1450 services that were applied in 79 sets of table tennis players in the cadet and junior age categories. Observing (Table 3) we notice that 54.3% recorded FH short service SEFHKR, then 14.7% BH short service SEBHKR, 13.9% FH semi-long service SEFHPO. The least represented service is the BH long service SEBDHU, which was performed 44 times out of 1450 services of both age categories of table tennis players.

Table 3. Display of frequencies of different types of services for juniors and cadets girls

Tabela 2. Rezultati testiranja razlika u frekvencijama karakteristika i efikasnosti servisa za juniorke i kadetkinje

Legenda: χ^2 – Vrednost hi kvadrat testa, p – nivo statističke značajnosti hi kvadrat testa, V – vrednost Kramerovog pokazatelja (Cramer's V), fi – vrednost fi koeficijenta (phi coefficient); * značajno na $p \leq 0.05$; **značajno na $p \leq 0.01$

Celokupan uzorak obuhvaćen ovim istraživanjem je 1450 servisa koji su primenjivani u 79 setova stonoteniserki kadetske i juniorske uzrasne kategorije. Posmatrajući (Tabelu 3) uočavamo da je 54,3% zabeležen FH kratki servis SEFHKR, zatim 14,7% BH kratki servis SEBHKR, 13,9% FH poludugi servis SEFHPO. Najmanje zastupljen servis je BH dugački servis SEBDHU, koji je 44 puta izведен od 1450 servisa obe uzrasne kategorije stonoteniserki.

Tabela 3. Prikaz frekvencija različitih vrsta servisa za juniorke i kadetkinje

Varijable / Varijable	Statistics / Statistici	Category / Kategorija		
		juniors girls / Juniorke	cadets girls / Kadetkinje	Total / Ukupno
Forhend short SEFHKR /	Frequency / Frekvencija	388	400	788
Forhend kratki SEFHKR	% for category / % za kategoriju	52.6%	56.1%	54.3%
Forhend half-long SEFHPO /	Frequency / Frekvencija	98	104	202
Forhend poludugi SEFHPO	% for category / % za kategoriju	13.3%	14.6%	13.9%
Forhend long SEBDHU /	Frequency / Frekvencija	83	65	148
Forhend dugacki SEBDHU	% for category / % za kategoriju	11.3%	9.1%	10.2%
Bekhend short SEBHKR /	Frequency / Frekvencija	124	89	213
Bekhend kratki SEBHKR	% for category / % za kategoriju	16.8%	12.5%	14.7%
Bekhend half-long SEBHPO /	Frequency / Frekvencija	28	27	55
Bekhend poludugi SEBHPO	% for category / % za kategoriju	3.8%	3.8%	3.8%
Bekhend long SEBDHU /	Frequency / Frekvencija	16	28	44
Bekhend dugacki SEBDHU	% for category / % za kategoriju	2.2%	3.9%	3.0%
Total / Ukupno	Frequency / Frekvencija	737	713	1450
	% for category / % za kategoriju	100.0%	100.0%	100.0%

$\chi^2 = 11.198$ p = 0.048 V = 0.088

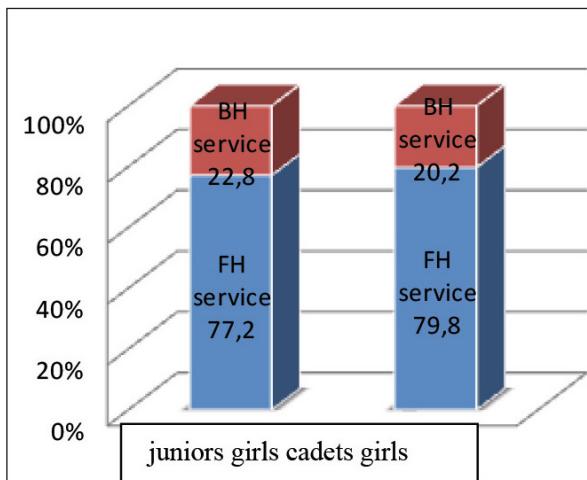
Legend: χ^2 – Chi square test value, p - level of statistical significance chi square test, V-Cramer's V

Legenda: χ^2 – Vrednost hi kvadrat testa, p – nivo statističke značajnosti hi kvadrat testa, V-Kramerov pokazatelj V (Cramer's V)

The results of the analysis of the Chi-square independence test showed that there is a statistically significant difference in the number of performed FH and BH short services in table tennis players. By 4.3%, more BH short services were recorded among juniors, while cadets significantly more used FH short services (3.5%) compared to older teammates.

FH long service (SEFH DU) is used more by juniors by 2.2% than cadets, which may indicate that they are technically and tactically better prepared for the attacking actions of opponents. The choice of service, as well as other technical and tactical elements in the match are certainly a consequence of the tactical ideas of the players.

BH semi-long services (SEBH PO) in both categories are also represented in relation to other types of services, while 1.3% of cadets use FH semi-long services more. Bearing in mind that semi-long service is often the intention of applying short service, ie it is a consequence of inaccuracy, we can say that cadets did not perfect short services the best. However, the semi-long service is also a competitive tool, ie the desire of the server, because the recipients of the service do not receive the service in the best way due to poor assessment of the length of the service, which gives the server an advantage to continue the points with attacking actions. Out of 1450 performed services, 78.5% perform table tennis services with forehand, 21.5% with backhand. Graph 1 shows that 2.6% of juniors in matches rely more on BH services.



Graph 1. Display of service type frequencies (FH / BH service) for juniors and cadets

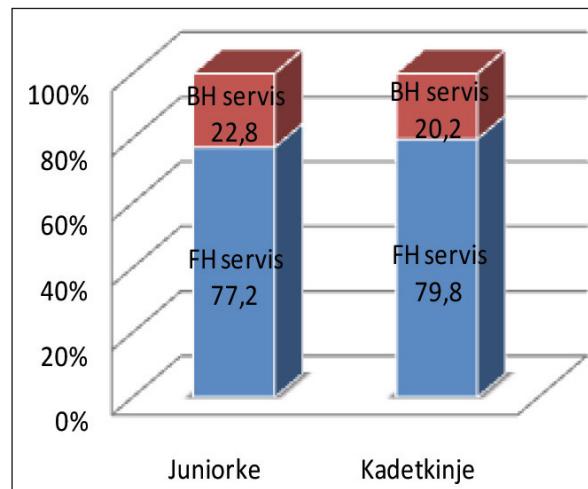
The results of our research differ from the research of Wu, X., Zhen, Z., (1996) and Đokić (2003), where in matches FH service is represented by 94.7%, and BH service by 5.3%, and show a significantly higher percentage participation of backhand service in matches. Look-

Rezultati analize Hi-kvadrat testa nezavisnosti su pokazali da postoji statistički značajna razlika u broju izvedenih FH i BH kratkih servisa kod stonoteniserki. Za 4,3% je zabeleženo više BH kratkih servisa kod juniorki, dok su kadetkinje značajno više koristile FH kratke ser-vise (3,5%) u odnosu na starije saigrăčice.

FH dugački servis (SEFH DU) više primenjuju juni-orke za 2,2% od kadetkinja, što može da nam ukaže da su one tehnički i taktički bolje spremne za napadačke akcije protivnika. Izbor servisa, kao i ostalih tehničko taktičkih elemenata u meču sugurno su posledica taktičkih zamisli igrača.

BH poludugi servisi (SEBH PO) kod obe kategorije su isto zastupljeni u odnosu na ostale vrste servisa, dok su 1,3% kadetkinje više primenjivale FH poluduge ser-vise. Imajući u vidu da je poludugi servis često namera primene kratkog servisa, odnosno posledica je nepreci-znosti, možemo reći da kadetkinje nisu najbolje usavršile kratke servise. Međutim, poludugi servis je i takmičar-sko sredstvo, odnosno želja servera, jer primaoci servisa zbog loše procene dužine servisa ne prime servis na naj-bolji način što predstavlja serveru prednost za nastavak poena napadačkim akcijama.

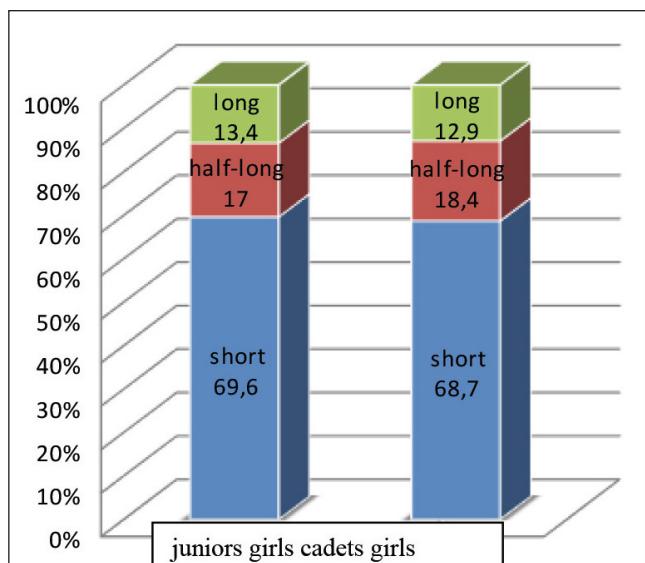
Od 1450 izvedenih servisa 78,5% servisa stonote-niserke izvode forhendom, 21,5% behendom. U grafi-konu 1 se vidi da se za 2,6% juniorke u mečevima više oslanjam na BH servise.



Grafikon 1. Prikaz frekvencija tipa servisa (FH/BH servis) kod juniorki i kadetkinja

Rezultati našeg istraživanja se razlikuju od istraživanja Wu, X., Zhen, Z., (1996) i Đokića (2003), gde je u mečevima FH servis zastupljen 94,7%, a BH servis 5,3%, i pokazuju značajno veći procenat učešća behend servisa u mečevima.

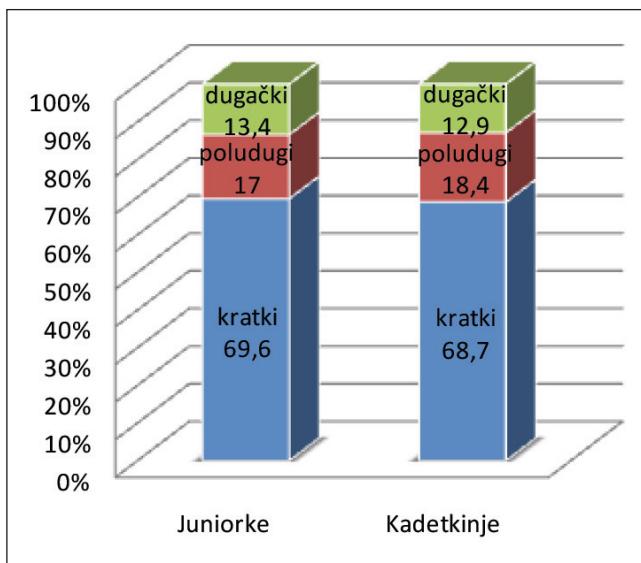
ing at Chart 2, we notice a slightly higher percentage of short services (0.5%) and 0.9% of long services among juniors, while 1.4% of semi-long FH and BH services were recorded among cadets, but no statistically significant difference. A total of 13.4% of long services differ from the research (Đokić, 2003) in which 19.90% of long services were served.



Graph 2. Display of frequencies of the type of service in relation to the length of juniors and cadets

Service efficiency is described by the following indicators: SERGRE - indicates a service error, ie an error in performing the service; SERBEZ - no advantage gained by service, good reception of service, poorly performed service; SERPRE-acquired service advantage, poor service reception, excellent service; SERDIR- directly scored a point with a service, an error in receiving the service. Inspecting (Table 4), we can conclude that there is a statistically significant difference in individual indicators of service efficiency. The variable SERBEZ is significantly higher by 6.9% in cadets, SERPRE is 5.9% higher in juniors. There is a difference in other indicators of service efficiency, but it is not statistically significant. Out of 1450 services performed by table tennis players, only 1% of services were performed incorrectly.

Posmatrajući grafikon 2 uočavamo neznatno veći procenat kratkih servisa (0,5%) i 0,9% dugačkih servisa kod juniorki, dok je 1,4% poludugih FH i BH servisa zabeležen kod kadetkinja, ali razlika nije statistički značajna. Ukupno 13,4% dugačkih servisa se razlikuje od istraživanja (Đokić, 2003) u kom je 19,90% servirano dugačkih servisa.



Grafikon 2. Prikaz frekvencija vrste servisa u odnosu na dužinu kod juniorki i kadetkinja

Efikasnost servisa opisan je sledećim indikatorima: SERGRE-označava servis grešku, odnosno grešku u izvođenju servisa; SERBEZ-nije stečena prednost servisom, dobar prijem servisa, loše izveden servis; SERPRE-stečena prednost servisom, loš prijem servisa, odlično izveden servis; SERDIR- direktno osvojen poen servisom, greška u prijemu servisa.

Uvidom u (Tabelu 4.) možemo konstatovati postojanje statistički značajne razlike u pojedinim indikatorima efikasnosti servisa. Varijabla SERBEZ je za 6,9% značajno veća kod kadetkinja, SERPRE je 5,9% više zabeležena kod juniorki. Razlika postoji i u ostalim indikatorima efikasnosti servisa, ali nije statistički značajna. Od 1450 servisa izvedenih kod stonoteniserki, samo 1% servisa je pogrešno izvedeno.

Table 4. Test results of differences in service efficiency frequencies in table tennis players of cadet and junior age

Variables / Varijable	Statistics / Statistici	Category / Kategorija		
		Juniors girls / Juniorke	Cadets girls / Kadetkinje	Total / Ukupno
Service error SERGRE / Servis greška SERGRE	Frequency / Frekvencija % for category / % za kategoriju	10 1.4%	5 0.7%	15 1.0%
Service without advantages SERBEZ / Servis bez prednosti SERBEZ	Frequency / Frekvencija % for category / % za kategoriju	535 72.6%	567 79.5%	1102 76.0%
Service-acquired advantage SERPRE / Stečena prednost servisom SERPRE	Frequency / Frekvencija % for category / % za kategoriju	77 10.4%	32 4.5%	109 7.5%
Direct service point SERDIR / Direktan poen servisom SERDIR	Frequency / Frekvencija % for category / % za kategoriju	115 15.6%	109 15.3%	224 15.4%
Total / Ukupno	Frequency / Frekvencija % for category / % za kategoriju	737 100.0%	713 100.0%	1450 100.0%

$\chi^2 = 20.94$ p = 0.000 V = 0.120

Legend: χ^2 – Chi square value of the test, p - level of statistical significance chi square of the test, V-Cramer's V

The recorded number of more efficient services among juniors tells us that older players have a greater need for better service due to the increased demands of the game in the older category, and therefore the training is more focused on this segment of the game. Juniors, compared to cadets, have more training experience, which certainly contributes to a better and more versatile service. For cadets, the service is not sufficiently perfected, as well as its diversity, which leads to better reception of the service and does not present difficulties in the game of the recipient. In general, service efficiency is extremely important in the table tennis game. Namely, with efficient service, first of all, we are able to directly win a point, or on the other hand, with efficient service, we can enable a better position in the continuation of the game to win points in the match.

CONCLUSION

The analysis of service, as an initial kick in a point, the only shot that is not performed after the opponent's kick, is of great importance in competitive table tennis. Changing the rules of service (prohibition of hiding the contact of the racket and the ball with the free hand), increasing the volume of the ball, switching to the use of a plastic ball have somewhat reduced the impact of service in the game. However, in addition to that, it is of great importance in the structure of points and represents the main technical and tactical weapon for many players.

In accordance with the initial assumptions, technical-tactical success affects the competitive success of

Tabela 4. Rezultati testiranja razlika u frekvencijama efikasnosti servisa kod stonoteniserki kadetskog i juniorskog uzrasta

Legenda: χ^2 – Vrednost hi kvadrat testa, p – nivo statističke značajnosti hi kvadrat testa, V-Kramerov pokazatelj (Cramer's V)

Zabeležen veći broj efikasnijih servisa kod juniorki nam govori da starije igračice imaju veću potrebu za kvalitetnijim izvođenjem servisa zbog povećanih zahteva igre u starijoj kategoriji, samim tim je i trening više usmeren na ovaj segment igre. Juniorke, u odnosu na kadetkinje imaju više trenažnog iskustva koji sigurno doprinosi boljem i svestranijem izvođenju servisa. Kod kadetkinja servis nije dovoljno usavršen, kao i njegova raznovrsnost što dovodi do boljeg prijema servisa i ne predstavlja poteškoće u igri primaoca. Generalno, efikasnost servisa izuzetno je važna u stonoteniskoj igri. Naiime, efikasnim servisom pre svega, u mogućnosti smo direktno osvojiti poen, ili u drugu ruku, efikasnim servisom omogućiti bolju poziciju u nastavku igre za osvajanje poena u meču.

ZAKLJUČAK

Analiza servisa kao početnog udarca u poenu, jedinog udarca koji se ne izvodi posle protivnikovog udarca, veliku važnost ima u takmičarskom stonom tenisu. Promena pravila servisa (zabrana skrivanja kontakta reketa i loptice slobodnom rukom), povećanje obima loptice, prelazak na upotrebu plastične loptice su donekle uticali na smanjenje uticaja servisa u igri. Međutim i pored toga, on ima veliku značaj u strukturi poena i predstavlja glavno tehničko-taktičko oružje mnogim igračima.

U skladu sa inicijalnim pretpostavkama tehničko-taktička uspešnost utiče na takmičarsku uspešnost

players. Table tennis belongs to the group of polystructural acyclic sports and its performance is a sports game, so it was clear that technical-tactical efficiency is the basis of table tennis success. In other words, the technical-tactical assumptions and requirements are particularly high and directly determine the final competitive success. The order of the influence of certain technical and tactical variables on the success in table tennis ranks the efficiency of the service among the most important indicators of success in the game.

The research proved that the service for juniors is more efficient, and 5.9% more services were recorded, which gave them an advantage in points compared to cadets. By 4.3%, more BH short services were recorded among juniors, while cadets significantly more used FH short services (3.5%) compared to older teammates.

The research tried to point out the importance of the service and its analysis, as well as the importance of noting its frequency in order to help sports experts and athletes in their work. Recording the frequencies of characteristics and efficiency of technical-competitive abilities should be an unavoidable segment of the training process in table tennis.

Announcement

We announce that the authors have equally contributed to this paper.

Conflict of interests

There is no conflict of interests among the authors themselves.

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igrača. Stoni tenis spada u grupu polistrukturalnih akcionalnih sportova i izvedbom je sportska igra, pa je bilo jasno kako tehničko-taktička efikasnost predstavlja osnovu stonoteniske uspešnosti. Drugim rečima, tehničko-taktičke pretpostavke i zahtevi su posebno visoki i direktno određuju konačnu takmičarsku uspešnost. Redosled uticaja pojedinih tehničko-taktičkih varijabli na uspeh u stonom tenisu, efikasnost servisa svrstava među najznačajnije indikatore uspeha u igri.

Istraživanjem je dokazano da je servis kod juniorki efikasniji, i zabeleženo je za 5,9% više servisa kojim je ostvarena prednost u poenu u odnosu na kadetkinje. Za 4,3% je zabeleženo više BH kratkih servisa kod juniorki, dok su kadetkinje značajno više koristile FH kratke ser vice (3,5%) u odnosu na starije saigratice.

Istraživanjem se pokušalo ukazati na značaj servisa i njegove analize, kao i na značaj notiranja njegove frekvencije u funkciji pomoći sportskim stručnjacima i sportistima u radu. Beleženje frekvencija karakteristika i efikasnosti tehničko-taktičkih sposobnosti treba da bude nezaobilazan segment trenažnog procesa u stonom tenisu.

Izjava

Izjavljujemo da su autori podjednako doprineli radu.

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Između autora ne postoji interesni konflikt.

DIFFERENCES IN PHYSICAL ACTIVITY LEVEL BETWEEN 3RD AND 4TH GRADE PUPILS OF ELEMENTARY SCHOOL

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Abstract: The aim of this research was to determine differences in physical activity (PA) level between 3rd grade pupils (3 lessons of PE per week) and 4th grade (2 lessons of PE per week) pupils of elementary school. Partial aims were referring to determine gender differences. The set of entities included 400 3rd and 4th grade pupils of elementary school. In the 3rd grade participated 200 pupils, 93 girls and 107 boys and in the 4th grade 200 pupils participated in the research, of which 102 girls and 98 boys. PA level was estimated by the croatian version of PAQ - C (Physical Activity Questionnaire for Children) which estimates overall weekly PA by summarising nine partial parameters of PA and PA occurring during PE lesson is one of them. Differences in level of overall PA between 3rd grade pupils and 4th grade pupils of elementary school were not determined. Also gender differences in level of overall PA (3rd or 4th grade pupils) were not determined. Only determined gender differences were the ones in some partial parameters of PA. According to the pupil's average result during PE (4,60), conclusion is that pupils were active often or every time, whereby the purpose of the PE lesson is in large scale fulfilled. The future research need to upgrade questionnaires for estimation of physical activity level based on self-evaluation, also need to determine reasons of pupil's insufficient levels of PA in some partial parameters of PA in order to raise level of overall PA.

Key words: physical activity, questionnaire, young school age, gender differences, Physical Education.

INTRODUCTION

The term physical activity may not be identified with the term exercise which is just its subcategory. Physical activity includes exercise, but also playing, work, active transportation, home activities, recreation etc. (World Health Organization). Importance of physical activity, especially at the age of growth and development, is manifested by its multiple positive influence on immediate and indirect indicators of a good health status.

Considering the global health interest in monitoring physical activity of the world population, scientific researches are carried out with different purposes. Jurakić and Andrijašević (2008) state four aims for measuring physical activity: 1. determining and monitoring a level of physical activity of a particular population (e.g. population of one country), 2. understanding the correlation between a level of physical activity and physical and/or mental health (epidemiological research), 3. understanding the determinants (patterns) of physical activity within certain groups, 4. determining the effects of intervention programs for improving health. Results of such scientific research are the appropriate starting point for various forms of intervention by health, school and other institutions with a purpose to improve present condition.

There are different ways of measuring and evaluating physical activity. Jurakić and Andrijašević (2008) distinguish three groups of measurements: laboratory methods, methods based on the use of electronic devices and instruments, and methods based on self - assessment of physical activity of the examinees themselves. Measuring and evaluating methods can be either direct or indirect. Direct methods include: calorimetry, a physical activity questionnaire taken by a researcher or an interviewer and electronic motion detectors recently developed in the form of pedometers, body motion recorders, cameras, etc. Indirect methods are: energy input determination techniques, energy consumption determination techniques such as measuring pulse, muscular strength, etc. (Mišigoj - Duraković and Duraković, 2006). The questionnaire is one of the most practical (and economical) method of assessing physical activity because it can be applied on a large sample of entities and it is quick (Jurakić and Andrijašević, 2008).

The PAQ - C questionnaire estimates level of overall physical activity of younger school children aged 8 to 14 (Crocker et al., 1997). According to the available research, the PAQ - C questionnaire has a croatian version and its reliability was tested on an appropriate sample (according to the age) (Vidaković - Samardžija and Mišigoj

- Duraković, 2013). Reliability was determined by a test - retest method ($r = 0.78$). The authors concluded that the PAQ - C questionnaire could be applied in future researches with the purpose of determining level of overall physical activity of children and youth in Croatia.

Considering the determined multiple benefits of physical activity, the problem is set, how to increase its overall level to all members of society, especially children and young people. In Republic of Croatia, Physical education lessons are the only form of physical exercise that is compulsory for all pupils (both elementary and secondary education), and therefore is the most important form of Physical education in school. There are all sorts of extracurricular physical activities provided by school (sports, hiking, field trips etc.) but only PE lessons are mandatory. PE provides an impact on kinanthropological status of all children and youth aged 6/7 to 18/19. Racette et al. (2015) determined in 7-day follow-up of pupils' physical activity by cardiac monitor that pupils spent on average 30,6 minutes in moderate to high-level physical activity ($HR = 140$ bpm) on days without a PE lesson and 44,4 minutes on days with a PE lesson, which is almost 50% more. Authors recommend schools to introduce PE lessons on every school day so pupils can reach recommended 60 minutes of moderate to high-level physical activity per day.

In Republic of Croatia Curriculum of Physical Education enacts 2 lessons of PE per week for compulsory education. But it also enacts 3 lessons per week for 1st to 3rd grade of elementary school. The reason are specific needs of children in this period of development (increased need for motion, application of moderate intensity activity etc.).

As these studies need to be carried out on a large number of subjects, objective measurement methods become over demanding to the resources. The method of estimation by questionnaire in such research would be much more economically acceptable.

The main aim of this research is to determine differences in overall physical activity level between 3rd and 4th grade pupils of elementary school. Partial aims are related to determining differences in partial indicators of physical activity, determining gender differences (3rd and 4th grades separately), and determining which gender contributes to the differences between 3rd and 4th grade pupils.

MATERIAL & METHODS

Participants

400 pupils of elementary school participated in the study. 200 pupils attended 3rd grade, 93 girls and 107 boys, and 200 pupils attended 4th grade, 102 girls and 98 boys. Pupils were given permission for participating by principal, teacher and parents/guardians.

The questionnaire was completed in the classroom during the school attendance. At the beginning of the study the pupils were given a detailed explanation of the questionnaire and its purpose, and they could ask any question if something was unclear. The questionnaire was anonymous. It took 10 to 20 minutes to complete it. Question number 10 showed that 18% of pupils were ill or had been prevented for some other reason from performing their usual physical activity. In the 3rd grade, 38 pupils were ill or prevented, 19 boys and 19 girls, and in the 4th grade 36, 16 boys and 20 girls. The most common reasons were health problems, and in the small number of times it was boredom or lessons pupils attended in the other shift. According to the instructions of the author of the questionnaire, absent pupils were excluded from the research.

Procedure

Physical activity was evaluated by the Croatian version of the questionnaire PAQ - C, a questionnaire for evaluating the level of overall physical activity of children and youth aged 6 to 14 (Vidaković Samaržija and Mišigoj-Duraković, 2013). The questionnaire is composed of 10 questions, the first 9 questions relate to self - assessment of physical activity over the past seven days, and the purpose of the last question is to determine if a pupil was prevented from his/her usual physical activity. The level of physical activity was evaluated at the Likert scale of 5 degrees (result 1 - insufficiently active, 5 - highly active). The variables are: 1. overall physical activity, 2. physical activity during leisure time, 3. physical activity during PE lesson, 4. physical activity during 5 min school recess, 5. physical activity during 15 min school recess, 6. physical activity after school, 7. physical activity in the evening, 8. physical activity on weekend, 9. physical activity on school days, 10. Total weekly physical activity. Variables 2 - 10 represent partial indicators of overall physical activity. The overall physical activity was calculated as the arithmetic mean of 9 partial indicators of physical activity according to the questionnaire instructions.

Statistical analysis

Arithmetic mean (AM) and standard deviation (SD) are presented for each group of participants separately. Shapiro-Wilk W test was used to determine normality of distribution. Correlation between variables was analyzed by Spearman's rank correlation. Differences between groups in variable overall physical activity were analyzed by a t - test for independent samples, and differences in other variables were analyzed by the Mann-Whitney U test. The data were analyzed by the computer program Statistica for Windows 12.0.

RESULTS

For the purpose of this research, all participants are divided into groups according to two criteria: a) grade (3rd or 4th) and b) gender (male or female). In this way the pupils are divided first into 2 groups, 3rd grade (3G) and 4th grade (4G) and then into 4 groups, 3rd grade girls (3F), 3rd grade boys (3M), 4th grade girls (4F), 4th grade boys (4M).

Table 1. Descriptive parameters of 3th and 4th grade pupils

Variables	AM	SD	AM	SD	AM	SD	AM	SD	AM	SD	AM	SD
	3G(n=162)		4G (n=164)		3M(n=88)		3F (n=74)		4M (n=82)		4F (n=82)	
PA – leisure time	1.61	0.49	1.70	0,48	1.61	0,48	1.61	0.50	1.67	0.50	1.74	0.46
PA – PE lesson	4.64	0.55	4.59	0,68	4.59	0,60	4.69	0.49	4.60	0.70	4.57	0.67
PA – 5 min recess	2.77	1.28	2.82	1.29	2.89	1,29	2.64	1.26	3.05	1.31	2.60	1.23
PA – 15 min recess	3.05	1.23	3.15	1.26	3.17	1.25	2.91	1.18	3.35	1.26	2.94	1.23
PA – after school	3.28	1.46	3.29	1.29	3.48	1.50	3.04	1.38	3.16	1.36	3.43	1.22
PA - evenings	3.15	1.41	3.18	1.22	3.19	1.48	3.09	1.33	3.21	1.27	3.15	1.17
PA – weekend	3.48	1.29	3.65	1.16	3.67	1.30	3.24	1.25	3.60	1.23	3.70	1.10
PA – school days	3.12	1.29	3.02	1.25	3.16	1.36	3.07	1.20	2.99	1.36	3.05	1.14
Total weekly PA	3.18	1.11	3.18	0.97	3.15	1.19	3.21	1.02	3.13	1.02	3.24	0.92
Overall PA	3.14	0.66	3.18	0.65	3.21	0.71	3.05	0.59	3.19	0.72	3.16	0.57

Normality of distribution of all variables was determined by the Shapiro - Wilk W test. Normal distribution was determined only in the variable Overall physical activity (table 2). Therefore, the differences in the variable Overall physical activity will be analyzed by a t-test for independent samples, and the differences in other variables will be analyzed by the Mann-Whitney U test.

Table 2. Results of Shapiro – Wilk W test

	PA –lei-sure time	PA –PE lesson	PA- 5 min recess	PA – 15 min recess	PA –after school	TA –eve-nings	TA - wee-kend	PA-school days	Total weekly PA	Overall PA
W	0.894	0.636	0.886	0.899	0.881	0.899	0.878	0.889	0.977	0.991
p	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.054

Since the variables describing partial physical activity indicators do not have normal distribution, the correlation between variables was analyzed by Spearman's rank correlation and the results are presented in table 3.

Table 3. The matrix of correlations between variables (questionnaire's items) (Spearman's rank)

Variables	PA – leisure time	PA – PE lesson	PA - 5 min recess	PA – 15 min recess	PA – after school	TA – evenings	TA - weekend	PA-school days	Total weekly PA	Overall PA
PA – leisure time	1.00									
PA – PE lesson	0.16*	1.00								
PA – 5 min recess	0.02	-0.02	1.00							
PA – 15 min recess	0.10	0.09	0.49*	1.00						
PA – after school	0.29*	0.24*	0.13*	0.16*	1.00					
PA - evenings	0.29*	0.22*	0.23*	0.20*	0.49*	1.00				
PA – weekend	0.31*	0.20*	0.14*	0.15*	0.48*	0.44*	1.00			
PA – school days	0.22*	0.17*	0.19*	0.25*	0.33*	0.38*	0.34*	1.00		
Total weekly PA	0.25*	0.29*	0.12*	0.17*	0.34*	0.33*	0.34*	0.38*	1.00	
Overall PA	0.40*	0.36*	0.47*	0.51*	0.68*	0.71*	0.67*	0.63*	0.59*	1.00

In table 3, it is shown that all coefficients of correlation of Overall PA with its partial indicators are statistically significant, meaning that every single question is estimating well the construct for which the questionnaire was constructed.

As mentioned above for the partial aims of this research, all participants are divided into four groups: 3rd grade girls (3F), 3rd grade boys (3M), 4th grade girls (4F), 4th grade boys (4M). Out of six possible paired comparisons for four group, selected were the ones relevant to the aim of this research. The results of the analysis for determining differences between groups are presented in Table 4.

Table 4. Results of Mann – Whitney U test and t – test for independent samples

Variables	3G – 4G	3F - 3M	4F – 4M	3F – 4F	3M – 4M
PA – leisure time	0.019*	0.870	0.208	0.021*	0.329
PA – PE lesson	0.923	0.433	0.716	0.509	0.633
PA – 5 min break	0.700	0.239	0.028*	0.851	0.372
PA – 15 min break	0.428	0.197	0.031*	0.876	0.283
PA – after school	0.943	0.056	0.256	0.072	0.132
PA - evenings	0.914	0.644	0.662	0.879	0.979
PA – weekend	0.268	0.032*	0.698	0.025*	0.652
PA – school days	0.522	0.811	0.711	0.845	0.429
Total weekly PA	0.892	0.758	0.288	0.701	0.907
Overall PA	0.631	0.131	0.710	0.276	0.868

The results in table 4 show that statistically significant differences in variable Overall PA were not determined in any comparison. Statistically significant differences were determined in some partial indicator of PA in several pairs of comparison.

DISCUSSION

As aforementioned, all coefficients of correlation of Overall PA with its partial indicators in table 3 are statistically significant, meaning that every single question is estimating well the construct for which the questionnaire was constructed. The lowest correlation of the variable Overall PA is with PA during PE lesson (0.36) and low correlation is also with PA - leisure time (0.40). The highest correlation but still moderate has PA - evenings (0.71), PA - after school (0.68) and PA - weekend (0.67). Correlation with other partial indicators (PA – school days, Total weekly PA, PA – 15 min recess and PA – 5 min recess) ranges from 0.47 to 0.63. A statistically significant correlation was not determined between variables PA – 5 min recess and PA – 15 min recess (both) and variables TA – PE lesson and PA – leisure time (both). The average correlation between items is 0.249, which represents a good agreement of the questions, and at the same time indicates that each one measures another construct. In comparison, Vidaković - Samaržija and Mišigoj - Duraković (2013) determined an average correlation between the particles 0.172.

The results presented in table 4 show that statistically significant differences in variable Overall PA were not determined in any comparison. The cause of such an occurrence can be interpreted in a way that only a year difference at the chronological age of 9 to 10 years is not large enough to achieve significant differences in pupils' behavior and habits of physical activity, and one lesson more of Physical Education per week doesn't have an influence big enough on overall physical activity next to its eight other partial indicators. The results also demonstrate that gender differences between pupils in overall physical activity have not been determined. As noted earlier, the researches so far have confirmed gender differences between girls and boys. Le Mura et al. (2000) come to the same conclusion, by evaluating physical activity of 4th grade pupils by accelerometer, that girls are less active. Their research has highlighted the need for additional motivation for girls to increase their physical activity. However, it is important to emphasize that gender differences are increasing with chronological age, the main cause being the biological age, puberty, to be exact. Nader et al. (2008) come to the conclusion that boys are more active but also that their activity decreases with age (about 15 years) as same as girls' activity does (about 13 years). But on the other hand, Thomson et al. (2003) determined that the differences within girls and boys of same chronological age almost disappear when they are grouped according to biological age. Chronological age of 9 and 10 years in this research is the age in which both girls and boys are still almost equal to biological age, so it is not surprising that there are no differences.

The difference analysis in partial indicators of overall physical activity showed statistically significant differences in four out of nine partial indicators. The first variable is PA - leisure time, between 3rd and 4th grade (both genders together) (4G = 1.70; 3G = 1.61) and between 3rd grade girls (1.61) and 4th grade girls (1.74). Considering that there are no differences in the PA - leisure time between the 3rd and 4th grade boys, it can be concluded that the greater activity of the 4th grade girls in leisure time contributes to the greater activity in leisure time of the 4th grade compared to the 3rd grade.

Second and third partial indicator in which the differences are determined are PA – 5 min recess and PA – 15 min recess, between boys and girls in 4th grade in both variables, and in both cases the girls have a lower result. Considering that differences between 3rd grade boys and girls in same variables have not been determined, it can be concluded that gender differences are still greater in one year of older pupils. This might be attributed to a possible change of habits and type of activity of girls in pre-puberty, in terms of reducing activity during 5 and 15 min recesses. Verstraete et al. (2006) in their research of the effects of providing physical activity games during morning recess and lunch break in elementary schools, have come to conclusion that play during recess is effective in increasing children's physical activity and can increase daily level of physical activity. Correlation coefficient between PA – 5 min recess (0.47) and PA – 15 min recess (0.51) with overall physical activity in this research suggest the same. Fourth statistically significant differences were determined in PA - weekend in two pairs of comparisons, 3rd grade girls achieved lower results compared to 3rd grade boys and 4th grade girls.

By examining the arithmetic means of all groups of participants in table 1, other occurrences may be noted, but with the emphasis of non-existence of statistical significance. 3rd grade pupils (both genders) have scores lower than 4th grade pupils at 6 out of 9 partial overall physical activity indicators. The overall score of 3rd grade girls (3.05) was lower than the other groups (3.16, 3.19, 3.21) and even in 7 out of 9 partial indicators lower than boys of the same grade (3rd) and one year older girls (4th grade). 3rd grade girls contribute to the difference between the 3rd and 4th grade (both gender together) because the group of boys (3rd grade) has the highest overall physical activity level and higher scores in 6 of the 9 partial indicators. Gender differences observed in 4th grade, they are slightly smaller than the ones in the 3rd grade (both not significant) ($p = 0.131 : p = 0.631$). Đokić (2014) determined in his research that boys are more active than girls during the PE lesson and sports activities, in leisure time boys are more engaged in sports while girls are walking. Also, Vidranski and Pejanić (2015) in their research confirm that boys are more active than girls. Furthermore, Jandrić (2010) in his research on Differences between Boys and Girls in Physical Activity has come to the same knowledge, boys are more active and spend more time in playing.

The highest level pupils achieved in partial physical activity indicators was during the PE lesson (4.60), ie all groups were "often" or "every time" active during the PE lesson. Therefore, it is of great importance to emphasize that the pupils' response to organized physical activity that is mandatory to attend is their high activity during them, thus the purpose of these activities is mostly fulfilled. Despite the fact that reported results suggest high activity during PE lessons, pupils' overall physical activity score is to a lesser extent dependent on their activity during PE, which is evident from the correlation between PA – PE lesson and Overall PA. Coefficient of correlation is 0,36 and is the lowest of all partial indicators of physical activity.

CONCLUSIONS

The main purpose of this research is to determine differences in overall physical activity between 3rd and 4th grade pupils of elementary school. The assumption was that the age difference between them and difference in number of Physical Education lessons per week between 3rd and 4th grade (3rd - 3 lessons/week; 4th - 2 lessons/week) will cause differences in level of overall physical activity. It was also assumed that gender differences could also cause differences between boys and girls of the same grade. The level of physical activity is estimated by questionnaire as the questionnaire is a practical and cost-effective tool for assessing a large sample of participants. The questionnaire selected for this research is Croatian version of PAQ-C questionnaire, a questionnaire of appropriate validity and reliability, according to his authors.

No statistically significant difference in overall physical activity level ($p = 0.631$) was determined between 3rd and 4th grade (both gender together). Gender differences were not determined either. Gender differences were identified in some partial indicators of physical activity, boys achieve higher scores than girls.

An average pupils' score in overall physical activity is 3.14 (3rd grade) and 3.18 (4th grade), which is consistent with the survey results (10 years old participants) (3.08 – 1. measurement; 3.04 – 2. measurement) (Vidaković-Samaržija and Mišigoj-Duraković, 2013). Also, pupils' physical activity during PE lesson (4.60) is similar in values to the survey (4.55 – 1. measurement; 4.63 – 2. measurement).

The future research need to upgrade questionnaires for estimation of physical activity level based on self-evaluation, also need to determine reasons of pupil's insufficient levels of PA in some partial parameters of PA. It is a recommendation that pupils should be encouraged to further increase of their physical activity in all of its extracurricular forms, and especially to maintain high levels of physical activity during PE lessons that is satisfactory to the results obtained. From the results of this research it can be concluded that both 3rd and 4th grade both boys and girls are highly active in mandatory physical activity (PE), while on the other hand the pupils participate differently in other arbitrary forms of physical activity. There is a need and also an obligation to increase physical activity of pupils who have reduced interest in non-mandatory physical activities.

Announcement

We announce that the authors have equally contributed to this paper.

Conflict of interests

There is no conflict of interests among the authors themselves.

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PHYSICAL ACTIVITY OF STUDENTS DURING THE PANDEMIC OF THE DISEASE COVID-19

TJELESNA AKTIVNOST STUDENATA U VRIJEME PANDEMIJE BOLESTI Covid-19

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Abstract: In mid-March of 2020, contact teaching at universities was interrupted due to the global pandemic of the disease COVID-19. While the teaching of Physical education took place online students were offered several assignments to fulfil their obligation to the course and try to stay physically active. The research was conducted on 166 participants from the student population of the University of Zagreb who, during the seventh week of online classes, filled out an online questionnaire related to physical activity and online teaching of physical education. The aim of the research was to determine whether there was a difference in the level of physical activity of students before and during the COVID-19 pandemic and whether there was a difference in the level of physical activity according to the gender of the research participants. Furthermore, to determine whether students had the desire to be physically active during the COVID-19 pandemic, whether they were satisfied with online teaching of physical education, and whether online teaching of physical education helped them stay physically active, and whether or not gender differences relevant to the research existed. Wilcoxon rank test demonstrated increased activity of research participants during the COVID-19 pandemic ($z=-4.61$, $p=0.00$) with no gender difference. As many as 94,6% of the research participants expressed a desire for physical activity during the pandemic, and 80,1% of them believed that online learning of physical education courses helped them in that goal. A significant difference between male and female students, in favour of female students, was obtained by the χ^2 independence test, precisely for the question whether they believed that online teaching of physical education helped them remain physically active. A total of 85,5% of research participants stated they liked online learning. Digital technology in teaching physical education is welcome, but is in no way a substitute for contact teaching. It could be considered as a sort of an intervention which could occasionally be used to refer students towards online assignments during the course of the academic year to

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Sažetak: Sredinom ožujka 2020. godine kontakt nastava na fakultetima je prekinuta uslijed globalne pandemije bolesti COVID-19. Dok se nastava Tjelesne i zdravstvene kulture (TZK) odvijala na daljinu, studenata je bilo ponuđeno nekoliko zadataka kako bi ispunjavali svoju obvezu prema kolegiju te pokušali ostati tjelesno aktivni. Istraživanje je provedeno na 166 ispitanika iz populacije studenata Sveučilišta u Zagrebu koji su tijekom sedmog tjedna nastave na daljinu ispunili on-line anketni upitnik vezan za tjelesnu aktivnost i nastavu TZK na daljinu. Cilj istraživanja bio je utvrditi postoji li razlika u razini tjelesne aktivnosti studenata prije i u vrijeme pandemije bolesti COVID-19 te postoji li razlika u razini tjelesne aktivnosti obzirom na spol. Zatim, utvrditi imaju li studenti želju biti tjelesno aktivni u vrijeme pandemije bolesti COVID-19, jesu li zadovoljni nastavom TZK na daljinu i pomaže li im nastava TZK na daljinu da ostanu tjelesno aktivni te postoje li razlike obzirom na spol. Wilcoxonovim testom ranga dokazana je povećana aktivnost ispitanika u vrijeme pandemije bolesti COVID-19 ($z=-4,61$, $p=0,00$) dok razlika prema spolu nije postojala. Čak 94,6% ispitanika izrazilo je želju za tjelesnom aktivnošću tijekom pandemije te ih 80,1% smatra kako im nastava na daljinu iz kolegija TZK u tome i pomaže. Značajna razlika između studentica i studenata, u korist studentica, dobivena je χ^2 -testom nezavisnosti upravo u pitanju smatraju li da im nastava TZK na daljinu pomaže da ostanu tjelesno aktivni. Ukupno 85,5% ispitanika izjasnilo se da im se nastava na daljinu sviđa. Digitalna tehnologija u nastavi TZK dobro je došla, ali nikako nije zamjena za kontakt nastavu. Mogla bi biti jedna od intervencija koja bi se koristila za povremeno upućivanje studenata na on-line zadatke tijekom akademске godine koji bi se dodatno bodovali i tako potaknuli studente na dodatnu tjelesnu aktivnost.

Ključne riječi: nastava na daljinu; studenti; tjelesna aktivnost; tjelesna i zdravstvena kultura.

enable them to gather additional points and thus, encourage them to take on additional physical activity.

Keywords: online teaching, physical activity, physical education, students.

INTRODUCTION

According to the World Health Organisation (WHO), physical activity is defined as a term that encompasses each movement, that is, all movements in everyday life, including physical activity at work or in school, recreation and sports activity. Physical inactivity is a serious health problem which affects people of all ages and is the fourth leading risk factor for mortality in the world (WHO, 2009). The World Health Organisation's recommendations for people over the age of 18 are 150 minutes of moderate-intensity aerobic activity or 75 minutes of high-intensity activity per week. Moderate and high-intensity physical activities can be combined with one another, while strength exercises for large muscle groups should be performed at least twice a week in combination with stretching exercises (WHO, 2010). During the day, the recommended or desired level of physical activity can be achieved over several periods, but no shorter than 10 minutes each, while additional health effects can be achieved by increasing moderate physical activity to 300 minutes per week or high-intensity activity to 150 minutes per week (WHO, 2010).

Organised teaching of Physical education (PE) at universities and institutions of higher education is mandatory during the first two years of study and marks the final stage of systematic exercise during school education which aims to turn physical exercise into a permanent routine and daily need for every student. It is performed in the form of exercises which amount to 30 hours per semester. Students can acquire knowledge about maintaining and improving health as well as the importance of a daily physical exercise within the curriculum of PE (Caput-Jogunica et al., 2008), and they will be able to apply the acquired knowledge in the future (Gošnik et al., 2002). International recommendations indicate that students attending PE courses should spend a minimum of 50% of their hours in moderate to high-intensity physical activity in order to achieve the health effects of the PE course (Costigan et al., 2015).

In the time of the global crises caused by coronavirus, the Republic of Croatia, as well as a large number of countries in Europe and the world, found itself in a situation where it had to take certain anti-epidemic measures. In line with global efforts, between 19 March and 11 May, 2020, the Croatian Government adopted measures to re-

UVOD

Tjelesna aktivnost je prema Svjetskoj zdravstvenoj organizaciji (WHO), definirana kao pojam koji obuhvaća sve pokrete, odnosno kretanja u svakodnevnom životu, uključujući tjelesnu aktivnost na poslu ili školi, rekreaciju i sportsku aktivnost (WHO, 2018). Tjelesna neaktivnost ozbiljan je zdravstveni problem koji obuhvaća ljude svih dobnih skupina i danas je četvrti vodeći faktor rizika smrtnosti u svijetu (WHO, 2009). Preporuke Svjetske zdravstvene organizacije za osobe starije od 18 godina su 150 minuta aerobne aktivnosti umjerenog intenziteta ili 75 minuta aktivnosti visokog intenziteta tjedno. Tjelesne aktivnosti umjerenog i visokog intenziteta mogu se međusobno kombinirati, a vježbe snage za velike mišićne skupine treba provoditi barem dva puta tjedno u kombinaciji s vježbama istezanja (WHO, 2010). Tijekom dana preporučena ili željena razina tjelesne aktivnosti može se postići kroz nekoliko perioda, ali ne kraćih od 10 minuta, a dodatni zdravstveni učinci mogu se postići povećanjem umjerene tjelesne aktivnosti na 300 minuta tjedno ili aktivnosti visokog intenziteta na 150 minuta tjedno (WHO, 2010).

Organizirana nastava Tjelesne i zdravstvene kulture (TZK) na visokim učilištima obvezna je na prvoj i drugoj godini studija te je zadnja stepenica sustavnog vježbanja za vrijeme školovanja koja ima za cilj da tjelesno vježbanje postane i ostane studentima trajna svojina i svakodnevna potreba. Izvodi se u obliku vježbi u fondu od 30 sati u semestru. Studenti u okviru nastavnog plana i programa TZK mogu usvojiti znanja o čuvanju i unapređenju zdravlja i značaju svakodnevnog tjelesnog vježbanja (Caput-Jogunica i sur., 2008), a usvojena znanja moći će primjenjivati u budućnosti (Gošnik i sur., 2002). Međunarodne preporuke ukazuju kako bi studenti na nastavi TZK trebali provesti minimalno 50% sata u umjereno do visokoj razini intenziteta tjelesne aktivnosti, kako bi se ostvarili zdravstveni učinci sata TZK (Costigan i sur., 2015).

U trenutku globalne krize uzrokovane koronavirusom Republika Hrvatska se kao i veliki broj zemalja Europe i svijeta našla u situaciji kada je morala poduzeti odredene protu epidemiske mjere. U skladu s globalnim kretanjima, između 19. ožujka i 11. svibnja, 2020., Vlada Republike Hrvatske usvojila je mjere za ograničavanje okupljanja na javnim mjestima i u parkovima, obustavu javnog prijevoza i zatvaranje institucija. Kontakt nastava na fakultetima je prekinuta. Pored svih društvenih okupljanja, rada ugostiteljskih objekata i uslužnih djelatnosti, i sportske aktivnosti bile su zabranjene. Stanovnici urbanih sredina posebno su bili pogodenii ovakvima mjerama.

strict gathering in public places and parks, suspend public transportation, and close numerous institutions. Contact teaching at universities was interrupted. Besides all social gatherings, work in retail and services including sports activities were also prohibited. People living in cities and urban areas seem to be the most affected by these measures, as they were obligated to stay at home and likely reduce their common activities (Karuc et al., 2020). Reducing the physical activity level could have a negative health impact, even among healthy, uninfected people (Hall et al., 2020).

