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HEALTH SPORT RECREATION

14th May 2021, Belgrade

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FOURTH INTERNATIONAL SCIENTIFIC CONFERENCE
„ HEALTH, SPORT, RECREATION“

ČETVRTA MEĐUNARODNA NAUČNA KONFERENCIJA
„ ZDRAVLJE, SPORT, REKREACIJA“

CONFERENCE PROCEEDINGS

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ZBORNIK RADOVA

COLLEGE OF SPORTS AND HEALTH /
VISOKA SPORTSKA I ZDRAVSTVENA ŠKOLA

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FOREWORD

The COVID-19 pandemic has affected all aspects of life in the past year and a half, not just health. A new way of life, which suppresses the natural need of the human organism to move, has governed the planet seemingly without a reasonable alternative. In an effort to preserve not only health, but also life, we were forced to engage in a new way of functioning, which in turn brings new challenges to maintaining health, as well as the affinity for sports and recreation.

This conference, the fourth in a row, entitled "Health, Sports, Recreation", is based on enthusiasm and the need to see the entire horizon of human functioning in the conditions of the COVID-19 pandemic. Focusing on health, we must not lose sight of the importance of sports and recreation in the function of preserving the overall psychophysical well-being of human functioning.

Through keynote lectures at the conference, the latest findings of scientific research on the interrelationship between sport, health and the COVID-19 pandemic were presented. Within three separate modules and scientific-professional fields: health, sports and recreation, conference participants coming from thirteen countries (Italy, Spain, Portugal, Greece, Turkey, Iran, Czech Republic, Moldova, Romania, Croatia, Bosnia and Herzegovina, North Macedonia, Serbia) presented and discussed the results of their scientific research and professional reflections.

We hope that with such a concept and realization of the conference, we managed to push the boundaries of scientific and professional knowledge in this moment marked by the COVID-19 pandemic.

Conference Programme and Organizing Committe

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UVODNA REČ

Pandemija covid19 obeležila je sve aspekte života u proteklih godinu i po dana, a ne samo zdravlje. Novi način života, koji potire prirodnu potrebu ljudskog organizma za kretanjem, zavladao je planetom naizgled bez argumentovane alternative. U nastojanju da se očuva ne samo zdravlje, već i život, bili smo primorani na nov način funkcionisanja, koji pak sa svoje strane donosi nove izazove očuvanju zdravlja, ali i afiniteta prema sportu i rekreaciji.

Ova konferencija, četvrta po redu, pod nazivom ’’Zdravlje, sport, rekreacija’’ iznikla je na entuzijazmu i potrebi da se sagleda celovit horizont ljudskog funkcionisanja u uslovima pandemije covid19. Stavljajući u prvi plan zdravlje, ne smemo izgubiti iz vida značaj sporta i rekreacije u funkciji očuvanja sveukupne psihofizičke dobrobiti ljudskog funkcionisanja.

Kroz uvodna predavanja na konferenciji predstavljeni su upravo najnoviji nalazi naučnih istraživanja o medjusobnoj povezanosti sporta, zdravlja i pandemije covid19. U okviru tri odvojene celine i naučno-stručna polja: zdravlje, sport i rekreacija, učesnici konferencije koji dolaze iz trinaest zemalja (Italija, Španija, Portugalija, Grčka, Turska, Iran, Češka, Moldavija, Rumunija, Hrvatska, Bosna i Herecegovina, Severna Makedonija, Srbija) prikazali su i diskutovali rezultate svojih naučnih istraživanja i stručnih promišljanja.

Nadamo se da smo tako koncipiranom i realizovanom konferencijom uspeli da pomerimo granice naučnog i stručnog saznanja u aktuelnom trenutku obeleženom covid19 pandemijom.

Programsko-organizacioni odbor konferencije

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ACCEPTED AUTHOR PROCEEDINGS / PRIHVAĆENIH AUTORSKIH RADOVA

HEALTH, SPORT, RECREATION
ZDRAVLJE, SPORT, REKREACIJA

HEALTH, SPORT, RECREATION

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ZDRAVLJE, SPORT, REKREACIJA

RELATIONSHIP BETWEEN COGNITIVE DEFICIT AND GAIT RECOVERY IN NEUROLOGICAL PATIENTS IN THE REHABILITATION PROCESS

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The Academy of Applied Preschool Teaching and Health Studies Department Cuprija

Abstract: In the last few decades, there has been a lot of talk about the problem of cognitive deficit in neurological patients, as well as the connection with motor impairments, with an emphasis on gait function. Multiple cognitive effects on walking, movement control and certain behaviors during walking have been observed. Preservation of cognitive functions is of special importance for the rehabilitation of neurological patients. The main goal of the research is based on the comparison of motor function and gait parameters with cognitive impairment in the examined patients after stroke. The study included 50 examined neurological patients after stroke, with diagnosed hemiparesis and completed early rehabilitation. The following were used to assess cognitive functioning: Mini Mental State Examination - MMSE; WCST - Wisconsin card sorting test and Trail Making Test - TMT A / B. The Functional Ambulation Category - FAC test was used to assess movement function. The results show that the examined patients after stroke with cognitive impairment have lower walking speed, lower walking frequency and shorter stride length than the examined patients after stroke without cognitive impairment, the difference is statistically significant. The results support the claim that there are specific cognitive deficits in patients after stroke, which may have an impact on the motor difficulties of these patients. One of the important goals of the rehabilitation process is to help the patient achieve the highest possible level of functional independence, within which walking is a basic component of independent functioning. The practical significance of the research can be fully confirmed, if the established connection is significant for the application of cognitive rehabilitation within medical rehabilitation and enable the achievement of a high degree of functional independence of neurological patients.

Keywords: cognitive functions; motor recovery; stroke; rehabilitation

INTRODUCTION

Cognitive deficits in neurological disorders are of multiple importances. It is assumed that in neurological patients, there is a conditionality of the quality of motor recovery with the degree of preservation of cognitive functions (Aditi & Mullick, 2015). In the last few decades, a large number of experts have dealt with the issue of cognitive deficit as part of a stroke. In addition, they analyzed the impact of the existing association with motor impairment, with an emphasis on gait function in these patients (Alvarez & Emory, 2006). Preservation of cognitive functions is of special importance for the rehabilitation of neurological patients. In accordance with the cognitive competence, the neurological patient will be able to set a goal and assess the real possibilities in achieving the goal in the rehabilitation process (Barcelo et al., 2006).

Multiple cognitive effects on gait and the relationship between movement control and appropriate behavior during gait were observed. Of all the motor functions, the gait function is the most endangered (Dobkin, 2006). Until recently, walking was considered a mostly automatic motor task that required minimal cognitive engagement at a higher level. However, growing evidence links changes in the ability to organize activities and attention, with gait irregularities present (Yogev-Seligmann et al., 2013).

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Executive functions are also included in gait control. These integrative functions include the motor and behavioral components necessary for the targeted actions necessary for the rehabilitation process. One of the most important goals of rehabilitation is for the neurological patient to achieve the highest possible level of functional independence (Deutsch, 2006). This can be achieved by mastering the skill of walking.

Given that the brain acts as a whole, not only in normal but also in disturbed conditions, it means that there are specifics of adaptation to lesions in which all preserved brain structures participate, which is another important field in research (Pavlović, 2013). This created the possibility for the application of cognitive rehabilitation within medical rehabilitation. This approach in rehabilitation can have a positive reflection on the course and outcome of rehabilitation treatment of neurological patients.

The main goal of the research is based on the examination of the connection between motor functioning and gait parameters with cognitive impairment in the examined neurological patients in the process of rehabilitation.

METHOD

Participants

Due to the precision in the study, the selected group of neurological patients consisted of 50 examined neurological patients after stroke, average age 69 years (SD 7.71), with diagnosed hemiparesis and completed early rehabilitation. The most common comorbidities are hypertension and type II diabetes. The examination was conducted at the Department of Extended Care with Rehabilitation of the General Hospital in Cuprija. All respondents voluntarily agreed to participate in the research. Ethics committee approval was obtained for conducting this research in accordance with the principles of the Declaration of Helsinki.

Cognitive assessment and motor assessment

Assessment of cognitive functions was conducted with the Mini Mental State Examination Scale (MMSE), Wisconsin Card Sorting Test (WCST), Trail Making Test (TMT) A / B and Functional Ambulation Category Test (FAC).

Mini Mental State Examination - MMSE

Mini Mental State Examination – MMSE is a test for assessing the cognitive state of the patient, a screening variant, easy to apply, sensitive and gives valid results (Folstein, Folstein & McHugh, 1975). Since its introduction into clinical practice, it has proven to be reliable and suitable for initial assessment of mental status as well as for monitoring. The implementation procedure is based on the principle of interviewing the patient. Temporal and spatial orientation, memory abilities, attention, language, speech comprehension are examined. Certain limitations must be taken into account during the test, so as not to distort the results. It is easy to use, but it must be taken into account that it gives only a rough estimate of the cognitive deficit.

Wisconsin card sorting test – WCST

WCST – Wisconsin card sorting test is a card sorting test and the most well-known test for detecting perseverance and mental rigidity. For more than four decades, the WCST test has been one of the most specific tests of prefrontal function. In its conventional form (Lezak, 2004) it is still used today. The test is sensitive to disorders of planning ability, concept formation and perseverance. Scoring is done in relation to several categories. In clinical screening, the most significant are the score of perseverative responses and the number of categories achieved. U.S. experts warn that this test may not be the only anatomical marker of brain dysfunction. However, many studies have shown that in patients with brain damage (not only frontal) the result is significantly poor on the WCST test (Nyhus & Barcelo, 2009).

Trail Making Test - TMT A/B

This is a test from the framework of the neuropsychological battery of tests and is used to assess the flexibility of attention. It has been recognized since its inception as a technique sensitive to the effects of brain damage in general (Reitan, 1958). The TMT test consists of two parts A / B. The test is evaluated by estimating the total time spent, required to complete the task, regardless of the number of possible errors. The test covers visuomotor and visual conceptual tracking. In principle, the second part of the test requires twice as much time as the first. The test shows difficulties in visuomotor monitoring. However, the most clinically significant data offered by the test are the quality and performance score on the second part of the test (B). The very extended time in part (B) relative to part (A) favors the difficulty of comparatively tracking two different conceptual sequences, or two activities. Qualitative performance of a subject with damage to the frontal regions will be characterized by the problem of switching from one category of stimulus to another.

Functional Ambulation Category - FAC

The test is intended to assess the quality of movement and performance of motor tasks in patients after a stroke. Functional Ambulation Category – FAC test or functional movement test (Holden, 1984) is a simple measuring instrument that includes the assessment of gait ability in patients after a stroke. In addition to the six basic concepts that are scored, this test evaluates gait speed, gait frequency, and stride length. The test itself requires a ten-meter track that the respondent needs to cross. The time for which the patient can cross this path is measured in seconds. The length of the steps is measured, as the distance between the fifth ipslateral and contralateral leg., it is the distance in which one foot is placed in front of the other. Thus, the length of one step (steps) can be calculated. Walking speed is an important piece of information because it enables the assessment of the time during which the patient can perform certain activities. Also, a high level of walking speed may indicate a good motor recovery of the patient after a stroke.

STATISTICAL ANALYSIS

Comparison of the obtained results of the subjects with the reference values of the test used was performed by arithmetic mean, standard deviation and χ^2 test. Data processing was performed in SPSS Statistical Package, version 17.

RESULTS

Table 1. Tabular presentation of the level of cognitive functioning of the subjects after stroke using the MMSE test

Total Points	Damage	Persons after stroke N (%)
24-30	No cognitive impairment	11 (22)
18-23	Mild cognitive impairment	36 (72)
0-17	Severe cognitive impairment	3 (6)
Total		**50 (100)**

χ^2 (2, N = 100) = 63,93, p<.001

Table 1 shows that according to the results of the MMSE test, 22% of people after stroke belong to the category without cognitive impairment, 72% belong to the category of mild cognitive impairment, while in 6% of respondents the test results indicate severe cognitive impairment. When classifying the respondents into categories of cognitive impairment according to the test norms, the existence of special norms depending on the level of education was taken into account.

Table 2. Tabular presentation of the results of the difference in gait parameters between persons with cognitive impairment and without cognitive impairment of subjects with stroke

Parameter	Middle grade score persons after stroke without cognitive impairment	persons after stroke with cognitive impairment	U	r	p
	n = 11	n = 39			
Walking speed (m/min)	34.50	22.96	115.50*	.23	.210
Walking frequency (number of steps in min)	33.91	23.13	122.00*	.21	.87
Step length (cm)	36.77	22.32	90.50*	.29	.004

The values in Table 2 show that there is a statistically significant difference in stride length, gait speed and gait frequency between patients after stroke with and without cognitive impairment (p <.05), the magnitude of the effect is small and consistent with sample size.
A statistically significant difference in stride length was found between subjects after stroke with and without cognitive impairment (p <.05). People without cognitive impairment have, on average, a statistically significantly longer step than people with cognitive impairment. There is also a statistically significant difference in walking speed and walking frequency between people after stroke who have cognitive impairment and people after stroke who do not have cognitive impairment (p <.05), the size of the effect is small because it is consistent with the sample size.

Table 3. Tabular presentation of results for examining differences in gait speed, gait frequency and stride length between subjects after stroke in relation to the value of the results of the estimated flexibility of attention using TMT B

Parameter	TMT B> AS (N = 37)	TMT B< or = AS (N = 13)	U	R
	Middle rank	Middle rank		
Walking speed (m/min)	26.03	19.92	161.00	.18
Walking frequency (number of steps in min)	23.10	28.71	165.50	.17
Step length (cm)	22.67	30.00	150.00	.22

Legend: TMT B> AS - TMT B group of persons whose result is greater than the arithmetic mean determined on a sample of persons after stroke; TMT B <or = AS - TMT B group of persons who have a result less than the arithmetic mean determined for persons after stroke or equal to it; U - value U statistics, r - effect size; * p <.05

The results show that there is a statistically significant difference in gait speed, U = 161.00, p = .190, gait frequency, U = 165.50, p = .229 and stride length, U = 150.00, p = .115, between persons after cerebral strokes that differ from each other in terms of TMT B scores.

Table 4. Tabular presentation of the results of the analysis of the prediction of movement characteristics based on the achievements on the WCST test

Variable	Koef	Rc	Rc² (%)
Walking frequency	.142	.416	17.31
Walking speed	.698	**.574**	32.95
Step length	.474	**.611**	37.33
Foot flexion	.473	.417	17.39
Knee extension	.158	**.777**	60.37
Hip flexion	1.289	**.823**	67.73
Rc²			54.1
Number of WCST categories	.780	**.987**	97.42
Number of perseverative errors WCST	.262	**.878**	77.09

Legend: FAC - functional movement test; WCST - Wisconsin Map Sorting Test; Coefficient - standardized coefficient of canonical function; Rc - structural coefficient; Rc² - squared structural coefficient.

A review of Table 4 shows that the fewer the categories achieved on the WCST test and the greater the number of perseverative errors, the lower the walking speed, the shorter the stride length. The presented results of the correlation analysis show that there is a statistically significant correlation between the examined variables of the planned behavior ability and the quality of movement. This means that in patients after a stroke in whom there is a low efficiency of the ability of planned behavior, there is a reduced internal strength to move and there is a manifest weaker movement.

DISCUSSION

One of the key questions of experts dealing with neurological patients, specifically patients after stroke, is whether stroke and to what extent it causes cognitive decline and whether and to what extent cognitive impairment affects the course and outcome of medical rehabilitation. Most studies that study this problem represent the population that these diseases do not have, or at least to a greater extent, global cognitive disorders, but specific cognitive deficits that can affect motor recovery and achieve a high degree of functional independence of these patients. In the case of frontal lesions, it may be the impossibility of using otherwise preserved knowledge about one's own condition in order to regulate behavior. This can be manifested by the inability to self-observe one's own problems and make adequate decisions (Carmichael, 2003). This is extremely important when involving patients in the process of medical rehabilitation as well as for its course.

It is considered that the leading feature of cognitive deficit in cerebrovascular diseases is the presence of impaired control functions (Galluzzi, 2005). The results of our research show that patients after a stroke show a problem with the ability to plan and organize activities. Also, the results of our study show that the examined patients after stroke had difficulties in comparative monitoring of two different conceptual sequences (Springer, 2006). Attention deficit disorder is not always the ultimate deficit it can be contained in a specific visual or verbal modality (Lezak, 2004). An InChanti study that examined the relationship between control functions and gait function explains that neurological patients have difficulty performing two or more tasks simultaneously. Cognitive dysfunctions are manifested in the form of measurable disorders in various activities. In people with a mild stroke, subtle disorders of language, visuospatial and motor activities can occur (Jennapher Lingo VanGilder, et. al., 2021). The results of our study show that people with a stroke with present cognitive impairment have a lower walking speed, a lower walking frequency and a shorter stride length compared to normative values. The results we obtained support the claim that patients after stroke do not have global cognitive disorders, but specific cognitive deficits, which can have, to a greater or lesser extent, an impact on the motor difficulties of these patients.

The most common goal to which overall kinesitherapy procedures are subordinated is to enable the muscle to contract through good voluntary control and without the influence of spasticity. Therefore, as soon as the active movement is reflexively obtained, the possibility of voluntarily starting and controlling it is practiced. In the production of voluntary movement, one component is a special repository of motor programs that contains "formulations of movement ideas", ie representations of actions and sequences of actions necessary for their execution, while the other component, relatively independent of the previous one, consists of higher cortical systems controlling motor output (Kakei, 2003). The results of the assessment of the motor index of the leg are indicators of the state of biomechanical parameters, necessary for the activity of normal gait (Stewart, 2006). Having in mind gait training in patients after a stroke, it is necessary to prepare for the adoption of this function, directed first in the direction of establishing stability in lower antigravity positions, all the way to stable standing and good balance or controlled mobility with time adjustment (Pavlović, 2006). One research study concluded that improvements in balance ability were seen in repetitive exercises and mobile platform exercises.

One research study came to the conclusion that treatments that enable motor recovery are based on high-intensity exercises and exercises for repeating special tasks, aimed at mental exercise with motor images (Peterea, 2009).

The results of a small pilot study, which aimed to examine the difference between straight and curved gait in people with mobility problems, support the results of our study obtained by assessing gait and overcoming obstacles in the examined patients after stroke (Nakao, 2010).

In the case of early gait, before stability and balance are obtained, there is a high risk for the development of unwanted deviations and their compensations, and ultimately it can lead to the development of uncertainty and insufficiently functional gait. The results of this study show an association between cognitive impairment and gait parameters in patients after stroke depending on the severity of cognitive impairment. This implies the inclusion of cognitive rehabilitation in the process of medical rehabilitation. The data we obtained using the available literature in the field for comparative analysis, support the results of our research and at the same time suggest that the limitations that may arise due to cognitive dysfunction, require new procedural conditions and adjustments in the process of medical rehabilitation. This would increase its efficiency and achieve the optimal level of functional independence. This primarily refers to the application of cognitive rehabilitation (Nair et al, 2017). Certainly, those patients after a stroke who have no or mild cognitive impairment will have an advantage.

CONCLUSION

Identification of cognitive dysfunction and eventual detection of factors that led to it, is important for timely therapeutic response and correction of the same, while monitoring motor parameters. Prevention of potential cognitive impairments and corrections already existing in patients after stroke by including cognitive rehabilitation, will significantly improve their adaptation, socialization, self-correction and contribute to faster and better motor recovery during medical rehabilitation. At the same time, it will improve the quality of life of these patients and contribute to more efficient achievement of complete functional independence.
The advantages and limitations of this study will be the basic basis for some new more comprehensive research on this extremely important topic.

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WOMEN AS A PART OF SPORTS - COACHES, REFEREES AND PLAYERS

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Abstract: Today, women can be a part of different sports fields. They can be players, assistant or head coaches, competitions organizers, referees, managers of clubs, sports federation or sports organizations, presidents of sports associations, sports journalists etc. There are many prejudices concering women as a part of sports because sports were first meant for men, and due to women's family role, religion, motherhood and marginalization of women in some countries. It can be concluded regardless of an increase of women in sports that sportsmen are still those who are more famous and popular and who sponsors would rather collaborate with. Women are the ones who have to create and keep the balance between their family and social life, their career and their sports involvement. If they are not professional sports players, rarely can women earn enough money to pay for basic living expenses. Thus, beside all their responsibilites, they have to search for another job. Explicit discrimination of women in sports is decreasing, but it is directly connected to their position in the society, especially when it comes to ''men's sports'' or women that come from countries which forbid them from participating in any activities of this kind. Female sportsplayer are talked about less that their male counterparts in the media. And when they are mentioned, the newspapers do not write only about their success, but their looks and other non-sports related deailes are noted as well. Also, the number of sports women who are sports managers and presidents is significantly lower both in Serbia and other countries. This paper focuses on highlighting women's position in sports. As references for this paper, various domestic and foreign sources were used: scientific and vocational magazines, as well as other publications that refer to matters which this paper focuses on.

Keywords: women, sports, family, work

ŽENE U SPORTU KAO TRENERI, SUDIJE I IGRAČI

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Sažetak: Žene danas učestvuju u različitim sferama sporta. Mogu biti igrači, pomoćni ili glavni treneri, organizatori takmičenja, sudije, rukovodioci klubova, saveza i različitih sportskih organizacija, predsednici sportskih udruženja, sportski novinari i dr. Postoje razne predrasude o ženama u sportu, što zbog toga što je sport prevashodno bio namenjen muškarcima, što zbog uloge žene u porodici, religije, majčinstva i u nekim zemljama marginalizovanoj poziciji žene. Bez obzira na to što žena ima sve više u sportu i dalje su muškarci ti koji su poznatiji i slavniji i kojima se sponzori više „okreću". Žene su te koje moraju napraviti i uvek držati balans izmedju porodičnog, društvenog života, karijere i sporta. Ukoliko se ne bave profesionalno sportom, žene retko mogu da obezbede egzistenciju, samim tim su primorane da pored svih ostalih obaveza imaju i dodatni posao. Direktna diskriminacija žena u sportu je sve manje prisutna, ali se nameće samim položajem žene u društvu, pogotovu kada je reč o „muškim

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sportovima“ ili ženama koje dolaze iz zemalja u kojima je na neki način ženama zabranjeno da učestvuju u bilo kakvim aktivnostima ovog tipa. Medijski su žene sportisti manje praćene od muškaraca i kada se piše o ženama u sportu ne piše se često samo o uspehu žene, već se često akcenat stavlja na njihov izgled i druge stvari koje nisu vezane za sport. Takodje, znatno je manje žena i na upravljačkim pozicijama u oblasti sporta kako kod nas, tako i u ostalim zemljama.

Ključne reči: žene, sport, porodica, posao, egzistencija

UVOD

Sport ima veliku ulogu u učenju pravih vrednosti, podsticanju timskog duha, *fair play*-a, poštovanju kako rasnih, religijskih tako i polnih razlika bilo da je reč o profesionalnim sportistima ili o rekreativcima.
Nacionalnim planom za borbu protiv diskriminacije za period od 2017. do 2022. godine i Akcionim planom koji je važio od 2017. do 2019. godine donete su mere za suzbijanje diskriminacije u sportu. Različite značajne organizacije u Evropi i svetu kao što su UNESCO, FIFA, Medjunarodni Olimpijski komitet i dr. različitim kampanjama, pesmama, natpisima na kapitenskim trakama fudbalera i na stadionima, promovišu medjusobno uvažavanje svih učesnika u sportu i šire.
Uprkos svim apelima za jednakost rasa i polova u sportu, može se primetiti da i dalje postoji dosta mržnje, nasilja, neuvažavanja i ponižavanja kako na sportskim terenima tako i van njih.
Takodje, uočava se sve veća prisutnost žena u sportu, ali i dalje su muškarci u velikoj brojčanoj prednosti. Mnogi i dalje smatraju da je sport više namenjen muškarcima nego ženama.
Postoji i mnogo više „muških“ sportova, od svega par „ženskih“ kao što su sinhrono plivanje i ritmička gimnastika. Polna neravnopravnost kada je reč o sportu postoji i u najrazvijenijim državama u svetu.
Muškarci, kada je reč o bavljenju sportom, u odnosu na žene imaju veću snagu, bolju konstituciju tela, veću izdržljivost i otporniji su na povrede. Pored toga bolje zaradjuju, medijski su više ispraćeni i manje su podložni diskriminaciji. S druge strane, negativni komentari vezano za žene uglavnom se odnose na izgled i manjak ženstvenosti.
Prepreka za žene da bi se profesionalno bavile sportom može biti majčinstvo, odnosno uloga žene u porodici (Planinić, Ljubičić, 2020).

RAD

Mnogo je više dečaka u mlađim kategorijama koji se bave sportom nego devojčica, pa samim tim, kasnije ima i više muškaraca na sportskim funkcijama od žena.
Mada, iako ima mnogo žena vrhunskih sportista, u centru pažnje su skoro uvek muškarci. Ređe su medijski ispraćene žene, izuzev skandala o kojima se piše a koji su vezani za žene.
Sponzori su više zainteresovani za muškarce nego za žene. Samim tim su žene i manje plaćene od muškaraca. Neuporedivo je manje žena sudija i trenera, iako imaju potrebne kvalifikacije i dovoljno znanja za obavljanje ovih funkcija. Mahom se zbog toga žene najviše opredeljuju za rad u oblasti fitnesa, rekreacije, pilatesa i sl.
Može se zaključiti da žene teško žive od sporta. Većina žena nije u mogućnosti da zarađuje dovoljno od sporta, pa su primorane da pored sporta rade druge poslove koji bi im omogućili egzistenciju.
Od žena se očekuje i da budu majke, domaćice, da čuvaju decu i to dosta utiče na njihove sportske karijere.
Često se interesi profesionalnih sportistkinja kose sa ulogom i očekivanjima koja im nameće društvo, pa je i ženstvenost sportistkinja često na meti kritika.

Na primer, Bejb Didrikson Zaharias, žena koja je na devetom mestu u konkurenciji sto najboljih sportista XX veka po izboru Associated Press-a, suočavala se sa osudama zbog svog izgleda i konstitucije koja je, kako tvrde, više podsećala na muškarca. Sličan primer je i južnoafrička atletičarka Kaster Semenja koja je morala da ode na testiranje kako bi se dokazalo da je žena (Simović, 2014).
Osnivanje Udruženja za žene sportiste 1972. značilo je da je došlo vreme da se žene više uključe u sport. Međutim, postavlja se pitanje da li žena može postati vrhunski sportista, a da ne „ispašta" društveni, porodični život ili neka treća stvar.
Naravno, postoji bezbroj primera vrhunskih sportistkinja gde je verovatno vredelo žrtvovati sve zarad uspeha. Isto tako, nameće se pitanje šta žena da radi nakon završene igračke karijere. Najveći broj devojaka odustane od bavljenja sportom oko 20. godine (Koković, 2005).
Evropska komisija je 2007. godine predstavila Belu knjigu o sportu, koja se odnosi na podjednaku ulogu muškaraca i žena u sportu.
U Ženskoj povelji i u Strategiji za jednakost žena i muškaraca od 2010. do 2015. godine akcenat je stavljen na jednaku ulogu žena u donošenju odluka u sportu.
Isto tako, nakon konferencije EU-e o rodnoj ravnopravnosti u sportu 2013. godine, prihvaćen je predlog za Strateške mere za rodnu ravnopravnost u sportu od 2014. do 2020. u kome je naglasak stavljen na razvoj mera i strategija na području rodne ravnopravnosti u sportu.
Zaključeno je da su sportske organizacije dužne da podstiču jednakost žena i muškaraca u sferi sporta, kako na rukovodećim pozicijama, tako i na omasovljenju žena sportista, trenera i sudija.
Ženama je učešće na sportskim manifestacijama i kao gledaocima u prošlosti bilo strogo zabranjeno.
Na prvim modernim Olimpijskim igrama u Atini 1896. godine žene nisu imale pravo nastupa, jer je „vizionarski osnivač modernih Olimpijskih igara "Pierre de Coubertin smatrao kako bi njihovo učešće bilo „nepraktično, nezanimljivo, neestetsko i nekorektno".
Prvo prisustvo žena beleži se 1900. godine na Olimpijskim igrama u Parizu i to kao takmičarke samo u golfu i tenisu. Nakon toga sve više žena se uključivalo u sport pa su se bavile i streljaštvom, klizanjem, plivanjem, skijanjem, atletikom, veslanjem, biciklizmom, džudom, badmintonom i biatlonom.
Odbojka je prvi ekipni sport u kojem su žene nastupile na Olimpijskim igrama 1964. godine.
Sa svakim Olimpijskim igrama, povećava se broj ženskih sudija, trenera i sportista u različitim sportovima.
Na Olimpijskim igrama u Sidneju, 2000. godine, žene su činile 38% sportista učesnika, 8% tehničkog osoblja i 4% medicinskog osoblja (European Parliament Resolution on Women and Sport, 2003).
Tek na Olimpijskim igrama 2008. godine za islamske zemlje Oman i Jordan, prvi put su nastupile žene, njih četiri. Dok je Turska, takođe islamska zemlja, na poslednjim Olimpijskim igrama 2016. godine imala 8 osvojenih medalja; četiri su osvojile žene, a četiri muškarci. Na istim Olimpijskim igrama Egipćanka Sara Ahmed je sa svega 18 godina, postala prva Egipćanka koja je osvojila medalju za tu zemlju. Bronzanu medalju u dizanju tegova osvojila je nosivši burku na glavi i tako načinila veliki korak vezan za religijske razlike i poštovanje ovakvih razlika (Hafizović, Hadžimešić, 2016).
Veći broj žena na Olimpijskim igrama dokazuje i podatak da je u Londonu 1908. godine bilo samo 1,8 % žena, dok je na Olimpijskim igrama u istom gradu 2012. godine bilo 44,2 % žena (Celebrating inspirational role models on international women's day, 2014). Na ovim Olimpijskim igrama 2012.godine se prvi put desilo da svaka zemlja učesnica ima bar jednog ženskog predstavnika. Među ovim zemljama bile su i Brunej, Katar i Saudijska Arabija.
Džudistkinja Wojdan Shahrkhan i atletičarka u disciplini na 800 metara Sari Atar bile su jedine prestavnice Saudijske Arabije, zemlje koja zabranjuje devojkama i fizičko vaspitanje u školama, kao i to da budu prisutne kao gledaoci na sportskim nadmetanjima. (Nafjan, 2012).

Zakon u Iranu ne dopušta ženama da polažu ni za automobile ni za motocikle.
Međutim, Baran Hadizadeh iz Irana je žena koja vozi motocross trke i bavi se egzibicionim skokovima sa motociklom. Uspela je da se izbori da žene u ovoj zemlji imaju pravo da se bave ovim sportom i da treniraju na određenim mestima, iako im je još uvek zabranjeno da voze. (Rapić, 2019).
Muška takmičenja za razliku od ženskih zakazuju se u večernjim, najgledanijim terminima. Žene se takmiče uglavnom dan za danom, dok je muškarcima omogućeno da imaju dan pauze između nadmetanja. Nakon Olimpijskih igara u Londonu 2012. godine, samo 3% sportskog izveštavanja odnosilo se na žene.
Tenis je sport koji iziskuje ogromna ulaganja i odricanja kako roditelja tako i njihove dece koja se odluče za ovaj sport. Oprema, treneri, aviokarte, smeštaj i ostali troškovi su identični bez obzira na pol. Međutim, mnoge izjave tenisera pokazuju da nemaju baš poštovanja ni razumevanja za svoje koleginice. Direktor turnira Indian Wellsa Raymond Moore, izjavio je kako se žene samo šlepaju na muškim uspesima.
Predsednik Ruskog teniskog saveza, Shamil Tarpischev, sestre Williams nazvao je braćom Williams. Serena Williams jedna je od najboljih igračica svih vremena, ali zbog svog afričkog porekla trpela je brojne rasističke uvrede.
Francuski teniser Jo Wilfred Tsonga rekao je da je ženski tenis haotičan jer su žene pod uticajem hormona pa su psihički nestabilnije od muškaraca. Francuski teniser Giles Simon smatra da teniseri i teniserke ne mogu biti isto plaćeni jer je muški tenis atraktivniji i teniski meč kod muškaraca duže traje. Letonijski teniser Ernest Gulbis izjavio je kako ne bi voleo da mu sestra bude teniserka jer bi to značilo mnogo odricanja, a žene bi trebale misliti na udaju i potomstvo. Australijski teniser Marinko Matošević izjavio je kako ne bi mogao angažovati ženskog trenera za sebe jer nema visoko mišljenje o ženskoj igri.
Jedan od lepših primera predstvalja teniser Britanac Andy Murray koji se zalaže za jednakost muškaraca i žena u tenisu i koji je tokom svoje profesionalne karijere angažovao i ženske trenere što se retko viđa kod tenisera (Jović, 2017).
Da diskriminacija nije prisutna samo u tenisu, pokazuje i izjava jednog od najboljih fudbalera sveta Zlatana Ibrahimovića, kada je rekao da bi dovoljna nagrada za fudbalerku sa najvećim brojem nastupa za Švedsku reprezentaciju bio bicikl sa njegovim potpisom.
Za razliku od ove fudbalerke koja uopšte nije nagrađena, fudbaler sa najvećim brojem nastupa za istu reprezentaciju dobio je novi Volvo (Simović, 2014).
Žene generalno zarađuju manje od muškaraca. Jedino u tenisu je nagradni fond na najvećim svetskim turnirima jednak za muškarce i žene.
Statistike pokazuju da u Americi muškarci dobiju 179 miliona dolara više od žena u sportskim stipendijama, dok "ženski sportovi" na fakultetima dobiju tek 24% sredstava namenjenih sportu (Jurković, 2014).
Ženski košarkaški klubovi u Sjedinjenim Američkim Državama, pre nekoliko godina izdvajali su svega 900 000 dolara na godišnje plate igračica, dok se za mušku košarku na tom nivou, za iste svrhe izdvajalo 45 miliona dolara. Dok je košarkašica sa najvećom zaradom godišnje dobijala jedva nešto više od 100 000 dolara, godišnja plata Kobi Brajanta iznosila je 30 miliona dolara. Što pokazuje da je ovaj košarkaš zarađivao 300 puta više od najplaćenije košarkašice, odnosno deset puta više od svih košarkašica koje igraju u američkoj profesionalnoj ligi (Simović, 2014).
Zakon o sportu Republike Srbije iz 2016. Nalaže ravnopravnije učešće žena u sportu kao i uključenje osoba sa invaliditetom u "sport".
Predsednik Olimpijskog komiteta Srbije, **Božidar Maljković,** je rekao da je povećanje broja žena uključenih u sport jedan od prioriteta narednih godina.
„*Podatak, da se samo 13 žena nalazi na liderskim pozicijama od ukupno 206 Nacionalnih Olimpijskih komiteta, a da je samo 14% njih uopšte bilo u prilici da se kandiduje na ovo mesto,*

jasno govori o tome koliko je važno da se broj žena na rukovodećim pozicijama u Savezima poveća.
Vrlo je bitno, da ženama bude omogućeno da budu birane za liderske pozicije jednako kao i muškarci, uzimajući u obzir da su veštine upravljanja kod žena poznate i dokazane kako u sportu tako i u mnogim drugim sferama života" (Žene u sportu, 2019).

ZAKLJUČAK

Značaj i uloga trenera u bilo kom sportu je veoma značajna.

Oni moraju biti pedagozi, koji znaju da prenesu znanje, pružaju podršku, a pre svega moraju imati potrebno obrazovanje. Kako na upravljačkim mestima, tako i trenera, neuporedivo je veći broj muškaraca nego žena.
Jedan od faktora koji utiče na to je i to što se žene u mnogo manjem procentu, u odnosu na muškarce, nakon sportske karijere odlučuju da ostanu u sportu. Tako da se retko viđa da žena trenira žensku ekipu, a pogotovu mušku. Međutim, žene su te koje sa devojčicama u mlađem uzrastu mogu verovatno na bolji način komunicirati i ostvariiti bolji odnos.
Ženskih sudija nema u svim sportovima, a tamo gde ih ima u mnogo su manjem broju od muškaraca.
Muškarci su u velikoj prednosti u odnosu na žene kada je reč o sportu.
Pored brojčane prednosti kao sportisti, treneri i sudije i medijskoj ispraćenosti, tako i po zaradama koje dobijaju, kao i sponzorima koji se njima okreću.
Obrazovanje žena u oblasti sporta je jedan od imperativa u budućnosti, kao i podsticaj ženske dece da se bave sportom.
Takođe, treba se regulisati zarada žena u sportu, tako da ne postoji tolika razlika u odnosu na muškarce.
Mediji su ti koji bi trebali da izveštavaju i o uspesima žena, a ne samo o muškarcima koliko god oni publici možda jesu zanimljiviji.
Potrebno je stalno podizati svest ljudi o uzajamnom poštovanju i podržavati poduhvate žena koje se osmele da se bave sportom u zemaljama u kojima sport za njih nije dozvoljen, a one nađu način da se uključe i dokažu da mogu biti itekako uspešne.
Diskriminacija žena u sportu je i dalje prisutna. Da bi se smanjila diskriminacija i povećao broj žena koje učestvuju u sportu, potrebno je edukovati ljude i poboljšati uslove rada. Kada bi se više pričalo o ženama u sportu, kao globalnom problemu, razbile predrasude i promenila svest ljudi, time bi se i više žena uključilo u sport.

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COMPRESSIVE LOAD AS A RISK FACTOR FOR THE DEVELOPMENT OF TENDINOPATHIES OF DIFFERENT LOCALIZATIONS

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Abstract: The role of tendons is to transmit the force generated by muscle contractions to allow them to perform movements and maintain posture. They are designed to withstand tensile loads, however, an excessive load can lead to the development of tendinopathy as an overexertion syndrome. This results in extensive changes in tenocytes and the extracellular matrix leading to cell activation, increased proteoglycan counts, and breakdown of collagen structure. Within the mentioned pathological changes, there are areas of fibrocartilaginous metaplasia, where mechanotransduction models show that such a response can be due to compressive, and not only tensile loading. As load management, primarily through kinesitherapy, is the cornerstone of tendinopathy treatment, defining the effects of the tensile and compressive load is very important for clinical treatment outcomes. This paper examines the potential role of compressive loads in the pathogenesis of tendinopathies of different localizations and provides an overview of anatomical, epidemiological and clinical evidence indicating the role of this type of load in the development of insertion tendinopathy of the Achilles tendon, supraspinatus muscle, posterior tibialis muscle, proximal part of the hamstring muscle, respectively, lateral epicondylitis, proximal patellar tendon tendinopathy, etc.

Keywords: kinesitherapy, Achilles tendon, supraspinatus muscle, lateral epicondylitis, patellar tendon.

KOMPRESIVNO OPTEREĆENJE KAO FAKTOR RIZIKA ZA RAZVOJ TENDINOPATIJA RAZLIČITIH LOKALIZACIJA

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Sažetak: Uloga tetiva je da prenose silu generisanu mišićnim kontrakcijama kako bi omogućile izvođenje pokreta i održavanje posture. One su dizajnirane da podnose elastična opterećenja, međutim prekomerno opterećenje može dovesti do razvoja tendinopatija kao sindroma prenaprezanja. Ovo rezultira opsežnim promenama u tenocitima i ekstracelularnom matriksu što dovodi do aktivacije ćelija, povećanog broja proteoglikana i raspada strukture kolagena. U okviru navedenih patoloških promena postoje područja fibrokartilaginozne metaplazije, gde nam mehanotransdukcijiski modeli pokazuju da ovakav odgovor može biti usled kompresivnog, a ne samo elastičnog opterećenja. Kako je upravljanje opterećenjem, pre svega kroz kineziterapiju, kamen temeljac lečenja tendinopatija, definisanje efekata elastičnog i kompresivnog opterećenja je veoma važno za kliničke ishode tretmana. Ovaj rad ispituje potencijalnu ulogu kompresivnih opterećenja u patogenezi tendinopatija različitih lokalizacija, i daje pregled anatomskih, epidemioloških i kliničkih dokaza koji ukazuju na ulogu ovog tipa

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opterećenja u razvoju insercione tendinopatije Ahilove tetive, tendinopatija nadgrebenog mišića (m. supraspinatus), zadnjeg golenjačnog mišića (m. tibialis posterior), proskimalnog dela mišića zadnje lože natkolenice, lateralnog epikondilitisa, proksimalne tendinopatije patelarne tetive itd.

Ključne reči: kineziterapija, ahilova tetiva, nadgrebeni mišić, lateralni epikondilitis, patelarna tetiva.

UVOD

Tetive su fibrozna vezivna tkiva lokalizovana između mišića i kostiju čija uloga je da prenose silu generisanu mišićnim kontrakcijama kako bi omogućile izvođenje pokreta i održavanje posture(Woo et al., 2005).
Zahvaljujući svoj funkciji, izložene su čestim opterećenjima što dovodi do promena u samim tetivama i različitih bolnih stanja. Bolne tetive se javljaju kao čest problem kod fizički aktivne populacije, kako kod profesionalnih sportista tako i kod rekreativaca. Iako u naučnoj literaturi i dalje dominira bavljenje akutnim, traumatskim povredama mekih tkiva, pre svega mišića i ligamenata (kao što su istegnuća, parcijalne i totalne rupture) u poslednje vreme se sve više pažnje poklanja tzv. povredama prenaprezanja u koje se u velikoj meri ubraja tetivna patologija različite etiologije i patofizioloških mehanizama (Albers et al., 2016). Iako su ova bolna stanja u prošlosti opisivana nazivom *tendinitis*, u stručnoj javnosti tokom poslednje dve decenije taj koncept je napušten jer je veliki broj histopatoloških studija utvrdio da ne postoje promene karakteristične za inflamaciju gde sufiks *–itis* predstavlja inflamaciju odnosno zapaljenje (Khan et al., 2002). Internacionalnim ekspertskim konsenzusom, klinički sindrom bolne i disfunkcionalne tetive označen je nazivom – tendinopatija (Scott et al., 2020).
Patofiziološki mehanizam tendinopatija opisan kroz model kontinuuma trenutno je u stručnoj i naučnoj javnosti prihvaćen kao najoptimalniji opis razvoja patoloških promena koje su indukovane prevelikim opterećenjem, odnosno opterećenjem koje prevazilazi kapacitet tkiva da ga podnese (Cook & Purdam, 2009). U odnosu na tipove opterećenja kojima tetiva može biti izložena napravljena je i podela koja je povezana i sa anatomskom lokalizacijom patoloških promena – insercione (na pripoju tetiva za kosti) i neinsercione tendinopatije (Waldecker et al., 2012). U ovom radu dat je pregled teorijiskih i kliničkih studija koje su pokazale značaj različitih tipova opterećenja na razvoj tendinopatije sa naročitim osvrtom na kompresivno opterećenje.