A number of comments, recommendations, and theoretical reviews have been written on the pandemic's possible negative consequences on health (Hall et al., 2020; Zhu, W. Should, 2020; Lippi et al., 2020; Laddu et al., 2020). Experts, scientists and world health institutions warn of the potential negative impact on health due to physical inactivity as an indirect consequence of quarantine due to COVID-19 disease (Hall et al., 2020; Zhu, W. Should, 2020; Lippi et al., 2020; Laddu et al., 2020). The potential consequences of inactivity and pandemic-induced sedentarism on cardiovascular, metabolic, and neuromuscular health are highlighted (Naricci et al., 2020). Dwyer et al. (2020) recommend physical activity during COVID-19 pandemic because it has been shown that physical activity can contribute to reducing the severity of COVID-19 illness and improving the quality of life before and after infection. Special attention is paid to the fact that staying at home can lead to increased stress, anxiety and depression, and in times when it is not possible to spend time outdoors, it is advisable to focus on practical instructions related to at-home exercises, such as strength and dance exercises and aerobic exercises on stationary bikes or rowing ergometers (Hammami et al., 2020). Tailored home physical activity programs can help combat the physiological and psychological side effects caused by restrictions associated with the COVID-19 pandemic (Chen et al., 2020; Halabchi et al., 2020; Jiménez-Pavón et al., 2020).

The aim of this paper is to determine whether there is a difference in the level of physical activity of students before and during the COVID-19 pandemic and whether there is any difference in the level of physical activity with respect to gender.

Sample of Research Participants

The research included 166 participants from the student population of the University of Zagreb at the age of 20.31 ± 0.99 years. Research participants filled out an anonymous questionnaire voluntarily during the seventh week of online learning. Students who are not in the system of training and sports competitions participated in the research.

ma jer su bili primorani ostati kod kuće i smanjiti razinu uobičajene aktivnosti. Smanjenje razine tjelesne aktivnosti može imati negativan utjecaj na zdravlje, čak i među zdravim, nezaraženim ljudima (Hall i sur., 2020).

Napisano je niz komentara, preporuka i teoretskih pregleda o mogućim negativnim posljedicama pandemije na zdravlje (Hall i sur., 2020; Zhu, W. Should, 2020; Lippi i sur., 2020; Laddu i sur., 2020). Stručnjaci, znanstvenici i svjetske zdravstvene ustanove upozoravaju na potencijalni negativni utjecaj na zdravlje zbog tjelesne neaktivnosti kao neizravne posljedice karantene uslijed bolesti COVID-19 (Hall i sur., 2020; Zhu, W. Should, 2020; Lippi i sur., 2020; Laddu i sur., 2020). Ističu se potencijalne posljedice neaktivnosti i sedentarizma zbog pandemije na kardiovaskularno, metaboličko i neuromuskularno zdravlje (Naricci i sur., 2020). Dwyer i sur. (2020) preporučaju tjelesnu aktivnost tijekom pandemije bolesti COVID-19 jer je dokazano da tjelesna aktivnost može doprinijeti smanjenju težine bolesti COVID-19 i poboljšanju kvalitete života prije i nakon infekcije. Posebnu pozornost usmjerava se na činjenicu kako boravak kod kuće može dovesti do povećanja stresa, tjeskobe i depresije te u vremenu kad nije moguće vrijeme provoditi na otvorenom poželjno je fokusirati su se na praktične upute vezane za tjelovježbu u vlastitim domovima, poput vježbi snage i plesa te aerobnih vježbi na sobnom biciklu ili veslačkom ergometru (Hammami i sur., 2020). Prilagođeni programi tjelesne aktivnosti u domu mogu pomoći u suzbijanju fizioloških i psiholoških nuspojava izazvanih restrikcijama vezanim za pandemiju bolesti COVID-19 (Chen i sur., 2020; Halabchi i sur., 2020; Jiménez-Pavón i sur., 2020).

Cilj ovog rada je utvrditi postoji li razlika u razini tjelesne aktivnosti studenata prije i u vrijeme pandemije bolesti COVID-19 te postoji li razlika u razini tjelesne aktivnosti obzirom na spol.

Uzorak ispitanika

Uzorak je obuhvatio 166 ispitanika iz populacije studenata Sveučilišta u Zagrebu starosti $20,31 \pm 0,99$ godina. Ispitanici su anonimni upitnik ispunjavali dobrovoljno tijekom sedmog tjedna nastave na daljinu. U istraživanju su sudjelovali studenti koji nisu u sustavu treninga i sportskih natjecanja.

Uzorak varijabli

Vodeći se preporukama WHO, te preporukama Hrvatskog zavoda za javno zdravstvo (HZJZ, 2020) koje navode da je dozvoljen boravak na zraku, hodanje i upo-

Sample Variables

Following the WHO's recommendations, as well as the recommendations of the Croatian Institute of Public Health (HZJZ, 2020) which stated that it was allowed to stay in open air, walk and cycle, while PE classes were carried out online, students offered to fulfil their obligations to the course and try to stay physically active. In addition to the recommended walking, cycling and rollerblading, it was also possible to exercise independently in the privacy of your home. Examples of exercises were available to everyone and the database was updated regularly.

Research variables are an integral part of an anonymous online survey questionnaire. Given the unique situation in which both students and professors found themselves in for the first time (online teaching, self-exercise, independently choosing activity...) a questionnaire was made for the purposes of this paper. Research participants answered questions about online teaching of PE and physical activity before and during the COVID-19 pandemic. Two questions (Physical activity at the time of the pandemic and Physical activity before the pandemic) were used from the international IPAQ questionnaire (IPAQ 2005) and the Likert scale for assessing physical activity was applied to them. Separate part of the questionnaire identified the variables such as gender, age and year of study on the basis of which the grouping and analysis of the results of the questionnaire was performed.

DATA PROCESSING METHODS

Data processing was carried out by the use of the *Statistical Package for the Social Sciences* (SPSS, Version 14.0; SPSS Inc, Chi-Cago, IL). Basic descriptive indicators were calculated and the Wilcoxon's rank test, Mann-Whitney U test and χ^2 -test for independent samples were used. Response frequencies were determined for all variables.

RESULTS

The questionnaire was filled out by 166 research participants (84 female students and 82 male students) with an average age of 20.31 ± 0.99 years. The largest share of research participants at the time of the survey was in the first year of undergraduate study (55%), then in the second (43%) and the smallest in the third year (2%).

treba bicikla studentima je dok se nastava TZK odvijala na daljinu bilo ponuđeno nekoliko zadatka kako bi ispunjavali svoju obvezu prema kolegiju te pokušali ostati tjelesno aktivni. Uz preporučeno hodanje, vožnju bicikla i rolanje moguće je bilo i samostalno vježbati u svom domu. Primjeri vježbi su svima bili dostupni te je baza često bila nadopunjavana.

Varijable istraživanja sastavni su dio anonimnog online anketnog upitnika. Obzirom na jedinstvenu situaciju u kojoj su se prvi puta našli i studenti i profesori (nastava na daljinu, samostalno održivanje zadatka, samostalan odabir aktivnosti...) upitnik je napravljen za potrebe ovog istraživanja. Ispitanici su odgovarali na postavljena pitanja o nastavi TZK na daljinu te tjelesnoj aktivnosti prije i u vrijeme pandemije bolesti COVID-19. Dva pitanja (tjelesna aktivnost prije i u vrijeme pandemije) korištena su iz međunarodnog IPAQ upitnika (IPAQ 2005) te se za njih primjenjuje Likertova ljestvica za procjenu tjelesne aktivnosti. Zasebnim dijelom upitnika utvrđene su varijable spol, godine i godina studija na temelju kojih je izvršeno grupiranje i analiza rezultata upitnika.

METODE OBRADE PODATAKA

Obrada podataka je provedena programom *Statistical Package for the Social Sciences* (SPSS, Version 14.0; SPSS Inc, Chi- cago, IL). Izračunati su osnovni deskriptivni pokazatelji te korišteni Wilcoxon-ov test ranga, Mann-Whitney U test i χ^2 -test za nezavisne uzorke. Za sve varijable određene su frekvencije odgovora.

REZULTATI

Upitnik je ispunilo 166 ispitanika (84 studentice i 82 studenta) prosječne dobi $20,31 \pm 0,99$ godina. Najveći udio ispitanika u vrijeme anketiranja bio je na prvoj godini prediplomskog studija (55 %), zatim na drugoj (43 %) i najmanji na trećoj godini (2 %).

Table 1. Differences in physical activity of the subjects before and during the pandemic**Tablica 1.** Razlike u tjelesnoj aktivnosti ispitanika prije i u vrijeme pandemije

Wilcoxon rank test / Wilcoxonov test ranga	
Physical activity at the time of the pandemic / Tjelesna aktivnost u vrijeme pandemije	
-	
Physical activity before the pandemic / Tjelesna aktivnost prije pandemije	
Z	-4.61
p	.00

Wilcoxon rank test revealed a statistically significant increase in physical activity of research participants at the time of the COVID-19 disease pandemic, $z=-4,61$, $p<0,00$ with small to medium impact (Table 1).

Table 2. Gender differences with respect to physical activity before and during the COVID-19 pandemic

Wilcoxonov test ranga otkrio je statistički značajno povećanje tjelesne aktivnosti ispitanika u vrijeme pandemije bolesti COVID-19, $z=-4,61$, $p<0,00$ s malim do srednjim utjecajem (Tablica 1).

Tablica 2. Razlike u spolu obzirom na tjelesnu aktivnost prije i za vrijeme pandemije bolesti COVID-19

Mann-Whitney U test / Mann-Whitney U test						
	Gender / Spol	N	Sumrank	U	Z	p
Physical activity before the pandemic / Tjelesna aktivnost prije pandemije	Ž	84	6547	2977.0	-1.55	0.12
	M	82	7314			
Physical activity at the time of the pandemic / Tjelesna aktivnost u vrijeme pandemije	Ž	84	7567	2891.0	-1.84	0.07
	M	82	6294			

As can be seen from Table 2, the Mann-Whitney U test did not register a statistically significant difference ($p = 0.12$) in the variable Physical activity before the pandemic nor Physical activity at the time of the pandemic ($p = 0.07$) between subjects of female ($n = 84$) and male ($n = 82$) gender.

Kako je vidljivo iz Tablice 2, Mann-Whitney U test nije registrirao statistički značajnu razliku ($p=0,12$) u varijabli Tjelesna aktivnost prije pandemije niti Tjelesna aktivnost u vrijeme pandemije ($p=0,07$) između ispitanika ženskog ($n=84$) i muškog ($n=82$) spola.

Table 3. Distribution of attitudes of female ($N=84$) and male students ($N=82$) about the desire for physical activity during the pandemic**Tablica 3.** Razdioba stavova studentica ($N=84$) i studenata ($N=82$) o želji za tjelesnom aktivnošću u vrijeme pandemije

At the time of the pandemic, I want to be physically active / U vrijeme pandemije želim biti tjelesno aktivan/na	Gender / Spol		
	Female / Ženski N (%)	Male / Muški N (%)	Total / Ukupno N (%)
Yes / Da	80 (95.2)	77 (93.9)	157 (94.6)
No / Ne	4 (4.8)	5 (6.1)	9 (5.4)
Total / Ukupno	84 (100)	82 (100)	166 (100)

The χ^2 independence test (with Yates's continuity correction) did not register a statistically significant correlation between gender and desire for physical activity, $c^2(1, n=166) = 0,00$, $p=0,97$, $\phi=-0,03$ (Table 3).

χ^2 -test nezavisnosti (uz korekciju neprekidnosti prema Yates-u) nije pokazao statistički značajnu povezanost spola i želje za tjelesnom aktivnošću, $c^2(1, n=166) = 0,00$, $p=0,97$, $\phi=-0,03$ (Tablica 3).

Table 4. Distribution of attitudes of female (N=84) and male students (N=82) towards online learning of PE.

<i>For me online learning of PE is: / Nastava TZK na daljinu mi se:</i>	<i>Gender / Spol</i>		
	<i>Female / Ženski N (%)</i>	<i>Male / Muški N (%)</i>	<i>Total / Ukupno N (%)</i>
<i>Appealing / Sviđa</i>	74 (88.1)	68 (82.9)	142 (85.5)
<i>Not appealing / Ne sviđa</i>	10 (11.9)	14 (17.1)	24 (14.5)
<i>Total / Ukupno</i>	84 (100)	82 (100)	166 (100)

The χ^2 independence test (with Yates's continuity correction) did not register a statistically significant relationship between gender and attitudes about whether the online learning of PE for research participants was appealing or not, $c^2(1, n=166) = 0.53$, $p=0.47$, $\phi=-0.07$ (Table 4).

Table 5. Distribution of attitudes of female (N=84) and male students (N=82) on the impact of online teaching of PE on the level of physical activity.

<i>Online teaching of PE helps me to be physically active during the pandemic / Nastava TZK na daljinu mi pomaže da budem tjelesno aktivan/na u vrijeme pandemije</i>	<i>Gender / Spol</i>		
	<i>Female / Ženski N (%)</i>	<i>Male / Muški N (%)</i>	<i>Total / Ukupno N (%)</i>
<i>Yes</i>	77 (91.7)	56 (68.3)	133 (80.1)
<i>No</i>	7 (8.3)	26 (31.7)	33 (19.9)
<i>Total</i>	84 (100)	82 (100)	166 (100)

The χ^2 independence test (with Yates's continuity correction) registered a statistically significant correlation between gender and student's attitudes regarding the impact of online teaching of PE on the level of physical activity, $c^2(1, n=166) = 12.80$, $p=0.00$, $\phi=-0.29$ (Table 5).

DISCUSSION

The main objective of this study was to determine whether there was any difference in the level of physical activity of students before and during the COVID-19 pandemic. Since many healthy behaviors are adopted during adolescence and early adulthood (Both, 2002.) and that research shows that physical activity habits adopted during study contribute significantly to physical activity in adulthood (Fish and Nies, 1996; Sparling and Snow, 2002; Keating et al., 2005) it is important to encourage students to engage in regular physical activity during the obligation to attend PE classes but also afterwards in their free time.

Recalling their physical activity before the pandemic, 16% of the research participants said they spent most of their free time doing things that did not involve physical activity, 28% had some kind of physical activity 1-2 times a week, 29% engaged in physical activity 3-4 times a week, 17% of them were physically active 5-6

Tablica 4. Razdioba stavova studentica (N=84) i studenata (N=82) prema nastavi TZK na daljinu

<i>Gender / Spol</i>	<i>Female / Ženski N (%)</i>	<i>Male / Muški N (%)</i>	<i>Total / Ukupno N (%)</i>
<i>Appealing / Sviđa</i>	74 (88.1)	68 (82.9)	142 (85.5)
<i>Not appealing / Ne sviđa</i>	10 (11.9)	14 (17.1)	24 (14.5)
<i>Total / Ukupno</i>	84 (100)	82 (100)	166 (100)

χ^2 -test nezavisnosti (uz Yates-ovu korekciju neprekidnosti) nije pokazao statistički značajnu povezanost spola i stava o tome sviđa li im se nastava TZK na daljinu ili ne, $c^2(1, n=166) = 0.53$, $p=0.47$, $\phi=-0.07$ (Tablica 4).

Tablica 5. Razdioba stavova studentica (N=84) i studenata (N=82) o utjecaju nastave TZK na daljinu na razinu tjelesne aktivnosti

<i>Gender / Spol</i>	<i>Female / Ženski N (%)</i>	<i>Male / Muški N (%)</i>	<i>Total / Ukupno N (%)</i>
<i>Yes</i>	77 (91.7)	56 (68.3)	133 (80.1)
<i>No</i>	7 (8.3)	26 (31.7)	33 (19.9)
<i>Total</i>	84 (100)	82 (100)	166 (100)

χ^2 -test nezavisnosti (uz Yates-ovu korekciju neprekidnosti) pokazao je statistički značajnu povezanost spola i stava studenata o utjecaju nastave TZK na daljinu na razinu tjelesne aktivnosti, $c^2(1, n=166) = 12.80$, $p=0.00$, $\phi=-0.29$ (Tablica 5).

RASPRAVA

Osnovni cilj ovog istraživanja bio je utvrditi postojeći li razlika u razini tjelesne aktivnosti studenata prije i za vrijeme pandemije bolesti COVID-19. Obzirom da se mnoga zdrava ponašanja usvajaju tijekom adolescencije i rane odrasle dobi (Both, 2002.) te da istraživanja pokazuju da navike bavljenja tjelesnom aktivnošću usvojene u vrijeme studija značajno pridonose tjelesnoj aktivnosti u odrasloj dobi (Fish i Nies, 1996; Sparling i Snow, 2002; Keating i sur., 2005), važno je studente poticati na redovitu tjelesnu aktivnost tijekom obaveze pohadanja nastave TZK ali i nakon toga u slobodnom vremenu.

Prisjećajući se tjelesne aktivnosti prije pandemije 16 % ispitanika izjasnilo se da su većinu slobodnog vremena provodili radeći stvari koje ne uključuju tjelesnu aktivnost, 28 % ih je imalo 1-2 puta tjedno tjelesnu aktivnost, 29 % se tjelesnom aktivnošću bavilo 3-4 puta tjedno, njih 17 % često je, 5-6 puta tjedno imalo tjelesnu aktivnost, dok je njih 10 % svakodnevno bilo tjelesno aktivno.

times a week, while 10% of them were physically active on a daily basis.

The results of physical activity at the time of the COVID-19 pandemic indicated increased activity among the research participants. 11% of subjects stated that they were not physically active in their free time, 16% were somewhat physically active, 1-2 times a week, 28% engaged in physical activity 3-4 times a week during their free time. 31% of subjects were physically active rather often, 5-6 times a week, while 14% of them were physically active very often. Wilcoxon rank test proved increased activity of subjects during the COVID-19 pandemic ($z=-4,61$, $p=0,00$) with no registered differences between genders.

Similar results can be seen in some other studies. In their study, Lesser et al. (2020) found that 22% of participants ($n = 1098$, <19 age) who were active before the pandemic reduced their physical activity and 37% did not change their physical activity level at all. However, among those who were not active before the pandemic, 33% became more active and 26% did not change their level of physical activity. Giustino et al. (2020) investigated levels of physical activity before and during the last seven days of quarantine of physically active subjects in Sicily ($n = 802$, $32,27 \pm 12,81$ age). They found that the number of highly active participants dropped (26%, $n = 193$), and the number of low and moderately active subjects increased (19%, $n = 200$; and 7%, $n = 409$). In the same study, both females and males decreased their total weekly energy expenditure, where males showed more reduction (Giustino et al., 2020). Results of Karuc et al. (2020) research suggest that 30-days of restrictions equally affect females and males where the evident drop in moderate-to-vigorous physical activity (MVPA) is seen in both genders ($n = 91$, $20-21$ age). However, previously active subjects reduced their level of physical activity during quarantine while a different pattern is seen in previously inactive subjects (Karuc et al., 2020). Since lack of time is one of the most frequently reported barriers to exercise (Rasbash et al., 2019), the increase in MVPA in inactive participants might be driven by the fact that, due to movement restrictions, people had more time for other activities (e.g., exercise) (Karuc et al. 2020). A recent study by Sekulić et al. (2020) examined the trends of changes in PA levels among adolescents in southern Croatia ($n=388$, $16,4 \pm 1,9$ age) during restrictions. This study found a significant drop in PA overall and a much larger decrease in physical activity was found in boys than in girls.

Although the mentioned results are difficult to compare with the results of our research due to the difference

Rezultati tjelesne aktivnosti u vrijeme pandemije bolesti COVID-19 ukazuju na povećanu aktivnost ispitanika. 11 % ispitanika izjasnilo se da u slobodno vrijeme nije tjelesno aktivno, 16% ponekad je, 1-2 puta tjedno tjelesno aktivno, njih 28 % 3-4 puta tjedno bavi se tjelesnom aktivnošću u svom slobodnom vremenu. Često, 5-6 puta tjedno, tjelesno je aktivno 31 % ispitanika dok je njih 14 % jako često tjelesno aktivno. Wilcoxonovim testom ranga dokazana je povećana aktivnost ispitanika u vrijeme pandemije bolesti COVID-19 ($z=-4,61$, $p=0,00$) dok razlika prema spolu nije registrirana.

Slični rezultati mogu se vidjeti u još nekim istraživanjima. Lesser i sur. (2020) u svom istraživanju otkrili su da je 22 % sudionika ($n = 1098$, <19 god.) koji su prije pandemije bili aktivni, smanjilo tjelesnu aktivnost a 37 % uopće nije promijenilo razinu tjelesne aktivnosti. Međutim, među onima koji nisu bili aktivni prije pandemije, njih 33 % postaje aktivnije, a 26 % nije promijenilo razinu tjelesne aktivnosti. Giustino i sur. (2020) istraživali su razinu tjelesne aktivnosti prije i tijekom posljednjih sedam dana karantene tjelesno aktivnih ispitanika na Siciliji ($n = 802$, $32,27 \pm 12,81$ god.). Otkrili su da je broj visoko aktivnih ispitanika smanjio razinu tjelesne aktivnosti (26 %, $n = 193$), a razina tjelesne aktivnosti kod nisko i umjereno aktivnih ispitanika se povećala (19 %, $n = 200$; i 7 %, $n = 409$). U istoj su studiji i žene i muškarci smanjili svoju ukupnu tjednu potrošnju energije koja je izraženija kod muškaraca (Giustino i sur., 2020). Rezultati istraživanja Karuc i sur. (2020) sugeriraju da 30-dnevne mjere karantene jednako utječu na žene i muškarce gdje je evidentan pad umjerene do visoko intenzivne tjelesne aktivnosti (MVPA) vidljiv kod oba spola ($n = 91$, $20-21$ god). Međutim, prethodno aktivni ispitanici smanjili su razinu tjelesne aktivnosti tijekom karantene dok se drugačiji obrazac vidi kod prethodno neaktivnih ispitanika (Karuc i sur., 2020). Budući je nedostatak vremena jedna od najčešće prijavljenih prepreka za vježbanje (Rasbash i sur., 2019), porast razine MVPA kod neaktivnih ispitanika mogao bi biti vođen činjenicom da su zbog karantene ljudi imali više vremena za druge aktivnosti (npr. vježbanje) (Karuc i sur. 2020). Nedavnim istraživanjem Sekulić i sur. (2020) ispitani su trendovi promjena razine tjelesne aktivnosti među adolescentima iz južne Hrvatske ($n = 388$, $16,4 \pm 1,9$ god.) tijekom pandemije bolesti COVID-19. Ista studija utvrdila je značajan pad ukupne razine tjelesne aktivnosti ispitanika te je primijećen puno veći pad tjelesne aktivnosti kod dječaka nego kod djevojčica.

Iako je spomenute rezultate teško usporediti s rezultatima našeg istraživanja zbog razlike u metodologiji

in methodology and instruments for assessing physical activity a decrease in the level of physical activity among subjects who were physically active before the pandemic and an increase in physical activity among subjects who were not active before the pandemic can be observed. In addition, the difference in populations that were studied can also potentially contribute to the difference in reported results (16 y.o. adolescents vs. 20-y.o. young adults vs. and 32 y.o. adults). It should be noted that the subjects of this study were motivated to physical activity with tasks that they had to perform as an obligation to the P.E. course and how daily communication with them was maintained, which was not the case in the aforementioned research projects.

As many as 94.6% of research participants expressed a desire for physical activity during the pandemic, while 80.1% of them believed that online PE courses helped them in that aspect. A significant difference between male and female students was obtained by the χ^2 independence test, precisely in the question whether they believed that online learning of PE helped them remain physically active. This type of teaching encouraged female students to engage in physical activity.

During online learning of PE, students independently chose their weekly activity to fulfil their obligation to the course. A total of 85,5% of subjects stated they liked that form of teaching. A study conducted in 2016 determined the effectiveness of using smartphone apps in promoting physical activity (Coughlin et al., 2016), which proved to be effective here as well. 89% of them preferred the possibility of independent choice of exercises while 11% preferred when the exercises were chosen by the course leader.

CONCLUSION

At the time of the global crisis caused by the coronavirus, many countries have taken a number of epidemiological measures to protect their population from the spread of the infection. Educational institutions closed their doors and all classes were moved to a virtual environment. Following the instructions of the Ministry of Science and Education (MZO 2020) and HZJZ the teaching of PE at universities was carried out online.

Physical activity during the COVID-19 pandemic, in a sample of 166 subjects, increased compared to physical activity before the pandemic. A large part of research participants (85.5%) stated they liked online teaching of PE, while 80.1% stated that online teaching helped them stay physically active. The obtained results show that students are satisfied with this model of online teaching and react positively to it.

i instrumentima za procjenu tjelesne aktivnosti, možemo primijetiti pad razine tjelesne aktivnosti među ispitanicima koji su bili tjelesno aktivni prije pandemije, te porast tjelesne aktivnosti među ispitanicima koji nisu bili aktivni prije pandemije. Razlike u populacijama koje su proučavane također doprinose razlici u iznesenim podacima (16 god. adolescenti, 20 god. mladi, 32 god. odrasli). Valja napomenuti da su ispitanici u ovom istraživanju bili potaknuti na tjelesnu aktivnost zadacima koje su morali izvršavati kao obvezu prema kolegiju TZK, te kako je s njima bila ostvarena svakodnevna komunikacija što u spomenutim istraživanjima nije bio slučaj.

U našem istraživanju, 94,6% ispitanika izrazilo je želju za tjelesnom aktivnošću tijekom pandemije, te ih 80,1 % smatra kako im nastava na daljinu iz kolegija TZK u tome i pomaže. Značajna razlika između studentica i studenata dobivena je χ^2 -testom nezavisnosti upravo u pitanju smatraju li da im nastava TZK na daljinu pomaže da ostanu tjelesno aktivni. Studentice je ovakav model nastave potaknuo na tjelesnu aktivnost.

Tijekom nastave TZK na daljinu studenti su samostalno birali tjednu aktivnost kako bi ispunili svoju obvezu prema kolegiju. Ukupno 85,5 % ispitanika izjasnilo se da im se nastava na daljinu sviđa. U istraživanju provenjenom 2016. godine utvrđena je učinkovitost korištenja aplikacija za pametne telefone u promicanju tjelesne aktivnosti (Coughlin i sur., 2016), što se i ovdje pokazalo učinkovito. Mogućnost samostalnog odabira vježbi preferira 89 % ispitanika, a 11 % više voli kada nositelj kolegija odabire vježbe.

ZAKLJUČAK

U trenutku globalne krize uzrokovane koronavirusom, mnoge države poduzele su brojne epidemiološke mjere kako bi stanovništvo zaštitile od širenja zaraze. Zatvorene su obrazovne ustanove, a sva nastava preselila se u virtualno okruženje. Vodeći se važećim uputama Ministarstva znanosti i obrazovanja (MZO 2020) i HZJZ nastava TZK na fakultetima provodila se na daljinu.

Tjelesna aktivnost tijekom pandemije bolesti COVID-19, na uzorku od 166 ispitanika, povećala se u odnosu na tjelesnu aktivnost prije pandemije. Veliki dio ispitanika (85,5%) izjasnilo se da im se nastava TZK na daljinu sviđa dok njih 80,1%, smatra kako im nastava TZK na daljinu pomaže da budu tjelesno aktivni. Dobiveni rezultati govore da su studenti zadovoljni ovakvim modelom nastave na daljinu i pozitivno reagiraju na nju.

Digitalna tehnologija u nastavi TZK dobro je došla, ali nikako ne smije biti zamjena za kontakt nastavu.

Digital technology in teaching of PE is welcome, but it is by no means a substitute for contact teaching. As previous research in Croatia states the worrying fact of a large share of insufficiently active young people in the age group of 15 to 24 (Jurakić et al., 2009), one of the possible interventions could be the occasional referral of students to online assignments during the academic year, which would provide them with the opportunity to score additional points and thus encourage them to additional physical activity.

Announcement

We announce that the authors have equally contributed to this paper.

Conflict of interests

There is no conflict of interests among the authors themselves.

Budući se u dosadašnjim istraživanjima na području Hrvatske navodi da zabrinjava činjenica velikog udjela nedovoljno aktivnih u dobroj skupini od 15 do 24 godine (Jurakić i sur., 2009), jedna od intervencija mogla bi biti i povremeno upućivanje studenata na online zadatke tijekom akademske godine koji bi se dodatno bodovali i tako ih potaknuli na dodatnu tjelesnu aktivnost.

Izjava

Izjavljujemo da su autori podjednako doprineli radu.

Konflikt interesa

Između autora ne postoji interesni konflikt.

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THE ANALYSIS OF THE TECHNICAL AND TACTICAL ACTIVITIES BY FEMALE HANDBALL PLAYERS - WORLD CHAMPIONSHIP, 2019

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Abstract: The subject of the research is the evaluation of the competitive performance of the female handball players senior level, with an emphasis on the differences in the competitive activities of successful and less successful teams at the 2019 World Handball Championship held in Japan.

The aim was to determine the level of efficiency of competitive activity of female handball players and the differences in the performance of a competitive activity, which potentially exist between successful and less successful handball teams, from the aspect of technical and tactical activities in the attack phase. The sample is represented by the female handball national teams that participated in the recently held Handball World Cup, and the entities are handball matches. The procedures of descriptive and comparative statistics were applied.

The conclusion is that, regardless of the top level of handball playing, there are significant differences in the realization of some competitive activities among successful and less successful female national teams. It was also found that the coefficient of efficiency of technical and tactical elements, in numerical sense, determines the success of most handball teams at this level of competition, and that there are differences, in the statistical sense, for 3 of the 7 variables designated as variables characteristic of the attack phase, from who success is directly achieved, respectively, the goals are achieved.

Keywords: handball, competition, technical and tactical activities, efficiency, attack.

INTRODUCTION

The analysis of competitive activity makes it possible to distinguish the factors on which the efficiency and the result in the chosen sports activity depend and to make a fairly accurate assessment of what level they

ANALIZA TEHNIČKO-TAKTIČKIH AKTIVNOSTI RUKOMETĀŠICA NA SVJETSKOM PRVENSTVU 2019. GODINE

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Sažetak: Predmet istraživanja je evaluacija takmičarske uspješnosti rukometāšica seniorskog nivoa takmičenja, sa akcentom na razlike u realizaciji takmičarske aktivnosti uspješnih i manje uspješnih ekipa na Svjetskom rukometnom prvenstvu, održanom u Japanu, 2019. godine.

Cilj je bio da se utvrdi nivo efikasnosti takmičarske aktivnosti rukometāšica i razlike u ispoljavanju takmičarske aktivnosti, koje potencijalno postoje između uspješnih i manje uspješnih rukometnih ekipa, sa aspekta tehničko-taktičkih aktivnosti u fazi napada. Uzorak ispitanih predstavljaju ženski rukometni nacionalni timovi koji su učestvovali na nedavno održanom Svjetskom prvenstvu, a entiteti (nosioci informacija) su rukometne utakmice. Korišteni su postupci deskriptivne i komparativne statistike.

Zaključak je da, bez obzira na vrhunski nivo igranja rukometa, postoje značajne razlike u realizaciji nekih takmičarske aktivnosti kod uspješnih i manje uspješnih ženskih nacionalnih timova. Utvrđeno je i to da koeficijent efikasnosti tehničko-taktičkih elemenata, u numeričkom smislu, determiniše uspješnost većine rukometnih ekipa na ovom nivou takmičenja, te da postoje razlike i u statističkom smislu za 3 od ukupno 7 varijabli koje su označene kao variabile karakteristične za fazu napada, iz kojih se direktno ostvaruje uspjeh, odnosno, kojima se postiže gol.

Ključne riječi: rukomet, takmičenje, tehničko-taktičke aktivnosti, efikasnost, napad.

UVOD

Analiza takmičarske aktivnosti omogućava da se izdvoje faktori, od kojih zavisi efikasnost i rezultat u izabranoj sportskoj aktivnosti i da se dosta precizno procjeni na kom se nivou oni nalaze. Pored toga pomoću ove

are at. Also, this analysis can identify all the activities that need to be applied to the competition, in particular their specific parts, on which success ultimately depends. That's how we come to know what exactly athletes should prepare for (Nešić, 2006).

In a handball game, only performances that interfere with the opponent are counted to evaluate the performance of the technical and tactical elements, because such an analysis provides a more realistic picture of the technical and tactical preparedness of players in competitive situations. The information obtained in this way serves as operational indicators for the coaches. The collection of relevant statistical data during sports games has become a lucrative business and every professional team or individual, in almost every sport, has its professional staff to the monitoring of important factors, both their own team and for the opponents. The advantage of this method of monitoring efficiency is that the obtained results can statistically show the state of the sports form the team is in.

The research deals with the evaluation of the competitive performance of the female handball players senior level, with an emphasis on the differences in the competitive activities of successful and less successful teams at the 2019 World Handball Championship held in Kumamoto, Japan.

The goals of the paper are to determine the level of efficiency of the competitive activity of handball players in attack, and the differences in the expression of competitive activity, which are assumed to exist between successful (1st-4th place) and less successful (5th-8th place) handball teams on this competition. Accordingly, it has been examined the relationship between the success of realization and the achieved placement at the World Women's Championship as well as the contribution of the technical and tactical elements of the attack between successful and less successful handball national teams.

The study used a descriptive and comparative research method. The data was taken from the official website of IHF, and for the variables of the technical and tactical dimensions of the competitive activity of female handball players was used the *Swiss Timing Sport¹* service for statistical data processing and reports, as an official partner of the European (EHF) and International Handball Federation (IHF).

analize mogu se utvrditi sve aktivnosti, koje treba primijeniti na takmičenju, a posebno, njihove specifične dijelove od kojih i zavisi uspjeh u konačnici. Tako se dolazi do saznanja za šta tačno sportiste treba pripremiti (Nešić, 2006).

U rukometnoj igri, za procjenu uspješnosti izvođenja tehničko-taktičkih elemenata računaju se samo izvođenja uz ometanje protivnika, jer takva analiza daje realniju sliku stanja tehničko-taktičke pripremljenosti igrača u takmičarskim situacijama. Podaci dobiveni na ovakav način služe kao operativni pokazatelji za trenera, selektora. Prikupljanje relevantnih statističkih podataka tokom sportske igre postao je unosan posao i svaka profesionalna ekipa ili pojedinač, u gotovo svakom sportu, ima vlastiti stručni kadar za praćenje važnih faktora, kako vlastite ekipe, tako i protivnika. Prednost ovakvog načina praćenja igračke efikasnosti je u tome što dobiveni pojedinačni rezultati i statistički mogu prikazati stanje sportske forme u kome se ekipa nalazi.

Istraživanje se bavi evaluacijom takmičarske uspješnosti rukometara seniorskog nivoa takmičenja, sa akcentom na razlike u realizaciji elemenata takmičarke aktivnosti uspješnih i manje uspješnih ekipa na svjetskom rukometnom prvenstvu, Kumamoto 2019. godine.

Ciljevi rada jesu utvrđivanje nivoa efikasnosti takmičarske aktivnosti rukometara u napadu, te razlike u ispoljavanju takmičarske aktivnosti, za koje se pretpostavlja da postoje između uspješnih (1.-4. mjesto) i manje uspješnih (5.-8. mjesto) rukometnih ekipa na ovom takmičenju. U skladu s tim, provjeravane su relacije uspješnosti realizacije sa ostvarenim plasmanom na svjetskom ženskom prvenstvu i ispitani doprinos tehničko-taktičkih elemenata napada u razlikovanju uspješnih i manje uspješnih rukometnih nacionalnih timova.

U istraživanju je korišten deskriptivni i komparativni metod istraživanja. Podaci su preuzeti sa zvaničnog sajta IHF, a za varijable tehničko-taktičke dimenzije takmičarske aktivnosti rukometara, korišten je *Swiss Timing Sport servis¹* za statističku obradu podataka i izvještaje, kao službeni partner Evropske (EHF) i Međunarodne rukometne federacije (IHF).

¹ The official service for collecting statistics at European and World handball competitions.

¹ Zvanični servis za prikupljanje statističkih podataka na evropskim i svjetskim rukometnim takmičenjima.

METHODS

The Sample

The Handball Championship was held from 30th November to 15th December 2019, in Japan. The tournament was attended by a total of 24 teams divided into four groups. The research covered the results of the first eight (8) teams placed in this World Cup (Netherlands, Spain, Russia, Norway, Montenegro, Serbia, Sweden, and Germany). Each of these teams played 10 matches, so a total of 80 matches were played from the observed sample of this research. Therefore, the entities (carriers of information) in this paper are handball matches.

The Variables

A sample of variables included an individual tactical performance in the attack phase, which is characterized by the completion of the attack action, i.e. shooting at the goal and scoring a goal. Based on standard indicators of situational efficiency, in the study were used 16 variables, as follows: PGUT - average goals per game, BRŠ - the total number of shots, BRG - the total number of goals, BRŠK - the total number of wing shots, BRGK - the total number of wing goals, BRŠ7M - the total number of 7m shots, BRG7M - the total number of 7m goals, BRŠ9M - the total number of 9m shots, BRG9M - the total number of 9m goals, BRŠ6M - the total number of 6m shots, BRG6M - the total number of 6m goals, BRŠPRO - the total number of breakthrough shots, BRGPRO - the total number of breakthrough goals, BRŠKN - the total number of fastbreak shots, BRGKN - the total number of fastbreak goals, BRNAP - the total number of attacks.

To process the data obtained were used a descriptive statistics procedures which contain methods and procedures for presenting and summarizing data and comparative statistics. It was also used the procedures of tabular presentation of data, as well as a calculation of measures of central tendency and variability. For each situational variable from the field of technical and tactical dimensions was calculated the coefficient of efficiency (KE). To calculate it, it is necessary to know the total number of executed game elements, as well as the number of successfully executed game elements. The general formula for calculating KE is (Godik, 1976):

$$KE = \frac{\text{the total number of executed game elements}}{\text{the number of successfully executed game elements}}$$

From a field of comparative statistics were used: t-test (test of mean difference for small dependent sam-

METHODS

Uzorak ispitanika

Prvenstvo za rukometušice održano je od 30. novembra do 15. decembra, 2019. godine u Japanu. Na turniru su učestvovali ukupno 24 reprezentacije podijeljene u četiri grupe. Istraživanjem su obuhvaćeni rezultati prvih osam (8) plasiranih timova na ovom svjetskom prvenstvu (Nizozemska, Španija, Rusija, Norveška, Crna Gora, Srbija, Švedska i Njemačka). Svaka od ovih reprezentacija odigrala je po 10 utakmica, pa tako, ukupno 80 odigranih utakmica čini posmatrani uzorak ovog istraživanja. Dakle, entiteti (nosioci informacija) u ovom radu su rukometne utakmice.

Uzorak varijabli

Uzorkom varijabli obuhvaćeno je individualno taktičko izvođenje u fazi napada, koje karakteriše završetak napadačke akcije, tj. šutiranje na gol i postignut gol. Na osnovu standardnih pokazatelja situacijske efikasnosti, u istraživanju je korišteno 16 varijabli i to: PGUT - prosjek golova po utakmici, BRŠ - ukupan broj šuteva, BRG - ukupan broj golova, BRŠK - ukupan broj šuteva s krila, BRGK - ukupan krov golova s krila, BRŠ7M - ukupan broj šuteva sa 7m, BRG7M - ukupno golova sa 7m, BRŠ9M - ukupno šuteva sa 9m, BRG9M - ukupno golova sa 9m, BRŠ6M - ukupno šut sa 6m, BRG6M - ukupno golova sa 6m, BRŠPRO - ukupno šuteva iz "prolaza", BRGPRO - ukupan broj golova iz "prolaza", BRŠKN - ukupan broj šuteva iz kontranapada, BRGKN - ukupan broj golova iz kontranapada i BRNAP - ukupan broj napada.

Za obradu dobijenih podataka korišteni su postupci deskriptivne statistike, koja sadrži metode i procedure za prezentovanje i sumiranje podataka, kao i komparativne statistike. Korištene su i procedure grafičkog i tabelarnog prikaza podataka i izračunavanja mjera centralne tendencije i varijabiliteta. Za svaku situacionu varijablu, iz prostora tehničko – taktičke dimenzije, izračunat je koeficijent efikasnosti (KE). Opšta formula za izračunavanje KE glasi (Godik, 1976):

$$KE = \frac{\text{broj uspješno izvedenih elemenata igre}}{\text{ukupan broj izvedenih elemenata igre}}$$

Iz prostora komparativne statistike upotrebljeni su: t-test (za testiranje razlike aritmetičkih sredina malih zavisnih uzoraka), kojim je ispitivana značajnost razlika efikasnosti između uspješnih i manje uspješnih reprezentacija (tehničko-taktička dimenzija) na svjet-

ples), which determines the significance of the difference in efficiency between more and less successful national teams (technical and tactical dimension) at the 2019 Women's Handball World Championship with. Statistical data processing was done using application software SPSS 20.0, on the laptop Acer, Aspire E1 – 510.

RESULTS

In the realization of the technical-tactical elements of the attack in handball game, participated 134 female handball players from eight (8) top national teams at this World Cup.

Table 1. Basic statistical parameters for variables from the technical and tactical activities - sample of played matches

Variables / Varijable	N	Mean	Min.	Max.	K. var.	St.dev.	K-S
PGUT	80	31.21	27,55	38.2	0.115	3.60	0.636
BRŠ	80	468.50	410	545	0.097	45.51	0.424
BRG	80	293.50	248	382	0.154	45.20	0.517
BRŠK	80	76.63	48	103	0.199	15.31	0.672
BRGK	80	43.38	20	55	0.271	11.78	0.682
BRŠ7M	80	39.75	27	69	0.551	21.93	0.952
BG7M	80	32.00	22	53	0.296	9.50	0.710
BRŠ9M	80	130.63	84	188	0.271	35.45	0.397
BRG9M	80	51.75	29	83	0.328	16.98	0.428
BRŠ6M	80	118.50	109	125	0.044	5.21	0.387
BRG6M	80	79.00	61	93	0.132	10.43	0.387
BRŠPRO	80	37.38	17	57	0.345	12.89	0.396
BRGPRO	80	29.00	13	44	0.344	9.97	0.441
BRŠKN	80	54.75	38	77	0.237	12.96	0.390
BRGKN	80	43.88	31	66	0.282	12.39	0.524
BRNAP	80	556.13	497	622	0.073	40.85	0.485

Legend: PGUT - average goals per game, BRŠ - the total number of shots, BRG - the total number of goals, BRŠK - the total number of wing shots, BRGK - the total number of wing goals, BRŠ7M - the total number of 7m shots, BRG7M - the total number of 7m goals, BRŠ9M - the total number of 9m shots, BRG9M - the total number of 9m goals, BRŠ6M - the total number of 6m shots, BRG6M - the total number of 6m goals, BRŠPRO - the total number of breakthrough shots, BRGPRO - the total number of breakthrough goals, BRŠKN - the total number of fastbreak shots, BRGKN - the total number of fastbreak goals, BRNAP - the total number of attacks.

With an overview of the results and statistical parameters for variables from the technical and tactical dimensions (TT) for the sample of matches (Table 1), it is stated that they are female handball players have achieved, an average, over 31 goals per game, then each

skom prvenstvu u rukometu za žene, 2019. godine. Statistička obrada podataka je urađena uz pomoć aplikativnog softvera SPSS 20.0, na laptopu Acer, Aspire E1 – 510.

REZULTATI

U realizaciji tehničko-taktičkih elemenata napada u rukometu, na ovom svjetskom prvenstvu, učestvovalo su 134 igračice iz osam (8) najbolje plasiranih nacionalnih timova.

Tabela 1. Osnovni statistički parametri za varijable iz prostora tehničko-taktičke aktivnosti za uzorak odigranih utakmica

Legenda: PGUT - prosjek golova po utakmici, BRŠ - ukupan broj šutova, BRG - ukupan broj golova, BRŠK - ukupan broj šutova s krila, BRGK - ukupan krov golova s krila, BRŠ7M - ukupan broj šutova sa 7m, BG7M - ukupan broj golova sa 7m, BRŠ9M - ukupan broj šutova sa 9m, BRG9M - ukupan broj golova sa 9m, BRŠ6M - ukupan broj šutova sa 6m, BRG6M - ukupan broj golova sa 6m, BRŠPRO - ukupan broj šutova iz prolaza, BRGPRO - ukupan broj golova iz prolaza, BRŠKN - ukupan broj šutova iz kontre, BRGKN - ukupan broj golova iz kontre, BRNAP - ukupan broj napada.

Pregledom rezultata i statističkih parametara za varijable iz prostora TT dimenzije za uzorak odigranih utakmica (Tabela 1.), konstatuje se da su rukometašice davale u prosjeku nešto više od 31 gol po utakmici, da je u prosjeku svaki tim šutirao na gol ukupno 468.5 puta

team, on average, shot on goal in total of 468.5 times in ten (10) games played by each team in the tournament. They achieved an average of 293.5 goals per national team. Also, from the position of wing, players were shot on average, more than 76 shots and the goalkeeper's net shook 43.38 times. From the 7m line, they shot an average of 39.75 times and achieved an average of 32 goals. From the 9m space, it was shot an average of 130 times and scored almost 52 goals. Then, from the pivot position, it was shot almost 118.5 times, on average from which almost 79 goals were achieved. From the "pass" action, 29 goals were achieved, with an average of 55 fastbreak opportunities, from which almost 44 goals were achieved. The number of attacks was 556.13 on average per one handball national team, in the 10 played matches.

Considering the values of the coefficients of variation, it is confirmed that the sample is quite uniform even by the criterion of attack. According to the values shown from the parameters, the distribution of results for the entire sample of variables ($N = 80$) is within the normal range, indicating homogeneity of the sample, and with it was also provided further processing of the data. To check the direct efficiency of national teams, the total number of observed variables (16), for further analysis was taken into account only those who are related to scoring goals. For these verification purposes, seven (7) variables were isolated.

Table 2. The coefficient of efficiency (KE) of the eight best-placed team - technical and tactical activities of attack

Tag / Oznaka	NED	ESP	RUS	NOR	MONT	SRB	SWE	GER
KE_PGUT	0.700	0.617	0.677	0.611	0.607	0.644	0.608	0.531
KE_GK	0.634	0.495	0.629	0.723	0.550	0.579	0.416	0.459
KE_G7M	0.875	0.768	0.891	0.731	0.909	0.733	0.707	0.888
KE_G9M	0.441	0.345	0.443	0.333	0.362	0.463	0.401	0.345
KE_G6M	0.692	0.656	0.647	0.631	0.618	0.775	0.739	0.559
KE_GPRO	0.702	0.771	0.866	0.761	0.757	0.880	0.764	0.727
KE_GKN	0.649	0.842	0.906	0.857	0.795	0.794	0.777	0.766

Legend: KE_PGUT – Shot efficiency coefficient (goal), KE_GK - Wing efficiency coefficient, KE_G7M - 7m shot efficiency coefficient, KE_G9M - 9m shot efficiency coefficient, KE_G6M - 6m shot efficiency coefficient, KE_GPRO - breakthrough shot efficiency coefficient, KE_GKN – fastbreak shot efficiency coefficient

By looking at the results (Table 2.) obtained by calculating the efficiency of a shot as an element of attack, Netherland could be considered as the most effective in scoring goals (0.700) and least effective in scoring goals,

u deset (10) utakmica koliko je svaka reprezentacija odigrala na turniru. Prosječno su postignuta 293.5 gola po jednom reprezentativnom sastavu. Sa pozicije krilnih igrača prosječno se šutiralo nešto više od 76 puta, a golmanova mreža se zatresla 43.38 puta. Sa linije 7m šutiralo se u prosjeku 39.75 puta, a postignuta su prosječno 32 gola. Iz prostora 9m šutiralo se prosječno 130 puta i postignuto gotovo 52 gola. S pozicije pivota lopta je šutirana skoro 118.5 puta u prosjeku i postiglo se gotovo 79 golova. Iz "prolaza" postignuto je 29 golova, a u prosjeku 55 prilika za kontranapad, iz kojih je postignuto skoro 44 gola. Prosječan broj napada po jednoj rukometnoj reprezentaciji, iz deset odigranih utakmica bio je 556.13.

S obzirom na vrijednosti koeficijenata varijacijske, potvrđuje se da je uzorak i po kriterijumu napada, dosta ujednačen. Prema prikazanim vrijednostima parametara, distribucija rezultata za cijeli uzorak varijabli ($N=80$) je u granicama normalnosti što ukazuje na homogenost uzorka, čime je obezbijeđena dalja obrada podataka. U cilju provjere direktne efikasnosti reprezentacija, od ukupnog broja posmatranih varijabli (16), za dalju analizu u obzir su uzete samo one koje se odnose na postizanje golova. Za te potrebe provjere izdvojeno je sedam (7) varijabli.

Tabela 2. Koeficijent efikasnosti (KE) osam najbolje plasiranih reprezentacija – tehničko-taktičke aktivnosti u napadu

Legenda: KE_PGUT – koeficijent efikasnosti šuta (gol), KE_GK - koeficijent efikasnosti šuta s krila, KE_G7M - koeficijent efikasnosti šuta sa 7m, KE_G9M - koeficijent efikasnosti šuta sa 9m, KE_G6M - koeficijent efikasnosti šuta sa 6m, KE_GPRO - koeficijent efikasnosti šuta iz "prolaza", KE_GKN - koeficijent efikasnosti šuta iz kontranapada.

Pregledom rezultata (Tabela 2.) dobijenih izračunavanjem koeficijenta efikasnosti šutiranja kao elemenata napada, može se smatrati da je najefikasnija u postizanju golova bila selekcija Nizozemske (0.700), a najmanje

Germany national team (0.531). The most effective in achieving the goals from the wing position was Norway (0.723), and the worst Sweden (0.416). From the 7m position, the most efficient was the Montenegrins (0.909) and the worts Swedes (0.707). From the field of 9m, the best realization of the attacks had the Serbians (0.463) and the worst Norwegians (0.333). On the 6m position, the Serbians were the most efficient (0.775), and the national team of Germany (0.553) had the lowest score in this segment of the game. The highest coefficient from the breakthrough was achieved by the Serbians (0.880) and the least by the Dutches (0.702). By the fastbreaks, the most successful were the Russians (0.906) and the least successful were the Dutches (0.649).