SASTAV I STUKTURA TETIVA

Osnovna ćelija tetive – tenocit, proizvodi sve komponente od kojih je tetiva sastavljena kao odgovor na uslove sredine (mehaničko opterećenje i hemijiski signali). Glavna fibrilarna komponenta ekstracelulernog matriksa (ECM) je kolagen tipa I, sa nešto manjom količinom kolagena tipa III i IV. Interfibrilarna komponenta ECM sadrži vodu (oko 65 % ukupne mase), proteoglikane (PG) koji u sebi sadrže dermatan sulfat glikozaminoglikan (GAG), elastin i druge glikoproteine (Tabela 1) pri čemu se količina dermatan sulfat GAG povećava u tetivama izloženim većem elastičnom opterećenju (Kannus, 2000).

Tabela 1: Sastav i struktura zdrave tetive (Canata et al., 2017)

Komponenta	Procenat (%)
Ćelije	3-6
Kolagen I	25-31
Kolagen III	2
Kolagen IV	1
Elastin	1
Proteoglikani	1-4
Voda	60-65

Tenociti imaju sposobnost da ‘’osećaju’’ mehaničku deformaciju kroz fizičke i funkcionalne veze sa matriksom i utiču na povećanu ili smanjenu sintezu njegovih komponenti (Wang, 2006). Citoskelet tenocita povezan je sa matriksom kroz adhezione molekule koji se nalaze u ćelijskoj membrani. Najvažniji od njih su integrini, familija transmembranskih receptora koji igraju važnu ulogu u prenosu signala kako hemijskih tako i mehaničkih (Paul et al., 2016) Kolagena vlakna su orijentisana paralelno u odnosu na dejstvo sile kojoj su izložena odnosno postavljena su paralelno vlaknima pripadajućeg mišića. S obzirom na svoju anatomsku poziciju tetive imaju dva kraja - pripoj tetive za kost i pripoj tetive za mišić (osim tzv intermedijatnih tetiva) (Benjamin et al., 2008).

TIPOVI OPTEREĆENJA

Već smo naveli da su tenociti mehano-senzitivni jer reaguju i na tip i stepen opterećenja kojem su izložene, i ukoliko je ono odgovarajuće, unutar-ćelijiske promene favorizuju pozitivne procese unutar ekstracelularnog tetivnog matriksa, dok ukoliko je opterećenje prekomerno dolazi do postepenog razvoja povrede, odnosno sindroma prenaprezanja i samih kliničkih ispoljavanja (Snedeker & Foolen, 2017). Kapacitet tkiva se ogleda u njegovoj sposobnosti da opterećenje podnese bez oštećenja i uz očuvanje funkcije. Kada ga optrećenje prevaziđe dolazi do povrede. Svaka tetiva u telu ima svoj kapacitet i on je krajnje individualan, i zavisi od izloženosti opterećenjima i funkcije (Cook & Docking, 2015).

Tetive mogu biti izložene nekolikim tipovima operećenja: na prvom mestu, tenzilnom (u daljem tekstu – zateznom) zahvaljujući dejstvu elastične sile. Zatim opterećenja koja nastaju usled trenja, takozvana frikciona, usled velikog broja repetitivnih pokreta. I naposletku, onim opterećenjima kojima ćemo se u daljem tekstu detaljnije baviti - kompresivnim, koja su u najvećem broju lokalizovana na mestima gde tetiva dolazi u kontakt sa koštanim izraštajima ili ispupčenjima, što je po prirodi stvari slučaj na insercijama odnosno pripojima tetiva za kost (Galloway et al., 2013).

Tokom određenih pokreta na velikom broju mesta u našem telu dolazi do ove vrste kompresije, pa tako je, na primer, Ahilova tetiva je prilikom dorzifleksije u skočnom zglobu komprimovana uz gornji deo petne kosti, tetive srednjeg i malog sedalnog mišića uz veliki trohanter butne kosti tokom adukcije kuka itd. No, kompresija ne mora poticati samo od koštanih struktura, pa je tako središnji deo Ahilove tetive izložen pritisku okolne muskulature, drugih tetiva i posteriornog retinakuluma (Cook & Purdam, 2012; Merza et al., 2021).

REAKCIJA TETIVNOG TKIVA NA KOMPRESIJU

U ranijim ispitivanjima u dvadesetom veku utvrđeno je da vezivno tkivo ima sposobnost diferencijacije u odnosu na različite mehaničke stimuluse (Carlin, 1977) . Tkivo reaguje na različite parametre opterećenja preko prilagođavanja strukture svog ekstracelularnog matriksa kako bi bilo u stanju da ista prenosi ili apsorbuje (Majima et al., 2000). Tetiva koja je

dizajnirana prvenstveno da podnosi zatezna opterećenja pokazuje nekoliko adaptivnih odgovora kada je izložena kompresiji. Suštinska promena u sastavu tetive u regiji neposredno uz koštane strukture je povećanje fibro-hrskavičavog veziva (Milz et al., 2002).
Tenociti, adaptirajući se na pritisak, postaju zaokrugljeniji, odnosno hondrocitični. Zatim produkuju sve veći broj proteina koji su karakteristični za ekstracelularni matriks hrskavice, velikih proteoglikana i kolagena tipa II. Veliki proteoglikani kao što su agrekan i versikan, pronađeni su u visokim koncentracijama i u delovima tetiva izloženim pritisku i onim delovima koji su patološki izmenjeni. Sam proces nazvan je fibrohrskavičava metaplazija (Wren et al., 2000). Ovo pokazuje da kompresija može biti i ključni okidač koji vodi u preopterećenje i trigeruje pojavu simptoma. Veliki proteoglikanski molekuli služe i za zaštitu tenocita od povećanog pritiska na mestima dejstva kompresivnih sila i mogu služiti za apsorbovanje opterećenja. Ipak smanjena produkcija kolagena tipa I može predstavljati pogodno tlo za razvoj tendinopatije. Diferencijacija ćelija i komponenti ekstracelularnog matriksa prikazana je u Tabeli 2.

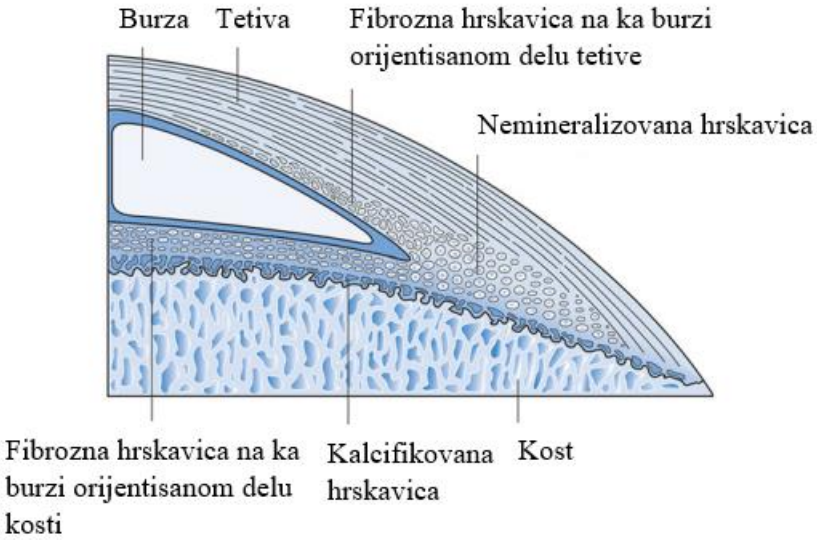
Tabela 2: Veza između kompresivnog opterećenja i promena u ECM (Cook & Purdam, 2012)

	Zdrava tetiva	**Fibrohrskavičava metaplazija**	**Tendinopatija**
Ćelije	Nekoliko ćelija vretenastog oblika	Bez ćelijiske proliferacije, čelije okruglog oblika	Ćelijiska proliferacija, okrugle ćelije, više endoplazmatskog retikuluma
Proteoglikani	Malo, većinom dekorin i biglikan	5-10 puta više nego u delovima izloženim zateznom opterećenju, najviše agrekana	25 puta ubrzan metabolizam, većinom agrekan i biglikan
Kolagen tip	Tip I	Tip I i II	Tip III
Kolagen struktura	Organizovana kolagena mreža	Organizovana kolagena mreža	Dezorganizacija kolagene mreža
Neovaskularizacija	Minimalna	Odsutna ili minimalna	Varijabilno ali može biti obilna

VEZA IZMEĐU KOMPRESIJE I RAZVOJA TENDINOPATIJE

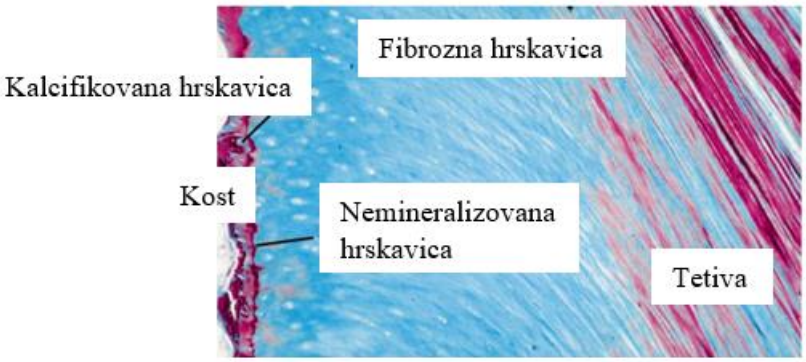
Skoro sve klinički manifestne tendinopatije se dešavaju na koštano-tetivnom spoju ili u njegovoj blizini, pa bi se mogle nazvati i entezopatije. Uobičajeni pripoj tetive izgleda tako što se tkivo postepeno menja iz fibrozno-hrskavičavog preko mineralizovanog fibro-hrskavičavog veziva do kosti i ta izmena se dešava na relativno malom prostoru ne dužem od 2mm (Benjamin & Ralphs, 2000). Ipak i dodatne strukture proksimalno od insercije imaju aktivnu ulogu u prenosu sile sa tetive na kost (Slika 1).

Slika 1: Pripoj tetive za kost i organ enteze (preuzeto i modifikovano od Cook & Purdam, 2012)



U daljim istraživanjima prikazan je i detaljniji uvid u dodatne anatomske strukture i opterećenja oko samog pripoja i svi zajedno su nazvani organom enteze (Benjamin et al., 2004). Glavne karakteristike enteze su pripoj tetivnih vlakana pod određenim uglom, često postojanje burze između tetive i kosti i ekspresija fibro-hrskavičavog vezivnog tkiva na površini i tetive i kosti koje služi apsorpciji kompresivnog opterećenja kostiju na tetive. Zahvaljujući ovim osobinama organ enteze ima dve funkcije, jedna je da smanjuje zatezno opterećenje na pripoju a druga da doprinosi mehaničkoj funkciji mišićno tetivne jedinice (Benjamin et al., 2004). Ilustrovani histološki prikaz organa eneteze dat je na Slici 2.

Slika 2: Pripoj tetive za kost i angulacija kolagenih vlakana pri tranziciji (preuzeto i modifikovano od Cook & Purdam, 2012)



Posmatrajući tipove opterećenja na entezi, naročito proksimalno od insercije, ustanovljeno je da su u tim regijama gotovo uvek istovremeno prisutni i zatezno i kompresivno opterećenje (Cook & Purdam, 2012), naročito u određenim zglobnim pozicijama, dakle - kombinacija opterećenja. Obično su upravo ta mesta i najčešća lokalizacija patoloških promena, što je potvrđeno u velikom broju radioloških i kliničkih ispitivanja (Docking et al., 2013). Pregled tetiva i anatomskih lokalizacija kompresije dati su Tabeli 3.

Tabela 3: Izloženost enteza koštanoj kompesiji (Cook & Purdam, 2012)

Tetive	Anatomska koštana lokalizacija kompresije	Pokret pri kojem dolazi do kompresije
Ahilova tetiva	Gornji deo zadnje strane petne kosti	Dorzalna fleksija skočnog zgloba
Tetiva zadnjeg golenjačnog mišića	Unutrašnji gležanj	Everzija skočnog zgloba i pad unutrašnjeg svoda stopala
Tetiva duge glave mišića dvoglavog mišića nadlakta	Međukvržni žleb	Ekstenzija ramena
Tetiva nadgrebenog mišića	Veliki tuberkulum	Adukcija ramena
Zajednička tetiva poluopnastog, polužilastog i dvoglavog mišića buta	Sedalna kvrga	Fleksija kuka
Tetiva srednjeg sedalnog mišića	Veliki trohanter	Adukcija kuka
Tetiva dugog privodioca buta	Preponska kvrga	Abdukcija I ekstenzija kuka
Tetive dugog i kratkog lišnjačnog mišića	Spoljašnji gležanj	Inverzija skočnog zgloba

Delovi tetiva koji se naslanjaju na koštane prominencije kao recimo tetiva zadnjeg golenjačnog mišića na unutrašnji gležanj ispitivani su radi boljeg razumevanja fibrohrskavičave metaplazije koja se u njima dešava (Giori et al., 1993; Kjær, 2004). Pokazano je da zone izložene kompresiji imaju manju permeabilnost zbog velike sposobnosti agrekana da vezuje vodu što vodi u restrikciju protoka tečnih komponenti i ima ulogu u zaštiti čvrstih struktura u ekstracelularnom matriksu pre svega ćelija i kolagena. Shodno tome pretpostavka je da delovi tetiva više izloženi zateznom opterećenju imaju veću permeabilnost (Wang, 2006; Wren et al., 2000).

Između navedenih morfološki različitih delova tetive (dominantno fibrozni i fibrozno-hrskavičavi) postoji zona tranzicije gde dejstvo prekomernog optrećenja dovodi do kretanja vode i promene u dijametru tetive na mestu izloženom zateznom opterećenju. Ovaj gubitak vode nadalje dovodi sada do novog izlaganja tenocita cikličnom unutrašnjem kompresivnom opterećenju i oni posledično, mehanizmom povratne sprege, luče više velikih proteoglikana kako bi vezali vodu. To dovodi do ranije pomenutog smanjenja permeabilnosti, i zaštite od daljeg pritiska (Grigg et al., 2009). Ukoliko se prekomerno opterećenje nastavi regija dodatno otiče i tkivo nije u stanju da održi homeostazu. Ovo posledično vodi u dodatnu promenu strukture i razvoj simptomatske tendinopatije (Hamilton et al., 2004) .

PRIMENA KONCEPTA U KLINIČKOJ PRAKSI

Zahvaljujući razumevanju ovog koncepta možemo objasniti dejstvo provocirajućih aktivnosti na rezličite vrste insercionih tendinopatija. Kao primer možemo uzeti opterećenje pri dorzifleksiji skočnog zgloba kada hodamo bosi ili na pesku, koje će provocirati bol kod insercione tendinopatije Ahilove tetive. Pacijenti sa ovom dijagnozom neće imati bol prilikom poskakivanja na prstima ali će im tegobu provocirati hod na petama, kada je skočni zglob u skoro maksimalnom obimu dorzifeksije. Isto tako, nošenje podizača za petu u obući, ili potpetice rasteretiće pripoj Ahilove tetive na petoj kosti prekomernog kompresivnog opterećenja (Schepsis et al., 2002).

Opterećenje na tetivu srednjeg sedalnog mišića u regiji velikog trohantera butne kosti prilikom hoda kod pacijenata sa lumbo-pelvičnom nestabilnošću idukuje sličan bolni odgovor. Pri razvoju glutealne (sedalne) tendinopatije vrlo je karakterističan i anamnestički podatak koji dobijamo od pacijenta koji se žale na bol pri ležanju na toj strani, jer ono izaziva i dodatni pritisak dodat na onaj koji se dešava pri adukciji kuka tokom hoda (Lauder, 2002). Ista

analogija postoji i pri sedenju kod pacijenata sa tendinopatijom proksimalnih tetiva mišića zadnje lože natkolenice (Lempainen et al., 2009).
Uzimanje u obzir kompresivnog opterećenja na inserciji objašnjava i dizmorfizam karličnih tendinopatija. Naime iz kliničke prakse je poznato da žene starije životne dobi imaju pet do šest puta veću učestalost pojave tendinopatije srednjeg glutealnog mišića (Pianka et al., 2021) dok je kod muškog pola značajno češća pojava aduktorne tendinopatije (Rabe & Oliver, 2010). Primenom ovog modela kompresivnog opterećenja na organ enteze može se zaključiti da veći ugao vrata butne kosti kod ženskog pola rezultiraće većom kompresijom velikog trohantera na tetivu (Cook & Purdam, 2012).
Treba napomenuti i da je kod insercionih tendinopatija istezanje veoma provokativno i u praksi se može smatrati stručnom greškom, s obzirom na dodavanje kompresije na inserciji pri istezanju (na primer, istezanje Ahilove tetive preko ivice stepenika).

ZAKLJUČAK

Upravljanje opterećenjem, njegovo delmično ukljanjanje i postepeno podizanje kapaciteta tkiva kroz programe postepeno progresivnih vežbi snage su kamen temeljac lečenja tendinopatija rezličitih lokalizacija (Escriche-Escuder et al., 2020; Karanasios et al., 2021; Malliaras et al., 2020; Murphy et al., 2018; Nasser et al., 2021; Sprague et al., 2018). Dizajn pripoja tetiva i organa enteze omogućava apsorpciju funkcionalnih opterećenja i prilagođavanje višim nivoima opterećenja. No, prilagođavanje na velika opterećenja je sporo i pojava sindroma prenaprezanja vodi u duži oporavak. Prekomerna opterećenja vode u razvoj tendinopatije i njihovo uklanjanje u kratkom vremenskom roku ne može dovesti do brze rezolucije promena koje se dešavaju pri tendinopatiji, i samim tim povratak funkcije se odlaže. Upravljenje opterećenjem se prvenstveno ogleda u smanjenju obima i intenziteta treninga, kao i uklanjanju biomehaničkih faktora rizika (Cook & Purdam, 2012).
Smanjenje kompresivnih opterećenja u insercionim tendinopatijama važan je deo u lečenju i upravljanju opterećenjem. Kroz kliničku praksu i veliki broj radova, naročito u poslednjoj deceniji, sve više razumemo patologiju tetiva na ćelijiskom i biomehaničkom nivou. Efekte provocirajućih opterećenja na tetivni pripoj treba još i u budućnosti istraživati. Potreban je veći broj kliničkih studija koje će pokazati vezu između prave mere redukcije opterećenja i kliničkog poboljšanja, odnosno povratka funkcije.

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DIFFERENCES IN MOTOR SKILLS BETWEEN PRESCHOOL BOYS AND GIRLS

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Abstract: So far, it is known that there are significant differences in motor skills between boys and girls of preschool age. The aim of the research is to determine the differences in motor abilities between boys and girls of preschool age by critical analysis of previous research and generalization of the results of all analyzed research. Searches were conducted in the following electronic databases: Medline, Google Scholar, and koBSON. The databases were searched using the following keywords in Serbian and English: motor abilities, differences, preschool children. In the first phase of the review, the relevance of the titles and abstracts of the identified papers was checked. In the second phase of the search, the complete papers were taken over and considered for inclusion. References from all collected papers were reviewed to obtain more research that was studied. A total of 15 studies met the inclusion criteria and were included in the systematic review. Significant improvement was observed in men in speed, coordination and strength, and in girls in tests of balance, endurance, and flexibility. Based on the analysis and discussion of the papers taken in the systematic research, it can be concluded that there are differences in motor abilities between boys and girls of preschool age.

Keywords: motor abilities, differences, preschool children.

RAZLIKE U MOTORIČKIM SPOSOBNOSTIMA IZMEĐU DEČAKA I DEVOJČICA PREDŠKOLSKOG UZRASTA

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Sažetak: Do sada je poznato da postoje značajne razlike u motoričkim sposobnostima između dečaka i devojčica predškolskog uzrasta.Cilj istraživanja je da se kritičkom analizom dosadašnjih istraživanja i generalizacijom rezultata svih analiziranih istraživanja utvrde razlike u motoričkim sposobnostima između dečaka i devojčica predškolskog uzrasta. Pretrage su vršene u sledećim elektronskim bazama: Medline, Google Scholar i Kobson. Baze podataka su pretražene pomoću sledećih ključnih reči na srpskom i engleskom jeziku: motoričke sposobnosti (motor abilities), razlike (differences), predškolska deca (preeschool children). U prvoj fazi pregleda, proverena je relevantnost naslova i apstrakata identifikovanih radova. U drugoj fazi pretrage, kompletni radovi su preuzeti i razmatrani za inkluziju. Reference iz svih sakupljenih radova su pregledane da bi se dobilo više istraživanja koja su proučavana. Ukupno je 15 studija zadovoljilo kriterijume za uključivanje i bile su uključene u sistematski pregled. Značajno poboljšanje kod muškaraca primećeno je u brzini, koordinaciji i snazi, a kod devojčica u testovima ravnoteže, izdržljivosti i fleksibilnosti. Na osnovu analize i diskusije radova koji su uzeti u sistematsko istraživanje može se zaključiti da postoje razlike u motoričkim sposobnostima između dečaka I devojćica predškolske dobi.

Ključne reči: motoričke sposobnosti, razlike , predškolska deca

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UVOD

Predškolska dob predstavlja idealni period za razvoj i odgoj – ne samo zdravstvenih, prehrambenih i higijenskih navika, nego i za celoviti razvoj u području telesne aktivnosti. Briga za dete, njegovo zdravlje, normalan fizički razvoj, prepoznata je kao jedan od najvažnijih zadataka u vaspitanju predškolske dece. Predškolska deca, za razliku od ostalih uzrasta, još uvek su u procesu formiranja zdravih navika, koje će se dalje reflektovati na kvalitet njihovog budućeg života (Planinsec & Matejek, 2004).

Sticanje motoričkih znanja, razvoj morfoloških karakteristika i funksionalnih sposobnosti da kvalitetnom primenom fizičkih aktivnosti predstavlja značajno razvijanje u predškolskoj dobi, jer u tom periodu dete ima prirodnu potrebu za kretanjem (Bala, 2003).

Kvalitet motorne aktivnosti je određen: snagom mišića koja je angažovana u toj aktivnosti (snaga zavisi od broja mišićnih vlakana potrebnih za sklupljanje mišića kako bi mišić dobio na snazi kojom deluje) i obimom; mogućnošću da se ta snaga moduliše prema onim aktivnostima koje zahtevaju preciznost ili prema potrebi bilo kojih drugih aktivnosti kada je stalno potrebno povećavati ili smanjivati snagu mišića; koordinacijom pokreta kao uslovom organizovanja složenih motornih aktivnosti. Za početni biološki razvoj motoričkih sposobnosti od prve do sedme godine života, usmerena motorna aktivnost je osnovni način pomoću koje se komponente motornog razvoja mogu razvijati do optimalnih granica. U određenim periodima razvoja deteta, motorna aktivnost kao vodeća aktivnost, ima odlučujući značaj za motorni razvoj, iako je ovaj razvoj pod uticajem CNS-a u velikoj meri određen genetski, on je usko povezan sa razvojem svih funkcionalnih sistema i sa razvojem fizičkih i psihičkih osobina deteta (Antropova, i Koljcova, 1986). Idrizović i Nićin (2006) smatraju da senzibilni periodi u razvoju motoričkih sposobnosti predstavljaju vremenske intervale koji omogućavaju kvalitetniji pristup segmentima motoričkog statusa sa stanovišta fizičkog vežbanja. Međutim, iako predstavljaju vrednu informaciju još uvek nisu kvalitetno iskorišćeni u procesu fizičkog vežbanja. Kada su motoričke sposobnosti predškolske dece u pitanju, u uzrastu 6. i 7. godine utvrđen je generalni motorički faktor definisan snagom i koordinacijom (Katić, Zagorac, Živičnjak i Hraski, 1994). Takođe je utvrđeno da su snaga, koordinacija i motorička kompetencija tesno povezani kod oba pola (Gallahue, & Ogmun, 1998). Dečaci dominiraju u snagi, brgini i koordinaciji, a devojčice u fleksibilnosti i ravnoteži (Dukovski, 1984; Rajtmajer i Proje, 1990; Videmšek i Cemič, 1991).

Prirast snage kod detinjstva nije linearan kod oba pola (Bala, Đorđić, Popović i Sabo, 2006). Istraživanje koje su sproveli Kurelić i saradnici (1975), te istraživanja Gredelja, Metikoša, Hošekove i Momirovića (1975) ukazuje na hijerarhijsku organizaciju motoričkih sposobnosti i ističe ulogu centralnih regulacionih mehanizama u motoričkoj aktivnosti kada su u pitanju starija deca i omladina. Iako ova dokazana dva modela nisu prikladni za decu od 6 i 7 godina, a pošto prikladniji model još ne postoji uzorak motoričkih testova u ovoj studiji biće preuzet iz redukovanog modela (Kurelić i sar., 1975) primenjenom u istraživanju Bale i Popovića (2007) proverenom na velikom uzorku ispitanika.

Novija istraživanja pokazuju da 75% odrasle dece oboli usled posledica bolesti u detinjstvu, a da se svako četvrto dete razboli u toku godine četiri puta, tako da je "apsolutno zdravo" samo 10% dece predškolskog uzrasta u Srbiji (Džinović, 2011). Ako se posmatraju deca mlađeg školskog uzrasta, takođe je poražavajući podatak da njih 85-90% izostaje sa nastavnih obaveza zbog lošeg zdravlja (Pelemiš, 2016).

Cilj istraživanja je da se kritičkom analizom dosadašnjih istraživanja i generalizacijom rezultata svih analiziranih istraživanja utvrde razlike u motoričkim sposobnostima između dečaka i devojčica predškolskog uzrasta.

METOD ISTRAŽIVANJA

Pretraživanje baza podataka

Literatura je sakupljena pretraživanjem interneta i sledećih baza podataka: Medline, Google Scholar i Kobson. Baze podataka su pretražene pomoću sledećih ključnih reči na srpskom i engleskom jeziku: motoričke sposobnosti (motor abilities), razlike (differences), predškolska deca (preeschool children).U prvoj fazi pregleda, proverena je relevantnost naslova i apstrakata identifikovanih radova. U drugoj fazi pretrage, kompletni radovi su preuzeti i razmatrani za inkluziju. Reference iz svih sakupljenih radova su pregledane da bi se dobilo više istraživanja koja su proučavana.

Kriterijumi za uključivanje i isključivanje radova

Selekcija radova je izvršena na osnovu određenih kriterijuma. Uključena su samo eksperimentalna istraživanja koja su ispunila kriterijume za uključivanje. Sva razmatrana istraživanja su proučavala razlike u motoričkim sposobnostima između dečaka i devojčica predškolskog uzrasta. Uzrast ispitanika je bio drugi važan kriterijum jer su u obzir uzeta samo ona istraživanja u kojima su ispitanici bili uzrasta od 3 do 7 godina. Kriterijumi za isključivanje su bili: stručni radovi, duplikati radova, neadekvatne varijable, neadekvatan uzrast učenika i nedostatak relevantnih podataka u radu. U analizu je uključeno i analizirano 15 radova koji su ispunili sve kriterijume za selekciju. Inicijalnom pretragom je identifikovano 403 radova, od kojih ogromna većina nije odgovarala istraživačkom problemu. Radovi su eliminisani na osnovu sledećih razloga (dijegram 1): duplikati (n=201), pregledani radovi (n=178), radovi isključeni na osnovu naslova i apstrakta (n=40), radovi isključeni zbog neadekvatanog organizacionog oblika rada (n =41), Radovi isključeni zbog neadekvatanog broja ispitanika (n=45), radovi isključeni zbog neadekvatnih izlaznih podataka (n=52), radovi koji ispunjavaju kriterijume za uključivanje (n=15). Za analizu sakupljenih radova, primenjeni su deskriptivni metod i metod teorijske analize. Analizirani radovi su prikazani u dijagramu toka aktivnosti (dijagram 1.). Svako istraživanje je prikazano pomoću sledećih parametara: istraživanje (autor i godina publikovanja rada), cilj istraživanja, uzorak ispitanika, broj ispitanika (n), uzrast (A) i pol (M i Ž), varijable i rezultati.

Dijagram 1. *Tok aktivnosti tokom pretrage radova.*

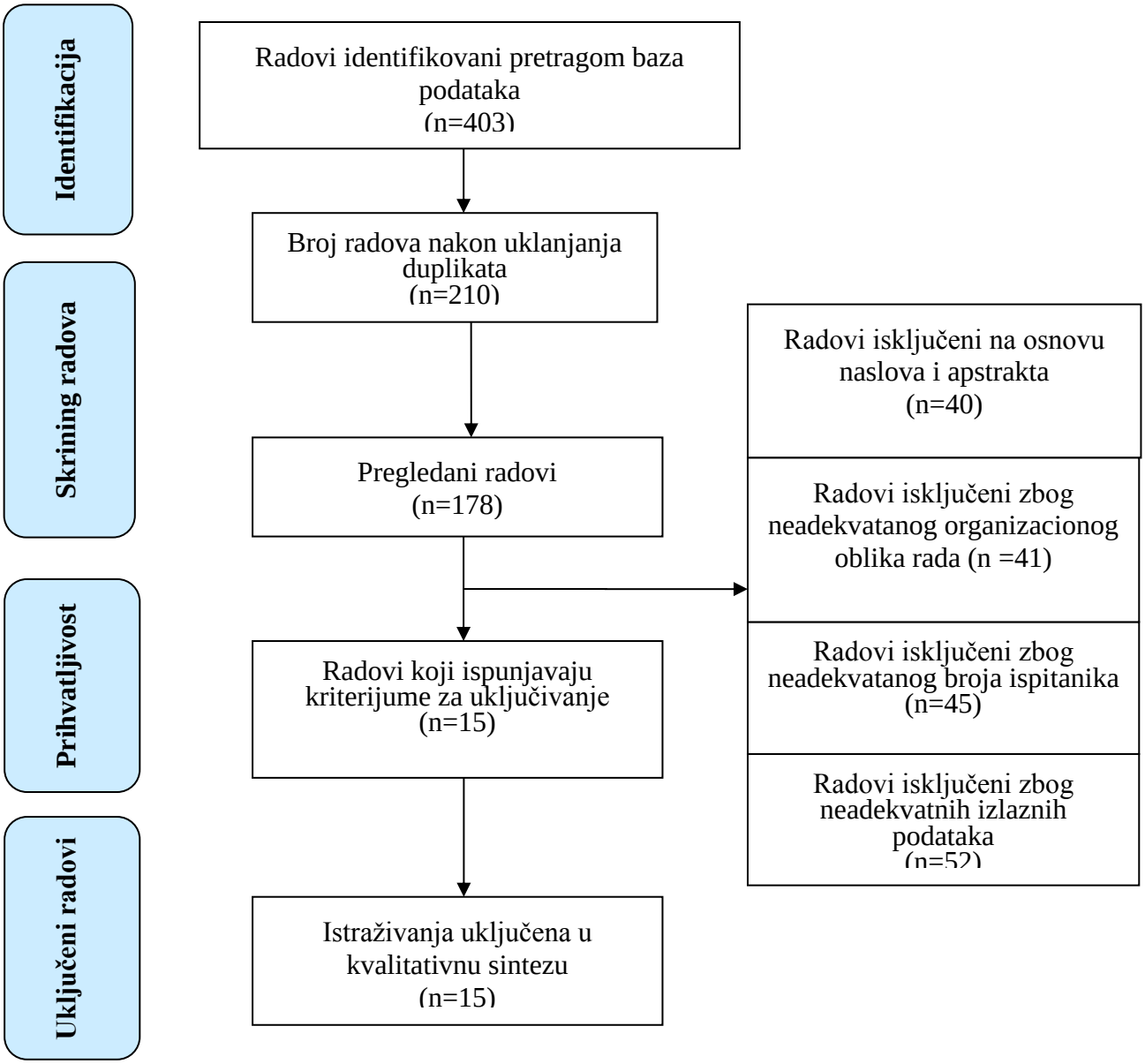

Tabela 1. *Pregled istraživanja uključenih u analizu.*

Referenca	Cilj istraživanja	Ispitanici		Varijable	Rezultati
		Broj	Uzrast		
Živčić et al. (2008)	Utvrđivanje motoričkih sposobnosti aktivne dece	N-96 M-57 Ž-39	4 - 6	"šatl run", hodanje unazad, "škola-hmelja", sedi - ustani, skok u dalj, izdržaj u zgibu, V - sedi i dostići, lateralna agilnost	Deca koja su učestvovala u sportskom programu poboljšali su svoje motoričke sposobnosti.
Bala et al. (2009)	Utvrđivanje kvantitativne i kvalitativne razlike između polova	N-333 M-162 Ž- 171	6-7	8 antropometrijskih 7 motoričkih 1 kognitivna varijabla.	Kognetivne sposobnosti su bolje povezane sa motoričkim sposobnostima kod ženskog pola, dok kod muškog pola bolja povezanost izmedju motoričkih sposobnosti i morfologijom rasta i razvoja.
Bala et al. (2009)	Utvrđivanje odnosa između antropometrijskih karakteristika i motoričkih sposobnosti	N-1170 M-565 Ž-605	4-7,5	8 antropometrijskih 7 motoričkih	Statistička značajnost polne razlike u antropološkim karakteristikama i motoričkim sposobnostima.
Iivonen et al. (2011)	Utvrđivanje linearnog i nelinearnog razvoja osnovnih motoričkih sposobnosti	N-84 M-46 Ž-38	4-5	Testovi osnovnih motoričkih sposobnosti	Brzina razvoja motoričkih sposobnosti kretala se linearno u odnosu na pol.
Venetsanou et al. (2011)	Utvrđivanje motoričke sposonosti -sposobnost balansiranja	N-283	4-6	Bruininks-Oseretsky	Ustanovljeno je da godište ima značajan uticaj na oba podtesta (p< ,001) i na pojedinačne testove (p<,001)
Trajkovski-Višić, et al. (2011)	Utvrđivanje univarijantnu i multivarijantnu statističku značajnost razlika u aritmetičkim sredstvima primenjenih morfoloških i motoričkih varijabli	N-393 M-224 Ž-169	4,5-6	14 morfoloških i 29 motoričkih varijabli	Rezultati su pokazali da postoji multivarijantna statistička značajnost razlika na nivou p = .00 između dečaka i devojčica.
Lopes et al. (2012)	Utvrđivanje povezanosti između motoričke koordinacije i <u>indeksa telesne mase</u>	N- 7175 M- 3559 Ž- 3616		Kiphard-Schillingova BMI	Koordinacija motorike pokazala je obrnut odnos s BMI u detinstvu i u ranoj adolescenciji.

Horvat, et al. (2013)	Prikaz razlike u motoričkim sposobnostima dečaka i devojčica	N-227 M- 106 Ž- 121	6-7	koordinacija, fleksibilnost, snaga, okretnost, preciznost i ravnoteža	U većini varijabli dečaci su postigli bolje rezultate, osim varijable koja je procenjivala fleksibilnost u kojoj su devojčice ostvarile bolje rezultate
De Miguel-Etayo et al. (2014)	Utvrđivanje o polnim i dobnim referentnim standardima za fitness dece	N- 10 302 Ž- 50,7%	6+	Testovi za procenu motoričkih sposobnosti	Utvrdjene su značajne razlike u polnim i dobnim referentnim standardima.
Đorđić et al. (2016)	Utvrđivanje odnosa fizičkog, motoričkog i intelektualnog razvoja	N-72 M-35 Ž-37	6-7	2 antropometrijske mere, dva testa motoričkih sposobnosti	Telesni rast i motorički razvoj u pozitivnoj su korelaciji-
Živanović, et al. (2017)	Utvrđivanje razlike između pola kod dece u vezi sa telesnim sastavom i koordinacijom pokreta	N-95 M-40 Ž-55	7	Koordinacija i 3 motorička testa	Postoji statistička značajnost razlike između polova, u vezi sa koordinacijom pokreta u korist dečaka.
Kokštejn et al. (2017)	Utvrđivanje razlika u poznavanju temeljnih motoričkih sposobnosti između dečaka i devojčica	N- 325 M-162 Ž- 163	3-6	Movement Assessment Battery	U upoređivanju dečaka I devojčica iste dobi, devojčice u dobi od 3 i 4 godine imale su veću ($p <.01$), finu motoričku sposobnost ($p <.01$) i ocenu ravnoteže ($p <.05$).
Nilsen et al. (2020)	Uticanje inteziteta telesne aktivnosti na motoričke sposobnosti	N-1081 M-52%	4-7	13 testova Specifične motoričke sposobnosti	Dečaci su postigli značajno veći stepen veština upravljanja objektima od veština kontrole predmeta
Bala et al . (2020)	Utvrđivanje razlika izmedju sposobnostima dečaka i devojčica	N- 367 M- 223 Ž- 144	4-7	3 antropometrijske mere i 7 motoričkih testova	Dečaci imaju značajno bolje rezultate na motornim testovima za procenu eksplozivne snage i funkcionalne koordinacije primarnih motoričkih sposobnosti, dok su djevojčice bolje ostvarile fleksibilnost ispitivanja.
Bala et al . (2020)	Utvrđivanje relacija morfoloških karakteristika i motričkih sposobnosti predškolaca	N-1.170 M-565 Ž-605	4-7,5	8 antropometrijsih karakteristika 7 motoričkih testova	Dečaci su bili bolji u svim testovima, osim preciznosti u kojoj su devočice pokazale bolje rezultate.

Legenda: N-broj ispitanika, M- muški pol, Ž- ženski pol, P- značajnost.

REZULTATI ISTRAŽIVANJA

U ovom preglednom istraživanju analizirano je 15 radova koji su proučavali motoričke sposobnosti dečaka i devojčica predškolskog uzrast akoji su ispunili sve kriterijume za inkluziju. Istraživanja su se sprovodina u uzrastu tri godine (Kokštejn et al. 2017), četiri i pet godina (Bala et al. 2020; Nilsen et al. 2020; Bala et al. 2020; Bala et al. 2009; Iivonen et al. 2011; Venetsanou et al. 2011; Trajkovski-Višić, et al. 2011; Živčić et al.2008) i šest i više godina (Horvat, et al. 2013; De Miguel-Etayo et al. 2014; Dordić et al. 2016; Živanović, et al. 2017; Bala et al. 2009). Izvestan broj autora je proučavao razlike u fleksibilnosti (Bala et al. 2009; De Miguel-Etayo, 2014; Bala et al. 2020), koordinaciji (Bala et al. 2009; Trajkovski-Višić, et al. 2011; Horvat, et al. 2013), ravnoteži (Iivonen, et al. 2011; Venetsanou et al.2011, Trajkovski-Višić, et al. 2011; Horvat, et al. 2013; Bala, 2009; Nilsen et, 2020) i snazi (Bala et al. 2009, Trajkovski-Višić, et al. 2011; Horvat, et al. 2013; Bala, 2020). Istraživanja pokazuju da je fleksibilnost najčešće proučavana motorička sposobnost a da su najređe proučavane segmentarna brzina i agilnost, pa bi ih narednim istraživanjima trebalo češće istraživati. Najveći uzorak ispitanika (N=10 302) je bilo u istraživanju De Miguel-Etayo et al. (2014) i istraživanju Lopes et al. (2012). Oni su sproveli istraživanje na uzorku od 7175 učenika. Najmanji uzorak od 72 ispitanika je bio u istraživanjima Dordić et al. (2016) i Iivonen et al. (2011).

Značajno poboljšanje kod muškaraca primećeno je u koordinaciji i snazi (statičke i ponavljajuće), a kod devojčica statičkoj snazi (vešanja savijenih ruku), kod mlađih starosnih grupa i brzina trčanja (crtica od 20 m) dok kod starijih starosnih grupa (6,5–7 godina). Značajna razlika je zabeležena samo u koordinaciji celog tela u korist muške dece, dok su ženska deca pokazala značajno bolju fleksibilnost (Bala et al. 2009). Dobijeni rezultati pokazuju da je kod devojčica ravnoteža ($p < 0.01$) dok kod dečaka ($p = 0.037$), i brzina trčanja ($p <0,01$) za oba pola što je pokazalo značajne promene. Takođe je ustanovljeno da godište i pol ima značajan uticaj na oba pod testa ($p <,001$) (Iivonen, et al. 2011; Venetsanou et al.2011). Devojčice su bolje u koordinaciji, ritmu i plesu, izdržljivosti, trbušnjacima, gipkosti, ravnoteži. Dok su dečaci bolji u pomeranju kockica, snazi, skoku u dalj i u poligonu (Trajkovski-Višić, et al. 2011). Studija koju su sproveli Horvat, et al. (2013) je pokazala da dečaci ove dobi (6-7 godina) postižu bolji rezultat od devojčica u većini testova koje procenjuju motoričke sposobnosti, naročito u motoričkim dimenzijama pod primarnim uticajem regulacionog mehanizma kretanja (koordinacija, agilnost i ravnoteža) i mehanizma regulacije snabdevanja energijom (snaga). Devojčice u ovom uzrastu i stariji postižu bolje rezultate u merama za procenu fleksibilnosti. Takodje, dečaci su bolji od devojčica u brzini (40-metarski sprint), mišićnoj snazi (čvrstoća stiska ruke i skoku u dalj stojeći) i CRF-u (20mSRT; šatlovi i VO_{2max}). Ipak, devojčice su bolje od dečaka bile u ravnoteži (flamingo) i fleksibilnosti (sedenje i postizanje leđa), (De Miguel-Etayo, 2014; Bala et al. 2020). Razlike među polovima u dobi od 3 do 6 godina su se razlikovale. U trećoj i četvrtoj godini dečaci i devojčice su se razlikovale u datim testovima (devojčice su imale veće ukupne rezultate testova ($U = 10357,5$ $p <.01$), ručne sposobnosti ($U = 9940$ $p <.01$) i ravnoteže ($U = 23657$ $p <.01$)) rezultata u poređenju sa dečacima, ali nije bilo razlike u ciljanju i hvatanju. U petoj godini nije bilo razlike među polovima niti za jedan test. Dok u šestoj godini nije bilo razlike u ukupnim rezultatima, ručnoj sposobnosti i ravnoteži između devojčica i dečaka. Međutim, dečaci su se pokazali značajno boljim u ciljaju i hvatanju u testova za kretanje ($U = 306,5$ $p <.01$; $r = 0,48$) (Kokštejn,2017). Nivo diferencijacije motoričkih sposobnosti mnogo je veći kod devojčica nego kod dečaka u uzrastu od 4-5 godina. Verujemo da se razlog za to može naći u bržem razvoju devojčica koje u ovom uzrastu prestignu svoje vršnjake. Neophodno je skrenuti pažnju na promenljivu promenu rastezanja sedišta, što je pokazatelj fleksibilnosti kod dece. (Bala, 2009; Nilsen et al. 2020)

DISKUSIJA

Poznato je da postoje razlike u polovima u motoričkim sposobnostima predškolske dece. Dobijeni rezultati pokazuju da razlike kod dečaka i devojčica u motoričkim sposobnostima se razlikuju u predškolskom uzrastu. Na temelju sudelovanja eksperimentalne grupe u realizaciji sportskog programa namenjenog deci predškolskog uzrasta, u trajanju od četiri dana, nedeljno po 50 - 60 minuta utvrđivane su moguće razlike u motoričkim sposobnostima (Živčić et al. 2008). To može ukazivati na pogodniji i proporcionalniji biološki rast i razvoj kod muške dece, u ovom slučaju koji se manifestuje telesnom konstitucijom, tj. antropometrijske karakteristike kod muške dece. Struktura opšteg motoričkog faktora se uglavnom procenjuju koordinacijom, brzim pokretima i pokreti (stojeći skok u dalj, 20-metarski skok, staza sa preprekama unazad i tapkanje ploče ruku), kao i snažni pokreti prtljažnika epetitivne prirode do iscrpljenosti (sedenje ukrštenih ruku), i statička (izometrijska) snaga ruku i ramena (savijena ruka). Kod ženske dece opšti motorički faktor je bio sličan onom kod muške dece, ali uloga promenljive koje procenjuju snagu prtljažnika, ruku i ramena u definisanju ovog faktora bila je mnogo niža. Kod ženske dece najvažnija karakteristika opšti motorički faktor je bio da obuhvata značajano kognitivno funkcionisanje (progresivne matrice), što nije slučaj kod muške dece. (Bala et al. 2009) Kvantitativno poboljšanje motoričkih sposobnosti primećeno je u svakoj grupi i muške i ženske dece. Stopa ovog razvoja kod predškolske dece je takva da dete može razviti motoriku u 1-2 meseca do te mere da školskoj deci treba godinu dana. (Bala et al. 2009). Takodje, količina devojčica koje su dobile maksimalan rezultat u statičkoj ravnoteži povećao se u proseku za 15,8% tokom merenja, dok dečaci nisu pokazali statističku značajnost. To znači da pol značajno utiče na uticaj ravnoteže. (Iivonen, et al. 2011; Venetsanou et al.2011). Postoje statistički značajne razlike kod dečaka u motoričkim varijablama: eksplozivne snage nogu, delimična koordinacija tela, fleksibilnost u ležanju, puls pre i posle aktivnosti i izdržljivost. Devojčice sa povećanim morfološkim vrednostima i volumenu mekih tkiva postižu bolje vrednosti u statičkoj snazi ruku i ramena, jačini ponavljanja trbuha, fleksibilnosti potkolenica, fleksibilnosti kukova i pulsu tokom izvođenja 3-minutnog poligona. (Trajkovski-Višić, et al. 2011) De Miguel-Etayo, (2014); Nilsen et al. 2020 i Bala et al. 2020 su utvrdili da su dečaci bolji od devojčica u brzini, snažnosti donjih i gornjih udova i kardiorespiratornoj kondiciji, a devojčice bolje u ravnoteži i fleksibilnosti. Prema karakteristikama iz ovih razvojnih profila može se zaključiti da fizički rast i motorički razvoj imaju pozitivan učinak korelacije kod dece u uzrastu od 5 do 6 godina (Dordića et al., 2016). U istraživanju Kokštejn et al. (2017) i Bala, (2020) mlađe devojčice (3–4 godine) nadmašile su dečake u ukupnim rezultatima testiranja, ručnim sposobnostima i ravnoteži, ali nisu primećene razlike u ciljanju i hvatanju. Kod starije dece (5-6 godina) nije bilo razlike u ukupnim rezultatima testiranja, ručnim sposobnostima i ravnoteži, ali su dečaci od 6 godina nadmašili devojčice u ciljanju i hvatanju. Ovi podaci pokazuju da devojčice uglavnom imaju bolje osnovne motoričke sposobnosti od dečaka u mlađoj dobi i da te razlike nestaju krajem predškolskog perioda. Umesto toga, ovi podaci mogu sugerisati da postoje prirodne razlike među polovima kod predškolaca i da se dečaci i devojčice predškolskog uzrasta ne smeju upoređivati jedni s drugima, već ih treba upoređivati samo sa decom iste starosti i pola. Relacije antropoloških karakteristika i motoričke sposobnosti predškolske dece oko 47% zajedničkog varijabiliteta. Generalno se može zaključiti da je relacija između morfološke I motoričke struktre veća kod dečaka tokom svih analizirajućih kategorija, sem u mlađem školskom uzrastu, gde je kod devojčica uočen veći nivo preciznosti (Bala, 2020).

Rezultati su generalno potvrdili rezlike među dečacima i devojčicama predškolskog uzrasta u motorickim sposobnostima.

ZAKLJUČAK

Cilj istraživanja je da se kritičkom analizom dosadašnjih istraživanja i generalizacijom rezultata svih analiziranih istraživanja koja su proučavala polne razlike u motorici predškolske dece, utvrde razlike u motoričkim sposobnostima između dečaka i devojčica predškolskog uzrasta.Pretraživanjem elektronskih baza podataka: Medline, Google Scholar i Kobson, identifikovano je 15 radova koji su ispunili uslove za inkluziju, pa su njihovi rezultati kritički analizirani i diskutovani u ovom istraživanju, da bi se izvukli generalni zaključci o motoričkim sposobnostima predškolske dece. Na osnovu rezultata svih analiziranih radova definisan je generalni zaključak koji pokazuje razliku među polova u motoričkim sposobnostima, kao i efekat telesne aktivnsti na razvoj motoričkih sposobnosti.

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DEVELOPMENT POTENTIAL OF CYCLOTURISM IN VOJVODINA

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Abstract: The development of cycling tourism contributes to the travel of paved bike paths and the tourist valorization of less developed areas. Cyclotourism affects public health, better air quality and reduced CO_2 emissions, but also opens up opportunities for job creation and economic development. Cyclotourism is growing steadily and travel of this mode of transport is projected to grow by 10 percent over the next ten years globally. Thanks to the flat and slightly undulating relief, Vojvodina has excellent opportunities for the development of cycling tourism, which has opened up opportunities to join three leading EuroVelo international cycling routes: EuroVelo 6, 11 and 13. The first tracing of the bicycle route and the installation of signalization began in 2006 through a project initiated by GIZ on the route from Bački Breg to Belgrade and the route known as the Danube bicycle route. The aim of the research in this paper was to determine how cyclists, after more than 10 years since the origin of the route, evaluate the contents and services it provides. Several different methods were used during the research process: (1) research of secondary material, (2) collection of primary data through a questionnaire, (3) statistical method, (4) analytical-synthetic method, (5) critical method. The results obtained by processing and analyzing the survey questionnaires indicate that cyclists are generally satisfied with the services provided on the Danube cycling route through Vojvodina. Cyclists emphasize as special values the landscape and cultural sights they have met, and the signposts, the arrangement of the trail and the quality of the asphalt are highly rated and placed. Cycling tourism, as a growing branch of tourism, requires further investments and improvement of the offer through stations for cyclists, traffic signs, landscaping, accommodation facilities. Cyclotourism will continue to grow and will bring long-term benefits to the economy and generate higher foreign exchange inflow, include ancillary activities and create new jobs, which tourism development policy should support planned and financial, ie through strategic and action plans, as well as investment-oriented projects.

Keywords: cycling tourism, routes, services, development opportunities, Vojvodina.

RAZVOJNI POTENCIJAL CIKLOTURIZMA U VOJVODINI

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Sažetak: Razvoj cikloturizma doprinosi putovanju trasiranim stazama na biciklu i turističkoj valorizaciji manje razvijenih područja. Cikloturizam utiče na javno zdravlje, bolji kvalitet vazduha i smanjenu emisiju CO_2, ali isto tako otvara mogućnosti za kreiranje novih radnih mesta i razvoj ekonomije. Cikloturizam beleži stalan rast i predviđa se rast putovanja ove vrste prevoza za 10 procenata tokom narednih deset godina na globalnom nivou. Vojvodina zahvaljujući ravničarskom i blago zatalasanom reljefu ima odlične mogućnosti za razvoj

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cikloturizma, a to je otvorilo mogućnosti da se uključi u tri vodeće EuroVelo međunarodne biciklističke rute: EuroVelo 6, 11 i 13. Prvo trasiranje biciklističke rute i postavljanje signalizacije počelo je 2006. godine kroz projekat koji je pokrenuo GIZ na trasi od Bačkog Brega do Beograda i ruti poznatoj kao Dunavska biciklistička ruta. Cilj istraživanja u ovom radu je bio da utvrdi kako cikloturisti posle više od 10 godina od nastanka rute procenjuju sadržaje i usluge koje ona pruža. U toku istraživačkog procesa korišćeno je nekoliko različitih metoda: (1) istraživanje sekundarne građe, (2) prikupljanje primarnih podataka putem anketnog upitnika, (3) statistički metod, (4) analitičko-sintetički metod, (5) kritički metod. Rezultati do kojih se došlo obradom i analizom anketnih upitnika ukazuju na to da su cikloturisti generalno zadovoljni pruženim uslugama na Dunavskoj biciklističkoj ruti kroz Vojvodinu. Cikloturisti ističu kao posebne vrednosti pejzaž i kulturne znamenitosti koje su upoznali, a visoko su ocenjeni i postavljeni putokazi, samo uređenje staze i kvalitet asfalta. Cikloturizam, kao rastuća grana turizma, zahteva dalja ulaganja i unapređenje ponude kroz stanice za bicikliste, saobraćajne znake, uređenje okoline, objekte smeštaja. Cikloturizam će nastaviti da raste i dugoročno će doneti benefite privredi i generisati veći devizni priliv, uključiti prateće delatnosti i kreirati nova radna mesta, što razvojna politika turizma treba da podrži planski i finansijski, odnosno kroz strateške i akcione planove, kao i projekte usmerene na investicionu podršku.

Ključne reči: cikloturizam, rute, usluge, mogućnosti razvoja, Vojvodina.

UVOD

Cikloturizam predstavlja oblik turizma posebnog interesa, gde se bicikl koristi kao glavno sredstvo prevoza do destinacije ili se koristi za rekreaciju tokom boravka turista u destinaciji. Cikloturizam je forma turističke aktivnosti sa velikim trendom rasta, gde se očekuje rast putovanja ove vrste prevoza za 10% tokom narednih deset godina na globalnom nivou. Procena je da postoji preko 60 miliona aktivnih biciklista u Evropi, koji u proseku troše 30% više od standradnih turista (Pinezić et al., 2017). Tako postoji podatak da cikloturista troši u proseku 53 EUR dnevno (uključujući smeštaj), dok izletnik cikloturista troši 16 EUR dnevno (Herceg, 2013). Neverovatno zvuči i podatak da Švajcarska ostvaruje veće prihode od cikloturizma nego od skijanja (Turudić, 2007). Benefit biciklizma je vrlo veliki i prema proceni Evropske biciklističke federacije (ECF) doprinos od biciklizma iznosi najmanje 150 milijardi evra evropskoj ekonomiji svake godine (Annual report ECF, 2019).
U cilju daljeg unapređivanja biciklizma Evropska biciklistička federacija poziva Evropsku Uniju da se obaveže na promenu paradigme politika transporta i mobilnosti.Tako je ECF identifikovala 4 ključna cilja koja treba ispuniti do 2030. godine (Annual report ECF, 2019):

1. Biciklizam kao ravnopravan partner u sistemu mobilnosti;
2. Korišćenje bicikla u EU trebalo bi da se poveća za 50% do 2030. godine, s tim da bi udeo u biciklizmu u transportnom modalnom učešću bio najmanje 12%;
3. Stopa smrtnih slučajeva i ozbiljnih povreda među biciklistima trebalo bi da se prepolovi do 2030;
4. U budžetu EU za period od 2021-2027. godine trebalo bi opredeliti 3 milijarde evra za biciklističke projekte, a u sledećem budžetu opredeliti 6 milijardi evra za takve projekte.

Cikloturisti su važan segment potrošača u turizmu, ali isto tako i važan segment porošača generalno u smislu kupovine opreme za biciklistička putovanja i sve više korišćenje bicikla u svakodnevnom transportu (Blondiau et al., 2016).
Vojvodina zahvaljujući ravničarskom i blago zatalasanom reljefu ima odlične mogućnosti za razvoj cikloturizma, a to je otvorilo mogućnosti da se uključi u tri vodeće EuroVelo

međunarodne biciklističke rute: EuroVelo 6, 11 i 13. To su ujedno tri staze koje prolaze kroz Srbiju generalno. Cilj istraživanja u ovom radu je bio da utvrdi kako cikloturisti posle više od 10 godina od nastanka Dunavske biciklističke rute (EuroVelo 6) ocenjuju sadržaje i usluge koje ona pruža u delu rute koji prolazi kroz Vojvodinu.

ZNAČAJ CIKLOTURIZMA I USTANOVLJENIH RUTA

Cikloturisti sami organizuju svoje putovanje sa ciljem da upoznaju prirodu i kulturu prostora kroz koji putuju, da ostvare neposredan kontakt sa ljudima iz lokalne zajednice, da probaju lokalne gastronomske specijalitete i drugo. Na svom putovanju cikloturisti očekuju mrežu markiranih puteva i staza, dobre mape i detaljne veb vodiče, očekuju određene pogodnosti i usluge koje će omogućiti siguran i komforan boravak i putovanje. Evropska mreža biciklističkih ruta (EuroVelo) formirana je upravo sa tim ciljem i pokriva 19 ruta koje se prostiru na oko 90.000 km u 42 zemlje (European cycle route network, 2021). Zahvaljujući tome, EuroVelo je postala najveća mreža biciklističkih ruta na svetu (Karta 1). U maju 2019. godine je Savet Evrope proglasio Stazu gvozdene zavese (EuroVelo 13) kulturnom rutom, što predstavlja prestižno priznanje koje je dodeljeno biciklističkom turizmu. U svetlu Evropskog Zelenog Plana (European Green Deal) Evrospka biciklistička federacija je usvojila Strategiju 2020-2030 za dalje jačanje i saradnju na polju razvoja biciklizma i cikloturizma (Annual report ECF, 2019).

Karta 1. Šematski prikaz EuroVelo ruta

Izvor: https://nl.eurovelo.com/news/2019-11-29_new-figures-show-there-are-nearly-90-000-kilometres-of-eurovelo-routes-to-explore-

Gledajući dužine EuroVelo ruta po zemljama može se uočiti da Nemačka ima vodeću ulogu sa preko 9.800 km EuroVelo ruta, a odmah iza nje sledi Francuska koja ima ukupno oko 8.600 km. Zatim dolazi Ujedinjeno Kraljevstvo sa preko 6.000 km EuroVelo ruta koje se poklapaju sa delovima Nacionalne mreže bicikala (https://nl.eurovelo.com/news/).
Usled rasta svesti o zdravom životu, cikloturizam je dobijao (i još uvijek dobija) na važnosti. S više od 60 miliona aktivnih biciklista u Evropi cikloturizam predstavlja brzo rastući trend u turizmu. Profil prosečnog cikloturiste može se opisati na sledeći način (Herceg, 2013):

- Većina osoba 45-55 godina
- Srednje ili visoko obrazovan
- Osoba viših primanja
- Učestaliji je broj osoba muškog pola
- 20% putuju sami, 50% u paru, ostatak male grupe 3-5 ljudi

Ipak, strukturne promene među cikloturistima su stalno prisutne i zahvaljujući promociji i različitim projektima namenjenim udruženjima cikloturista, kao i pružaocima usluga u cikloturizmu, može se očekivati da novi cikloturisti budu osobe svih uzrasta, zanimanja i pola, različitih interesovanja, a isto tako da postoje i oni koji putuju zbog zadovoljstva i nisu u mogućnosti potrošiti veliku svotu novca, odnosno nisu veliki potrošači. Cikloturiste karakteristiše skromnost u zahtevima prema komforu smeštaja, ali s druge strane traže obezbeđene posebne pogodnosti u vezi njihovog bicikla i sopstvenog odmora. Stoga su usvojeni „Bike and bed“ standardi koji omogućavaju (Herceg, 2013):

- prihvat cikloturista i za samo jednu noć
- sigurna prostorija pod ključem za besplatno ostavljanje bicikala preko noći (po mogućnosti u prizemlju ili podrumu, npr. garaža)
- prostor za sušenje odeće i putne opreme (npr. soba za sušenje, podrum, tavan, sušilica rublja itd.)
- bogata ponuda doručka ili mogućnost korištenja kuhinje
- podela ili prodaja karata regije/biciklističkih karata;
- raspored vožnje za autobus, voz, trajekt ili avion
- mogućnost korišćenja alata za jednostavne popravke
- informacije o lokaciji, radnom vremenu i telefonskim brojevima najbližih mehaničara u slučaju većih kvarova.

Srbija se uključila u „Bike&Bed“ sistem smeštajnih objekata specijalizovanih za prihvat biciklista, u koji se može uključiti bilo koji pružalac usluga smeštaja koji smatra da može ispuniti tražene kriterijume. Takav sistem povezuje objekte smeštaja sa svim ostalim uslugama koje se biciklistima pružaju u Srbiji (staze, biciklistički vodiči, pružanje strukovnih usluga poput iznajmljivanja, servisiranja, prevoza, učešća na manifestacijama i slično).
U Nemačkoj je razvoj cikloturizma doživeo ekspanziju 80-tih godina 20. veka, a u našoj zemlji prvo trasiranje biciklističke rute i postavljanje signalizacije počelo je 2006. godine kroz projekat koji je pokrenuo GIZ (Nemačka organizacija za tehničku saradnju) na trasi od Bačkog Brega do Novih Banovaca i ruti poznatoj kao Dunavska biciklistička ruta. Ova ruta je jedan od najpopularnijih biciklističkih pravaca u Evropi, kretala je od izvora Dunava do delte u Crno more, a kasnije je prerasla u EuroVelo 6 (Atlantik-Crno more). Ukupna dužina glavne rute kroz Srbiju je 667 kilometara, a za prelazak te rute prosečno je potrebno sedam do deset dana (Turudić, 2007). Markiranjem rute i objavljivanjem karata za cikloturiste broj turista se

značajno povećao, a Srbija je prestala biti *terra incognita* za bicikliste. Karte sadrže glavne rute koje vode najlepšim i najmirnijim putevima uz obalu Dunava (bez obzira na to da li su asfaltirani ili ne), alternativne rute (uvek po asfaltnim putevima) i preporučene lokalne vožnje koje cikloturiste raspoložene za otkrivanje novog vode kroz lepe pejzaže ili na zanimljiva mesta izvan same rute. Table na našoj deonici Dunava imaju originalan dizajn, a sastoje se od tabli za usemeravanje (Slika 1) i tabli za informisanje biciklista (preglednih karti)[1].

Slika 1 Signalizacija za cikloturiste
(Izvor: https://sr.wikipedia.org/sr-el/)

Kroz Srbiju prolazi između 12 i 15 hiljada biciklista godišnje, a plan je da taj broj bude povećan na 50 hiljada biciklista, s obzirom na to da kroz našu zemlju prolaze tri međunarodna biciklistička koridora – Eurovelo 6, 11 i 13. Realno je očekivati da će vrlo brzo doći do povećanja broja cikloturista u Srbiji (Pajević, 2019). U daljem razvoju cikloturizma treba obratiti pažnju na sve ključne elemente u privlačenju novih cikloturista: promociju i informisanje, uređenje puteva, smeštajne kapacitete, servisne usluge, vodiče, mape i drugo.
Rukovođeni složenim i specifičnim potrebama cikloturista postavili smo sledeće hipoteze:
H1 Cikloturisti su zadovoljni singalizacijom i kvalitetom puta
H2 Cikloturisti su zadovoljni smeštajnim kapacitetima
H3 Cukloturisti su zadovoljni restoraterskom ponudom i pratećim sadržajima

METOD I UZORAK

U toku istraživačkog procesa korišćeno je nekoliko različitih metoda: (1) istraživanje sekundarne građe, (2) prikupljanje primarnih podataka putem anketnog upitnika, (3) statistički metod, (4) analitičko-sintetički metod, (5) kritički metod.

Veličina i struktura uzorka

U radu su predstavljeni rezultati istraživanja koji se odnose na ocenu elemenata važnih cikloturistima na delu EuroVelo 6 rute koja prolazi kroz Vojvodinu. Istraživanje je sprovedeno terenskim radom, primenom tehnike anketiranja. Uzorak je obuhvatio 100 slučajno izabranih ispitanika, domaćih i stranih, koji su se nalazili na ruti EuroVelo 6. Obuhvaćeno je 66% ispitanika muškog pola i 34% ispitanika ženskog pola, gde se vidi da 2/3 učesnika ciklotura predstavljaju muškarci. U uzorak su ušli ispitanici iz različitih starosnih grupa, kao i različitog

[1] Razvoju biciklističkog turizma i regionalne povezanosti značajno je doprineo i projekat „Unapređenje međunarodne biciklističke rute *Dunav-Cycling Danube*", finansiran u sklopu Programa Evropske unije za prekograničnu saradnju Republika Hrvatska – Srbija. Da bi unapredili postojeću biciklističku rutu, projektni timovi su doprineli podizanju nivoa bezbednosti biciklista i promovisali ovaj region kao cikloturističku destinaciju. Projekat je bio vredan više od 300.000 evra.

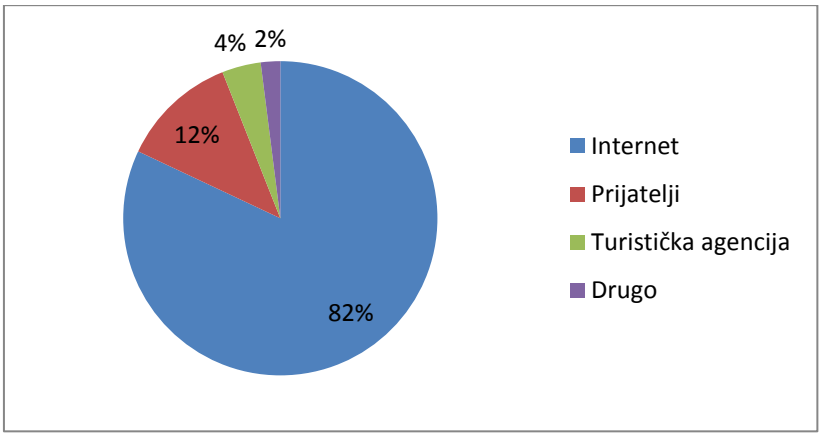
radnog statusa. Najviše su zastupljene osobe iz mlađih i srednjih starosnih grupa (populacija od 20 do 39 godina života učestvuju 65%) što je bilo očekivano s obzirom na potrebnu fizičku spremnost za duže rute. Radni status upućuje na platežne mogućnosti ispitanika tokom putovanja, gde je uzorkom obuhvaćeno 69% osoba koje imaju lične izvore prihoda (zaposleni i penzioneri) (Tabela 1). Više od 2/3 uzorka su činili domaći biciklisti, a manje od 1/3 strani biciklisti.

Tabela 1. Socio-demografske karakteristike uzorka

Pol		Godine		Radni status		Poreklo	
Muškarci	66%	<20	12%	Student	17%	Srbija	71%
Žene	34%	20-29	41%	Zaposlen	67%	Stranci	29%
		30-39	24%	Nezaposlen	14%		
		40-49	14%	Penzioner	2%		
		50+	9%				

REZULTATI ISTRAŽIVANJA SA DISKUSIJOM

Dominantan način informisanja cikloturista predstavlja internet (82%), što je postala najčešća praksa svih turista generalno (Grafikon 1). Brojni sajtovi, nalozi na društvenim mrežama, kao i blogovi iskusnih biciklista predstavljaju odličan način skupljanja informacija koje su često prenete u realnom vremenu, tako da sve promene na putu mogu da se prate iz „prve ruke“[1]. Znatno manje biciklisti se informišu preko svojih prijatelja i poznanika (12%), odnosno putem usmene promocije (word-of-mouth). Ostali izvori informisana su trenutno zanemarljivi.



Grafikon 1. Na koji način su se cikloturisti informisali o ruti EuroVelo 6?

Cikloturisti su zadovoljni kvalitetom puta na ruti EuroVelo 6 u delu gde prolazi kroz Vojvodinu (75%). Anketirani su zadovoljni i uređenjem staza (71%), kao i saobraćajnom signalizacijom (63%) (Tabela 2). Ipak, ne treba izgubiti iz vida da kod svake tvrdnje oko ¼ do 1/3 ispitanika

[1] Sajtovi Ciklonaut, TransSibir 2001, Freebiking, Freebiking blog redovno objavljuju putopise i fotopise sa putovanja na dva točka: „1000 kilometara kroz Transilvaniju i Karpate“, stazama Grze, Kučaja, Homoljskih planina, stazama neistraženih delova Beograda i dr. (Nedeljković, 2011).

nije zadovoljna putem, stazama ili signalizacijom, što ukazuje da prostora za poboljšanje saobraćajne usluge ima dosta i da su potrebne obimne investicije kako bi kvalitet dostigao evropski nivo.

Tabela 2. Zadovoljstvo cikloturista kvalitetom puta, uređenjem staza, saobraćajnom signalizacijom

	Veoma nezadovoljan	Nezadovoljan	Ne mogu da procenim	Zadovoljan	Veoma zadovoljan
Kvalitet puta	2%	17%	6%	65%	10%
Uređenje staza	2%	21%	6%	53%	18%
Saobraćajna signalizacija	2%	22%	13%	54%	9%

Prema rečima iskusnog cikloturiste Zlatka Zlatkovića, koji je proputovao dobar deo Evrope, postoje slabe tačke u putnoj infrastrukturi: „Nama nedostaje infrastruktura, nemamo biciklističkih staza, ni stajališta za bicikliste, ali to ne znači da nije uživanje voziti kroz našu zemlju, posebno Dunavskom rutom. Putovati na biciklu je poseban doživljaj, jer upoznaješ zemlju izbliza, neposredno, češće ulaziš u razgovor za meštanima, koji ti, u stvari, otkrivaju autentičnost predela kroz koje prolaziš. Tako, zapravo, upoznaješ kulturu jedne zemlje" (Delegacija EU u Republici Srbiji, 2021).

Usluga smeštaja za bickliste obično mora da ispuni neke specifične zahteve, tako da nije svaki smeštajni objekat povoljan za prihvat cikloturista. Iskustvo sa uslugom smeštaja nije moglo da proceni čak 83% ispitanika (očekivano s obzirom da su pretežno domaći ispitanici koji ne noće), a 4% je bilo veoma nezadovoljno i nezadovoljno. Uslugu ishrane i pića su ispitanici u mnogo većoj meri procenili i uočava se da je 19% veoma nezadovoljno i nezadovoljno ishranom, a 17% ispitanika veoma nezadovoljno i nezadovoljno uslugom pića i napitaka (Tabela 3). Dosta visok stepen nezadovoljstva cikloturista usmeren je na dostupnost navedenih usluga, odnosno koliko su objekti prilagođeni cikloturistima i na koji način mogu da odlože bicikl, a da bude siguran. Takođe, nezadovoljstvo je usmerena delimično na visinu cena, jer domaćim cikloturistima su usluge klasičnih restorana, hotelskih restorana, atraktivnijih kafea (pogotovo u većim gradovima duž rute) često visoke.

Tabela 3. Zadovoljstvo cikloturista uslugama smeštaja, ishrane i pića

	Veoma nezadovoljan	Nezadovoljan	Ne mogu da proceenim	Zadovoljan	Veoma zadovoljan
Usluga smeštaja	1%	3%	83%	11%	2%
Usluga ishrane	8%	11%	21%	56%	4%
Usluga pića i napitaka	4%	13%	19%	61%	3%

Prema iskustvu Aleksandra Veljkovića, koji je novinar, kartograf i administrator sajta Freebiking, prohtevi biciklista su najčešće skromni:„Bajkeri su u većini slučajeva skromni

ljudi, koji ne traže luksuz, a natprosečan broj njih se odlučuje da kampuje“ (Nedeljković, 2011), zato su njihova očekivanja da cena putovanja bude što niža s obzirom na ukupan izdatak koji je povezan sa dužinom trajanja putovanja (8-10 dana).
Cikloturisti imaju često potrebu za servisom gde mogu da poprave bicikl, međutim u ispitivanju smo utvrdili da čak 68% ne može da proceni tu uslugu jer je nisu ni koristili. Zadovoljnih i veoma zadovoljnih uslugom servisa je bilo 22% ispitanika. Bezbednost bicikala se odnosi na načine njihovog čuvanja tokom noći ili sigurnost parkiranja na javnim površinama, a ispitanici su se 51% izjasnili da su zadovoljni i veoma zadovoljni bezbednošću svojih dvotočkaša. Usluge infocentara nije moglo da proceni 79% ispitanika, što znači da nisu svraćali u infocentre (za put se pripreme sa kartama, vodičima, GPS-om). Zadovoljnih i veoma zadovoljnih radom infocentara je bilo 18% ispitanika (Tabela 4).

Tabela 4. Zadovoljstvo pratećim uslugama: servisi za popravak, bezbednost bicikala, infocentri

	Veoma nezadovoljan	Nezadovoljan	Ne mogu da proceenim	Zadovoljan	Veoma zadovoljan
Usluga servisa	3%	7%	68%	17%	5%
Bezbednost bicikala	4%	4%	41%	44%	7%
Infocentri	1%	2%	79%	12%	6%

ZAKLJUČAK

Planskim i dugoročnim razvijanjem cikloturizma jača se konkurentnost destinacije i prepoznatljivost destinacije na globalnom tržištu, raste devizni prihod od turizma, dolazi do produženja trajanja turističke sezone, otvaraju se nova radna mesta, razvija se turizam u onim delovima zemlje gde nema uslova za masovni turizam, gde nema kvalitetnih saobraćajnica i dr. Na taj način cikloturizam se može razvijati čak i u onim prostorima koji nemaju puno komparativnih prednosti za standardne oblike turizma.
Rezultati do kojih se došlo obradom i analizom anketnih upitnika ukazuju na to da su cikloturisti generalno zadovoljni pruženim uslugama na Dunavskoj biciklističkoj ruti kroz Vojvodinu. Visoko su ocenjeni postavljeni putokazi, samo uređenje staze i kvalitet asfalta, kao i usluga hrane i pića. Usluga smeštaja, servisa za porpavku bicikala i infocentara su ostali najčešće bez jasne ocene, jer njihove uslugu ispitanici su najmanje koristili. Cikloturizam, kao rastuća grana turizma, zahteva dalja ulaganja i unapređenje ponude kroz stanice za bicikliste, saobraćajne znake, uređenje okoline, specifične objekte smeštaja. Cikloturizam može omogućiti stabilniju ekonomiju malih i većih gradova uz Dunav, koji bi imali koristi od biciklističkog turizma, dok biciklisti mogu uživati u bogatoj kulturi, hrani i prirodi koju region Vojvodine nudi.
Cikloturizam će nastaviti da raste i dugoročno može doneti benefite privredi i generisati veći devizni priliv, uključiti prateće delatnosti i kreirati nova radna mesta, što razvojna politika turizma treba da podrži planski i finansijski, odnosno kroz strateške i akcione planove, kao i projekte usmerene na investicionu podršku.

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INFLUENCE OF PHYSICAL ACTIVITY ON CARDIORESPIRATORY FITNESS OF ADOLESCENTS OF DIFFERENT LEVELS OF NUTRITION - PILOT STUDIES

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Abstract: High levels of cardiorespiratory fitness during childhood and adolescence are closely related to cardiovascular health in this period, but also in later life. Higher levels of physical activity have a positive effect on the cardiovascular system. The aim of the study was to determine the impact of physical activity levels on the cardiorespiratory fitness of adolescents of different nutritional levels. The sample consisted of a total of 104 adolescents aged 16 years, of which 64 were normally fed and 40 with increased body weight. Physical activity was assessed by the FELS questionnaire, and the level of cardiorespiratory fitness by the Shutle Run test at 20m. Data processing was performed using the SPSS program, and regression analysis was applied to determine the impact. The results showed that physical activity significantly affects the cardiorespiratory fitness of normally nourished adolescents F (4,59) = 2,5145 p <, 050 and adolescents with increased body weight p <, 045. Research has confirmed that low levels of physical activity affect the cardiorespiratory fitness of adolescents with different levels of nutrition. Exercise has a positive effect on cardiorespiratory fitness, which is in line with other research.

Keywords: adolescent, physical activity, VO2max, impact

UTICAJ FIZIČKE AKTIVNOSTI NA KARDIORESPIRATORNI FITNES ADOLESCENATA RAZLIČITOG NIVOA UHRANjENOSTI – PILOT STUDIJA

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Sažetak: Visok nivo kardiorespiratornog fitnesa tokom detinjstva i adolescencije usko je povezan sa kardiovaskularnim zdravljem u ovom periodu, ali i u kasnijem životnom dobu. Veći nivo fizičke aktivnosti utiče pozitivno na kardiovaskularni sistem. Cilj istraživanja bio je da se utvrdi uticaj nivoa fizičke aktivnosti na kardiorespiratorni fitnes adolescenata različitog nivoa uhranjenosti. Uzorak ispitanika činilo je ukupno 104 adolescenta uzrasta 16 godina, od kojih je 64 bilo normalno uhranjeno, a 40 sa povećanom telesnom masom. Fizička aktivnost procenjivana je FELS upitnikom, a nivo kardiorespiratornog fitnesa Shutle Run testom na 20m. Obrada podataka realizovana je pomoću SPSS programa, a za utvrđivanje uticaja primenjena je regresiona analiza. Rezultati su pokazali da fizička aktivnost utiče značajno na kardiorespiratorni fitnes normalno uhranjenih adolescenata F(4,59)=2,5145 p<,050 i adolescenata sa povećanom telesnom masom p<,045. Istraživanjem je potvrđeno da nizak nivo fizičkih aktivnosti utiče na kardiorespiratorni fitnes adolescenata različitog nivoa uhranjenosti.

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Bavljenje fizičkom aktivnošću pozitivno utiče na kardiorespiratorni fitnes, što je u saglasnosti sa drugim istraživanja.

Ključne reči: adolescencija, fizička aktivnost, adolescent, VO2max, uticaj

UVOD

Fizička aktivnost se definiše kao bilo koja aktivnost tela koja uključuje skeletne mišiće, a rezultira trošenjem energije (Caspersen, Powell, & Christenson, 1985; Alves & Alves, 2019). Prilikom rasta i razvoja dece i adolescenata, potrebno je da fizička aktivnost bude sastavni deo njihovog života, zato što igra važnu ulogu u mentalnom, socijalnom, a pre svega fizičkom razvoju ličnosti. Sastavni deo fizičke aktivnosti su dečija igra, nastava fizičkog vaspitanja, aktivno i rekreativno bavljenje sportom (Maksimović i sar., 2009). Fizička aktivnost predstavlja jedan od važnih faktora koji utiče na očuvanje zdravlja čoveka, samim tim deluje na smanjenje rizika od različitih bolesti (Petrić i sar., 2009). Nizak nivo fizičke aktivnosti i visok nivo sedentarnog ponašanja povezani su pojavom gojaznosti, odnosno lošim ishodima metabolizma (Fearnbach et al., 2020). Studije koje su se bavile dečijom gojaznošću ustanovile su izrazit trend povećanja prekomerne telesne mase i gojaznosti u poslednje dve decenije (Anderson, 2018; Skinner, Ravanbakht, Skelton, Perrin & Armstrong, 2018; Garrido-Miguel et al., 2019). Porast gojaznosti u Evropi ispitivana je u meta-analizi Garrido-Miguel et al., (2019) koja je koristila za analizu studije sa reprezentativnim uzorcima. Učestalost prekomerne mase i gojaznosti promenila se sa 20.0% u periodu između 1999. i 2006. godine na 22.9% između 2011. i 2016. godine. Prevalenca gojaznosti se promenila sa 4.2% na 6.3%. Nedavno objavljeni rezultati meta analize navode da je visok nivo sedentarnog ponašanja pozitivno povezan sa rizikom od gojaznosti i lošeg metaboličkog zdravlja, što rezultira pojavom kardiovaskularnih bolesti, dijabetesom i smrtnosti od svih uzroka u odrasloj dobi (Oliveira & Guedes, 2016).

U detinjstvu i adolescenciji visok nivo kardiorespiratornog fitnesa usko je povezan sa kardiovaskularnim zdravljem u ovom periodu, kao i u kasnijem životnom dobu (Artero, 2011). Studije koje su vršile ispitivanja povezanosti nivoa fitnesa i kardivaskularnih bolesti kod dece i adolescanata ukazuju na postojanje povezanosti kardirespiratornog fitnesa sa faktorima rizika kardiovaskularnih bolesti, odnosno pokazale su da veći nivo fizičkih aktivnosti utiče pozitivno na kardiovaskularni sistem (Mintjens, et al., 2018).

Redovna fizička aktivnost utiče na kardiovaskularni sistem tako što srčani mišić čini elastičnijim i jačim i samim tim povećava udarni srčani volumen. Kapilarna mreža srčanog mišića je bogatija, pri čemu smanjuje mogućnost infarkta miokarda. Naime, redovno upražnjavanje fizičkih aktivnosti utiče na smanjenje pritiska u krvnim sudovima za otprilike 10/8 mmHg. Povećani disajni volumen, bogatija alveoralna mreža i uspešnije preuzimanje kiseonika iz udahnutog vazduha predstavljaju pozitivne efekte redovne fizičke aktivnosti. Pored benificija koje pruža redovna pravilno dozirana fizička aktivnost tako što deluje na kardiovaskularne i respiratorne organe javlja se i delovanje na niz drugih čovekovih organa i lokomotornog aparata čoveka (Mitić, 2011).

Cilj istraživanja bio je da se utvrdi uticaj nivoa fizičke aktivnosti na kardiorespiratorni fitnes adolescenata različitog nivoa uhranjenosti.

METODE

Uzorak ispitanika

Uzorak ispitanika za istraživanje činilo je ukupno 104 adolescenta uzrasta 16 godina ± 6 meseci, svrstanih u dve grupe. Prvu grupu činili su ispitanici koji su bili normalno uhranjeni (n=64), a drugu ispitanici sa povećanom telesnom masom (n=40). Svrstavanje ispitanika u jednu od grupa realizovano je na osnovu vrednosti indeksa telesne mase (BMI) (Haff & Triplett, 2016), a prema kriterijumima koje su predložili Cole, Bellizzi, Flegal & Dietz (2000).

Uzorak mernih instrumenata

Za utvrđivanje nivoa fizičke aktivnosti bio je primenjen protokol anketiranja standardizovanim međunarodnim upitnikom za procenu nivoa fizičke aktivnosti za decu i mlade - FELS upitnikom (FELS PAQ For Children) (Treuth, Hou, Young, & Maynard, 2005). FELS upitnik obuhvata pitanja o učestalosti i intenzitetu fizičke aktivnosti u području sporta, fizičke aktivnosti u slobodnom vremenu, fizičke aktivnosti kod kuće i ukupne fizičke aktivnosti. Validnost i relijabilnost upitnika za ovu populacionu grupu potvrđena je u studijama Abreu, Nascimento, Jardim, & Rozov (2010) i Treuth et al. (2005). Upitnik je korišćen i u studijama koje su ranije realizovane (Chinapaw, Mokkink, van Poppel, van Mechelen, & Terwee, 2010). Nivo kardiorespiratornog fitnesa utvrđivan je pomoću Shutle Run testa trčanja na 20m (Council of Europe, Commitee for the Development of Sport, 1993) izračunavanjem vrednosti VO2max.

Statistička obrada podataka

Statistička obrada podataka realizovana je pomoću statističkog paketa SPSS. Izračunati si osnovni parametri deskriptivne statistike, a za utvrđivanje uticaja nivoa fizičke aktivnosti na kardiorespiratorni fitnes primenjena je regresiona analiza.

REZULTATI

U Tabeli 1. prikazani su deskriptivni parametri nivoa fizičke aktivnosti i kardiorespiratornog fitnesa normalno uhranjenih i prekomerno uhranjenih ispitanika. Takođe, prikazane su i vrednosti telesne visine i telesne mase, kao i vrednosti BMI.

Na osnovu rezultata deskriptivne statistike može se zaključiti da je dobru diskriminativnost merenja pokazao veliki broj varijabli i kod normalno uhranjenih i kod prekomerno uhranjenih ispitanika.

Tabela 1. Deskriptivna statistika

Normalno uhrnjeni	n	Mean	SD	Max	Min	Range
Telesna visina	64	1.73	0.10	2.02	1.59	0.43
Telesna masa	64	64.28	12.55	98.00	49.00	49.00
BMI	64	21.21	1.92	24.67	17.78	6.89
Sport	64	2.65	0.82	4.33	1.33	3.00
Slobodno vreme	64	2.96	0.60	4.33	2.00	2.33
Kućni poslovi	64	1.73	0.59	3.50	1.00	2.50
Ukupno	64	7.34	1.50	11.17	4.67	6.50
VO2max	64	3.94	5.72	56.40	31.00	25.40

Prekomerno uhranjeni	n	Mean	SD	Max	Min	Range
Telesna visina	40	1.78	0.06	1.88	1.68	0.20
Telesna masa	40	86.90	6.19	97.00	75.00	22.00
BMI	40	27.56	1.19	29.94	25.85	4.08
Sport	40	2.72	0.86	4.00	1.33	2.67
Slobodno vreme	40	3.33	0.63	4.33	2.00	2.33
Kućni poslovi	40	1.68	0.84	4.00	1.00	3.00
Ukupno	40	7.72	1.77	11.17	5.00	6.17
VO2max	40	38.52	6.16	55.30	31.00	24.30

Legenda: n- broj ispitanika; Mean - srednja vrednost; Min - minimalna vrednost.; Max - maksimalna vrednost; Range - raspon; SD- standardna devijacija; Skew - skjunis; Kurt - kurtozis; VO2max – maksimalna potrošnja kiseonika

Regresionom analizom utvrđivan je uticaj nivoa fizičke aktivnosti na kardiorespiratorni fitnes. U Tabeli 2 prikazani su rezultati uticaja procenjene fizičke aktivnosti na kardiorespiratorni fitnes (VO2max) normalno uhranjenih ispitanika. Na osnovu dobijenih rezultata može se konstatovati da postoji statistički značajan uticaj na multivarijantnom nivou $p < .050$. Koeficijent multiple korelacije iznosi R= .38, dok je koeficijent determinacije R^2= .14.

Tabela 2. Uticaj fizičke aktivnosti na VO2max normalno uhranjenih ispitanika

	R	Part R	Beta	t(64)	p
Sport	.23	.20	.31	1.55	.125
Slobodno vreme	-.21	-.25	-.35	-2.00	.050
Kućni poslovi	-.01	.02	.03	.16	.876
Ukupno FA	.04	.02	.04	.13	.899
R= .38 R^2 = .14 F(4,59)= 2,51 p < .050					

Legenda: R - koeficijent multiple korelacije kriterijumske varijable i sistema prediktora; Part R - parcijalna korelacija; Beta - standardni koeficijent parcijalne regresije svake prediktorske varijable sa kriterijumom; T - test; p - nivo značajnosti; **- p< .01; * - p< .05.