It's very interesting a ranking after the analysis by the criterion of efficiency coefficient (KE). Namely, according to these parameters, the national team of Serbia was the most efficient and in the tournament would take first place, Russia should be second, national team Netherlands third, while the Spanish team would take only sixth place. Other teams are eventually confirmed their position through to the coefficient of performance of technical and tactical elements (Table 3).

Table 3. The efficiency based on coefficients values (KE)

No. / Br.	Ranking by value KE / Poredak prema KE
1. NETHERLAND / NIZOZEMSKA	-2 ↓ (3)
2. SPAIN / ŠPANIJA	-4 ↓ (6)
3. RASSIA / RUSIJA	+1↑ (2)
4. NORWAY / NORVEŠKA	= (4)
5. MONTENOGRO / CRNA GORA	= (5)
6. SERBIA / SRBIJA	+5↑ (1)
7. SWEDEN / ŠVEDSKA	= (7)
8. GREMANY / NJEMAČKA	= (8)

The key question of the research is: is the numerical difference between less successful (place od 1st-4th) and successful (place of 5th-8th) big enough, to be considered as statistically significant to?

To make the necessary conclusion easier, it should be said that the national teams are divided by the criterion of success into two groups (1) and (2). Group 1 consisted of better-placed teams (Netherlands, Spain, Russia, Norway), while Group 2 consisted of lower placed teams (Montenegro, Serbia, Sweden, and Germany). The results were obtained based on the values of the degree of freedom $df=39$ and the limit value of the two-way t-test. For the statistically significant values accepted are those whose (limited) value of t-test is higher than, or equal to $t \geq 2.021$, at a significance level of $p=0.05$.

According to the results in Table 4, it is clear that there are also differences between the groups in three

efikasna, selekcija Njemačke (0.531). Najefikasnija u postizanju golova s pozicije krila je bila Norveška (0.723), a najlošija Švedska (0.416). Sa linije 7m najefikasnija bila je selekcija Crne Gore (0.909), a najlošija selekcija Švedske (0.707). Iz prostora od 9m najbolju realizaciju napada imala je selekcija Srbije (0.463), a najlošiju selekcija Norveške (0.333). Na liniji od 6m najefikasnije je bila selekcija Srbije (0.775), a najslabiji rezultat u ovom segmetu igre postigla je selekcija Njemačke (0.531). Najviše golova iz "prolaza" postizala je selekcija Srbije (0.880), a najmanje selekcija Nizozemske (0.702). U kontranapadima najuspješnija je bila selekcija Rusije (0.906), a najmanje uspjeha imala je selekcija Nizozemske (0.649).

Interesantan je poredak nakon analize prema kriterijumu koeficijenta efikasnosti (KE). Naime, prema tim parametrima, nacionalni tim Srbije je bio najefikasniji i na turniru bi zauzeo prvo mjesto, Rusija bi trebalo da bude druga, nacionalni tim Nizozemske treći, dok bi tim Španije zauzeo tek šesto mjesto. Ostali timovi su potvrdile svoj plasman i prema koeficijentu efikasnosti izvođenja tehničko-taktičkih elemenata (Tabela 3.).

Tabela 3. Efikasnost na osnovu koeficijenta efikasnosti (KE)

Ključno pitanje istraživanja je: da li je numerička razlika između uspješnjih (1.-4. mjesto) i manje uspješnih (5.-8. mjesto) dovoljno velika da bi se mogla smatrati i statistički značajnom?

Kako bi se lakše donijeli neophodni zaključci, treba reći da su reprezentacije podijeljene po kriterijumu uspješnosti u dvije grupe (1) i (2). Grupu 1 činile su bolje plasirane ekipe (Nizozemska, Španija, Rusija i Norveška), dok su Grupu 2 činile slabije plasirane reprezentacije (Crna Gora, Srbija, Švedska i Njemačka). Rezultati su dobijeni na osnovu vrijednosti stepena slobode $df=39$ i granične vrijednosti dvostrjnog t-testa. Za statistički značajne vrijednosti prihvaćene su one čija je (granična) vrijednost t-testa veća ili jednaka od $t \geq 2.021$ na nivou značajnosti od $p=0.05$.

Prema rezultatima iz Tabele 4., jasno se vidi da između grupa razlike postoje kod tri (3) varijable od ukupno sedam (7) označenih kao varijable iz kojih se direk-

(3) variables out of seven (7) marked as a variable from which contributes directly to the success, that is, which achieves goal with. Statistically significant differences are shown in the variables Shot efficiency coefficient (KE_PGUT) $p= 0.034$, Wing efficiency coefficient (KE_GK) $p=0.068$ and breakthrough shot efficiency coefficient (KE_GPRO) $p=0.065$. For other variables, there was no statistical significance at this level of inference.

Table 4. The differences between less successful and successful handball teams

Var.	Gr.	N	X	SD	Skew.	Kurt.	t	df	p
KE_PGUT	1	40	33.73	3.628	1.75	1.65	5.281	39	0.034
	2	40	28.69	1.173	0.38	-3.78			
KE_GK	1	40	5.22	0.198	3.11	2.61	3.637	39	0.068
	2	40	3.45	1.050	-1.16	1.08			
KE_G7M	1	40	3.77	1.037	1.76	3.27	1.573	39	0.256
	2	40	2.62	0.386	-0.16	-4.40			
KE_G9M	1	40	5.22	2.250	0.95	1.93	-1.643	39	0.242
	2	40	5.12	1.287	-1.35	2.36			
KE_G6M	1	40	7.85	0.451	-1.57	2.41	-0.533	39	0.647
	2	40	7.95	1.526	-0.49	-3.08			
KE_GPRO	1	40	3.70	0.560	-1.28	2.42	3.729	39	0.065
	2	40	2.10	0.548	-1.70	2.92			
KE_GKNAP	1	40	3.70	0.560	0.61	-2.30	-0.170	39	0.881
	2	40	3.95	0.635	-0.84	0.93			

DISCUSSION

Taking into account the frequency of certain technical-tactical activities, the data of 622 attacks that the Netherlands team made in 10 played matches makes it clear that modern handball is played fast and offensively, which many authors agree with, while exploring the character of modern handball (Talović, Kazazović & Kolasević, 2007; Pokrajac, 2008; Petricală, 2009; Šibila, Bon, Mohorić & Pori, 2011; Urban, Kandrac & Taborsky, 2011, Foretić, 2012). The teams from Spain (586 attacks), Russia (568), Norway (584) who finished the tournament as the top four teams, also did not have a different concept of the game. The number of shooting opportunities also contributes to the conclusion that the tactics of the game were based on an aggressive approach and aim to achieve a goal. The fact that a significant difference appeared in only 3 of the 7 variables characteristic of the final action in the attack can be explained by the great uniformity of the teams, which is at this level of competition within the expected range. On the other hand, it is evident that national teams,

who are represented in the tournament, have a specific concept of the game, which is characterized by a large number of attacking actions. In the attack, they are able to score more goals than other teams, which is reflected in the significantly higher percentage of successful shots. This is also evident in the results of the statistical analysis, where the differences in the variables related to the attack are statistically significant. The results show that the difference in the variables related to the attack is statistically significant, while the differences in the variables related to defense and counter-attack are not statistically significant. This indicates that the differences in the variables related to the attack are statistically significant, while the differences in the variables related to defense and counter-attack are not statistically significant. This indicates that the differences in the variables related to the attack are statistically significant, while the differences in the variables related to defense and counter-attack are not statistically significant.

Tabela 4. Razlike između manje uspješnih i uspješnih rukometnih timova

DISKUSIJA

Uzimajući u obzir učestalost određenih tehničko-taktičkih aktivnosti, podatak od 622 napada koliko je ekipa Nizozemske izvela u 10 odigranih utakmica, jasno govori o tome da se danas rukomet igra brzo i napadački s čime se slažu mnogi autori istraživajući karakter modernog rukometa (Talović, Kazazović i Kolasević, 2007; Pokrajac, 2008; Petricală, 2009; Šibila, Bon, Mohorić i Pori, 2011; Urban, Kandrac i Taborsky, 2011, Foretić, 2012). Ništa drugaćiji koncept igre nisu imale ekipe iz Španije (586 napada), Rusije (568), Norveška (584) koje su završile turnir kao četiri najbolje plasirane ekipe. Broj prilika za šutiranje takođe doprinosi zaključku da se takтика igre bazirala na agresivnom pristupu i ciljem da se postigne gol. Činjenicu da se značajna razlika pojavila u samo 3 od ukupno 7 varijabli karakterističnih za začvršnicu akciju u napadu, moguće je objasniti velikom ujednačenošću ekipa, što je na ovom nivou takmičenja u granicama očekivanog. Sa druge strane, vidljivo je i to da su nacionalni timovi, čiji se koncept igre temelji

whose concept of the game is frequent shooting, are of different technical and tactical quality, as confirmed by Gardašević & Terzić, 2010; Vukosavljević Kocic, Berić & Stojić (2015), Vučeta, Sporiš & Milanović, (2015), Kragulj (2016) Karalić, Čeleš & Skender (2019) i Čeleš, Karalić & Kurtović, (2019) in their research. The statistical significance of the observed sample was found for the variable average number of goals (PGUT) which tells us that success in handball is measured by winning or losing, not by the number of goals scored. By comparison, Romania's national team at the 2009 World Cup finished only eighth in the final standings with 306 goals scored and a 63% success rate, which is a better result than the first-ranked team in Russia with a slightly higher number of 315 goals and a success rate of 59%. Or, at the 2013 World Cup, Denmark's national team as third-ranked, had a better goal difference (255) and a better success rate (61%) than Brazil's world champion with 253 goals and 59% success rate. Then, in the 2015 World Cup, the Netherlands team, as the second-ranked team in terms of goals scored, was the best (300) but had a lower percentage of efficiency (60%) than the Norwegian team who scored 279 goals, with an efficiency of 65% (according to Kragulj, 2016). So, regardless of the modern style of play, the only thing that matters is which team will win and which one will lose.

The number of goals scored from the wing positions (BRGK) also helped to determine the team's "better" or "worse" performance in terms of player position. Often, game tactics are designed based on the percentages of realization in the game but also based on the specific positions and specialization of the player's individual. Previous studies of situational efficiency by position support this (Srboj, Ragulj, & Katić, 2001; Vučeta, Milanović & Sertić, 2003 and Grujić, Vučeta, Milanović & Ohnjec, 2005; Rogulj, Srboj & Čavala, 2005). The Variable The total number of breakthrough goals (BRGPRO) also stood out as statistically significant at the level of completion in favor of a group of successful teams. Simić (2017) confirmed that in the top-class handball there is also a significant difference in the performance of this technical-tactical element. The analysis of playing positions efficiency is often the subject of research and in the male and in the female handball (Srboj & Rogulj, 2003; Taborsky, 2008; Vila, Manchado, Abraldes, Alcaraz, Rodríguez & Ferragut, 2011; Zapartidis, Kororos, Christodoulidis, Skoufas & Bayios, 2011; Bičanić, 2015; Đurinović, 2016; Mateković, 2016 and Lalić, 2017). The point of such analysis is to determine how certain parameters of situational efficiency affect on the team, but also on the individual, and what is its role and contribution to the success or failure, in the form the final results.

na čestom šutiraju, ipak različitih tehničko - taktičkog kvaliteta što potvrđuju i Gardašević i Terzić, 2010; Vukosavljević, Kocić, Berić i Stojić (2015), Vučeta, Sporiš i Milanović, (2015), Kragulj (2016) Karalić, Čeleš i Skender (2019) i Čeleš, Karalić i Kurtović, (2019) u svojim istraživanjima.

Statistička značajnost za posmatrani uzorak utvrđena je za varijablu Projek broja golova (PGUT) što nam govori da se uspjeh u rukometu mjeri pobjedom ili porazom, a ne brojem postignutih golova. Poređenja radi, nacionalni tim Rumunije na SP 2009. zauzeo je tek osmu poziciju u konačnom plasmanu sa 306 datih golova i procentom uspješnosti od 63%, što je bolji rezultat od tada prvoplasiranog tima Rusije sa neznatno većim brojem od 315 golova i procentom uspješnosti od 59%. Ili, na SP 2013 nacionalni tim Danske kao trećeplasirani, je imao bolju gol razliku (255) i bolji procenat uspješnosti (61%), od Brazila svjetskog prvaka sa 253 gola i 59% uspješnosti. Zatim, na SP 2015. tim Holandije, kao drugoplasirani tim, je po broju postignutih golova bio najbolji (300), ali je imao niži procenat efikasnosti (60%) u odnosu na tim Norveške koje su dale 279 golova, uz efikasnost od 65% (prema Kragulj, 2016). Dakle, bez obzira na moderan način igre, jedino je važno koji će tim pobjediti, a koji izgubiti.

Broj postignutih golova sa krilnih pozicija (BRGK) je također doprinijelo tome da se i po efikasnosti po igrackim pozicijama ekipe determinišu na "bolje" ili "lošije". Nerijetko se taklike igre i osmišljavaju na temelju procenata realizacije u igri, ali i na temelju specifičnih pozicija i specijalizacije igrača pojedinca. U prilog tome govore ranija istraživanja situacione efikasnosti po pozicijama (Znoj, 1990; Srboj, Ragulj i Katić, 2001; Vučeta, Milanović i Sertić, 2003; Grujić, Vučeta, Milanović i Ohnjec, 2005 i Rogulj, Srboj i Čavala, 2005). Varijabla ukupan broj golova iz "prolaza" (BRGPRO), izdvojila se također kao statistički značajna na nivou zaključivanja u korist grupe uspješnih ekipa, a da se, u vrhunskom rukometu, može govoriti o značajnoj razlici u izvođenju i ovog tehničko-taktičkog elementa potvrdila je i Simić (2017). Analiza efikasnosti po igrackim pozicijama česta je tema istraživanja i u muškom i u ženskom rukometu (Srboj, i Rogulj, 2003; Taborsky, 2008; Vila, Manchado, Abraldes, Alcaraz, Rodríguez i Ferragut, 2011; Zapartidis, Kororos, Christodoulidis, Skoufas i Bayios, 2011; Bičanić, 2015; Đurinović, 2016; Mateković, 2016 i Lalić, 2017). Smisao ovakvih analiza je utvrditi kako određeni parametri situacione efikasnosti utiču na ekipu, ali i na pojedinca, te kolika je njegova uloga i doprinos uspjehu ili neuspjehu u vidu krajnjeg rezultata. Nespor-

Undeniably, there are differences and they determine the success of the tactics of one group or team to a greater or lesser extent. However, it must be admitted, that the differences between losing and winning teams are less. By working more systematically, with high quality and with the vision of a coach, the losing teams are approaching the winning teams in the competition. With the quality of professionals, with the acquisition of knowledge and adaptation to winning teams, the players of the defeated teams are also being refined, who gets with it on quality and performance (Ćavar, 2019).

CONCLUSION

Based on the results of the research can be carried out more conclusions. Namely, one of the conclusions is that the coefficient of efficiency of the technical-tactical elements, in numerical terms, clearly determines the performance of most handball teams at this 2019 World Cup held in Japan.

The second conclusion of the research is that there are significant differences in the realization of competitive activity in successful and less successful women's senior handball national teams, especially by Everage goals per game (PGUT), The total number of wing goals, (BRGK) and The total number of breakthrough goals (BRGPRO), for the other variables observed have been determined numerical, but not statistical differences between groups.

Well, considering that in top-class sports as well as in handball, it is imperative to achieve higher efficiency for the shortest possible time, an important, perhaps the general conclusion is that in modern world handball, the primary goal is to achieve victory, a sports result respectively, which is, most often, the result of good preparation of handball players, adaptive ability of the organism, in a one word, well-designed and implemented training technology.

The research results can be used by expert coaches in player selection, evaluation of player performance on the game, planning, and programming of the training process and technical and tactical preparation of the team for the competition.

Announcement

We announce that the authors have equally contributed to this paper.

Conflict of interests

There is no conflict of interests among the authors themselves.

no, razlike postoje i one u većoj ili manjoj mjeri određuju uspjeh taktike jedne ekipe ili tima.

Mora se, međutim, priznati da su razlike između poraženih i pobjedničkih ekipa sve manje. Sistematičnim i kvalitetnijim radom poražene ekipe približavaju se kao i samom vizijom trenera i igrača do pozitivnih pomaka u samom takmičenju sa pobjedničkim ekipama. Kvalitetom stručnih ljudi i usvajanjem znanja i prilagođavanjem pobjedničkim ekipama, usavršava se i sam igrački kadar poraženih ekipa, koji time dobija na kvaliteti i uspješnosti (Ćavar, 2019).

ZAKLJUČAK

Na osnovu dobijenih ukupnih rezultata istraživanja može se izvesti više zaključaka. Naime, jedan od zaključaka je da koeficijent efikasnosti tehničko-taktičkih elemenata, u numeričkom smislu, jasno determiniše uspješnost većine rukometnih ekipa na ovom Svjetskom prvenstvu 2019., održanom u Japanu.

Drugi zključak istraživanja je da postoje značajne razlike u realizaciji takmičarske aktivnosti kod uspješnih i manje uspješnih ženskih seniorskih rukometnih nacionalnih timova, naročito po Projektu golova po utakmici (PGUT), Ukupnom broju golova s krila (BRGK) i varijablu Ukupnom broju golova iz "prolaza" (BRGPRO), za ostale posmatrane varijable utvrđene su numeričke, ali ne i statističke razlike između grupa.

No, s obzirom na to da je u vrhunskom sportu, tako i rukometu, imperativ da se za što kraće vrijeme, postigne što veća efikasnost, važan, možda generalni zaključak je taj da je u modernom svjetskom rukometu, prevashodni cilj postizanje pobjede, odnosno, sportski rezultat, a koji je, najčešće, rezultat dobre pripremljenosti rukometnika, adaptivne sposobnosti organizma, odnosno, dobro osmišljene i sprovedene trenažne tehnologije.

Rezultati istraživanja mogu koristiti eksperternim trenerima pri selekciji igrača, evaluaciji učinka igrača na utakmici, planiranju i programiranju trenažnog procesa i tehničko-taktičkoj pripremi ekipe za takmičenje.

Ijava

Ijavljujemo da su autori podjednako doprineli radu.

Konflikt interesa

Između autora ne postoji interesni konflikt.

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THE EFFICIENCY OF VIBRATION TRAINING ON CHANGES IN STRENGTH

EFIKASNOST VIBRACIONOG TRENINGA NA PROMENU SNAGE

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Abstract: The study aim was to determine the effectiveness of vibration training on changes in strength in individuals of both sexes. Vibration training is a modern form of training that is becoming more and more widespread and frequent, and involves the application of vibrational stimulations of a certain form to cause functional and structural changes. It is used during strength training, where it can act in isolation on individual muscle regions or as whole body vibrational training. These observations provide an opportunity to apply a new method in training to improve the training itself and thus the performance of the athletes. The impact of this training on motor skills, and even strength, as one of the most studied areas, has not been extensively researched. This paper analyzes 14 studies on the effects of vibrational training on the change in power, and the papers are systematically analyzed. A review of research conducted in the field of this training shows that the effects of such training methods show in both professional and recreational athletes. In most of the studies analyzed, training has shown significant changes in power as well as in other motor skills.

Keywords: vibration training, motor skills, explosive strength, power.

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Sažetak: Cilj studije bio je da se utvrdi efikasnost vibracionog treninga na promene snage kod pojedinaca oba pola. Vibracioni trening predstavlja savremeni vid treninga koji je sve masovniji i učestaliji i podrazumeva primenu vibracionih stimulacija određenog oblika s ciljem izazivanja funkcionalnih i strukturalnih promena. Koristi se tokom treninga snage, gde izolovano može delovati na pojedine mišićne regije ili kao vibracioni trening celog tela. Osim što deluje na promenu snage, vibracioni trening takođe utiče na bolje rezultate tokom zagrevanja. Ova zapažanja pružaju mogućnost primene nove metode u treningu kako bi došlo do unapređenja samog treninga, a time i performansi sportista. Uticaj ovog treninga na motoričke sposobnosti, pa i na snagu kao jednu od najproducavanijih oblasti, nije mnogo istraživan. U radu je analizirano 14 istraživanja o efektima vibracionog treninga na promenu snage, radovi su tabelarno prikazani i sistematski obrađeni. Pregledom istraživanja koja su sprovedena iz oblasti ovog treninga pokazuju da efekti ovakvih metoda treniranja postoje kako kod profesionalnih sportista, tako i kod rekreativaca. U najvećem broju istraživanja koje su analizirana, trening je pokazao značajne promene snage, kao i drugih motoričkih sposobnosti.

Ključne reči: vibracioni trening, motoričke sposobnosti, snaga, eksplozivna snaga.

INTRODUCTION

Strength is the basic motor ability that has always attracted the most attention of people and professionals. A large number of authors has tried to approach and explain the term of strength. Today, in the literature, strength is generally seen as a qualitative characteristic of a person manifested in a particular movement or exercise (Kukolj, 2006). Strength training has gained enormous popularity over the last two decades, especially because of its role in improving sports performance, enhancing maximum

UVOD

Snaga je bazična motorička sposobnost koja je oduvek privlačila najviše pažnje ljudi i stručnjaka. Veliki broj autora pokušalo je da na najbolji način približi i objasni snagu. Danas se u literaturi snaga uglavnom posmatra kao kvalitativna karakteristika čoveka ispoljena u određenom kretanju, odnosno u određenoj vežbi (Kukolj, 2006). Trening snage je stekao ogromnu popularnost u poslednje dve decenije, posebno zbog svoje uloge u poboljšanju sportskih performansi, pobošljanjem maksimalne snage, brzine, mišićne iz-

strength, speed, muscular endurance, coordination, and balance (Kraemer & Ratamess, 2000). In this regard, the authors note that training to increase muscle strength also increases the success in performing motor tasks (Ignjatovic, Radovanovic, & Stankovic, 2007). This leads to the fact that many athletes from both collective and individual sports see training strengths as the basis of their preparations (Idrizovic, 2001).

Training that increases strength with combined muscle contractions is divided into plyometric and vibration training, according to Radovanovic and Ignjatovic (2009). Vibration training is a modern form of training that is becoming more and more widespread and frequent. Markovic (2005) stipulates that vibration training involves the application of vibrational stimulations of a particular shape to cause functional and structural changes. With the development of technology, training processes were developed, as well as training methods aimed at improving the fitness of the athletes. One of these methods is vibration training. In his research, he shows that the use of vibration training in sports leads to improved jump height and flexibility so that injuries are reduced to some extent (Kunninenmeyer & Schmidtbileicher, 1997). This type of training is practiced by many European teams from the moment information on vibration training was available to public. It is also used for medical purposes. Vibration training applies vibration stimulations of a particular shape to bring about functional and structural changes (Markovic, 2005). Vibrational stimulation is applied to contracted muscles. The human body exposed to vibration stimuli responds with muscle contraction (Babajic, Bradic, Pojskic, Kovacevic, & Abazovic, 2013). There are two types of vibration training, as stated by Zatsiorsky & Kraemer (2009), namely: strength exercises with added vibrational stimulation and motor tasks performed when vibrating the body. This review aim was to examine the impact of vibration training on strength.

METHODOLOGY

To collect as many research papers as possible regarding the effects of vibration training on power changes, the following electronic databases were searched: PubMed, MEDLINE, Google Scholar, SCIndex, and ScienceDirect. Papers from 2000 to 2017 were searched. To be covered by the final analysis, they had to fulfill two criteria: that the research is experimental in nature and that the respondents who were in the adult category were without health problems. The keywords used in the database search were: vibration training, motor skills, explosive strength, power. The review and

držljivosti, koordinacije i ravnoteže (Kraemer & Ratamess, 2000). S tim u vezi, autori primećuju da se treningom za povećanje mišićne snage, povećava i uspešnost u izvođenju motoričkih zadataka (Ignjatović, Radovanović, & Stanković, 2007), što dovodi do toga, da veliki broj sportista iz kolektivnih i iz individualnih sportova trening snage vide kao osnov i srž svojih priprema (Idrizović, 2001).

Trening koji povećava snagu sa kombinovanim mišićnim kontrakcijama deli se na: pliometrijski i vibracioni trening, prema Radovanoviću i Ignjatoviću (2009). Vibracioni trening predstavlja savremeni vid treninga koji je sve masovniji i učestaliji. Marković (2005) daje definiciju da vibracioni trening podrazumeva primenu vibracionih stimulacija određenog oblika s ciljem izazivanja funkcionalnih i strukturalnih promena. Razvojem tehnologije, razvijali su se i trenažni procesi kao i metode treninga čiji su ciljevi bili unapređivanje kondicijske pripremljenosti sportista. Jedan od tih metoda je vibracioni trening. U svojim istraživanjima pokazuje da korišćenje vibracionog treninga u sportu dovodi do poboljšavanja visine skoka i fleksibilnosti, tako da su povrede u oredenoj meri smanjene (Kunninenmeyer & Schmidtbileicher, 1997). Ovaj vid treninga primenjuju mnoge evropske ekipe od trenutka kada su informacije o vibracionom treningu izašle u javnost. Osim toga koristi se i u medicinske svrhe. Vibracioni trening primenjuje vibracione simulacije određenog oblika sa ciljem kako bi došlo do funkcionalnih i stukovnih promena (Marković, 2005). Na mišiće koji su kontrahovani primenjuje se vibraciona stimulacija. Ljudsko telo izloženo stimulusima vibracija reaguje mišićnom kontrakcijom (Babajić, Bradić, Pojskić, Kovačević, & Abazović, 2013). Postoje dva tipa vibracionog treninga, kako navode Zatsiorsky & Kraemer (2009) i to: vežbe snage sa dodatom vibracionom stimulacijom i motorički zadaci koji se izvode prilikom vibriranja tela. Cilj ovog rada je da, putem pregleda literature prikaže uticaj vibracionog treninga na promenu snage.

METOD

U cilju prikupljanja što većeg broja istraživačkih radova koji su se bavili efektima vibracionog treninga na promene snage, pretražene su sledeće elektronske baze podataka: PubMed, MEDLINE, Google Scholar, SCIndex i ScienceDirect. Pretraživani su radovi od 2000. do 2017. godine. Kako bi bili obuhvaćeni konačnom analizom morali su da ispune dva kriterijuma: da su istraživanja eksperimentalnog karaktera i da su ispitnici koji su činili kategoriju odraslih osoba bez zdravstvenih problema. Ključne reči koje su korišćene prilikom pretrage baza podataka su: vibracioni trening, motoričke sposobnosti, snaga, eksplozivna snaga. Prikaz i analiza istraživačkih radova izvršena je na osnovu: referenci (prvi

analysis of the research papers were performed based on references (first authors and year), several subjects, age categories, groups, gender, experimental program, and duration of the experimental program and research results.

RESULTS

REZULTATI

Table 1. Systematic review and characteristics of the research involved

First author and year	Sample of participants				Experimental program		Measuring instruments and results
	T	Age	Group	G	Duration and frequenc.	Exercise program	
Torvinen, (2002)	56	19-38	1 C 1 E	21 M 35 F	4 m 3-5x weekly	Whole-body VT	E: VS↑, ESDE↑
Rønnestad, (2004)	15	21-41	1 C 1 E	8 M 7 F	5 weeks 2-3x weekly	Whole-body VT Frequency (40Hz)	E: CMJ↑ C:CMJ↑
Delecluse, (2005)	20	17-30	1 E 1 C	13 M 7 F	5 weeks 3x weekly	Whole-body VT Power Plate, Frequency (35-40Hz)	E: IS→, DS→, VKE→ C: IS→, DS→, VKE→
Paradisis, (2007)	24	21,3 ± 1,2	1 E 1 C	12 M 12 F	6 weeks 3x weekly	Whole-body VT Jump and sprint	E: S↓, CMJ↑ C: S→, CMJ→
Hoyo Lora, (2009)	10	18-32	1 E	10 M	/	Whole-body VT Galileo Fitness ® platform	E: SJ↑, CMJ↑
Hoyo Lora, (2010)	12	22,9	1 E	12 M	/	Whole-body VT Galileo Fitness ® platform, Frequency (30Hz)	E: SJ↑ , CMJ↑
Sarshin(2010)	20	21,5 ± 1/4	1 E 1 C	20 M	4 weeks 3 x weekly	Whole-body VT	E: ES↑, B↑ C:ES→, B→
Obradovic, (2010)	36	20 ± 6	/	36 M	/	Whole-body VT	E: ESDE↑ C: ESDE→
Melania, (2010)	20	22,6 ± 3,7 – 23,6 ± 4,9	1 C 1 E	20 M	3 weeks 3 x weekly	Whole-body VT especially knees	E: ISE→ C: ISE→
Osawa, (2011)	33	22- 49	1 C 1E	6 M 27 F	7 weeks 3 x weekly	Whole-body VT	E: LE↑ EC↑
Hawkey, (2012)	22	/	1 E 1 C	22 M	6 weeks 1 x weekly	Whole-body VT NEMES Bosco vibrating platform, Frequency (35-40Hz)	E: VS↑ C:VS→
Zivkovic, (2015)	60	21 ± 6	2 E 1 C	60 M	10 weeks 3 x weekly	VT with flexi-bar	E: ESGE↑, ESDE↑ C: ESGE→, ESDE→
Kim, (2016)	28	23,2 ± 2,4 23,5 ± 4,2	1E 1PI	28 F	8 week 3 x weekly	Whole-body VT Plyometric training	E: Ver.S↑ PI: Ver.S→
Rønnestad, (2017)	11	/	1 E 1 C	11 F	/	Whole-body VT Frequency (40Hz)	E: MIS↑, SIS↑ C: MIS↑ , SIS↑

Legend: B-speed; C-control group; CMJ-counter movement jump; DS-dynamic power; E-experimental group; EC-knee extension; ES-explosive strength; ESDE-lower extremity strength; ESGE-explosive upper extremity strength; F-female; G-gender; IS-isometric strength; ISE-isometric extensor strength; LE-lumbar extension; M-male; MIS-maximum output power; S-sprint; SIS-Medium power output; SJ-squat jump; T-total number of respondents; Ver.S-vertical jump; VKE-knee extension velocity; VS-jump height; VT-vibration training

Tabela 1. Sistematski pregled i karakteristike uključenih istraživanja

Prvi autor i godina	Uzorak ispitanika				Ekperimentalni program			Merni instrumenti i rezultati
	B	God	Gr	P	Trajanje i učestalost	Program vežbanja		
Torvinen, (2002)	56	19-38	1K 1E	21 m 35 ž	4 m 3-5x nedeljno	Vibracioni trening celog tela	E: VS↑, SDE↑	
Rønnestad, (2004)	15	21-41	1K 1E	8 m 7 ž	5 nedelja 2-3x nedeljno	Vibracioni trening celog tela Frekfencija (40Hz)	E: CMJ↑ K:CMJ↑	
Delecluse, (2005)	20	17-30	1E 1K	13 m 7 ž	5 nedelja 3x nedeljno	Vibracioni trening celog tela Na platformi Power Plate Frekfencija (35-40Hz)	E: IS→, DS→, BEK→ K: IS→, DS→, BEK→	
Paradisis, (2007)	24	21,3 ± 1,2	1E 1K	12 m 12 ž	6 nedelja 3x nedeljno	Vibracioni trening celog tela Skok i sprint	E: S↓, CMJ↑ K: S→, CMJ→	
Hoyo Lora, (2009)	10	18-32	1E	10 m	/	Vibracioni trening celog tela Galileo Fitness® platforma	E: CJ↑, CMJ↑	
Hoyo Lora, (2010)	12	22,9	1E	12 m	/	Vibracioni trening celog tela Galileo Fitness® platforma Frekfencija (30Hz)	E: SJ↑, CMJ↑	
Sarshin, (2010)	20	21,5 ± 1/4	1 E 1K	20 m	4 nedelje 3 x nedeljno	Vibracioni trening celog tela	E: ES↑, B↑ K:ES→, B→	
Obradović, (2010)	36	20 ±6	/	36 m	/	Vibracioni trening celog tela	E: ESDE↑ K: ESDE→	
Melania, (2010)	20	22,6– 23,6	1K 1E	20 m	3 nedelje 3 x nedeljno	Vibracioni trening celog tela posebno kolena	E: ISE→ K: ISE→	
Osawa, (2011)	33	22- 49	1K 1E	6 m 27 ž	7 nedelja 3 x недељно	Vibracioni trening celog tela	E: LE↑ EK↑	
Hawkey, (2012)	22	/	1 E 1K	22 m	6 nedelja 1 x nedeljno	Vibracioni trening celog tela NEMES Bosco vibracionoj platformi Frekfencija (35-40Hz)	E: VS↑ K:VS→	
Živković, (2015)	60	21 ± 6 m	2E 1K	60 m	10 nedelja 3 x nedeljno	Vibracioni trening sa flexi-barom	E: ESGE↑, ESDE↑ K: ESGE→, ESDE→	
Kim, (2016)	28	23,2 - 23,5	1E 1Pl	28 ž	8 nedelja 3 x nedeljno	Vibracioni trening celog tela Pliometrijski trening	E:Ver.S↑ Pl: Ver.S→	
Rønnestad, (2017)	11	/	1E 1K	11 m	/	Vibracioni trening celog tela Frekfencija (40Hz)	E: MIS↑, SIS↑ K: MIS↑, SIS↑	

Legenda: B-broj ispitanika, God-godine ispitanika, Gr-grupe, P-pol, M-muškog pola, Ž-ženskog pola, E- eksperimentalna grupa, K-kontrolna grupa, CMJ-skok iz čučnja sa pripremom, SJ- skok iz čučnja, VS-visina skoka, ESDE-snaga donjih ekstremiteta, IS-izometrijska snaga, DS-dinamička snaga, S-sprint, ISE-izometrijska snaga ekstenzora, ESGE-eksplozivna snaga gornjih ekstremiteta, Ver.S-vertikalni skok, MIS-maksimalna izlazna snaga, SIS-srednja izlazna snaga, ES-eksplozivna snaga, B-brzina, LE-lumbalna ekstenzija, EK-ekstenzija kolena

The number of respondents in the surveys varied considerably from survey to survey. The smallest number of respondents was 10 (Hoyo Lora, Sañudo Corrales, Carrasco Páez, Martínez Díaz, & Ochiana, 2009) and the largest 60 (Zivković, Herodek, Bubanj, Zivković & Djosic, 2015). According to the age categories, when it comes to the samples of the youngest and the oldest respondents, they cannot be strictly divided, since the most of the respondents in the large number of surveys that were processed ranged from 20 to 50 years. Such is, for example, a survey by Osawa & Oguma (2011), where the age of the respondents is 22-49 years. Experimental treatment included two groups (control and experimental) in two papers (Torvinen et al., 2002; Rønnestad, 2004), followed by two groups with only the experimental group (Hoyo Lora et al., 2009; Hoyo Lora, Ochiana, Sañudo Corrales, Carrasco Páez, & Martínez Díaz, 2010), ten papers that had both a control and an experimental group (Delecluse, Roelants, Diels, Koninckx, & Verschueren, 2005; Hawkey, 2012; Melania, Grajela-Flavia, Octavian, Iuliana, & Peter, 2010; Obradović, Madić, & Pantovic, 2010; Osawa & Oguma, 2011; Paradisis & Zacharoqiannis, 2007; Rønnestad, 2004; Rønnestad, Falch, & Ellefsen, 2017; Sarshin, Mohammadi, Khadam, & Sarshin, 2010; Torvinen et al., 2002), one paper that had two experimental and one control group (Zivković et al., 2015), while one paper had one experimental and one plyometric group (Kim & Park, 2016).

Analyzing the papers, it can be concluded that the respondents in one study were females (Kim & Park, 2016), in six studies were males and females (Delecluse et al., 2005; Hoyo Lora et al., 2010; Osawa & Oguma, 2011; Paradisis & Zacharoqiannis, 2007; Rønnestada, 2004; Torvinen et al., 2002), and in 7 studies respondents were males (Hoyo Lora et al., 2009; Hawkey, 2012; Melania et al., 2010; Obradovic et al., 2010; Rønnestad et al., 2017; Sarshin et al., 2010; Zivković et al., 2015). The shortest experimental treatment lasted three weeks (Melania et al., 2010), and the longest experimental treatment lasted four months (Torvinen et al., 2002). Some of the studies did not have a precise determination of the duration, such are, for example, the researches by Hoyo Lora et al. (2009); Hoyo Lora et al. (2010); Obradovic et al. (2010); Rønnestad et al. (2017). The effects of the whole-body vibrational training on the explosive power of jump and sprint type - sprint speed (Hoyo Lora et al., 2009; Hoyo Lora et al., 2010; Paradisis & Zacharoqiannis, 2007) have been studied in three studies. In two studies, the impact of vibration training on the rapid achievement of motor performance was studied (Obrad-

Broj ispitanika u istraživanjima je prilično varirao. Najmanji broj ispitanika bio je 10 (Hoyo Lora, Sañudo Corrales, Carrasco Páez, Martínez Díaz, & Ochiana, 2009), a najveći 60 (Živković, Herodek, Bubanj, Živković & Đošić, 2015). Prema uzrasnim kategorijama, kada je u pitanju najmlađi i najstariji uzorak ispitanika ne može se striktno podeliti jer je većina ispitnika u velikom broju istraživanja imala od 20 pa do 50 godina. Takvo je na primer istraživanje (Osawa & Oguma, 2011), gde je starnosno doba ispitanika od 22 do 49 godina. Eksperimentalnim tretmanom su obuhvaćene dve grupe (kontrolna i eksperimentalna) u dva rada (Torvinen et al., 2002; Rønnestad, 2004), zatim dva rada imaju samo eksperimentalnu grupu (Hoyo Lora et al., 2009; Hoyo Lora, Ochiana, Sañudo Corrales, Carrasco Páez, & Martínez Díaz, 2010), deset radova imaju i kontrolnu i eksperimentalnu grupu (Delecluse, Roelants, Diels, Koninckx, & Verschueren, 2005; Hawkey, 2012; Melania, Grajela-Flavia, Octavian, Iuliana, & Peter, 2010; Obradović, Madić, & Pantović, 2010; Osawa & Oguma, 2011; Paradisis & Zacharoqiannis, 2007; Rønnestad, 2004; Rønnestad, Falch, & Ellefsen, 2017; Sarshin, Mohammadi, Khadam, & Sarshin, 2010; Torvinen et al., 2002), jedan rad ima dve eksperimentalne i jednu kontrolnu grupu (Živković i sar., 2015), i jedan rad ima jednu eksperimentalnu i jednu pliometrijsku grupu (Kim & Park, 2016).

Analizom radova može se zaključiti da su ipitanici u jednom istraživanju bili ženskog pola (Kim & Park, 2016), kod šest istraživanja su bili i muškog i ženskog pola (Delecluse et al., 2005; Hoyo Lora et al., 2010; Osawa & Oguma, 2011; Paradisis & Zacharoqiannis, 2007; Rønnestada, 2004; Torvinen et al., 2002), a kod 7 istraživanja ispitanici su bili muškog pola (Hoyo Lora et al., 2009; Hawkey, 2012; Melania et al., 2010; Obradović i sar., 2010; Rønnestad et al., 2017; Sarshin et al., 2010; Živković i sar., 2015). Najkraće eksperimentalni tretman traje tri nedelje (Melania et al., 2010), a najduži eksperimentalni tretman trajao je četiri meseca (Torvinen et al., 2002). Pojedina istraživanja nisu imala precizno određenje trajanja, takva su na primer istraživanja (Hoyo Lora et al., 2009; Hoyo Lora et al., 2010; Obradović i sar. 2010; Rønnestad et al., 2017). U tri istraživanja proučavani su učinci vibracijskog treninga celog tela na eksplozivnu snagu tipa skoka i sprinta - brzina sprinta (Hoyo Lora et al., 2009; Hoyo Lora et al., 2010; Paradisis & Zacharoqiannis, 2007). U dva istraživanja proučavan je uticaj vibracionog treninga na brzo postizanje kvaliteta motoričkih performansi (Obradović i sar. 2010; Sarshin et al., 2010). U dva istraživanja proučavan je uticaj vibracionog treninga na mišićnu jačinu, mišić-

dovic et al. 2010; Sarshin et al. 2010). The impact of vibrational training on muscle strength, muscular endurance, and neuromuscular activity has been studied in two studies comparing identical conventional training (Delecluse, Roelants, Diels, Koninckx, & Verschueren, 2005; Osawa & Oguma, 2011). One study examined the effects of four-month full-body vibration training on muscular performance and body balance in young, healthy non-athletes (Torvinen et al., 2002). One study evaluated the effect of whole-body vibration exercise and plyometric training on volleyball players (Kim, & Park, 2016). The impact of adding whole body vibration training (WBV) on the warm-up procedure during a later-cycle sprint was examined in one study (Rønnestad et al., 2017). One study examined the chronic effects of whole-body vibration on the strength and strength of the lower extremities, in which vibrational stimulation was added to standard exercise training (Rønnestad, 2004). In one study, the effect of long-term WBV training on the maximum isometric knee strength of rugby players was examined (Melania et al., 2010). One study examined the effect of a six-week vibration training program on a recreationally active population (Hawkey, 2012). One study found the effects of two 10-week programs on changes in explosive parameters, the ability to cause effects by stimulating muscle vibration or isometric training (Zivković et al., 2015).

DISCUSSION

Changes were noted in the following surveys: The results of Torvinen et al. (2002) show that under the influence of whole body vibration training (WBV) there was an improvement in jump height by 8.5%. Lower limb strength increased by 3.7% after two months, however, this value decreased after four months. Rønnestad (2004) showed that the experimental group that under the influence of WBV showed positive effects in the maximum strength of 1RM (repetition maximum) ($32 \pm 9\%$) and in the countermovement jump height (CMJ) ($9.1 \pm 5.5\%$), while the control had a positive effect on the maximum strength 1RM ($24.2 \pm 3.9\%$) and statistically significant effect on CMJ jump height ($4.2 \pm 4.2\%$). Paradisis & Zacharoqianis (2007) found that under the influence of the WBV the sprinting test recorded displacement of 3.4%. The jump height under the influence of WBV was improved by 3.3% and the explosive strength endurance was advanced by 7.8%. The result of Hoyo Lora et al. (2009) showed an increase in SJ (1.85 ± 3.85 cm) and CMJ (1.22 ± 3.35 cm) post-test immediately after vibration. The post-test value displayed 30 minutes after the jump from

nu snagu, mišićnu izdržljivost i neuromišićnu aktivnost upoređujući sa identičnim konvencionalnim treningom (Delecluse, Roelants, Diels, Koninckx, & Verschueren, 2005; Osawa & Oguma, 2011). U jednom istraživanju je ispitivan uticaj efekata četvoromesečnog vibrationog treninga celog tela na mišićne performanse i ravnotežu tela kod mlađih, zdravih nesportista (Torvinen et al., 2002). U jednom istraživanju je vršena procena efekta vežbanja vibracije celog tela i pliometrijskog treninga kod odbojkašica (Kim, & Park, 2016). U jednom istraživanju je ispitivan uticaj dodavanja vibrationog treninga za celo telo (WBV) na proceduru zagrevanja prilikom sprinta kasnijeg ciklusa (Rønnestad et al., 2017). U jednom istraživanju su proučavani hronični efekti vibracije celog tela na jačinu i snagu donjih ekstremiteta u kojoj je vibracioni nadražaj bio dodat standardnom treningu sa opterećenjem (Rønnestad, 2004). U jednom istraživanju je ispitivan efekat dugoročnih WBV treninga na maksimalnu izometrijsku snagu kolena ragbi igračima (Melania et al., 2010). U jednom istraživanju je ispitivan efekat šestonedeljnog programa vibrationog treninga na rekreativno aktivnom stanovništvu (Hawkey, 2012). U jednom istraživanju su utvrđivani efekati dva programa od 10 nedelja na promene parametara eksplozivnosti, mogućnost uzorkovanja efekata stimulacijom vibracije mišića ili izometrijskog treninga (Živković i sar., 2015).

DISKUSIJA

Rezultati Torvinen et al. (2002) pokazuju da je pod uticajem vibrationog treninga za celo telo (WBV) došlo do poboljšanja visine skoka za 8,5%. Snaga donjih ekstremiteta je povećana za 3,7% nakon dva meseca, međutim ova vrednost se smanjila nakon četiri meseca. Rønnestad (2004) je pokazao da je eksperimentalna grupa pod uticajem WBV ostvarila pozitivne efekte na maksimalnu jačinu od 1RM (maksimalni ponovak) ($32 \pm 9\%$), te visinu skoka u skoku iz čučnja sa pripremom (CMJ) ($9,1 \pm 5,5\%$), dok je kontrola imala pozitivan uticaj na maksimalnu jačinu 1 RM ($24,2 \pm 3,9\%$) i statistički značajan uticaj na CMJ visinu skokova ($4,2 \pm 4,2\%$). Paradisis & Zacharoqianis (2007) su utvrdili da je pod uticajem WBV treninga, test sprinterskog trčanja zabeležio pomak od 3,4%. Visina skoka je pod uticajem WBV poboljšana za 3,3 %, a izdržljivost u eksplozivnoj jačini je napredovala za 7,8%. Rezultat Hoyo Lora et al. (2009) je pokazao povećanje SJ ($+1.85 \pm 3.85$ cm) i CMJ ($+1.22 \pm 3.35$ cm) post-testa odmah nakon vibracije. Vrednost post-testa prikazana 30 minuta nakon skoka iz čučnja je iznad vrednosti kod pre-testa, ali i ispod vrednosti neposredno kod post-testa ($+0.51 \pm 4.37$ cm). Kao kontrast, vrednost

the squat was above the value of the pre-test, but also below the immediate post-test value (0.51 ± 4.37 cm). In contrast, the value of the CMJ falls below the pre-test value (-0.15 ± 2.36 cm). Hoyo Lora et al. (2010) achieved an increase in squat jump (SJ) (1.76 ± 4.05 cm) and CMJ (1.10 ± 3.20 cm) in a post-test performed immediately after vibration. The values of the post-test performed 30 minutes after the jump from the squat remained above those from the pre-test but just below those from the current post-test (0.42 ± 4.43 cm). In contrast, the jump values from the squat with the preparation fall below those from the test (0.12 ± 2.45 cm). Sarshin et al. (2010) achieved a statistically significant increase in EG with an increase of 7.8% in explosive power ($p \leq 0.002$), and there was a significant difference in the speed of EG (5m: $p \leq 0.001$, 10m: $p \leq 0.042$ and 20m: $p \leq 0.001$) in the post-test. After conducting experimental treatments based on the aforementioned different methods of preparation of the locomotor apparatus for the upcoming maximum muscular effort in the study of domestic authors, it was concluded that the vibration training method is significantly more effective ($p=0.01$) than the conventional method used (Obradović et al., 2010). In Osawa & Ogum's (2011) study, vibrational training was found to be better at the level of statistical significance compared to conventional training. Based on the statistical significance ($p=0.0001$) in the study (Hawkey, 2012), it can be concluded that there was an increase in the height of the jump in the experimental group, before (0.43 ± 0.08 m) and after (0.49 ± 0.08 m). Analyzing the obtained research results of Živković et al. (2015) found that under the influence of WBV there were changes in the mean values in the explosive power of the upper and lower extremities. Performing preconditioning exercise with WBV at 40 Hz in the study of Rønnestad et al. (2017) resulted in superior maximum output power compared to the preconditioning exercise without WBV (1413 ± 257 V vs 1353 ± 213 V, $P = .04$) and a tendency toward superior mean output power during the 15 second-out sprint (850 ± 119 V vs 828 ± 101 V, $P = .08$). Effect size showed a moderate practical effect of WBV without WBV on both strengths - both maximum and mean. Measurement of vertical jump in a study by Kim & Park (2016) found that the WBV group showed significant improvement in vertical jump from the control group.