Analizom pojedinačnih regresionih koeficijenata može se zaključiti da najveći uticaj na kardiorespiratorni fitnes ima prediktorska varijabla Slobodno vreme (p= .050). Ostali parametri fizičkih aktivnosti nemaju statistički značajan uticaj na VO2max kod normalno uhranjenih ispitanika.

U Tabeli 3 prikazani su rezultati uticaja procenjene fizičke aktivnost na kardiorespiratorni fitnes (VO2max) prekomerno uhranjenih ispitanika. Na osnovu dobijenih rezultata može se konstatovati da postoji statistički značajan uticaj na multivarijantnom nivou $p < .045$. Koeficijent multiple korelacije iznosi R= .48, dok koeficijent determinacije iznosi R^2= .24

Tabela 3. Uticaj fizičke aktivnosti na VO2max prekomerno uhranjenih ispitanika

	R	Part R	Beta	t(40)	p
Sport	.09	.25	.40	1.52	.138
Slobodno vreme	-.41	-.39	-.61	-2.51	.017
Kućni poslovi	-.16	.03	-.04	-.20	.844
Ukupna FA	-.27	.02	-.05	-.12	.902
R= .48 R^2 = .24 F(4,35)= 2,72 p < .045					

Legenda: R - koeficijent multiple korelacije kriterijumske varijable i sistema prediktora; Part R - parcijalna korelacija; Beta - standardni koeficijent parcijalne regresije svake prediktorske varijable sa kriterijumom; T - test; p - nivo značajnosti; **- p< .01; * - p< .05.

Analizom pojedinačnih regresionih koeficijenata može se zaključiti da najveći uticaj na kardiorespiratorni fitnes ima prediktorska varijabla Slobodno vreme (p= .045). Ostali parametri fizičkih aktivnosti nemaju statistički značajan uticaj na kardiorespiratorni fitnes (VO2max) kod normalno uhranjenih ispitanika.

DISKUSIJA

Dobijeni rezultati uticaja procenjene fizičke aktivnosti na rezultat kardiorespiratornog fitnesa kod normalno uhranjenih adolescenata (Tabela 2), ukazuju da postoji statistički značajan uticaj. Najveći negativan uticaj na kardiorespiratorni sistem (VO2max) ima procenjena fizička aktivnost u slobodno vreme (p = .050). Ovako dobijeni rezultati ukazuju da adolescenti svoje slobodno vreme najmanje posvećuju fizičkoj aktivnosti, odnosno da što je viši nivo sedentarnog ponašanja nivoa kardiorespiratornog fitnesa je niži. Rezultati dosadašnjih istraživanja ukazuju da ova populacija najveći deo slobodnog vremena provede u sedentarnim aktivnostima (Song et al., 2019), odnosno pišu domaći, gledaju televizor, koriste telefone i računare. Takođe, veliki deo ove populacije nije redovan na časovima fizičkog vaspitanja (Vlaški & Katanić, 2010), pa su dobijeni rezultati očekivani. Rezulatati govore u prilog tome da su adolescenti najmanje fizički aktivni kada imaju slobodno vreme. U ranije realizovanim studijama, zabrinjava podatak da samo 33% adolescenata postiže preporučeni cilj od najmanje 60 minuta fizičke aktivnosti dnevno (Foster, Moore, Singletary & Skelton, 2018).

Dosadašnje studije su utvrdile da su adolescenti sa indeksom telesne mase koji se nalazi u preporučenim normalnim granicama, fizički aktivniji u odnosu na ostale dve kategorije (sa prekomernom telesnom masom i gojaznim) iako, kao i u slučaju realizovanog istraživanja, pripadaju kategoriji fizički neaktivnih ispitanika (Ruiz et al., 2010). Takođe, utvrđeno je da je učešće u fizičkim aktivnostima tokom slobodnog vremena povezano sa boljim indeksom telesne mase i kardiorespiratornim fitnesom (Ruiz et al., 2010).

Kad su upitanju ispitanici iz grupe prekomerno uhranjenih ispitanika, rezultati realizovane studije ukazuju da se isti ne razlikuju od adolescenata koji su normalno uhranjeni. Naime, i kod prekomerno uhranjenih ispitanika slobodno vreme ima najveći negativan uticaj (p= .045) na kardiorespiratorni fitnes. Ovako dobijeni rezulatiu skladu su rezultatima drugih studija gde su pojedini autori došli do saznanja da adolescenti slobodno vreme najčešće upražnjavaju koristeći računar i TV, što iziskuje sedentarno ponašnje (Đokić, 2014). Takođe, prekomerno uhranjene i gojazne osobe manje se bave sportom, spavaju u slobodno vreme i najviše gledaju TV. Đokić (2014) upućuje da svega 44% učenika slobodno vreme koristi za upražnjavanje fizičkih aktivnosti (igra u parku – dvorištu, fudbal, košarka, odbojka, lastiš....), dok 56% učenika slobodno vreme najčešće koristi za igre na kompjuteur ili televiziju ili nema nikakvu

fizičku aktivnost. Ovakav način provođenja slobodnog vremena ima negativan uticaj na parametre kardiorespiratornog fitnesa. Kada se govori o relacijama fizičkih aktivnosti i kardiorespiratornog fitnesa adolescenata rezultati drugih studija potvrđuju visoku povezanost između nivoa fizičke aktivnosti i nivoa kardiorespiratornog fitnesa (Aires et al., 2010), odnosno da je učešće u fizičkim aktivnostima povezano sa boljim kardiorespiratornim fitnesom (Ruiz et al., 2010).

ZAKLJUČAK

Smatra se da je period adolescencije presudan u sticanju navika koje prate čoveka kroz čitav život, a u tom kontekstu i navika za redovno upražnjavanje fizičkih aktivnosti. Veliki broj studija utvrdio je da redovna fizička aktivnost tokom detinjstva i adolescencije smanjuje rizik od različitih oboljenja u odraslom dobu, a istovremeno poboljšava kardiorespiratorni fitnes i telesni sastav adolescenata. Fizička neaktivnost postala je sastavni deo života adolescenata, što negativno utiče na kardiorespiratorni fitnes, ali i druge parametre vezane za zdravlje ove populacije. Adolescenti svoje slobodno vreme najmanje posvećuju fizičkoj aktivnosti, pri čemu to vreme koriste za aktivnosti koje iziskuju sedentarno ponašanje. Istraživanje je potvrdilo povezanost između nivoa fizičke aktivnosti i kardiorespiratornog fitnesa kod adolescenata različitog nivoa uhranjenosti

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MEASURING INSTRUMENTS FOR ASSESSING THE SPECIFIC FLEXIBILITY OF GYMNASTS

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Abstract: The aim of this study was to describe specific measuring instruments for assessing flexibility in gymnasts. In artistic gymnastics, flexibility is an important motor ability, both for the identification of young talents and for the sport itself, given that it is one of the most prominent character traits of this sport. Although it has not received much attention in recent decades, it is crucial factor for the identification of young talents, the performance of gymnasts in the competition itself, which facilitates the implementation of the training process, resulting more progressive improvement, reducing possibility of injuries, because due to the insufficiently expressed aesthetic character, the judges may reject more negative points in competition. Adequate 7 measuring instruments can be used to assess the specific flexibility of gymnasts and the results represent a detailed description and method of application of each measuring instrument individually. Since joint mobility is individual, flexibility tends to decrease and with the given measuring instruments it is possible to check, monitor and improve the specific flexibility of gymnasts. Therefore, it is necessary to create awareness of the importance of this motor ability for artisitc gymnastics, as well as the measuring instruments themselves and their proper application. Also, this study may have practical application for future researchers and coaches, who would properly create their own battery of tests to assess or monitoring flexibility in gymnasts, with proper usage method and approach to exercises.

Keywords: sports diagnostics, specific flexibility, artistic gymnastics

MERNI INSTRUMENTI ZA PROCENU SPECIFIČNE FLEKSIBILNOSTI GIMNASTIČARA

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Sažetak: Cilj ovog istraživanja bio je opis specifičnih mernih instrumenata za procenu fleksibilnosti kod gimnastičara. U sportskoj gimnastici, fleksibilnost je važna motorička sposobnost, kako za identifikaciju mladih talenata, tako i za sam sport, obzirom da je ona jedna od najistaknutijih karakternih crta ovog sporta. Iako se na nju ne obraća velika pažnja poslednjih decenija, ona je krucijalna za identifikaciju mladih talenata, nastup gimnastičara na samom takmičenju, pri čemu se olakšava realizacija trenažnog procesa, usled čega se javlja progresivniji napredak, smanjuje se mogućnost stvaranja povreda, ali i olakšava suđenje, jer zbog nedovoljno izraženog estetskog karaktera sudija može odbiti više negativnih bodova. Adekvatnih 7 mernih instrumenata se mogu primeniti za procenu specifične fleksibilnosti kod gimnastičara, a rezultati predstavljaju detaljan opis i način primene svakog mernog instrumenta ponaosob. Obzirom da je pokretljivost zglobova individualna za svakog pojedinca, fleksibilnost ima tendenciju smanjivanja, a datim mernim instrumentima je moguće proveriti, izvršiti monitoring i poboljšati specifičnu fleksibilnost kod gimnastičara. Stoga je potrebno stvoriti svest o značaju ove motoričke sposobnosti za sportsku gimnastiku, kao i samih mernih

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instrumenata i njihovoj pravilnoj primeni, a ovaj rad može imati i praktičnu primenu za buduće istraživače i trenere, koji bi na pravi način kreirali svoju bateriju testova za procenu ili monitoring fleksibilnosti kod gimnastičara, uz pravilnu primenu i pristup vežbi.

Ključne reči: sportska dijagnostika, specifična fleksibilnost, sportska gimnastika

UVOD

Najširi auditorijum sportsku gimnastiku doživljava, a on je pojmovno definisan kao takmičarska disciplina, polistrukturalnog sadržaja, acikličnog tipa i strogo definisanim pravilima kao konvencijom u primeni i praksi (Petković, Veličković, Petković, Ilić, Mekić, 2010). U stručnoj literaturi, kao sinonimi za gipkost susreću se, pored pojmova pokretljivosti i fleksibilnost i sintagme zglobna amplituda, obim pokreta, zglobno-mišićna pokretljivost, dok se u srpskom jeziku koriste više sinonima za označavanje istih motoričkih sposobnosti, fleksibilnost, gipkost, pokretljivost, savitljivost. Dakle, pojam fleksibilnosti u sportskoj gimnastici može biti amplituda pokreta u kome određena funkcija (aktivna ili pasivna) ima mišićni sistem (Rafailović, 2013), a sportska gimnastika je sport čije su generalne karakteristike visok nivo snage u odnosu na telesnu težinu, ali i visok nivo fleksibilnosti (Arkaev, & Sutsilin, 2004).

Mnogi gimnastički treneri će se složiti oko esencijalnog aspekta sportske gimnastike i samog performansa, a to je da je fleksibilnost bitan faktor prilikom identifikacije mladih talenata (Hubley, 1982; Sands, 1990; O'Brien, 1993; Sands, 1994; Brodie & Royce, 1998). Međutim, gimnastički svet se iz godine u godinu razvija, pa je i sam gimnastički performans sve složeniji. Zbog promena koji se javljaju u gimnastičkim pravilima, modalitet fleksibilnosti postaje jedna od najistaknutijih sposobnosti i postaje fundamentalan među gimnastičkim elementima (FIG, 2013). Obzirom da postoje pravila za svaki element (*Code of Points*), može se reći da je fleksibilnost okarakterisana ne samo kao estetskim, već i tehničkim elementom sporta (Laffranchi, 2001; Barbosa-Rinaldi, Martineli, & Teixeira, 2009), a pravila ocenjivanja zahtevaju da sudija bude strožiji ukoliko gimnastičar ne postigne adekvatnu poziciju prilikom izvedbe elemenata, obzirom da se na njihov trening fleksibilnosti obraća vrlo malo pažnje (Sands & McNeal, 2000). Stoga je od krucijalne važnosti da se od samog početka bavljenja ovim sportom utiče na fleksibilnost, jer se maksimalno smanjuje rizik od povreda, ubrzava se proces učenja i ovladavanja novih i težih elemenata, a postiže se i najpravilnije izvođenje istih. Na osnovu navedenih činjenica, potrebno je stvoriti svest o značaju fleksibilnosti za sportsku gimnastiku, stoga se cilj ovog istraživanja ogleda u opisu mernih instrumenata za procenu specifične fleksibilnosti gimnastičara.

METODE

Za prikupljanje odgovarajuće literature koja je adekvatna za istraživanje ovakvog tipa, pretraživane su sledeće baze podataka: SCIndeks, Google Akademik, Science Direct, Mendeley i Scopus. Takođe su pregledane i liste referenci prethodnih originalnih istraživanja koje su primenjivale merne instrumente za procenu specifične fleksibilnosti kod gimnastičara, dok je za analizu dobijenih podataka primenjena deskriptivna metoda. Strategija pretraživanja je bila modifikovana i prilagođena svakoj bazi i pretraživanju u cilju povećanja senzitivnosti, kako studija, tako i mernih instrumenata za procenu specifične fleksibilnosti kod gimnastičara.

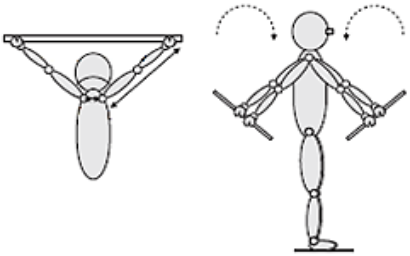
REZULTATI

Predstavljeno je 7 mernih instrumenata za procenu specifične fleksibilnosti, uz detaljan opis i pregled referentnih i prosečnih vrednosti za svaki merni instrument pojedninačno, i to sledećim redosledom:

1. Iskret palicom;
2. Most;
3. Test statičke fleksibilnosti ramena;
4. Test dubokog pretklona na klupici;
5. Pretklon u sedu raznožno;
6. Čeona špaga;
7. Bočna špaga.

1. Iskret palicom - Static flexibility test - Shoulder (Metikoš, Hofman, Prot, Pintar, & Oreb, 1989)

Cilj testa: Nadgledanje razvoja fleksibilnosti ramena.
Oprema i rekviziti: Drvena palica dužine 165cm, na jednom kraju palice je plastični držač koji pokriva 15cm drvenog dela palice, dok je na ostatku palice ucrtana centimetarska skala s nultom tačkom neposredno do plastičnog držača.
Opis testa: Iz stojećeg stava, ispitanik podiže palicu rukama opruženim ispred sebe i istovremeno razdvaja ruke klizeći desnom šakom po palici, dok je leva fiksirana na držaču. Zadatak ispitanika je da napravi iskret iznad glave držeći palicu opruženim rukama, tako da je razmak između ruku najuži mogući. Celo kretanje mora da se izvede lagano, bez zamaha ili bez uzastopnih trzaja u uzručenju. Test ponoviti tri puta.
Ocena testa: Najuži razmak između ruku tokom iskreta (Slika 1., tabela 1.).



Slika 1. Iskret palicom

Tabela 1. Tabela prosečnih vrednosti utvrđene na testu iskret palicom

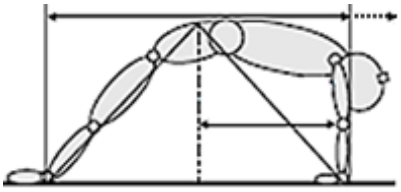
Autor i godina	Ispitanici	Godine	Prosečne vrednosti	
			A	R
Irurtia, Busquets, Carrasco, Ferrer, & Marina (2010)	M-15	11.4±1.1	g-49.3±20.4° s-33.9±11.8° t-26.4±10.6°	g-58.8±20.4° s-47.4±13.1° t-45.0±11.6°

Legenda: M-muški pol, **A**-antroverzija, **R**-retroverzija, **g**-generalni period, **s**-specifični period, **t**-takmičarski period; **Napomena:** Vrednosti su prikazane kao Mean±SD i u stepenima (°)

2. "Most"- Back BridgeTest (Irurtia et al., 2010)

Cilj testa: Nadgledanje razvoja fleksibilnosti ramena.
Oprema i rekviziti potrebni za izvođenje testa: Neklizajuća strunjača, veliki uglomer.
Opis testa: Ispitanik leži na leđima, ruke su savijene u zglobu lakta, a dlanovi su pored glave i na podu, noge su spojene i zgrčene pod 90°. Iz ovog položaja, ispitanik treba da podigne svoje telo koristeći ruke i noge opružajući ih, tako da ramena prelaze zamišljenu vertikanu liniju preko ručnih zglobova.

Ocena testa: Ugao koji ramena zaklapaju u odnosu na „zamišljenu“ vertikalnu liniju (Slika 2., tabela 2.).



Slika 2. „Most“

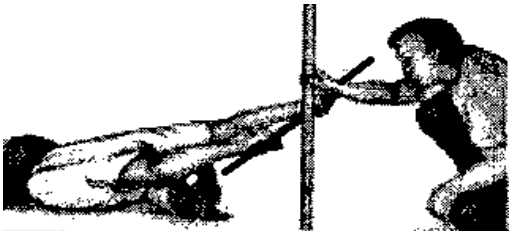
Tabela 2. Tabela prosečnih vrednosti utvrđene na testu „most“

Autor i godina	Ispitanici	Godine	Prosečne vrednosti
Irurtia et al. (2010)	M-15	11.4±1.1	g-58.8±7° s-56.9±9.7° t-57.4±10.1°

Legenda: M-muški pol, **g-**generalni period, **s-**specifični period, **t-**takmičarski period; **Napomena:** Vrednosti su prikazane kao Mean±SD i u stepenima (°)

3. Test statičke fleksibilnosti ramena - Static flexibility test - shoulder (Ashoc, 2008)

Cilj testa: Nadgledanje razvoja fleksibilnosti ramena.
Oprema i rekviziti: Lenjir ili metar, štap.
Opis testa: Ispitanik leži na trbuhu, ruke su u uzručenju, potpuno opružene i ispitanik drži štap u rukama. Cilj je podići štap što je više moguće, tako da su kukovi sve vreme u kontaktu sa podom, da brada dodiruje pod, a ruke su potpuno opružene i u širini su ispitanikovih ramena. Pomoćnik može da pomogne držeći ispitanika za noge. Test ponoviti tri puta.
Ocena testa: Meri se najbolja visina držanog štapa od tla (Slika 3., tabela 3.).



Slika 3. Test statičke fleksibilnosti ramena

Tabela 3. Referentne vrednosti testa statičke fleksibilnosti ramena i zglobova (Ashoc, 2008)

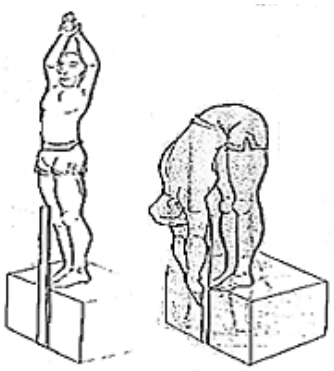
Ocena	Muškarci	Žene
Odlično	< 31.7	< 29.8
Vrlo dobro	36.6 – 29.2	29.7 – 27.3
Dobro	29.1 – 20.9	27.2 – 19
Dovoljno	20.8 – 15.2	18.9 – 13.9
Nedovoljno	> 15.1	> 13.8

Napomena: Konvertovano iz inča u centimetar (1in = 2.54cm)

4. Test dubokog pretklona na klupici (Metikoš et al., 1989)

Cilj testa: Nadgledanje razvoja fleksibilnosti zgloba kuka i mišića zadnje lože.
Opis testa: Ispitanik stane sunožno na klupicu i vrši dohvat rukama u pretklonu sa potpuno opruženim kolenima, što je dublje moguće, a na klupicu se pričvrsti vertikalno postavljen metar, tako da stoji iznad i ispod ruba klupice po 30cm.
Oprema i rekviziti: Klupica visine 30 cm, metar.

Uputstvo za ispitanike: Ispitanik vrši pretklon sa opruženim nogama iz stajaće pozicije, tako da su vrhovi nožnih prstiju do samog ruba klupice. Šake su jedna na drugu, tako da se srednji prsti poklapaju. U dubokom pretklonu treba ostati miran u najdubljoj poziciji koja se može dostići sa potpuno opruženim kolenima. Test se obavlja tri puta, a najbolji rezultat se računa kao ocena. Rezultat je određen najdubljom pozicijom koju ispitanik dostiže na skali vrhovima svojih prstiju.
Ocena testa: Najbolji rezultat u centrimetrima (Slika 4., tabela 4.).



Slika 4. Test dubokog pretklona

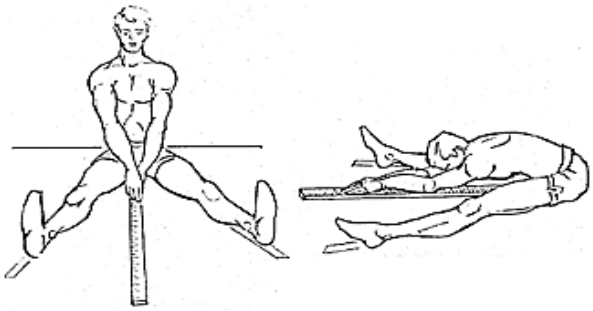
Tabela 5. Referentne vrednosti testa dubokog pretklona (Aschoc, 2008)

Ocena	M	Ž
Super	> +27	> +30
Odlično	+17 – +27	+21 – +30
Dobro	+6 – +16	+11 – +20
Prosečno	0 – -5	+1 – +10
Srednje	-8 – -1	-7 – 0
Slabo	-19 – -9	-14 – -8
Mnogo slabo	< -20	< -15

Legenda: M-muški pol, **Ž-**ženski pol; **Napomena:** Referentne vrednosti su prikazane u centimetrima (cm)

5. Pretklon u sedu raznožno (Metikoš et al., 1989)

Cilj: Nadgledanje razvoja fleksibilnosti zgloba kuka i mišića zadnje lože.
Oprema i rekviziti: Merna traka sa tačnošću od 0.1cm. Na podu su ucrtane dve linije ili zalepljene dve trake dužine 1.5m koje se spajaju pod uglom od 45°. Vrh ugla dodiruje zid.
Opis testa: Ispitanik sedne na ugao poda, oslonjen čvrsto leđima i glavom o zid. Opružene noge raznoži, tako da su iznad mernih traka. Iz tog položaja opružiti ruke, šake jedna iznad druge, tako da se srednji prsti poklapaju. Tako postavljene ruke spustiti na tlo ispred sebe. Zadatak ispitanika je da izvede što dublji pretklon, bez savijanja u kolenima. Zadatak se ponavlja tri puta, upisuju se svi rezultati posebno.
Ocena testa: Maksimalna dohvatna daljina izražena u centimetrima (Slika 5., tabela 5.).



Slika 5. Pretklon u sedu raznožnom

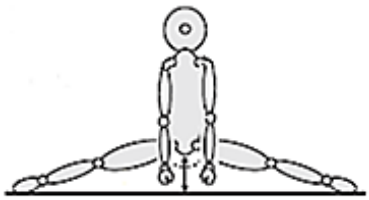
Tabela 6. Tabela prosečnih vrednosti utvrđene na testu pretklon u sedu raznožno

Autor i godina	Ispitanici	Godine	Prosečne vrednosti
Sabolč, & Lepeš (2012)	N-125 M-62 Ž-63	7.39 dec.god.	M-35.86±6.72cm Ž-41.49±7.15cm

Legenda: N-ukupan broj ispitanika, **M-**muški pol, **Ž-**ženski pol, **dec.god.-**decimalne godine;
Napomena: Vrednosti su prikazane kao Mean±SD i u centimetrima (cm)

6. Čeona špaga - Forward split test (Irurtia et al., 2010)

Cilj: Nadgledanje razvoja fleksibilnosti zgloba kuka.
Oprema i rekviziti potrebni za izvođenje testa: Neklizajuća strunjača, metar.
Opis testa: Stojeći na obe noge, odvojiti donje ekstremitete što je više moguće u odnoženju, sve dok pubična regija ne dotakne pod, tako da je trup u uspravnom položaju, dozvoljeno je održavanje šakama o pod.
Ocena testa: Što manja udaljenost pubičnog dela od tla (Slika 6., tabela 6.).



Slika 6. Čeona špaga

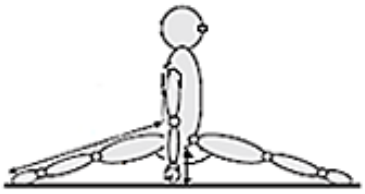
Tabela 7. Tabela prosečnih vrednosti utvrđene na testu čeona špaga

Autor i godina	Ispitanici	Godine	Prosečne vrednosti
Irurtia et al. (2010)	M-15	11.4±1.1	g-166.2±11.8° s-169.1±7.2° t-173.3±6.9°
Bago et al. (2013)	Ž-1	6	3cm

Legenda: M-muški pol, **Ž-**ženski pol, **g-**generalni period, **s-**specifični period, **t-**takmičarski period;
Napomena: Vrednosti su prikazane kao Mean±SD, u stepenima (°) i centrimetrima (cm)

7. Bočna špaga – Side split test (Irurtia et al., 2010)

Cilj: Nadgledanje razvoja fleksibilnosti zgloba kuka.
Oprema i rekviziti potrebni za izvođenje testa: Neklizajuća strunjača, metar.
Opis testa: Stojeći na obe noge, odvojiti donje ekstremitete, što je više moguće, tako da je jedna noga u prednoženju, a druga u zanoženju, sve dok pubična regija ne dotakne pod, tako da je trup u uspravnom položaju, dozvoljeno je održavanje šakama o pod
Ocena testa: Što manja udaljenost pubičnog dela od tla (Slika 7., tabela 7.).



Slika 7. Bočna špaga

Tabela 8. Tabela prosečnih vrednosti utvrđene na testu bočna špaga

Autor i godina	Ispitanici	Godine	Prosečne vrednosti
Irurtia et al. (2010)	M-15	11.4±1.1	g-172.0±8.7° s-173.3±7.8° t-179.0±7.0°
Bago et al. (2013)	Ž-1	6	3cm

Legenda: M-muški pol, **Ž**-ženski pol, **g**-generalni period, **s**-specifični period, **t**-takmičarski period;
Napomena: Vrednosti su prikazane kao Mean±SD, u stepenima (°) i centrimetrima (cm)

DISKUSIJA

Cilj ovog istraživanja bio je opis mernih instrumenata za procenu specifične fleksibilnosti kod gimnastičara. Za razliku od drugih motoričkih sposobnosti, fleksibilnost ima tendenciju smanjivanja, a ne povećanja. Bez obzira na anatomsku sličnost istih zglobova kod ljudi, pokretljivost zgloba je individualna (male razlike u strukturi ili promene nastale iz različitih razloga u zglobovima uslovljavaju razlike u pokretljivosti istih zglobova različitih ljudi). Zato elastičnost mišića, osim što je uslovljena strukturom svakog mišića posebno, zavisi i od mnogih drugih faktora, a jedan od njih je adekvatan gimnastički trening. Uticajem rasta i razvoja organizma, fleksibilnost se neravnomerno menja. Kod dečaka, fleksibilnost kičmenog stuba se povećava od 7-14 godina, a kod devojčica od 7-12 godina, dok se u starijim uzrastima ona smanjuje. U ramenom zglobu, najbolji rezultati su od 9-11 godina i povećava se od 12-13 godine. Fleksibilnost skočnog zgloba se smanjuje za 15% od 10-12 godine, a kičmenog stuba još više, do 14 godine. Devojčice su u proseku 20-25% fleksibilnije u odnosu na dečake (Rafailović, 2013).

Monteiro (2000) ističe značaj periodične evaluacije treninga fleksibilnosti, dok Lebre (1993) ističe značaj trenera koji posvećuje pažnju svojim vežbačima, kada je u pitanju monitoring motoričkih sposobnosti, a pogotovo fleksibilnosti. Takođe ističe individualno poznavanje svakog gimnastičara ponaosob, što je presudna činjenica prilikom sastavljanja i planiranja programa treninga koji su usmereni na poboljšanje individualnih potreba, uočavanju fizičko-tehničkih nedostataka, uz poštovanje ograničenja svakog gimnastičara ponaosob. Efektivnim vežbanjem i uticajem na fleksibilnost dolazi i do korekcije drugih motoričkih sposobnosti, a u slučaju Ozer, & Soslu (2019) došlo je poboljšanja ravnoteže kod gimnastičara oba pola.

Donti, Tsolakis, & Bogdanis (2014) ukazuju na dužinu trajanja vežbi fleksibilnosti i zagrevanja, jer su autori dokazali da se dužim zagrevanjem povećava opseg pokreta, ali i do poboljšanja eksplozivne snage, uz isti protokol i dužinu trajanja vežbi fleksibilnosti i zagrevanja. Trajanje i intenzitet vežbi fleksibilnosti igraju ključnu ulogu u prevenciji i redukciji mnogih povreda, te je potrebno realizovati svaku vežbu u određenom vremenskom periodu zarad postizanja maksimalnih efekata (Behm, & Chaouachi, 2011).

Sportstka gimnastika je kompleksan sport, gde se prilikom realizacije elemenata aktivira cela muskulautra, a u isto vreme se uključuje veći broj zglobova. S druge strane je i jednostavan po načinu i lakoći izvođenja iz ugla gledalaca. Ta jednostavnost se postiže baš zbog izraženog estetskog karaktera koji maksimalno upotpunjuje izvedene elemente, bez obzira na njihovu težinu izvođenja. Stoga je važno da se od samog početka bavljenja ovim sportom utiče na

fleksibilnost, čime se smanjuje rizik od povreda, ubrzava proces učenja i ovladavanja novim elementima, a postiglo bi se i najpravilnije izvođenje elemenata, što je za sam sport krucijalan faktor. Iako su fizički zahtevi veći kod vrhunskih gimnastičara, ukoliko se ne utiče dovoljno na fleksibilnost u mlađem dobu, gimnastičari će više biti podložniji povredama, teže će savladavati elemente, što će rezultirati stvaranju greškama prilikom procesa učenja, kao i nepravilnijem i težem izvođenju elemenata u starijem dobu.
Zato je u ovoj studiji naveden skup vežbi namenjen za procenu specifične fleksibilnosti namenjene za gimnastičku populaciju, a ovo istraživanje može imati i praktičnu primenu za buduće istraživače i trenere, koji bi na pravi način kreirali svoju bateriju testova za procenu ove motoričke sposobnosti, a na osnovu ovog istraživanja bi imali pravilan pristup i primenu.

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EFFECTS OF WALKING ON ARTERIAL BLOOD PRESSURE CONTROL: A SYSTEMATIC REVIEW

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Abstract: Based on numerous studies, the increasing incidence of hypertension in all age categories and regardless of gender has been identified. Since hypertension can be directly affected by establishing a proper lifestyle habits, including increased physical activity, the primary goal of this study was to determine whether the specially designed walking programs have resulted in significant changes in arterial blood pressure levels in people of all ages and both genders. Electronic search of databases PubMed, Google Scholar, SCIndeks was performed. Papers published in the period from 2007 to 2019 were searched. The included studies met the following criteria: (1) the study was written in English or Serbian, (2) the studies could include persons of all ages regardless of gender, (3) the studies contained data on the characteristics of arterial blood pressure, (4) walking was an integral part of the exercise program in the studies. The results of this systematic review showed once again that the high blood pressure and hypertension are leading health problems and a serious public health issue, which affects a large number of people of different ages and both gender all around the world. In this systematic review, most of the studies have founded a positive effect of walking on the blood pressure control. Studies that gave beneficial results in lowering blood pressure were those that had a longer duration, a larger sample of subjects, and a higher intensity of walking. The effects of walking were determined for both systolic and diastolic blood pressure, but also for the both parameters.

Keywords: hypertension, physical activity, exercise programming

EFEKTI HODANJA NA KONTROLU ARTERIJSKOG KRVNOG PRITISKA: PREGLEDNO ISTRAŽIVANJE

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Sažetak: Na osnovu brojnih istraživanja prepoznata je sve učestalija pojava hipertenzije kod svih uzrasnih kategorija i bez obzira na pol. S obzirom da se na hipertenziju direktno može uticati uspostavljanjem pravilnih životnih navika, između ostalog i povećanjem fizičke aktivnosti, primarni cilj ovog istraživanja je da se utvrdi da li su posebno osmišljeni programi hodanja, rezultirali značajnim promenama na nivo arterijskog krvnog pritiska kod osoba svih uzrasnih kategorija i oba pola. Obavljena je elektronska pretraga baza podataka PubMed, Google scholar, SCIndeks. Pretraživani su radovi koji su publikovani u vremenskom periodu

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od 2007. do 2019. godine. Studije koje su uključene u rad ispunile su sledeće kriterijume: (1) studija je napisana na engleskom ili srpskom jeziku, (2) studije su mogle uključiti osobe svih uzrasnih kategorija bez obzira na pol, (3) studije su sadržale podatke o karakteristikama arterijskog krvnog pritiska, (4) hodanje je bilo sastavni deo programa vežbanja u studijama. Rezultati ovog preglednog rada su još jednom pokazali da su povišen krvni pritisak i hipertenzija vodeći zdravstveni problemi i ozbiljno javno zdravstveno pitanje koje pogađa veliki broj osoba različitog uzrasta i oba pola širom Sveta. U ovom pregledu, većina ispitivanja utvrdila je pozitivan uticaj hodanja na kontrolu krvnog pritiska. Ispitivanja koja su dala blagotvorne rezultate na smanjenju krvnog pritiska bila su ona koja su imala duži period trajanja, veći uzorak ispitanika i veći intenzitet hodanja. Efekti hodanja utvrđeni su i za sistolni i dijastolni krvni pritisak, ali i za oba parametra.

Ključne reči: hipertenzija, fizička aktivnosti, programiranje vežbanja

UVOD

Prošlo je više od 100 godina od kada je prvi put krvni pritisak meren kod čoveka, i više od 50 godina od saznanja kako hipertenziju ne čine samo sistolni i dijastolni pritisak, odnosno ne karakterišu je samo "dva broja na papiru". Hipertenzija je bolest savremene civilizacije i prema definiciji Svetske zdravstvene organizacije (WHO, 2017), predstavlja porast arterijskog krvnog pritiska iznad vrednosti 140/90 mm Hg, udruženog sa brojnim komplikacijama na organskim sistemima. Iako je visok krvni pritisak za mnoge misterija, arterijska hipertenzija predstavlja najmasovniju hroničnu nezaraznu bolest u svetu. Više od jedne trećine mladih osoba uzrasta od 16-34 godine pati od nekog oblika hipertenzije, a takođe se može javiti i kod dece i beba (WHO, 2017). Većina ljudi sa povišenim krvnim pritiskom nema nikakve "vidljive" simptome, a skoro jedna trećina ljudi sa povišenim krvnim pritiskom uopšte i ne zna da ga ima. U svojim ranim fazama on ne izaziva nikakve primetne posledice na zdravstveni status ljudi, posebno kod mlađe populacije. Obično se otkriva pri poseti lekaru, kada lekar rutinski kontroliše vrednost krvnog pritiska. Simptomi u kasnijim fazama su vrtoglavica, glavobolja, zamućen vid i krvarenje iz nosa.

Povišen krvni pritisak je poznat i kao "tihi ubica". Napredovanjem bolesti dolazi do oštećenja krvnih sudova vitalnih organa: srca, mozga, bubrega i oka. Hipertenzija predstavlja vodeći faktor rizika za nastanak infarkta miokarda, angine pektoris i razvoj srčane bolesti praćene gušenjem, zamaranjem, malaksalošću, slabim podnošenjem napora, otokom nogu. Kao posledica hipertenzije nastaju i promene na krvnim sudovima mozga usled čega se javljaju: glavobolja, vrtoglavica, nesvestica, nestabilnost pri hodu, zujanje u ušima, mučnina. Najozbiljnija posledica je moždani udar. Postoje faktori rizika koji se ne mogu kontrolisati, kao što je nasledni faktor ili starost. Neki od faktora koji dovode do ovog stanja, a koji se mogu kontrolisati su gojaznost, količine soli koje se unose, fizička aktivnost i stres.

Dakle na hipertenziju se direktno može uticati uspostavljanjem pravilnih životnih navika, pre svega vodeći računa o telesnoj težini, zatim smanjenjem unosa soli u ishrani (manje od 2,4 grama dnevno), povećanjem fizičke aktivnosti, smanjenjem alkohola i nivoa stresa.

A upravo je urbani i moderan način života, kako kod gradske, tako i kod ruralne populacije, prouzrokovao smanjeni obim kretnih habitualnih aktivnosti. Osnovne karakteristike ovog fenomena definisanog kao hipokinezija se mogu prepoznati u specifičnoj negativnoj adaptaciji organizma, prvenstveno u odnosu na smanjenje fizičke sposobnosti, odnosno na smanjenje nivoa fizičko – radne pripremljenosti pojedinca (Vuori, 2004; Ivanović & Gajević, 2016). Na osnovu brojnih istraživanja, pod svakodnevnim uticajem ovih faktora i sve veće zagađenosti životne sredine, zdravlje čoveka, sve više i dece, karakteriše enormno uvećenje nivoa prisustva takozvanih hroničnih – nezaraznih bolesti savremene civilizacije: povišen krvni pritisak, kardio

vaskularne smetnje, diabetes tipa 2, osteoporoza..., izazvanih uglavnom prekomernom telesnom težinom do stepena patološke gojaznosti, koja je u mnogim zemljama poprimila razmere epidemije. Podsticanje redovnog vežbanja ne samo da je korisno kao način lečenja za osobe sa hipertenzijom, već je i odlično sredstvo za prevenciju. Aerobne vežbe koje se upražnjavaju 3-5 puta nedeljno u trajanju od 30min, olakšavaju borbu protiv hipertenzije i mogu smanjiti krvni pritisak za 4-9 mmHg. Zadovoljavajuća fizička aktivnost je i brzo hodanje, vožnja bicikla ili plivanje, najmanje 3-5 puta nedeljno u trajanju od 30-45 minuta. Kraj šezdestih godina prošlog veka smatra se počecima istraživanja koja su predstavila potencijalne zaštitne efekte fizičke aktivnosti u prevenciji hipertenzije a rezultati tih studija su pokazala da muškarci koji su prijavili da vežbaju više od 5 sati nedeljno su dve do tri decenije kasnije ređe obolevali od hipertenzije (Paffenbarger et al., 1968) i da fizičko aktivnost pozitivno utiče u snižavanju krvnog pritiska. Na globalnom nivou, u svetu je 2010. godine svaka četvrta odrasla osoba (starija od 18 godina) bila nedovoljno fizički aktivna (20% muškaraca i 27% žena), dok je u visoko razvijenim zemljama, 26% muškaraca i 35% žena bilo je nedovoljno fizički aktivno, u poređenju sa 12% muškaraca i 24% žena u zemljama sa niskim prihodima (WHO, 2017). Po podacima Istraživanja zdravlja stanovnika Republike Srbije iz 2006. godine, 18,3% stanovnika je bilo gojazno, 67,7% stanovnika fizički neaktivno dok rezultati ovog istraživanja iz 2013. godine ukazuju na trend povećanja učestalosti gojaznosti sa 18,3% na 21,2% (Institut za javno zdravlje Srbije, 2007; 2014). Nedovoljna fizička aktivnost je jedan od deset vodećih faktora rizika smrtnosti u svetu i ključan faktor rizika za hronične nezarazne bolesti. Osobe koji su nedovoljno fizički aktivne imaju 20% do 30% veći rizik od prevremenog smrtnog ishoda u poređenju sa ljudima koji su dovoljno fizički aktivni (WHO, 2017).

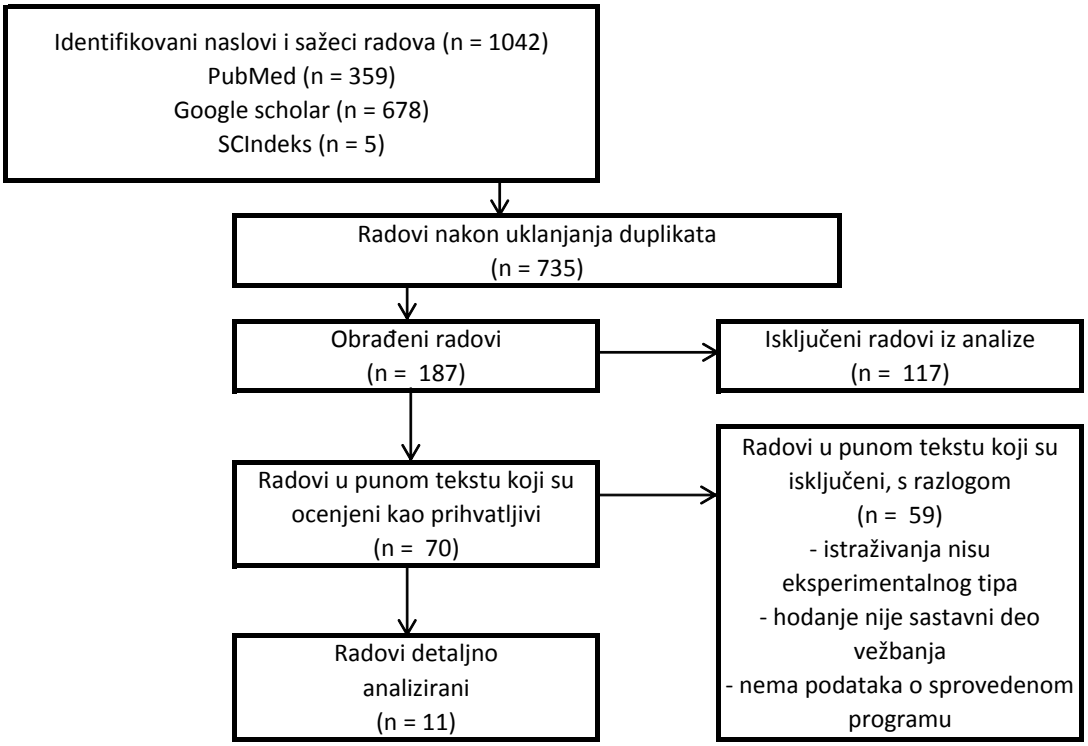
Zbog svih gore navedenih činjenica, sve više pažnje u dostupnoj literaturi se posvećuje merenju, praćenju i kontroli arterijskog krvnog pritiska i uticaja na isti putem programiranog fizičkog vežbanja.

Na osnovu brojnih istraživanja prepoznata je sve učestalija pojava hipertenzije kod svih uzrasnih kategorija i bez obzira na pol. Pod uticajem hipokinezije, zdravlje čoveka u svim njegovim razvojnim periodima karakteriše enormno uvećenje nivoa prisustva takozvanih hroničnih – nezaraznih bolesti savremene civilizacije, među kojima je vodeća hipertenzija. Upravo zbog toga, primarni cilj ovog istraživanja je da se utvrdi da li su posebno osmišljeni programi hodanja, rezultirali značajnim promenama na nivo arterijskog krvnog pritiska kod osoba svih uzrasnih kategorija i oba pola.

METOD RADA

Pretraživanje literature

U cilju prikupljanja podataka o efektima programa hodanja na arterijski krvni pritisak obavljena je elektronska pretraga baza podataka PubMed, Google Scholar i SCIndeks u vremenskom periodu od 2007. do 2019. godine. Sledeće ključne reči su korišćene u strategiji za pretragu: „arterijski krvni pritisak“ ILI „krvni pritisak“ ILI „sistolni pritisak“ ILI „dijastolni pritisak“ ILI „hipertenzija“ i „hodanje“ ILI „aerobni trening“. Studije koje su uključene u rad ispunile su sledeće kriterijume: (1) studija je napisana na engleskom ili srpskom jeziku, (2) studije su mogle uključiti osobe svih uzrasnih kategorija bez obzira na pol, (3) studije su sadržale podatke o karakteristikama arterijskog krvnog pritiska, (4) hodanje je bilo sastavni deo programa vežbanja u studijama. Podaci su izvučeni iz svakog istraživanja i organizovani u odnosu na karakteristike arterijskog krvnog pritiska i programa hodanje koje su merene i primenjene. Osnovni podaci deskriptivne statistike (u zavisnosti od toga da li su objavljeni) su izvučeni iz svake studije. Na slici 1. prikazan je tok postupka preuzimanja podataka.



Slika 1. Dijagram toka

REZULTATI

U Tabeli 1 su prikazani podaci prikupljenih i analiziranih istraživanja sa aspekta uticaja različitih programa hodanja na arterijski krvni pritisak.

Tabela 1. Pregled istraživanja

*Istraživanje	*Ispitanici	*Karakteristike programa	*Rezultati
Gilson et al., 2007;UK, sedentarni	N = 70; 9% M Ž: 42±11 g M: 41±11 g	10 w, 15', 5* w; H1- po ruti u grupi, N=23; H2 - sa zadacima, N=23; K, N=24	H1= 1.6/-1.5 H1 vs K p < .008 H2= 2.8/-1.1 H2 vs K p < .005
Lee et al., 2007; Tajvan	N=202, 58% M; E=71.3±6.4 g; K=71.3±5.7g SKP = 140-179	26 w, 20'*5S, >5*w; E, N=102; K, N=100	-7(p = .002)/-1.76 H vs K p < .0005
Nemoto et al., 2007; Japan	N = 216, 24% M 44 - 78 g	H1- 26w, 61±1', 50%VO_2max, 4,8±0.1* w, N=75; H2- 26w, 51±1', 70-84% VO_2max, 4.5±0.1*w, N=87; K, N=54	H1=-1.04/-1.02 H2= -5.19(p< .01)/-3.04
Sohn et al., 2007; USA, sedentarni	N=18, 33% M E = 46.9±5.2 g K = 42.0±6.1 g KP= 140/90	26w; H- 30', N=8; 7*w; K, N=10	-9.9 p=.000/-8 p=.000

*Istraživanje	*Ispitanici	*Karakteristike programa	*Rezultati
Tully et al., 2007; UK; sedentarni	N=106, 40% M 40-61 gM KP=128-134/83-87	12 nedelja, BH1- 29.5±10.5', 3*w, N=44; BH2- 26.9±10.8', 5 *w, N=32; K, N=20	-0.06/-0.26
Mikalački et al., 2011; Srbija; sedentarni	N=60 Ž 58.5±6.90 g SKP= 29.83±14.74 DKP=84.66±10.84	12 w, 3*w; E – nordijsko hodanje, 60-80% HRmax, N = 30; K, N=30	-11.41 p=.000/-5.62 p=.000 E vs K p = .000
Soroush et al., 2013; Švedska i USA	N=355, 20 – 65 g SKP=118.14±16.05 DKP=78.91 ±10.10	6 meseci H - 10000 koraka na dan, N=355	-5.57 p=0.001/-4.03 p=0.001
Baross et al., 2017; UK	N= 48, 54% M 20.7 ± 1.7 g	6w, 4*w; HT – 30' 6.5 $km \cdot hr^{-1}$, N=12; HGT – 3* tokom 30'(20%), N=12; E = HT + HGT; K, N=12	SKP: E vs K p < 0.001
Mandini et al., 2018; Italija, sedentarni	N=296, 38% M; Ž 59.6 ±9.0 g, M 65.4±8.6 g SKP>120	6 meseci, 2+1*w, 50-70' po S; , E1: SKP=>160mmHg, N= 27; E2: SKP= 150-159 mmHg, N= 35; E3: SKP= 140-149 mmHg, N= 70; E4: SKP= 130-139 mmHg, N= 75; E5: SKP= 120-129 mmHg, N= 75	E1: -21.4 p<.0001/-7.3 p<.001; E2:-11.8 p<.001/-2.9 p<.001; E3:-7.5 p<.0001/-1.9 p<.05; E4:-5.3 p<.0001/-2.2 p<.001 E5:-2.6 p<.0001/-2.4 p<.001
Okamoto et al., 2018; Japan	N=14, 36% M 27.5±3.8 g; SKP=108 ± 2 DKP=62 ± 2	Akutni efekti; E1 – 5*3', 30-70%VO2max, 6'po S; E2 – 30'umereni intenzitet	E1= - 1/0.9 E2= -0.9/0
Park et al., 2019; Južna Koreja	N=72, 70.0±10.0 g bolest perifernih arterija	E – hodanje u vodi, N= 35 K, N=37 12w, 4*w, 60', 50-85% HRR	-3/-5.1

Legenda: Istraživanje*- autori, godina i država; Ispitanici*- uzrast, ukupan broj, vrednosti pritiska; Karakteristike eksperimentalnog programa*- broj grupa, trajanje, intenzitet, učestalost; Rezultati*- efekti u mmHg SKP/DKP; M – muškarci; Ž– žene; H– hodanje grupa; K– kontrolna grupa; w– nedelja; E– eksperimentalna grupa; S- sesija; BH– brzo hodanje; KP– krvni pritisak; SKP– sistolni pritisak; DKP– dijastolni pritisak; HRmax– maksimalna srčana frekvenca; VO_2max– maksimalna potrošnja kiseonika; K– kontrolna grupa; E– eksperimentalna grupa; HRR– rezerva srčane frekvence; HT– hodanje na tredmilu, HGT- handgrip trening.

DISKUSIJA

Analizirajući rezultate dostupnih istraživanja sa aspekta efekata posebno osmišljenih programa hodanja na karaktristike arterijskog krvnog pritiska kod osoba svih uzrasnih kategorija i oba pola očigledno je da se ovom problematikom bave istraživači iz celog sveta (Tabela 1). Od ukupno 11 analiziranih studija 6 radova su sa područja Evrope (Gilson et al., 2007; Tully et al., 2007; Mikalački et al., 2011; Soroush et al., 2013; Baross et al., 2017; Mandini et al., 2018;), tri studije sa područja Azije (Lee et al., 2007; Nemoto et al., 2007; Okamoto et al., 2018; Park et al., 2019), dva rada sa područja Sjedinjenih američkih država (Sohn et al., 2007; Soroush et al., 2013). Ova činjenica ne iznenađuje s obzirom da hipertenzija u mnogim zemljama poprimila razmere epidemije.

U svim prezentovanim radovima, autori su hipertenziju definisali kao porast arterijskog krvnog pritiska iznad vrednosti 140/90 mmHg udruženu sa brojnim komplikacijama na organskim sistemima.

Broj učesnika je prilično varirao od istraživanja do istraživanja tako da je najmanji broj učesnika bio do 50 u istraživanjima Sohn et al. (2007), Baross et al. (2017) i Okamoto et al. (2018). U dva istraživanja uzorak je činilo od 50 do 100 ispitanika i to u istraživanjima Gilson et al. (2007) i Park et al. (2019). Broj ispitanika u rasponu od 100 do 150 zabeležen je u jednom istraživanju (Tully et al., 2007). Nešto više od 200 ispitanika prijavljeno je u istraživanjima Lee et al. (2007) i Nemoto et al. (2007). Najveći broj ispitanika bio je 355 u istraživanju Soroush et al. (2013) i nešto manji od 296 ispitanika u istraživanju Mandini et al. (2018).

Ovaj pregled je utvrdio da postoje dokazi koji pokazuju blagotvorne efekte hodanja na snižavanje ili sistolnog ili dijastolni krvni pritisak ili oba parametra. U istraživanjima koja su imala veći uzorak ispitanika, viši inicijalno izmereni nivo krvnog pritiska kod ispitanika i koje su realizovale programe hodanja umerenog do visokog intenziteta utvrđeno je blagotvornije dejstvo na krvni pritisak u poređenju sa sa onim ispitivanjima koja nisu pokazala blagotvorno dejstvo. Ove intervencije su takođe bile nešto dužeg trajanja iako na generalnom nivou učestalost tretmana na nedeljnom nivou nije se značajno razlikovao od onih intervencija čiji rezultatai nisu pokazali blagotvorno dejstvo.

Većina eksperimentalnih programa hodanja u ovom radu sledila je uobičajeno primenjivane preporuke za fizičke aktivnosti Američkog koledža sportske medicine, koje su većinom podrazumevale što učestalije vežbanje po mogućnosti svih dana u nedelji, na umerenom nivou intenziteta, tokom 20–60 min po sesiji. Pojedini autori analiziranih radova su primetili da vežbanje niskog do umerenog intenziteta može imati sličan efekat kao trening većeg intenziteta za kontrolu krvnog pritiska kod osoba sa hipertenzijom, a vežbanje niskog do umerenog intenziteta može imati čak i veće uticaj na sistolni krvni pritisak (Lee et al., 2007). Rezultati ovog preglednog rada ukazuju da programi hodanja umerenog do visokog intenziteta mogu biti povoljniji od hodanja niskog intenziteta pri snižavanju krvnog pritiska (Nemoto et al., 2007).

Autori analiziranih radova sugerišu da su glavne karakteristike programa fizičke aktivnosti, poput intenziteta, trajanja i učestalosti programa fizičke aktivnosti, međusobno povezane; odnosno aktivnost nižeg intenziteta koja se sprovodi duži vremenski period ekvivalentna je većem intenzitetu aktivnost (Lee et al., 2007; Nemoto et al., 2007) i visokog intenziteta sa kraćim trajanjem (Nemoto i sar., 2007).

Pored toga, autori nekih studija smatraju da na efekat hodanja na kontrolu krvnog pritiska može uticati starost učesnika studije. Ovaj efekat objašnjavaju činjenicom viših inicijalnih nivoa krvnog pritiska kod starijih odraslih ispitanika. Međutim, prema rezultatima analiziranih studija u ovom radu ne postoji statistički značajna korelacija između srednjeg inicijalnog krvnog pritiska (sistolnog ili dijastolnog krvnog pritiska) i srednje početne starosti. Većina studija sa pozitivnim efektima u ovom pregledu regrutovale su učesnike starije od 60 godina

(Lee et al., 2007; Nemoto et al., 2007; Mikalački et al., 2011; Soroush et al., 2013; Mandini et al., 2018).
Duži program sam po sebi možda nije presudan za postizanje efikasnog rezultata, jer neki programi u trajanju od 6 meseci do jednogodišnjeg hodanja nisu utvrdili statistički značajan efekat na smanjenje krvnog pritiska. Među 4 ispitivanja sa periodom intervencije dužim od 24 nedelje (Lee et al., 2007; Nemoto et al., 2007; Sohn et al., 2007; Soroush et al., 2013), tri od ovih istraživanja utvrdila su značajan pad u vrednostima sistolnog krvnog pritiska (Lee et al., 2007; Nemoto et al., 2007; Sohn et al., 2007), dva u vrednostima dijastolni krvni pritisak (Soroush et al., 2013; Sohn et al., 2007) i dva kod oba parametra (Soroush et al., 2013; Sohn et al., 2007). Veliki problem koji može da se javi u realizovanju vežbanja u dužem vremenskom periodu je pitanje koliko se ispitanici pridržavaju definisanog programa, odnosno većina autora smatra da se značajno može smanjiti pridržavanje programu od strane ispitanika.

ZAKLJUČAK

Rezultati ovog preglednog rada su još jednom pokazali da su povišen krvni pritisak i hipertenzija vodeći zdravstveni problemi i ozbiljno javno zdravstveno pitanje koje pogađa veliki broj osoba različitog uzrasta i oba pola širom Sveta.
U ovom pregledu, većina ispitivanja utvrdila je pozitivan uticaj hodanja na kontrolu krvnog pritiska. Ispitivanja koja su dala blagotvorne rezultate na smanjenju krvnog pritiska bila su ona koja su imala duži period trajanja, veći uzorak ispitanika i veći intenzitet hodanja. Efekti hodanja utvrđeni su i za sistolni i dijastolni krvni pritisak, ali i za oba parametra.
Iako je hodanje relativno lak oblik fizičke aktivnosti među svim starosnim grupama, rezultati pregledanih radova sugerišu da među različitim karakteristikama prilikom programiranja fizičke aktivnosti (kao što su trajanje, intenzitet i učestalost) intenzitet hodanja može igrati presudnu ulogu u kontroli krvnog pritiska. Zbog toga, u narednim istraživanjima potrebno je pažljivije se pozabaviti pitanjem intenziteta kako bi se postigao što blagotvorniji efekat na snižavanje krvnog pritiska. Šetnja se uglavnom izvodi u formatu relativno niskog intenziteta kod svih grupa stanovništva. Kada zdravstveni radnici savetuju hodanje kao sredstvo za smanjenje krvnog pritiska, treba posebno preporučiti umereni do visoki intenzitet hodanja (65% –85% HRmax ili veći od 60% VO_2max) sa ostalim karakteristikama fizičke aktivnosti, kao što su učestalost (3-5 dana nedeljno) i trajanje (20–60 minuta neprekidno ili se akumuliraju tokom dana u kraćim intervalima od 10 minuta).
Dalja istraživanja na ovoj problematici su svakako opravdana kako bi se procenio efekat programa hodanja na krvni pritisak. Takva istraživanja bi trebalo da imaju rigorozniji program vežbanja i idealno bi trebalo da obuhvati što veći broj ispitanika oba pola, kako sa hipertenzijom tako i normotenzivne ispitanike. Tek tada zdravstveni radnici mogu osobama sa hipertenzijom pružiti jasna uputstva o tome kako da imaju koristi od najjednostavnijeg oblika fizičke aktivnosti – hodanja u kontroli arterijskog krvnog pritiska.

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ENDOCRINE RESPONSE IN ADULT WOMEN TO RESISTANCE EXERCISE

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Abstract: Resistance exercise has been shown to elicit a significant acute hormonal response. It appears that this acute response is more critical to tissue growth andremodelling than chronic changes in resting hormonal concentrations, as many studies have not shown a significant change during resistance training despite in creases in muscle strength and hypertrophy. The different hormonal context between women and men leads to a different behavior in terms of managing resistance training. A thorough analysis leads to the understanding of the hormonal response of the adult woman during resistance training. The purpose of this systematic analysis is to identify and evaluate the literature and current studies on the endocrine response and hormonal changes that occur during and after resistance training. The following electronic databases were searched: PubMed, Physiotherapy Evidence Database (PEDro), Cochrane Central Register of Controlled Trials, Scopus, and Web of Science. The endocrine system supports the normal homeostatic function of the body and helps it responds to external stimuli. It is part of a complex signaling system in the human body to affect change and support exercise demands and recovery. The importance of the endocrine system in the field of strength and conditioning is reflected by the critical role this this system played in the theoretical development of periodiyation of training. Hormonal mechanisms are a part of an integrated signaling system that meditates change in the metabolic in cellular processes of muscle as a result of resistance exercise and training. Muscle remodeling involves the disruption end damage the muscle fiber an inflammatory response, degradation of damaged proteins, hormonal and other signal interaction, and ultimately the synthesis of new protein and orderly incorporation into existing or new sarcomeres. The primary anabolic hormones involved in muscle tissue growth and remodeling are testosterone, growth hormone and IGFs, which are discusses which are just cause it here as well as insulin and the thyroid hormone, which are examined in greater detail in other sources. Some study observed acute increase in free testosterone in man and women who are trained in response to a heavy resistance exercise protocol, but the concentration in women were dramatically lower than in man. The testosterone concentration can vary substantially between individual woman, as some woman security secrete higher concentration of adrenal androgens. In one report, changes were observated in baseline concentration of testosterone in woman who exercises regularly compared with inactive controls. Hormone concentration and hormone response to exercise vary with menstrual phase, althouth the mechanisms of this variation are unclear. At present, womens reduced concentration of testosterone and different resting hormonal concentration over the course of the menstrual cycle appear to be their most striking neuroendocrine differences from men.

Keywords: hormones, endocrine, resistance, exercise,women, training

INTRODUCTION

Resistance exercise has been shown to elicit a significant acute hormonal response. It appears that this acute response is more critical to tissue growth and remodelling than chronic changes in resting hormonal concentrations, as many studies have not shown a significant change during resistance training despite in creases in muscle strength and hypertrophy (Aristizabal, et al.,

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2014; Fragala, et al., 2011). The different hormonal context between women and men leads to a different behavior in terms of managing resistance training. A thorough analysis leads to the understanding of the hormonal response of the adult woman during resistance training.

PURPOSE

The purpose of this systematic analysis is to identify and evaluate the literature and current studies on the endocrine response and hormonal changes that occur during and after resistance training.

METHODS

The following electronic databases were searched: PubMed, Physiotherapy Evidence Database (PEDro), Cochrane Central Register of Controlled Trials, Scopus, and Web of Science.

DISCUSSIONS

The endocrine system supports the normal homeostatic function of the body and help it responds to external stimuli it is part of a complex signaling system in the human body to affect change juice and support exercise demands and recovery the importance of the endocrine system in the files field of strength and conditioning is reflected by the critical role this system played in the theoretical development of a period is action of train (Gordon, et al., 2014).

It is important to have a basic understanding of the hormonal response to resistance exercise hormonal signals play a role in a variety of mechanisms from anabolic to build to permissive to a low and catabolic to break down.

Hormonal mechanisms are a part of an integrated signaling system that meditates change in the metabolic in cellular processes of muscle as a result of resistance exercise in and training (Clasen, et al., 2013; Gordon, et al., 2014). Muscle remodeling involves the disruption and damage of muscle fiber, an inflammatory response degradation of damaged proteins, hormonal and other signal interaction, and ultimatly the synthesis of new proteins and their orderly incorporation into existing or new .

The inflammatory process involves the imunne system and various immune cells which are influenced by the endocrine system. Hormones are intimately involved with proteins synthesis and degradation mechanisms that are part of the muscle adaptation to resistance exercise (Hakkinen, et al., 1990). The production of the contractile protein, actin in myosin, as well as structural proteins and the ultimate incorporation of all these protein into the sarcomere completed the process of the molecular level (Kraemer, et al., 2003).

Hormones are secreted before, during and after resistance exercise bout due to the physiological stress of resistance exercise (Hetrick & Wilmore, 1979; Gregory, et al., 2013; Gordon, et al., 2014)

Acute hormonal secretions provide information to the body regarding such things as the amount and type of physiological stress the metabolic demands of the exercise and thus the need for subsequent changes interesting metabolism. With specific patterns of nervous system stimulation from resistance exercise certain hormonal changes occur simultaneously for specific propose related to the meeting the demands of the exercise bout, recovery, and adaptation to the acute exercise stress. The patterns of stress and hormonal responses combine to shape the tissues adaptive response to a specific training program (Gregory, et al., 2013, Kraemer, et al., 2003; Brown, 2013).

Hormonal increases in response to resistance exercise take place in a physiological environment that is unique to this type of exercise stress. The heavy external loads being lifted and resultant large muscle force requirement necessitate the activation of high- threshold motor units not typically stimulated by others type of exercise such as aerobic endurance exercise (Fry, et al., 2006).

The amount of muscle tissue activated by the exercise dictates which physiological system is needed and how involved it is to me today homeostatic demands of the force/power production during the exercise and for the demands of recovery. For example, heart rate will be much higher to support and 80% of 1 RM squat exact size squat exercise performed for 3 sets of repetition with 2 minutes rest between sets then the same protocol done for biceps curls. While similar system will be involved with both, exercise protocol differences will exist based on the amount of muscle tissue mass affected by the protocol (Hetrick, et al, 1979). Hormonal systems are also involved with other target tissues and glands death where stressed in a particular workout, but again, their needs are also dictated by the specific neural recruitment demands and their involvement to support movement. Thus, a five-set 5RM workout has different demands then a one-set 25 -RM workout in its & nbsp; motor unit activation and its need for physiological support and recovery (Fry, et al., 2006).

The primary anabolic hormones involved in muscle tissue growth and remodeling are testosterone, growth hormone and IGF which are discusses which are just cause it here as well as insulin and the thyroid hormone, which are examined in greater detail in other sources (Jensen, et al., 2012; Kraemer, et al., 2006).

Testosterone: Is the primary male sex hormone, woman have about 15-to-20 fold lower concentration of circulating testosterone than men do. Most studies have not been able to demonstrate an acute increase in testosterone following resistance exercise workout for a woman data show that they've if increases do occur they are relatively small (Fragala, et al., 2011; Gordon, et al., 2014), and are sometimes observation only for the free testosterone. Yet in younger woman, a small but significant increase in serum testosterone in response to see six set of 10 AM squats has been observed. In addition, Vingren and colleagues (Kraemer, et al., 2003; Brown, 2013), acute increase in free testosterone in man and women who are trained in response to a heavy resistance exercise protocol, but the concentration in women were dramatically lower than in man. The testosterone concentration can vary substantially between individual woman, as some woman secrete higher concentration of adrenal androgens. In one report changes with observation in baseline concentration of testosterone in woman who exercises regularly compared with inactive controls. Still others studies have been enable to demonstrate changes in serum concentration of testosterone with training (Hetrick, et al, 1979). However, again, the use of testosterone by the upregulation of skeletal muscle androgen receptors in a rapid manner, in about an hour, shows the great sensitivity than women have to increase in testosterone and the importance of its use (Kraemer, et al., 2001). So expecting increases in resting concentration may be an outmoded concept, but one might expect an increase in the exercise induced concentration due to improved functional capacity and the ability to do more work in an exercise protocol. It appears that training time and experience may be very important factors in altering the resting in exercise induced concentration of this hormone. Its role in skeletal muscle might change, however, as upper limits of muscle cell size increases our achieved. In a classic study, Hakkinem and colleagues (Kraemer, et al., 2003), demonstrated that over the course of two years of training, even in elite weightlifters, small increases in resting serum testosterone concentration do occur, concomitant with increases in follicle stimulating hormone and luteinizing hormone, which are involved in regulation of

testosterone production and our released and secreted from the anterior pituitary in response to signal from the brain via two hypothalamus (Gordon, et al., 2014).

Growth hrmone: Women have higher blood concentration of the growth hormone (GH) then man due to greater frequency and amplitude of secretion. Hormone concentration and hormone responses to exercise vary with menstrual phase, all through oh true the mechanism of this variation are unclear. Kraemer and colleagues found that during the early follicular phase of the menstrual cycle, woman has significantly higher GH concentration addressed compared with men. Furthermore, with use of a heavy resistance exercise protocol characterized by long rest periods (3 minutes) and heavy loads (5RM), GH concentration did not increase above resting concentration. However when a short rest (1 minute) and moderate resistance exercise (10RM) protocol was used, significant increases in serum GH value were observed. Hormonal response patterns to different resistance exercise routine may very over the course of the menstrual cycle owing to alterations in resting levels (Gordon, et al., 2014).

Studies show that the bio active GH is also made of many different molecular sizes based on what molecular size bind together. Interestingly, in woman by octave GH has been shown to be altered by resistance training. It appears that the resting concentration are increasing while little change occurs in GH form (Gordon, et al., 2014; Kraemer, et al., 2001; Kraemer, et al., 2003).

Estrogen: Estrogens are a class of steroid molecules of which women have about four times the amount compared with men until menopause. Estrogen receptors (ER) have been localized within skeletal muscle tissue but also in tendons and ligaments. The important actions of the endogenous estrogens are mediated by ER, which are synthesized in many cell types in two protein forms, ER-alpha and ER-beta, that function as transcription factors once bound to their ligand. Estrogen prevents this effect of testosterone by lowering the density of androgen receptors. Estrogen also stimulates the production of growth hormones (Clasen, et al., 2013; Fragala, et al., 2011).

CONCLUSIONS

Hormone concentration and hormone response to exercise vary with menstrual phase, althouth the mechanisms of this variation are unclear. At present, womens reduced concentration of testosterone and different resting hormonal concentration over the course of the menstrual cycle appear to be their most striking neuroendocrine differences from men.

It seems growth factors like growth hormone take over the anabolic role that testosterone has in men. Growth factors are more important for strength and muscle mass in women than in men. Since women have just as much GH as men and women produce ~3 times as much growth hormone as men, this explains in part why having less testosterone does not limit how much muscle they can build. To make matters more complex, the sex hormones and growth factors interact and all these hormones also interact with your genes.

In short, saying women have less potential to build muscle mass because they don’t have as much testosterone as men it is unfounded.

Lastly, the women that do actually train seriously in spite of the stigma often train like men, which doesn’t align with their physiological strengths. Since women produce much more estrogen than men, this gives them several advantages over men in the gym. Women don’t fatigue as much as men and women recover faster after training. There are many more important gender differences in metabolism, anatomy, neurology and physiology.

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THE NONLINEAR PEDAGOGY APPLIED TO SOCCER COACHING

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Abstract: In the world there are over 240 million active footballers: for these reasons, the team sports, and the soccer in particular, are looking for a methodology capable of structuring more effectively the requirements necessary for the training of the future athlete / player. The aim of this study is to describe how non-linear pedagogy can be beneficial for the young soccer player training. For the bibliographic search PubMed and Sport Discuss databases were used selecting articles published between 01/01/2011 and 01/03/2021. Two keyword groups were identified, using synonyms and similar terms, using the operator "OR":1)"nonlinear pedagogy" OR "soccer" 2)" nonlinear pedagogy" OR "young soccer players". Subsequently, all the categories were combined together using the "AND" operator. The database search produced 5 results. Research shows that non-linear pedagogy is not widespread in youth football. In the soccer the perceptual, decisional and cognitive aspects play a very significant role in solving motor problems. The relationships between motor and cognitive functions have been highlighted by neuroimaging studies providing evidence that motor and cognitive processes draw on common neural mechanisms and resources. Many studies have indicated that the relationship between these two processes is influenced by the novelty and difficulty of the task. At this time it is advisable to question how to make the training sessions highly variable, both for what is known about motor learning methods, and for what is known about the benefits deriving from the diversification of sports activity in the pre-pubertal phase.

Keywords: nonlinear pedagogy, young soccer players, game approach

INTRODUCTION

In the world there are over 240 million active soccer players: in fact, people can practice soccer at a professional, competitive, youth, or recreational level.
Soccer is characterized by complexity, variability, and unpredictability (Alves et al., 2017; Malta and Travssos, 2014; Clemente et al., 2014): infact, the players and team performance are a result of the training process, once it prepares them for the complex and dynamic requirements of the match (Sampaio and Maçãs, 2012; Giuriato and Lovecchio, 2018; Raiola, 2014 & 2017).
This competitive environment can be reproduced in training sessions by using specific tasks that aim at the possibility of interactions and increase the frequency of technical actions and decision making (Raiola and Altavilla, 2020; García-Angulo et al., 2019; Giuriato and Lovecchio, 2018).
For these reasons, the team sports, and the soccer in particular, are looking for a methodology capable of structuring more effectively the requirements necessary for the training of the future athlete / player (Araújo, and Davids, 2018; Savelsbergh and Wormhoudt, 2019; Seifert et al., 2019; Sannicandro, 2020).

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This attention is justified because soccer is an open skills sport in which the player must continually adapt to a changing environment, seeking new solutions (Giuriato and Lovecchio, 2018).
This constantly changing environment in relation to the movements of all participants, teammates and opponents, requires the search for creative, non-stereotyped motor solutions (Woods et al., 2020; Davids, 2015; Savelsbergh and Van der Kamp, 2000).
The creative actions are a production of the individual who must meet the constraints of the task and the environment. Consequently, creative motor actions are understood as functional movement patterns that are new to the individual and/or group and adapted to meet the constraints of the motor problem. The literature argues that creative motor actions can be promoted by didactic interventions that favor exploration by manipulating constraints (Orth et al.,2017; Davids, 2015; García-Angulo et al., 2019; Silva et al.,2016).
This methodological approach is supported by the ecological dynamics theory: the ecological dynamics advocates that the relevant scale of analysis for understanding behaviour is the functionality of the individual–environment relationship (Araújo, et al., 2006). The mutuality and reciprocity of performers and their environments can result in an enhanced coupling of perception and action subsystems through learning. The skill acquisition derives as a consequence of indeterminate interactions between learners and the environment (Araújo, et al., 2007; Chow et al., 2011; Aitken and MacMahon, 2019).
The aim of this study is to describe how non-linear pedagogy can be beneficial for the young soccer player training

METHODS

For the bibliographic search PubMed and Sport Discuss databases were used selecting articles published between 01/01/2011 and 01/03/2021. Two keyword groups were identified, using synonyms and similar terms, using the operator “OR”:1)“nonlinear pedagogy” OR “soccer” 2)“ nonlinear pedagogy” OR “young soccer players”. Subsequently, all the categories were combined together using the “AND” operator.

RESULTS

The database search produced 5 results. The studies selected by the research show some application methods of non-linear pedagogy. In particular, they focus on the game based approach, which is a training methodology for the young player who leaves out the learning analytical phase and favors a defined "*situational*" phase. Research shows that non-linear pedagogy is not widespread in youth football.

DISCUSSION

This study aims to describe how the literature has analyzed the orientation of non-linear pedagogy in the young soccer player training.
The literature suggested that individuals, as complex and dynamical systems in degeneracy processes adapt their motor actions and coordinate their degrees of freedom using among others such factors as: “*multi-stability”*(i.e. the ability to transit between multiple states of organisation under given constraints), “*metastability*” (i.e. the ability to exploit coexisting coordination tendencies in a transition or unstable region) and “*variability*” properties (the exploitation of critical fluctuations to enable adaptive behavioural transitions). Degeneracy signifies that an individual can vary motor behaviour (structurally) without compromising function, providing evidence for the adaptive and functional role of movement pattern variability in order to satisfy task constraints. The presence of degeneracy in a biological

system increases its complexity and robustness against perturbation and underlies '*pluripotentiality*', a property that ensures an organism's functional ongoing engagement with the dynamic performance environment" (Seifert et al., 2013).
An element emerges from the review that underlines the complexity of the motor tasks presented with an ecological approach: the role of the cognitive dimension is more prevalent than in analytical motor tasks (García-Angulo and García-Angulo, 2018).
Among the 5 selected studies, 3 studies focused their attention on specifically tactical aspects and did not describe the methodological aspects of non-linear pedagogy applied to the young soccer player training (Machado et al., 2020; Robeerts et al., 2020; Machado et al., 2019).
Among the 3 studies that described the benefits of applying a methodology based on non-linear pedagogy, one in particular highlighted the advantages obtained in a group of young 12-year-old footballers followed for 14 training sessions (Praxedes et al., 2018).
The teaching program, which was based on the application of modified games characterized by a numerical superiority in attack, was used for 14 training sessions. This program was conducted in two phases (preparation-for-intervention and intervention). Decision-making and execution for pass and dribbling actions were evaluated through the Game Performance Evaluation Tool. The results showed significant differences in favour of the experimental group in decision-making ($p < .000$) and the execution of passes ($p = .003$) after the intervention. However, such differences were not found for dribbling (decision-making, $p = .402$ and execution, $p = .143$). These findings demonstrate the effectiveness of this type of program for teaching actions with a high tactical component, such as the pass, and a different approach must be considered in actions with a high technical component, such as dribbling (Praxedes et al., 2018).
The other two studies focus attention on motor factors and on the health benefits deriving from the application of non-linear methods in soccer training: in fact, the data deriving from the analysis of the decline trends of children's motor skills in the last twenty years are known. (Tomkinson et al., 2006 and 2007; Tomkinson, 2007; Negasheva and Mishkova, 2005; Ruiz et al., 2006; Podstawski and Żurek, 2020).
The aim of the one of this study was to analyze the impact of a learning methodology based on Nonlinear Pedagogy on health-related levels of physical activity (heart rate) in young soccer players (U-11). A quasi-experimental study was developed in which three tasks were applied using structural modifications of the soccer elements related to Nonlinear Pedagogy (modification of the number of players related to situations of inferiority, equality and numerical superiority; dimensions of the field of play). The sample studied was composed of Under 11 years old soccer players ($n = 32$). The players carried out each task for 10 min. Physical activity levels were measured by controlling heart rate using heart rate monitors. The results showed very high levels of vigorous and very vigorous physical activity in all the tasks designed. These data show that the use of these new teaching methodologies has an impact on levels of physical activity in accordance with the recommended parameters (García-Angulo et al., 2019).
The most recent study is very interesting because it combines the game based approach with the multilateral training issue (AbateDaga et al., 2020).
The purpose of this study was to investigate the effects of a 12-week-game-based training versus a traditional multilateral approach on motor skills acquisition and physical fitness, in a group of children (age = 9 years old) playing soccer.
Forty children recruited from a soccer school were assigned in a 1:1 ratio to a game-based training program (GB) or a multilateral training (MA) approach. The training programs lasted 12 weeks, and players were tested at baseline and at the end of the program (12-week follow-up) through standing long jump test, shuttle dribble test, 10×5 shuttle run test and Mini-Cooper test.

Within-group comparisons showed statistically significant improvements in both of the groups in the standing long lump (P<0.0001), shuttle dribble test (P<0.0001), shuttle run test (P<0.0001) and Mini-Cooper test (P<0.0001). Furthermore, the MA group showed better performance in the shuttle run test after 12 weeks of training compared to the GB group (P=0.0002; +8%).

This brief review of studies highlights how the path that leads to identifying the most advantageous methodology in the young soccer player training is very complex.

The studies analyzed seem to suggest that an ecological approach based on the principles of non-linear pedagogy favors a better solicitation of technical skills and motor requirements (Serra-Olivares et al., 2017; Sannicandro, 2020).

The integration with multilateral training programs can help provide more advantageous motor experiences for the young soccer player training.

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ULOGA DOZIRANOG VEŽBANJA U PREVENCIJI I LEČENJU HRONIČNIH NEZARAZNIH BOLESTI

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Sažetak: Hronične nezarazne bolesti (HNB) karakteriše dugo trajanje, sporo napredovanje i hronično stanje (Hardman, & Stensel, 2009). Ove bolesti predstavljaju vodeće uzroke morbiditeta i mortaliteta i globalna su pretnja zdravlju čovečanstva (Sears, & Genuis, 2012). Različiti činioci dovode do funkcionalnih promena u organizmu koje mogu da rezultiraju HNB, a faktori rizika povećavaju verovatnoću oboljevanja. Faktori rizika mogu biti metabolički (hipertenzija, hiperglikemija, hiperlipidemija i gojaznost), nezdrave životne navike (konzumiranje alkohola i duvana, fizička aktivnost i ishrana) i opšti faktori (starenje ili uticaj životne sredine). Ipak, u osnovi pojave HNB leži životni stil, tj. navike u vezi sa ishranim i fizičkom aktivnošću. Cilj rada je prikaz uloge doziranog vežbanja u prvenciji i lečenju najčešćih hroničnih nezaraznih bolesti, uz pružanje opštih smernica za izradu programa vežbanja koji bi odgovarao najvećem broju obolelih osoba. Analiza releventne literature. **Mehanizam delovanja fizičkih vežbi na prevenciju i lečenje HNB.** Budući da u osnovi HNB leži visokokalorična ishrana uz značajno umanjenu energetsku potrošnju, odnosno sedenteran način života, terapija medikamentima nije dovoljna. S tim u vezi, ključna stvar u lečenju ali i prevenciji HNB, treba da bude promena načina života. Fizička aktivnost obezbeđuje veliku zdravstvenu dobit, a saznanja o preventivnim i terapijskim efektima dobrog nivoa fizičke spremnosti smatraju se značajnim dostignućima savremene medicine. Vežbanje poboljšava sposobnost mišića da koriste masne kiseline kao izvor energije, poboljšava kontraktilnost srčanog mišića, povećava zapreminu krvi, pojačava udarni volumen srca i snižava frekvenciju srca (Stojiljković i sar., 2011). Fizička aktivnosti smanjuje količinu lošeg holesterola i stimuliše aktivnost enzima i proteina koji umanjuju nakupljanje naslaga u krvnim sudovima (Svilar, i sar., 2015). Osim metaboličke promene u smislu kontrole glikemije, lipidnog statusa i krvnog pritiska smanuju rizik od koronarnih oboljenja i moždanog udara. Dodatno, fizička aktivnost doprinosi mentalnom blagostanju. Pojačano lučenje neurotransmitera izaziva osećaj zadovoljstva, dovodi do regulacije ponašanja (Cordeiro et al., 2017), doprinosi smanjenju zamora i stresa, poboljšava raspoloženje, smanjuje anksioznost i simptome depresije.
Za obolele od HNB potreban je individualan pristup vežbanju. Treba voditi računa o doziranju opterećenja u skladu sa osnovnom bolešću, ali i ostalim faktorima (starost, pol, životne i radne navike i sl.). Uopšteno, program treba da se bazira na elementima treninga snage, aerobnim aktivnostima i vežbama istezanja. Aerobne vežbe omogućavaju bolji dotok kiseonika, jačaju srce, krvne sudove i pluća. Vežbe snage su efikasne za povećanje mineralne gustine kostiju i osetljivosti receptira na insulin, smanjenje krvnog pritiska, poboljšanje lipidnog profila i vaskularnog stanja, bolju aktivnost gastrointestinalnog trakta, smanjenje depresije, poboljšanje funkcije srca i pluća. Vežbe istezanja smanjuju rizik od povreda i bolova u mišićima i pomažu u lakšem izvođenju drugih vežbi (ACSM, 2011., prema Svilar, i sar., 2015). Planiranje fizičkih aktivnosti osoba obolelih od HNB podrazumeva poštovanje navedenih opštih smernica. Međutim, individualno sagledavanje funkcionalnih kapaciteta i komorbiditeta obolelih je ključno za sačinjavanje usmerenog, doziranog i kontrolisang programa vežbanja. Učestalost, intenzitet, vrstu i trajanje aktivnosti treba pažljivo planirati u skladu sa karakteristikama vežbača i odlikama osnovne bolesti.

Ključne reči: hronične nezarazne bolesti, dozirano vežbanje, prevencija, lečenje.

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THE EFFECT OF DOSED EXERCISE IN THE PREVENTION AND TREATMENT OF CHRONIC NON-COMMUNICABLE DISEASES

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Abstract: Chronic non-communicable diseases (NCDs) are characterized by long duration, slow progression, and chronic condition. Various factors lead to changes in the body that can result in NCD. In the literature, unfavorable metabolic status, bad life habits and general factors (aging, urbanization, environmental pollution, etc.) are singled out as risk factors that increase the probability of disease. However, the basis of the emergence of the NCD, first lies the lifestyle, ie. nutritinal and physical activity habits.
Since the base causes for many NCDs are based on bad life habits (unhealthy diet and reduced physical activity), changing the diet while raising the level of physical activity reduces the risk for a large number of diseases. There is ample evidence that physical activity improves levels of glycemia, lipid status, and blood pressure, which reduces the risk of coronary heart disease and stroke. In addition to metabolic changes, physical activity also leads to mental well-being, because it causes a feeling of satisfaction, contributes to the reduction of mental fatigue and stress, reduces anxiety and improves mood. The aim of this paper is to point out the effect of dosed exercise in prevention and healing of most common chronic non-communicable diseases, whilst providing guidelines for developing an exercise program which would be fitting to a large number of afflicted people.

Keywords: chronic non-communicable diseases, dosed exercise, prevention, treatment

INTRODUCTION

Olshansky et al., (2005) warn of the possibility of interrupting the trend of prolonging life expectancy, as a consequence of insufficient human adaptation to changed living conditions. In the last 50 years, the daily energy intake per capita of industrialized countries has increased from 2358 calories in 1965, to 3440 calories in 2015 (an increase of 46%), with forecasts that it will reach 3500 calories per day in 2030 (Ostojić, Đorđić, & Jorga, 2017). High-calorie diet with significantly reduced energy consumption and inadequate nutrient intake are the cause of metabolic changes in the body such as high blood pressure, elevated blood glucose levels, abnormal blood lipids (especially LDL cholesterol), overweight (body mass index (BMI) ≥ 25 kg / m2) and obesity (BMI ≥ 30 kg / m2). Metabolic changes, especially hypertension and obesity, along with a sedentary lifestyle, underlie chronic non-communicable diseases (Dean et al., 2014; WHO, 2018; Lazić, Mijović, & Maksimović, 2020).

Risk factors for the develop of the chronic non-communicable diseases

Chronic non-communicable diseases include groups of diverse diseases characterized by long-term, slow progression and long duration (Hardman, & Stensel, 2009). This diseases lead to a reduced vital and functional state of the body and represent the leading causes of morbidity and mortality in developed countries, and increasingly in developing countries, which is why they are the main threat to human health in the 21st century. The fact that NCD rates are rising among younger people, should be considered of particular concern (Sears, & Genuis, 2012).
Various factors lead to functional changes in the body that can result in NCD and risk factors increase the likelihood of disease. Risk factors can be metabolic (hypertension, hyperglycemia, hyperlipidemia and obesity), lifestyle habits (alcohol and tobacco consumption, level of

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physical activity and diet) and general factors such as aging or environmental impact (urbanization, pollution, etc.) (Ezzati, & Riboli, 2013; Lazić, Mijović, & Maksimović, 2020). It is important to point out that the risk of developing a NCD decreases proportionally with the increase of a healthy lifestyle (Dean et al., 2014). Specifically, increasing physical activity while consuming a healthy and balanced diet, leads to weight control and stress reduction and thus reduces the risk of most of NCDs.

Optimal nutrition consumption is based on a precisely determined quantity (in terms of energy) and quality (in terms of nutrition) of consumed food and fluids (Clover, 2015). However, for the overall effect of nutrition on health, it is necessary to observe the "diet pattern". This term describe a regular diet defined on the basis of quantities, ratios, variations and combinations of different foods and beverages as well as the frequency of their intake (Ostojić, Đorđić, & Jorga, 2017). In order to prevent the NCD's upward trend, the European Union set population nutrition targets back in 2001 (Table 1).