No changes were observed in the following surveys: The isometric and dynamic strength of the knee flexors and extensors was unchanged ($r > 0.05$) in the whole body vibration training group and the control group. Also, the knee extension rate remained unchanged

CMJ pada ispod vrednosti pre-testa (-0.15 ± 2.36 cm). Hoyo Lora et al. (2010) su ostvarili povećanje u skoku iz čučnja (SJ) ($+1.76 \pm 4.05$ cm) i CMJ ($+1.10 \pm 3.20$ cm) u post testu koji se sprovodi odmah posle vibracija. Vrednosti post testa izvršenog 30 minuta posle skoka iz čučnja ostale su iznad onih iz pre - testa ali neposredno ispod onih iz trenutnog post-testa ($+0.42 \pm 4.43$ cm). Nasuprot tome vrednosti skoka iz čučnja sa pripremom padaju ispod onih iz pre – testa (0.12 ± 2.45 cm). Sarshin et al. (2010) su ostvarili statistički značajno uvećanje kod EG sa povećanjem od 7.8% u eksplozivoj snazi ($P \leq 0/002$), a javila se i značajna razlika u brzini EG (5m: $P \leq 0.001$, 10m: $P \leq 0.042$ i 20m: $P \leq 0.001$) u post testu. Nakon sprovedenih eksperimentalnih tretmana zasnovanih na pomenu tim različitim metodama pripreme lokomotornog aparata za nastupajuće maksimalno mišićno naprezanje u istraživanju domaćih autora zaključeno je da je metoda vibracionog treninga značajno efikasnija (na nivou značajnosti 0.01) u odnosu na primjenjenu konvencionalnu metodu (Obradović i sar., 2010). U istraživanju Osawa & Oguma (2011) vibracioni trening se pokazao boljim na nivou statističke značajnosti u odnosu na konvencionalni trening. Na osnovu statističke značajnosti ($p = 0.0001$) u istraživanju (Hawkey, 2012) može se konstatovati da je došlo do povećanja visine skoka u eksperimentalnoj grupi (pre - 0.43 ± 0.08 m i posle - 0.49 ± 0.08 m). Analiziranje dobijenih rezultata istraživanja Živković i sar. (2015) utvrdilo je da je pod uticajem WBV došlo do promena u srednjim vrednostima u eksplozivnoj snazi gornjih i donjih ekstremiteta. Izvođenje predkondicionog vežbanja sa WBV na 40 Hz u istraživanju Rønnestad et al. (2017) rezultiralo je superiornom maksimalnom izlaznom snagom u poređenju sa vežbom za predkondicioniranje bez WBV-a (1413 ± 257 V vs 1353 ± 213 V, $P = .04$) i tendencijom ka superiornom srednjem izlaznom snagom tokom 15 sekunde- out sprint (850 ± 119 V vs 828 ± 101 V, $P = .08$). Veličina efekata pokazala je umereni praktični efekat WBV-a bez WBV-a na obe snage - kako maksimalnu tako i srednju. Merenje vertikalnog skoka u istraživanju Kim & Park (2016) otkrilo je da grupa vežbanja vibracija celog tela pokazuje značajno poboljšanje vertikalnog skoka od kontrolne grupe.

Izometrijska i dinamička snaga fleksora i ekstenzora kolena nije bila promenjena ($R > 0.05$) u grupi treninga vibracije celog tela i u kontrolnoj grupi. Takođe brzina ekstenzije kolena je ostala nepromenjena ($R > 0.05$). Trajanje početne akcije, rezultat početne brzine, početno ubrzanje i brzina trčanja ostalo je nepromenjeno ($R > 0.05$) u svakoj grupi (Delecluse et al., 2005). Paradisis & Zacharoqianis (2007) pokazuju da se vreme

($r>0.05$). The duration of the initial action, the result of the initial speed, the initial acceleration, and the running speed remained unchanged ($r>0.05$) in each group (Delecluse et al., 2005). Paradisis & Zacharoqianis (2007) show that the sprint time in the experimental group decreased: 10m-4.3%, 20m-3%, 40m-2.2%, 50m-2.1% and 60m-2.1%. CMJ height improved by 3.3% (also statistically significant). During the experimental procedure, the control group achieved statistically insignificant moving changes for the sprint speed: 10m-0.7%, 20m-0.6%, 40m-0.4%, 50m-0.4% and 60m-0.3%, while the CMJ height improved by 0.3%. The characteristics of the vibration stimulus are reflected in a frequency of 30 Hz, an amplitude of 2.5 mm, and a vibrational acceleration of 2.28g. Statistically significant differences in CG in the study by Sarshin et al. (2010) were not found ($P\geq0.05$, $P\geq0.05$). Melania et al (2010) found no significant change between pre- and post-intervention values of the same group. There were no significant changes in the isometric strength of the knee extensors between the experimental and control groups. Based on statistical significance ($p\geq0.01$) in the Hawkey (2012) study, it can be concluded that no increase in vertical jump was observed in the control group subjects (before 0.43 ± 0.07 m and after 0.41 ± 0.08 m). Neither vibration training with Flexi-bar nor isometric training has been found to have a statistically significant effect on the change in the value of the explosive power of the lower extremities (Zivković et al., 2015). Kim & Park (2016) research plyometric training showed no significant improvement in vertical jump. Although both whole-body vibration and plyometric training are effective methods, they have different effects on improving isokinetic muscle strength, jumping performance, and balance.

CONCLUSION

The application of vibration training results in positive changes in the results of explosive power tests. It can be concluded that the use of a vibration exercise program in subjects is an effective method for improving both explosive power and other motor abilities.

If the appropriate type and intensity of vibration training is applied, there is an increase in explosive power. When it comes to the length of the program, it can be concluded that the minimum frequency where there can be an improvement in the results of explosive power is two to three training sessions per week.

A review of the research conducted in the field of this training shows that the effects of such training methods exist with both active athletes and recreational ath-

sprinta u eksperimentalnoj grupi smanjilo: 10m - 4,3%, 20m - 3%, 40m - 2,2%, 50m - 2,1% i 60m - 2,1%. Visina CMJ-a poboljšana je za 3,3% (takođe statistički značajno). Kontrolna grupa je u toku eksperimentalnog postupka ostvarila statistički neznačajne promene koji se kreću, za brzinu sprinta: 10m - 0,7% 20m - 0,6%, 40m - 0,4%, 50m - 0,4% i 60m - 0,3%, dok je CMJ visina poboljšana za 0,3%. Karakteristike vibracijskog nadražaja se ogledaju u frekvenciji od 30 Hz, amplitudi od 2,5 mm i vibracionoj akceleraciji od 2,28g. Statistički značajne razlike kod CG u istraživanju Sarshin et al. (2010) nije bilo ($P\geq0.05$, $P\geq0.05$). Melania et al (2010) nisu pronašli značajne promene između vrednosti pre - i postinterventnih vrednosti iste grupe. Nije bilo značajnih promena u izometrijskoj snazi ekstenzora kolena između izvođenja eksperimentalne i kontrolne grupe. Na osnovu statističke značajnosti ($p\geq0.01$) u istraživanju Hawkey (2012) može se konstatovati da nije zabeleženo povećanje vertikalnog skoka kod ispitanika kontrolne grupe (pre - 0.43 ± 0.07 m i posle - 0.41 ± 0.08 m). Utvrđeno je da ni vibraciona obuka sa Flexi-barom niti izometrijska obuka, ne pokazuju statistički značajan uticaj na promenu vrednosti eksplozivne snage donjih ekstremiteta (Živković, i sar., 2015). Grupa vežbanja u istraživanju Kim & Park (2016) pliometrijskog treninga nije pokazala značajno poboljšanje u vertikalnom skoku. Iako su i vibracije celog tela i pliometrijski trening efikasne metode, imaju različite efekte na poboljšanje izokinetičke snage mišića, performanse skakanja i ravnoteže kod odbojkašica.

ZAKLJUČAK

Primenom vibracionog treninga dolazi do pozitivnih promena u rezultatima na testovima eksplozivne snage. Može se zaključiti da primena vibracionog programa vežbanja kod ispitanika predstavlja efikasan metod za poboljšanje kako eksplozivne snage, tako i ostalih motoričkih sposobnosti i kod žena i kod muškaraca.

U savremenom sportu koji se razvija iz godine u godinu sve više, nivo fizičke spreme među sportistima se povećava. Ako se primenjuje odgovarajući tip i intenzitet vibracionog treninga, dolazi do povećanja eksplozivne snage. Kada se radi o dužini trajanja programa koji dovodi do poboljšanja eksplozivne snage, na osnovu dosadašnjih studija primetno je u tabeli 1. da su dati programi izvođeni dva do tri puta sedmično u trajanju od četiri sedmice pa do pet meseci.

Pregledom istraživanja koja su sprovedena iz oblasti ovog treninga pokazuju da efekti ovakvih metoda treniranja postoje kako kod aktivnih sportista tako i kod rekreativaca. Rezultati ovog rada mogu koristiti budućim

letes. The results of this work can be utilized by future research to find the most efficient type of vibration training to improve the explosive power that is the dominant motor ability in certain sports (eg as starting acceleration in sprint, athletic high jump, long jump, triple jump...).

istraživanjuma u cilju pronalaženja što efikasnijeg tipa vibracionog treninga, radi poboljšanja eksplozivne snage koja predstavlja dominantnu motoričku sposobnost u određenim sportskim disciplinama (npr. kao startno ubrzanje u sprintu, u atletskim skokovima u vis, u dalj, u troskoku...).

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RELATIONSHIP BETWEEN MOTOR COMPETENCE AND BODY COMPOSITION AMONG CHILDREN AND ADOLESCENTS: A SYSTEMATIC REVIEW

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Abstract: Context and objective: The scientific evidence on the association between motor competence and body composition among children and adolescents. The aim is to review the literature based on the association between motor competence and body composition to answer the question: does body mass index (BMI) has a negative impact on the Körperkoordinations test für Kinder (KTK) performance?

Data Sources and Study Selection: A systematic review from 4 electronic databases (i.e., PubMed, ScienceDirect, SciELO, and Scopus) was used to search for research articles. The study had to include the KTK battery test to evaluate motor competence (MC) and BMI for measuring body composition among children and adolescents written in the English language. A total of 7 research articles were included in the review.

Synthesis Methods and results: Two authors independently extracted the articles. The analyzed studies suggest that motor competence is negatively associated with body composition among children and adolescents. Thus, children with better BMI should have a higher MC score evaluated with the KTK assessment.

Conclusions: The findings suggest that motor competence and body mass index are negatively associated among children and adolescents. Further research should include another type of test for examining motor competence.

Key words: children, adolescents, body mass index, Körperkoordinations test für Kinder.

INTRODUCTION

Sedentary behavior and lifestyle can easily lead to obesity (Doloma, Kambas, Aggeloussis, & Michalopoulou, 2020), which prevalence is increasing (Graf et al., 2004), and it is associated with cardiovascular risk factors (Ander sen, Riddoch, Kriemler, & Hills, 2011). In addition, a lack of physical activity (PA) decreases children's motor competence (MC) levels (Bardid, Rudd, Lenoir, Polman, & Barnett, 2015; Fransen et al., 2014) and has a negative impact on their health (Moreira et al., 2019). Overweight and obese people have a high body mass index (BMI), which is widely used to measure body composition and weight, precisely adiposity (Freedman et al., 2005).

An adequate coordination level is essential for children's general development, health, psychosocial, and well-being reasons (Vandorpe et al., 2011). MC can be described as a complex human movement influenced by physical, psychological, maturational, sociological, and environmental constraints besides an individual's growth and development (Cattuzzo et al., 2016). Moreover, organized sports participation can predict an individual's MC (Eva D'Hondt et al., 2013).

On average, childhood MC is lower than the desired level, which is contrary to the scientific evidence that it is an important determinant of PA and fitness in adulthood (Bardid et al., 2015). Furthermore, children nowadays have a decline in coordination compared to their peers 40 years ago (Barnett et al., 2016; Cattuzzo et al., 2016; Vandorpe et al., 2011).

In the past decade, the interest increased to evaluate the relationship between MC and weight status among children and adolescents (E. D'Hondt et al., 2014). Numerous testing batteries are available for evaluating MC in the population mentioned above. Through this systematic study, MC was evaluated with a reliable, low cost (Moreira et al., 2019), standardized test battery called Körperkoordination Test für Kinder.

KTK test battery is an assessment instrument used in the clinic environment, school practice settings, physical education, sport, health sciences, medicine, and biomechanics. Furthermore, this measurement is appropriate for both

children with typical and atypical development. It can be used for investigation associations, testing the effect of different interventions and treatment, or even diagnostic. (Livonen, Sääkslahti, & Laukkanen, 2016).

The KTK (Kiphard & Schilling, 1974) was created in Germany for measuring whole-body coordination with four subtests: Balancing Backwards (BB), Jumping Sideways (JS), Hopping for Height (HH), and Moving Sideways (MS). Results are presented in raw scores (steps, jumps), which are, in the end, converted into motor quotient (MC). Thus, it allows comparison between different gender, ages, and population's norms. This test is provided with normative values from 6 to 15 years old children.

Several studies used the KTK battery test for measuring MC over four decades (Livonen et al., 2016). Additionally, a few of them included the association between MC and BMI, as shown in Table 1. The purpose of this study is to systematically review the literature on the association between KTK and MC.

METHODS

Study design and eligibility

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) Statement (Liberati et al., 2009) was used to conduct and report this study. In addition, the PICO criteria is addressed for selecting the articles.

Eligibility criteria were used for inclusion or exclusion of the studies first based on the title and abstract, then on their full text. Inclusion criteria were: using the KTK battery test to measure general motor competence; BMI to determine body composition; children and adolescent population; written in the English language; article older than 1974. Articles were excluded if they were systematic review or meta-analysis; did not include KTK or BMI; evaluated another population than children or adolescents; measured another parameter besides motor competence and body composition.

Information source and search strategy

We used four major electronic databases (i.e., PubMed (2004-2020), ScienceDirect (1974-2020), SciELO (2016-2020), and Scopus (2007-2020)) for the systematic literature search.

The search criteria for the published works were from 1974 to 10 September 2020. The search strategy included the following keywords: ("Körperkoordinationstest für Kinder" OR "Körperkoordinationstest" OR "KTK") AND ("body mass index" OR "BMI") AND ("children" OR "adolescents"). Restrictions by the database: 1) Pubmed: Full text, journal article, English, 2004-2020; 2) ScienceDirect: Research articles, 1974-2020; 3) SciELO: Article, English; 4) Scopus: Article, English.

Two reviewers (BB) and (AK) independently did the first (title and abstract) and second (full text) screening process. The disagreement was solved through a discussion and consensus.

RESULTS

Study selection

The selection process identified 89 articles combined from all databases, as shown in Figure 1. After identification, all duplicates (27) were removed with the Endnote program. Furthermore, through screening of the titles and abstracts, 41 articles were excluded. In addition to eligibility criteria across a screening of the left 21 study, based on their full text, 7 articles were finally accepted.

The selected studies are collected in Table 1, including their characteristics: authors, year of publication, sample characteristics (number, gender, age), the measurement for motor competence and body composition, and the general findings of the study.

DISCUSSION

The paper aimed to review the literature based on the relationship between MC using KTK test battery (Kiphard & Schilling, 1974) and body composition evaluated through BMI. The analyzed articles suggest that MC inversely associated with body composition among children and adolescents (Antunes et al., 2015; E. D'Hondt et al., 2014; Doloma et al., 2020; V. P. Lopes, Malina, Maia, & Rodrigues, 2018; Vítor P. Lopes, Stodden, Bianchi, Maia, & Rodrigues, 2012; V. P. Lopes, Stodden, & Rodrigues, 2014).

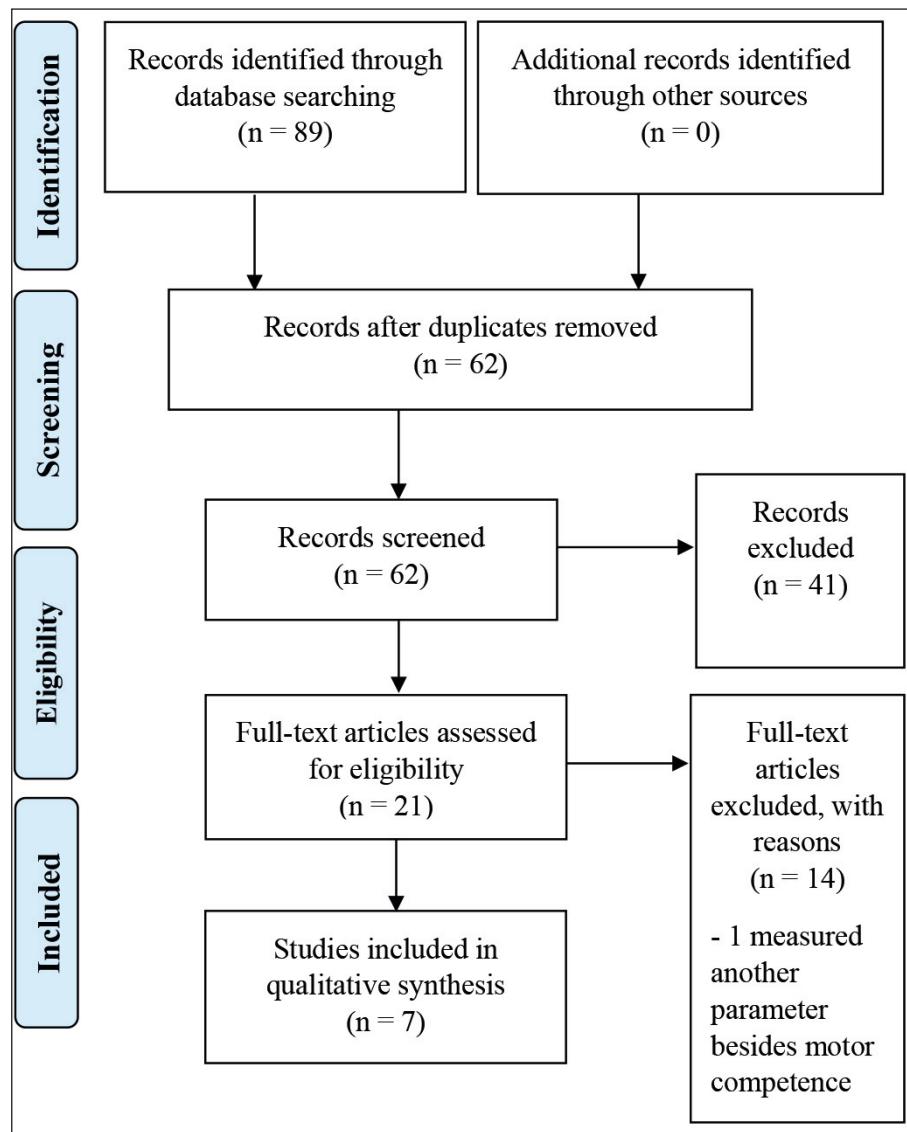


Figure 1. Data collection process with Flow Diagram

As shown in Table 1., the seven included research articles in the systematic review were published between 2012 and 2020 years. According to these studies' context and purpose, the sample sizes varied in the range of 27 and 7175.

KTK test battery has been shown as a great tool for evaluating motor coordination for the whole spectrum of children aged between 6-15 years (Vandorpe et al., 2011). Furthermore, the level of gross motor coordination was strongly related over time to children's weight status (Eva D'Hondt et al., 2013).

In most studies, obesity, such as being overweight, is a limitation for motor tests (Antunes et al., 2015; Doloma et al., 2020). It can explain that overweight and obese children have lower MC scores on KTK in contrast to their normal-weight or thin peers. Those results suggest an inverse association between body weight status and MC level (Fransen et al., 2014), which explains that decreasing MC usually resulted in increased BMI in children (V. P. Lopes et al., 2018).

It is interesting to note that besides BMI, gender differences can also affect the prediction of children's motor coordination (Doloma et al., 2020). In addition, differences in age, culture, socioeconomic status, physical education, and active transport might have the power to enhance the low level of MC (Barnett et al., 2016; Fransen et al., 2014).

As expected, overweight and obesity status is associated with lower gross motor development and endurance performance. However, an active lifestyle is positively correlated with gross motor development in first-grade children (Graf et al., 2004). In addition, MC across childhood and adolescence positively impacts on cardiorespiratory and musculoskeletal fitness (Fransen et al., 2014) in both genders.

Table 1. An overview of the basic's characteristics from the selected articles

Title of the study	Authors	Year of publication	Sample characteristics	Measure of motor competence	Measure of body composition	Main results
Correlation between BMI and motor coordination in children	Vítor P. Lopes, David F. Stodden, Mafalda M. Bianchi, Jose A.R. Maia, and Luis P. Rodrigues	2012	Data were collected from 7175 children: boys N=3616 and, girls N=3559, aged 6–14 years.	KTK	BMI	MC has an inverse relationship with BMI. The strength of this negative relationship increased through childhood, but on the contrary, decreased during early adolescence. Overweight and obese children demonstrated significantly lower MC compared to normal-weight peers.
Body mass index and motor coordination: Non-linear relations in children 6–10 years	V. P. Lopes, R. M. Malina, J. A. R. Maia, and L. P. Rodrigues	2018	Number of respondents was 3738. Of these, 1912 boys, and 1826 girls, aged from 6 to 10 years.	KTK	BMI	The general conclusion is that decrease in MC lead to an increase in BMI. Moreover, on average, children with normal weight had a higher MQ in both genders than overweight and obese peers. The highest MQ results were also detected in normal-weight children, with a few exceptions.
Gross Motor Coordination and Weight Status of Portuguese Children Aged 6–14 Years	António M. Antunes, José A. Maia, Mikis D. Stasinopoulos, Élio R. Gouveia, Martine A. Thomis, Johan A. Lefevre, Alexandra Q. Teixeira, and Duarte L. Freitas	2015	The total number of the participants was 1276 in the study. Of this sample: 619 boys and 657 girls participated, aged between 6 and 14 years.	KTK	BMI	Normal-weight boys and girls scored better compared to their obese peers. Moreover, overweight children performed better than obese individuals. In conclusion, being overweight or obese was a major limitation in MC tests, and for their health and performance-related physical fitness.
A Longitudinal Study for the Relationship between Motor Coordination and Body Mass Index in Primary School Children	Dimitra Doloma, Antonios Kambas, Nikolaos Aggeloussis, and Maria Michalopoulou	2020	The total number of the sample was 42. The study included 20 boys and 22 girls, aged from 5 to 14 years.	KTK	BMI	They examined the correlation between BMI and KTK. Increases in BMI were correlated with decreases in a rating of the KTK results, and every year there was a statistically significant interaction between MC and BMI. Furthermore, a sedentary lifestyle and physical inactivity lead to weight gain and deficit in MC.

Relationship between body mass index and gross motor skill in four to six-year-old children	Fabrizio Zandonadi Catenassi, Inara Marques, Carina Barbiero Bastos, Luciano Basso, Enio Ricardo Vaz Ronque, and Aline Mendes Gerage	2007	In this study, 27 children participated. Precisely, 16 boys and 11 girls. Their mean age was 5.64 ± 0.67 years.	KTK	BMI	This work concluded that even children with low BMI could perform adequately or even better rough motor tasks. So, tasks involving gross motor skills did not relate to BMI. Besides, there was no significant interaction when the gender distinction was taken into consideration.
Weight status is associated with cross-sectional trajectories of motor coordination across childhood	V. P. Lopes, D. F. Stodden, and L. P. Rodrigues	2014	The total number of respondents was 6625. Of these, 3344 were boys, and 3281 were girls, aged from 6 to 11 years.	KTK	BMI	Interpreting the results, children with higher MC results demonstrated lower BMI values. In addition, children with low MC levels have a higher risk of being overweight or obese. It is important to note that that risk is dramatically increasing with age in both boys and girls.
A Longitudinal Study of Gross Motor Coordination and Weight Status in Children	Eva D'Hondt, Benedicte Deforche, Ilse Gentier, Joke Verstuyf, Roel Vaeyens, Ilse De Bourdeaudhuij, Renaat Philippaerts, and Matthieu Lenoir	2014	The research was conducted on 2517 children (5-13 years, 52.8% of boys, and 47.2 % girls).	KTK	BMI	This study suggests that children's weight status negatively influences the future level of gross MC. Analyzing the results, lower performance at the baseline on the KTK predicted an increase in BMI scores and, a high baseline in BMI values predicted a decrease in the evaluating MC through the KTK battery test.

Legend: KTK Körperkoordinations Test, BMI body mass index

Children with low levels of MC have a higher risk (which is increasing with age) of being overweight or obese (V. P. Lopes et al., 2014). Moreover, children's weight status negatively influences the future level of gross motor coordination (E. D'Hondt et al., 2014).

Surprisingly, only one research article reported contrary findings for the relationship between weight status and MC. They discovered an equally (it was not detected significant differences) performance on motor tasks between normal-weight and overweight or obese children. Also, the gender distinction does not have a role in distinguishing children based on their motor performance (Catenassi et al., 2007).

Special attention is required for overweight and obese children to promote regular participation in PA (Eva D'Hondt et al., 2013; Graf et al., 2004). Accordingly, the key to improving motor coordination could be participation in organized physical activities (Doloma et al., 2020), sport, or even just to be active throughout the day and reach the daily recommended limit of PA.

CONCLUSION AND LIMITATIONS

The findings suggest that MC and BMI are negatively associated among children and adolescents, which means that an increased BMI usually results in lower performance on the KTK test battery.

It is important to mention that our findings, based on the used literature, do not defend the stereotype of obese or overweight children as not skilled. Thus, they can do various motor tasks, but on average, with a lower result. Further research should include another type of test for examining motor competence.

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OPPORTUNITIES FOR IMPROVING ADULT EDUCATION IN THE REPUBLIC OF SRPSKA

MOGUĆNOSTI ZA POBOLJŠANJE OBRAZOVANJA ODRASLIH U REPUBLICI SRPSKOJ

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Abstract: Continuing education of adults is becoming a condition for the survival and development of modern states. With development of science and technology, formal education, regardless of the level of the development achieved, becomes insufficient to follow modern social and technological trend. In this context, there is a need to acquire new knowledge that would involve all participants in civil life on the path to successful accomplishment of their life missions. Acquiring and use of knowledge in adulthood improves human relations, raises economic growth, encourages employment, raises the quality of the environment, protects and promotes health, raises personal self-confidence, etc. These are the basic reason why modern democratic societies have agreed on the key goals and principles of adult education, as well as the role of education in individual and social development. Lifelong learning must be the guiding principle of education, as well as the foundation for the development of the individuals, social connections and employment. Adult education includes retraining, additional training, vocational training and other activities related to lifelong learning. Access to this education is not limited regardless of age. The realization of successful education requires the participation and responsibility of all partners: adults involved in education, parents, teachers, employers, unions, public institutions, charities and others. This work explores the goals and principles of the development of adult education, and the possibilities of its improvement in the Republic of Srpska as well as the limitations in the realization of the set educational goals. The work aims to point out the gap between offer and needs in labor market, on which future capacities in adult education should be based.

Keywords: adult education, improving adult education, principles, limitations and opportunities.

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Sažetak: Stalno obrazovanje odraslih postaje uslov opstanka i razvoja modernih država. Sa razvojem nauke i tehnologije formalno obrazovanje, bez obzira na doстигнути stepen razvoja, postaje nedovoljno za praćenje savremenih društvenih i tehnoloških trendova. U tom kontekstu se stvaraju potrebe za sticanjem novih znanja u koje bi se uključili svi akteri građanskog života na putu uspješnog izvršavanja svojih životnih misija. Sticanje i korištenje znanja u odrasлом dobu unapređuje ljudske odnose, podiže ekonomski rast, potiče zapošljavanje, podiže kvalitet životne sredine, štiti i unapređuje zdravlje, podiže samopouzdanje ličnosti, itd. To su i osnovni razlozi zbog kojih su savremena demokratska društva postigla saglasnost oko ključnih ciljeva i principa obrazovanja odraslih, kao i uloge obrazovanja u individualnom i društvenom razvoju. Celoživotno učenje mora biti vodeći princip obrazovanja, kao i temelj za razvoj pojedinaca, društvene povezanosti i zapošljavanja. Obrazovanje odraslih obuhvata prekvalifikacije, dokvalifikacije, profesionalnu obuku i ostale aktivnosti koje su vezane za doživotno učenje. Pristup ovom obrazovanju nije ograničen bez obzira na godine života.

Za realizaciju uspješnog doživotnog obrazovanja potrebno je učešće i odgovornost svih partnera: odraslih koji su uključeni u obrazovanje: roditelja, nastavnika, poslodavaca, sindikata, javnih institucija, dobrotvornih organizacija i dr.

Ovaj rad istražuje ciljeve i principe razvoja obrazovanja odraslih, te mogućnosti njegovog poboljšanja u Republici Srpskoj, kao i ograničenja u realizaciji postavljenih obrazovnih ciljeva. Radom se želi ukazati na raskorak između ponude i potreba na tržištu rada, na čemu bi se trebali temeljiti budući kapaciteti u obrazovanju odraslih.

Ključne reči: obrazovanje odraslih, poboljšanje obrazovanja odraslih, principi, ograničenja i mogućnosti.

INTRODUCTION

Today, adult education has become one of the priorities, of developed countries as well as those countries that strive for it. "Adult education, which is now a social and individual need, is considered one of the key factors of economic prosperity, technical progress of each country, but at the same time is the basis for the efficient functioning of civil society and the personal development of each individual" (Harmonization policy adult education in Bosnia and Herzegovina, 2018; str 7).

In the 1960s, an adult education system was developed on the territory of the former Yugoslavia through primary schools for adults, workers' universities, and evening secondary and higher schools. After education reform, during the 1970s, adult education was destroyed, and the education alinstitutions, that implemented it, were pushed to the margins. Today, adult education is being realized through a network mostly modern institutions, but in the traditional way. Since knowladge becomes an important lever of country development, it is necessary to align the development of adult education with the world quality criteria.

Today, adult education operates within the education system of Republic of Srpska, with a focus on specialization, learning and training adults. Modern strategies in education are based on the principle of lifelong learning, since existing knowledge is obsolete and they are not adequate for the development of the individual and society. Strategies of the development of education in Republic of Srpska must be aligned with the national strategies, as well as EU strategies.

Adult education in Republic of Srpska has not been the subject of serious research, so the infrastructure was created according to possibilities. This paper should contribute to the realization of the possibilities of improving the existing system of adult education in the Republic of Srpska, based on the processing of publicly published data on employed persons and job seekers.

THEORETICAL CONSIDERATIONS OF ADULT EDUCATION

The term adult education has been treated different by individual authors. We will list some of the basic definitions, which are the most commonly cited. According to UNESCO, adult education means "a set of organized educational processes of all content, levels and methods (formal and other) whether adults continue or replace started education or apprenticeships, whether an adult develops his abilities, expands his knowledge, improves his technical or professional qualifications or redirects them,

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Danas je obrazovanje odraslih postalo jedan od prioriteta, i razvijenih zemalja, i zemalja koje teže ka tom putu. Obrazovanje odraslih, koje je danas društvena i individualna potreba, smatra se jednim od ključnih faktora ekonomskog prosperiteta, tehničkog napretka svake zemlje, ali u isto vrijeme predstavlja osnov za efikasno funkcionisanje građanskog društva i ličnog razvoja svakog pojednica (Harminizacija politika obrazovanja odraslih u BiH, 2018; str 7).

Šezdesetih godina prošlog vijeka na prostorima tadašnje Jugoslavije bio je razvijen sistem obrazovanja odraslih putem osnovnih škola za odrasle, radničkih univerziteta, te večernjih srednjih i viših škola. Poslije izvršene reforme školstva, tokom 70-tih godina, uništeno je obrazovanja odraslih, a obrazovne institucije, koje su ga provodile, potisnute su na marginu. Danas se obrazovanje odraslih realizuje kroz mrežu, uglavnom savremenijih ustanova, ali na tradicionalnoj osnovi. S obzirom da znanje postaje važna poluga razvoja zemlje, neophodno je razvoj obrazovanja odraslih uskladiti sa svjetskim kriterijima kvaliteta.

Obrazovanje odraslih danas djeluje u okvirima obrazovnog sistema Republike Srpske, s fokusom na usavršavanje, učenje i ospozobljavanje odraslih osoba. Savremene strategije u obrazovanju se baziraju na principu doživotnog učenja, s obzirom da postojeća znanja zastarijevaju i nisu adekvatna za razvoj pojedinca i društva. Strategije razvoja obrazovanja Srpske moraju biti usklađene sa nacionalnim strategijama, kao i strategijama EU.

Obrazovanje odraslih u Republici Srpskoj nije bilo predmet ozbiljnijih istraživanja, tako da je infrastruktura stvarana prema mogućnostima. Ovaj rad bi trebao dati doprinos spoznaji mogućnosti usavršavanja postojećeg sistema obrazovanja odraslih u Republici Srpskoj, na temelju obrade javno objavljenih podataka o zaposlenim licima i licima koja traže posao.

TEORIJSKA RAZMATRANJA OBRAZOVANJA ODRASLIH

Pojam obrazovanje odraslih različito je tretiran od pojedinih autora. Navećemo neke od osnovnih definicija, koje su i najčeće citirane. Tako, prema UNESCO-u obrazovanje odraslih označava "skup organiziranih edukacijskih procesa svih sadržaja, razina i metoda (formalnih i drugih) bez obzira da li odrasli nastavljaju ili zamjenjuju započeto školovanje ili naukovanje, bez obzira razvija li odrasla osoba svoje sposobnosti, proširuje svoje znanje, poboljšava svoje tehničke ili stručne kvalifikacije ili ih preusmjerava te dovodi do promjene svojih stavova

and leads to a change in his attitudes or behaviors both in the perspective of full personal development and in the perspective of participation in balanced and independent social, economic and cultural development”(Pastuović, 200; str 88-89). A similar definition was given by Prof. Petričević, who defines adult education as a “scientifically based, lifelong, organized and flexible educational and educational activity which is aimed at meeting the personal educational needs of adults, as well as the educational needs of company's, local communities, religious communities, political parties, trade unions and other factors. This understanding of the concept of adult education is actually a type of service that is the subject of business of adult education institutions, various companies, adult recreation centers, non-governmental organizations, etc. (Petričević, 2011).

Adult education is often associated with terms such as “continuing education, permanent education, permanent education, lifelong education, return education and lifelong education and lifelong learning”(Vekić, 2015; str 5), although essentially all terms speak of the need for further education after completing formal education.

Prof. Alibabić, adult education is considered as “an organized activity through which adults acquire and improve their knowledge, skills and abilities in different fields or areas, at different levels and through various forms and methods, contributing to their own development and development of society as a whole.” (Alibabić, 2002; str 80) .

These definitions suggest that adult education is a lifelong process, which “covers a formal, non-formal and informal form of education and attempts to integrate and articulate all the structures and stages of education along the vertical and horizontal dimensions. It is also characterized by its flexibility in terms of time, space, content, way of learning and therefore requires self-governing learning, sharing one's enlightenment with others and embracing different styles and strategies of learning” (Dave according to Pastuović, 2008; str 254).

The European Commission in its study “Adult Education and Training in Europe: Widening Access to Learning Opportunities,” pointed out that “there are a number of programmes that provide education in basic skills, but not in a clear way. In particular, there are ‘preparatory’ programs designed to improve students' motivation for learning as well as provide education in the skills needed to be included in the formal qualification program, programs that take place in the workplace and those that fall within the framework of active labour market policies, programs held under liberal (or

ili ponašanja i u perspektivi potpunog osobnog razvijanja i u perspektivi sudjelovanja u uravnoteženom i nezavisnom socijalnom, gospodarskom i kulturnom razvoju” (Pastuović, 2001; str 88 - 89). Sličnu definiciju je dao i prof. Petričević, koji obrazovanje odraslih definje i kao “znanstveno utemeljenu, doživotnu, organiziranu i fleksibilnu obrazovno - odgojnu djelatnost koja je usmjerena na zadovoljavanje osobnih obrazovnih potreba odraslih osoba, kao i obrazovnih potreba poduzeća, lokalne zajednice, vjerskih zajednica, političkih stranaka, sindikata i drugih čimbenika. Ovakvo shvaćanje pojma obrazovanja odraslih zapravo je vrsta usluge koja je predmet poslovanja ustanova za obrazovanje odraslih, raznih poduzeća, centara za rekreaciju odraslih, nevladinih udruženja, itd. (Petričević, 2011).

Obrazovanje odraslih se često povezuje sa terminima poput: “kontinuirano obrazovanje, trajno obrazovanje, permanentno obrazovanje, doživotno obrazovanje, povratno obrazovanje te cjeloživotno obrazovanje i cjeloživotno učenje” (Vekić, 2015; str 5), mada u suštini svi termini govore o potrebi daljnog obrazovanja poslije završenog formalnog obrazovanja.

Prof. Alibabić, obrazovanje odraslih smatra kao “organizovanu aktivnost putem koje odrasli stiču i usavršavaju svoja znanja, umjenja i sposobnosti u različitim oblastima ili područjima, na različitim nivoima i putem raznovrsnih oblika i metoda, čime doprinose sopstvenom razvoju i razvoju društva u celini.” (Alibabić, 2002; str 80).

Navedene definicije upućuju da je obrazovanje odraslih cjeloživotni proces, koji “pokriva formalni, neformalni i informalni oblik obrazovanja i pokušava integrirati i artikulirati sve strukture i faze obrazovanja duž vertikalne i horizontalne dimenzije. Ono je također karakteristično po svojoj fleksibilnosti što se tiče vremena, prostora, sadržaja, načina učenja i stoga zahtijeva samoupravljivo učenje, dijeleći nečije prosvjetljenje s drugima i prihvatajući različite stilove i strategije učenja” (Dave prema Pastuović, 2008; str 254).

Evropska komisija je u svojoj studiji “Obrazovanje i osposobljavanje odraslih u Europi: Proširenje pristupa mogućnostima učenja” istakla da “postoji čitav niz programa koji pružaju obrazovanje u osnovnim vještinama, ali ne na jasan način. Osobito, postoje ‘pripremni’ programi namijenjeni poboljšanju motivacije polaznika za učenje kao i pružanju obrazovanja iz vještina potrebnih za uključivanje u formalni program za stjecanje kvalifikacije, programi koji se odvijaju na radnom mjestu te oni koji spadaju u okvir aktivnih politika tržišta rada, programi koji se održavaju u okviru liberalnog (ili popularnog)

popular) adult education and, finally, programs that are on the border between non-formal and informal learning, such as family literacy programmes. (Eurydice report, 2015).

Regardless of the different approach in defining the term, importance and programme for adult education, most authors will agree with its positive effects, which are primarily reflected in raising the quality of adult education, having a positive impact on society's economic and social development, better connecting the education system to the job market, creating new jobs at all levels, opportunities for inclusion in international projects, and the use of their resources, etc.

In addition to positive effects, adult education encounters certain disadvantages, such as quality of education, availability, content, openness of institutions and efficiency. When it comes to Bosnia and Herzegovina, and within it the, Republic of Srpska, the following shortcomings (weaknesses) in adult education stand out:

- “underdevelopment of non-formal and inflexibility of the formal adult education system,
- insufficient orientation of educational content on the development of key competences of the workforce,
- low educational level of unemployed persons,
- low level of management knowledge, skills and competences and their obsolescence among employees,
- insufficient connection and harmonization of institutions and individuals in the adult education system,
- lack of a network of specialised institutions for adult education,
- misfits of adult education to the demands of the job market and the economy as a whole,
- vaguely expressed needs of the economy for certain educational profiles,
- lack of special laws on adult education in Federation of Bosnia and Herzegovina and Brčko district Bosnia and Herzegovina,
- lack of standards for adult education,
- lack of adult education strategies,
- low level of technical equipment of adult education institutions,
- lack of textbooks for adult education,
- non-existence of a framework for recognition of prior learning
- insufficient qualification of professional staff for educational work with adults” (Strategic Platform, 2013; str 17-18).

The basic goals of adult education are intertwined and relate to four key areas: “personal fulfilment, active citizenship, social inclusion (cohesion) and employment

obrazovanja odraslih te, na kraju, programa koji se nalaze na granici između neformalnog i informalnog učenja, kao što su programi obiteljske pismenosti” (Izvješće Eurydicea, 2015; str 9).

Bez obzira na različit pristup u definisanju pojma, značaja i programa za obrazovanja odraslih, većina autora će se složiti sa njegovim pozitivnim efektima koji se, prije svega, ogledaju u podizanju kvaliteta obrazovanja odraslih, pozitivnom uticaju na privredno-socijalni razvoj društva, kvalitetnijem povezivanju obrazovnog sistema sa tržištem rada, stvaranju novih radnih mesta na svim nivoima, mogućnostima uključivanja u međunarodne projekte, kao i korištenje njihovih sredstava, itd.

Pored pozitivnih efekata, obrazovanje odraslih, se susreće sa određenim nedostacima, kao što su kvalitet obrazovanja, dostupnost, sadržaj, otvorenost institucija i učinkovitost. Kada je u pitanju Bosna i Hercegovina, a u njenom sklopu i Republika Srpska, ističu se sljedeći nedostaci (slabosti) u obrazovanju odraslih:

- “nerazvijenost neformalnog i nefleksibilnost formalnog sustava obrazovanja odraslih,
- nedovoljna orijentiranost obrazovnih sadržaja na razvoj ključnih kompetencija radne snage,
- niska obrazovna razina nezaposlenih osoba,
- nizak stupanj upravljačkih znanja, vještina i kompetencija i njihova zastarjelost kod zaposlenih,
- nedovoljna uvezanost i usuglašenost institucija i pojedinaca u sustavu obrazovanja odraslih,
- nedostatak mreže specijaliziranih institucija/ustanova za obrazovanje odraslih,
- neprilagođenost obrazovanja odraslih zatjevima tržišta rada i gospodarstva u cijelini,
- nejasno iskazane potrebe gospodarstva za određenim obrazovnim profilima,
- nedostatak posebnih zakona o obrazovanju odraslih u Federaciji Bosne i Hercegovine i Brčko distriktu Bosne i Hercegovine,
- nedostatak standarda za obrazovanje odraslih,
- nedostatak strategija obrazovanja odraslih,
- niska razina tehničke opremljenosti institucija / ustanova za obrazovanje odraslih,
- nedostatak udžbenika za obrazovanje odraslih,
- ne postojanje okvir za priznavanje prethodnog učenje
- nedovoljna sposobljenost stručnog kadra za obrazovni rad s odraslima (Strateška platforma, 2013).

Osnovni ciljevi obrazovanja odraslih se međusobno prožimaju, a odnose se na četiri ključna podučja: “osobno ispunjenje, aktivno građanstvo, socijalna uključenost (kohezija) i sposobnost zapošljavanja (prilagodljivost)”

capacity (adaptability)" (Strategic Platform, 2013; str 4). Lifelong learning is key to training the workforce to the requirements and needs of the job market. It is also an important prerequisite for reducing inequality, especially for marginalized individuals groups.

METHODOLOGICAL FRAMEWORK

This paper discusses the regulatory framework in the field of adult education, the situation and trends in the field of adult education in Republic of Srpska, as well as the possibilities and limitations in the realization of the set educational goals. The paper aims to point out the essence and dynamics of changes in the structure of employed persons and persons seeking employment in Republic of Srpska, by age and by the degree of professional qualification, in a ten-year period, and on that basis on that to determinate conclusions and give recommendations for improving adult education in Republic of Srpska. In addition to theoretical part, which deals with defining the concept of adult education, current models of education, and the advantages and disadvantages of this type of education, the analytical part deals with the research of the capacity, condition and need for adult education in Republic of Srpska, based on secondary data published by the Republic Bureau of Statistics as part of the Statistical Yearbook, and the Institute for Adult Education of Republic of Srpska. That is also the goal of this research, since that studies on this issue are quite rare. The basic hypothesis of this work: Recognize opportunities for improving adult education in Republic of Srpska.

The final part of this paper is dedicated to the interpretation of the obtained results, with the aim of determining measures that would contribute to improving the quality and efficiency of the adult education in Republic of Srpska.

REGULATORY FRAMEWORK FOR ADULT LEARNING

The strategy for the development of adult education in the EU was initially defined by the European Commission in the document "Building a European area of Lifelong Learning" and all other documents are linked to this source.

Learning and education of adults in Bosnia and Herzegovina is regulated by *The Framework Law on Primary and Secondary Education* (2003), *The Framework Law on Secondary Vocational Education and Training* (2008), and *The Framework Law on Higher Education* (2007). Adult education was also treated in the document - The Strategy for Development of Vocational Education and Training in Bosnia and Herzegovina for the period 2007. - 2013. In 2013.

(Strateška platforma, 2013; str 4). Cjeloživotno učenje je ključno za osposobljavanje radne snage prema zahtjevima i potrebama tržista radne snage. Ono je ujedno i bitan preuslov za smanjenje nejednakosti, posebno kod marginalizovanih pojedinaca ili grupa.

METODOLOŠKI OKVIR

Ovaj rad razmatra regulatorni okvir u oblasti obrazovanja odraslih, stanje i trendove u oblasti obrazovanja odraslih u Republici Srpskoj, kao i mogućnosti i ograničenja u realizaciji postavljenih obrazovnih ciljeva. Radom se želi ukazati na suštinu i dinamiku promjena u strukturi zaposlenih lica i lica koja traže zaposlenje u Republici Srpskoj, kako po starosnoj dobi, tako i po stepenu stručne spreme, u desetogodišnjem periodu, te na osnovu toga utvrditi zaključke i dati preporuke za poboljšanje obrazovanja odraslih u Republici Srpskoj. Pored teorijskog dijela, koji se bavi definisanjem pojma obrazovanja odraslih, aktuelnim modelima obrazovanja, te prednostima i nedostacima ovog vida obrazovanja, analitički dio se bavi istraživanjem kapaciteta, stanja i potrebe za obrazovanjem odraslih u Republici Srpskoj, na osnovu sekundarnih podataka koji je objavio Republički zavod za statistiku u sklopu Statističkog godišnjaka, te Zavod za obrazovanje odraslih Republike Srpske. To je ujedno i cilj ovog istraživanja, s obzirom da su dosta rijetke studije o ovoj problematiki. Osnovna hipoteza ovog rada glasi: Spoznati mogućnosti za poboljšanje obrazovanja odraslih u Republici Srpskoj.

Završni dio rada je posvećen interpretaciji dobijenih rezultata, s ciljem utvrđivanja mera koje bi doprinijele poboljšanju kvaliteta i učinkovitosti sistema obrazovanja odraslih u Republici Srpskoj.

REGULATORNI OKVIR ZA OBRAZOVANJE ODRASLIH

Strategija razvoja obrazovanja odraslih u EU- i je početno definisana od strane Evropske komisije u dokumentu „Izgradnja evropskog prostora doživotnog učenja“, a svi drugi dokumenti se vezuju za ovaj izvor.

Učenje i obrazovanje odraslih u Bosni i Hercegovini je regulisano *Okvirnim zakonom o osnovnom i srednjem obrazovanju* (2003), *Okvirnim zakonom o srednjem strukovnom obrazovanju i obuci* (2008), te *Okvirnim zakonom o visokom obrazovanju* (2007). Obrazovanje odraslih je tretirano i u dokumentu- Strategije razvoja stručnog obrazovanja i obuke u Bosni i Hercegovini za period 2007. - 2013. god.

Od strane Vijeća Ministara Bosne i Hercegovine usvojena je, 2014. godine, *Strateška platforma ra-*

In 2004, the Council of Ministers of Bosnia and Herzegovina adopted *the Strategic Platform for the Development of Adult Education in the context of lifelong learning in Bosnia and Herzegovina for the period 2014-2020*, according to which adult education will be realized within the adopted framework laws in the field of education, which, among other things, regulate adult education, and the Law on the Agency for Preschool, Primary and Secondary Education.

Adult education in RS is regulated by the Law on Adult Education (from 2009.), and bylaws that are in line with a Principles and standards in the field of adult education at the level of Bosnia and Herzegovina, as well as current laws in Bosnia and Herzegovina. Umbrella institutions have also formed, such as the Institute of Education and The Educational Pedagogical Institute. At the same time, the importance of interdepartmental activities of the competent ministries, and above all, the Ministry of Family, Youth and Sports, the Ministry for Scientific and Technological Development, Higher Education and Information Society and other ministries headed by the Ministry of Education and Culture was emphasized. This Minstitute, together with the Educational and Pedagogical Institute, is responsible for deciding on budgets, programs, textbooks, teaching materials, control of standards and number of teachers, in order to implement a centralized curriculum.

The Law on Adult Education Republic of Srpska defines the structure, organization and manner of managing the adult education system. The most important provisions of the Law are:

- “adults are persons over the age of 15 who have not completed primary education, i.e. persons over the age of 18 who have completed primary education in regular education and other persons who are being educated without having the status of a pupil or student”(Article 5, paragraph 1, period a.),
- adult education can take place in a formal, non-formal and informal way. Formal education is provided in institutionalized and publicly verified forms of education.

Through non-formal education, adults are trained for work, personal development and a social activities.

Informal education refers to continuous self-education, acquistion of skills and knowledge and training other with out institutions.

- Adult education can be performed within primary, secondary and higher schools, universities, special institutions and organizations for adult education (e.g. public universities, driving schools, foreign language schools, etc.).
- the right to establish adult education institutions

zvoja obrazovanja odraslih u kontekstu cjeloživotnog učenja u BiH za razdoblje (2014.-2020.), po kojem će se obrazovanje odraslih realizovati u sklopu usvojenih okvirnih zakona iz oblasti obrazovanja, koji između ostalog regulišu i obrazovanju odraslih, i Zakona o Agenciji za predškolsko, osnovno i srednje obrazovanje.

Obrazovanje odraslih u Republici Srpskoj je uređeno Zakonom o obrazovanju odraslih (iz 2009. godine), i podzakonskim aktima koji su usklađeni sa Principima i standardima u oblasti obrazovanja odraslih na nivou Bosne i Hercegovine, kao i važećim zakonima u Bosni i Hercegovini. Formirane su i krovne institucije, poput Zavoda za obrazovanje odraslih i Prosvjetno pedagoškog zavoda. Istovremeno, naglašen je značaj međuresornog djelovanja nadležnih ministarstava, a prije svega, Ministarstva porodice, omladine i sporta, Ministarstvo za naučnotehnološki razvoj, visoko obrazovanje i informaciono društvo i drugih ministarstava na čelu sa Ministarstvom prosvjete i kulture. Ovo Ministarstvo je, zajedno sa Prosvjetno - pedagoškim zavodom, nadležno za odlučivanje o budžetu, programima, udžbenicima, nastavnom materijalu, kontroli standarda i broja nastavnika, a u cilju implementacije centraliziranog kurikuluma.

S Zakonom o obrazovanju odraslih Republike Srpske (<http://www.mpoo.org>) je definisana struktura, organizacija i način upravljanja sistemom obrazovanja odraslih. Najvažnije odredbe Zakona su:

- “odrasli su lica starija od 15 godina koja nisu završila osnovno obrazovanje, odnosno lica starija od 18 godina koja su završila osnovno obrazovanje u redovnom školovanju i druga lica koja se obrazuju, a da pri tom nemaju status učenika ili studenta” (član 5, stav 1, tačka a.),
- obrazovanje odraslih osoba se može odvijati na formalan, neformalan i informalan način. Formalno obrazovane se vrši u institucionalizovanim i javno verifikovanim oblicima obrazovanja.

Kroz neformalno obrazovanje se vrši osposobljavanje odraslih za rad, lični razvoj i aktivnosti socijalne prirode.

Informalno obrazovanje se odnosi na kontinirano samobrazovanje, sticanje vještina i znanja i usavršavanje mimo institucija.

- obrazovanje odraslih se može izvoditi u okviru osnovnih, srednjih i visokih škola, univerziteta, specijalovanih ustanova i organizacija za obrazovanje odraslih (npr. narodni univerziteti, auto-škole, škole stranih jezika i sl.).
- pravo za osnivanje ustanova za obrazovanje

have the Republic, local self-government units, as well as other legal and physical persons.

Universities and colleges must be involved in the life-long learning program through the offer of current programs that will attract experts with experience. The practice is increasingly looking for highly educated adults, who want to advance in the profession, change their profession or train personality. Certain professions are “dying out” in the job market, and at the same time new ones are appearing. Accordingly, instead of occupations, certain knowledge and skills are increasingly required, and employees are constantly required to innovate their knowledge. In recent years, the licensing of new knowledge and skills has been updated, which is becoming a condition for permanent employment.

ANALYSIS OF CAPACITIY AND NEEDS FOR ADULT EDUCATION IN REPUBLIC OF SRPSKA

There are currently 76 adult education organisers in Republic of Srpska (Table 1st).

Table 1. State of Adult Education Organisers in Republic of Srpska, in 2020

Serial number / Red. br.	Town / Grad	Number of adult education organizations / Broj organizatora obraz.odraslih
1	Banjaluka	18
2	Bileća	1
3	Bijeljina	10
4	Bratunac	1
5	Brod	1
6	Vojkovići	1
7	Vukosavlje	1
8	Gacko	1
9	Gradiška	4
10	Pond	1
11	Teslić	3
12	Trebinje	3
13	Foča	2

Source: Official Website “Institute for Adult Education Republic of Srpska” http://www.mpoo.org/?page_id=268

It is important to point out that the mentioned organisers accredited a larger number of programmes, so that 14 organisers from Banja Luka accredited 109 programmes. In the area of Bijeljina, the number of accredited programs is 71, Prijedor 54, Dobojski 21, Trebinja 12, etc.

odraslih ima Republika, jedinica lokalne samouprave, kao i druga pravna i fizička lica.

U program doživotnog učenja se moraju uključiti, i univerziteti, i visoke škole, kroz ponudu aktuelnih programa koji će privući stručnjake iz prakse. Praksa sve više traži visokoobrazovane odrasle osobe, koji žele napredovati u struci, promjeniti struku ili lično se osposobiti. Određene struke „odumiru“ na tržištu rada, a istovremeno se pojavljuju nove. Shodno tome, umjesto zanimanja sve više se traže određena znanja i vještine, a od zaposlenih se traži stalno inoviranje znanja. Zadnjih godina je aktuelizirano licenciranje novih znanja i vještina, koje postaje uslov za trajno zaposlenje.

ANALIZA KAPACITETA I POTREBA ZA OBRAZOVANJE ODRASLIH U REPUBLICI SRPSKOJ

U Republici Srpskoj trenutno djeluje 76 organizatora za obrazovanje odraslih (Tabela 1.).

Tabela 1. Stanje organizatora za obrazovanje odraslih u Republici Srpskoj, u 2020. godini

Serial number / Red. br.	Town / Grad	Number of adult education organizations / Broj organizatora obraz.odraslih
14	Čelinac,	1
15	Derventa	3
16	Doboj	7
17	Zvornik	2
18	East Sarajevo	3
19	Kozarska Dubica	1
20	Kotor Varoš	1
21	Laktaši	1
22	Milići,	2
23	Mrkonjić Grad	1
24	Novi Grad	1
25	Pale	1
26	Prijedor	5

Izvor: Zvanična internet stranica JU “Zavod za obrazovanje odraslih Republike Srpske” http://www.mpoo.org/?page_id=268

Bitno je istaći da su navedeni organizatori akreditovali veći broj programa, tako da su 14 organizatora iz Banjaluke akreditovali 109 programa. Na području Bijeljine broj akreditovanih programa iznosi 71, Prijedora 54, Doboja 21, Trebinja 12, itd.

In order to determine the guidelines for the development of adult education in Republic of Srpska, it is necessary to analyze the age structure of employees and unemployed persons.

The following table shows employment quotas in Republic of Srpska from 2009. to 2018., based on the working population aged 24 to 65 and older.

Table 2. RS employees, from 2009 to 2018, according to age groups, the annual average

Age groups / Starosne grupe	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total / Ukupno	207781	202483	200076	201297	201890	204714	207709	213844	219899	225342
of the / do 24	11800	10307	9723	9112	8513	8536	9025	10011	10767	11994
25–29	27020	26013	25587	24780	24227	23487	23304	23365	23460	23118
30–34	29307	29188	29221	30048	30759	31177	31936	32309	32927	32613
35–39	28233	28266	28505	29376	30257	30851	31535	32700	34024	35253
40–44	28720	27059	26009	25918	26042	27110	27835	29640	30463	31911
45–49	31944	30459	28816	27979	26795	26641	25787	25754	26337	27235
50–54	27242	26937	27345	28042	28027	27936	27553	27056	26691	26105
55–59	17328	17526	17635	18469	19178	20343	21620	22952	24027	24475
60–64	5756	6347	6780	7101	7620	8083	8492	9357	10405	11717
65+	431	381	455	472	472	550	622	700	798	921

Source: Republic of Srpska Statistical Office, Statistical Yearbook, Banjaluka, 2019. https://www.rzs.rs.ba/front/article/4014/?left_mi=287&up_mi=&add=287

The analysis shows that the employment of people under the age of 24 is increasing, especially in recent years. A slight increase in employment is also evident in populations aged 40-44; 45-49; 60-64 and over 65 years. At the same time, there is a slight decrease of employees aged 50 to 54, while in other age groups there is mostly stagnation in the number of employees.

Unemployment quotas according to different age groups, from 2009. to 2018., in Republic of Srpska are as follows (Table 3):

Table 3. Persons seeking employment in Republic of Srpska, from 2009 to 2018, according to the age groups, the annual average

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total / Ukupno	145396	145620	153535	153458	149284	142675	135585	125906	114364	96005
15–19	5281	5213	4812	5485	6011	5652	5324	4432	3471	2948
20–23	13776	13673	14439	14008	13116	13048	12231	11171	10319	8005
24–26	12084	12192	13756	13499	13471	12455	11424	9627	8153	6774
27–29	11749	11907	13151	13099	13236	12225	11338	9907	8723	7296

Da bi se utvrdile smjernice razvoja obrazovanja odraslih u Republici Srpskoj potrebno je analizirati starosnu strukturu zaposlenih i nezaposlenih osoba.

U narednoj tabeli prikazane su kvote zaposlenosti u Republici Srpskoj, u periodu od 2009. do 2018. godine, na osnovu radne populacije od 24 do 65 i više godina.

Tabela 2. Zaposleni u Republici Srpskoj, u periodu od 2009. do 2018. god., prema starosnim grupama, godišnji prosjek

Izvor: Republički zavod za statistiku Republike Srpske, Statistički godišnjak, Banjaluka, 2019. https://www.rzs.rs.ba/front/article/4014/?left_mi=287&up_mi=&add=287

Analiza pokazuje da se zaposlenost lica starosti do 24 godina povećava, posebno zadnjih godina. Blagi rast zaposlenosti je vidljiv i kod populacija starosne dobi 40 – 44; 45 – 49; 60 - 64 i preko 65. godina. Istovremeno se primjećuje blago smanjuje broj zaposlenih starosti od 50 do 54 godine, dok je kod ostalih starosnih grupa uglavnom prisutna stagnacija u broju zaposlenih.

Kvote nezaposlenosti prema različitim starosnim grupama, u periodu od 2009. do 2018. god., u Republici Srpskoj su sljedeće (Tabela 3):

Tabela 3. Lica koja traže zaposlenje u Republici Srpskoj, u periodu od 2009. do 2018. god., prema starosnim grupama, godišnji prosjek

30–34	18604	18783	19471	19600	19262	18205	16910	15469	13663	11341
35–39	18055	18344	19167	18951	18550	17267	16025	14438	12938	10904
40–44	19370	18438	18610	18462	17457	16353	15623	14634	13192	10992
45–49	19080	19093	19677	19518	18288	17004	15348	14483	13127	10758
50–54	15997	16068	16894	17159	16060	15716	15434	14937	13598	11518
55–59	9430	9659	10895	10541	10477	10756	11271	11537	11561	10079
60+	1970	2250	2663	3136	3356	3994	4657	5271	5619	5390

Source: Republic of Srpska Statistical Office, Statistical Yearbook, Banjaluka, 2019.

If we look at the age structure of the unemployed, it can be seen that there is a large representation of adults in all age groups, especially in the age group of 30–59. In all individual groups of the stated age, there was a decrease in unemployment during 2018 with decline starting in 2012. began as further as 2012. In 2013. The share of this group in total unemployment is 68.32%.

Table 4. shows the percentage share of persons seeking employment in the RS in the total age structure of employees from 2009 to 2018.

Table 4. Participation of persons seeking employment in Republic of Srpska in the total age structure of employees, from 2009 to 2018. (in %)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
-29	110.5	118.4	130.7	136.0	140.0	135.5	124.7	105.3	89.6	71.3
30–34	63.5	64.4	66.6	65.2	62.6	58.4	52.9	47.9	41.5	34.8
35–39	63.9	64.9	67.2	64.5	61.3	56.0	50.8	44.2	38.0	30.9
40–44	67.4	68.1	71.6	71.2	67.0	60.3	56.1	49.4	43.3	34.4
45–49	59.7	62.7	68.3	69.8	68.3	63.8	59.5	56.2	49.8	39.5
50–54	58.7	59.7	61.8	61.2	57.3	56.3	56.0	55.2	50.9	44.1
55–59	54.4	55.1	61.8	57.1	54.6	52.9	52.1	50.3	48.1	41.2
60+	31.8	33.4	36.8	41.4	41.5	46.3	51.1	52.4	50.2	42.6

Source: Republic of Srpska Statistical Office, Statistical Yearbook, Banjaluka, 2019.

It is a worrying fact that the share of persons seeking employment in Republic of Srpska in the total age structure of employees from 2009 to 2018 is significant for all age groups and ranges from 31.8% to 140.0%. If we look at the last reporting year, 2018, we see that the largest share is in the age group up to 29 years, supported by the age group 50–54 years (44.1%); over 60 years (42.60%); 55–59 years (42.2%), while in other groups the share ranges from 30.9% to 39.5%. a higher number of job seekers in relation to the number of employees by age group up to 29 in the period from 2009 to 2016. year,

Izvor: Republički zavod za statistiku Republike Srpske, Statistički godišnjak, Banjaluka, 2019.

Ukoliko posmatramo starosnu strukturu nezaposlenih, može se uočiti da je velika zastupljenost odraslih u svim starosnim grupama, a posebno u starosti od 30 - 59 godina. U svim pojedinačnim grupama navedene starosti došlo je do smanjenja nezaposlenosti tokom 2018. godine, s tim da je pad otpočeo još 2012. godine. Učešće ove grupe u ukupnoj nezaposlenosti je 68,32%.

U Tabeli 4. prikazano je procentualno učešće lica koja traže zaposlenje u Republici Srpskoj u ukupnoj starosnoj strukturi zaposlenih, u periodu od 2009. do 2018. god.

Tabela 4. Učešće lica koja traže zaposlenje u Republici Srpskoj u ukupnoj starosnoj strukturi zaposlenih, u periodu od 2009. do 2018. god. (u %)

Izvor: Republički zavod za statistiku Republike Srpske, Statistički godišnjak, Banjaluka, 2019.

Zabrinjavajuća je činjenica, da je udio lica koja traže zaposlenje u Republici Srpskoj u ukupnoj starosnoj strukturi zaposlenih, u periodu od 2009. do 2018. god značajan po svim starosnim grupama i kreće se u rasponu od 31,8% do 140,0%. Ako posmatramo zadnju izveštajnu godinu, 2018., vidimo da je najveće učešće kod starosne dobi do 29 godina, potpom starosne dobi 50 - 54 godine (44,1%); preko 60 godina (42,60%); 55 - 59 godina (42,2%), dok se kod ostalih grupacija učešće kreće u rasponu 30,9% do 39,5%. Veći broj lica koja traže posao u odnosu na broj zaposlenih po starosnim gru-

retrospective 4070; 6665; 10848; 12199; 13094; 11357; 7988 and 1761.

In order to determine the gap between employees according to the level of education and job seekers, in the following tables we will give an overview of this situation and trends in the period from 2009 to 2018.

Table 5. Employees according to the level of vocational education in Republic of Srpska from 2009 to 2018.

Degree of vocational education / Stepni stručnog obrazovanja	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total / Ukupno	207781	202483	200076	201297	201890	204714	207709	213844	219899	225342
Doctors of The H.A. / Doktori nauka	846	857	910	973	1059	1079	1174	1281	1398	1366
Master degree / Magistri	1076	1224	1368	1575	1859	1985	2250	2373	2477	2541
Higher education / Visoka str. spremu (VS)	30867	33215	36245	39735	42419	44319	46674	48915	50878	53255
Higher professional qualifications / Viša stručna spremu (VSS)	14259	13183	12412	11579	10986	10220	9843	9375	9457	9367
Secondary qualifications / Srednja stručna spremu (SSS)	88168	87284	85657	86515	86838	89085	90595	95880	99977	103868
Lower professional qualifications / Niža stručna spremu (NSS)	4646	4238	4365	3797	3895	3836	3885	4321	4383	3934
Highly qualified / Viskokvalifikovani (VKV)	9257	8710	8250	8158	7777	7325	7121	6752	6767	6420
Qualified / Kvalifikovani (KV)	38027	34972	33571	32630	31890	32010	31724	31095	30833	30813
Half qualified / Polukvalifikovani (PK)	4881	4306	4000	3667	3320	3222	2899	2902	3134	2944
Unqualified / Nekvalifikovani (NK)	15754	14494	13298	12668	11847	11633	11544	10950	10595	10834

Source: Republic of Srpska Statistical Office, Statistical Yearbook, Banjaluka, 2019.

In the structure of employees, the highest of secondary education in all analyzed years. In the final year, 2018. In addition to 46.1% of employees in a high school education, there were 23.6% with VS, 13.7% KV, 4.8% NK, 4.2% VSS, 2.8 % VK, 1.7% NSS, 1.3% PK, 1.1% master's degree and 0.6% of doctors.

For job seekers, the largest number is with VKV, SSS, NKV and VS, which can be seen in Table 6.

pama je bio evidentan u starosnoj dobi do 29 godina, u periodu od 2009. do 2016. godine, retrospektivno 4070; 6665; 10848; 12199; 13094; 11357; 7988 i 1761.

Da bi utvrdili raskorak između zaposlenih prema stepenu obrazovanja i lica koja traže zaposlenje, u nadrednim tabelama ćemo dati pregled tog stanja i kretanja u periodu od 2009. do 2018. godine.

Tabela 5. Zaposleni prema stepenu stručnog obrazovanja u Republici Srpskoj u periodu od 2009. do 2018. god.

Izvor: Republički zavod za statistiku Republike Srpske, Statistički godišnjak, Banjaluka, 2019.

U strukturi zaposlenih najveća je zastupljenost srednje stručne spreme u svim analiziranim godinama. U završnoj, 2018. godini, pored 46,1% zaposlenih sa SSS, bilo je 23,6% sa VS, 13,7% KV, 4,8% NKV, 4,2% VSS, 2,8 % VKV, 1,7% NSS, 1,3% PK, 1,1 % magistara i 0,6% doktora.

Kod lica koja traže zaposlenje najveći broj je sa VKV, SSS, NKV i VS, a što se može vidjeti u Tabeli 6.

Table 6. Persons seeking employment in Republic of Srpska according to the level of vocational education from 2009 to 2018.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Higher education (VS) / Visoka str. spremna (VS)	5249	6265	10311	10996	13264	13847	14471	13488	12785	11387
Higher education short cycle (VSS) / Viša str. spremna (VSS)	2623	2447	2430	2238	2171	1941	1784	1595	1409	1203
Secondary education (SSS) / Srednja str. spremna (SSS)	35951	37397	39896	41316	41830	41278	39781	37574	34739	30139
Highly qualified (VKV) / Visokokvalifikovani (VKV)	56289	55995	57307	57049	54875	51946	48365	44240	39272	32223
Qualified and lower-secondary education-KV I NSS / Kvalifikovani i niža str.sprema (KV I NSS)	4207	3910	3804	3612	3155	2895	2686	2399	2162	1737
Unqualified (NKV) / Nekvalifikovani (NKV)	41077	39606	39787	38247	33989	30768	28498	26610	23997	19316

Source: Republic of Srpska Statistical Office, Statistical Yearbook, Banjaluka, 2019.

In 2018, the share of VKV in the total structure of unemployed was 33.6%, SSS 31.4%; NKV 20.1%; VS 11.9%, KV and NSS 1.8% and VSS 1.3%.

The share of job seekers according to the level of vocational education in the total structure of employed person in the RS in the period from 2009 to 2018 can be seen from Table 7.

Table 7. Participation of persons seeking employment according to the level of vocational education in the total structure of employed persons in Republic of Srpska in the period from 2009 to 2018. Year (in %)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
VS	16.0	17.7	26.8	26.0	29.3	29.2	28.9	25.7	23.4	19.9
VSS	18.4	18.6	19.6	19.3	19.8	19.0	18.1	17.0	14.9	12.8
SSS	40.8	42.8	46.6	47.8	48.2	46.3	43.9	39.2	34.7	29.0
VKV	608.1	642.9	694.6	699.3	705.6	709.2	679.2	655.2	580.3	501.9
KV I NSS	8.8	9.0	9.1	9.0	8.1	7.4	7.0	6.3	5.6	4.6
NKV	260.7	273.3	299.2	301.9	286.9	264.5	246.9	243.0	226.5	178.3

Source: Republic of Srpska Statistical Office, Statistical Yearbook, Banjaluka, 2019.

The data from Table 7 show that the supply of highly qualified (VKV) and unqualified (NKV) workers is oversized, so that in 2018 the offer reaches 5.0 times higher in number than the number of employees with highly qualified (VKV), as well as 1.8 times more with unqualified (NKV). The supply of job seekers with other qualifications is also large, but still smaller than employees with the same qualifications.

Tabela 6. Lica koja traže zaposlenje u Republici Srpskoj prema stepenu stručnog obrazovanja u periodu od 2009. do 2018. god.

Izvor: Republički zavod za statistiku Republike Srpske, Statistički godišnjak, Banjaluka, 2019.

U 2018. godini učešće VKV lica u ukupnoj strukturi nezaposlenih je iznosilo 33,6%, SSS 31,4%; NKV 20,1%; VS 11,9%, KV i NSS 1,8%, a VSS 1,3%.

Koliko je učešće lica koja traže zaposlenje prema stepenu stručnog obrazovanja u ukupnoj strukturi zaposlenih lica u RS, u periodu od 2009. do 2018. godine, može se vidjeti iz Tabele 7.

Tabela 7. Učešće lica koja traže zaposlenje prema stepenu stručnog obrazovanja u ukupnoj strukturi zaposlenih lica u Republici Srpskoj u periodu od 2009. do 2018. godine (u %)

Izvor: Republički zavod za statistiku Republike Srpske, Statistički godišnjak, Banjaluka, 2019.

Podaci iz Tabele 7 govore da je predimenzionirana ponuda VKV i NKV radnika, tako da u 2018 godini ponuda dostiže 5,0 puta veće brojno stanje u odnosu na broj zaposlenih sa VKV, kao i 1,8 puta više kod NKV. Ponuda lica koja traže posao sa ostalim kvalifikacijama je takođe velika, ali još uvek manja od zaposlenih sa istim kvalifikacijama.

DISCUSSION

Analysis of capacities and needs for education of adults in Republic of Srpska has shown that there are certain disproportions, and even illogicalities in their condition and trends, of which it is necessary to point out the following:

- low growth of employees (in the observed 10-year period was 8.4%),
- low representation of employees up to 24 years (in 2018 it amounted to only 5.3% in the total structure of employers) and age 60-64 years (5.2%),
- significant share of persons seeking employment in the RS in the total age structure of employees: at the age of up to 29 years (71.0%), aged 50-54 (44.1%); over 60 years (42.60%); 55-59 years (42.2%), while in other groups participation ranges from 30.9% to 39.5%.
- representation of high school diploma among employed persons in all analyzed years. In 2018, In addition to 46.1% of employees with high school diploma, it was 23.6% with VS; 13.7% KV; 4.8% NK; 4.2% VSS; 2.8% VK; 1.7% NSS; 1.3% PK; 1.1% of master's and 0.6% of doctors.
- representation of VKV persons in the total structure of the unemployed. In 2018, there were 33.6% of unemployed VKV persons; SSS 31.4%; NKV 20.1%; VS 11.9%; KV; NSS 1.8% and VSS 1.3%.

Although there are certain laws and documents that regulate adult learning and education, in Bosnia and Herzegovina, even in Republic of Srpska, that education does not occupy an important and strategic place in economic and social development. Education is increasingly becoming a personal interest, and less and less chance of tackling unemployment.

Professional schools in Republic of Srpska provide training for adults according to the same methodology and used in regular education. So, education exists, but it's not entirely institutionalized.

In practice, there are several projects intended for adults and educational programs, which are often unrelated to common principles and standards. Adult education is financed mainly by the students or the participants or the Employment Service, and less often by the companies themselves.

The training of teaching staff is important for quality adult education. The number and structure of teachers in adult education in the Republic of Srpska is difficult to determine. Adult education can also be performed by professionals from other fields, who do not have specific

DISKUSIJA

Analiza kapaciteta i potreba za obrazovanjem odraslih u Republici Srpskoj je pokazala da postoje određene disproportije, pa čak i nelogičnosti u njihovom stanju i trendovima, od kojih je neophodno istaći sljedeće:

- mali rast zaposlenih (u posmatranom 10-ogodišnjem periodu je iznosio 8,4%),
- mala zastupljenost zaposlenih do 24 godine (u 2018. godini je iznosila svega 5,3% u ukupnoj strukturi zaposlenih) i starosne dobi 60 - 64 godine (5,2%),
- značajan udio lica koja traže zaposlenje u Republici Srpskoj u ukupnoj starosnoj strukturi zaposlenih: kod starosne dobi do 29 godina (71,0%), starosne dobi 50 - 54 godine (44,1%); preko 60 godina (42,60%); 55 - 59 godina (42,2%), dok se kod ostalih grupacija učešće kreće u rasponu 30,9% do 39,5%.
- zastupljenost srednje stručne spreme kod zaposlenih lica u svim analiziranim godinama. U 2018. godini, pored 46,1% zaposlenih sa SSS, bilo je 23,6% sa VS; 13,7% KV; 4,8% NK; 4,2% VSS; 2,8% VK; 1,7% NSS; 1,3% PK; 1,1% magistara i 0,6% doktora
- zastupljenost VKV lica u ukupnoj strukturi nezaposlenih. U 2018. god. je bilo 33,6% nezaposlenih VKV lica; SSS 31,4%; NKV 20,1%; VS 11,9%; KV i NSS 1,8%, a VSS 1,3%.

Iako postoje određeni zakoni i dokumenti sa kojima se reguliše učenje i obrazovanje odraslih, u Bosni i Hercegovini, pa i u Republici Srpskoj, to obrazovanje ne zauzima važno i strateško mjesto u ekonomskom i društvenom razvoju. Obrazovanje sve više postaje lični interes, a sve manj šansa za rješavanje nezaposlenosti.

Stručne škole u Republici Srpskoj vrše obuku za odrasle po istoj metodologiji i nastavnom koji se koristi u redovnom školovanju. Znači, obrazovanje postoji, ali nije u cijelosti institucionalizovano.

U praksi djeluje i više projekata namijenjenih odraslim osobama i obrazovnih programa, koji su često međusobno nepovezani zajedničkim principima i standardima. Obrazovanje odraslih financiraju uglavnom polaznici ili Zavod za zapošljavanje, a rjeđe i same kompanije.

Za kvalitetno obrazovanje odraslih bitna je osposobljenost nastavnog kadra. Broj i strukturu nastavnika u obrazovanju odraslih na području Republike Srpske je teško utvrditi. Odrasli su specifična ciljna grupa s obzirom na različita prethodno stećena znanja i iskustva, koja

teaching knowledge. Such experts in formal education programs should possess the additional pedagogical-psychological education necessary for the teaching process. By-laws should regulate new methods in adult education, including distance learning, mentoring work, etc. Adults are a specific target group with regard to various previously acquired knowledge and experience, which are often greater than the knowledge of teachers. Precisely because of that, an adult must be an active participant in the education process, and the process of education must be in the function of realizing his needs.

In the former Yugoslavia, adult education was conducted mainly through workers', people's and open universities. Due to reduced budget funding, most of these institutions have stopped working or privatised. Privatization was followed by a change in activities and a turn towards commercial programmes, most often unrelated to education.

Most of the workers', people's and open universities, which continued their work, specialized in certain programs, such as IT education, foreign language courses, etc.

Adult education has been reduced to classical forms, which is not in line with the adopted concept of lifelong learning. Also, the resources of potential participants in the field of education, such as NGO, cultural institutions, companies, professional associations, etc. are insufficiently used. Activities in the field of adult education in Republic of Srpska are non-synchronized, partial and often marginalized, out of the interest of society. The main reasons for this condition are mainly the lack of sources of funding, lack of coordination, and generally poor use of their resources in order to achieve important social goals.

In the interest of enriching the knowledge market, it is necessary to create conditions for the development of institutions and organisations for all types of education (formally, non-formally and informal).

The most important limitations for the preservation and development of adult education systems are:

- unregulated status of non-formal education institutions in the conditions of privatization,
- inadequate sources of funding,
- rigid tax policies towards non-formal education institutions, including NGOs engaged in adult education,
- inadequate information technology in educational institutions (the need to affirm of multimedia adult education),
- insufficient support for the development of education projects and programmes,
- lack of new forms of informal education (centres for independent learning).

su nerijetko veća od znanja nastavnika. Upravo zbog toga, odrasla osoba mora biti aktivni učesnik u procesu obrazovanja, a proces obrazovanja mora biti u funkciji ostvarivanja njegovih potreba.

U bivšoj Jugoslaviji obrazovanje odraslih je vršeno pretežno preko radničkih, narodnih i otvorenih univerziteta. Zbog smanjenog budžetskog financiranja najveći dio ovih institucija je prestao sa radom ili privatizovan. Sa privatizacijom je uslijedila i promjena djelatnosti i okretanja ka komercijalnim programima, najčešće nevezanim za obrazovanje.

Većina radničkih, narodnih i otvorenih univerziteta, koji su nastavili sa radom, se specijalizovala za određene programe, poput informatičkog obrazovanja, kurseva stranih jezika i sl.

Obrazovanje odraslih je svedeno na klasične oblike, a što nije u skladu sa usvojenom koncepcijom doživotnog učenja. Takođe, nedovoljno se koriste resursi potencijalnih učesnika u oblasti obrazovanja, kao što su nevladine organizacije, kulturne institucije, kompanije, stručne asocijacije, itd. Aktivnosti na polju obrazovanja odraslih u Republici Srpskoj su nesinhronizovane, parcialne i često marginalizovane, van interesovanja društva. Osnovni razlozi takvog stanja su, uglavnom, nedostatak izvora financiranja, nedostatak koordinacije, i uopšte slabo korištenje njihovih resursa u svrhu ostvarivanja važnih društvenih ciljeva.

U interesu obogaćivanja tržišta znanja potrebno je stvoriti uslove za razvoj institucija i organizacija za sve vrste obrazovanja (formalno, neformalno i informalno).

Najvažnija ograničenja za očuvanje i razvoj sistema obrazovanja odraslih su:

- neregulisan status institucija za neformalno obrazovanje u uslovima privatizacije,
- neadekvatni izvori financiranja,
- kruta poreska politike prema institucijama koje provode neformalne vidove obrazovanja, uključujući i nevladine organizacije koje vrše djelatnost obrazovanja odraslih,
- neadekvatna informatička tehnologija u obrazovnim institucijama (potreba afirmacije multimedijskog obrazovanja odraslih),
- nedovoljna podrška za izradu projekata i programa obrazovanja,
- nepostojanje novih oblika neformalnog obrazovanja (centara za samostalno učenje).

Naveda ograničenja ujedno upućuju na mјere koje je potrebno preduzeti u podsistemu neformalnog obrazovanja odraslih, a time i na mogućnosti za poboljšanje obrazovnog procesa odraslih, a što je bila svrha postav-

These limitations also indicate the measures that need to be taken in the subsystem of non-formal adult education, and thus the possibilities for improving the adult educationl process, which was the purpose of the hypothesis: to know the possibilities for improving adult education in Republic of Srpska.

Innovations or good examples from practice are not offered in the system of adult education in Republic of Srpska. A positive shift has been made by NGOs that have been activated to raise the awareness of adults about the importance of their education and lifelong learning. At the level of Republic, there is no strategic document with established priorities in the field of adult education. And the priorities should be:

- establishment of institutional forms of participation of potential partners in adult education,
- establishing a system for support and management of adult education,
- development of institutions and programs for better and more efficient adult education,
- establishment and development of quality systems in adult education (Herić & Grgić, 2008).

Partners in education can be different interest groups, such as government, unions, employers, research organisations, etc.

The system for management and suport of adult education should focus on creating new models of managament in adult education, as well as finding opportunities for better financing of adult education. In addition, it is necessary to form special organizational units and an Andragogical Centre for Adult Education.

The development of programs and institutions for adult education can be done through:

- higher rate of adult participation in education and training programmes,
- use of EU funds through the country's integration into European trends,
- greater mobility and flexibility of the workforce,
- higher employment of individuals and specific groups, etc.

Adult education must meet a certain qualitye standards. It is necessary to develop quality system in adult education through the establishment of institutions for education and program development. Teachers should be trained to work with adult persons, which can be ensured through the development of a quality licensing system.

Unemployment is high among people over the age of 45. Special attention, from the aspect of education, should be paid to older unemployed people who generally have a lower level of education, lack of confidence

Ijene hipoteze: Spoznati mogućnosti za poboljšanje obrazovanja odraslih u Republici Srpskoj.

U sistemu obrazovanja odraslih u Republici Srpskoj nisu ponuđene inovacije ili dobri primjeri iz prakse. Pozitivni pomak je dat od strane nevladinih organizacija koje su aktivirane na dizanju svijesti o značaju njihovog obrazovanja i doživotnog učenja. Na nivou Republike ne postoji starteški dokument sa utvrđenim prioritetima na području obrazovanja odraslih. A prioriteti bi trebali biti:

- uspostavljanje institucionalnih oblika participacije potencijalnih partnera u obrazovanju odraslih,
- uspostavljanje sistema za podršku i upravljanje obrazovanjem odraslih,
- razvoj institucija i programa za kvalitetnije i učinkovitije obrazovanja odraslih,
- uspostavljanje i razvoj sistema kvaliteta u obrazovanju odraslih (Heric i Grgic, 2008).

Partneri u obrazovanju mogu biti različite interesne grupe, poput vlade, sindikata, poslodavaca, naučno-istraživačkih organizacija, itd.

Sistem za upravljanje i podršku obrazovanju odraslih bi se trebao fokusirati na kreiranje novih modela upravljanja u obrazovanju odraslih, kao i iznalaženje mogućnosti kvalitetnijeg financiranja obrazovanja odraslih. Uz to je potrebno formirati posebne organizacione jedinice i andragoški centar za obrazovanje odraslih.

Razvoj programa i institucija za obrazovanje odraslih se može vršiti kroz:

- veću stopu participacije odraslih u programima obrazovanja i obuke,
- korištenje fondova EU-e kroz integraciju zemlje u evropske tokove,
- veću mobilnost i fleksibilnost radne snage,
- veću zaposlenost pojedinaca i specifičnih grupa i sl.

Obrazovanje odraslih mora biti zadovoljiti određene standarde kvaliteta. U tu svrhu je potrebno razviti sistem kvaliteta u obrazovanju odraslih kroz osnivanje institucija za obrazovanje i razvoj programa. Predavači bi morali biti obučeni za rad sa odraslim osobama, a što se može osigurati kroz razvoj kvalitetnog sistema licenciranja.

Nezaposlenost je velika kod osoba koje su iznad 45 godina starosti. Posebnu pažnju, sa aspekta obrazovanja, treba posvetiti starijim nezaposlenim osobama koje uglavnom imaju niži stepen obrazovanja, nedostatak povjerenja u svoje mogućnosti, kao i nemotiviranost za obrazovanje. Ova kategorija prva ostaje bez posla u slučaju stečaja ili većih reorganizacija u preduzećima.

in their abilities, as well as lack of motivation for education. This category is the first to lose its job in case of bankruptcy or major reorganizations in companies. The education system must adapt educational methods to this population and thus enable them to become useful members of society. There are no active employment policies in the Republic of Srpska. Employment promotion is mainly done through the Employment Institute or through NGOs.

CONCLUSION

In recent years, employment growth has been slow in the Republic of Srpska. Rapid technical and technological progress requires continuous improvement and innovation of knowledge, it is necessary for the Republic of Srpska to recognize the importance of adult education as soon as possible. If the Republic of Srpska does not offer institution and adequate adult education programs, especially for specific professions, most employers will have to send their employees abroad for further training.

The competent institutions of the Republic should work on raising awareness of adults about the necessity of lifelong education, as well as the responsibility of teachers engaged in education. Perspectives of learning and education in Republic of Srpska must be based on the following priorities:

- a systemic approach to the development of adult education,
- development of institutions dealing with adult education,
- encouraging international cooperation of educational institutions,
- development of programmes, methods and modules that are acceptable to adults,
- harmonization of the education system with the needs of the working and economic environment,
- providing access to education for all adults,
- development of teaching staff of the need for adult education,
- identify sources of funding for adults,
- develop mechanisms for quality control of adult education institutions.

Opportunities for improving adult education are great, which is proven in the work through an oversized supply of labor with qualifications for which there is no need in the job market. In addition, a large share of workers with lower qualifications in the structure of employees indicate that there is a need for additional education and training in this area as well. The larger number of organizers of adult education in a small area is not a sign of sufficiency and adequacy, given the requirements for

Sistem obrazovanja mora prilagoditi obrazovne metode ovoj populaciji i tako im omogućiti da postanu korisni članovi društva. U Republici Srpskoj nije osmišljena aktivna politika u zapošljavanju. Podsticanje zapošljavanja se uglavnom vrši preko Zavoda za zapošljavanje ili preko nevladinih organizacija.

ZAKLJUČAK

U Republici Srpskoj je zadnjih godina izražen spor rast zaposlenosti. S obzirom da brz tehnički i tehnološki napredak zahtijeva kontinuirano usavršavanje i inoviranje znanja, potrebno je da Republika što prije prepozna značaj obrazovanja odraslih. Ukoliko Republika Srpska ne ponudi institucije i adekvatne programe za obrazovanje odraslih, posebno za specifične profesije, većina poslodavaca će morati svoje zaposlene slati u inostranstvo na dalju obuku.

Nadležne institucije Republike trebaju raditi na podizanu svijesti odraslih o neophodnosti doživotne edukacije, kao i odgovornosti nastavnika koji se bave obrazovanjem odraslih. Perspektive učenja i obrazovanja u Republici Srpskoj se moraju bazirati na sljedećim prioritetima:

- sistemski pristup razvoja obrazovanja odraslih,
- razvoj institucija koje se bave obrazovanjem odraslih,
- podsticanje međunarodne saradnje obrazovnih institucija,
- razvoj programa, metoda i modula koji su prihvativi odraslim osobama,
- usklađivanje obrazovnog sistema sa potrebama radnog i ekonomskog okruženja,
- omogućavanje pristupa obrazovanja svim odraslim osobama,
- razvoj nastavnog kadra potrebe za obrazovanje odraslih,
- utvrditi izvore financiranja odraslih,
- razviti mehanizme za kontrolu kvaliteta institucija za obrazovanje odraslih.

Mogućnosti za poboljšanje obrazovanja odraslih su velike, a što je u radu dokazano kroz predimenzioniranu ponudu radne snage sa kvalifikacijama za koje ne postoji potreba na tržištu rada. Osim toga, veliki udio radnika sa nižim kvalifikacijama u strukturi zaposlenih upućuje da i u tom dijelu postoji potreba za dodatnim obrazovanjem i usavršavanjem. Veći broj organizatora obrazovanja odraslih na malom prostoru nije znak dovoljnosti i adekvatnosti, s obzirom na zahtjeve za novim profesijama i potrebu usavršavanja vještina kroz kontinuirani proces sertifikacije i licenciranja.

Obrazovanje odraslih u Republici Srpskoj se mora shvatiti kao strateška djelatnost, pri čemu politika ob-

and the need to improve skills through a continuous process of certification and licensing.

Adult education in Republic of Srpska must be understood as a strategic activity, with education policy being aligned with development projections and labour market needs. To this end, strong promotion of the importance of lifelong learning is needed by state administration, employment offices, local communities, associations, business entities, state institutions and other organizations. Open participation of adults in discussions should become the basis for acquiring knowledge. Active education motivates adult to learn, acquire skills, think critically, and learn and use knowledge correctly. Therefore, as part of measures for adult education, it is necessary to define measures for continuous teachers training.

razovanja mora biti uskladena sa razvojnim projekcijama i potrebama tržišta rada. U tu svrhu potrebna je jaka promocija važnosti doživotnog obrazovanja od strane organa državne uprave, zavoda za zapošljavanje, lokalne zajednice, udruženja, privrednih subjekata, državnih institucija i drugih organizacija.

Obrazovanje odraslih mogu izvoditi i stručnjaci iz drugih područja, koji nemaju određena nastavnička znanja. Takvi stručnjaci u programima formalnog obrazovanja bi trebali posjedovati dodatno pedagoško-psihološko obrazovanje potrebno za nastavni proces. Podzakonskim aktima bi trebalo urediti nove metode u obrazovanju odraslih, uključujući i učenje na daljinu, rad putem mentorstva, i sl.

Otvoreno učešće odraslih u diskusijama bi trebalo postati osnov za sticanje znanja. Aktivno obrazovanje motiviše odraske osobe za učenje, sticanje vještina, kritičko mišljanje, te ispravan načina učenja i korištenja znanja. Zato je u sklopu mjera za obrazovanje odraslih potrebno definisati i mjere za trajno usavršavanje nastavnika.

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THE INFLUENCE OF THE DEMOGRAPHIC FACTOR ON THE GROWTH AND DEVELOPMENT OF YOUNGER SCHOOL-AGE GIRLS

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Abstract: In order to determine the difference in morphological characteristics, a survey was conducted on a sample of 120 fourth-grade elementary schoolgirls from different socio-economic backgrounds in Montenegro. The total sample of respondents was divided into two subsamples. One sub-group consisted of 60 schoolgirls from urban and the other 60 schoolgirls of the same age from rural environment. A sample of measuring instruments consisted of 12 measures (body height, arm length, leg length, shoulder width, elbow diameter, knee diameter, body mass, upper arm circumference, lower leg circumference, skin fold of the back, skin fold of the upper arm and skin fold of the abdomen). In the process of statistical data processing, descriptive and canonical discriminatory analysis were applied in order to identify possible differences between sub-databases. The obtained research data generally indicate the existence of statistically significant differences between sub-samples. This difference is evident in indicators of longitudinal and transversal dimensionality of the skeleton, and in contrast, the difference was not evident in indicators of volume and body weight and subcutaneous fat tissue. Girls from the urban environment were taller and had more pronounced measures in the upper and lower extremities and girls from rural areas had more pronounced measures of knee joint diameter than their peers from urban life.

Keywords: morphological characteristics, schoolgirls, primary school, urban and rural environment.

INTRODUCTION

Special attention should be focused on the optimal growth and development of anthropological characteristics and abilities of children in childhood. In achieving

UTICAJ DEMOGRAFSKOG FAKTORA NA RAST I RAZVOJ DJEVOJČICA MLADJEG ŠKOLSKOG UZRASTA

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Sažetak: Na uzorku od 120 učenica četvrtog razreda osnovne škole iz različitih socio-ekonomskih sredina u Crnoj Gori, izvršeno je istraživanje u cilju utvrđivanja razlike u morfološkim karakteristikama. Ukupan uzorak ispitanica, podijeljen je na dva subuzorka. Jedan subuzorak je brojao 60 učenica iz urbane životne sredine, a drugi 60 učenica istog uzrasta iz ruralne životne sredine. U uzorak mjernih instrumenata činilo je 12 mjer (tjelena visina, dužina ruke, dužina noge, širina ramena, dijametar lakti, dijametar koljena, masa tijela, obim nadlaktice, obim potkoljenice, kožni nabor leđa, kožni nabor nadlaktice, kožni nabor trbuha). U postupku statističke obrade podataka, primijenjena je deskriptivna analiza i kanonička diskriminativna analiza za utvrđivanje mogućih razlika između subuzoraka. Dobijeni podaci istraživanja generalno upućuju na postojanje statistički značajnih razlika između subuzoraka. Ta razlika je evidentna kod pokazatelja longitudinalne i transverzalne dimenzionalnosti skeleta, a nasuprot tome, razlika nije bila evidentna u pokazateljima volumena i mase tijela te potkožnom masnom tkivu. Djevojčice iz urbane životne sredine su imale veću telesnu visinu i imale su više izražene mjerne longitudinalne dimenzionalnosti, a djevojčice iz ruralne sredine imale su više izražene mjerne transverzalne dimenzionalnosti (dijametar zgloba koljena) od svojih vršnjakinja iz urbane životne sredine.

Ključne reči: morfološke karakteristike, učenice, osnovna škola, urbana i ruralna životna sredina.

UVOD

U dječjem uzrastu posebna pažnja treba da se usmjeri na optimalni rast i razvoj antropoloških karakteristika i sposobnosti djece. Posebnu ulogu u ostvari-

optimal growth and development of children, a special role is played by teachers who implement the curriculum at a younger school age. The growth and development of children are influenced by endogenous and exogenous factors (Dragutinović, 2019). The growth and development of children takes place in relatively regular and predictable stages, which is not conditioned by calendar but by biological maturity. However, it should be kept in mind that there are certain differences between children in growth and development rate (Mikić, Bašinac, Begović, Pireva and Aljukić, 2016). Endogenous factors that affect the growth and development of children are biological heritage and hormones, while exogenous factors are nutrition, socioeconomic and psychological status, physical activity, climate, season and others (Mišogoj-Duraković, 2008). Overweight and obesity in childhood is a phenomenon that has been permanently accompanying us lately, and it is a global health problem to which we need to pay special attention and look for a quality solution in combating such a phenomenon. Because of overweight and obesity, children at an early age face serious health problems (WHO, 2004). School age is a period when it is necessary to monitor growth and development permanently, in order to detect possible irregularities in growth and development as well as early identification of children obesity and malnutrition in time.

Research by some authors aimed to determine the existence of possible differences in anthropological characteristics and abilities between children living in different socio-economic environments, (Reilly and Dorosty, 1999; Tsimeas, Tsiokanos, Koutedakis, Tsigilis and Kells, 2005; Ozdirenc, Ozcan, Akin and Gelecek, 2005; Relly, 2007; Petrić and Novak, 2007; Aberle, Blekić, Ivaniš, and Pavlović, 2009; Horvat, Mišogoj-Duraković and Prskalo, 2009; Tinazci and Emiroglu, 2009; Cetinić, Petrić and Vidaković-Samardžija, 2011, Vasić, Vidović, Vulić, Šnjegota, Šuščević, Bojić and Baroš, 2012; Momčilović V. and Momčilović Z., 2018) indicate that differences exist and that children from the urban living environment are mostly overweight and obese.

The subject of this research is focused on the morphological characteristics of young school children, fourth grade elementary schoolgirls, in order to determine the existence of statistically significant differences between girls of the same age living in different socio-economic environments (urban and rural).

METHOD OF WORK

Data collection for this research was performed during 2019 in six primary schools in Montenegro. In order to meet the territorial representation of the north-

vanju optimalnog rasta i razvoja djece imaju nastavnici koji realizuju program nastave u mlađem školskom uzrastu. Na rast i razvoj djece utiču endogeni i egzogeni faktori (Dragutinović, 2019). Rast i razvoj djece odvija se u relativno pravilnim i predvidjenim etapama, što nije uslovljeno kalendarskom nego biološkom zrelošću. Međutim, treba imati u vidu da postoje odredjene razlike izmedju djece u tempu rasta i razvoja (Mikić, Bašinac, Begović, Pireva i Aljukić, 2016). Endogeni faktori koji utiču na rast i razvoj djece su biološko nasledje i hormoni, dok su egzogeni faktori ishrana, socioekonomski i psihološki status, fizička aktivnost, klima, godišnje doba i drugi (Mišogoj-Duraković, 2008). Prekomjerna težina i gojaznost u dječijem uzrastu je pojava koja nas permanentno prati u poslednje vrijeme, i to predstavlja globalni zdravstveni problem kojem treba posebno da se posvetimo i tražimo kvaliteno rješenje u suzbijanju takve pojave. Upravo zbog prekomjerne težine i gojaznosti, djeca u najranijem uzrasu se suočavaju sa ozbiljnim zdravstvenim problemima (WHO, 2004). Školsko doba je period kada je potrebno permanentno pratiti rast i razvoj da bi se na vrijeme detektovala moguća nepravilnost u rastu i razvoju te rana identifikacija gojaznosti i pothranjenosti djece.

Istraživanja nekih autora koja su imala za cilj da utvrde postojanje eventualnih razlika u antropološkim karakteristikama i sposobnostima izmedju djece koja žive u različitim socio-ekonomskim sredinama (Reilly i Dorosty, 1999; Tsimeas, Tsiokanos, Koutedakis, Tsigilis i Kells, 2005; Ozdirenc, Ozcan, Akin i Gelecek, 2005; Relly, 2007; Petrić i Novak, 2007; Aberle, Blekić, Ivaniš, i Pavlović, 2009; Horvat, Mišogoj-Duraković i Prskalo, 2009; Tinazci i Emiroglu, 2009; Cetinić, Petrić i Vidaković-Samardžija, 2011, Vasić, Viđović, Vulić, Šnjegota, Šuščević, Bojić i Baroš, 2012; Momčilović V. i Momčilović Z., 2018), ukazuju na to da razlike postoje, te da djecu iz urbane životne sredine uglavnom prati prekomjerna težina i učestala gojaznost.

Predmet ovog istraživanja je fokusiran na morfološke karakteristike djece mlađeg školskog uzrasta, učenica četvrtog razreda osnovne škole, sa ciljem da se utvrdi postojanje statistički značajnih razlika izmedju djevojčica istog uzrasta koje žive u različitim socio-ekonomskim sredinama (urbanim i ruralnim).

METOD RADA

Prikupljanje podataka za ovo istraživanje izvršeno je tokom 2019. godine u šest osnovnih škola na teritoriji Crne Gore. Da bi zadovoljili teritorijalnu zastupljenost

ern, central and southern regions of Montenegro, schools from Bijelo Polje, Podgorica and Bar were selected. Two schools from each municipality, one from the urban area (urban area) and the other from the rural area (rural area) were selected too.

Sample of examinee

Measurements were conducted on a sample of 120 respondents, fourth grade elementary schoolgirls, aged 10 years +/- 6 months. The total sample was divided into two subsamples: the first subsample consisted of 60 girls from the urban living environment and the second 60 girls from the rural living environment. For the purposes of this study, the sample of examinees was selected by the random selection method.

Sample of measuring instruments

In order to assess morphological characteristicstwelve measures were used: AVIS body height, ADUR arm length, ADUN leg length, ASHIR shoulder width, ADIL elbow diameter, ADIK knee diameter, AMAS body weight, AOBN upper arm circumference, AOBP lower leg circumference, AK skin fold, , skin fold of the upper arm AKNN, skin fold of the abdomen AKNT.

Statistical data processing

The data obtained by measurement, were processed by descriptive and comparative statistics. The significance of the differences between the subsamples was verified by canonical discriminant analysis. All statistical data processing was done using the Statistical Package for Social Sciences software (SPSS 20.0).

RESEARCH RESULTS

Results of descriptive analysis

Based on the performed measurements, the following tables show the parameters of descriptive statistics. All results are grouped in tables according to residential status.

sjeverne, centralne i južne regije Crne Gore, škole su odabrane iz sledećih opština: Bijelog Polja, Podgorice i Bara. Iz svake opštine odabrane su po dvije škole, jedna iz gradskog područja (urbana sredina) a druga iz seoskog područja (ruralna sredina).

Uzorak ispitanika

Mjerenja su sprovedena na uzorku od 120 ispitanica, učenica četvrtog razreda osnovne škole, starosne dobi od 10 godina +/- 6 mjeseci. Ukupan uzorak je podijeljen na dva subuzorka i to: prvi subuzorak je brojao 60 djevojčica iz urbane životne sredine, a drugi 60 djevojčica iz ruralne životne sredine. Za potrebe ovog istraživanja uzorak ispitanica bio je odabran metodom slučajnog izbora.