Table 1. Population goals for nutrient intake for preventing major public health problems

Physical Activity Levels	>1,75 (PAL*)
Adult Body Weight	21-22 (kg/m^2)
Dietary Fat	<30% total energy intake
- Saturated	<10% total energy intake
- Trans	<2% total energy intake
- Polyunsaturated n-6	4-8% total energy intake
- Polyunsaturated n-3	2 g g linolenic i 200 mg EPA i DHA
Carbohydrates	>55% total energy intake
Sugary food consumption	<5% total energy intake
Fruit and Vegetables	>400 g / day
Folate from food	>400 µg/ day
Dietary Fibre	>25 g/ day
NaCl	< 6 g/ day
Iodine	150 µg / day ; pregnancy 200 µg /dan

*The PAL value is equivalent to 60-80 min. walking daily to avoid weight gain on high fat intakes; this includes the 30 min. goal for preventing cardiovascular diseases and diabetes.

Taken from: Eurodiet core report. Nutrition & Diet for Healthy Lifestyles in Europe. 2001.

However, diet is only one component of a healthy lifestyle. The second component is physical activity. The aim of this paper is to present the role of dosed exercise in the prevention and treatment of the most common chronic non - communicable diseases, while providing general guidelines for the development of an exercise program that would suit the largest number of patients.

METHOD

For the realization of the set goal, the analysis of relevant literature was used as a method of work.

RESULTS

Physical exercises on prevention and treatment of NCD - mechanism of action

Regular and optimally dosed physical activity provides a lot of health benefits. Also, tha knowledge about the preventive and therapeutic effects of achieving and maintaining good physical fitness is considered a significant achievement of modern medicine. Increased levels of physical activity reduce the risk of mortality regardless of the cause, and about 80% of

cardiovascular diseases, strokes and type 2 diabetes, as well as a third of all types of malignant diseases, can be prevented by increasing physical activity or eliminating obesity (Mendes et al. , 2017; Mendis et al., 2015, according to Stojadinović & Malićević, 2017).

The mechanisms of exercise impact on the prevention and treatment of CNB are different. In the case of type 2 diabetes mellitus, physical activity increases the transport and metabolism of glucose, which has a positive effect on metabolism of glycogen, improves glucose tolerance and insulin activity. Also, vigorous exercise improves the ability of muscles to use fatty acids as a source of energy. Exercise improves the contractility of the heart muscle, increases blood volume, lowers the heart rate during exercise and rest, and increases the stroke volume of the heart (Stojiljković et al., 2011).

Related to atherosclerosis, physical activity has the great effect of reducing fat tissue, which increases the amount of cholesterol. Exercise also stimulates the activity of enzymes and proteins that reduce the possibility of cholesterol accumulation in blood vessels (Svilar, Krakan, & Bagarić Krakan, 2015). These metabolic changes, control of glycemia, lipid status and blood pressure, lead to a significant reduction in the risk of coronary heart disease and stroke. Physical activity stimulates the functions of the immune system, contributes to bone building and bone mass preservation, which reduces the risk of colon and breast cancer (Stojiljković et al., 2011; Jović, 2016). Physical activity not only affects physical health, but also leads to mental well-being. Secretion of neurotransmitters as a consequence of exercise is responsible for the fight against depression. Changes in the dopaminergic, noradrenaline, and serotonin systems provide satisfaction of exerciser, which leads to regulation of behavioral (Cordeiro et al., 2017), reduced fatigue and stress, improve mood, reduce anxiety and depressive symptoms (Molanorouzi, Khoo, & Morris, 2015).

General recommendations for dosed exercise

For people with chronic non-communicable diseases, an individual approach to exercise is required, primarily dosing the load in accordance with the underlying disease, but also other factors such as the patient's age, gender, life and work habits, etc. Certainly, the exercise program should be based on elements of resistance training, aerobic activities and flexibility, where the frequency, intensity, duration and type of activity should be taken into account (Westcott et al., 2009; Stojadinović & Malićević, 2017). In accordance with these guidelines, general recommendations for maintaining health or improving health status would be the following:

1. Aerobic exercise with moderate-intensity (e.g. walking) should be practiced for 30 min., five days a week (a total of 150 min.), while high-intensity exercises (e.g. jogging) are recommended up to 3 times a week, lasting 20 to 25 min. (75 min in total) (Molanorouzi, Khoo, & Morris, 2015; Westcott, et al. 2009). It is certainly best to practice activities such as running, cycling, swimming, hiking, squash, yoga, boxing, group fitness programs, etc. (ACSM, 2011, according to Svilar, Krakan, & Bagarić Krakan, 2015). Aerobic exercise provides better oxygen supply and strengthens the heart, blood vessels and lungs (Westcott et al. 2009).
2. Resistance training is especially important to exercise regularly, in order to prevent the muscle mass loss, and consequently, to reduce basal metabolism by 2-3% per decade (Westcott et al., 2009). Resistance exercises include training with weigh 2-3 times a week (ACSM, 2011, according to Svilar, Krakan, & Bagarić Krakan, 2015). It is recommended to do 8 -10 exercises for all main muscle groups, 2 times a week (but not on consecutive days), so that the exerciser can overcome the load by performing a maximum of 8-12 repetitions until failure (Westcott et al., 2009). Regular resistance training are effective for increasing bone mineral density, increasing insulin receptor sensitivity, lowering blood pressure, improving lipid profile and vascular status, improving gastrointestinal activity and heart function, reducing depression, and

mitigates the consequences of chronic obstructive pulmonary disease and arthritis (Westcott et al., 2009).

3. In order to reduce the risk of injuries and muscle pain, exercises for increase flexibility are recommended for two to three times a week (ACSM, 2011, according to Svilar, Krakan, & Bagarić Krakan, 2015). Maintaining / increasing flexibility helps to perform other physical activities more easily.

Inclusion of a NCD patient in a dosed exercise program, request a detailed assess the general health and functional condition in order to eliminate risk factors for performing exercises of higher intensity (e.g. to prevent possible cardiovascular events). Health screening allows identifying people who need medical approval before joining an exercise program that leads to an increase in heart rate, as well as those with health conditions that may require an exemption from exercise (Riebe et al., 2015).

CONCLUSION

Chronic non-communicable diseases reduce the quality of life of a large number of people and their families and create a great burden for the community. Economically, the costs of treating these patients significantly burden the health system, and the emotional consequences for the individual and their family can be very severe.

Since the NCD is based on bad eating habits and hypokinesia, changing life habits could be of great importance. Regular and optimally dosed physical activity leads to increased energy consumption which provides great health benefits. An appropriate exercise program can help those patients to make the most of their functional capacities, alleviate symptoms and reduce the need for medication, which leads for significantly improving the quality of life. However, is not possible to apply general recommendations for exercise. It is necessary to individually consider functional capacities and comorbidities and, in accordance with the underlying disease, develop a program that will improve the patient's health.

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INCIDENCIJA POVREĐIVANJA U KONJIČKOM SPORTU

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Sažetak: Iako je rizik u konjičkom sportu permanentno prisutan, bilo bi nepravedno tumačiti ga kao neprihvatljiv rizik obzirom na popularnost konjičkog sporta u svetu. Cilj ovog rada je utvrđivanje rizika od povreda u konjičkom sportu, pri čemu su korišćene sistematizacija, analiza i deskriptivna metode. Pretraživanje literature obavljeno je pomoću pretrage elektronske baze podataka Google Schollar, Pub Med i Kobson. Za potrebe ove studije korišćena su naučna longitudinalna i trasverzalna, randomizirana i nerandomizirana istraživanja, koja su obuhvatila učesnike oba pola i svih uzrasta, pisana na engleskom i objavljivana u celosti u periodu od 1984 do 2018.godine. Dobijeni rezultati ukazuju da se konjički sport smatra rizičnim sportom, dok je „Three day Event“ disciplina sa najvećom prevalencijom povreda. Zaključak sugeriše da sigurnošću u Eventingu treba da se posveti pažnja u daljnjim istraživanjima i da se preduzmu postupanja usmerena na povećanje sigurnosti jahača i konja.

Ključne reči: konjički sport, pad, povreda, konj, jahač.

INJURY INCIDENCE IN THE EQUESTRIAN SPORT

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Abstract: Eventhough the risk in the equestrain sports in permanently present, it would be unfair to interpret it as the unacceptable, bearing in mind the popularity of the equestrian sport in the world. The aim of this paper is to determine the risk of injury in the equestrian sport using sistematization, analysis and descriptive method. Liretature review has been conducted through the electronic data bases Google Schollar, Pub Med and Cobson. For the purpose of this study, longitudinal and transversal methods were used, as well as randomized and non-randomized research, which included participants of both sexes and of all ages, written in English and published between the years of 1984 and 2018. Extracted results indicate that equestrian sport is considered to be a risky sport, with the Three-day-event being the discipline most prevalent to injuries. Conclusion suggests that further research should be conducted for the Three-day-eventing in order to take steps to ensure higher safety of both riders and horses.

Keywords: equestrian sport, fall, injury, horse, rider.

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INTRODUCTION

Partnership of horse and rider is deeply pervaded through interaction and two-sided inclusive relationship, and can turn out to be especially important in overcaming sports challenges. Regardless the fact that rider is considered to be more of a sportsman within joint sports actions, phylosophy of riding puts synchronized relationship of horse and rider in its center (Douglas, et. al., 2012). Many authors indicate equestrian sport to be a dangerous sport, while taking Three-Day-Event as a leading discipline for such indications (Paix, 1999). Numerous studies indicate Cross-Country to be the most risky Three-Day-Eventing phase, taking into consideration that the highest number of riders' falls followed by injuries and hospitalization (Murray, et al. 2006; Ball, et. al., 2007; Mayberry, et. al., 2007; Havlik, 2010; Thompson, & Nesci, 2016; O'Brien, 2016). Paix (1999) indicates that one injury occurs per every 1000 hours of riding (Paix, 1999). Results of the abovementioned studies indicate the risk of this phase of the Three-Day-Eventing competitions, which may also result in death cases.
The aim of this study is to determine the risk of injuries in equestrian sport, while reviewed studies justify the frequency analysis of injuries in order to impove safety.

RESEARCH METHODOLOGY

For development of this paper, systematization, analysis and descriptive methods were used, while the secondary source of data was used for research systematization. Research was conducted using electronic databases Google Schollar, Pub Med and Cobson. Scientific longitudinal and transfersal, randomized and non-randomized research methods were used, which included participant of both sexes and all ages, written in English and published in the years between 1984 and 2018.

Out of the initial 99 papers, 48 was rejected based on the inadequate title, while 35 was rejected based on the inadequate subject. Systematization included 16 papers that fit the criteria and covered topics of injuries and safety in the here-Day-Eventing competitions.

RESULTS

Three-day-eventing is considered to be the most risky equestrian discipline, with the focus on Cross-country phase. One-years data detected 143 injuries out of which 37,2% occurred during the competition. Prevalence of 26,6% of injuries, separated prevalence of 19% of trauma injuries, specific prevalence of 19,3% of trauma injuries and 10,9% of the excessive injuries advocate for the risk level of the Three-day-eventing. Out of the total number of injuries, 28% were considered heavy, and one ended in death outome (Ekberg, et al., 2011). Whitlock (1999) indicates that 193 injuries during 54 days of competition between 1992 and 1997, 16 death outcomes per year between 1982-1992. (source: Office of Population Censuses and Surveys. Documents DH4 84/3–93/3), and 98 death outcomes between 1982 and 1998 support the position of Three-day-eventing being considered risky (Whitlock, 1999).
Thompson, & Nesci (2016) indicate in their study that Three-day-eventing is a high risk sport, especially in the Cross-county phase, with the risk coming from the interaction with horse (Thompson, & Nesci, 2016), with the prevalence of rider's injury being 0,88%-1,1% (Paix, 1999). stipulate connection of rider-horse variables, with rider's activity highly correlating with the risk of fall and injury, which supports quotes of other authors on a danger and complexity of Three-day-eventing (Singer, et al., 2003). High risk of Three-day-eventing is supported by the data of five deathly outcomes due to fall of the horse (Murray, et al., 2006). In order to understand the complex role of the horse in prevalence of riders' injuries in Cross-country, it is necessary to stipulate that horse is a big, fast and impulsive animal, which moves

in speeds of 480-570 m/min in Cross-country, and where the main risk occurs during jumps over fixed fences. This is the phase in which most of the deathly outcomes of riders occur due to the roational fall of the horse (Thompson, & Nesci, 2016). Falling off the horse (39,2 %), fall of the horse (21,6 %), and joint fall of both rider and horse (13,4 %) are the cases measured during the one-year competition period in Sweeden, where out of the 86 % of rauma injuries, rider's mistake caused 58,1 % and factors connected to the itinerary 34,8 %. Lighter and medium injuries were caused by the rider's mistake (Ekberg, et al., 2011), which is a consequence of the lower level of riders' competencies, competing mostly on the lower and medim level competitions, where falls occur in less demanding situations. According to the retrospective study of Meredith (2018) between 42,7 % and 82% of the total number of injuries were caused by the fall of the horse (Meredith, et. al., 2018). Murray (2006) indicates a total risk of fall of the horse being 3,5 falls/10.000 of jumps, out of which 9,5 falls/10.000 jumps, 2.7/10.000 during the one-day compettion, 0.0/10.000 during the two-days competitions at the begginers level, and 14.6/10.000 during the 4* three-days competitions (Murray, et al., 2006). Data suggests that the risk of fall of a horse, and therefore of the injury of a rider, is lower on the lower level of competition, and it rises with rising of the level of competition. Lower risk at the two-days begginers level competition suggests good distribution of the total low level of load in two days, with the good load-rest cicle, which is not the case in one-day begginers level competitions. 4* three-days competitions are the most demanding, and demand and risk are present during the whole course of the competitions. Monitoring of the Electonic Medical Records between 1995 and 2005., published by Ball, et al. (2007), introduces the fact that out of the total of 7941 trauma patients 151 (2%) were injured in equestrian sports, 20 with medium level of injuries, with death rate of 7%, out of which 45 % went to surgery (Ball, et al., 2007). High risk of injury in the Three-day-eventing is supported by the study of O'Brien (2016), where it is stipulated that for the period 2005-2014., out of 152.821 starts, 8556 falls occurred, fall rate was 1/34 starts, out of which 311 riders were deathly or seriously injured, and the incident rate of injury per rider was 0.65% (source: www.fei.org). Furthermore, O'Brien (2016) stipulates that the Australian National Monitoring Project identified 374 injured riders out of the 1732 falls from 58.557 starts, out of which 31% suffered serious injuries, and with the incident rate of rider's injuries being 0.63%. Australian National Monitoring Project identified 59 death cases, 15 on FEI tournaments, 34 on national competitions and three pony club comptitions, out of which a total of 41 falls was caused by the roational fall of the horse. Risk of the moment is supported by the data that 90% of falls occurred during or around the moment of jump, which caused 74 horse deaths, or 7 horse deaths per the year of competition (O'Brien, 2016). Approximate value of incident per rider according to FEI (0.65%) and the same value according to the Australian National Monitoring Project (0.65%) strongly support other authors' positions that Cross-country competitions are of higher risk. High number of death cases at the national level of competition in Australia is caused by the approximately same level of difficulty as at the FEI competition, but not with the same level of riders'competency, taking into consideration that competitors at the FEI level are usually competitors at the national team level. Riders' injuries caused by the rotational fall of the horse are caused by the compex interaction of the insufficient or too fast approach towards the fence, wrong estimation of the take-off point, surprise factor due to the fence design, where a contact between horse's front extremities and the fixed fence occur and, due to the body inertia and sudden stop, horse makes a rotation across the fence, rider inevitably falls, frequently followed by the horse falling on the rider. In the USA between 1989-1991., 19.1 % of riders had one, and 5.6% two injuries, 16.8% of injuries occurred during jumping, out of which 49.6% due to the fall of the horse, and at least 13% was hospilatized, while 43% was treated in the emergency room (Nelson, et.al., 1994). Take-off phase is the most risky moment for both the rider and the horse, while all jump parameters (take-off, airborne, landing, itinerary, parabole, energy of the jump, speed of the

movement across the obstacle) have to be taken into consideration, eventhough each jump takes various and important disruptive factors (shape, colour, dimensions, quality of the surface, position of the fence in relation to other fence etc.). In his study, Paix, (1999) indicates that in the 35 Three-day-eventing competitions between 1990 and 1998 in South Australia, 37 out of 4220 competitors were injured, with the overall incident injury rate 0.88% per competitor per competition. 26 were hospitalized, 12 was kept, while 11 received help on the spot. Highest level competitions had the highest frequency of injuries of 2.2 % per competition, with emphasis that Cross-country is 70 times more dangerous that the recreational sport (Paix, 1999). High level of demand set by itinerary designers and organization boards, in order to maintain crowd interest, produces high incident injury rates (0.88 %) per competitor and per competition. Cross-country asks for the high level of preparation from horse and rider, which are not always at the sufficient level to prevent the risk at the competitions of the highest level. Retrospective review conducted by Havlik (2010) for the period 1997-2009. indicated 37 deathly outomes during the Cross-country phase, while it is indicated that during the period 2007-2009. equestrian sport caused 25 % out of all deathly outomes in children with the mortality rate of 2.5 % (Havlik, 2010). Studies show that out of the 679 participating riders, 81% had at least once a need for medical care due to injury (Mayberry, et. al., 2007). In Sweeden, death rate due to equestrian sport is 0,5 on a million population per year (Ingemarson, et. al., 1989), while in South Africa equestrian sport has the highest death rate compared to all other sports and is around one per a million of population (Pounder, 1984). In the period from 1982 to 1988 in Wales, 98 deathly outcomes of adult riders and 19 of children riders were detected (Avery, et. al., 1990). Kako Sorli (2000) indicates that between 1991 and 1996 in British Columbia (Canada), a total of 1950 injuries was reported (390/year), and 15 persons died (Sorli, 2000).

Based on the reviewed data, it can be concluded that Cross-country is the most risky phase of the Three-Day-Eventing, which is the equestrian discipline with the highest prevalence of injuries, which is connected with the risk caused by the rider-horse interaction in the context of fast movement and jumping over fixed obstacles at the high level of competitions with high demand.

CONCLUSION

Equestrian sport, and Three-Day-Eventing especially, can never be risk free, due to the combination of speed and movement, jumping through the air, and the horse-rider relation in joint performance. Even the most experienced riders are never fully protected from the risk of injury. It is important to accept that quantitative research of the equestrian sport, injury and risk excludes the perception of subjective experience of risk through the two sided horse-rider relation. In order to obtain clearer resuls in the future in order to reveal the risks in the equestrian sports, it would be usefull to connect the research on horses with the theory of risk. Strong approach to the horse-rider team unity is stipulated, but, at the same time, it is noticed that the separation of the sense of this team unity induces the risk of falls and injuries. Close partnership that has been disturbed for one moment in the risky situation where the horse is scared and inhibated, follows by the greater care of the rider for the horse, than for him/herself. Conclusion that Three-day-eventing is the most risky equestrian discipline, with very high incident injury rate, points towards the need of wider and quality formal and informal education on the structural topic of the discipline, which would include coaches, riders, managers, doctors, organization boards, itinerary designers, vets, horse breeders, farriers etc. Defining the index of the educational impact, that would be widely accepted as the general starting point when deciding where and how much to invest in education and training, would decrease the risk of injury for riders and horses.

Also, a conclusion that Cross-country is especially dangerous phase is the result of the interaction of multiple factors. Standardization and classification of risks, falls and injuries, unified analysis, identification of the context, risk record, control, analysis and drawing conclusions may in the future bring us to the quantification of the risk, aiming to ensure clearer identification of risky cases that can provide us with the answers to the questions related to risks in the equestrian sports.

Eventhough the risk in the equestrain sports in permanently present, it would be unfair to interpret it as the unacceptable, bearing in mind the popularity of the equestrian sport in the world. Results suggest that imrpovement of the risk factors and raising of the level of professionality, can for sure impact that the risk of injury in the equestrian sports decreases to the lower rate. Risk does not have to be final, and the incidence injury can be decreased with the joint, simultaneous, expert and constant work of subjects of the equestrian sports, on the detected injury factors.

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PREVALENCIJA POVREDA U KONJIČKOM SPORTU U ODNOSU NA ANATOMSKU TOPOGRAFIJUM POL I GODINE JAHAČA

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Sažetak: Sportisti u konjičkom sportu su veoma raznolika grupacija sa rasponom godina jahača, gde su izloženi riziku od povreda pri padu sa konja. Cilj ovog rada je utvrđivanje prevalencije povreda u konjičkom sportu u odnosu na anatomsku topografiju, pol i starosnu dob jahača. Pregled literature obavljen je pretragom elektronske baze podataka Google Schollar, Pub Med i Kobson izdatim u periodu od 1994 do 2018.godin. Za potrebe ove studije korišćena su naučna longitudinalna i trasverzalna, randomizirana i nerandomizirana istraživanja, koja su obuhvatila učesnike oba pola i svih uzrasta, pisana na engleskom, dok su korišćene deskriptivna metoda, sistematizacija i analiza. Dobijeni rezultati ukazuju da je najveći procenat povrede glave i gornjeg dela trupa i ekstremiteta, da su žene i mlađi jahači izloženiji povredama. Zaključak sugeriše na neophodnost svesti o rizicima i faktorima koji ih proizvode, da treba podići standard zaštitne opreme i unaprediti pravila konjičkog sporta. Uobičajena ograničenja su nemogućnost definitivne izolacija uticaja odabranih faktora od drugih faktora kada se analizira procena rizika od povređivanja obzirom na kompleksnsot konjičkog sporta. Radi dobijanja potrebnih nalaza potrebno je nastaviti sa istraživanjem.

Ključne reči: konjički sport, povreda, telo, pol, starost.

INJURY PREVALENCE IN REGARD TO THE ANATOMICAL TOPOGRAPHY, SEX AND AGE OF THE RIDER IN THE EQEUSTRIAN SPORT

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Abstract: Equestrian athletes are a very diverse group with a range of age riders, where they are at risk of injury when falling from a horse. The aim of this paper is to determine the injury prevalence in regard to the anatomical topography, sex and age of the rider in the equestrian sport. Literature review was conducted using the electronic databases Google Schollar, Pub Med and Cobson, reviewing the documents published between 1994 and 2018. For the purpose of this study, longitudinal and transversal, and randomize and non-randomized methods were used, which included participants of both sexes and of all ages, written in English, while using descriptive methods, sistematyzation and analysis. Extracted results show the highest rate of head injuries and upper body and upper extremities, and that women and younger riders are more prone to injuries. Conclusion suggests that it is necessary to raise awareness of the risks and factors that produce them, that it is necessary to raise the standard of the safety equipment and to imrpove the safery regulations in equestrian sport. The usual constraints are related to the inability to isolate the impact of certain factors from the others when conducting risk

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analysis, bearing in mind the complexity of the equestrian sport. It is necessary to continue the research in order to obtain necessary results.

Keywords: equestrian sport, injury, body, sex, age.

INTRODUCTION

When refering to the risk in the equestrian sport, whether the rider will fall of the horse is not the only question, but also whether that fall will cause any injuries (Havlik, 2010). Particularity of the contemporary equestrian sport is supported by the fact that 80% of riders are women and that they are competing equally in the same categories with men (Ille, et. al., 2014), while at the higher level men are prevalent competing sex (Dashper, 2012). Athletes in the equestrian sport are considered to be a various group, with age span from 5-6 years old to up to 70, while the average age of the Olympics competitors is around 40 (Pugh, 2004). Bearing in mind the evidence based incidence injury of riders, a number of authors has researched the injury prevalence in regards to the anatomical localization, sex and age (Northey, 2003; Ekberg, et. al., 2011; Krüger, et al., 2018; Meredith, et. al., 201).
The aim of this paper is to detect the injury prevalence in regard to the anatomical topography, sex and age of riders in equestrain sports, while abovementioned research justifies analysis of the injury frequency in order to improve safety.

RESEARCH METHODOLOGY

For the purpose of this paper, systematization, analysis and descriptive methods were used, while the secondary data source was used for research and research systematization. Research was conducted using Google Schollar, Pub Med and Cobson. Scientific longitudinal and transversal, randomized and non-randomized methods were used, including participants of both sexes and of all ages, written in English and published in the period between 1994 and 2018.
Out of the initial 78 papers, 36 were rejected based on the research problem, 30 based on the inadequate subject, while 12 papers fitted the criteria.

RESULTS

Classification of injuries based on the anatomical topography

Findings of the study conducted by Ekberg, et al. (2011) detect the injury prevalence in regards to the topography of the body as head/neck (22,7%), back (14,4%), shoulders (14,4%) and kneese (13,4%) for trauma injuries, and for excesive injuries (33,3%) and kneese (12,5%), pointing towards the falls as cause of trauma injuries and the inadequate load on the rider which can also be the cause of the extensive injuries (Ekberg, et al., 2011). Ball (2007) indicates in 10-years study on a ten period between 1995 and 2005 that 151 injuries occured, out of which 54% were chest injuries, head was 48%, abdomen 22% and extremities 17% (Ball, 2007). Whitlock (1999) in his study stipulates that 31.1% are head and face injuries, shoulders 20,7%, focusing on the significance of head and abdomen injuries, which resulted in intensification of the safety helmets and wests testing. The same author stipulates the importance of wearing of safety equipment in order to prevent the risk of injuries, while in practice this is reflects in the fact that a number of riders who wore safety equipment was able to continue with the competition (Whitlock, 1999). Krüger, et al. (2018) stipulate that (n=143) distribution of injuries that required surgical intervention is as follows: head (n=47) 32, 9%, abdomen (n=13) 9, 1%, upper extremities (n=46) 32, 2 %, lower extremities (n=28) 19, 6 %, neck (n=9) 6, 3 % (Krüger, et al. 2018). Paix (1999) indicates that head injuries are 19/37, soft tissue injuries of

the thoracic/lumbar areas of the spine 5/37, lower extremities breaks 3/37 and ribs breaks 3/37. One fatal and one life threatening injury occurred in the situation where the horse jumped over the fence and fell on the rider (Paix, 1999). Findings of the study indicate the severity of injuries and the need for adequate medical assistance in order to prevent tragic outcomes in riders. Findings of the study published by Sorli, (2000) introduce us to the results with injury rate of head 20%, upper extremities 19%, lower extremities 18% and abdomen 18%, spinal cord 7% and other 17%. In the same study it is indicated that in children 29% are head injuries, 48% upper and 22% lower extremities (Sorli, 2000). Meredith, et al. (2018) stipulate that approximately 20% of riders sustained head injury, mostly of the soft tissue (56, 3%) and concusion (33, 4%) (Meredith, et al. 2018). Nelson, et al. (1994) stipulate that 49,6% of injuries were due to the rider falling of the horse followed by trampling or leg kick, while the most common was the injury of upper extremities, followed by lower extremities, and followed by neck/back and head (Nelson, et al. 1994).

This topography diversification of injuries can be explained with the fact that riders most frequently fall off the horse in front of or aside from the horse, from the half seat position, so the inertia is pulling the rider forward lead by the head and the abdomen, while the need to protect themselves from the fall puts upper extremities in the protective position. In relation to children, it is important to pay attention to all safety standards, including the properly educated staff. Injuries of the caused by the rotational fall of the horse are a result of the complex interaction of the too fast or insufficient speed when approaching the fence, mistaken estimation of the take-off point, surprise factor due to the design of the fence when horse's front extremities make contact with the fixed fence and, due to the inertia and sudden stop, horse rotates over the fence, rider falls inevitably, in numerous cases followed by a horse falling on the rider.

Northey (2003) in his study stipulates that breaks and injuries of upper extremities have risen from 186 (26%) in 1993. to 206 (31%) in 2001., head injuries made 25% of injuries and that number has decreased from 175 (25%) in 1993. to 134 (20%) in 2001., breaks and leg dislocations have decreased from 145 (20%) in 1993. to 100 (15%) in 2001. (Northey, 2003). Havlik (2010) stipulates that injuries of upper extremities make 31%, in regard to the head and neck injuries that make 20% (Havlik, 2010). Presented results suggest that one of the potential reasons for the decrease of head and neck injury percentage use of adequate safety equipment. Results indicating the percentage of the injury of upper extremities indicate the inefficiency of the safety equipment for upper extremities. Nothing has been done in the area of protection of the rider when in situation of facing a large force on the stretched out hands, which leads to the raise of the number of injuries of the upper extremities, while constant improvement of safety helmets, vests and footwear show positive results in decreasing number of injuries of head and legs. Presented results indicate the severity and frequency of the injuries, which in the meantime initiated more significant production of the safety equipment, aiming to decrease the risk rates in the equestrian sport.

Injury prevalence in regard to sex

A number of authors stipulate that women are the more numerous actors in the equestrian sport (Petridou, et al., 2004). In the study by Meredith, et. al. (2018) women made 88% of the total sample (Meredith, et al. 2018), while Ekberg, (2011) stipulates that 87, 1% of the sample was made of women, and 12, 9 % of men, bearing in mind that the total amount of time of women being exposed to injuries was 180.245 hours, and in men 28.875 hours out of the total of 209.120 hours (Ekberg, 2011). Sorli (2000) in his research stipulates that during the period from 1991 to 1996. out of the total number of hospitalized riders, 62% were women. In the same time period, there were 15 injuries with deathly outcome, out of which 60% were women (Sorli, 2000). Northey (2003) in his study for the period from 1993 to 2001. indicates 5613

injuries, and stipulates that women made 69% (n = 3893) out of the total number of injuries and 56% (n = 9) with deathly outcome. (Northey, 2003). The study conducted on 770 patients, out of which 67.7% was caused by falling of the horse, women made 87, 9%, and men 12, 1 % (Krüger, et al. 2018). Findings of the study indicate higher injury prevalence of women in regard to men, which is connected to the higher participation of women at the lower and medium level of competition in the equestrian sport, while more serious injuries are more frequent at the professional level.

Injury incidence in regard to the age of the rider

Equestrianism is a sports activity that people can start to train at the early age (children in pony clubs) with the span until the old age, supported by the study of Sorli (2000) that stipulates that an 83-year old man needed medical assistance due to the injury. Injury incidence of head injuries is localized on children and adolescents, bearing in mind that injury incidence of the head injury in children was 29%, while in adults 20%, while Meredith, et al. (2018) determined that there is a higher injury prevalence of the head injury in younger age categories (Sorli, 2000; Meredith, et al., 2018). This percentage of the head injuries can be explained with the fact that development of competencies necessary for a rider takes a long time and that the beginner categories have not yet reached a certain level of skills, which would protect them from frequent falls, and therefore, frequent injuries. Havlik, (2010) in his study stipulates that beginner riders have greater risk of being injured, while older riders suffer from more serious injuries. Beginner riders with less than 3 years of experience have a triple amount of risk to be injured compared to the medium level riders, five times higher risk compared to the advanced level riders and eight times higher risk compared to the professional (Havlik, 2010). Age between 20 and 21, when the rider transits from the Young Riders to the Seniors category, and transits towards the more serious sports tasks, is the period when the risk of the injury rises (Krüger, et al., 2018). Period between 10-29 years of age is taken as the age with the most injuries, with the top age of 13-15, as isolated by the pediatric examinations (Havlik, 2010). Northey (2003) supports findings that injuries are localized to younger categories (Northey, 2003). Riders who were riding in the half seat style with 10 years of experience were most prone to injuries in the age between 15 and 44 (Nelson, et al., 1994). Older riders are more exposed to more serious injuries at the higher levels of competition. In Australia, 59 death cases were recorder with the average age od 34, with the range from 12 years old (3 in pony clubs) to 64 years old, and who participated at the higher level of competition (15 at the FEI competitions and 34 at the national level competitions) (O'Brien, 2016).

Results of the studies suggest that, due to the fact that lower level of competition bears lower levels of load, they do produce the risk of more serious injuries, but occur in higher number due to the lower level of competencies-riding technique of younger competitors. Older riders are in the reverse situation, as the higher level of competition poses higher requirements, producing the risk of the more serious injuries, and the number of injuries is lower, because the competencies-riding technique of professional riders are at the higher level. When determining the age category as the risk factor of the injury, it is necessary to be delicate, because it is not an isolated factor and it is hard to isolate it from the other factors. A large number of joint factors may interrupt the drawing of the conclusions about the connection of the risk of injury and the age of the rider.

CONCLUSION

We can conclude that the most frequent and the most severe injuries are the injuries of head, abdomen and upper extremities, while lower extremities are not in the significant risk of the injury. Serious injuries and deathly outcomes should be used as a motivation to improve the regulations and their applicability in the equestrian sport, which would increase the level of safety at the competitions. Data that injuries are more frequent in young riders, but more severe in higher level riders, initiates the conclusion that insufficient level of riding competencies and experience in younger riders who are competing at the lower levels, excludes the higher number of more serious injuries, but represents a risky group for the higher number of lighter injuries. More serious injuries of higher level riders speak of the load level and frequency of starts in competitions. The conclusion is that younger athletes should be more explicitly included in educational and training programs, which is supported by the data mistakes of riders are more common cause in the lighter and medium level injuries. The decrease of the injury incidence of severe injuries in the higher level riders can be conducted by the better periodization of the effort-rest cycle, and by the better identification of the load in the itinerary. This leads us to the position that it would be desirable to make an effort to increase the awareness among riders of the risks that lead to falls and injuries, of the importance of the timely check in with the medical assistance teams after the incident and of the danger of covering up the health condition after the risky fall. Women are more prone to checking in with medical assistance teams which indicates their positive approach in taking into consideration the risk that leads to the injury. The study did not find a causality between the level of risk of the injury and the sex of the rider at the lower and medium level of the competition. Presence of women is greater in the equestrian sport, so their presence in the total number of injuries is greater than men as well. Only at the highest level of competition (Olympic Games, World Equestrian Games and European Championship, FEI 4* competitions, national competitions at the 4* level) injury incidence is higher in men, bearing in mind that men are more present at that level of competition. Some studies enhance the risk of injuries of children, which, with the joint efforts of coaches, and managers of the national responsible federations and clubs, have to be decreased to the minimum. Bearing in mind the anatomical topography and the variation in injuries, and in the intensity, it is necessary to design the adequate quality safety equipment for the body parts that are exposed to the risk of the injury. Raising of the awareness among coaches, parents, riders, club officials, officials of the sports and training centers on the importance of use of the adequate certified safety equipment during riding, and its adequate adjusting during wearing and continuous use, is of great importance for the decrease of the injury incidence.

Education of the medical assistance teams in the domain of the injuries of riders, specialized vehicles equipped for the terrain service and better availability at the spot of the incident would decrease the time until the first aid has been provided and would raise the quality of the medical treatment, which would decrease the severity of the consequences of the injury.

General conclusion is that the greater awareness of the risks and factors that cause them is necessary, that the standard of the safety equipment worn by riders should be improved, and that the regulations of the equestrian sport should be improved. The usual limitation is the inability to isolate the impact of the selected factors from the other factors when conducting the risk assessment from the injuries, complexity of the equestrian sport due to the fact that animals are included in the sports activity, the low number of studies in regard to the popular sports (football, basketball, volleyball, handball, judo, karate, box…), a lack of the universal coding of the samples and of the level of the risk of the injury, and the generalization of the conclusions.

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HEALTH TOURISM AND SPORTS AND RECREATIONAL PROGRAMS FOR CHILDREN

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Abstract: Sport and recreational activity play an important role in all areas of human life. Physical activity has a positive effect on the adoption of a healthy lifestyle, improves health and quality of life. Regular physical activity is one of the key factors for a healthy life. Some of the positive effects of physical activity are the improvement of health and quality of life. It prolongs life expectancy and reduces the risk of chronically non-communicable diseases such as heart and blood vessel diseases, diabetes, malignant diseases, improving physical and mental health and the like. It is never too early to start adopting healthy habits and educating about the importance of sports and physical activity. Studies show that most children who play sports and are physically active in childhood, maintain such habits even later when they grow up. Children, who have been involved in some sport activity since they are young, develop work habits and self-discipline at an early age. Sport, on the other hand, has a positive role in the emotional development of children, since it also facilitates the process of their socialization. The subject of the paper is to get as close as possible to the importance of sports and recreational programs and point out the connection with health tourism. Sports and recreational programs in nature can be expressed through various forms such as schools in nature, recreational classes, sports and recreational camps or children's recreation festivals. The theoretical analysis of the mentioned activities and their significance for health tourism will be performed using the bibliographic method of data collection. Sport and recreational activity develop self-awareness in individuals and reduce anxiety and stress. It teaches the child how to win but also to accept defeat, teaches him fair play in play and life, develops friendship. Children who play sports have healthier eating habits, smoke less as adults, consume less alcohol, and get less sick. The program, which is implemented through sports and recreational activities for children, also develops various skills, shows what teamwork looks like, develops self-discipline and socialization in society. Habits acquired from early childhood remain for a lifetime and are difficult to change. In conclusion, the fact is that sports and recreational programs that are placed through the mentioned programs have a positive effect on strengthening health tourism. In addition to all the positive effects on the physical health as well as on the proper growth and development of the child, it is important to point out that fitness, speed, flexibility, coordination and finally strength and endurance are improved. Pleasant fatigue after physical activity provides the child with fast and easy sleep, which, along with improving blood circulation in the brain and greater oxygen supply, enables better and longer concentration, easier overcoming of imposed tasks, faster process of thinking and combinatory moves, and easier acceptance of any challenge. Staying in nature and all of the above is one of the important components of health tourism.

Keywords: health, tourism, sports and recreation program, children

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ZDRAVSTVENI TURIZAM I SPORTSKO REKREATIVNI PROGRAMI ZA DECU

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Sažetak: Sport i rekreativna aktivnost imaju važnu ulogu u svim područjima ljudskog života. Fizička aktivnost pozitivno utiče na usvajanje zdravog načina života, unapređuje zdravlje i kvalitet života. Redovna fizička aktivnost jedan je od ključnih faktora za zdrav život. Neke od pozitivnih uticaja fizičke aktivnosti su unapređenje zdravlja i kvaliteta života. Ona produžuje očekivano trajanje života i smanjuje rizik od hronično nezaraznih bolesti kao što su bolesti srca i krvnih sudova, šećerna bolest, maligne bolesti, poboljšavanje fizičkog i mentalnog zdravlja i sl. Nikada nije prerano da se započne s usvajanjem zdravih navika i edukacijom o važnosti sporta i fizičke aktivnosti. Studije pokazuju da većina dece koja se bave sportom i fizički su aktivna u detinjstvu, zadrže takve navike i kasnije kad odrastu. Deca koja se od malena bave nekom sportskom aktivnošću, već u ranoj životnoj dobi razvijaju radne navike i samodisciplinu. Sport sa druge strane ima pozitivnu ulogu i u emocionalnom razvoju dece budući da olakšava i proces njihove socijalizacije. Predmet rada je da se na što bolji način približi važnost sportsko rekreativnih programa i ukaže na povezanost sa zdravstvenim turizmom. Sportsko rekreativni programi u prirodi mogu biti iskazani kroz različite forme poput škola u prirodi, rekreativnih nastava, sportsko rekreativnih kampova ili dečijih festivala rekreacije. Bibliografskom metodom prikupljana podataka izvršiće teorijska analiza pomenutih aktivnosti i njihov značaj za zdravstveni turizam. Sport i rekreativna aktivnost razvijaju kod pojedinca svest o sebi i smanjuju anksioznost i stres. Uči dete kako pobeđivati ali i prihvatati poraz, uči ga fair-play-u u igri i životu, razvija prijateljstvo. Deca koja se bave sportom imaju zdravije navike hranjenja, manje puše, manje konzumiraju alkohol, manje se razboljevaju. Program koji se sprovodi kroz sportsko-rekreativne aktivnosti kod dece takođe razvija i različite veštine, pokazuje kako izgleda timski rad, razvija samodisciplinu i socijalizaciju u društvu. Navike stečene od ranog detinjstva ostaju za čitav život i teško se menjaju. U zaključku se nameće činjenica da sportsko rekreativni programi koji se plasiraju kroz pomenute programe imaju pozitivan efekat na jačanje zdravstvenog turizma. Pored svih pozitivnih efekata na fizičko zdravlje kao i na pravilan rast i razvoj deteta, važno je istaći da se poboljšava kondicija, brzina, fleksibilnost, koordinacija i na kraju snaga i izdržljivost. Prijatan umor nakon fizičke aktivnosti obezbeđuje detetu brz i lak san koji uz poboljšanje cirkulacije krvi u mozgu i većeg dotoka kiseonika omogućuje bolju i dužu koncentraciju, lakše savlađivanje nametnutih zadataka, ubrzaniji proces razmišljanja i kombinatorike, te lakše prihvatanje svake vrste izazova. Upravo je boravak u prirodi i sve prethodno navedeno jedan je od važnih komponenata zdravstvenog turizma.

Ključne reči: zdravlje, turizam, sportsko rekreativni program, deca

UVOD

Veze između zdravlja, blagostanja i aktivnog odmora uočene su već dugi niz godina Zbog toga su putovanja sa namerom poboljšanja zdravstvenog stanja postala popularna. Tehnologija, a posebno ona na radnom mestu, smanjila je fizičke sposobnosti društva, što je za posledicu imalo to da je svakodnevni život postao gotovo bez značajnijih aktivnosti. Iako nedostatak fizičke aktivnosti nije neosporno ustanovljen kao neposredni i nezavisni faktor rizika za koronarne bolesti srca, često postoji posredna veza između načina života bez aktivnosti

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(sedenje i ležanje) i prejedanja, što dovodi do pojave gojaznosti. Zauzvrat, gojaznost doprinosi povećanom riziku od bolesti kao što su oštećenje srčane funkcije, hipertenzije i moždanog udara, plućnih bolesti, dijabetesa, nekoliko vrsta karcinoma, degenerativnih bolesti zglobova i kostobolje. Postoje dokazi da se kod fizički aktivnih ljudi ove bolesti ređe pojavljuju, a posebno bolesti koronarnih srčanih problema, što čini se ukazuje na činjenicu da vežba obično smanjuje rizik. Ulozi fizičke aktivnosti u prevenciji srčanih bolesti dat je veliki publicitet u svetu. Ustanovljeno je da postoji pozitivan odnos između fizičke kondicije i mentalnog ili psihičkog zdravlja. Od sredine 1970-tih godina, zapadni svet postaje u većoj meri svesan zdravstvenog i kondicionog stanja, pa mnogi ljudi počinju da upražnjavaju fizički aktivan načina života. Šire se saznanje o ekonomskim koristima od fizičke aktivnosti. Ovo je povećalo interesovanje za zdravstveni turizam. Kako navode Ivanovski i sar. (2021) citiraju Vidicki i sar. „zdravstveni turizam predstavlja posebnu vrstu turističkih aktivnosti u kojoj bitno mesto zauzima stručno i kontrolisano korišćenje prirodnih lekovitih elemenata s ciljem održavanja i unapređenja fizičkog, psihičkog i duhovnog zdravlja turista. Pored toga, isti autori citiraju Gligorijević i Novović, da zdravstveni turizam predstavlja putovanje čiji je cilj da se dobije zdravstvena nega. Zdravstveni turizam je povezan s osobama koje imaju određene zdravstvene probleme i koje dolaze na turističku destinaciju radi tretmana koji će im pomoći da poboljšaju zdravstveno stanje. S druge strane, posebnu vrstu zdravstvenog turizma čine sportsko-rekreativni programi i velnes turizam u kojem učestvuju ljudi koji imaju dobro zdravstveno stanje i koji kroz turističku ponudu nastoje da to stanje i održe.