Uzorak mjernih instrumenata

Za procjenu morfoloških karakteristika primijenjeno je 12 manifestnih mjeri: Tjelesna visina AVIS, dužina ruke ADUR, dužina noge ADUN, širina ramena AŠIR, dijametar lakta ADIL, dijametar koljena ADIK, masa tijela AMAS, minimalni obim nadlaktice AOBN, minimalni obim potkoljenice AOBP, kožni nabor leđa AKNL, kožni nabor nadlaktice AKNN, kožni nabor trbuha AKNT.

Statistička obrada podataka

Podaci dobijeni mjeranjem, obrađeni su postupcima deskriptivne i komparativne statistike.

Značajnost razlika između subuzoraka, provjerena je kanoničkom diskriminativnom analizom. Cjelokupna statistička obrada podataka je urađena pomoću softvera Statistical Package for Social Sciences (SPSS 20.0).

REZULTATI ISTRAŽIVANJA

Rezultati deskriptivne analize

Na osnovu sprovedenih mjeranja, u narednim tabelama su prikazani parametri deskriptivne statistike. Svi rezultati su grupisani u tabelama prema rezidencijalnom statusu.

Table 1. Descriptive parameters of morphological characteristics (girls-urban living environment)

Variable	N	Range	Min.	Max.	Mean	Std. Deviation	Variance	Skewness	Kurtosis
AVIS	60	23.00	131.00	154.00	142.60	5.08	25.83	.24	.12
ADUR	60	15.00	57.00	72.00	64.70	3.90	15.25	-.06	-1.03
ADUN	60	17.00	64.00	81.00	71.20	3.88	15.06	.57	-.02
AŠIR	30	8.00	30.00	38.00	32.60	1.73	3.00	1.56	3.02
ADIL	60	3.50	6.00	9.50	7.87	.75	.57	-.17	.23
ADIK	60	3.90	8.00	11.90	9.93	.79	.62	.05	.68
AMAS	60	23.60	26.50	50.10	35.48	4.67	21.80	1.02	2.36
AOBN	60	8.00	18.00	26.00	21.20	2.00	4.01	.82	.14
AOBP	60	8.00	26.00	34.00	30.88	2.04	4.19	-.44	-.24
AKNL	60	6.10	4.20	10.30	7.81	1.76	3.11	-.26	-.91
AKNN	60	8.20	7.40	15.60	11.05	2.25	5.07	.21	-.62
AKNT	60	7.60	7.60	15.20	10.62	1.74	3.03	.63	.27

Legend: Variables - variables, N - number of entities, Range - range of variation, Min. - minimum value, Max. - maximum value, Mean - arithmetic mean, Std. Dev. - standard deviation, square root of variance, Variance - variance, mean square deviation, Skewness - distortion, Kurtosis - curve

The values of the basic descriptive parameters for the morphological variables of girls in the urban living environment are presented in table 1. Based on the presented results, it can be concluded that there is a normal distribution for most of the presented variables. There is a more noticeable positive asymmetry in the variables shoulder width (AŠIR) and body weight (AMAS), which means that results with lower values in the treated variables predominate.

Table 2. Descriptive parameters of morphological characteristics (girls-rural environment)

Variable	N	Range	Min.	Max.	Mean	Std. Deviation	Variance	Skewness	Kurtosis
AVIS	60	0.00	139.00	149.00	42.80	2.67	7.13	.83	-.09
ADUR	60	9.00	57.00	66.00	60.45	2.48	6.19	.65	-.65
ADUN	60	9.00	65.00	74.00	68.91	2.19	4.82	.51	-.22
AŠIR	60	6.00	30.00	36.00	32.79	1.48	2.19	.53	.07
ADIL	60	2.30	7.10	9.40	8.20	.54	.30	.18	.35
ADIK	60	2.80	9.40	12.20	10.56	.65	.42	.49	.12
AMAS	60	22.30	26.50	48.80	34.79	5.31	28.23	1.05	1.41
AOBN	60	12.00	17.00	29.00	22.05	2.70	7.29	.40	.34
AOBP	60	12.00	26.00	38.00	30.33	2.91	8.48	.69	.49
AKNL	60	4.60	5.20	9.80	7.58	1.22	1.49	-.10	-.81
AKNN	60	6.00	7.50	13.50	10.51	1.74	3.03	-.19	-.88
AKNT	60	7.60	7.10	14.70	10.23	1.67	2.79	.54	.34

Legend: Variables - variables, N - number of entities, Range - range of variation, Min. - minimum value, Max. - maximum value, Mean - arithmetic mean, Std. Dev. - standard deviation, square root of variance, Variance - variance, mean square deviation, Skewness - distortion, Kurtosis - curve

Tabela 1. Deskriptivni parametri morfoloških karakteristika (djevojčice-urbana životna sredina)

Legenda: Variable – varijable N – broj entiteta, Range – raspon varijacije, Min. – minimalna vrijednost, Max. – maksimalna vrijednost, Mean – aritmetička sredina, Std. Deviation – standardna devijacija, Variance – varijansa, prosječno kvadratno odstupanje, Skewness – koeficijent simetričnosti, Kurtosis – koeficijent zakrivljenosti

U tabeli 1, predstavljene su vrijednosti osnovnih deskriptivnih parametara za morfološke varijable djevojčica urbane životne sredine. Na osnovu prikazanih rezultata, može se konstatovati da postoji normalna distribucija kod većine prikazanih varijabli. Izražajnija pozitivna asimetrija prisutna je kod varijabli širina ramena (AŠIR) i masa tijela (AMAS), što znači da preovladavaju rezultati sa nižim vrijednostima u tretiranim varijablama.

Tabela 2. Deskriptivni parametri morfoloških karakteristika (djevojčice-ruralna životna sredina)

Legenda: Variable – varijable N – broj entiteta, Range – raspon varijacije, Min. – minimalna vrijednost, Max. – maksimalna vrijednost, Mean – aritmetička sredina, Std. Deviation – standardna devijacija, Variance – varijansa, prosječno kvadratno odstupanje, Skewness – koeficijent simetričnosti, Kurtosis – koeficijent zakrivljenosti

By analyzing the results from Table 2, which shows the descriptive parameters of girls in rural areas, it can be concluded that the results are normally distributed. The deviation of the distribution curve to the left in the variable body mass (AMAS) has an enhanced positive asymmetry, which indicates that there is an increased grouping of results in the zone of lower values.

Results of comparative analysis

Results of discriminant analysis of morphological characteristics of girls in urban and rural environment

Table 3. Specific roots of morphological characteristics of girls in urban and rural environment

Eigenvalues				
Function	Eigenvalue% of	Variance	Cumulative%	Canonical Correlation
1	1.89	100.0		100.0 .81

Legend: Function- canonical function, Eigenvalue- characteristic roots% of Variance- percentages of variance, Cumulative%- Cumulative percentages of variance, Canonical Correlation- canonical correlation

The table below shows an isolated canonical discriminant function (Table 3). Here, the discriminant function shows the correlation of variance both among subsamples and within subsamples, as well as the canonical correlation (.81), which indicates that the isolated function among subsamples is significantly high.

Table 4. Wilks' Lambda morphological characteristics of girls from urban and rural living environment

Wilks' Lambda				
Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	.35	55.18	12	.00

Legend: Test of Function (s) - function test, Wilks' Lambda- contribution of independent variables to discriminative function, Chi-square- Hi square test, df- degrees of freedom, Sig.- statistical significance

The results of the canonical discriminant analysis presented in Table 4 show that there are statistically significant differences in the examined morphological characteristics in girls with respect to residential status. It is noticed that the statistically significant discriminant function at the level of Sig. = .00. Using Wilks' Lambda, it is observed that the discriminant strength of the morphological characteristics presented by the test is high (.35), and the value of the Chi-square test (55.18) confirms that

Analizom rezultata iz tabele 2 u kojoj su prikazani deskriptivni parametri djevojčica ruralne životne sredine, može se konstatovati da su rezultati normalno distribuirani. Otklon krive distribucije ulijevo kod varijable masa tijela (AMAS), ima pojačanu pozitivnu asimetriju koja ukazuju na to da tu postoji povećano grupisanje rezultata u zoni nižih vrijednosti.

Rezultati komparativne analize

Rezultati diskriminativne analize morfoloških karakteristika djevojčica urbane i ruralne životne sredine

Tabela 3. Karakteristični korjeni morfoloških karakteristika djevojčica urbane i ruralne životne sredine

Legenda: Function- kanonička funkcija, Eingvalue- karakteristični korjeni, % of Variance- procenti varijanse, Cumulative %- kumulativni procenti varijanse, Canonical Correlation- kanonička korelacija

U prikazanoj tabeli nalazi se izolovana kanonička diskriminativna funkcija (tabela 3). Ovdje je diskriminativna funkcija prikazala povezanost varijansi među subuzorcima i varijanse unutar subuzoraka, kao i kanoničku korelaciju (.81), koja ukazuje na to da je među subuzorcima izolovana funkcija značajno visoka.

Tabela 4. Wilksova Lambda morfoloških karakteristika djevojčica urbane i ruralne životne sredine

Wilks' Lambda				
Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1	.35	55.18	12	.00

Legenda: Test of Function(s)- test funkcije, Wilks' Lambda- doprinos nezavisnih varijabli diskriminativnoj funkciji, Chi-square- Hi kvadrat test, df- stepeni slobode, Sig.- statistička značajnost

Prikazani rezultati kanoničke diskriminativne analize u tabeli 4 pokazuju da postoje statistički značajne razlike u ispitivanim morfološkim karakteristikama kod djevojčica s obzirom na rezidencijalni status. Uočava se da je statistički značajna diskriminativna funkcija na nivou Sig.=.00. Pomoću Wilksove Lambde uočava se da je diskriminativna jačina morfoloških karakteristika prikazanih testom visoka (.35), a vrijednost Hi kvadart testa (55.18) potvrđuje da postoje razlike između ispitanih.

there are differences between the subjects. The obtained results support the fact that morphological characteristics contribute to discrimination with regard to the residential status of girls.

Table 5. Coefficients of standardized canonical discriminant function of morphological characteristics of girls in urban and rural living environment

Tabela 5. Koeficijenti standardizovane kanoničke diskriminativne funkcije morfoloških karakteristika djevojčica urbane i ruralne životne sredine

Variable	Function 1
AVIS	.52
ADUR	-1.45
ADUN	.59
AŠIR	.46
ADIL	-.08
ADIK	.59
AMAS	-.76
AOBN	1.10
AOBP	-.64
AKNL	.35
AKNN	-.19
AKNT	-.21

Legend: Variables- variables, Function 1- coefficients of standardized canonical function

Legenda: Variable – varijable, Function 1 – koeficijenti standardizovane kanoničke funkcije

From the previous tables (Tables 5 and 6), it can be noticed that the greatest contribution to the overall discrimination is given by the following variables: arm length (ADUR = -1.26), upper arm circumference (AOBN = 1.10), body weight (AMAS = -.76) and lower leg circumference (AOBP = -.64), which have the highest values of the coefficient. This means that they have the greatest impact on the contribution of differences between girls with regard to residential status. High odds also have: leg length (ADUN), knee diameter (ADIK), body height (AVIS) and shoulder width (AŠIR). The variables skin fold of the upper arm (AKNN = -.19) and diameter of the elbow (AOBP = -.08) gave the least contribution to the discriminant function.

Dobijeni rezultati idu u prilog činjenici da morfološke karakteristike doprinose diskriminaciji s obzirom na rezidencijalni status djevojčica.

Table 6. Coefficients of non-standardized canonical discriminant function of morphological characteristics of girls in urban and rural living environment

Tabela 6. Koeficijenti nestandardizovane kanoničke diskriminativne funkcije morfoloških karakteristika djevojčica urbane i ruralne životne sredine

Variable	Function 1
AVIS	.12
ADUR	-.44
ADUN	.18
AŠIR	.28
ADIL	-.13
ADIK	.82
AMAS	-.15
AOBN	.46
AOBP	-.25
AKNL	.23
AKNN	-.09
AKNT	-.12
(Constant)	-16.79

Legend: Variables- variables, Function 1- coefficients of non-standardized function

Legenda: Variable – varijable, Function 1 – koeficijenti standardizovane kanoničke funkcije

Iz prethodnih tabela (tabela 5 i 6) može se primijetiti da najveći doprinos ukupnoj diskriminaciji daju sljedeće varijable: dužina ruke (ADUR=-1.26), obim nadlaktice (AOBN=1.10), masa tijela (AMAS=-.76) i obim potkoljenice (AOBP=-.64), koje imaju najveće vrijednosti koeficijenta, što znači da one najviše utiču na doprinos razlike između djevojčica s obzirom na rezidencijalni status. Visoke koeficijente imaju još: dužina noge (ADUN), dijametar koljena (ADIK), visina tijela (AVIS) i širina ramena (AŠIR). Varijable kožni nabor nadlaktice (AKNN=-.19) i dijametar laka (AOBP=-.08) su dale najmanji doprinos diskriminativnoj funkciji.

Table 7. Structure of discriminant functions of morphological characteristics of girls in urban and rural areas

Variable	Function 1
ADUR	-.47
ADIK	.32
ADUN	-.26
ADIL	.18
AOBN	.13
AKNN	-.09
AKNT	-.08
AOBP	-.08
AKNL	-.05
AMAS	-.05
AŠIR	.05
AVIS	.01

Legend: Variable- variables, Function 1- structural coefficients

Structural coefficients (Table 7) indicate which variables define the discriminant function. It is easy to see from the table that the range of coefficients is moving from -.47 to .32. The greatest contribution was made by the variables: arm length (ADUR = -.47), knee diameter (ADIK = .32) and leg length (ADUN = -.26). Other variables had small values of discriminant function, indicating that girls do not differ much at the level of morphological characteristics with respect to residential status. The smallest contribution to discrimination was given by the variables shoulder width (AŠIR = .04) and body height (AVIS = .01).

Table 8. Centorides group morphological characteristics of a girl of urban and rural environment

Geupa	Function 1
Girls city	-1.35
Girls village	1.35

Legend: GROUP- subsamples of canonical discriminant function, Function 1- group centroid coefficients

Table 8 shows the results on the position of the centroids of the groups ranging from -1.35 to 1.35, which indicates that the subsamples differ statistically significant in the canonical discriminant function. Girls from urban environments achieved better results in a number of variables of morphological characteristics: arm length (ADUN = -.47), leg length (ADUR = -.26), as well as values of skin folds, lower leg circumference and low bodyweight. On the other hand, girls from rural areas had higher results with the variables: knee diameter (ADIK = .32), elbow diameter

Tabela 7. Struktura diskriminativnih funkcija morfoloških karakteristika djevojčica urbane i ruralne sredine

Variable	Function 1
ADUR	-.47
ADIK	.32
ADUN	-.26
ADIL	.18
AOBN	.13
AKNN	-.09
AKNT	-.08
AOBP	-.08
AKNL	-.05
AMAS	-.05
AŠIR	.05
AVIS	.01

Legenda: Variable- varijable, Function 1- strukturalni koeficijenti

Strukturalni koeficijenti (tabela 7) nam ukazuju koje varijable definišu diskriminativnu funkciju. Iz tabele lako je uočiti da se raspon koficijenata kreće od -.47 do .32. Najveći doprinos su dale varijable: dužina ruke (ADUR=-.47), dijametar koljena (ADIK=.32) i dužina noge (ADUN=-.26). Ostale varijable su imale male vrijednosti diskriminativne funkcije, što ukazuje da se djevojčice ne razlikuju puno na nivou morfoloških karakteristika s obzirom na rezidencijani status. Najmanji doprinos diskriminaciji su dale varijable širina ramena (AŠIR=.04) i visina tijela (AVIS=.01).

Tabela 8. Centoridi grupa morfološke karakteristike djevojčice urbane i ruralne životne sredine

Geupa	Function 1
Djevojčice – grad	-1.35
Djevojčice - selo	1.35

Legenda: GRUPA- subuzorci kanoničke diskriminativne funkcije, Function 1- koeficijenti centroida grupe

U tabeli 8 se nalaze rezultati o položaju centroida grupe koji se kreću od -1.35 do 1.35, što ukazuje da se subuzorci statistički značajno razlikuju u kanoničkoj diskriminativnoj funkciji. Djevojčice iz urbanih životnih sredina su ostvarile bolje rezultate u većem broju varijabli morfoloških karakteristika: dužina ruke (ADUN=-.47), dužina noge (ADUR=-.26), kao i vrijednosti kožnih nabora, obima potkoljenice i mase tijela koje su niske. S druge strane djevojčice iz ruralnih životnih sredina imale su veće rezultate kod varijabli: dijametar koljena

(ADIL = .18), lower leg circumference (AOBP = .13), and the smallest differences, were shown by the shoulder width variables. (ASHIR = .04) and body height (AVIS = .01).

DISCUSSION

Based on the presented research results, it can be concluded that there are differences between younger school-age students who come from different demographic backgrounds in Montenegro. Specifically, it has been shown that the environment (urban and rural), as one of the exogenous factors, may affect the growth and development of schoolgirls to a lesser extent, especially in a sensitive period such as younger school age.

It was found that there are statistically significant differences in the applied morphological variables. The difference was evident in some indicators of longitudinal and transverse dimensionality of the skeleton. Variables for estimating longitudinal skeletal dimensionality (arm length and leg length) were more pronounced in girls from urban living areas and variables for estimating transverse skeletal dimensionality (knee diameter) in girls from rural living areas.

The longitudinal dimensionality of the skeleton is mostly determined by hereditary factors and the influence of the environment. Girls living in urban areas have better living conditions, hygienic and psychosocial conditions and consume food that is quite enriched with additives of hormonal matter. It can be said that it is a series of interrelated environmental factors that influenced the faster growth of certain body segments of girls from the urban environment compared to girls from the rural environment.

In the indicators of body mass and volume and subcutaneous adipose tissue, which were the subject of monitoring in this study, no differences were recorded between girls in urban and rural environment, which was confirmed in studies by other authors (Cetnić et al., 2011). Many studies (Janssen and LeBlanc, 2010; Boreham and Riddoch, 2001) have shown that continuous physical activity, as an exogenous factor, plays an important role primarily in children's health and thus in regulating body composition, body mass and volume in some segments.

On this basis, it can be concluded that both girls from urban and rural environment who are of the same age, have a similar lifestyle that directly affects the level of physical activity and which is represented through physical education classes and free children's play. Therefore, there is an indirect influence on the anthropological characteristics of girls, in this case on the subcutaneous adipose tissue, weight and body volume, and for these reasons no differences were observed in the treated

(ADIK=.32), dijametar lakta (ADIL=.18), obim potkoljnice (AOBP=.13), a najmanje razlike su pokazale varijable širina ramena (AŠIR=.04) i visina tijela (AVIS=.01).

DISKUSIJA

Na osnovu prezentiranih rezultata istraživanja, može se konstatovati da postoje razlike između učenica mlađeg školskog uzrasta koje potiču iz različitih demografskih sredina u Crnoj Gori. Tačnije, pokazalo se da životna sredina (urbana i ruralna), kao jedan od egzogenih faktora, u manjoj mjeri može uticati na rast i razvoj djevojčica, pogotovo u osjetljivom periodu kao što je mlađji školski uzrast.

Utvrđeno je da postoje statistički značajne razlike kod primijenjenih morfoloških varijabli. Razlika je bila evidentna u pojedinim pokazateljima longitudinalne i transverzalne dimenzionalnosti skeleta. Varijable za procjenu longitudinalne dimenzionalnosti skeleta (dužina ruke i dužina noge) dominantnije su bile izražene kod djevojčica iz urbanog životnog područja, a varijabla za procjenu transverzalne dimenzionalnosti skeleta (dijametar koljena), kod djevojčica iz ruralnog životnog područja.

Longitudinalna dimenzionalnost skeleta je najvećim dijelom odredjena naslednjim činocima, a zatim i uticajem životne sredine. Djevojčice koje žive u urbanoj sredini, imaju bolje uslova za život, higijenske i psihosocijalne prilike, te konzumiraju hranu koja je u priličnoj mjeri obogaćena aditivima hormonske materije. Može se reći da je to niz uzajamno povezanih faktora sredine koji su uticali na brži rast pojedinih segmenata tijela djevojčica iz urbane u odnosu na djevojčice iz ruralne životne sredine.

U pokazateljima mase i volumena tijela te potkožnog masnog tkiva, koji su bili predmet praćenja u ovom radu, nijesu zabilježene razlike izmedju djevojčica urbane i ruralne životne sredine što je potvrđeno i u istraživanjima drugih autora (Cetnić i sar.,2011). U mnogim istraživanjima (Janssen i LeBlanc, 2010; Boreham i Riddoch, 2001) dokazano je da kontinuirana fizička aktivnost, kao egzogeni faktor, ima važnu ulogu prije svega na zdravlje djece, a samim tim i na regulaciju sastava tijela, mase i volumena tijela na pojednim segmentima.

Na osnovu toga, može se konstatovati da djevojčice u ovom uzrastu, iz urbane i ruralne životne sredine, imaju sličan životni stil koji utiče direktno na nivo fizičke aktivnosti, a koji je zastupljen kroz nastavu fizičkog vaspitanja i u slobodnoj dječjoj igri. Samim tim vrši se indirektan uticaj na antropološka obilježja djevojčica, u ovom slučaju na potkožno masno tkivo, masu i volumen tijela, te iz tih razloga nijesu zabilježene razlike u tretiranim pokazateljima. Međutim, s obzirom na to da je ispitivano dvanaest

indicators. However, since twelve variables were examined, such data indicate that there are no significant differences in terms of overall morphological status in girls of the same age but different residential status.

CONCLUSION

Based on the obtained results of this research, it was shown that a statistically significant difference was observed in a small number of analyzed morphological variables, which are under the influence of hereditary traits. In most of the analyzed variables, which are not predominantly influenced by hereditary traits, no difference was found. Thus, the growth of girls is regulated by the action of various influences. These influences can be endogenous and exogenous. Endogenous influences are primarily heredity (genetic factor), sex and endocrine glands, and exogenous influences are socio-economic conditions, nutrition, climate, physical activities, etc. These results can be explained by a similar lifestyle of girls of this age from urban and rural environments. The results of this research confirm the results of the previous research conducted by (Badža, 2007). These facts should indicate the importance of the influence of exogenous factors for the proper growth and development of girls, regardless of the environment in which they are.

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varijabli, ovakvi podaci ukazuju na to da kod djevojčica istog uzrasta, ali različitog rezidencijskog statusa ne postoje značajnije razlike u pogledu cijelokupnog morfološkog statusa, što je vidljivo iz tabele 7.

ZAKLJUČAK

Na osnovu dobijenih rezultata ovog istraživanja pokazalo se da je kod manjeg broja analiziranih morfoloških varijabli, koje su pod uticajem naslednih osobina, uočena statistički značajna razlika. Kod većine analiziranih varijabli, koje nijesu dominantno pod uticajem naslednih osobina, nije ustanovljena razlika. Dakle, rast djevojčica je regulisan djelovanjem različitih uticaja. Ti uticaji mogu biti endogeni i egzogeni. Endogeni uticaji su prije svega nasledje (genetski faktor), pol i endokrine žlijezde, a egzogeni uticaju su socio-ekonomske prilike, ishrana, klima, fizičke aktivnosti i sl. Ovakvi rezultati mogu se objasniti sličnim načinom življenja djevojčica ovog uzrasta iz urbane i ruralne životne sredine. Rezultati ovog istraživanja potvrđuju rezultate predhodnog istraživanja koje je proveo (Badža, 2007).

Navedene činjenice treba da ukažu na važnost uticaj egzogenih faktora za pravilan rast i razvoj djevojčica, bez obzira na životnu sredinu u kojoj se nalaze.

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FINANCING AND FINANCIAL RISKS OF PROFESSIONAL SPORTS CLUBS IN THE REPUBLIC OF CROATIA

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Abstract: The system of financing sports clubs in the Republic of Croatia is the closest to a mixed model in which the main sources of financing are: budget funds and the economy. It is an indisputable fact that professional sports clubs in the Republic of Croatia from the beginning of the 1990s until today have actually relied mainly on city administrations and majority state-owned companies in terms of funding. In the total revenue structure of all major sports clubs in Croatia, all other revenues including the private sector, TV rights, ticket revenues, revenues from own marketing, were extremely small and in fact such an inadequate revenue structure of almost all clubs created "dependent clubs" that have become existentially addicted to public money in the case of non-commercial sports, or in the case of football addicted to UEFA revenues or player transfers which in turn have great variability. The paper examines and proves that the greatest impact on reducing financial risk in business have their own revenues generated by sports teams in Croatia. All the funds they receive from the budget or from sponsors from the economy are not enough to reduce the risk and the club to operate without difficulty.

Keywords: sports club, financing, Sports Law, sports joint stock company, citizens' association.

INTRODUCTION

In addition to dependence on public money and variable or volatile income, clubs are further weakened by inadequate management by established management structures that often operate as "drunk millionaires", which leads to questioning the integrity and viability of clubs that were great in Europe. As a consequence of this synergy of dependence and mismanagement, the vast ma-

FINANCIJANJE I FINANSIJSKI RIZICI PROFESIONALNIH SPORTSKIH KLUBOVA U REPUBLICI HRVATSKOJ

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Sažetak: Sustav financiranja sportskih klubova u Republici Hrvatskoj najблиži je nekom mješovitom modelu u kojem se kao glavni izvori financiranja nameću: proračunska sredstva i gospodarstvo. Neprijeporna je činjenica da su profesionalni sportski klubovi u Republici Hrvatskoj od početka devedesetih godina prošlog stoljeća, pa sve do današnjih dana zapravo uglavnom u smislu financiranja bili naslonjeni na gradske uprave i poduzeća u većinskom državnom vlasništvu. U ukupnoj strukturi prihoda svih najvećih sportskih klubova u Hrvatskoj svi ostali prihodi koji uključuju privatni sektor, tv prava, prihode od ulaznica, prihode od vlastitog marketinga, bili su iznimno mali i zapravo je takva neadekvatna prihodovna struktura gotovo svih klubova stvorila „ovisne klubove“ koji su u egzistencijalnom smislu postali ovisnici javnog novca u slučaju nekomercijalnih sportova, ili pak u slučaju nogometne ovisnosti o prihodima od UEFA ili transfera igrača koji pak imaju veliki varijabilitet. U radu je ispitano i dokazano da najveći utjecaj na smanjenje finansijskog rizika u poslovanju imaju vlastiti prihodi koji ostvaruju sportski kolektivi u Hrvatskoj. Sva sredstva koja dobiju iz proračuna ili od sponzora iz gospodarstva, nisu dovoljna da bi se rizik smanjio, a klub poslovao bez poteškoća.

Ključne riječi: sportski klub, financiranje, zakon o sportu, sportsko dioničko društvo, udruga građana.

UVOD

Osim ovisništva o javnom novcu i varijabilnom odnosno nestabilnom prihodu, klubovi su dodatno oslabljeni neadekvatnim upravljanjem od strane postavljenih upravljačkih struktura koje su nerijetko upravljale kao „pijani milijunaši“ dovodeći u pitanje integritet i opstojnost klubova koji su bili velikani u europskim okvirima. Kao posljedica navedene sinergije ovisništva i lošeg

jority of Croatian professional clubs have been brought into a situation of struggle for a bare existence, including going into pre-bankruptcy settlements (BC Cibona, BC Zadar, CAWPC Mladost, BC Split, FC Osijek, etc.) thus saving the competition status in national leagues, but questioning the financial-existential and sports-performance integrity of clubs that won titles in the most prestigious European competitions during the former state, often in continuity as is the case in BC Cibona, BC Split (ex Jugoplastika) or CAWPC Mladost who in total won more than 10 titles of European basketball and water polo champions in the 1970s and 1980s. Therefore, it can be concluded that the financing of sports clubs that are not based on solid foundations and their activities carries financial risk. The aim of the research is to determine, on the basis of primary data, the extent to which certain business parameters affect the reduction of financial risk of sports clubs in Croatia.

According to the above, it is considered justified to set the following hypothesis, which reads:

The greatest impact among budget funds (local communities), economy and own revenues on reducing the financial risk of sports clubs in Croatia is borne by their own revenues, and these factors are strongly correlated.

The multiple regression model analyzed the impact of certain independent variables, in the form of different forms of funding, where funding from state budgets, funding through sponsorship, and funding from own activities (membership fees, revenues from European competitions, TV rights, youth facilities, viewers etc.) were taken into consideration.

Sources of financing of sports teams in Croatia and organizational structure

When it comes to financing sports in the Republic of Croatia from budget funds, we must divide these budget funds into three parts, namely: (FINA, 2018)

- Money from the state budget, at HRK 400 million per year by which the state finances sports through the Central State Office for Sports, which finances the Croatian Olympic Committee and national federations,
- Money from city and municipal budgets that finance professional and amateur clubs at the level of cities and municipalities that are mainly registered as citizens' associations;
- Money from city budgets by which cities finance sports clubs that have been transformed into sports joint stock companies on the basis of the Sports Law, and the cities are shareholders, which, in accordance with the decision of the

upravljanja velika većina hrvatskih profesionalnih klubova dovela se u situaciju borbe za golu egzistenciju uključujući odlazak u predstečajne nagodbe (KK Cibona, KK Zadar, HAVK Mladost, KK Split, NK Osijek itd.) i na taj način spašavajući natjecateljski status u nacionalnim ligama, ali dovodeći u pitanje financijsko-egzistencijalni i sportsko-rezultatski integritet klubova koji su za vrijeme bivše države osvajali titule u najprestižnijim europskim natjecanjima, često i u kontinuitetu kao što je slučaj u primjerima KK Cibone, KK Splita (ex Jugoplastike) ili HAVK Mladosti koji su u zbroju osvojili više od 10 titula europskih prvaka u košarci i vaterpolu u sedamdesetim i osamdesetim godinama prošlog stoljeća. Prema tome, može se zaključiti da finasiranje sportskih klubova koji nisu zasnovani na čvrstim temeljima i svojoj djelatnosti nosi financijski rizik. Cilj rada je na osnovu primarnih podataka utvrditi koliko određeni parametri poslovanja utiču na smanjenje finansijskog rizika sportskih klubova u Hrvatskoj.

Prema navedenom, smatra se opravdanim postaviti sljedeću hipotezu rada, a koja glasi: *Najveći utjecaj između proračunskih sredstava (lokalnih zajednica), gospodarstva i vlastitih prihoda na smanjenje finansijskog rizika sportskih klubova u Hrvatskoj imaju vlastiti prihodi, te se nalaze u najjačoj korelacionoj vezi.*

Multipli regresioni model je analizirao uticaj određenih nezavisnih varijabli, u vidu različitih oblika finasiranja, a gdje je uzeto finasiranje putem državnih proračuna, finasiranje uz pomoć sponzoriranja, te finasiranje iz vlastitih aktivnosti (članarina, prihodi od evropskih takmičenja, tv prava, omladinski pogoni, gledaoci itd.).

Izvori finasiranja sportskih kolektiva u Hrvatskoj i organizaciona struktura

Kada je u pitanju finansiranje sporta u Republici Hrvatskoj iz proračunskih sredstava, onda ta proračunska sredstva moramo podijeliti na tri dijela, i to na: (FINA, 2018)

- Novac iz državnog proračuna, i to na 400 milijuna kn godišnje kojim država financira sport putem Središnjeg državnog ureda za sport koji financira hrvatski olimpijski odbor i nacionalne saveze,
- Novac iz gradskih i općinskih proračuna kojima se financiraju profesionalni i amaterski klubovi na nivou gradova i općina koji su uglavnom registrirani kao udruge građana;
- Novac iz gradskih proračuna kojima gradovi finansiraju sportske klubove koji su temeljem zakona o športu preoblikovani u športska dionička društva, a gradovi su dioničari, te sukladno od-

General Meeting and the percentage of ownership, participate in recapitalization procedures;

When it comes to the number of clubs, in 2017, there were 4131 Olympic, 2840 non-Olympic, 152 CPC clubs and 62 CSAD in Croatia. The number of Olympic athletes was 246694, non-Olympic 36038, CPC athletes 1305 and CSAD 296. The source for 2017 was taken from the Croatian Olympic Committee, the Croatian Paralympic Committee and the Croatian Sports Association of the Deaf.

Based on the taken secondary data, it can be concluded that from 2013 to 2017, Croatia won 11 medals at the Olympics, 311 medals at world championships and 358 medals at European championships. Therefore, it can be concluded that the financing of sports teams is not followed by the sports results of athletes who are actually the best Croatian ambassadors in the world. (Coface Croatia, 2018)

If we talk about the income structure of professional sports clubs in the Republic of Croatia, then it is different from sport to sport. The leading CFL football clubs that continuously play in Europe, even if only in the preliminaries, earn 70 to 90% of their annual income from receipts for appearances in European competitions and the sale of players, which is again closely related to appearances in Europe, since the appearances in Europe are the only real showcase that raises the price of players in Europe. (Coface Croatia, 2018)

The sale of one's own staff is a combination of one's own reproduction through youth school and scouting, i.e. speculative buying and selling of players who are mostly bought cheaply from even weaker or less attractive leagues, and then transferred to richer European leagues and clubs through good European performances. (Beech & Chadwick, 2010)

It is important to emphasize that the revenues of the best Croatian clubs from year to year do not have continuity and deviations go up to 25-30%, depending mainly on the income and maturity of transfer installments for player transfers and the quality of placements in European competitions, as there are huge financial differences between national champions who play in the qualifications of the European Champions League, and the rest of the clubs that play in the qualifications of the European League on the basis of placement. In addition, there is a huge difference between CFC Dinamo, which absolutely dominates the Croatian championship, and based on its top reproduction has gained the status of the undisputed best Balkan club whose players have many times higher market value than players of similar qualities and characteristics from other clubs in Croatia and the wider region.

luci skupštine dioničara i postotnom udjelu vlasništva sudjeluju u postupcima dokapitalizacija;

Kada je u pitanju broj klubova, u 2017.godini, u Hrvatskoj je bilo 4131 olimpijsko, 2840 neolimpijsko, 152 HPO kluba i 62 HSSG. Broj sportaša, olimpijskih je bilo 246694, neolimpijskih 36038, HPO sportaša 1305 i HSSG 296. Izvor za 2017.godinu preuzet je iz Hrvatskog olimpijskog odbora, Hrvatskog paraolimpijskog odbora i Hrvatskog sportskog saveza gluhih.

Na osnovu preuzetih sekundarnih podataka može se zaključiti da od 2013 do 2017.godine Hrvatska ima 11 osvojenih medalja na OI, 311 osvojenih medalja na svjetskim prvenstvima i 358 osvojenih medalja na evropskim prvenstvima. Dakle, može se zaključiti da finasiranje sportskih kolektiva ne prati sportske rezultate sporta koji predstavljaju najboljeg ambasadora Hrvatske u svijetu. (Coface Hrvatska, 2018)

Ako pak govorimo o strukturi prihoda profesionalnih sportskih klubova u Republici Hrvatskoj, onda je ona različita od sporta do sporta. Vodeći nogometni klubovi HNL-a koji u kontinuitetu nastupaju u Europi, pa makar samo i u pretkolima od 70 do 90 % godišnjih prihoda ostvaruju od primitaka za nastupe u europskim takmičenjima i prodaje igrača koja je opet usko vezana uz nastupe u Europi jer su nastupi u Europi jedini pravi izlog koji podiže cijenu igrača u europskim okvirima. (Coface Hrvatska, 2018)

Pritom je prodaja vlastitog kadra kombinacija vlastite reprodukcije putem omladinske škole i skoutinga, odnosno špekulativne kupoprodaje igrača koji se pretežito kupuju jeftino iz još slabijih ili manje atraktivnih liga, a zatim se putem dobrih europskih nastupa transferiraju u bogatije europske lige i klubove. (Beech & Chadwick, 2010)

Važno je naglasiti da prihodi najboljih hrvatskih klubova iz godine u godinu nemaju kontinuitet i odstupanja idu i do 25-30 %, ovisno uglavnom o prihodu i dospijeću transfernih rata za transfere igrača i kvaliteta plasmana u europskim natjecanjima, budući su ogromne financijske razlike između nacionalnog prvaka koji nastupa u kvalifikacijama lige europskih prvaka, i ostatka klubova koji temeljem plasmana nastupaju u kvalifikacijama europske lige. Osim toga, ogromna je razlika između GNK Dinama koji apsolutno dominira u hrvatskom prvenstvu, te je temeljem vrhunske vlastite reprodukcije stekao status neprijeporno najboljeg balkanskog kluba čiji igrači imaju višestruko veću tržišnu vrijednost od igrača sličnih kvaliteta i karakteristika iz drugih klubova u Republici Hrvatskoj i široj regiji.

Dinamo's strategic model, guided by the projection that European appearances and self-reproduction are the only way to long-term survival in the "second league of European football" is actually a unique model of functioning of clubs from the region that ensures continuity in European competitions and consequently medium-term financial stability. There is a serious difference from year to year in the levels of income from participation in European competitions and income from the sale of fixed assets, i.e. transfer of players (players are registered as fixed assets in accordance with IAS 38 where the value of assets is actually capitalized acquisition value of players during 2-4 years). Practically, it is calculated with transfers depending on the income from UEFA waiting for the moment for the best exit transfer which is in principle realized two years before the expiration of the existing contract mainly in the summer transfer window, and preferably after large representative competitions (European or world championships) in the case of a player who is a member of the national team that won a major competition.

Apart from Dinamo, which is an association of citizens and has not yet used the opportunity to transform into a public company, the big four are closed by Hajduk, Rijeka, Dinamo and Osijek, which are sports joint stock companies with the majority ownership in Rijeka and Osijek in the hands of private owners, while in Hajduk the main owner is still the city of Split. Accordingly, there are similarities and differences in sports and infrastructure strategy. The sports strategy is very similar and actually rests on the already described Dinamo model where the key emphasis is on appearances in Europe and player transfers, with the predominant revenue from player transfers. Except for Rijeka, which managed to reach the group stage of the European League on three occasions, Hajduk and Osijek did not succeed in it, and they were doomed to perform in the preliminary rounds, so the infrastructure strategy in the case of Rijeka and Osijek is similar because Rijeka has already built a new Stadium Rujevica with complete supporting infrastructure while Osijek is in the process of building a new stadium that will be the most luxurious in Croatia. On the other hand, Hajduk uses the city stadium Poljud, which was built in 1979 for the needs of the Mediterranean Games. Of course, the intention is to increase the revenue from ticket sales and accompanying facilities (restaurants, club fan shops, etc.) through own high-level stadiums and thus try to reduce the dependence on the already mentioned revenues that prevail in the overall revenue structure.

It is very important to emphasize that it is difficult to find a balance between the need to retain existing play-

Strateški Dinamov model koji je vođen projekcijom da su europski nastupi i vlastita reprodukcija jedini način dugoročnog opstanka u „drugoj ligi europskog nogomet-a“ zapravo je unikatan model funkciranja klubova iz regije koji osigurava kontinuitet nastupanja u europskim natjecanjima i posljedično srednjoročnu financijsku stabilnost u navedenim nacionalnim i europskim okvirima toga ranga. Pritom iz godine u godinu postoji i ozbiljna razlika u razinama prihoda od nastupa u europskim takmičenjima i prihoda od prodaje dugotrajne imovine, odnosno transferiranja igrača (igrači se se sukladno MRS 38 vode kao dugotrajna imovina gdje je vrijednost imovine zapravo kapitalizirana vrijednost stjecanja igrača 2-4 godine) gdje se u principu kalkulira sa transferima ovisno o prihodima od UEFE čekajući trenutak za najbolji izlazni transfer koji se u principu realizira dvije godine prije isteka postojećeg ugovora pretežito u ljetnom prijelaznom roku, i po mogućnosti nakon velikih reprezentativnih natjecanja (europskih ili svjetskih prvenstava) u slučaju da je riječ o igraču koji je reprezentativac reprezentacije koja je izborila veliko natjecanje.

Osim Dinama koji je udruga građana i još uvijek nije iskoristio mogućnost preoblikovanja u s.d..d., veliku hrvatsku četvorku zatvaraju Hajduk, Rijeka, Dinamo i Osijek koji su sportska dionička društva s tim što je većinsko vlasništvo u Rijeci i Osijeku u rukama privatnih vlasnika, dok je u Hajduku i dalje glavni vlasnik grad Split. Sukladno tome, postoji sličnosti i razlike u sportskoj i infrastrukturnoj strategiji. Dok je sportska strategija vrlo slična i zapravo počiva na već opisanom Dinamovom modelu gdje ključni akcent jesu nastupi u Europi i transferi igrača, s time da preovladava zapravo prihod od transfera igrača jer izuzev Rijeke koja je u tri navrata uspjela dohvati grupnu fazu europske lige Hajduku i Osijeku to nije uspjelo, te su osuđeni na nastupe u pretkolima, dotle je infrastrukturna strategija zapravo u slučaju Rijeke i Osijeka slična jer je Rijeka već izgradila novi Stadion Rujevica sa kompletnom popratnom infrastrukturom dok je Osijek u fazi izgradnje novog stadiona koji će po svim standardima zapravo biti najluksuzniji u Hrvatskoj, a Hajduk pak koristi gradski stadion Poljud koji je izgrađen još 1979. godine za potrebe mediteranskih igara. Dakako, intencija je putem vlastitih stadiona visoke europske razine povećati prihod od prodaje ulaznica i popratnih sadržaja (restorana, klupskih fan shopova i sl.) i time pokušati smanjiti ovisnost od već spomenutih prihoda koji preovladavaju u ukupnoj strukturi prihoda.

Pritom je vrlo važno naglasiti da je teško naći balans između potrebe zadržavanja postojećeg igračkog ka-

ers that allows better European performance and the need for urgent sales to patch up the revenue side in case the sales revenues and Europe in the previous season were insufficient.

This level of dependence on two sources of income is a great danger to the survival of clubs, especially in crisis situations that could not have been foreseen, due to the narrowed possibility of reactive action, which significantly affects the high level of vulnerability in times of crisis.

Ways of financing some clubs in Croatia

If we compare the situation of the leading Croatian first leagues in football with the leading clubs from other sports, then we come to the conclusion that it is not so bad, since football is actually the only real commercial sport in Europe whose umbrella European organization UEFA managed to make football an unrealistically high level business activity that enables clubs to receive extremely high amounts of rewards for their placement in the European Champions League, as well as for the results achieved within the group and elimination phases of the European Champions League. Thus, in the still current season, UEFA provided a prize fund in the amount of unrealistic two and a half billion euros, which is 93.5% of the revenue that UEFA will generate during the current season, of which Dinamo earned 29.5 million euros from the prize fund, and another 5 million euros from TV rights and ticket sales, so if we compare this with the total revenue of about 51 million euros that CFC Dinamo generated in 2019, then we see that only from the appearance in the Champions League, Dinamo actually achieved almost 68% of total revenue in fiscal 2019.

Very similar to Dinamo's report for 2019 is the preliminary and unaudited report of Hajduk for 2019, where, out of the total revenue of approximately HRK 173 million, 123 million is actually the revenue from the sale of players, which makes 71% of the total revenue in 2019, with the difference that Dinamo's revenue is dominated by revenue from UEFA, supported by approximately 93 million revenues from the sale of players, and in the total structure of other revenues of CFC Hajduk in that year, which amounts to HRK 49 million, approximately 30% falls on revenues from sponsorship and advertising, as well as commercial revenues, whose structure includes revenues from national competitions, revenues from the sale of products and revenues from the use of facilities when there are no matches, approximately 20% or slightly more than 9 million on ticket revenues, around HRK 3.5 million on UEFA revenues, and slightly more than HRK 6 million to other revenues. (FINA, 2018) If we

dra koji omogućuje kvalitetniji europski nastup i potrebe za hitnom prodajom da bi se pokrpalala prihodovna strana u slučaju da su prihodi od prodaje i Europe u prethodnoj sezoni bili nedostatni.

Ovakva razina ovisnosti o dva izvora prihoda velika je opasnost za opstojnost klubova, poglavito u križnim situacijama koje se nisu mogle predvidjeti, i to zbog sužene mogućnosti reaktivnog djelovanja što u bitnome utječe na veliku razinu ranjivosti u križnim vremenima.

Načini finasiranja nekih klubova u Hrvatskoj

Ako pak situaciju vodećih hrvatskih prvoligaša u nogometu kompariramo sa vodećim klubovima iz drugih sportova onda dolazimo do zaključka da ona i nije toliko loša, budući da je nogomet u cijeloj Europi zapravo jedini pravi komercijalni sport čija je krovna europska organizacija UEFA uspjela od nogometa napraviti možda i nerealno visoku razinu poslovne aktivnosti koja klubovima omogućuju strahovito velike iznose nagrada za sam plasman u Ligu europskih prvaka, kao i za ostvarene rezultate unutar grupne i eliminacijskih faza Lige europskih prvaka. Tako je UEFA u još uvijek aktualnoj sezoni osigurala nagradni fond u iznosu od nestvarnih dvije i pol milijarde eura što čini 93,5 % prihoda koji će ostvariti UEFA tijekom postojeće sezone, od čega je za ilustraciju Dinamo zaradio 29,5 milijuna eura od nagradnog fonda, te još cca 5 milijuna eura od tv prava i prodaje ulaznica, pa ako to uporedimo sa ukupnim prihodom od cca 51 milijun eura koji je GNK Dinamo ostvario u 2019. godini, onda vidimo da je samo od nastupa u Ligi prvaka Dinamo zapravo ostvario gotovo 68% ukupnog prihoda u fiskalnoj 2019. godini.

Vrlo slično Dinamovom izvještaju za 2019. godinu govori i preliminarni i nerevidirani izvještaj Hajduka za 2019. godinu gdje je u ukupnom prihodu od cca 173 milijuna kuna 123 milijuna zapravo prihod od prodaje igrača što čini 71 % ukupnog ostvarenog prihoda u 2019. godini s tom razlikom što kod Dinama dominira prihod od UEFE potpomognut za cca 93 milijuna prihoda od prodaje igrača, a u ukupnoj strukturi ostalog prihoda HNK Hajduk u navedenoj godini koji iznosi 49 milijuna kn otprilike po 30 % otpada na prihode od sponzorstva i oglašavanja, te komercijalne prihode koji opet u svojoj strukturi sadržavaju prihode od nacionalnih natjecanja, prihode od prodaje proizvoda i prihod od korištenja objekata za vrijeme neodigravanja utakmica, cca 20 % ili nešto više od 9 milijuna na prihode od ulaznica, oko 3,5 milijuna kn na prihode od UEFE, i nešto više od 6 milijuna kn na ostale prihode (FINA, 2018).

look at the business history of CFC Rijeka, CFC Hajduk and FC Osijek, which were trade companies in the period 2015-2018, it can be concluded that Rijeka was convincingly the most successful in the first year as a result of the Group stage of the European League and consequently higher player value, that is, mainly one player Andrej Kramarić, for whom they transferred EUR 9 million according to the specialized transfer market, which again means that the majority of revenues relate to the sale of players and revenue from UEFA. At that time in 2015, FC Osijek was still majority owned by the city of Osijek, and in 2016 Hungarian investors became the majority shareholders, and the growth of income from year to year was evident, which in 2018 resulted in a profit that was almost nominal at the level of total revenue generated in 2015. All three clubs reached revenue levels above HRK 100 million with the highest percentage growth of Osijek in the observed period 2015-2018, which quadrupled the overall revenue level, Hajduk doubled it, while Rijeka had oscillations from year to year, although in that period it had the best results in European competitions.

The biggest problem with the functioning of football clubs in Croatia, at least these four best observed lies in the impossibility of adequate projection of future revenues since the majority income is actually variable, and it is impossible to project and maintain the expenditure structure at the level of majority variable expenditure, so the sensitivity of Croatian football clubs, which generate most of their income from UEFA and player transfers to negative changes in just one year, is of such a nature that it can completely jeopardize functioning and survival, while a possible second and third year without such income would have unforeseeable consequences and would absolutely question the viability of the clubs.

Ways of financing clubs from other sports

Unlike football globally and professional football clubs in Croatia, professional clubs in other sports have much lower budgets, since they participate in competitions in "non-commercial sports" where the interest of potential sponsors both globally and nationally is significantly lower, or even and in the case of a nominally large number of interested parties, these are financially less demanding marketing packages. In the analysis of what we can call professional sports clubs in the Republic of Croatia, which are not related to football and have at least some available data, we will touch on four basketball clubs (BC Cibona, BC Zadar, BC Split and BC Cedevita while it functioned in Zagreb), two handball clubs (HC PPD Zagreb and HC Nexe), and two water polo clubs (CAWPC Mladost and WPC Jug).

Ako pogledamo povijesni prikaz poslovanja HNK Rijeke, HNK Hajduka i NK Osijeka koji su trgovačka društva u periodu 2015-2018, može se zaključiti da je Rijeka u prvoj godini bila ubjedljivo najuspješnija i to kao rezultat nastupa u Grupnoj fazi europske lige i posljedično veće vrijednosti igrača, odnosno poglavito jednoga igrača Andreja Kramarića za kojeg su po specijaliziranoj stranici za transfere transfermarkt utržili 9 milijuna eura što opet znači da se glavnina prihoda odnosi na prodaju igrača i prihod od UEFA. U tom trenutku 2015. NK Osijek je još uvijek u većinskom vlasništvu grada Osijeka, i u 2016. godini većinski dioničari postaju mađarski investitori, te je vidljiv rast prihoda iz godine u godini koji je u 2018. godini rezultirao sa dobiti koja je u nominalnom iznosu skoro na razini ukupno ostvarenog prihoda u 2015. godini. Sva tri kluba su dosegnula razine prihoda iznad 100 milijuna kuna sa najvećim postotnim rastom Osijeka u promatranom periodu 2015-2018. koji je upetostručio ukupnu razinu prihoda, Hajduk je udvostručio, dok Rijeka ima oscilacije iz godine u godinu iako u tom periodu ima najbolje rezultate u europskim natjecanjima.

Najveći problem funkcioniranja nogometnih klubova u Hrvatskoj, barem ova četiri najbolja i promatrana, leži u nemogućnosti adekvatnog projiciranja budućih prihoda jer je većinski prihod zapravo varijabilni, a nemoguće je strukturu rashoda projicirati i održavati na razini većinskog varijabilnog rashoda, pa je osjetljivost hrvatskih nogometnih klubova koji većinu prihoda ostvaruju od UEFA i transfера igrača na negativne promjene u samo jednoj godini takve prirode da može u potpunosti dovesti u pitanje funkcioniranje i opstojnost, dok bi eventualna druga i treća godina bez takvih prihoda imale nesagleđive posljedice i apsolutno dovele u pitanje opstojnost klubova.

Načini finasiranja klubova iz ostalih sportova

Za razliku od nogmeta globalno i profesionalnih nogometnih klubova u Hrvatskoj, profesionalni klubovi u ostalim sportovima imaju puno manje proračune, naravno jer su sudionici natjecanja u „nekomerčijalnim sportovima“ gdje je i interes potencijalnih sponzora i na globalnom i na nacionalnom nivou višestruko manji, odnosno čak i slučaju nominalno velikog broja zainteresiranih riječ je o financijski manje zahtjevnim marketinškim paketima. U analitici onoga što možemo zvati profesionalnim sportskim klubovima u Republici Hrvatskoj, a koji ne pripadaju nogometu i imaju ikakve dostupne podatke dotaknut ćemo se četiri košarkaška kluba (KK Cibona, KK Zadar, KK Split i KK Cedevita do trenutka dok

Basketball has been the number 2 Croatian sport for years or even decades, especially during the former Yugoslavia, in the 1980s it was even the number one sport, primarily thanks to Cibona and Split, who combined to win 5 European titles (Cibona two titles and Split three titles under different names Jugoplastika and Pop 84) and this is actually the period of the best results of Croatian club sports in history. Zadar should certainly be added to these, which became the champion in the then strongest European league-Yugoslavia in 1986, defeating the then current European champion Cibona in the final, which spoke enough about the strength of the Yugoslav championship at that time.

From the moment of Croatian independence, the complete domination of Cibona in terms of results began, which has been the most trophy-winning Croatian club since Croatian independence until today, and that domination lasted more or less until ten years ago with two titles won by Zadar, and one by Split and BC Zagreb each, until BC Cedevita emerged in the Croatian basketball scene, whose rise actually occurred when one of the largest Croatian corporations Atlantic entered the local club from the western suburbs of Zagreb, Hiron Botinec, promoting the brand of famous Cedevita juices.

This was the moment when the emergence of the corporate model and the functioning of the club coincided with the decline of Cibona's financial power, and Cedevita was the most trophy-winning and only financially stable Croatian club in the last decade. In parallel with Cibona's financial problems, BC Split and BC Zadar had the same or similar problems, and at about the same time all three clubs ended up in pre-bankruptcy settlements as a result of completely irrational management for years due to apparent competitiveness, which was actually not the case, since, apart from one title won by Cibona in the regional ABA League, in fact, none of these clubs had any role in the European context.

It is important to note that the regional ABA League is played in the former state, which was founded as the Adriatic in 2001, and in 2017 expanded to another ABA League, so BC CIBONA and BC Zadar are members of the first, and BC Split is a member of the second Aba League. All three clubs actually had serious bankruptcy reasons with financial dubiousness from which it was difficult to get out, but they used the possibility of a pre-bankruptcy settlement institute where creditors forgave them 60-70% of total claims and the entire amount of statutory default interest. They also used the possibility of reorganization in accordance with the Sports Law, where they used the possibility of transferring tax liabilities to

je funkcionalala u Zagrebu), dva rukometna kluba (RK PPD Zagreb i RK Nexe), te dva vaterpolo kluba (HAVK Mladost i VK Jug).

Košarka je godinama ili *čak* desetljećima, poglavito za vrijeme bivše Jugoslavije bila hrvatski sport broj 2, u osamdesetim godinama prošlog stoljeća *čak* i sport broj 1 prvenstveno zahvaljujući Ciboni i Splitu koji su kombinirano osvojili 5 titula europskih prvaka (Cibona dvije titule i Split tri tutule pod različitim imenima Jugoplastika i Pop 84) i to je zapravo period ponajboljih rezultata hrvatskog klupskega sporta u povijesti. Njima svakako treba dodati i Zadar koji je je u tadašnjoj najjačoj europskoj ligi-jugoslavenskoj postao prvak u 1986. godini pobijedivši u finalu tadašnjeg aktualnog europskog prvaka Cibonu što je dovoljno govorilo o jakosti jugoslavenskog prvenstva u tom trenutku.

Od trenutka hrvatskog osamostaljenja zapravo počinje i potpuna dominacija Cibone u rezultatskom smislu koja je najtrofejniji hrvatski klub od hrvatskog osamostaljenja do danas, i ta je dominacija više manje trajala do prije desetak godina uz dvije titule Zadra, te po jednu Splita i KK Zagreb sve do pojave KK Cedevite na hrvatskom košarkaškom nebuh *čiji* uzlet zapravo nastaje kada u lokalni klub iz zapadnog zagrebačkog predgrađa Hiron Botinec ulazi ni manje ni više nego jedna od najvećih hrvatskih korporacija Atlantic promovirajući brand poznatih sokova Cedevita.

Riječ je o trenutku u kojem pojavljivanje korporativnog modela i funkcioniranja kluba koincidira sa opadanjem finansijske moći Cibone, te je Cedevita u zadnjem desetljeću najtrofejniji i jedini finansijski stabilan hrvatski klub. Paralelno sa finansijskim problemima Cibone, istu ili sličnu problematiku imaju i KK Split i KK Zadar, te otprilike u isto vrijeme sva tri kluba završavaju u predstečajnim nagodbama kao posljedicom potpuno neracionalnog upravljanja godinama poradi prividne konkurentnosti koja to zapravo nije bila, jer osim jedne titule Cibone u regionalnoj ABA Ligi zapravo ni jedan od navedenih klubova u europskim okvirima nije imao nikakvu ulogu.

Važno je napomenuti da se na području bivše države igra regionalna Aba liga koja je osnovana kao Jadranska 2001. godine, a 2017. proširena i na drugu ABA Ligu, te su KK CIBONA i KK Zadar članovi prve, a KK Split član druge Aba lige. Sva tri kluba su zapravo imala ozbiljne stečajne razloge sa finansijskim dubiozama iz kojih se teško izvući, ali su iskoristili mogućnost instituta predstečajne nagodbe gdje su im vjerovnici oprostili 60-70 % ukupnih tražbina i cijelokupan iznos zakonske zatezne kamate, a KK Zadar i KK Split su iskoristili i

the state to the cities, which then recapitalized them and became the majority owners. (FINA, 2018)

The City of Zadar acquired 131,814 newly issued shares for more than HRK 32.9 million, which is 73.8 percent of ownership. The claims of *Tankerska plovidba* amounted to HRK 4.02 million, and were 'converted' into 16,080 shares (9 percent), the claims of *Tankerkomerc*, from HRK 844 thousand to 3,376 shares (1.89 percent), while the company *Marina Dalmacija* got 2,840 shares (1.59 percent) for its 710 thousand HRK receivables. *Tvornica kruha Zadar* acquired 416 newly issued shares of BC Zadar (HRK 0.23 percent) for a debt of HRK 104,000.

The transformation of BC Split from an association of citizens into a sports joint stock company took place just before the opening of the pre-bankruptcy settlement procedure, in such a way that the National Sports Federation and the Commission for Professional Sports Clubs at the Ministry of Science, Education and Sports obtained approvals for the Study on the Transformation of BC Split, which determined the share capital in the amount of HRK 7,758,750.00. At the Assembly of BC Split held on October 4, 2012, the Articles of Association of the Basketball Club Split of the sports joint stock company for performing sports activities were adopted, which regulated the basic rules regarding the legal status and organization of BC Split j.s.c. (hereinafter: the Company), as well as the relations between the shareholder and the relations between the shareholders and the Company. After the adoption of the Articles of Association, in accordance with Article 10 of the Company's Articles of Association, the process of subscribing shares begins in a way that the association BC Split sends a step-by-step invitation to subscribe and pay for shares to the City of Split, members of BC Split and the public. Thus, in the period from October 26, 2012 to December 28, 2012, 4 rounds of subscription and payment of shares in cash took place. The fifth subscription round was approved by the Commission for Professional Sports Clubs on February 1, 2013, and an invitation was sent to all creditors of the club to convert claims into roles in the Company. At the end of the fifth subscription round of the March 23, 2013 the share capital of the Company in the amount of HRK 7,758,750.00 was closed, namely by cash payments in the amount of HRK 3,956,500.00 and by replacement of receivables in the amount of HRK 3,802,250.00.

After that, the city of Split performed a recapitalization in the amount of slightly over HRK 24 million, based on the transfer of liabilities in the name of taxes, contributions and other public benefits that the Ministry of Finance transferred to the city of Split. However,

mogućnost preoblikovanja sukladno Zakonu o sportu gdje su iskoristili mogućnost prijenosa poreznih obveza prema državi na gradove koji su ih onda dokapitalizirali i postali većinski vlasnici (FINA, 2018).

Grad Zadar je za više od 32,9 milijuna kuna stekao 131.814 novoizdanih dionica, što čini 73,8 posto vlasništva. Tražbine Tankerske plovidbe iznosile su 4,02 milijuna kuna, a 'pretvorene' su u 16.080 dionica (9 posto), tražbine Tankerkomerca, od 844 tisuća kuna u 3.376 dionica (1,89 posto), dok je tvrtka Marine Dalmacije za svojih 710 tisuća kuna potraživanja dobila 2.840 dionica (1,59 posto). Za 104 tisuća kuna duga Tvornica kruha Zadar stekla je pak 416 novoizdanih dionica KK Zadra (0,23 posto).

Preoblikovanje KK Split iz udruge građana u sportsko dioničko društvo dešava se netom prije otvaranja postupka predstecajne nagodba i to na način da je od Nacionalnog sportskog saveza te od strane Povjerenstva za profesionalne sportske klubove pri Ministarstvu znanosti, obrazovanja i sporta ishodovane su suglasnosti na Elaborat o preoblikovanju KK Split, a u kojem je utvrđen temeljni kapital u visini od 7.758.750,00 kuna. Na Skupštini KK Splita održanoj 4. listopada 2012. g. usvojen je Statut Košarkaškog kluba Split sportskog dioničkog društva za obavljanje sportskih djelatnosti, a kojim se uređuju temeljna pravila u pogledu pravnog statusa i ustrojstva KK Splita s.d.d. (dalje u tekstu: Društvo), kao i odnosi između dioničara, te odnosi između dioničara i Društva. Nakon usvajanja Statuta, sukladno članku 10. Statuta Društva, započinje proces upisivanja dionica i to na način da udruga KK Split upućuje stupnjeviti poziv na upis i uplatu dionica Gradu Splitu, članovima udruge KK Split i javnosti. Tako se u periodu od 26. listopada 2012. do 28. prosinca 2012. g. održavaju 4 kruga upisa i uplata dionica u novcu. Peti upisni krug je odobrilo Povjerenstvo za profesionalne sportske klubove dana 1. veljače 2013. godine, te je upućen poziv svim vjerovnicima kluba da tražbine pretvore u uloge u Društву. Završetkom i petog upisnog kruga dana 23. ožujka 2013. g. zatvoren je temeljni kapital Društva u vrijednosti od 7.758.750,00 kuna, i to uplatama u novcu u iznosu od 3.956.500,00 kuna i zamjenom potraživanja u iznosu od 3.802.250,00 kn.

Nakon toga, grad Split radi dokapitalizaciju u iznosu nešto većem od 24 milijuna kn i to temeljem prijenosa obveza na ime poreza, doprinosa i drugih javnih davanja koje je Ministarstvo financija prenijelo na grad Split. Međutim, neovisno i o uplati temeljnog kapitala u novcu i dodatne dokapitalizacije prenešenom tražbinom Ministarstva financija, to je bilo nedostatno za daljnje nesme-

regardless of the payment of share capital in cash and additional recapitalization by the transferred claim of the Ministry of Finance, this was insufficient for further smooth functioning of the club and a pre-bankruptcy settlement was initiated due to additional liabilities in the amount of slightly over HRK 26 million.

BC Cibona, which did not go through the transformation, also ended up in a pre-bankruptcy settlement with liabilities of slightly more than HRK 40 million, most of which fell on suppliers in the amount of slightly more than HRK 18 million, slightly over HRK 16 million was owed to players and a little over 6 million to local government bodies. In the pre-bankruptcy settlement procedure this obligation was reduced by almost 60% to about HRK 17 million.

This was actually the end of the chronology of the collapse of the three largest Croatian basketball clubs that were highly renowned in Europe until the 1990s.

In contrast, there was a corporate concept of functioning of the club with the background of *Atlantic trade* (one of the largest Croatian corporations) which sometime in the 2005/2006 season entered Croatian basketball through the Cedevita brand through the already existing pioneer Hiron Botinac which changed its name. They increased their investments from year to year and sometime from 2010 they actually took over the primacy in the Croatian basketball scene until the surprising departure to Ljubljana before the 2019/2020 season and the merger with the largest Slovenian club BC Olimpija. However, BC Cedevita also spent quite large sums during the rule of Croatian club basketball, with which they exclusively had the upper hand in the national championship, failing to win the regional ABA League, the title of which was worth playing in the Euroleague.

It is worth mentioning that the placement in the FINAL Four ULEB Eurocup in 2011 was won, along with the 3rd place.

When it comes to the financial aspect, it is worth noting that in the last two years of operation and business in Zagreb, BC Cedevita had revenues of slightly more than HRK 46 million, with a profit of approximately HRK 2 million in 2017 and a loss of slightly more than HRK 2 million in 2018. Certainly, expectations at this level of the budget were much higher than the titles of national champion and cup winner, which could have been achieved with a much smaller budget, whereas for the regional-European step where it would have to almost double to reach the Euroleague to achieve the smallest budgets of the Euroleague, this was obviously insufficient.

Unlike all professional basketball sports clubs analyzed so far, BC Cedevita was the only one to have stable

tano funkcioniranje kluba te je pokrenuta predstečajna nagodba zbog dodatnih obveza u iznosu nešto većem od 26 milijuna kuna u kojem pretežiraju obveze u kratkom roku.

I KK Cibona koja nije išla u preoblikovanje je također završila u predstečajnoj nagodbi sa obvezama nešto većim od 40 milijuna kuna, od čega je najveći dio odпадao na dobavljače u iznosu nešto većem od 18 milijuna kuna, nešto više od 16 milijuna kn je bio dug prema igračima i nešto više od 6 milijuna prema tijelima lokalne uprave, te je u postupku predstečajne nagodbe ta obveza smanjena za gotovo 60 % na nekih 17 milijuna kn.

Ovo je zapravo bio završetak kronologije urušavanja tri najveća hrvatska košarkaška klubu koji su bili velikani u europskim okvirima sve do devedesetih godina prošlog stoljeća.

Nasuprot tome, pojavio se korporativni koncept funkcioniranja kluba sa background-om Atlantic trade-a (jedne od najvećih hrvatskih korporacija) koji negdje u sezoni 2005/2006. ulazi u hrvatsku košarku kroz brand Cedevita i putem već postojećeg prvogaša Hiron Botinca koji mijenja ime, da bi iz godine u godinu povećavali svoja ulaganja i negdje od 2010. godine zapravo preuzeli primat na hrvatskom košarkaškom nebu sve do iznenađujućeg odlaska u Ljubljano prije sezone 2019/2020. i fuzioniranjem sa najvećim slovenskim klubom KK Olimpija. Međutim i KK Cedevita je za vrijeme vladavine hrvatskom klupskom košarkom trošila poprično velike iznose s kojima su isključivo imali prevlast u nacionalnom prvenstvu pritom ne uspijevši ni u jednom navratu osvojiti regionalnu ABA Ligu čiji naslov vrijedi nastupa u Euroligi.

Vrijedi napomenuti da je izboren plasman na FINAL Four ULEB eurokupa 2011. godine i pritom osvojeno 3. mjesto.

Kad je pak riječ o finansijskom aspektu, vrijedi napomenuti da je KK Cedevita u zadnje dvije godine rada i poslovanja u Zagrebu imala prihode nešto veće od 46 milijuna kn pritom ostvarivši dobit od cca 2 milijuna kn u 2017. godini i gubitak nešto veći od 2 milijuna kn u 2018. godini. Svakako su očekivanja na ovoj razini budžeta bila puno veća od titula nacionalnog prvaka i pobjednika kupa koje su mogle biti ostvarene i sa višestruko manjim budžetom, a za regionalno-europski iskorak očito nedostatan gdje bi ga za nastup u Euroligi trebalo gotovo udvostručiti da bi se dostigli najmanji budžeti euroligaša.

Za razliku od svih dosad u radu analiziranih profesionalnih košarkaških sportskih klubova, KK Cedevita je za vrijeme djelovanja u glavnom hrvatskom gradu jedina

financing during its operations in the Croatian capital, in which there were so-called regular revenues, as it was not dependent on public money or some other source that lacks stability or continuity.

Therefore, when it comes to the best Croatian basketball clubs, three of the four analyzed (BC Cibona, BC Zadar and BC Split) have a lot in common, especially in terms of excessive management and dependence on city money, and their future is questionable at a more serious level than the existing one, and the present is unworthy of clubs of such reputation and tradition. In addition, it is important to emphasize that in fact all three clubs reached the level of positive capital by writing off liabilities in pre-bankruptcy settlements that were earned, thus creating a "fictitious" profit in the fiscal year of completion of pre-bankruptcy settlements, to return to the realms of negative capital through irrational operations and losses.

As for handball, as we have already mentioned, it is worth noting two clubs, the undisputed ruler of Croatian club handball, the HC PPD Zagreb team (throughout history, the club almost always contained the names of large Croatian companies that sponsored the name - *Chromos, Badel, Croatia Osiguranje*), which is also the most trophy-winning Croatian club in terms of the number of titles won, with a kind of rarity that HC PPD Zagreb won all the titles of champions of the Republic of Croatia, it won 10 titles in the former Yugoslavia, and is a two-time European champion with four European Champions League. It is also the only club that has played all seasons in the European Champions League since taking over the European Champions League EHF (European Handball Federation) from the IHF (International Handball Federation) under whose jurisdiction it was until 1993. It is important to note that HC PPD Zagreb is eighth on the eternal list of clubs with the best results in the European Champions League since its founding in 1956 until today, and only two clubs have played more European Champions League finals than the best Croatian team, namely the renowned clubs Barcelona and THW Kiel.

We have already pointed out that in recent history, HC PPD Zagreb has almost always had one large Croatian company as a name sponsor, while the rest of the funding has relied on the City of Zagreb and other majority state-owned companies. Due to the new EU regulations according to which majority state-owned companies are not allowed to finance clubs, HC PPD Zagreb was left without this source of funding, and two years ago turned to diversifying the revenue structure by developing the "Small Sponsors Pool" model as a new source where a large number of new sponsors with relatively small amounts of sponsorship in total

imala stabilno financiranje u kojem su pretežirali tzv. redoviti prihodi, i nije bila ovisna o javnom novcu li nekom drugom izvoru koji nema stabilnost ili kontinuitet.

Dakle, kad su u pitanju najbolji hrvatski košarkaški klubovi, tri od četiri analizirana imaju (KK Cibona, KK Zadar i KK Split) jako puno zajedničkih odrednica, poglavito u dijelu neumjerenog upravljanja i ovisnosti od gradskog novca, te je njihova budućnost na ozbilnijoj razini od postojeće vrlo upitna, a sadašnjost nedostojna klubova takvog renomea i tradicije. Osim navedenog, bitno je naglasiti da su zapravo sva tri kluba razine pozitivnog kapitala dosegli otpisom obveza u predstičajnim nagodbama koje su oprihodovane stvarajući na taj način „fiktivni“ profit u fiskalnoj godini završetka predstičajnih nagodbi, da bi ponovno neracionalnim poslovanjem i gubicima došli u sfere negativnog kapitala.

Što se pak tiče rukometa, kao što smo već spomenuli vrijedi istaknuti dva kluba, neprijepornog vladara hrvatskog klupskega rukometa, momčad RK PPD Zagreba (klub je kroz povijest gotovo uvijek u imenu sadržavao imena velikih hrvatskih kompanija koje su bile sponzor imena-Chromos, Badel, Croatia Osiguranje), koji je ujedno i najtrofejniji hrvatski klub po broju osvojenih titula uz svojevrsni raritet da je RK PPD Zagreb osvojio sve titule prvaka Republike Hrvatske, a u bivšoj Jugoslaviji je osvojio 10 titula, te je dvostruki prvak Europe uz još četiri finala Lige europskih prvaka, te je riječ o jedinom klubu koji je odigrao sve sezone u ligi europskih prvaka od trenutka preuzimanja nadležnosti za Ligu europskih prvaka EHF-a (europske rukometne federacije) od IHF-a (svjetske rukometne federacije) pod čijom nadležnošću je bio do 1993. godine. Važno je napomenuti da je RK PPD Zagreb osmi na vječnoj listi klubova sa najboljim rezultatima u ligi europskih prvaka od njenog osnutka 1956. godine pa sve do današnjih dana, te su samo dva kluba igrala više finala lige europskih prvaka od najbolje hrvatske momčadi, i to velikani Barcelona i THW Kiel.

Već smo istaknuli da je RK PPD Zagreb kroz noviju povijest imao gotovo uvijek jednu veliku hrvatsku kompaniju kao sponzora imena, dok je ostatak financiranja bio naslonjen na Grad Zagreb i druge kompanije u većinskom državnom vlasništvu. Usljed nove regulative europske unije po kojoj tvrtke u većinskom državnom vlasništvu ne smiju financirati klubove, i RK PPD Zagreb je ostao bez tog izvora financiranja, te se unatrag dvije godine okrenuo diverzifikaciji prihodovne strukture razvijajući model „Pool-a malih sponzora“ kao novoga izvora gdje veliki broj novih sponzora sa relativno malim iznosima sponzorstva u ukupnom zbroju daju relativno veliki nominalni iznos koji može nadomjestiti

give a relatively large nominal amount that can compensate for most or almost the entire amount of lost sponsorship from state-owned companies. On the other hand, this would activate a 100% owned company whose profits in the last fiscal year financed 20% of the total income of the club with a large variability of the expenditure structure that allowed greater flexibility and the possibility of easier adjustment in conditions of reduced income for any reason.

This combination of the greatest possible diversification of the revenue structure and the greatest possible variability of the expenditure structure is actually the only model of functioning of professional sports clubs in non-commercial sports in Croatia except for the corporate model nurtured by BC Cedevita and Nexe Handball Club from Našice, which is the greatest competitor of HC PPD Zagreb. HC PPD Zagreb needs a minimum of 3 million euros annually, which ensures primacy at the national level, and within the League of European Champions in elite groups it is the smallest budget with that of HC Celje Pivovarna Laško and is sufficient for a difficult struggle from year to year to pass among the 16 best teams of the old continent. HC PPD Zagreb is also one of the very few clubs from "non-commercial sports" that was not in the pre-bankruptcy settlement, nor did it use the possibility of transformation by converting the transferred tax debts into share capital. The analysis of business results for the last four years shows the ability of expenditure adjustment to reduce revenues in the short term, where expenditures in 2018 fell from 26 million in 2017 to 22.67 million, which included two lawsuits in the amount of approx. 1.3 million which are expenditures of previous periods, and then in 2019 grow by about 14%, while revenues in 2019 grew by 31.5%, which means that, through nonlinear growth of revenues and expenditures, the club increased profitability by solving accumulated losses, or in the words of nonprofits association, cumulative income shortfalls.

When it comes to HC Nexe from Našice, we are talking about an essentially similar model as BC Cedevita in basketball, where large domestic companies practically stand behind the club with the wholehearted help of their suppliers or service providers who, due to the large volume of turnover with the corporation, give sponsorship to the club as a bonus. However, unlike BC Cedevita, HC Nexe did not create the largest budget in the country through the corporate model, but approximately three times lower than HC PPD Zagreb.

In terms of playing, they rely on young Croatian scouts and players from the region who show the potential for serious achievements in the early stages of their careers, and they have made a good model in that segment.

veći dio ili gotovo cijeli iznos izgubljenog sponzorstva od državnih tvrtki, a s druge strane aktivirajući trgovac-ko društvo u stopostotnom vlasništvu *čijim* je profitom u zadnjoj fiskalnoj godini financirano cca 20 % ukupnog prihoda kluba uz veliki varijabilitet rashodovne strukture koja omogućuje veću fleksibilnost i mogućnost lakše prilagodbe u uvjetima smanjenih prihoda iz bilo kojeg razloga.

Navedena kombinacija *što* je moguće veće diverzifikacije prihodovne strukture s jedne strane i *što* je moguće veće varijabilnosti rashodovne strukture zapravo jedini model funkciranja profesionalnih sportskih klubova u nekomercijalnim sportovima u Hrvatskoj izuzev korporativnog modela koji je njegovala KK Cedevita i koji njeguje Rukometni klub Nexe iz Našica, najveći konkurent RK PPD Zagreba. RK PPD Zagreb na godišnjoj razini treba minimalno 3 miljuna eura koji iznos osigurava primat na nacionalnoj razini, a u okvirima Lige europskih prvaka u elitnim skupinama riječ je o najmanjem proračunu uz onaj od RK Celje Pivovarna Laško i dostatan je za tešku borbu iz godine u godinu za prolazak među 16 najboljih ekipa starog kontinenta. RK PPD Zagreb je ujedno jedan od vrlo rijetkih klubova iz „nekomercijalnih sportova“ koji nije bio u predstecajnoj nagodbi, niti je iskoristio mogućnost preoblikovanja pretvarajući prenesene porezne dugove u temeljni kapital. Iz analitike poslovnih rezultata zadnje *četiri* godine vidljiva je sposobnost rashodovne prilagodbe smanjenju prihoda u kratkom roku, gdje su rashodi u 2018. godini pali sa 26 milijuna u 2017. godini na 22,67 milijuna u koje su uključena i dva sudska spora u iznosu od cca 1,3 milijuna koja su rashod prošlih razdoblja, a zatim u 2019. godini rastu cca 14 %, dok prihodi u 2019. rastu 31,5 %, *što* znači da kroz nelinearni rast prihoda i rashoda klub povećava profitabilnost rješavajući kumulirane gubitke, odnosno riječnikom neprofitnih udruga kumulirane manjke prihoda.

Kada je pak riječ o RK Nexe iz Našica onda govorimo o suštinski sličnom modelu kao *što* je KK Cedevita u košarci, gdje u principu velike domaće kompanije stoje iza klubu uz svesrdnu pomoć svojih dobavljača ili pružatelja usluga koje zbog velikog obujma realiziranog prometa sa korporacijom kao bonus daju sponzorstvo klubu, s tim *što* za razliku od KK Cedevita, RK Nexe nije kroz korporativni model stvorio najveći proračun u državi nego otprilike trostruko manji od RK PPD Zagreb.

U igračkom smislu su oslojeni na skouting mladih hrvatskih i igrača iz regije koji u ranim fazama karijere pokazuju potencijal za ozbiljne domete, i u tom segmentu su napravili dobar model. Problem funkciranja ru-

The problem with the functioning of handball as a “sport of small towns” lies in the fact that in our economies in small towns it is very difficult to make a serious budget, so the endeavor of the Našice Club is commendable, and one of the few that exists in the former Yugoslavia.

It should be emphasized that the corporate model of Našice in terms of results in relation to the value of the budget looks healthier than a similar model of BC Cedevita, which was also associated with a big city and a more commercially viable sport. According to the data from the last available year 2017, Našice earned HRK 6,167,919.00, mainly from two sources - income from the provision of services in the amount of HRK 3,677,228.00 and income from donations in the amount of HRK 2,149,986.00, which is practically income that comes from the main sponsor of the economic “giant” from Našice on the one hand and their corporate partners who, due to long-term cooperation and high levels of mutual business activities, additionally pay HC Nexe. Expenditures were slightly over HRK 7 million, more precisely HRK 7,049,362.00, and the players were mostly employees of the Club, which is enabled by the Sports Law.

When it comes to water polo, the flagships of Croatian water polo from Croatian independence to the present day are WPC Jug from Dubrovnik and CAWPC Mladost from Zagreb who has won a total of 25 national championship titles (WPC Jug 15 and CAWPC Mladost 10) with two titles of Rijeka Primorje and one of the Split POŠK (i.e. *Splitska banka*). These two teams also combine eleven European championship titles (Mladost 7 and Jug 4), making water polo the most trophy-winning club sport in Europe in Croatia. According to available data, WPC Jug annually spends between HRK 8.1 and 8.7 million, and revenues and expenditures are balanced. CAWPC Mladost, on the other hand, went into pre-bankruptcy settlement in 2013 with a total debt of HRK 19.3 million, from of which slightly more than 2 million referred to the debt to the state, Zagreb Holding and the Croatian Water Polo Association, 4.4 million to *Privredna banka Zagreb*, and HRK 12.8 million to other creditors, among whom former players predominated. The pre-bankruptcy settlement was finally concluded in 2014 in such a way that the Club was obliged to pay the former players the total amount of 60% increased by interest in the four-year period, and other creditors the amount of 40% in the same period. While Jug earns between HRK 8.1 and 8.7 million a year with the same level of expenditures, CAWPC Mladost earns approximately HRK 6 million a year after the pre-bankruptcy settlement, of which approximately 80% is income from donations from the City of Zagreb. It is much easier for WPC Jug because they

kometa kao „sporta malih gradova“ leži u *činjenici* da je u našim gospodarstvima u malim gradovima jako teško složiti ozbiljan proračun, tako da je poduhvat Kluba iz Našica hvale vrijedan, i jedan od rijetkih koji ozbijno egzistira u bivšoj Jugoslaviji.

Treba naglasiti da korporativni model Našičana u rezultatskom smislu u odnosu na vrijednost proračuna izgleda zdravije od sličnog modela KK Cedevita koji je k tome bio vezan za veliki grad i komercijalno isplatljivi sport. Pritom su Našičani prema podacima iz zadnje dostupne godine 2017. uprihodovali 6.167.919,00 kn, i to pretežito iz dva izvora-prihoda od pružanja usluga u iznosu od 3.677.228,00 kn i prihoda od donacija u iznosu od 2.149.986,00 kn što su u principu prihodi koji potječu s jedne strane od glavnog sponzora gospodarskog „diva“ iz Našica s jedne strane i njihovih korporativnih partnera koji poradi dugogodišnje suradnje i velike razine uzajamne poslovne aktivnosti dodatno honoriraju RK Nexe. Pritom su rashodi bili nešto iznad 7 milijuna kn, točnije 7.049.362,00 kn, te su igrači uglavnom bili zaposlenici Kluba što omogućava Zakon o sportu.

Kada je u pitanju vaterpolo, perjanice hrvatskog vaterpola od hrvatske samostalnosti, pa do današnjih dana su VK Jug iz Dubrovnika i HAVK Mladost iz Zagreba koji su osvojili ukupno 25 titula nacionalnog prvaka (VK Jug 15 i HAVK Mladost 10) uz dvije titule riječkog Primorja i jednu splitskog POŠK-a (odnosno Splitske banke). Te dvije momčadi također kombinirano nose jedanaest titula prvaka europske (Mladost 7 i Jug 4) po čemu je vaterpolo najtrofejniji klupski sport u europskim okvirima u Hrvatskoj. Prema dostupnim podacima VK Jug godišnje troši između 8,1 i 8,7 milijuna kuna na godišnjem nivou, te su prihodi i rashodi uravnoteženi. HAVK Mladost je pak otišla u predstečajnu nagodbu 2013. godine sa ukupnim dugom od 19,3 milijuna kn, od čega se nešto više od 2 milijuna odnosio na dug državi, Zagrebačkom holdingu i hrvatskom vaterpolskom savezu, 4,4 milijuna prema Privrednoj banci Zagreb, te 12,8 milijuna kn prema ostalim vjerovnicima među kojima su preovladavali bivši igrači. Predstečajna nagodba je u konačnici sklopljena 2014. godine na način da je Klub obvezan isplatiti bivše igrače u ukupnom iznosu od 60 % uvećanom za kamate u četverogodišnjem razdoblju, a ostale vjerovnike od 40 % u istom periodu. I dok Jug godišnje uprihoduje između 8,1 i 8,7 milijuna kn uz jednaku razinu rashoda, HAVK Mladost nakon predstečajne nagodbe uprihoduje godišnje cca 6 milijuna kuna od čega je cca 80% prihod od donacija Grada Zagreba. Pritom je VK Jugu puno lakše jer su jedini dubrovački klub na ovakvoj razini, te je VK Jug jedan od simbola grada Dubrovnika, i postoji veliki konsenzus

are the only Dubrovnik club at this level, and WPC Jug is one of the symbols of the city of Dubrovnik, while there is a great consensus between the city authorities and the economy about financing WPC Jug.

The common determinant of Croatian club sports lies in the dependence on non-permanent sources, and the variability of these revenues is independent of whether the variability relies on results such as football or the ability of the city budget in other sports. At the moment, there is no adequate solution in the existing system and functioning of sports in the Republic of Croatia.

Zajednička odrednica hrvatskog klupskega sporta leži v ovisnosti o izvorima koji niso stalni, te je varijabilnost tih prihoda neovisna o tome je li varijabilitet ovisi o rezultatima, kar što je primjer u nogometu ili o sposobnosti gradskog proračuna u ostalim sportovima zapravo nestabilnost klubova za koju se u ovom trenutku ne nazire adekvatno rješenje u postojećem sustavu i funkcioniranju sporta u Republici Hrvatskoj.

Model of the impact of budget funds (local communities), economy and own revenues on reducing the financial risk of sports clubs in Croatia

The following model investigates the impact of different forms of financing sports clubs in Croatia on the reduction of financial risk. The variables used in this research are the following:

- Appropriations (independent variable),
- Economy (independent variable),
- Own source revenues (independent variable) and
- Financial risk (dependent variable).

The data used for the regression analysis were taken from the financial agency FINA on the basis of annual reports of sports clubs from Croatia. Not all sports clubs are taken into consideration, only those that compete in European competitions. The independent variables tested relate to investments in sports on three sides, budget funds from all levels of government, as well as economic investment and own revenues generated by sports clubs (membership fees, viewers, TV rights, European competitions, etc.).

The dependent variable that measures financial risk was set so that 0 are those sports teams that operate at a loss, while 1 are those sports teams that operate positively.

The model will directly provide an answer to the hypothesis, which examines the greatest impact of these types of funding, on reducing financial risk in sports clubs in Croatia. According to the above, as well as the set hypothesis of the paper, zero and alternative hypotheses can be set, where one will be accepted and the other rejected, which read:

gradskih vlasti i gospodarstva oko financiranja VK Juga.

Zajednička odrednica hrvatskog klupskega sporta leži v ovisnosti o izvorima koji niso stalni, te je varijabilnost tih prihoda neovisna o tome je li varijabilitet ovisi o rezultatima, kar što je primjer u nogometu ili o sposobnosti gradskog proračuna u ostalim sportovima zapravo nestabilnost klubova za koju se u ovom trenutku ne nazire adekvatno rješenje u postojećem sustavu i funkcioniranju sporta u Republici Hrvatskoj.

Model utjecaja proračunskih sredstava (lokalnih zajednica), gospodarstva i vlastitih prihoda na smanjenje finansijskog rizika sportskih klubova u Hrvatskoj

Naredni model istražuje utjecaj različitih oblika finansiranja sportskih klubova u Hrvatskoj, na smanjenje finansijskog rizika. Varijable koje se koriste u ovom istraživanju su:

- Proračunska sredstva (nezavisna varijabla),
- Gospodarstvo (nezavisna varijabla),
- Vlastiti prihodi (nezavisna varijabla) i
- Finansijski rizik (zavisna varijabla).

Podaci koji su korišteni za regresionu analizu preuzeti su iz finansijske agencije FINA na bazi godišnjih izvještaja sportskih klubova iz Hrvatske. U razmatranje nisu uzeti svi sportski klubovi, već samo oni koji se takmiče u evropskim takmičenjima. Nezavisne varijable koje su testirane, odnose se na ulaganja u sport sa tri strane: sredstva iz budžeta sa svih razina vlasti, zatim ulaganje privrede i vlastiti prihodi koje ostvaruju sportski klubovi (članarine, gledaoci, tv prava, evropska takmičenja i sl.).

Zavisna varijabla koja mjeri finansijski rizik se postavila tako da 0 čine oni sportski kolektivi koji posluju sa gubicima, dok 1 oni sportski kolektivi koji posluju pozitivno.

Model će direktno dati odgovor na postavljenu hipotezu, koja ispituje koji je najveći utjecaj navedenih vidova finansiranja na smanjenje finansijskog rizika u sportskim klubovima u Hrvatskoj. Prema navedenom, kao i postavljenoj hipotezi rada, mogu se postaviti nulta i alternativna hipoteza, gdje će jedna biti prihvaćena, a druga odbačena, a koje glase:

Ho – Najveći uticaj na smanjenje finansijskog rizika sportskih klubova imaju vlastiti prihodi.

Također, bitno je naglasiti da su korišteni podaci u uzorku prikupljeni na osnovu primarnih podataka, a ispitano je blizu 500 sportskih radnika u Hrvatskoj.

Ho – Sports clubs' own revenues have the greatest impact on reducing their financial risk

Also, it is important to emphasize that the data used in the sample were collected on the basis of primary data, and nearly 500 sports workers in Croatia were surveyed.

When it comes to variables related to the impact of reducing funding risk, it can be concluded that the Cronbach Alpha test showed that there is a medium-high relationship between variables, and that there is a presumption of compatibility between these variables, therefore we may proceed with further analysis of the model. (Jerkovic, Obhodjas, & Ilicic, 2019)

Common criteria for the Crombach Alpha Reliability Coefficient (De Vellis, 2010) are listed in the following table:

Table 2. Acceptable and unacceptable levels of Crombach Alpha Reliability Coefficient

Alpha Coefficient / Alfa koeficijent	Implied Reliability / Implicitirana pouzdanost
Below 0.6 / Ispod 0,6	Unacceptable / Neprihvatljiv
0.6 – 0.65	Border / Granična
0.65 – 0.7	Acceptable / Prihvatljiva
0.7 – 0.8	Very good / Vrlo dobra
0.8 – 0.9	Excellent / Odličan
Over 0.9 / Iznad 0,9	Scale should be shortened / Treba skratiti skalu

Source: De Vills 2010

This model provides the best possible prediction of the value of a dependent variable based on the value of the independent variables, if all assumptions are met. Based on the magnitude of the regression coefficients, we can conclude what is the relative influence or importance of each independent variable, if these coefficients are converted into beta coefficients β . These coefficients are obtained when all values of the variables are standardized. (Šupuković, Jakupović, & Obhodaš, *Modeliranje procesa upravljanja upravljanja u funkciji ispunjavanja dugoročnih ciljeva u hrvatskim tvrtkama*, 2019)

One of the assumptions for the use of regression analysis is the existence of a linear relationship between the variables. It is necessary because the analysis begins with the calculation of simple correlation coefficients (bivariate correlations) for all pairs of variables, and all these calculations require a linear relationship between pairs of variables. (Šupuković, Merkaš, & Gajić, *Operational Leverage as a Source of Profitability of Business in Croatia*, 2017)

Table / Tabela 1. Cronbach Alpha test

Reliability Statistics	
Cronbach's Alpha	N of Items
.668	4

Source: Authors' processing in SPSS 20.

Izvor: Obrada autora u SPSS 20.

Kada su u pitanju varijable koje se odnose na utjecaj smanjenja rizika financiranja, može se zaključiti da je Cronbach Alpha test pokazao da postoji srednje visoka veza između varijabli, te da postoji pretpostavka kompatibilnosti između navedenih varijabli, te se može krenuti sa daljom analizom modela. (Jerković, Obhodaš, & Iličić, 2019)

Uobičajeni kriterij za Crombachov alfa koeficijent pouzdanosti (De Vellis, 2010.) navedeni su u sljedećoj tabeli:

Tabela 2. Prihvatljive i neprihvatljive razine Crombach alfa koeficijenta pouzdanosti

Alpha Coefficient / Alfa koeficijent	Implied Reliability / Implicitirana pouzdanost
Below 0.6 / Ispod 0,6	Unacceptable / Neprihvatljiv
0.6 – 0.65	Border / Granična
0.65 – 0.7	Acceptable / Prihvatljiva
0.7 – 0.8	Very good / Vrlo dobra
0.8 – 0.9	Excellent / Odličan
Over 0.9 / Iznad 0,9	Scale should be shortened / Treba skratiti skalu

Izvor: De Vills 2010.

Ovaj model daje najbolje moguće predviđanje vrijednosti zavisne promjenjive na osnovu vrijednosti nezavisnih promjenjivih, ako su sve pretpostavke ispunjene. Na osnovu veličine regresionih koeficijenata možemo zaključiti koliki je relativni uticaj ili važnost svake nezavisne promjenjive, ako se ti koeficijenti konvertuju u beta koeficijente β . Ovi koeficijenti se dobiju kada se sve vrijednosti promjenjivih standardizuju (Šupuković, Jakupović i Obhodaš, 2019).

Jedna od pretpostavki za upotrebu regresione analize jeste postojanje linearne zavisnosti između varijabli. Ona je neophodna jer analiza započinje izračunavanjem koeficijenata proste korelacije (bivarijantnih korelacija) za sve parove varijabli, a sva ova izračunavanja zahtevaju linearan odnos između parova varijabli (Šupuković, Merkaš i Gajić, 2017).

Table 3. Model Correlations**Tabela 3. Korelacija modela**

		Correlations			
		<i>Financial risk reduction / Smanjenje finansijskog rizika</i>	<i>Funds from the budget / Sredstva iz proračuna</i>	<i>Economy / Gospodarstvo</i>	<i>Own revenues / Vlastiti prihodi</i>
<i>Pearson Correlation</i>	<i>Financial risk reduction / Smanjenje finansijskog rizika</i>	1.000	-.631*	.429*	-.827**
	<i>Funds from the budget / Sredstva iz proračuna</i>	-.631*	1.000	-.236**	-.191*
	<i>Economy / Gospodarstvo</i>	-.429*	-.236**	1.000	-.399**
	<i>Own revenues / Vlastiti prihodi</i>	-.827**	-.191*	-.399**	1.000
<i>Sig. (1-tailed)</i>	<i>Financial risk reduction / Smanjenje finansijskog rizika</i>	.	.037	.047	.01
	<i>Funds from the budget / Sredstva iz proračuna</i>	.037	.	.000	.034
	<i>Economy / Gospodarstvo</i>	.047	.000	.	.000
	<i>Own revenues / Vlastiti prihodi</i>	.001	.034	.000	.

Source: Authors' processing in SPSS 20.

From Table 3, we can conclude that there is a negative correlation between independent and dependent variables, which can be interpreted as revenue growth on any basis affecting financial risk reduction. It is important to emphasize that all coefficients are statistically significant, and that they are in a linear relation with financial risk reduction. However, what is important is that the club's own revenues have the greatest impact on financial risk reduction in sports clubs in Croatia.

Table 4. Model Coefficients

Izvor: Obrada autora u SPSS 20.

Iz Tabele 3. se može zaključiti da postoji negativan korelacioni odnos između nezavisnih i zavisne varijable, a što se može protumačiti da rast prihoda po bilo kojem osnovu utiče na smanjenje finansijskog rizika. Bitno je naglasiti da su svi koeficijenti statistički značajni, te da se nalaze u linearном odnosu sa smanjenjem finansijskog rizika. Međutim, ono što je bitno, da najveći utjecaj na smanjenje finansijskog rizika kod sportskih klubova u Hrvatskoj imaju vlastiti prihodi klubova.

Tabela 4. Koeficijenti modela

Model	Unstandardized Coefficients			t	Sig.
	B	Std. Error	Beta		
1 (Constant)	4.631	.416		4.224	.000
<i>Funds from the budget / Sredstva iz proračuna</i>	-.630	.079	-.594	-4.995	.031
<i>Economy / Gospodarstvo</i>	-.209	.165	-.197	-6.987	.042
<i>Own revenues / Vlastiti prihodi</i>	-.712	.071	-.690	-.807	.009

a. Dependent Variable: *Financial risk reduction / Smanjenje finansijskog rizika*

Source: Authors' processing in SPSS 20.

The previous table examines the impact of the form of financing of sports clubs in Croatia, and according to the results it can be concluded that the multiple regression function is as follows:

$$y = 4.631 - 0.630X_1 - 0.209X_2 - 0.712X_3$$

Whereby:

- X1 – *Funds from the budget,*
- X2 – *Economy,*
- X3 – *Own revenues.*

Izvor: Obrada autora u SPSS 20.

Prethodna tabela ispituje utjecaj oblika financiranja sportskih klubova u Hrvatskoj, a prema rezultatima može se zaključiti da multipli regresiona funkcija izgleda:

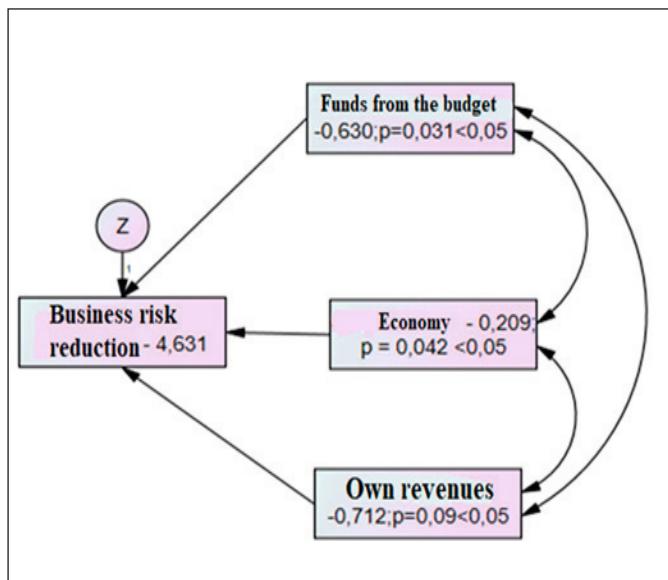
$$y = 4,631 - 0,630X_1 - 0,209X_2 - 0,712X_3$$

Gdje je:

- X1 – *Sredstva iz proračuna,*
- X2 – *Gospodarstvo,*
- X3 – *Vlastiti prihodi.*

An interesting fact is that if funds from the budget, economy and own revenues were 0 Kn, in that case the financial risk would be 4,631. This data is important, because the scale by which financial risk is measured goes from 1 - the lowest risk, to 5 - the highest risk. Therefore, it can be concluded that sports clubs in Croatia are funded from these three categories in over 90%.

It can also be concluded that own revenues still have the greatest impact on financial risk reduction. Clubs that base their business on their own income have less possibilities of increasing financial risk. According to the above, it can be concluded that the hypothesis set in the paper is proven, and the following statement is accepted:
Ho - Sports clubs' own revenues have the greatest impact on reducing their financial risk.



Graph 1. Model of the impact of funds from the budget, economy and own revenues on risk reduction in the operations of Croatian sports clubs

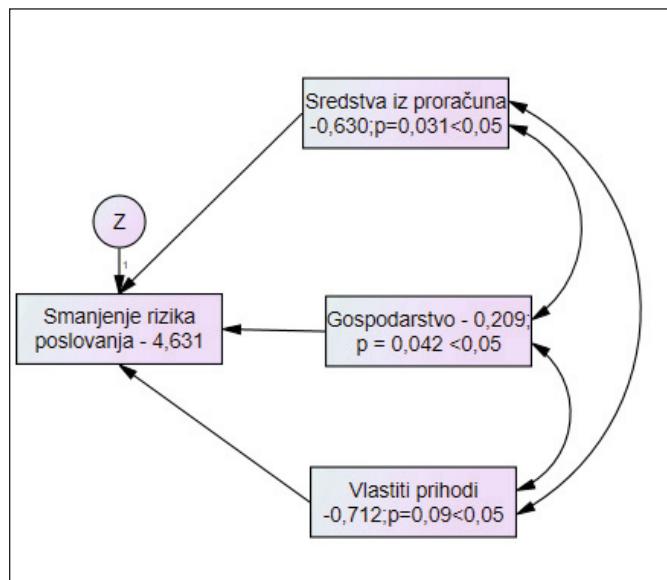
Source: Authors' processing in AMOS program

CONCLUSION

The issue of the functioning of top sports clubs in the Republic of Croatia is a broader social question to which the answer cannot be given without the consensus of all participants and regulators: legislative and executive power represented by the Central State Office for Sports, national sports federations, top sports clubs and ultimately the economy that must finance it. Since there is currently no adequate platform for the functioning of federations and clubs, and given the dependence of football and clubs and the Croatian Football Federation on money from UEFA and FIFA, which finances

Interesantan podatak, da ako bi sredstva iz proračuna, gospodarstva i vlastiti prihodi iznosili 0 Kn, u tom slučaju financijski rizik bi iznosio 4,631. Ovaj podatak je bitan, jer skala po kojoj se mjeri financijski rizik ide od 1 – najmanji rizik, pa do 5 – najveći rizik. Prema tome, može se zaključiti da se sportski klubovi u Hrvatskoj preko 90% financiraju iz ove tri kategorije.