DISKUSIJA SA ANALIZOM I PRIMERIMA DOBRE PRAKSE

Kroz teorijsku i iskustvenu analizu pokušali smo na što bolji način približiti važnost sportsko rekreativnih programa i ukazati na povezanost sa zdravstvenim turizmom. Sportsko rekreativni programi u prirodi mogu biti iskazani kroz različite forme poput škola u prirodi, rekreativnih nastava, sportsko rekreativnih kampova ili dečijih festivala rekreacije. Bibliografskom i iskustvenom metodom prikazanih podataka izvršena je teorijska analiza pomenutih aktivnosti i njihov značaj za zdravstveni turizam.

Zdravstveni turizam predstavlja i skup svih odnosa i fenomena koji rezultiraju promenom lokacije i mesta boravka radi promovisanja, stabilizacije i eventualno vraćanja fizičkog, mentalnog i socijalnog stanja kroz korišćenje različitih zdravstvenih usluga (Dašić, 2018). Značaj zdravstvenog turizma sve više raste, posebno ako se posmatraju evropski trendovi po kojima preko 10 odsto turista putuje na različite zdravstvene tretmane (Gligorijević i Novović, 2014). Povezanost rekreativnih programa i turizma je neminovna. Ivanovski i sar. (2021) citiraju Živanovića koji kaže „Rekreacija i turizam sve više predstavljaju biološko-kulturnu potrebu i deo standarda masovnog društva i, gde god se pojave, oni su uzrok ili posledica boljih uslova rada i života. Pioniri modernog turizma uočili su interesovanje i oduševljenje turista kojima je bio pripremljen sadržajan boravak. Oni su u repertoar usluga uvrstili sportsko-rekreativne aktivnosti i vrednosti toga vide u sledećem:

– uspešniji boravak turista sa zdravstveno-vaspitne i rekreativne tačke gledišta,

– sadržajnije zadovoljenje potreba gostiju bez osećanja dosade i izgubljenog vremena,

– sigurnost prodaje kapaciteta, ubedljivost reklame i povećanje prometa.

Isti autori dalje citiraju Čečuk (1972) koji konstatuje: „Sportska rekreacija kao razonoda, ili kao aktivni oblik odmora, danas je prirodna potreba savremenog čoveka, koji je opterećen životom i radom u urbaniziranim i visokoindustrijaliziranim zonama, progonjen nametnutim i neprirodnim načinom života, traži upravo takve mogućnosti destinacija koje mu perspektivno nude aktivan odmor. Nadalje, visoki standard srednjoevropskog turističkog potrošača, uz

značajan fond slobodnog vremena te relativno visoka prosvećenost općenito, a posebno s velikim nivoom fizičke osobne kulture, stvorili su kod njega već u domicilu potrebe bavljenja rekreacijom. Nezadovoljavanje ovakvih potreba potrošača značilo bi diskvalifikaciju ove kategorije tržišta, a to se ne bi moglo ničim opravdati, pogotovu što rekreacija pa i ona najskuplja, ima u masovnom turizmu i masovnu tendenciju."
Da se vratimo onima koji najviše upotrebljavajusportske i rekreativne programe, a to su deca.

Igra se po svojim karakteristikama razlikuje od svih ostalih aktivnosti. Igra je nešto lično, pa je i prirodno da je njen značaj za dete tako dubok i svestran. Dete ne vidi svet u kom živi isto kao i odrasli. Stvari vidi onako kako ih doživljava. Dečiji svet najprirodnije dolazi do izražaja u igri. Igra razvija organe, mišiće i celokupan organizam. Razvija detetovu ličnost kao celinu, obogaćuje i produbljuje, zatim razvija dečije funkcije i sposobnosti, a samo dete stiče iskustvo na veoma karakterističan način. U radu sa mlađim predškolskim uzrastom, a pogotovo ne po samom dolasku u predškolsku ustanovu, ne preporučuju se ekipne, odnosno grupne igre sve dok dete ne stekne određeno samopouzdanje i poverenje u drugu decu i vaspitača - nastavnika. Podizanjem sposobnosti ali i interesa dece za grupne aktivnosti, mogu se u njih postepeno uključiti elementi takmičenja, npr. hodanje u parovima, trčanje u parovima, preskoci preko vijače, kotrljanje lopte i sl. Sadržaj u igrama odražava život okoline koja okružuje dete. U jednima se prikazuje život životinja, ptica, insekata, u drugima događaji iz života ljudi, dece, saobraćaja. Sadržaj određuje redosled zbivanja u igri. Gotovo u svakoj igri deca beže, sakrivaju se, neko ih juri i lovi, a pri tome se uživljavaju u različite situacije, poistovećuju sa svojom ulogom u igri i oponašaju svojim glasom različite zvukove. Takav sadržaj motiviše decu da u aktivnost unose svoje utiske i osećanja. Pojam elementarnih igara označava da se njihov sadržaj sastoji od pojedinačnih elementarnih kretanja, kao i od elemntarnih složenijih vežbanja koje se (terenske igre) realizuju na nepoznatom zemljištu, sa zadatkom upoznavanja prirode i prirodnih pojava, kao i savlađivanje prirodnih nepogoda. *Elementarne igre* predstavljaju značajno sredstvo, zato što deluju na svestranost ranog razvitka dece. U njima može učestvovati neograničen broj učesnika. Značaj ovih igara je višestruki: utiču na fizičko-biološki i psihosocijalni razvoj dece. Kako navodi Kamenov E. (1989) „Kretanja su izazvana nervno-mušićnim naporom, sa odgovarajućim fizičkim i mentalnim mogućnostima, sklonostima i željama, i često se ponavljaju u određenom vremenu i sa optimalnim intenzitetom". Navedene promene se ispoljavaju u razvoju dečijeg organizma i u osposobljavanju za psihofizičke napore svake vrste. Pokretne igre ubrajamo u igre sa pravilima koje deca uče od odraslih. To su igre kojima se realizuju zadaci fizičkog vežbanja. One zadovoljavaju dečiju potrebu za kretanjem i imau ulogu u daljem sticanju kretnih navika. Pokretnom igrom utiče se na sve apekte psihofizičkog razvoja dece (fizičke, umne, moralne, estetske...).

Sport i fizička aktivnost imaju važnu ulogu u svim područjima ljudskog života. Fizička aktivnost pozitivno utiče na usvajanje zdravog načina života, unapređuje zdravlje i kvalitet života. Redovna fizička aktivnost jedan je od ključnih faktora za zdrav život. Ovo su samo neke od pozitivnih uticaja fizičke aktivnosti: unapređenje zdravlja i kvaliteta života, produžuje očekivano trajanje života i smanjuje rizik od hronično nezaraznih bolesti kao što su bolesti srca i krvnih sudova, šećerna bolest, maligne bolesti, poboljšavanje fizičkog i mentalnog zdravlja i sl. Nikada nije prerano da se započne s usvajanjem zdravih navika i edukacijom o važnosti fizičke aktivnosti: studije pokazuju da većina dece koja se bave sportom i fizički su aktivna u detinjstvu, zadrže takve navike i kasnije kad odrastu. Deca koja se od malena bave nekom sportskom aktivnošću, već u ranoj životnoj dobi razvijaju radne navike i samodisciplinu. Sport sa druge strane ima pozitivnu ulogu i u emocionalnom razvoju dece budući da olakšava i proces njihove socijalizacije. Sport i fizička aktivnost razvijaju svest o sebi i smanjuju anksioznost i stres. Uči dete kako pobeđivati ali i prihvatati poraz, uči ga fair-play-u u igri i životu, razvija prijateljstvo.

Začetak **škole u prirodi** kao oblika sportsko rekreativnih programa, bio je u Šarlotenburgu, Nemačkoj 1904. godine. Škola namenjena deci koja su fizički zaostala u razvoju, koja su lošeg zdravlja, lošeg socijalnog položaja. Učionice su zamenjene prirodom - više vremena posvećeno igri, odmoru i oporavku, dok je nastavno gradivo ostavljeno po strani. Znanja su sticana doživljajem i radom u prirodi ili u posebno građenim učionicama. Aspekti rada ocenjeni su kao veoma uspešni: zdravstvena nega dece, ojačana pažnja, pamćenje, koncentracija, poraslo interesovanje za rad, opadanje osećanja umora i uzrujanosti. Škola u prirodi jeste bitna, kako za fizičko tako i za vaspitno-obrazovno napredovanje dece. Škola u slobodnoj prirodi javila se kao pokret nastao u pedagoga, socijalnih i zdravstvenih radnika sa ciljem da se gradska deca prebace u prirodu, na planinu i na more, ili jezero, na čist vazduh i da, ne prekidajudi školski rad i ne rasturajući razrednu zajednicu pod rukovodstvom svojih učitelja, provedu nekoliko nedelja u slobodnoj prirodi kako bi se preduzelo i ostvarilo povezivanje intelektualnih, telesnih, moralnih, emocionalnih snaga u novoj životnoj sredini. Škola u prirodi je poseban vid celodnevne organizacije vaspitno-obrazovne delatnosti škole sa internatskim smeštajem, koji se ostvaruje van mesta stanovanja u uslovima prirodne sredine, uz prošireno pedagoško delovanje putem aktivnosti u slobodnom vremenu. Vaspitno-obrazovni rad povezuje se sa psihofizičkom rekreacijom u prirodi. Realizacija nastavnih sadržaja, utvrđenih nastavnim planom i programom, prilagođava se konkretnim uslovima prirodne i lokalne sredine. Obrađuju se oni sadržaji kojima ti uslovi najviše odgovaraju i u kojima se oni mogu najuspešnije ostvariti pod stručnim rukovodstvom nastavnog i vannastavnog rada. Bilo da su u predškolskom ili školskom uzrastu, većina dece sanja o odlasku na rekreativnu nastavu s drugarima. Pedagozi ističu da je boravak i škola u prirodi od izuzetnog značaja za psihofizički razvoj svakog mališana. Deca puno vremena provode iz raznoraznih razloga u zatvorenim prostorijama, pored televizora i kompjutera, pa se više nego ikada javlja potreba za organizovanjem škole u prirodi. Takav vid nastave dečju nezainteresovanost za verbalno-predavačku nastavu zamenjuje učenjem neposrednim iskustvom, što se lakše, ali i duže, odnosno kvalitetnije prihvata. Pored toga što u prirodi neposredno uočavaju njenu lepotu, raznovrsnost i bogatstvo zvukova i mirisa, deca uče da je više poštuju, čuvaju i neguju. Prirodna sredina budi radoznalost i razvija istraživački duh deteta. Škola u prirodi je značajan momenat u socijalizaciji dece, jer ona tada sve vreme provode zajedno u kolektivu. Mališani odrasli u gradu, prvi put mogu da se sretnu sa domaćim ili divljim životinjama koje žive u prirodnom staništu. Isto tako, pruža im se prilika da uče orijentaciju u prirodi, vide reljef, upoznaju vode, prošire znanje o istoriji i ljudima tog kraja. Kako navodi Spasojević P. (2010) nastava u prirodi je fakultativni, organizacioni oblik nastave koja se najčešće izvodi u prirodi, kombinovanjem nastave i učenje sa odmorom, zabavom i sportsko rekreativnim sadržajem.

Programski, **zimski festival dečije rekreacije** je bio zamišljen kao grupno, odnosno ekipno takmičenje. Zasniva se na učestvovanju u ponuđenim sportsko rekreativnim aktivnostima, koje se boduju za pojedinačni i ekipni plasman. Ekipu čini 10 učesnika, s' tim da se vodi evidencija kako o ekipnom, tako i o svakom pojedinačnom učestvovanju. Grupe formiraju škole, društvene organizacije, najbolji učenici iz pojedinih opština, pobedničke ekipe sa takmičenja i humanitarne organizacije. Poželjno je da ekipa sa sobom ponese maskotu, da pripremi svoju navijačku pesmu i pozdrav pred nastup. Dužina trajanja Festivala je sedam, dana, tj. šest noćenja. Lokacije na kojima se organizovao do sada dečiji festival su Kopaonik, Zlatibor, Divčibare i Tara.

Sportsko rekreativni kamp, kao jedan od oblika sportskih rekreativnih programa**,** ima organizovan život i rad učenika u kolektivu, koji pruža mogućnost za svestranije i bolje upoznavanje dece, za ispitivanje njihovih potreba, želja i interesovanja, njihovih problema i teškoća, pa zbog toga ima poseban društveni značaj. Kolektivni uslovi života i rada dece kod njih razvijaju potrebe i navike da se međusobno pomažu, brinu jedni o drugima, da lične

interese usaglašavaju sa interesima kolektiva, što u velikom stepenu doprinosi socijalizaciji mladih. Učesnici kampa su istovremeno pripadnici mnogih grupa koje su često povezane u celinu, a njihovo formiranje zavisi od aktivnosti koje stoje pred decom. Različite aktivnosti zadovoljavaju različita interesovanja, pa samim tim omogućavaju i različite socijalne komunikacije. Nekad aktivnost počinje spontano, nekad je potrebna posebna motivacija, ali je važno da svako dete ima velike šanse da promeni svoj status u grupi. Sve te okolnosti utiču na bogaćenje socijalnog iskustva učenika, proširivanje oblika komunikacije i osposobljavanje za raznovrsne kontakte. Isto tako zajedničke obaveze, radosti, porazi, želje i doživljaji, svakodnevno zbližavaju decu i razvijaju prijateljska i drugarska osećanja i učvršćuju ih u snažan i jedinstven kolektiv.

Podela kampova

Kampovi mogu da se dele prema prostoru: na otvorenom i zatvorenom

Kampovi mogu da se dele prema *vremenu*: zimski i letnji

Kampovi mogu da se dele prema nameni: sportski (određeni sportovi), sportsko rekreativni (mnoštvo rekreativnih i sportskih aktivnosti), edukativni (radionice za sticanje znanja-jezički),ekološki, religiozni, vojni i dr.

Kampovi mogu da se dele prema uzrastu: za predškolski uzrast, niže školski uzrast, školski uzrast, srednješkolski uzrast.

PRIMERI DOBRE PRAKSE:

SPORTSKO-REKREATIVNI KAMP „ART“ je realizovan u toku letnjeg školskog raspusta na Kopaoniku. Usled dugododišnjeg iskustva i rada u rekreaciji, animaciji i turizmu, i kao dugogodišnji saradnici i realizatori mnogobrojnih kampova i festivala kako za decu tako i za odrasle, ekipa ART centra organizuje i realizuje letnji kamp ‘’KOPAONIK’’ sa veoma bogatim sportsko rekreativnim i zabavnim sadržajem. Povod za organizaciju kampa je odmor, zabava, rekreacija dece, učenje raznovrsnih sportskih veština, sticanje radnih navika, boravak dece u prirodi i na čistom vazduhu, podizanje moralnih vrednosti, socijalizacija dece i pozitivno vaspitno delovanje. Na kampu je učestvovalo 130 dece različitog uzrasta od 6 do 14 godina, i svako od njih se bavi nekim sportom. Učesnici kampa su bili plivači, plesači i balerine. Imali su mogućnost da se upoznaju sa više ili manje poznatim sportovima, igrama zabavnog ali i edukativnog karaktera. Program je prilagođen broju učesnika, objektu, rekvizitima, opremi i uslovima koje su postojale na kampu. Koncepcija rada je napravljena tako da deca nikad nisu sama, animatori i nastavnici provode ceo dan sa njima. Počevši od jutarnjeg vežbanja pa preko unapred utvrđenim aktivnostima u kojim deca učestvuju sa svojom grupom, a po unapred određenom rasporedu. Svako učestvovanje u nekoj od aktivnosti se evidentira i dobija se određeni broj bodova koji nosi ta aktivnost, treba naglasiti da nije obavezno učešće u svim aktivnostima. Evidentiranje se vrši tako što svaki učesnik kampa poseduje svoju ID karticu ili učesničku legitimaciju koja sadrži ime, prezime i redni broj, zatim animator evidentira prisutne i oni dobijaju određeni broj bodova. Bodovi se sabiraju svakog dana i na završnoj večeri se vrši dodela nagrada, pehara, medalja, diploma za najvrednije i najbolje učesnike kampa. Nakon svakog večernjeg programa učesnici kampa mogu da vide raspored za sutrašnji dan koji se nalazi na nekoliko lokacija tj. oglasnim tablama (u holu recepcije, na svakom spratu hotela).
Svake godine na Sunčanim vrhovima Kopaonika održava se Košarkašpki Kamp YUBAC. Program ovog kampa do sada je pohađalo i završilo preko 20 000 dečaka i devojčica iz 41 zemlje sveta, a postao je i omiljeno stecište dece, njihovih roditelja i trenera iz dijaspore. Jedan od razloga uspeha i popularnosti Košarkaškog kampa YUBAC svakako je uspeh

jugoslovenskih košarkaša koji su postizali sjajne rezultate. Između ostalog, 1998. i 2002. godine osvojili su četvrtu i petu zlatnu medalju na svetskim prvenstvima u košarci. Košarkaški kamp YUBAC dobio je zbog ostvarenog kvaliteta, 2003. godine, licencu FIBE - Svetske košarkaške organizacije. Osim što poseduje dvoranu, pa se nijedan trening ne gubi zbog lošeg vremena, ovaj kamp pored programa tradicionalnog kampa predviđenog za decu od 9 do 14 godina ima i specijalne programe: za bekove, za šutere, za visoke igrače od 15 do 19 godine, kao i za sudije. Osim toga, tu je i Pro Camp za profesionalne igrače. Cilj kampa je napredak i usavršavanje u svakom smislu.

ZAKLJUČAK

Sportsko rekreativni programi (Škole u prirodi, zimski i letnji dečiji festivali rekreacije, sportsko rekreativni i sportski kampovi) dovode kod mladih ljudi do razvoja veština, timskog rada, samodiscipline, bolje socijalizacije u društvu. Sport i fizička aktivnost ispunjavaju društveni život mladih i ne prepušta ih negativnim socijalnim pojavama i kriminalu, i u njima se javlja pozitivniji pristup životu. Po preporukama Svetske zdravstvene organizacije, nema donje i gornje starosne granice za bavljenje fizičkim aktivnostima. Ona je preporučena svima i u svako doba, u zavisnosti od ličnih karakteristika i zdravstvenog stanja. Za razliku od odraslih, kod kojih se fizička aktivnost uglavnom namenski sprovodi bavljenjem sportom i rekreacijom, deca je upražnjavaju i kroz igru, a efekti su mnogostruki po očuvanje zdravlja i pravilan rast i razvoj. Mitić D. (2001) navodi da navike stečene od ranog detinjstva ostaju za čitav život i teško se menjaju. Zato ličnim pozitivnim primerom naučite dete da je fizička aktivnost deo svakodnevnice. Za vreme vežbi ubrzava se i stimuliše pravilno disanje, veće količine kiseonika se unose u organizam, ubrzava se rad srca i podstiče cirkulacija, pospešuje se rad mozga, povećava se imunitet i sprečava nastanak akutnih i hroničnih bolesti, sprečava se nastanak gojaznosti, razvijaju se skeletni mišići te se sprečava loše držanje i nastanak deformiteta kičmenog stuba, stopala. Redovna fizička aktivnost najbolji je čuvar zdravlja. Sagledavajući pomenute programe koji se realizuju na otvorenmom dobijamo kompletnu sliku važnosti tih programa na otvorenom. Na ovaj način se postižu maksimalni efekti zdravstvenog turizma. Turistička ponuda se sve više zasniva upravo na ovakvim programima. Kroz sport, igru i druge fizičke aktivnosti, deca stiču samopouzdanje, upoznaju prijatan osećaj uspeha i socijalizuju se. Fizička aktivnost pomaže sprečavanje i kontrolu rizičitih oblika ponašanja kao što su pušenje, alkoholizam i zloupotreba psihostimulativnih supstanci i narkotika; tako se deca i mladi ljudi uče pravim vrednostima i zdravom načinu života. Pored svih pozitivnih efekata na fizičko zdravlje kao i na pravilan rast i razvoj deteta, važno je istaći da se poboljšava kondicija, brzina, fleksibilnost, koordinacija i na kraju snaga i izdržljivost. Prijatan umor nakon fizičke aktivnosti obezbeđuje detetu brz i lak san koji uz poboljšanje cirkulacije krvi u mozgu i većeg dotoka kiseonika omogućuje bolju i dužu koncentraciju, lakše savlađivanje nametnutih zadataka, ubrzaniji proces razmišljanja i kombinatorike te lakše prihvatanje svake vrste izazova. Sve to rezultira pozitivnim stavom ka mogućim problemima i životu uopšte. U svakom slučaju, treba istaći da se fizička aktivnost dece i omladine danas smatra ne samo poželjnom, nego i dozvoljenom, i to iz sledećih razloga: navike koje se stiču u detinjstvu i pubertetu ostaju trajne; navika kretanja ostaje sačuvana za čitav život; doba rasta i razvoja, a posebno pubertet, izvanredno je pogodno za organizam da prihvati podražaje kojima fizička aktivnost utiče na razvoj funkcionalnih sposobnosti, a verovatno i na morfološke osobine; fizičkom aktivnošću je moguće sprečiti neke pojave koje se češće javljaju u fazi puberteta: adipoznost, poremećaje cirkulacije, loše držanje, i drugo. Navedeni efekti boravka u prirodi na otvorenom postaju prioriti te je turistička ponuda sve češće okrenuta razvoju zdravstveno preventivnog turizma.

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WELLNESS CONCEPT

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Abstract: Throughout history, we see that wellness as a medical practice dates back to India, 5000 BC. Women in Egypt used cosmetics as far back as 3000 BC (fragrant baths, bathing in goat's milk ...). Homer and other classical writers state that the Greeks encouraged various social baths 500 BC, including hot air baths known as Laconium. Twenty-five years before Christ, Emperor Agrippa built one of the first Roman Baths and each subsequent Roman emperor surpassed his predecessor by building larger and more extravagant Baths. Throughout the time, spas were built throughout the Roman Empire, from Africa to England, gradually growing into complexes offering sports, restaurants, and various types of baths. As the Roman Empire grew, so did the number of bathrooms. About 300 AD there were over 900 bathrooms throughout the kingdom. At the same time, they served to maintain hygiene and to preserve health, then to relax, but also to socialize. The subject of the paper is to present the concept of wellness as a way of life. The aim of the paper is to bring such a concept closer to today's audience. The bibliographic method of data collection and theoretical analysis will show the results. In conclusion, we see that Wellness can be presented as an overlap of eight different dimensions of life. Some of them are: Physical dimension (regular physical activity, proper nutrition etc.) Intellectual dimension (intellectual development of one's own personality), Emotional dimension (coping with one's own problems), Social dimension (maintaining good family relations, communication with the outside world), Professional dimension (means that it is necessary to awaken existing talents to engage in certain activities or a hobby.), Spiritual dimension (find your way, achieve your own satisfaction and peace.) and Environmental dimension (ecological dimension).

Keywords: Wellness, spa, recreation

VELNES KONCEPT

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Sažetak: Kroz istoriju vidimo da velnes kao medicinska praksa datira iz Indije i to 5000 god.pre nove ere. Žene u egiptu su koristile kozmetičke preparate još 3000 god.pre nove ere (mirišljave kupke, kupanje u kozijem mleku...). Homer i drugi klasični pisci navode da su Grci podsticali različita socijalna kupanja 500 godina pre Hrista, uključujući vruće vazdušne kupke poznate kao Lakonijum. Dvadest pet godina pre Hrista Car Agripa izgradio je jedne od prvih rimskih Termi i svaki sledeći rimski car nadvisio je svog prethodnika gradeći sve veće i ekstravagantnije Terme. Kroz svo vreme terme su se gradile u celom rimskom carstvu, od Afrike do Engleske, postepeno izrastajući u komplekse koje nude sport, restorane, i različite

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tipove kupališta. Kako je raslo Rimsko carstvo, tako je rastao i broj kupatila. Oko 300 g.n.e. bilo je preko 900 kupatila u celom carstvu. One su istovremeno služile i za održavanje higijene i za očuvanje zdravlja zatim za opuštanje, ali i za druženje. Predmet rada je da se predstavi koncepcija velnesa kao načina života. Cilj rada je da se takva koncepciji približi današnjoj publici. Bibliografskom metodom prikupljanja podataka i teroijskom analizom biće prikazani rezultati radi. U zaključku vidimo da se Wellness može da se predstaviti kao preklapanje osam različitih dimenzija života.
Neke od njih su: Fizička dimenzija (redovna fizička aktivnost, pravilna ishrana itd.), Intelektualna dimenzija (razvoj sopstvene ličnosti u intelektualnom pogledu), Emocionalna dimenzija (suočavanje sa sopstvenim problemima), Socijalna dimenzija (održavanje dobrih porodičnih odnosa, komunikacija sa spoljnim svetom), Profesionalna dimenzija (znači da je potrebno probuditi već postojeće talenate za bavljenje određenim aktivnostima ili hobijem), Duhovna dimenzija (naći svoj put, dostići sopstveno zadovoljstvo i mir.) i Dimenzija okruženja (ekološka dimenzija).

Ključne reči: velnes, spa, rekreacija

UVOD

Velnes je multidimenzionalni concept brige o ljudskom zdravlju koji obuhvata mentalne, emocionalne, duhovne aspekte ljudskih sposobnosti ali i standardne programe rekreacije radi očuvanja i podizanja zdravlja.Velnes je nastao sedamdesetih godina 20.veka i tada je u sklopu sistema fit velnesa bio deo modela medicinskog tretmana. Brojni programi u to vreme su bili su utemeljeni kao modeli za očuvanje zdravlja i isticalo se njihovo preventivno delovanje na simptome različitih bolesti. Kao vrlo važna stvar u očuvanju zdravlja velnes podrazumeva način razmišljanja i model ponašanja koji doprinosu očuvanju zdravlja.
Kroz istoriju vidimo da velnes kao medicinska praksa datira iz Indije i to 5000 god.pre nove ere. Žene u egiptu su koristile kozmetičke preparate još 3000 god.pre nove ere (mirišljave kupke, kupanje u kozijem mleku...). Homer i drugi klasični pisci navode da su Grci podsticali različita socijalna kupanja 500 godina pre Hrista, uključujući vruće vazdušne kupke poznate kao Lakonijum. Dvadest pet godina pre Hrista Car Agripa izgradio je jedne od prvih rimskih Termi i svaki sledeći rimski car nadvisio je svog prethodnika gradeći sve veće i ekstravagantnije Terme. Kroz svo vreme terme su se gradile u celom rimskom carstvu, od Afrike do Engleske, postepeno izrastajući u komplekse koje nude sport, restorane, i različite tipove kupališta. Kako je raslo Rimsko carstvo, tako je rastao i broj kupatila. Oko 300 g.n.e. bilo je preko 900 kupatila u celom carstvu. One su istovremeno služile i za održavanje higijene i za očuvanje zdravlja zatim za opuštanje, ali i za druženje.

REZULTAT I DISKUSIJA

Definicija velnesa

Praktično se svi slažu da je odsustvo bolesti primarna komponenta zdravlja, međutim, to ne ukazuje ništa na naše stanje blagostanja. Velnes kao pokazatelj zdravstvenog stanja usko je povezan sa našim načinom života i svakodnevnim životnim izborima koji mogu imati uticaja na naše živote. Svako od nas ima odgovornost prema sebi, treba da obezbediti osnove dobrog zdravlja - pravilnom kontrolom telesne težine, dobrom ishranom, fizičkom aktivnošću i vežbanjem, kao i kontrolom faktora rizika po zdravlje, kao što su upotreba duvana, upotreba alkohola, droga i dr.

Internet rečnik definiše velnes kao uslov dobrog fizičkog i mentalnog zdravlja, posebno ako se održava pravilnom ishranom, vežbanjem i navikama. Velnes se može široko definisati kao kvalitet ili stanje zdravlja tela i uma, posebno kao rezultat namernog napora. Velnes je aktivan proces kroz koji ljudi postaju svesni i donose odluke o uspešnijem postojanju. Velnes se smatra aktivnim procesom osvešćivanja i učenja donošenja izbora koji vode ka dužem i uspešnijem postojanju(www.dictionarycom).

Kako Milojković M. (2013, str.14 i 15) navodi da Koncept velnes-a i velnes filozofije razvija američki doktor Halbert Dunn 1959. godine, kada je prvi put pisao o posebnom stanju zdravlja koji podrazumeva osećaj dobrostanja gde se čovek posmatra kao jedinstvo tela, duše i uma, zavisno od svoje okoline, razvijajući u SAD-u velnes pokret (Wellness movement) . Dunn je nazvao ovo stanje ličnog zadovoljstva „high-level wellness". "Wellness" je engleska reč koja je došla iz Amerike sastavljena iz "well-being" (dobro se osećati) i "fitness" (biti u formi). Isti autor u svom radu iznosi da Adams navodi četiri osnovna principa "wellness – a":

1. Velnes je multi-dimenzionalan,

2. Istraživanje i praktikovanje velnes -a treba biti orjentisano ka identifikovanju uzroka velnes -a pre nego uzroka bolesti,

3. Velnes se tiče balansa,

4. Velnes je relativan, subjektivan ili perceptualan.

Andrijašević (2010 str.375) navodi kako u velnes ponudi prepoznajemo: **urbani velnes** u gradovima u sklopu poslovnih zgrada, hotela ili centara za rekreaciju građana; **turistički velnes** u turističkim centrima; **medicinski ili zdravstveni** velnes koji se nudi u sklopu medicinskih i zdravstveno preventivnih ustanova.

Koncept osam dimenzija

Iako svim dimenzijama velnesa treba pažnja da bi se postigao uspeh, ne mora postojati savršena ravnoteža među svim dimenzijama. Umesto toga, cilj je pronaći ono što svakoj individui najbolje odgovara. Dimenzije su međusobno povezane, pa može se primetiti da većina tema (npr. Stres, finansije, zdravi odnosi, upotreba supstanci itd.) utiče na više dimenzija.

Emocionalno blagostanje uključuje razvoj svesti o svojim osećanjima i odgovoru na svakodnevne interakcije. Ova svest omogućava da bolje razumemo zašto se tako osećamo i može aktivno da odgovori na naša osećanja.

Poboljšanje emocionalnog zdravlja se postiže: Ukoliko odvojimo vreme za sebe utišamo um i razmislimo. Smeh. Ponekad je humor najbolji lek za smanjenje stresa i stavljanje životnih izazova u perspektivu. Traženje ili prihvatanje pomoći i podrške od drugih po potrebi. Podelimo svoje misli i osećanja sa nekim kome verujemo. Da ne zaboravimo da slušamo i tuđe emocije. Vežbamo zahvalnost. Prihvatamo greške i učimo iz njih za sledeći put. Briga o svom telu. Jelo, aktivnost i spavanje - mentalno i fizičko blagostanje međusobno su povezani. Budimo ljubazni prema sebi.

Velnes na poslu omogućava da se istraže različite mogućnosti karijere i ohrabruje da se iskoriste mogućnosti u kojima se najviše uživa. Ova dimenzija blagostanja prepoznaje važnost zadovoljstva, bogaćenja i smisla kroz rad.

Načini za poboljšanje poslovnog velnesa su kompleksni. Često razmišljamo- gde nalaziti radost i smisao u životu? Treba imati otvoren um. Iskoristiti resurse usluga karijere. Istraživanje različitih mogućnosti karijere i/ili volontiranja koje se pojave. Vežbanje otvorene komunikacije i pravilnog upravljanja sukobima sa kolegama. Postavljanje realnih ciljeva karijere i rad na ostvarenju ovih ciljeva.

Intelektualni velnes nas ohrabruje da se bavimo kreativnim i mentalno stimulativnim aktivnostima, a zahteva celoživotno učenje i znatiželju. Intelektualno blagostanje može se razviti kroz akademske radove, kulturno uključivanje, uključivanje zajednice i lične hobije koji proširuju znanje i veštine, a istovremeno omogućavaju da se podele znanje i veštine sa drugima.
Poboljšanje se ogleda kroz mnoge stavke. Treba biti otvoren. Slušati druge. Kada učestvujemo u aktivnom slušanju, u potpunosti možemo da razumemo informacije koje se daju. Preuzimanje hobija. Hobiji su odlični načini da se povećaju sopstvene sposobnosti. Oni takođe mogu biti zabavni. Najbolji način za sticanje znanja, kao i za uvažavanje druge kulture je lično iskustvo. Čitanje iz zadovoljstvo. Proveriti seminar ili konferenciju o nečemu novom. Učenje drugog jezika. Uključivanje u mogućnosti istraživanja itd.

Ekološki velnes se odnosi na vođenje načina života koji ceni odnos između pojedinca, zajednice i životne sredine. Osnovni princip zdravlja životne sredine je poštovanje - poštovanje sve prirode i svih vrsta koje u njoj žive.
Potrebno je poboljšati sopstveno zdravlje po životnu sredinu. Skupljati smeće. Provoditi vreme na otvorenom. Vožnja biciklom ili pešačenje na posao. Korišćenje kesa za višekratnu upotrebu i flaša sa vodom. Imati na umu potrošnju vode. Reciklaža je važan faktor. Odlazak na poljoprivrednu pijacu. Gašenje svetla i računara. Isključivanje iz tehnologije. Doniranje neželjene odeće.

Finansijski velnes uključuje proces učenja kako uspešno upravljati finansijskim troškovima. Novac igra ključnu ulogu u našim životima i može uticati na vaše zdravlje, kao i na akademske performanse. Treba početi od malih promena (tj. Skuvati kafu umesto da se kupuje). Korišćenje resursa za proširenje sopstvenog budžeta. Pokretanje štednog računa. Identifikovanje i rešavanje svih finansijskih problema pre nego što počnu. Planiranje unapred i postavljanje budžetskih ciljeva. Napisati listu pre nego što se krene u kupovinu.

Fizičko zdravlje je sposobnost održavanja kvaliteta života koji vam omogućava da izvučete maksimum iz svakodnevnih aktivnosti bez nepotrebnog umora ili fizičkog stresa. Fizičko zdravlje prepoznaje da naše svakodnevne navike i ponašanje utiču na naše opšte zdravlje, blagostanje i kvalitet života.
Možemo poboljšati svoje fizičko zdravlje kroz pronalaženje vremena za kretanje. Potrebno je da pokušamo da pomerimo svoje telo na način koji povećava naš broj otkucaja srca svakodnevno najmanje 30 minuta. Možemo čak i podeliti svojih 30 minuta dnevno na tri desetominutna okršaja! Treba koristiti stepenice umesto lifta ili pokretnih stepenica. Treba naučiti prepoznavati znakove upozorenja kada telo počne da se oseća loše. Jesti hranu zbog koje se osećamo dobro. Održavati redovan raspored spavanja i spavati između 7-9 sati svake noći.

Socijalno zdravlje fokusira se na izgradnju i negovanje smislenih i podržavajućih odnosa sa pojedincima, grupama i zajednicama. Omogućava nam da stvorimo granice koje podstiču komunikaciju, poverenje i upravljanje sukobima. Socijalno blagostanje takođe uključuje iskazivanje poštovanja prema drugima, sebi i drugim kulturama. Svoju društvenu dobrobit možemo unaprediti razmišljajući o sebi i svojim društvenim potrebama. Da razmislimo o pitanju: U kojim aspektima našeg društvenog života uživamo? Koje delove želimo da poboljšamo?
Potrebno je potruditi se da ostanemo u kontaktu sa prijateljima, porodicom i mentorima koji nas podržavaju. Potrebno je učešće u grupnim diskusijama i vežbanje aktivnog slušanja. Pridruživanje klubu ili organizaciji. Učešće u studijskim grupama. Volontiranje u zajednici.

Duhovni velnes nam omogućava da budemo u skladu sa svojim unutrašnjim ja. Ovo carstvo velnesa omogućava nam da pronađemo smisao u životnim događajima i definišemo svoju individualnu svrhu. Duhovnost može poticati od verovanja, vere, vrednosti, etike ili moralnih principa koji pružaju svrhu i smernice u našim životima. Zdrav duh pomaže nam da ostanemo otporni i bolje pripremljeni da se suočimo sa životnim izazovima.
Možemo poboljšati svoje duhovno zdravlje tako što ćemo istražiti svoju unutrašnjost.Potrebno je da odvojimo vreme da razmislimo ko smo. Razvijati meditiranje ili vežbanje svesnog opuštanja. Vežbanje prihvatanja. Ako se dogodi nešto što nas čini i najmanje znatiželjnim, odvojiti trenutak da istražimo iskustvo malo dublje. Tražiti versku veru koja je u skladu sa našim vrednostima. Putovati i doživljavati druge kulture.

ZAKLJUČAK

Velnes možemo posmatrati kao stanje zdravlja koje podrazumeva harmoniju tela, uma i duha, sa samoodgovornošću, fizičkom aktivnošću, kozmetičkom negom, zdravom ishranom, relaksacijom, meditacijom, mentalnom aktivnošću, edukacijom i socijalnim kontaktima kao fundamentalnim elementima.
Velnes je aktivan proces kroz koji postajemo svesniji sebe i donosimo odluke koje će nam pomoći da živimo svoj život na uspešniji, zdraviji i uravnoteženiji način. Velnes je mnogo više od pukog fizičkog zdravlja, vežbanja ili ishrane. To je potpuna integracija fizičkog, mentalnog i duhovnog blagostanja.

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VISIBILITY OF PARALYMPIC ATHLETES IN THE MEDIA

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Abstract: When reporting about non-disabled sport, such news gets far more media space than disability sport, and that sends a message to society that the latter are not important or interesting enough, and that their sports achievements are not so valuable. The aim of this review was to analyze the relevant literature in order to point out the ways in which the world media treat the disability sport and people with disabilities in their biggest competition - the Paralympic Games. The literature review was performed by searching books and electronic journals through the GoogleScholar search engine. After the initial search, over 50 scientific papers corresponding to the topic were found, and after reading the abstracts, 15 papers and one book that met the criteria were selected. Criteria for inclusion are the following: papers fully available, papers containing quantitative and/or qualitative analysis of articles published in world media during the Paralympic Games, papers containing analysis of photographs published during the Paralympic Games, papers containing qualitative interviews with journalists who reported about the Paralympic Games, papers referring to the Paralympic Games held from 2000 to 2016, papers published in English. The analysis of papers showed that journalists present paralympic athletes as "passive victims", "super-disabled" or "others", and that the photos emphasize hiding disability, passive poses in pictures, focus on disability or overrepresentation of athletes in wheelchairs. No research has been done yet that would analyze the way Serbian media treat paralympic sports, so the need for such a project is highlighted.

Keywords: paralympic games, media coverage, disability

VIDLJIVOST PARAOLIMPIJSKIH SPORTISTA U MEDIJIMA

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Sažetak: Kada se izveštava o sportu osoba tipične populacije, takve vesti dobijaju daleko više medijskog prostora nego što je slučaj sa sportom osoba sa invaliditetom, a to društvu šalje poruku da drugopomenuti nisu dovoljno važni niti zanimljivi, i da njihova sportska postignuća nisu toliko vredna. Cilj ovog preglednog rada bio je da se analizom relevantne literature ukaže na načine na koji svetski mediji tretiraju sport osoba, ali i same osobe sa invaliditetom na njihovom najvećem takmičenju, Paraolimpijskim igrama. Pregled literature izvršen je pretragom elektronskih časopisa i knjiga preko pretraživača GoogleScholar. Nakon inicijalne pretrage pronađeno je preko 50 naučnih radova koji odgovaraju temi, a nakon čitanja apstrakata izdvojeno je 15 radova i jedna knjiga koji ispunjavaju kriterijume. Kriterijumi za uključivanje su sledeći: dostupnost radova u celini, da se radovi bave kvantitativnom i/ili kvalitativnom analizom članaka objavljenih u svetskim medijima za vreme trajanja Paraolimpijskih igara, da se radovi bave analizom fotografija objavljenih za vreme trajanja Paraolimpijskih igara, da radovi sadrže kvalitativne intervjue sa novinarima koji su izveštavali sa Paraolimpijskih igara,

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da se radovi odnose na Paraolimpijske igre održane u periodu od 2000. do 2016. godine, da su radovi publikovani na engleskom jeziku. Analiza radova pokazala je da novinari paraolimpijske sportiste predstavljaju kao „pasivne žrtve“, „superinvalide“ ili „ostale“, a fotografije potenciraju sakrivanje invaliditeta, pasivne poze na slikama, fokus na invaliditetu ili prezastupljenost sportista u kolicima. Još uvek nisu rađena istraživanja koja bi na ovaj način analizirala stav srpskih medija prema paraolimpijskom sportu, pa se ističe potreba za takvim poduhvatom.

Ključne reči : paraolimpijske igre, mediji, izveštavanje, invaliditet

UVOD

Mediji se, kao glavno sredstvo masovne komunikacije, često posmatraju kao prozor koji vodi u svet (Phaik et al., 2016). Istovremeno, medijima se pripisuje sposobnost da utiču na društvo, društvene vrednosti, norme i verovanja, a njihovo delovanje odražava se i na mišljenja i stavove javnosti (Chang & Crossman, 2009). Navodi se da postoje četiri elementa koja određuju pojavu medija: potreba za komunikacijom, tehnologija koja tu komunikaciju omogućava, društvena organizacija koja proizvodi i distribuira, i na kraju postupanje u skladu sa interesovanjem javnosti (McQuail, 2005, prema Džajls, 2011). Ukoliko mediji izveštavaju o nekom događaju ili problemu, to znači da ga smatraju vrednim i važnim iz različitih razloga. Kada to uzmemo u obzir, sport je konstrukt koji će uvek privlačiti pažnju medija, ali se čini da je sport relevantna vest samo ako ga posmatramo kao tvorevinu osoba bez invaliditeta za osobe bez invaliditeta. Kada se izveštava o sportu osoba tipične populacije, takve vesti dobijaju daleko više medijskog prostora nego što je slučaj sa sportom osoba sa invaliditetom, a to društvu šalje poruku da drugopomenuti nisu dovoljno važni niti zanimljivi, i da njihova sportska postignuća nisu toliko vredna (Brittain, 2017). Čak ni Paraolimpijske igre (POI), jedan od najvećih sportskih događaja u svetu, ne dobijaju dovoljno medijske pažnje, dok, sa druge strane, njihov neinvalidni pandan, Olimpijske igre, gotovo sva svetla reflektora okreće ka sebi. Tako, Golden (Golden, 2003) ističe da su novinari koji su se bavili izveštavanjem o Zimskim olimpijskim igrama 2002. godine naveli da ne bi izveštavali o POI zato što smatraju da publiku to ne zanima i ne privlači, i zato što POI ne posmatraju kao pravo sportsko takmičenje. Ovo nam govori da snishodljiv stav medija prema invaliditetu, kao i njegova marginalizacija i banalizacija nisu zaobišli ni profesionalne paraolimpijske sportiste (Riley, 2005, prema Phaik et al., 2016).