Također, može se zaključiti da najveći utjecaj na smanjenje financijskog rizika ipak imaju vlastiti prihodi. Klubovi koji svoje poslovanje zasnivaju na vlastitim prihodima imaju manju mogućnost od povećanja financijskog rizika. Prema navedenom, može se zaključiti, da je hipoteza, postavljena u radu i dokazana, te da se prihvata
Ho - Najveći uticaj na smanjenje financijskog rizika sportskih klubova imaju vlastiti prihodi.



Grafikon 1. Model utjecaja sredstava iz proračuna, gospodarstva i vlastitih prihoda na smanjenje rizika u poslovanju hrvatskih sportskih klubova

Izvor: Obrada autora u programu AMOS

ZAKLJUČAK

Pitanje funkciranja vrhunskih sportskih klubova u Republici Hrvatskoj je šire društveno pitanje na koje odgovor nije moguće dati bez konzenzusa svih sudionika i regulatora: zakonodavne i izvršne vlasti koju predstavlja Središnji državni ured za sport, nacionalnih sportskih saveza, vrhunskih sportskih klubova i u konačnici gospodarstva koje mora sve to isfinancirati. Budući da adekvatna platforma za funkcioniranje saveza i klubova trenutačno ne postoji. S obzirom na ovisnost u nogometu i klubova i hrvatskog nogometnog saveza o novcu iz UEFA i FIFE iz kojih se financira hrvatski nogometni

the Croatian Football Association, based on the results of senior national football teams in qualifications and appearances at European and world football championships, and the leading HNL clubs that are participants in the qualifications and group stages of European club competitions, as well as indirectly the rest of the first league through the so-called Solidarity Fund established by UEFA, after talks with the European Commission where depending on the placement of national champions and other high-ranking clubs that end up in the Champions League groups, the rest of the league is entitled to a substantial amount where, for example, the rest of the Croatian league distributed the amount of EUR 4,000,000.00, and the rest of the sports that depend on public money, whether it is the financing of federations through CSOS or state-owned companies, or clubs that depend on local government budgets, the possibilities of adaptation to crisis situations are very small, and the resilience of clubs is almost non-existent. The ongoing crisis caused by the Covid pandemic is a clear indicator of the situation in Croatian professional clubs, whose amortization possibilities regarding much smaller impact than the current one are virtually non-existent, as capital stocks do not exist while future revenue projections are difficult to predict and severely compromised by reduced budgets of local self-government units, reduced liquidity of UEFA and large European clubs that paid high indemnity clauses during the transfer of the best players from Croatian football clubs.

In such a "black environment" for the survival of Croatian professional clubs, a solution must be sought on the one hand in agreement with all participants who will make an acceptable legal solution with a clear decision on sports of vital national interest, the manner of financing and evaluationg the sport itself or its status in the Croatian sports hierarchical pyramid, as well as the results of clubs in national, regional and European competitions, and on the other hand in adequate management solutions that provide rational corporate business regardless of the legal status of clubs, i.e. form of their registration.

Since Croatia is a country in which sports results in either collective or individual sports imply great cohesion and homogeneity of the population, there is a greater need for full regulation of professional sports, or clubs in the Republic of Croatia, as large and economic effects of top sports results are primarily evident in trade and tourism industry. On the other hand, the positioning and repositioning of Croatian professional clubs in national and European frameworks with the help of legislation and revenues that such regulated legislation will allocate

savez temeljem rezultata seniorske nogometne reprezentacije u kvalifikacijama i nastupima na europskim i svjetskim nogometnim prvenstvima, te vodeći klubovi HNL-a koji su sudionici kvalifikacija i grupnih faza europskih klupske natjecanja, a posredno i ostatak prve lige putem tzv. Fonda solidarnosti. Fond koji je UEFA osnovala nakon razgovora sa europskom komisijom gdje ovisno o plasmanu prvaka država i ostalih visoko plasiranih klubova koji završe u skupinama lige prvaka ostatak lige ima pravo na pozamašan iznos. Gdje je primjerice ostatak hrvatske lige na temelju plasmana Dinama u Ligu prvaka u 2019. godine podijelio iznos od 4.000.000,00 eura, te ostakta sportova koji ovise o javnom novcu bilo da je riječ o financiranju saveza putem SDUŠ-a ili pak tvrtki u državnom vlasništvu, ili klubova koji ovise o proračunima lokalne samouprave, to je mogućnost prilagodbe u kriznim situacijama vrlo mala, a otpornost klubova gotovo nikakva. Upravo je kriza koja još uvijek traje uzrokovana pandemijom covid 19 zorni pokazatelj stanja u hrvatskim profesionalnim klubovima čije su mogućnosti amortizacije i puno manjih udara krize od ove postojeće zapravo nikakve, jer kapitalne zalihe ne postoje, a projekcije budućih prihoda teško predvidive i debelo ugrožene smanjenim budžetima jedinica lokalne samouprave, te smanjenom likvidnošću UEFE i velikih europskih klubova koji su plaćali visoke odštete klauzule prilikom transfera najboljih eksponata iz hrvatskih nogometnih klubova.

U takvom „crnom okruženju“ za opstojnost hrvatskih profesionalnih klubova, rješenje se mora tražiti s jedne strane u suglasju svih sudionika koji će donijeti prihvatljivo zakonsko rješenje sa jasnom odlukom o sportovima od vitalnog nacionalnog interesa, načinu njihova financiranja i načinu evaluacije kako samog sporta odnosno njegovog statusa u hrvatskoj sportskoj hijerarhiskoj piramidi, tako i rezultata klubova u nacionalnim, regionalnim i europskim natjecanjima, a s druge strane u adekvatnim upravljačkim rješenjima koja sa sobom nose racionalno korporativno poslovanje neovisno o pravnom statusu klubova, tj. obliku njihove registracije.

Budući je Hrvatska država u kojoj sportski rezultati bilo u kolektivnim, bilo u pojedinačnim sportovima sa sobom nose veliku koheziju i homogenost stanovništva, time je veća potreba za punom regulacijom funkcioniranja profesionalnog sporta, odnosno klubova u Republici Hrvatskoj, jer su veliki i gospodarski učinci vrhunskih sportskih rezultata prije svega u trgovini i turističkoj industriji. S druge pak strane pozicioniranje i repozicioniranje hrvatskih profesionalnih klubova u nacionalnim i europskim okvirima uz pomoć zakonodavstva i prihoda

depends on the internal organizational structure of the clubs, adequate projection of future revenues that will have minimal oscillation and enable expenditure adjustment based on a minimum level of fixed cost where this operating leverage will not be a burden, and variability of all other costs that have been fixed and have not been vital so far, as well as full revenue diversification where club management structures will find diverse sources of income through available sponsorships, yet by lowering the nominal amounts of value in order to make it acceptable to average entrepreneurs in the Croatian economy with full tax relief that would be provided to these entrepreneurs by the Sports Law and Profit Tax Law.

Therefore, it can be concluded that the model showed a high degree of correlation between independent and dependent variables. Thus, it can be concluded that there is a high correlation between reducing financial risk in the business of sports clubs and different forms of financing. However, the strongest link is the one between own revenues and reducing financial risk. This correlation also coincides with impacts, where by far the largest beta coefficient of impact on financial risk reduction is, precisely, the one of own revenues. Finally, it can be concluded that the set goal of the research has been fulfilled, and the set hypothesis has been proven.

koje će tako regulirano zakonodavstvo dodijeliti, najviše ovisi o unutarnjem organizacijskom ustrojstvu samih klubova. Adekvatnoj projekciji prije svega budućih prihoda koja će imati minimalnu oscilaciju i omogućiti rashodovnu prilagodbu zasnovanu na minimalnoj razini fiksнog troška, gdje ta operativna poluga neće biti teret i varijabilizaciji svih ostalih troškova koji su u dosadašnjim poslovanjima imali fiksni karakter a nisu imali vitalni značaj. Kao i punoj prihodovnoj diverzifikaciji gdje će upravljačke strukture klubova naći raznolike izvore prihoda putem dostupnih sponzortava, ali snižavanjem nominalnih iznosa vrijednosti ne bi li postala prihvatljiva prosječnim poduzetnicima u hrvatskom gospodarstvu uz pune porezne olakšice koje bi tim poduzetnicima omogućili Zakon o sportu i Zakon o porezu na dobit.

Prema tome, može se zaključiti da je model pokazao visok stepen povezanosti između nezavisnih i zavisne varijable. Dakle, može se zaključiti da postoji visoka povezanost smanjenja finansijskog rizika u poslovanju sportskih klubova i različitim oblicima financiranja. Ipak, najveća povezanost je između vlastitih prihoda i smanjenja finansijskog rizika. Ova povezanost se poklapa i sa utjecajem, gdje su daleko najveći beta koeficijent utjecaja na smanjenje finansijskog rizika, upravo vlastiti prihodi. Na kraju se može zaključiti da je ispunjen postavljeni cilj istraživanja, kao i dokazana postavljena hipoteza.

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ANALYSIS OF THE EDUCATIONAL PROCESS IN TEACHING PHYSICAL AND SPORTS ACTIVITIES COLLECTIVES FOR SECONDARY EDUCATION UNDER THE COMPETENCY APPROACH

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Abstract: This study aimed to analysis the educational process in teaching physical and collective sports activities for secondary education in light of the competencies approach, that is to say that we analyze here the phenomena of teaching group physical and sports activities for secondary education as they exist in the educational system, and in their association with various institutional and educational conditions, and we try to deconstruct And analyze the teaching of these activities, where we used the descriptive analytical approach. The study was conducted on a sample of 206 teachers of physical and sports education working in some high schools in the Algerian region using a questionnaire network. We have come to say that the educational process in teaching collective physical and sports activities is based on educational goals and procedures and evaluation; and through this, the material of physical and sports education becomes a leading role as a result of developing the performance of teachers, and therefore this offering can be considered as a way to reform educational systems through the reform of educational materials.

Conclusions: The findings suggest that motor competence and body mass index are negatively associated among children and adolescents. Further research should include another type of test for examining motor competence.

Key words: The analysis, Educational proces, teaching, competency approach.

INTRODUCTION

The school is an educational institution which contributes to the education of the individual and helps him to grow in all aspects of his physical, psychological, mental, spiritual and social personalit. It also helps to develop the will of individuals and to correctly orient their preferences and desires ; and modify their behavior and provide them with expertise and skills to help them adapt to the society in all areas. In order to properly prepare the individual, the school as an educational institution must provide a different set of study materials and educational programs. Among the academic subjects, we find physical education and sports because it is considered as an integral part of general education which aims to prepare the appropriate citizen for physical, mental, emotional and social aspects through the colors of activity chosen to achieve these characteristics (Harshaoui youssef and others, 2011) . It is an essential element of the Algerian education system, and one of the milestones of education which aims to prepare the student physically, psychologically and mentally in perfect balance (Ben saber muhammad and others, 2017) . Through which the professor seeks to achieve the existing goals, whether they are in the physical skill or cognitive domain (zubaysh samir and others, 2020) ; In the light of the fundamental changes that the Algerian education system has undergone linked to the development of programs, the so-called skills approach has become an organized educational process through which the teacher works to place the learner in front of several posts. The learner uses their tribal gains in knowledge, skills and competence (Fatima Al-Zahra Sadig, 2014). It is a new formulation of educational goals based on the teacher's skill in building the goal, known as educational behaviors (kroum mohammed , 2010) . As physical education and sports teachers and our desire to raise awareness in the field of teaching physical and sports activities, it was necessary to analyze teaching phenomena in the form in which they exist in the education system, and in their association with various institutional and educational conditions. As far as teaching is concerned, it includes all the conditions and capacities that the teacher provides in a specific teaching situation (Harbash Ibrahim, 2013). Given the fact that this subject is unique in its nature compared to other subjects, we decided to throw our current study on analysis and try to dismantle the teaching of collective physical and sports activities and, as a result from

this, several directions appeared to us, including we began to seek the correct way by which the educational process in the teaching of physical activities and sports for secondary education, And given that this subject is unique in its nature compared to the other subjects, we decided to throw our current study on the analysis and to try to dismantle the teaching of the physical and sports collective activities. As a result of this, several trends have emerged for us, among which we have sought to seek the correct way in which the educational process is conducted in the teaching of physical and sports activities for secondary education. It was necessary to look for an appropriate way to analyze these practices, because the analysis depends on reference models which allow a rational reading of the facts and based on the reference models for the analysis of the educational process as a model of pedagogical analysis. from the Dutch researcher Van Gelder (1965) , Educational activity analysis model by Suarez (1985) , Clazire presented her model which integrates the two models and simplifies the basic concepts of very complex educational work and highlights the elements necessary in their mutual relationship. This is what Drig Muhammad does in his book The Analysis of the Educational Process and Teacher Training (Al-Dorij mohammed , 2004) , And based on studies such as the Center for Teacher Training at the University of Florida (1985), which is considered one of the serious studies in the analysis and identification of educational skills , And the study by Jack Noel (1997), entitled Analysis of educational practices, is an ethical and symbolic framework for educating the point of view of a teacher , A study by Rochelle Davis (2000) on the teacher evaluation system at Montgomery prepared by the researcher developed by the Maryland Commission in the context of programs known as the year "The Search for Better Teaching" (2010) in the United States. United States of America recognizes the importance and complexity of teaching in high performing schools , A study by belQaidum Belkacem (2013) on the educational efficiency of an intermediate teacher, processes and interaction as criteria , And a study by Fatima Zahra Sadiq (2014) , The study of Hamdan salah (2018), The study of Sadiq Khalid Al-Hayek (2018), The study of Bitar Hisham (2020), All these studies have dealt with the subject of the educational process, and on the basis of previous theoretical readings, we have presented the following problem:

Is the educational process in teaching collective physical and sports activities for secondary education in Algeria based on criteria) model (?.

2- Research Procedures:

2-1-The method used in the research: The two researchers used the descriptive approach

2-2- The sample and its selection methods: The research sample included 23% of the research community consisting of 879 professors, to obtain a sample of 206 teachers for physical education and mathematics for secondary education, who were randomly selected. without taking into account the variable of age, sex or years of work The questionnaires were distributed to teachers during seminars and days study with inspectors.

2-3- search tools:

2-3-1-Questionnaire: The researcher used a form (of three grades) prepared by the researcher, Mohamed Al-Saleh Saadawi, and presented it to a group of arbitration professors with specialization to make it appropriate to study what was prepared for him according to the local environment.

2-3-2-Distribution of questionnaires: The questionnaire was distributed to professors during seminars and academic days with the inspectors in some secondary schools in the cities of the western Algeria,The attached table shows the distribution of questionnaire forms to teachers.

Table 1: clarifies the distribution of the questionnaires among the professors of each of the western states surveyed

the number	Direction	Number of forms expressed	The percentage of the study population
01	Tlemcen	22	% 2.5028
02	ain Temouchent	15	% 1.7064
03	sidi belabbes	22	% 2.5028
04	oran	67	% 7.6222
05	mascara	10	% 1.1376
06	mostaghnem	37	% 4.2093
07	chlef	33	3.7542 %
Échantillon total		206	% 23.4353

Source: prepared by the researcher

2-4-Statistical tools: The researcher used statistical methods using the SPSS statistical program in order to calculate: percentage, iterations, alpha-Krumbach coefficient, standard deviation, The average Arithmetic , quadratic test (Ca2)

1- View, analyze and discuss the results of the questionnaire as a whole

Table 2: clarifies the results of the questionnaire as a whole

the number	the hub	The average Arithmetic	standard deviation	Degree of approval
01	Goal axis	2.646	0.2124	%88.2
02	Axis of educational procedures	2.672	0.3548	%89.1
03	Calendar axis	2.617	0.3336	%87.2

2- View, analyze and discuss the results of the questionnaire :According to the axes

2-1- View, analyze and discuss the results of the first axis linked to the objectives

Table 3: clarifies the results of the first axis (objectives)

the question	The average Arithmetic	Significance level	Degree of liberty	Ka2 Calculated	ka2 schedule	Degree of approval	Significance
01	2.43			101.282		%80.9	
02	2.69			150.184		%89.8	
03	2.86			274.291		%95.5	
04	2.43			86.515		%81.1	
05	2.88			118.136		%96.0	
06	2.87			279.505		%95.8	
07	2.35	0.01	2	90.913	5.99	%78.3	means
08	2.48			91.379		%82.5	
09	2.38			80.981		79.4	
10	2.88			284.107		%96.0	
11	2.62			118.961		%87.2	
12	2.83			89.786		%94.3	
13	2.59			111.184		%86.4	

2-2- View, analyze and discuss the results of the second axis linked to the pedagogical procedures:

Table 4: clarifies the results of the second axis (educational procedures)

<i>the question</i>	<i>The average Arithmetic</i>	<i>Significance level</i>	<i>Degree of liberty</i>	<i>Ka2 Calculated</i>	<i>ka2 schedule</i>	<i>Degree of approval</i>	<i>Significance</i>
14	2.45			101.282		%81.6	
15	2.46			150.184		%81.9	
16	2.51			274.291		%83.7	
17	2.90			86.515		%96.6	
18	2.59			118.136		%86.2	
19	2.69			279.505		%89.6	
20	2.66			90.913		%88.5	
21	2.40	0.01	2	91.379	5.99	%79.9	means
22	2.75			80.981		%91.7	
23	2.50			284.107		%83.3	
24	2.93			118.961		%97.7	
25	270			89.786		%90.0	
26	2.71			111.184		%90.3	
27	2.75			182.019		%91.6	
28	2.82			235.757		%94.0	

2-3-Presentation, analysis and discussion the results of the third axis linked to evaluation:

Table 5: clarifies the results of the third axis (evaluation)

<i>the question</i>	<i>The average Arithmetic</i>	<i>Significance level</i>	<i>Degree of liberty</i>	<i>Ka2 Calculated</i>	<i>ka2 schedule</i>	<i>Degree of approval</i>	<i>Significance</i>
29	2.86			109.223		%95.5	
30	2.69			147.796		%89.6	
31	2.70			158.456		%90.1	
32	2.55			94.495		%85.0	
33	2.60	0.01	2	110.456	5.99	%86.6	means
34	2.38			88.379		%79.4	
35	2.44			86.049		%81.4	
36	2.60			110.573		%86.6	
37	2.75			189.33		%91.7	
38	2.45			72.01		%81.7	

DISCUSS THE RESULTS

1-Through the results of the first axis of the questionnaire, we concluded that the educational process of teachers of physical and sports education in teaching physical and sports activities collective for secondary education in Algeria is based on objectives ; With an average score of 2,646 and a very high approval score of 88.2% ; this is due to the fact that teachers have constructed and formulated objectives ; starting with diagnostic assessment and indicators ; Where these results were consistent with the results of the Asiri study in (2001) under the title «The extent of the importance of the pedagogical skills required for physical education teachers at Riyadh college ; And the study of Mohammed Al-Draij in (2004) under the title of analysis of the educational process and teacher training; Through the previous presentation to discuss the results of the first hypothesis, it is clear that this hypothesis indicates that the

educational process in teaching collective physical and sports activities for secondary education in Algeria is based on the objectives.

2- Through the results of the second axis of the questionnaire, we concluded that the educational process of teachers of physical and sports education in teaching physical and sports activities collective for secondary education in Algeria is based on Educational procedures and achievements ; With an average score of 2.672 and a very high approval score of 89.1% ; This is due to the use of teachers in teaching group physical and sporting activities for very acceptable educational procedures and achievements represented in appropriate methods and methods and appropriate strategies such as cooperative learning strategy and problem solving strategy; Where these results were consistent with the results of the Asiri study in (2001) under the title «The extent of the importance of the pedagogical skills required for physical education teachers at Riyadh college ; And the study of Mohammed Al-Draij in (2004) under the title of analysis of the educational process and teacher training; A Mauban study at Cherbrooke University in Geneva in 2009 under the title Professional educators: a new perspective on the analysis of teaching practices, Through the previous presentation to discuss the results of the second hypothesis, it is clear that this hypothesis indicates that the educational process in teaching collective physical and sports activities for secondary education in Algeria is based on the Educational procedures and achievements.

3-Through the results of the third axis of the questionnaire, we concluded that the educational process of teachers of physical and sports education in teaching physical and sports activities collective for secondary education in Algeria is based on evaluation ; With an average score of 2.617 and a very high approval score of 87.2% ; This is the result of the great role that teachers give to the evaluation component, starting with diagnostic evaluation, since formative evaluation as a process evaluation is in line with the educational process and indicators, and finally at the end of the periodic unit ; Where these results were consistent with the results of the Asiri study in (2001) under the title «The extent of the importance of the pedagogical skills required for physical education teachers at Riyadh college ; And the study of Mohammed Al-Draij in (2004) under the title of analysis of the educational process and teacher training , Through the previous presentation to discuss the results of the third hypothesis, it is clear that this hypothesis indicates that the educational process in teaching collective physical and sports activities for secondary education in Algeria is based on the evaluation

CONCLUSIONS

1- In discussing the results of the first partial hypothesis, we have come to say that the educational process in teaching collective physical and sports activities for secondary education in Algeria is done on the basis of the objectives.

2- In discussing the results of the second partial hypothesis, we have come to say that the educational process in teaching collective physical and sports activities for secondary education in Algeria is done on the basis of the Educational procedures and achievements.

3-In discussing the results of the third partial hypothesis, we have come to say that the educational process in teaching collective physical and sports activities for secondary education in Algeria is done on the basis of the evaluation.

GENERAL CONCLUSION

Through our study focused on the subject of the analysis of the educational process in the teaching of physical activities and group sports for secondary education in the light of the competency-based approach, we found that most teachers of physical education and sports in secondary schools in some cities of western Algeria focus on the objectives because of this axis of great importance and the great importance of the analysis of the educational process, The component of educational procedures is also of great importance in light of their use of appropriate strategies such as cooperative learning strategy in the first place and problem-solving strategy, as well as evaluation and achievement component, plays an important role and important in the course of this process

Thus, the analysis of the educational process in the teaching of group physical and sports activities for secondary education in the secondary towns of the towns of western Algeria in particular and of Algeria in general has positively reflected their professional performance , as shown by the results achieved.

This process, which is represented in the pedagogical analysis in the teaching of group physical and sports ac-

tivities for secondary education in the light of the competency approach, is a complex process in which a group of elements s' are intertwined, but it is very positive that he should focus on the development of educational processes and work on the development of study methods in order to highlight weaknesses to work on correcting them. And highlight strengths and work to assess them

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E-SPORT DURING THE COVID-19 PANDEMIC AND ITS NEGATIVE IMPACT ON CHILD HEALTH

E-SPORT TOKOM PANDEMIJE COVID-19 I NJEGOV NEGATIVAN UTICAJ NA ZDRAVLJE DECE

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Abstract: The Covid-19 virus pandemic has brought many problems, both in the functioning of everyday life and in various spheres of human health. Sport has always been considered a synonym for a healthy physical and mental state of people. The emergence of the phenomenon of e-sports has brought agility to a new market that cannot be defined by physical culture. The research will explain and prove the negative effects on children's health based on a survey whose results prove that most of the surveyed children engage in e-sports activities during a pandemic, rather than physical exercise, as well as other relevant research. Considering that sport in general and e-sport as a newly formed occupation, mostly children, have no other than terminological similarities, the research topic is subject to critical evaluation.

Keywords: Covid-19, physical culture, e-sports, health.

INTRODUCTION

In a study by Hamari and Sjöblom (2017), e-sports are defined as "a form of sport where the primary aspects of sport are facilitated by electronic systems, which in practical terms explain e-sport as competitive playing of video games with sports content".

Physical Education Ilić, Mijatović (2008) explained through two terminological concept, "the word "physical", which originates from the Greek and means a natural, sensual and carnal aspect and "culture", which is a word derived from Latin and means in translation words : cultivating, perfecting, nurturing, which in today's human activities means development and perfecting, that is, the set of all the achievements of the human spirit that man has created in his socio-historical development".

Also, Ilić, Mijatović (2008) defined the concept of physical culture as "part of general culture, the totality of

Sažetak: Pandemija Covid-19 virusa donela je mnoge probleme, kako u funkcionalisanju svakodnevnog života, tako i u raznim sferama zdravlja ljudi. Sport je uvek važio za sinonim zdravog fizičkog i mentalnog stanja ljudi. Pojava fenomena e-sporta donela je agilnost jednom novom tržištu koje se ne može definisati fizičkom kulturom. U istraživanju će biti objašnjeni i dokazani negativni efekti po zdravlje dece na osnovu ankete čiji nam rezultati dokazuju da se većina ispitane dece bavi e-sport aktivnostima tokom pandemije, a ne fizičkim vežbanjem, kao i na osnovu drugih relevantnih istraživanja. Obzirom da sport uopšteno i e-sport kao novonastala zanimacija, uglavnom dece, nemaju osim terminoloških sličnosti nijednu drugu, tema istraživanja podleže kritičkoj oceni.

Ključne reči: Covid-19, fizička kultura, e-sport, zdravlje.

UVOD

U istraživanju Hamari i Sjöblom (2017), e-sport definišu kao "oblik sporta gde su primarni aspekti sporta olakšani elektronskim sistemima, koji u praktičnom smislu objašnjavaju e-sport kao takmičarsko igranje video igara sportskog sadržaja".

Fizičku kulturu su Ilić, Mijatović (2008) objasnili kroz dva terminološka pojma, "reč "fizička" koja ima poreklo iz grčkog jezika i označava prirodni, čulni i telesni aspekt i "kultura" koja je reč poreklom iz latinskog jezika i označava u prevodu reči: gajenje, usavršavanje, negovanje, što u današnjim ljudskim aktivnostima označava razvitak i usavršavanje, odnosno skup svih tekovina ljudskog duha koje je čovek stvorio u svom društveno istorijskom razvoju".

Takođe, Ilić, Mijatović (2008) definisali su pojам fizičke kulture kao "deo opšte kulture, sveukupnost ma-

material and spiritual achievements in this field, aimed at physical development and raising human health".

The problem we are dealing with in this research indicates that e-sports, by its definition, does not contain aspects of the definition of physical culture, that it is harmful to the physical and mental health of children, compared to physical culture that develops positive psycho-physical aspects in children.

The Covid-19 virus pandemic has brought some new rules of living, distancing and anti-socialization that can have long-term consequences for people's psyche and health.

While the current trend of stagnation of professional sports is due to non-holding of competitions and other sports events due to the pandemic, e-sports activities are represented in an increasing number.

The so-called e-sports industry has experienced the greatest success due to the pandemic, which is not a good choice for parents to develop and preserve the health of their children.

The development of so-called e-sports has experienced such prosperity that it has been favored over some traditional, old sports for centuries based on the basic principles of sports and physical culture, for the commercialization that brings huge money and benefits to children through sports video games, a false image of sport in general and health as well.

The use of video games significantly is associated with aggressive behavior, aggressive cognition, aggressive influence and physiological arousal as well as negative children developed empathy towards others. It was also found that playing games and aggression in real life were correlated (Hatings et al., 2009).

The questions that include this research are the following:

What is the nature in terms of the social context of playing sports games for young children?

What is the relationship between playing video games of a child aged 8 to 10 and the outcome of the child as a result (weakening of intellectual performance, weakening of health and changes in behavior)?

Due to the absence, the reduction of the intensity of traditional sports activities during the pandemic, the e-sports industry used the current emotional, social, motivational state of society, in order for this industry to seize cognitive benefits. Pre pandemic itself, the audience and participants of e-sports was 272 million, while due to the reason of the pandemic is expected to be 495 million by the end of 2020, which is the main indicator of the aforementioned claims (Center for Sport and Human Rights, 2020).

terijalnih i duhovnih dostignuća u ovoj oblasti, usmernih fizičkom razvitku i podizanju zdravlja čoveka".

Problem kojim se bavimo u ovom istraživanju ukazuje nam da e-sport po svojoj definiciji ne sadrži aspekte definicije fizičke kulture, da je po fizičko i mentalno zdravlje dece štetan, u odnosu na fizičku kulturu koja kod dece razvija u najvećoj mogućoj meri pozitivne psihofizičke aspekte.

Pandemija virusa Covid-19 donela je neka nova pravila življenja, distanciranja i asocijalizacije koja može imati dugoročne posledice po psihu i zdravlje ljudi.

Dok je trenutni trend stagnacije profesionalnog sporta zbog neodržavanja takmičenja i drugih sportskih priredbi usled pandemije, e-sport aktivnosti su zastupljene u sve većem broju.

Industrija takozvanog e-sporta doživila je najveći uspeh usled pandemije što ne predstavlja dobar izbor roditelja za razvoj i očuvanje zdravlja dece.

Razvoj takozvanog e-sporta je doživeo takav prosperitet, da je favorizovan u odnosu na neke tradicionalne, stare sportove nekoliko vekova koji su se zasnivali na osnovnim principima sporta i fizičke kulture, radi komercijalizacije koja putem sportskih video igara donosi ogroman novac i benefite, pruža deci lažnu sliku o sportu uopšteno i zdravlju takođe.

Upotreba video igara značajno je povezana sa agresivnim ponašanjem, agresivnom spoznajom, agresivnim uticajem i fiziološkim uzbudjenjem kao i sa negativno razvijenom empatijom dece prema drugima. Takođe je utvrđeno da su igranje igara i agresija u stvarnom životu bili u korelaciji (Hatings i dr., 2009).

Pitanja koja uključuju ovo istraživanje su sledeća:

Kakva je priroda u smislu društvenog konteksta igranja sportskih igara za malu decu?

Kakvi su odnosi između igranja video igara deteta od 8 do 10 godina i posledica po dete usled toga (slabljenje intelektualnih performansi, slabljenje zdravlja i promene u ponašanju)?

Usled odsutnosti, odnosno smanjenjem inteziteta aktivnosti tradicionalnog sporta tokom pandemije, e-sport industrija iskoristila je trenutno emocionalno, socijalno, motivaciono stanje društva, kako bi ova industrija prigrabila kognitivne benefite. Pre same pandemije, publike i učesnika e-sporta je bilo 272 miliona, dok se usled razloga pandemije očekuje da će biti 495 miliona do kraja 2020. godine što je osnovni pokazatelj pomenuće tvrdnje (Center for Sport and Human Rights, 2020).

Zbog sve veće popularnosti e-sporta, naročito tokom pandemije, važno je utvrditi kakve negativne efekte

Due to the growing popularity of e-sports, especially during a pandemic, it is important to determine what negative effects this phenomenon causes in children, as well as what can affect them to be reduced or reduced.

RESEARCH METHODS

The research used a questionnaire on 120 school children aged 8-10, with 40 questionnaires per year, in order to confirm the problem posed by the argument that due to the Covid-19 virus pandemic, children were damaged by being measures engage in e-sports activities, playing video games, instead of physical exercise.

Using the results of the survey, this study should investigate the frequency of playing sports video games in children (ages 8 to 10), to assess the effects of changes in children's intellectual and physical abilities, problems and behavioral changes, and to predict long-term possible consequences.

Three inclusion criteria were used in the research:

The study dealt with playing video games as an exposure and thus assessed the extent to which and how to achieve the goal of reducing video game play during a pandemic and in general,

The study compares the effects of playing video games and engaging in physical culture,

The study was conducted as a controlled experiment.

RESULTS AND DISCUSSION

Based on the analysis of the reviewed questionnaires, the result can be seen in Table 1.

Table 1. Result of the number of children engaged in physical and e-sports activities

Age of children / Uzrast dece	He has physical activity / Ima fizičku aktivnost	E-sports activities / E-sport aktivnosti
8 years	25	15
9 years	17	23
10 years	8	32

The analysis of the survey questionnaire shows us that children as young as 8 have more physical activity in the form of recreational sports than e-sports activities.

9-year-olds spend more time indoors with e-sports activities, to then notice a drastic difference in 10-year-olds where most play video games.

According to the above, we can conclude that younger children, children as young as 8, are the most active in physical exercise activities, assuming that their parents have a greater educational influence on them. We notice that older children aged 9 and 10 spend time with

ovaj fenomen izaziva kod dece, kao i šta može uticati da se oni redukuju ili smanje.

METODE ISTRAŽIVANJA

U istraživanju je korišćen anketni upitnik na 120. školske dece godina između 8-10, sa po 40 upitnika po godištu, kako bi se potvrdio postavljen problem koji se odnosi na argumentaciju da su usled pandemije virusa Covid-19 deca oštećena time što se u velikoj meri bave e-sport aktivnostima, odnosno igranjem video igara, umesto fizičkim vežbanjem.

Koristeći rezultate ankete, ova studija treba da istraži učestalost igranja sportskih video igara kod dece (uzrasta od 8 do 10 godina), kako bi se ocenili efekti promena u intelektualnim i fizičkim sposobnostima dece, problemi i promene u ponašanju i da se predvide dugoročne eventualne posledice.

U istraživanju su korišćena tri kriterijuma inkluzije:

Studija se bavila igranjem video igara kao ekspozicijom i na taj način vršila procenu u kojoj meri i na koji način postići cilj smanjenja igranja video igara tokom pandemije i uopšte,

Studija upoređuje efekte igranja video igara i bavljenja fizičkom kulturom,

Studija je sprovedena kao kontrolisani eksperiment.

REZULTATI I DISKUSIJA

Na osnovu analize pregledanih upitnika, rezultat se može videti u Tabeli 1.

Tabela 1. Rezultat broja dece koja se bave fizičkom i e-sport aktivnostima

Analiza anketnog upitnika nam pokazuje da deca od 8 godina imaju više fizičke aktivnosti u vidu rekreativnog sporta, nego e-sport aktivnosti.

Deca od 9 godina više vremena provode u zatvorenom prostoru uz e-sport aktivnosti, da bi se zatim primećila drastična razlika kod dece od 10 godina gde se većina bavi video igram.

Po prethodno navedenom možemo zaključiti da su mlađa deca, deca od 8 godina najaktivnija u aktivnostima fizičkog vežbanja pod pretpostavkom da roditelji imaju veći vaspitni uticaj na njih. Primećujemo da starija

e-sports activities.

The e-sports industry, which is carrying out a huge media campaign during the virus pandemic due to financial benefits, does not pay attention to children who have a negative impact due to playing video games, which can produce a decline in mental and intellectual abilities, physical and social disabilities.

Restricting sports can therefore have “detrimental effects on young people and children, mental health and well-being, with periods of inactivity; isolation from sports teams; distance from the sports community; less qualified interactions with sports coaches; and lack of social activities shown to cause emotional distress and psychological disorders among young people and children” (Claudia & Reardon, 2017).

It is known that children who became infected with the Covid-19 virus, and are engaged in sports, reacted better even though they became infected with the virus due to a better general condition of the organism, while recovery was faster and better.

The propaganda used by the e-sports industry can very easily be characterized as violence against children and manipulation, because it has already been proven in academic circles that playing video games indoors can have long-term consequences.

The International Olympic Committee, as the highest governing body of the Olympic Movement, has given the following guidelines regarding the relationship between sports during a pandemic, but at no time issued a public statement suggesting that it is safer for children to play sports with protection measures. stands in the way of a profitable video game industry.

As stated in the statement, the instructions refer to the following: (International Olympic Committee, 2020)

It is necessary to store scientific advice, exchange of professional communications, connections and relevant information collected and provided by IOC members in research centers, academic institutions of sports medicine, national Olympic committees, international sports federations and among members of the general medical academic environment.

Dissemination of ongoing literature searches for relevant scientific papers to be added to the existing database.

Providing a platform for publishing an international series of cases to study the recovery of athletes from COVID-19.

From all the above, which refers to the instructions of the International Olympic Committee, we can conclude that they appeal to the academic community, pro-

deca od 9 i 10 godina provode vreme uz e-sport aktivnosti.

E-sport industrija koja zbog finansijskih benefita vrši ogromnu medijsku kampanju u toku pandemije virusa, ne obazire se na decu koja usled igranja video igara imaju negativan uticaj koji može proizvesti pad mentalnih i intelektualnih sposobnosti deteta, fizičke i socijalne nedostatke.

Ograničenje bavljenja sportom stoga može imati “štetan uticaj na mlade ljude i decu, mentalno zdravlje i blagostanje, sa periodima neaktivnosti; izolacije od sportskih timova; udaljenost od sportske zajednice; manje kvalifikovane interakcije sa sportskim trenerima; i nedostatak socijalnih aktivnosti pokazalo je da izaziva emocionalnu uzinemirenost i psihološke poremećaje kod mladih i dece” (Claudia & Reardon, 2017).

Poznato je da su deca koja su se inficirala virusom Covid-19, a bave se sportom, bolje reagovala čak iako su se inficirala virusom zbog bolje opšteg stanja organizma, pri čemu je oporavak bio brži i bolji.

Propaganda koju koristi e-sport industrija, veoma lako se može okarakterisati kao nasilje nad decom i manipulacija jer je u akademskim krugovima već dokazano da igranje video igara u zatvorenom prostoru može imati dugoročne negativne posledice.

Međunarodni olimpijski komitet kao najviši organ upravljanja olimpijskim pokretom dao je smernice vezane za odnos sporta za vreme pandemije, ali nijednog trenutka nije izdao javno saopštenje u kom sugeriše da je za decu bezbednije da se bave sportom uz mere zaštite, pri čemu kršeći principe olimpizma ne staje na put profitabilnoj industriji video igara.

Kako je navedeno u saopštenju, smernice se odnose na sledeće: (International Olympic Committee, 2020).

Neophodno je skladištiti naučne savete, potrebna je razmena stručnih komunikacija, veza i relevantnih informacija koje prikupljaju i pružaju članovi MOK-a u istraživačkim centrima, akademskim institucijama sportske medicine, nacionalnim olimpijskim komitetima, međunarodnim sportskim federacijama i među članovima opšte medicinske akademske sredine.

Širenje tekućih pretraga literature za relevantnim naučnim radovima koji bi se dodali u postojeću bazu podataka.

Obezbeđenje platforme za objavljivanje međunarodnih serija slučajeva za proučavanje oporavka sportista od COVID-19.

Po svemu navedenom što se odnosi na smernice Međunarodnog olimpijskog komiteta, možemo zaključiti da upućuju apel akademskoj zajednici, profesionalnim

fessional organizations and athletes, but not to the wider community and parents, in order to get the impression of the importance of their children's physical exercise during a pandemic. On the one hand, there is a strong marketing campaign of the e-sports industry, and on the other hand, there is no activity of sports organizations that would promote sports, and not playing video games.

It should be borne in mind that there are video games that are cooperative in nature and games that are competitive. Many games designed for multiple players have the modes of cooperative games in which players are encouraged to work together with others. Numerous studies support the hypothesis that cooperative gaming can promote pro-social behavior and can curb aggressive behaviors. Unlike cooperative gaming, researchers also investigated whether competitive gaming promotes aggression and discourages pro-social behavior. Using experimental and longitudinal designs, these studies indicated that both short-term and long-term, competitive gaming may be a greater predictor of aggressive outcomes than violence itself. However, cooperative and competitive game play has yet to be explored in the way these forms of play most commonly occur in the real world, in tandem. This is because many competitive video games not only allow for cooperative modes, but the competition in these games is often team-based. However, no longitudinal study has so far investigated the impact of both cooperative and competitive video game play (Lobel, Engels, Stone, Burk, & Granic, 2017).

The content of sports video games is diverse, and the psychological approach of a child while playing differs significantly in relation to the time of engaging in physical activity. During sports activities, the child in most cases feels empathy towards the opposing player. The child often does not feel responsible while playing games and due to curiosity, he can express aggression within the game he manages, knowing that he will not be responsible for it and really hurt the other person, especially if it is about martial arts. However, if a child plays a video game for a long time in which it is possible to express aggression, especially if we look at the age group surveyed in the survey results, we may find that the psychological effect on the child is such that video game behavior can be transferred to the real environment.

The problem of playing video games in children, in addition to psychological ones, is largely related to the physical health of children, namely: Anxiety, obesity, sleep disorders, stress, vision problems, muscular problems and epileptic seizures.

And the branching of video games related to vision

organizacijama i sportistima, ali ne i široj društvenoj zajednici i roditeljima, kako bi stekli utisak važnosti fizičkog vežbanja njihove dece tokom pandemije. Sa jedne strane postoji jaka marketinška kampanja e-sport industrije, a sa druge ne postoji aktivnost sportskih organizacija koje bi promovisale sport, a ne igranje video igara.

Treba imati u vidu da postoje video igre koje su kooperativnog karaktera i igre koje su takmičarskog. Mnoge igre dizajnirane za više igrača imaju režime kooperativnih igara u kojima se igrači ohrabruju da rade zajedno sa drugima. Brojne studije podržavaju hipotezu da kooperativno igranje igara može da promoviše prosocijalno ponašanje i može obuzdati agresivna ponašanja. Za razliku od kooperativnog igranja kompjuterskih igara, istraživači su takođe istraživali da li konkurentno igranje igara promoviše agresiju i obeshrabruje prosocijalno ponašanje. Koristeći eksperimentalne i longitudinalne dizajne, ove studije su ukazale da i kratkoročno i dugoročno, takmičarsko igranje može biti veći predviđač agresivnih ishoda od samog nasilja. Međutim, kooperativno i takmičarsko igranje igara tek treba da se istraži na način na koji se ovi oblici igre najčešće dešavaju u stvarnom svetu, u tandemu. To je zato što mnoge takmičarske video igre ne samo da dozvoljavaju kooperativne režime, već je konkurenčija u ovim igramama često zasnovana na timu. Međutim, nijedna do sada longitudinalna studija nije istovremeno istraživala uticaj i kooperativnog i takmičarskog igranja video igara (Lobel, Engels, Stone, Burk, & Granic, 2017).

Sadržaj sportskih video igara je raznolik, a psihološki pristup deteta dok igra se znatno razlikuje u odnosu na vreme bavljenja fizičkom aktivnošću. Dete za vreme sportske aktivnosti u najvećem broju slučajeva oseća empatiju prema protivničkom igraču. Dete često za vreme igranja igara ne oseća odgovornost i zbog radoznalosti može da u okviru igrice kojom upravlja, iskaze agresivnost znajući da za to neće odgovarati i stvarno povrediti drugu osobu, posebno ukoliko se radi o borilačkim veština. Međutim, ukoliko dete duže vreme igra video igru u kojoj je moguće izraziti agresivnost, posebno ukoliko se osvrnemo na starosnu ispitani grupu u rezultatima ankete, možemo doći do saznanja da psihološki efekat na dete bude takav da ponašanje iz video igre može da prenese u stvarno okruženje.

Problem igranja video igara kod dece, pored psiholoških se u velikoj meri odnose na fizičko zdravlje dece i to: Anksioznost, gojaznost, poremećaj spavanja, stres, problemi sa vidom, muskulurni problemi i epileptični napadi.

Igranje video igara povezano sa problemima sma-

problems in children. Extensive and fixed viewing of the screen causes a reaction of the cornea and pupil that are not biologically equipped for chronic viewing from electronic devices. Stressing the visual system from frequent use of video games causes headaches, dizziness, and in some cases, nausea and vomiting. Since children do not have fully formed muscles, due to sitting and insufficient movement for a long period of time, children may experience pain in the arms and joints up to the back and neck. As stated in the research of the mentioned author, in addition to the previously mentioned negative effects, a new term "Play-station finger" was established, which is characterized by numbness and blistering caused by friction between the thumb and the joystick. Using dermoscopy, dermatologists have discovered bleeding and oiholysis in children who play video games with great intensity. There is a high possibility of tendon injury caused by sudden movements of children while holding the joystick, then injuries and spinal deformities due to improper sitting (Ayenigbara, 2018a, Vission issues, para. 7).

And the video game industry is consistently directly linked to obesity. This aspect can be related to the fact that children who play e-sports are physically inactive, while playing video games they often have a meal and mostly snacks that are most practical at the time, but they are certainly not reduced to a healthy diet. Health workers concerns about epileptic seizures began in the 1980s. The first medically documented case was recorded in 1993, when it was announced that in the United States, a boy suffocated by his own vomiting during an attack caused by playing video games. According to the author, in 1994 it was noted that video games cause attacks only in predisposed people, with advice that such people can greatly reduce the risk of attack by being 3 meters or more away from the TV or wearing sunglasses (Ayenigbara, 2018b, Musculoskeletal & Obesity, para. 8).

CONCLUSION

E-sports and playing video games have become a modern trend that generations of adults are turning to in the age of modern technologies, and in the lack of free time of parents who can dedicate themselves to their children. In today's time when a lot is available, when sport is no longer a priority for children or parents, it is necessary to create strategies at the national level that would limit e-sports organizations, with previously argued research by government agencies to protect mental and physical development of children.

Effective applicable strategies could be reflected in the following:

njenja vida kod dece. Opsežno i fiksno gledanje u ekran izaziva reakciju rožnjače i zenice koje nisu biološki opremljene za hronično gledanje sa elektronskih uređaja. Naprezanje vizuelnog sistema od česte upotrebe video igara izaziva glavobolju, vrtoglavicu, a u nekim slučajevima i mučninu i povraćanje. Obzirom da deca nemaju potpuno formiranu muskulaturu, usled sedenja i nedovoljnog pomerenja duži vremenski period, kod dece se mogu javiti bolovi u rukama i zglobovima do leđa i vrata. Kako je navedeno u istraživanju pomenutog autora, pored prethodno navedenih negativnih efekata, ustanovljen je i novi termin "Playstation finger" koga odlikuje utrnulost i žulj koji nastaje trenjem između palca i džoystika. Koristeći dermoskopiju, kod dece koja u velikom intenzitetu igraju video igre, dermatolozi su otkrili krvarenje i oiholizm. Postoji velika mogućnost povrede tetiva izazvane naglim pokretima dece tokom držanja džoystika, zatim povreda i deformiteti kičme usled nepravilnog sedenja (Ayenigbara, 2018a, Vission issues, para. 7).

Igranje video igara je dosledno direktno povezano sa gojaznošću. Taj aspekt se može povezati sa činjenicom da su deca koja se bave e-sportom fizički neaktivna, tokom igranja video igara često imaju obrok i uglavnom grickalice koje su najpraktičnije u tom trenutku, ali se svakako ne svode na zdravu ishranu. Zabrinutost zdravstvenih radnika po pitanju epileptičnih napada počela je osamdesetih godina. Prvi medicinski dokumentovani slučaj zabeležen je 1993. godine kada je objavljeno da se u Sjedinjenim Američkim Državama dečak ugušio sopstvenom povraćkom tokom napada izazvanim igranjem video igara. Kako autor navodi, godine 1994. zabeleženo je da video igre izazivaju napade samo kod predisponiranih ljudi, uz savete da takve osobe mogu da u velikoj meri smanje rizik od napada tako što će biti udaljeni od televizora 3 ili više metara ili da nose zaštitne naočare za sunce. (Ayenigbara, 2018b, Musculoskeletal & Obesity, para. 8).

ZAKLJUČAK

E-sport i igranje video igara postao je savremeni trend kom se okreću generacije odrasle u vreme savremenih tehnologija, a u manjku slobodnog vremena roditelja koji mogu da se posvete svojoj deci. U današnjem vremenu kada je dosta toga dostupno, kada sport vise nije prioritet ni deci ni roditeljima, neophodno je napraviti strategije na nacionalnom nivou koji bi ograničio E-sport organizacije, uz prethodno argumentovano sprovedeno istraživanje državnih organa kako bi se na taj način zaštito mentalni i fizički razvoj dece.

Efikasne primenjive strategije mogle bi da se ogledaju u sledećem:

1. Educating children about the consequences of long-term playing video games on their mental and physical health
2. A program in which psychologists would participate and which would guide children within preschool and school institutions and teach them how to control their instinct to play games
3. Interactive communication between psychologists and children with an identified problem caused by playing video games and helping to build identity, self-esteem of the child and promote emotional intelligence outside the virtual world
4. Developing a new lifestyle for the child with the direct participation of the parents
5. Educating parents about the harmfulness of playing e-sports, ie playing video games.

Through the research, based on the survey and reference other research on the topic of this paper, the negative impact of e-sports as a phenomenological phenomenon for children's health, their psychological and physical development has been proven. A proposal for solving the set problem and instruments that can be used to solve it are given.

1. Edukacija dece o posledicama dugoročnog igranja video igara po njihovo mentalno i fizičko zdravlje
2. Program u kome bi učestvovali psiholozi i koji bi u okviru predškolskih i školskih ustanova usmeravali decu i učili kako da kontrolišu svoj nagon za igranjem igara
3. Interakcijska komunikacija psihologa i dece sa utvrđenim problemom izazvanim igranjem video igara i pomoći u izgradnji identiteta, samopoštovanja deteta i unapređenja emocionalne inteligencije izvan virtualnog sveta
4. Razvijanje novog stila života deteta uz obavenu direktno učestvovanje roditelja
5. Edukovanje roditelja o štetnosti bavljenja e-sportom, odnosno igranja video igara.

Kroz istraživanje je na osnovu ankete i referentnih drugih istraživanja oblasti teme ovog rada, dokazan negativan uticaj e-sporta kao fenomenološke pojave za zdravlje dece, njihov psihološki i fizički razvoj. Dat je predlog rešavanja postavljenog problema i instrumenti koji se mogu iskoristiti za rešavanje istog.

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