CILJ I METODOLOGIJA

Cilj ovog preglednog rada bio je da se analizom relevantne literature ukaže na načine na koji svetski mediji tretiraju sport osoba, ali i same osobe sa invaliditetom na njihovom najvećem takmičenju, Paraolimpijskim igrama.

Ključne reči koje su korišćene prilikom pretrage su: media, coverage, Paralympic games. Pregled dostupne literature izvršen je pretragom elektronskih časopisa i knjiga. Nakon korišćenja ključnih reči na pretraživaču GoogleScolar pronađeno je preko 50 naučnih radova koji odgovaraju temi, a nakon čitanja apstrakata izdvojeno je 15 radova i jedna knjiga koji ispunjavaju kriterijume. Kriterijumi za uključivanje su sledeći: dostupnost radova u celini, da se radovi bave kvantitativnom i/ili kvalitativnom analizom članaka objavljenih u svetskim medijima za vreme trajanja Paraolimpijskih igara, da se radovi bave analizom fotografija objavljenih za vreme trajanja Paraolimpijskih igara, da radovi sadrže kvalitativne intervjue sa novinarima koji su izveštavali sa Paraolimpijskih igara, da se radovi odnose na Paraolimpijske igre održane u periodu od 2000. do 2016. godine, da su radovi publikovani na engleskom jeziku jer na srpskom jeziku ne postoji nijedan rad koji se bavi ovom temom.

MEDIJSKA DIJAGNOZA

Invalidnost možemo da posmatramo kroz dva modela, medicinski i socijalni. Medicinski model na invalidnost gleda kao na izolovanu patologiju, dok socijalni ispituje socijalne uzroke već pomenutog stanja (Nedović i sar., 2012). Ono što zabrinjava je činjenica da svetske medije preplavljuje percepcija invaliditeta kao isključivo medicinskog stanja uz neizbežno ignorisanje društveno-političke dimenzije koju svaki invaliditet nosi sa sobom (Brittain, 2017). U prilog tome govore Majka i Denilčak (Maika & Danylchuk, 2016) koje izdvajaju okvire u koje se najčešće smeštaju osobe sa invaliditetom, i koji su nesumnjivo produkt medicinskog pogleda na njihovo stanje, a radi se o „pasivnim žrtvama“ i „superinvalidima“.

U ove okvire mogli bismo da smestimo i načine na koji mediji izveštavaju o uspesima paraolimpijskih sportista. Pasivne žrtve podrazumevaju da se o njima izveštava jezikom sažaljenja i pritom se naglašava da osoba „boluje“ od neke bolesti, da je „napaćena“ itd. (Maika & Danylchuk, 2016). Kvalitativni deo jednog istraživanja koje se bavilo detaljima konteksta članaka objavljenih u nekoliko popularnih nacionalnih novina u Velikoj Britaniji tokom održavanja POI u Sidneju 2000. godine, istakao je pokušaj da se kroz ovakvo pisanje izazove sažaljenje publike. Navodi se primer sportista sa cerebralnom paralizom koji su predstavljeni kao „žrtve“ tog svog stanja, ili kao osobe koje „pate“ od cerebralne paralize. U jednom slučaju pominje se i „šteta“ koju je izazvala spina bifida, dok se plivači opisuju kao osobe koje je sport oslobodio okova „slomljenog“ tela (Thomas & Smith, 2003). Do sličnih rezultata došlo se i nakon tematske i deskriptivne tekstualne analize članaka objavljenih u Njujork Tajmsu (New York Times) u periodu između 1955. i 2012. godine, čiji je cilj bio da se otkriju skriveni problemi koji utiču na vidljivost POI i paraolimpijskih sportista. Pokazalo se da se u velikom broju izveštavanja sportisti sa invaliditetom opisuju uz reči poput „bolest“, „oštećenje“ ili „defekt“ (Tynedal & Wolbring, 2013). Zanimljivo je da su autori jednog istraživanja, koje se bavilo tekstualnom analizom članaka o sportistima sa invaliditetom u jednim kanadskim novinama tokom POI u Pekingu 2008. godine, istakli da nisu pronašli nijedan članak koji opisuje ove sportiste kao žrtve, i da su isti predstavljeni kao „pravi sportisti“ ili „najbolji sportisti Kanade“ (Chang et al., 2011). Međutim, kada jednu svoju sportistkinju opišu kao „simbol prepoznavanja sportista u invalidskim kolicima kao ravnopravnih igrača, a ne kao žrtava nesreća“ (Chang et al., 2011, p. 42) jasno je da se, uz sav trud da se ovi sportisti predstave u superlativu, ipak provukao „žrtveni“ narativ.

Kada govorimo o okviru „superinvalida“, njega prati izveštavanje koje ističe hrabrost sportista sa invaliditetom da nadvladaju svoje stanje i prateće probleme da bi ponovo bili „normalni“ (Brittain, 2017). Grupa autora (McGillivray et al., 2021) koja je vršila tekstualnu analizu članaka britanskih novina, tabloida i online platformi pre, tokom i nakon POI u Rio de Žaneiru, navodi da su brojni naslovi paraolimpijske sportiste predstavljali kao „superljude“, a sami članci sadržali su reči poput „hrabrost“, „posvećenost“ ili „neodustajanje“. Slične rezultate dobili su i američki autori nakon analize članaka objavljenih u Njujork Tajmsu (New York Times) u periodu između 1955. i 2012. godine, te oni navode da je narativ najčešće praćen rečima kao što su „hrabrost“, „posebnost“, „izvanrednost“, ili „heroji“, kao i da su sami učesnici POI bili frustrirani kada su bili prikazivani kao sportisti koji su pobedili i pre nego što su otišli na samo takmičenje (Tynedal & Wolbring, 2013). Isto tako, jedan grčki košarkaš u kolicima nije dozvolio, tokom intervjua za vreme POI u Atini 2004. godine, da od njega naprave žrtvu ili heroja pominjanjem njegove nesreće, već je želeo da odgovara na pitanja koja će svetu poručiti da je on samo sportista, a ne osoba sa motoričkim poteškoćama (Pappous et al., 2011).

Ovo gotovo tragično prikazivanje invaliditeta od strane medija šalje poruku da je mnogo važnije predstaviti šta sam invaliditet znači za osobu bez invaliditeta, nego izveštavati o osećanjima i postignućima samih sportista sa invaliditetom (Brittain, 2017).

SPORTISTI I „OSTALI“

Nesavršenstvo sportista sa invaliditetom je konstrukt sa kojim se svet jako teško nosi jer savremeni mediji svoju moć koriste da bi sport predstavili kao okruženje stvoreno za idealna atletska tela i njihova velika postignuća, a paraolimpijski sportisti sa svojim „oštećenim“ telima jako se teško uklapaju u tu slagalicu. Autori koji su analizirali češke štampane medije pre, tokom i nakon POI u periodu od 1992. do 2008. godine, ovu situaciju objašnjavaju time da se među mnogobrojnim češkim novinarima uglavnom ne nalazi gotovo niko ko ima bilo kakvu vrstu invaliditeta, pa u skladu sa sopstvenim iskustvom sport posmatraju isključivo kao privilegiju osoba bez invaliditeta, dok se svako ko je drugačiji svrstava u grupu „ostalih“ (Tejkalová & Strielkowski, 2015), a to postaje problem kada mediji, zbog nemogućnosti da se poistovete sa paraolimpijskim sportistima, njihova takmičenja ne shvataju ozbiljno. Huang (Huang, 2005, prema Brittain, 2017) navodi primer izveštavanja medija na Tajvanu tokom POI u Atini 2004. godine i činjenicu da se o njima izveštavalo samo zato što je njihove paraolimpijske sportiste na takmičenje ispratila žena predsednika Tajvana, koja je u invalidskim kolicima. Čim je ona napustila Atinu sve vesti o ovom takmičenju su prestale, što govori da nisu čak ni imale sportski već isključivo politički karakter. Golden (Golden, 2003), koja je sprovela intervjue sa novinarima iz čitavog sveta nakon Zimskih POI 2002. godine, izdvojila je izjavu jednog američkog novinara koji je ovo takmičenje uporedio sa ženskom NBA ligom (WNBA), navodeći kako to i nisu prava takmičenja jer njihovi učesnici ne mogu da se takmiče na dovoljno visokom nivou i da su organizovana kako bi se njihovi akteri osećali bolje. Sličan stav odaje i način izveštavanja medija u Južnoj Koreji, gde su jedne novine za vreme trajanja Olimpijskih igara u Atini 2004. godine svojoj sportskoj sekciji dodale još dve stranice na kojima se izveštavalo samo o ovom takmičenju. Međutim, ta praksa nije obuhvatila i POI koje su usledile, pa se na taj način poslala poruka da paraolimpijski sportisti u očima ovih medija nisu shvaćeni kao profesionalni sportisti (Chang & Crossman, 2009).

Naravno, postoje slučajevi kada se o POI govori kao o velikom sportskom takmičenju, i kada se njeni akteri prepoznaju kao profesionalni sportisti. Međutim, čak se ni tada ne propušta prilika da se napravi poređenje sa Olimpijskim igrama i njenim učesnicima, pa britanski autori navode da je tokom izveštavanja o POI u Sidneju 2000. godine čak četvrtina analiziranih članaka sadržala takve komparacije (Thomas & Smith, 2003). Kanadski novinari su svoju petostruku osvajačicu zlatnih medalja na POI u Pekingu 2008. godine konstantno poredili sa, takođe, višestrukim osvajačima medalja na Olimpijskim igrama, kao da su mislili da u suprotnom njen uspeh neće biti dovoljno naglašen (Chang et al., 2011).

Ovaj neodgovarajući način izveštavanja ima dalekosežne posledice ako se uzme u obzir da sportski mediji svoje limitirano poznavanje i razumevanje invaliditeta i parasporta dele sa svojim čitaocima, a u pojedinim zemljama radi se i o milionskoj čitalačkoj publici (Thomas & Smith, 2003).

„PTIČICA!“

Fotografije opisuju način na koji posmatramo realnost i izabrane su sa namerom da izazovu određene emocije ili reakcije, i zato je važno ko se na njima (ne) prikazuje i na koji način (Hilgemberg, 2016). Način na koji fotografija predstavlja paraolimpijskog sportistu otkriva kako mediji posmatraju invaliditet u sportu, a tu mogu da se jave problemi koji se tiču sadržaja fotografija kao što su sakrivanje invaliditeta, pasivne poze na slikama, fokus na invaliditetu, prikazivanje emocija umesto pokreta, ili prezastupljenost sportista u kolicima (Pappous, 2008, prema Brittain, 2017).

Kada govorimo o sakrivanju invaliditeta, istraživanje koje je analiziralo slike u francuskim, grčkim, španskim, nemačkim i britanskim medijima nastale na POI tokom perioda od 2000. do

2008. godine, pokazalo je da, tokom POI u Sidneju 2000. godine, na samo 18% fotografija nije bio prikazan invaliditet. Međutim, osam godina kasnije, tokom POI u Pekingu, situacija se značajno promenila pa je invaliditet bio izostavljen na čak 58% objavljenih fotografija (Pappous et al., 2011). Ovi rezultati poklapaju se sa rezultatima istraživanja koje se bavilo fotografijama iz štampanih medija u Kini, Južnoj Africi, na Novom Zelandu, u Italiji i SAD-u tokom POI u Pekingu, gde invaliditet nije bio vidljiv na 61% fotografija (Buysse & Borcherding, 2010). Ovakav način izveštavanja govori da mediji negiranjem invaliditeta negiraju i čitav identitet parasportista, i da naglašavanjem fizički sposobnih sportista možda odvlače od bavljenja sportom one osobe sa invaliditetom koje smatraju da nisu sposobne za takva postignuća (Thomas & Smith, 2003).

Još jedan način na koji mediji negiraju identitet osoba sa invaliditetom jesu pasivne poze na slikama. Brojna istraživanja pokazala su da je broj pasivnih fotografija gotovo isti kao broj fotografija sa akcionim kontekstom (Buysse & Borcherding, 2010; Phaik et al., 2016), ili da je tokom godina broj pasivnih kadrova postao veći (Pappous et al., 2011). Možda je ovo posledica želje da se parasportisti najpre posmatraju kroz sport pa tek onda kroz invaliditet, a na aktivnim fotografijama to nije toliko izvodljivo, ali se umesto toga pojačava stereotip da su osobe sa invaliditetom slabe i nemoćne (Brittain, 2017).

Ono što dodatno naglašava razlike između sportista bez invaliditeta i sportista sa invaliditetom jesu fotografije na kojima je fokus upravo na invalidnosti, jer se ista naglašava na pogrešan način. Hilgembrg (Hilgemberg, 2016) navodi da je pregledom brazilske štampe tokom POI u Londonu 2012. godine došla do saznanja da su najčešće bile objavljivane fotografije petoro sportista, i da samo jedan od njih nije imao neko protetičko ili tehnološko pomagalo. Ovakva tela su hibridna, predstavljena kao polumašine za koje ne postoje nikakva ograničenja i na njih se, kao takve, gleda kao na kiborge – organizme koji, zahvaljujući tehnologiji, imaju ojačane kompetencije. Navodi se da što je telo bliže tom idealu, to više privlači novac, sponzore i ulaganja (Tynedal & Wolbring, 2013). Možda se zbog toga dešava da su na fotografijama parasportista prezastupljeni oni koji su u kolicima. To potvrđuje istraživanje koje se bavilo medijima u pet svetskih zemalja (Buysse & Borcherding, 2010), istraživanje koje je ispitivalo brazilske (Hilgemberg, 2016), kao i ono koje je ispitivalo britanske medije (Thomas & Smith, 2003). Prva dva istraživanja dodaju i da se u medijima sve češće prikazuju sportisti sa amputacijama, što samo potvrđuje još jedan stereotip o invalidnosti u medijima, a to je da se ona vezuje isključivo za motoričko oštećenje.

Mediji imaju moć, koja ne mora nužno da podrazumeva nešto loše, pa tako kroz fotografije oni ljudima predstavljaju njihove potencijalne sportske uzore i na taj način ih ohrabruju da i sami pokušaju da se bave nekim sportom na visokom ili profesionalnom nivou, ali, nažalost, ovakva praksa se ne primenjuje u dovoljnoj meri kada su u pitanju osobe sa invaliditetom i parasportisti na koje bi oni mogli da se ugledaju (Brittain, 2017). Zato ne čudi što se nakon istraživanja uzroka opadanja broja osoba sa invaliditetom u sportu u Engleskoj u godinama nakon POI u Londonu, kao jedan od razloga navodi medijska tišina koja je usledila nakon što se takmičenje završilo (Brown & Pappous, 2018).

ZAKLJUČNA RAZMATRANJA

Kada se invaliditet posmatra kao medicinski problem, onda se u njemu vidi samo ograničenje. Nijedan uspeh nije dovoljno dobar i veliki da bi zasenio nesavršenstvo osoba sa invaliditetom, i zbog toga je gotovo ustaljena praksa da mediji invaliditet prikazuju očima osoba bez invaliditeta. U sportskom kontekstu ovo znači da uspesi i emocije parasportista nisu važni, makar ne onoliko koliko je bitno šta žele da vide i čuju predstavnici tipične populacije. Tako jedan španski novinar tokom intervjua, koji je sproveden u okviru istraživanja, navodi da je njegov zadatak bio da se ne obazire na pobednike i medalje već da se fokusira isključivo na

život sportista van sporta i put koji su morali da pređu da bi se našli na tom takmičenju jer je privatna, a ne sportska strana njihovog života ono što zanima publiku (Solves et al., 2019). Pojedini brazilski novinari koji su izveštavali o POI u Rio de Žaneiru 2016. godine, takođe navode da je upravo drama preživljavanja i prevazilaženja problema koja prati ove sportiste važan deo narativa, i da, za njih, bez toga ne bi postojao dovoljno dobar način da se ispriča njihova priča (Santos et al., 2020). Ono što može da predstavlja poseban problem je činjenica da mnogi novinari koji izveštavaju o paraolimpijskom sportu malo znaju o istom i nemaju potrebu da svoje znanje nadograde jer ga posmatraju nadmeno i sa nepoštovanjem, a takvim stilom izveštavanja mogu da utiču i na čitalačku publiku. U skladu sa ovim, urednici u Češkoj smatraju da sportisti na POI nisu u stanju da se takmiče na najvišem nivou, a samim tim nisu ni razlog da neko kupi novine (Tejkalová & Strielkowski, 2015). Golden (Golden, 2003) navodi primer novinara koji smatra da Olimpijske i POI ne bi trebalo ni da se održavaju zajedno jer ta dva takmičenja nemaju nikakve veze jedno s drugim. Možda su paraolimpijski sportisti trn u oku jer ne ispunjavaju ulogu koju im društvo uporno dodeljuje – nisu bespomoćni i slabi, već na sve načine potenciraju svoj prkos, snagu i sposobnost.

Ako mediji posmatraju osobe sa invaliditetom kao „ostale“, to može da bude mač sa dve oštrice. Sa jedne strane, prenaglašavanje invaliditeta dovodi do toga da se sportski uspeh ovih osoba ne priznaje kao validan, jer u očima svetskih medija veliki sportski uspesi podrazumevaju samo nesvakidašnje rezultate sportista u njihovoj punoj snazi, odnosno sportista bez invaliditeta. Zato bi, kada se invaliditet i sport predstave kao dva nepoveziva sveta, sintagmu „sportista sa invaliditetom“ mnogi mogli da počnu da posmatraju kao oksimoron (Brittain, 2016; prema Brittain, 2017). Sa druge strane, ako te „ostale“ prihvate kao ravnopravne, profesionalne sportiste, postoji tendencija poređenja njihovih rezultata sa rezultatima osoba tipične populacije, što na neki način potiskuje invalidnost iz prvog plana, a samim tim i potpuni identitet paraolimpijskih sportista. Zato je pitanje kako uopšte napraviti balans u izveštavanju, a pritom priznati i validnost invaliditeta i validnost sportskog postignuća, i nameće se odgovor da je, pre svega, potrebno osvestiti i obrazovati svetske medije da bi paraolimpijski sportisti bili prezentovani na respektabilan način. Jedan od načina na koji Međunarodni paraolimpijski komitet pokušava da podstakne te transformacije su nagrade za različite novinarske kategorije koje se tiču izveštavanja sa POI, a koje se dodeljuju od 2005. godine (International Paralympic Committee, 2021).

Veliki deo identiteta sportista sa invaliditetom nalazi se na fotografijama. Trend sakrivanja tog invaliditeta kako nekome ne bi bilo neprijatno dok ga gleda, ili potenciranja samo određenih vrsta invalidnosti, ne respektuje sve ono što ovi sportisti grade za sebe i buduće sportiste sa invaliditetom. Kada mediji aktuelne parasportiste ne prezentuju kako dolikuje, oni ih sprečavaju da osveste i inspirišu neke nove, mlade ljude da se, makar rekreativno, uključe u svet sporta, pa onda nedovoljne i neadekvatne prezentacije onemogućavaju osnaživanje budućih sportista sa invaliditetom kroz lokalne i nacionalne sportske organizacije (Thomas & Smith, 2003). Sport je privilegija koju bu trebalo da sebi može da omogući svako ko želi da poboljša kvalitet života, i mediji ne bi smeli da na snishodljiv način percipiraju nečiju slobodu da izabere da bude više od onoga što je društvo za njega namenilo.

U našoj zemlji ne postoje istraživanja koja su se bavila ovom temom, te nema mogućnosti da se analizira stav srpskih medija prema paraolimpijskom sportu, pa se ističe potreba da se takvo istraživanje sprovede.

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ATTITUDES OF SECONDARY SCHOOL STUDENTS REGARDING HEALTH AND SPORTS CULTURE DURING COVID-19

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Abstract: Being one of the important dimensions of life, health and sports culture of secondary school students can be viewed and optimized in different ways. From the corpus of multidimensional approach, in this paper we have decided to focus on the health and sports culture of high school students and their attitudes regarding sports and recreational activities during COVID-19. The problem of this paper refers to the observation of whether and to what extent the health and sports culture is developed among high school students, as well as the assessment of their attitudes regarding sports and recreational activities and COVID-19. Aligned to the problem, the goal of this research is to determine the level of health and sports culture and to discover and determine the attitudes of secondary school students regarding COVID-19 . The sample of the research consisted of 102 students from the "St. Cyril and Methodius" Grammar School in Dimitrovgrad. In this empirically non-experimental research we used the following methods: the survey method and the method of theoretical analysis. In the research we applied the following techniques: the survey technique and the scaling technique. The average value of the items of health and sports attitude observed at the level of the entire population is PVzss = 3.57. Such a value is above the mean score of the Likert scale. This expressed measure of the average was calculated as the total arithmetic mean. This tells us that the attitudes about the health and sports of the surveyed students generally have positive valences, but that they lack significant intensities, which indicates the fact that work should be done and efforts should be made to improve the health and sports culture of secondary school students.

Keywords: healt culture, sports culture, COVID-19, attitude assessment, healt preservation

STAVOVI SREDNJOŠKOLACA O ZDRAVSTVENOJ I SPORTSKOJ KULTURI U VREME COVID-19

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Sažetak: Zdravstvena i sportska kultura učenika srednjih škola kao jedna od značajnih dimenzija življenja se može sagledati i optimizovati na različite načine. Iz korpusa multidimenzionalnog pristupa mi smo se u ovom radu opredelili za zdravstvenu i sportsku kulturu srednjoškolaca i njihovih stavova u vezi sportsko-rekreativnih aktivnosti u vreme COVID-19. Problem ovog rada odnosi se na sagledavanje, da li i u kojoj meri je razvijena zdravstvena i sportska kultura kod srednjoškolaca, kao i procena stavova u vezi sportsko-rekreativnih aktivnosti i COVID-19. Shodno problemu cilj ovog istraživanja je utvrđivanje nivoa zdravstvene i sportske kulture i otkrivanje i utvrđivanje stavova srednjoškolaca u vezi

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COVID-19. Uzorak je činilo 102 učenika Gimnazije „ Sv. Kirilo i Metodije“ u Dimitrovgradu. U ovom empirijsko neeksperimentalnom istraživanju koristili smo sledeće metode: servej metoda, metoda teorijske analize. U istraživanju primenili smo sledeće tehnike: tehnika anketiranja, tehnika skaliranja .Prosečna vrednost ajtema zdravstvenog i sportskog stava posmatrani na nivou celokupne populacije iznosi PVzss=3,57. Takva vrednost je iznad srednjeg skora Likertove skale. Ovakva iskazana mera proseka je izračunata kao totalna aritmetička sredina. To nam govori da stavovi o zdravlju i sportu ispitivanih učenika uglavnom imaju pozitivne valencije, ali da nemaju značajne intenzitete, što ukazuje na činjenicu da treba raditi i ulagati napore u cilju poboljšanja zdravstvene i sportske kulture srednjoškolaca.

Ključne reči: zdravstvena kultura, sportska kultura, COVID-19, procena stavova, očuvanje zdravlja

UVOD

Poštovanje pravila zdravog i bezbednog života za sebe i druge je prioritet u vreme COVID-19. Ideja o vrednostima zdravlja i unapređenja svih dimenzija zdravlja zauzima značajno mesto u savremenom društvu. Mere usmerene na sticanje potreba za zdravim načinom života su prioritet u vreme pandemije, a posebnu važnost u cilju podizanja imuniteta i očuvanju zdravlja ljudi zauzima fizička aktivnost-sportsko rekreativne aktivnosti.

Zdravlje srednjoškolaca, psihološka, socijalna i fizička adaptacija su u velikoj meri određeni sredinom u kojoj žive, jer je organizam mladih osetljiv na spoljne faktore. Na optimizaciju zdravstvenog stanja mladih u velikoj meri utiču obrazovne institucije-škola i sportske organizacije. Sva deca i mladi najviše vremena provode u vaspitno-obrazovnim institucijama, a tu se odvija najintenzivniji razvoj i sticanje navika. Porodica, škola i sportske organizacije su mesto gde se rešava problem očuvanja zdravlja učenika, stiču navike zdravih stilova života od kojih će značajno zavisiti njihova budućnost, a pre svega zdravlje mladog naraštaja i čitave nacije. Zdravlje i obrazovanje su jedne od najvažnijih karika i blagodeti života čiji kvalitet u značajnoj meri određuje životni standard pojedinca, ali i stepen razvijenosti države u kojoj živimo. Sticanje navika i primena mera za poboljšanje zdravlja mladih treba da bude prioritet ne samo lekara, ali i nastavnika u školama, sportskih pedagoga u sportskim organizacijama i td. Prema tome svrha rada ovih institucija je očuvanje i unapređenje zdravlja učenika.

Istraživanja su pokazala da je fizička aktivnost van školske nastave sve manje zastupljena, naročito u period srednjoškolskog uzrasta kada dolazi do smanjivanja fizičke aktivnosti, što je posebno izraženo kod devojčica. Samo 6,8% devojčica prvog razreda srednjih škola je svakodnevno fizički aktivno, a 11,4% dece nikada ne vežba van redovne školske nastave(Rakić, 2018.).Potrebu za očuvanjem zdravlja koje ističe Ministarstvo zdravlja i Ministarstvo prosvete, često je u suprotnosti sa nedovoljno praktičnom realizacijom zadataka u vezi sticanja zdravstvene i sportske kulture i zdravog načina života kod mladih. Naime, u poslednje vreme učinjeni su napori u cilju širenja ideje o zdravom načinu života, te je tako u gimnazijama uveden izborni predmet „ Zdravlje i sport” koji tretira problematiku zdravih stilova života. Zdrav način života je koncept savremenog društva usmeren na očuvanju i poboljšanju ljudskog zdravlja. Da li naši školarci-srednjoškolci se mogu nazvati zdravim? Statistički podaci kažu ne. Na osnovu ispitivanja Zavoda za javno zdravlje „Batut“ podaci pokazuju da kod populacije osnovnih i srednjih škola više od 20% imaju neki zdravstveni problem koji se odnosi na koštani-zglobne deformitete, a najčešće se radi o deformitetima kičmenog stuba (Institut za javno zdravlje Srbije „ Dr Milan Jovanović Batut”, 2017).

Zdrav stil života sastoji se od više komponenti: fizičko vežbanje, zdravstveno-higijenske navike, kvalitet ishrane, prisustvo korisnih životnih navika itd. Posebnu važnost imaju sledeći faktori koji utiču na sticanje sportske i zdravstvene kulture: porodica ima značajnu ulogu u

formiranju zdravstvene i sportske kulture; škola treba da postavi temelje zdravstvene i sportske kulture i sistematski je sprovodi; sistematski rad sa roditeljima o pitanjima očuvanja i unapređenja zdravstvene i sportske kulture; inicijativa roditelja o zajedničkom vežbanju i sadržajnog sproviđenja slobodnog vremena; aktivnosti sportsko-rekreativnih organizacija u cilju sticanja i razvijanja zdravstvene i sportske kulture; saradnja zdravstvenih ustanova, škola i sportskih organizacija u cilju promocije sportsko-rekreativnih aktivnosti ka bitnog faktora u prevenciji zdravlja mladih. Sticanje zdravstvene i sportske kulture zasniva se na informisanju mladih o faktorima koje donose korist po njihovo zdravlje. Osnove zdravog načina života čini kompleks zdravstveno-higijenskih, sportsko-rekreativnih i kulturnih aktivnosti usmerenih na zaštitu i optimizaciju fizičkog i mentalnog zdravlja učenika. Zdravstvena kultura je deo opšte kulture koja u sebi sadrži brojne komponente koje su od značaja i uticaja na psiho-somatsko zdravlje čoveka (Angaždajan, 2008).Zdravstvena kultura je zaliha informacija i nagomilanog znanja, načina mišljenja, saosećanja i delova vezanih za zdravlje i različite oblike zdravstvenog ponašanja (Rađenović, 2015).

Od nivoa zdravstvene i sportske kulture mladih zavise njihovi stavovi, kao i stepen odgovornosti koje imaju prema sopstvenom zdravlju. Kroz vaspitno-obrazovni proces odbacuju se stare navike i shvatanja, a izgrađuju se novi stavovi o zdravlju, sportu i značaju sportsko-rekreativnih aktivnosti u cilju podizanja zdravstvene i sportske kulture na naučnim, medicinskim i psihološkim osnovama. Na osnovu svega dosada iznetog možemo definisati sportske kulturu na sledeći način: Organizovana sportsko-rekreativna aktivnost ljudi, usmerena na očuvanju i optimizaciju antropoloških karakteristika čoveka i shvatanju prave vrednosti i značaja sportsko-rekreativnih aktivnosti, kao i negovanju i promociji zdravih stilova života predstavlja socijalni fenomen poznat pod imenom sportska kultura.

Aktuelnost ovog rada uslovljena je značajnim smanjenjem nivoa zdravlja srednjoškolaca u vreme COVID-19. Socijalna distanca tokom pandemije COVID-19 ograničila je opseg fizičke aktivnosti, što stoji u preporukama „Svetske zdravstvene organizacije”(Hammami,2020). Prema navodima Lipi i sar,(2002) navodi se da bi bilo dobro dati preporuke o ishrani za ljude koji su dugo vremena bili izolovani zbog virusa COVID-19. Posebnu važnost u cilju podizanja imuniteta u vreme pandemije ima fizička aktivnost. Naime, studije su pokazale da vežbanje umerenog intenziteta do 45min. je najefikasnije za optimizaciju imunog sistema, dok vežbe visokog intenziteta negativno utiču na imunitet (Woods i sar.2020). Prema navodima Panajotov(2014) ističe da je posebno efikasno ono vežbanje koje je planirano i programirano u cilju poboljšanja jedne ili više antropomotoričkih komponenti-performansi.

Istraživanje koje tretira problematiku sporta i COVID-19 sprovedeno je na Univerzitetu u Torinu. Naime, naučnici su istraživali koji je najopasniji sport u smislu širenja COVID19. Došli su do zaključka da je najopasnija odbojka. Odbojka je prva na listi i to čak ispred kontaktnih sportova. Oni su u okviru svoje studije istraživali 387 disciplina. Drugi sport po opasnosti je ragbi, a slede košarka, džudo, boks, biciklizam, fudbal, vaterpolo, plivanje, mačevanje, atletika,skijanje,tenis... (https://www.hzjz.hr/priopcenja-mediji/koronavirus-najnoviji-podatci/).

U kom stepenu je COVID-19 uspeo da pokrene ljude da napuste svoje domove, bave se nekom fizičkom aktivnošću i koriste prirodne resurse, igrališta, tek treba da se utvrdi (Holl et al, 2020).

Predmet ovog istraživanja su zdravstvena i sportska kultura i stavovi srednjoškolaca u vezi sportsko-rekreativnih aktivnosti u vreme COVID19.

Problem ovog rada odnosi se na sagledavanje, da li i u kojoj meri je razvijena zdravstvena i sportske kultura kod srednjoškolaca, kao i procena stavova u vezi sportsko-rekreativnih aktivnosti u vreme COVID-19.

Shodno problemu cilj ovog istraživanja je utvrđivanje nivoa zdravstvene i sportske kulture i otkrivanje i utvrđivanje stavova srednjoškolaca u vezi COVID-19 i sportsko-rekreativnih aktivnosti.
Za realizaciju postavljenog cilja neophodno je realizovati sledeće zadatke: proučiti dostupnu literaturu vezanu za sticanje zdravstvene i sportske kulture srednjoškolaca, kao i uticaj sportsko-rekreativnih aktivnosti u uslovima pandemije-COVID19; utvrditi stavove srednjoškolaca o zdravstvenoj i sportskoj kulturi, kao i stavove o sportsko-rekreativnim aktivnostima u uslovima COVID-19; utvrditi razlike u stavovima između anketiranih učenika i učenica-vrednosti t-testa za dve nezavisne grupe.

METODE

Ovo istraživanje je primenjeno na uzorku od 102 učenika, od toga 49 ispitanika su muškog pola, odnosno 48,0% i 53 ispitanika ženskog pola, odnosno 52,0%. Istraživanje je sprovedeno u Gimnaziji „Sv. Kirilo I Metodije" u Dimitrovgradu kod učenika koji izučavaju izborni predmet „Zdravlje i sport" u prvoj i drugoj godini gimnazije. U ovom empirijski neeksperimentalnom istraživanju korišćene su sledeće metode: Servej metoda (ispitivanje stavova izvršeno je transferzalno, odnosno ispitivani su stavovi učenika onakvi kakvi jesu u sadašnjoj situaciji, što predstavlja suštinu servej metoda); metoda teorijske analize (analiziranje dosadašnjih istraživanja vezana za datu problematiku).
U zavisnosti od primenjenih istraživačkih metoda i instrumenata u ovom istraživanju, primenili smo sledeće tehnike: Tehnika anketiranja, tehnika skaliranja, statističke tehnike prikupljenih podataka.
Anketiranjem pomoću anketnog upitnika ispitani su stavovi učenika o zdravstvenoj i sportskoj kulturi, kao i stavovi vezani za COVID-19. Tehnikom skaliranja (Likertovog tipa) ispitani su opšti stavovi o zdravstvenoj i sportskoj kulturi, kao i stavovi vezani za COVID19. U nastojanju da utvrdimo stavove o zdravstvenoj i sportskoj kulturi konstruisali smo skalu koja nam je poslužila kao instrument merenja stepena slaganja ispitanika sa određenim tvrdnjama koje su predstavljale određene elemente zdravstvene i sportske kulture u vreme COVID 19.

Tabela 1. Krombah Alfa

Krombah Alfa	Broj ajtema
0,82	21

Valjanost skale utvrđena je kroz prethodno pilot istraživanje sprovedeno među učenicima. Pouzdanost skale utvrđena je putem Krombah Alfa analize (Tabela 1.), a ona iznosi 0,82 što predstavlja dobru unutrašnju konzistentnost skale. Dobijenim odgovorima je prvo izračunata distribucija frekvencije. Kvalitativna analiza koja je trebala da pokaže osnovne karakteristike raspodele učestalosti stepena slaganja učenika sa datim tvrdnjama, urađena je uz pomoć aritmetičkih sredina (skalnih vrednosti) kao mera srednjih vrednosti. Izračunata je i njoj odgovarajuća mera varijabilnosti-standardna devijacija. Na osnovu aritmetičkih sredina pojedinih tvrdnji i njihovih standardnih devijacija utvrdili smo hijerarhijsku strukturu, odnosno uspostavili smo rang-listu aritmetičkih sredina ajtema stavova vezanih za zdravstvenu i sportsku kulturu. Dobijene standardne devijacije nam ukazuju na meru (ne)saglasnosti ispitivanih učenika sa pojedinim tvrdnjama skale ispitivanih stavova, odnosno ukazuju u kojim granicama se kreću odstupanja pojedinih slaganja u odnosu na srednju vrednost.

REZULTATI

Tabela 2. *Struktura stavova srednjoškolske omladine vezana za zdravstvenu i sportsku kulturu u vreme COVID-19*

Rangovi skajnih vrednosti	Tvrdnje		Stepen slaganja						Skalna vrednost	SD
			Uopšte se ne slažem	Uglavnom se slažem	Neodlučan sam	Uglavnom se ne slažem	Potpuno se slažem	Ukupno		
1.	*U slučaju ugrožavanja zdravlja učenika koji vode sedentarni način života potrebno je baviti se sportsko-rekreativnim aktivnostima.*	*F*	1	1	6	34	60	102	4,48	0,794
		%	**0,98**	**0,98**	**5,90**	**33,30**	**58,80**	**100,00**		
2.	*Princip zdravstveno-higijenske usmerenosti koji se odnosi na higijenu fizičkog vežbanja u vreme pandemije u našoj školi je ispoštovan.*	*F*	2	5	7	22	66	102	4,42	0,784
		%	**1,96**	**4,90**	**6,90**	**21,60**	**64,60**	**100,00**		
3.	*Sportsko-rekreativne aktivnosti doprinose podizanju zdravstvene kulture učenika.*	*F*	1	1	14	26	60	102	4,40	0,829
		%	**0,98**	**0,98**	**13,70**	**25,50**	**58,80**	**100,00**		
4.	*Neophodno je i opravdano da vodim računa o sopstvenom zdravlju i promovošem zdrave stilove života.*	*F*	2	1	10	31	58	102	4,39	0,986
		%	**1,96**	**0,98**	**9,80**	**30,36**	**56,90**	**100,00**		
5.	*Potrebno je svakodnevno upražnjavati sopstveni kompleks vežbi oblikovanja jer ćemo time poboljšati svoje zdravstveno stanje i izbeći odsustvovanje iz škole.*	*F*	2	4	12	28	56	102	4,28	0,991
		%	**1,96**	**3,90**	**11,80**	**27,50**	**54,90**	**100,00**		
6.	*Važnije je svakom učeniku omogućiti da kroz izborni predmet Zdravlje i sport nauči osnove zdravog života nego oslanjati se na neproverene i poluistinite informacije o zdravlju koje mogu da se čuju među ljudima.*	*F*	2	7	13	27	53	102	4,19	1,052
		%	**1,96**	**6,80**	**12,80**	**26,50**	**52,00**	**100,00**		
7.	*Sistematičnost upražnjavanja sportsko-rekreativnih aktivnosti je uslov za optimizaciju psiho-somatskog stanja učenika.*	*F*	5	6	12	25	54	102	4,14	1,145
		%	**4,90**	**5,90**	**11,80**	**24,50**	**52,90**	**100,00**		
8.	*Vežbanje u kućnom okruženju važno je za održavanje zdravog života tokom krize korona virusa.*	*F*	2	5	28	15	52	102	4,08	1,101
		%	**1,96**	**4,90**	**27,50**	**14,70**	**60,00**	**100,00**		
9.	*Pozitivan odnos prema sportsko-rekreativnim aktivnostima uticaće na smanjenje upotreba psiho-aktivnih supstanci.*	*F*	1	13	16	22	50	102	4,05	1,148
		%	**0,98**	**12,80**	**15,70**	**21,60**	**49,00**	**100,00**		
10.	*Uvek se treba suprotstaviti konzumiranju energetskih pića i napitaka koji sadrže veliku količinu šećera i kofeina.*	*F*	4	5	21	30	42	102	3,99	1,076
		%	**3,90**	**4,90**	**20,60**	**29,40**	**41,10**	**100,00**		

11.	*Ne treba upotrebljavati previše brzu hranu koja u značajnoj meri može uticati na zdravlje učenika.*	*F*	1	18	15	27	41	102	3,87	1,235
		%	**0,98**	**16,16**	**14,70**	**26,50**	**40,20**	**100,00**		
12.	*Učešćem đaka u razne sportsko-rekreativne aktivnosti smanjiće se odsustvovanje usled bolesti.*	*F*	5	15	23	25	34	102	3,66	1,221
		%	**4,90**	**14,70**	**22,50**	**24,50**	**33,30**	**100,00**		
13.	*Nakon završetka nastave osećam se umoran.*	*F*	19	6	27	19	31	102	3,36	1,452
		%	**18,60**	**5,90**	**26,50**	**18,60**	**30,40**	**100,00**		
14.	*Đaci koji promovišu zdrav način života treba nagraditi.*	*F*	8	7	29	17	41	102	3,35	1,277
		%	**7,90**	**6,90**	**28,40**	**16,70**	**39,20**	**100,00**		
15.	*Kada se nađem na svežem vazduhu svoje slobodno vreme provodim tako što sam fizički aktivan.*	*F*	11	16	31	25	17	102	3,14	1,219
		%	**10,80**	**15,70**	**30,40**	**24,50**	**16,70**	**100,00**		
16.	*Znatno više posvetiću se vežbanju nakon što se potpuno otkloni opasnost od širenja korona virusa.*	*F*	9	23	30	25	15	102	3,13	1,187
		%	**8,80**	**22,50**	**29,40**	**24,50**	**14,70**	**100,00**		
17	*U slučaju ugrožavanja bezbednosti usled COVID-19 za vreme vežbanja u fitnes centru korisnici programa treba da nose maske.*	*F*	20	28	12	22	20	102	2,94	1,354
		%	**19,60**	**27,50**	**11,80**	**21,60**	**19,60**	**100,00**		
18.	*Kada bi upražnjavao neku sportsko-rekreativnu aktivnost u vreme pandemije prioritet bi imalo plivanje i individualni fitnes trening u odnosu na odbojku i košarku.*	*F*	21	21	16	27	10	102	2,63	1,400
		%	**20,60**	**20,60**	**15,70**	**26,50**	**9,80**	**100,00**		
19.	*Celokupno fizičko vaspitanje i sportsko-rekreativne aktivnosti koje se sprovode u školi treba biti podređene sticanju zdravlja.*	*F*	23	29	25	17	8	102	2,60	1,235
		%	**22,50**	**28,40**	**24,50**	**16,70**	**7,90**	**100,00**		
20.	*U slučaju uvođenja nastave na daljinu učenici nisu u obavezi da osmisle 10 minutnu aktivnu pauzu i da je svakodnevno primenjuju.*	*F*	7	7	17	27	44	102	2,09	1,221
		%	**5,90**	**4,90**	**16,70**	**26,50**	**43,10**	**100,00**		
21.	*U slučaju ugrožavanja zdravstveno-higijenske bezbednosti u školskoj fiskulturnoj sali učenici nisu u obavezi da poštuju preporuke u vezi nošenja sportske opreme .*	*F*	6	5	15	28	48	102	1,98	1,320
		%	**5,90**	**4,90**	**14,70**	**27,50**	**47,00**	**100,00**		

N = 102 (100,00 %)

Prosečna vrednost ajtema stavova u vezi zdravstvene i sportske kulture (PVzss) = 3,57

Visoka skalna vrednost je dobijena kod tvrdnji pod rednim brojem od 1-5, a ona se kreće od M=4,28 do M=4,48, što se može videti iz tabele 2.Nešto manji intenzitet aritmetičkih sredina iskazane su kod tvrdnji pod rednim brijem od 6-15, te njihov skalna vrednost se kreće od M=3,14 do M=4,19.Najniže rangove i skalne vrednosti imaju tvrdnje pod rednim brojem od 17-21, a njihova skalna vrednost varira od M=1,98 do M=2,94.

DISKUSIJA

Analiza rezultata empirijskih podataka nam ukazuje da u globalu gledano ispitivana populacija srednjoškolaca ima pozitivan stav prema zdravstvenoj i sportskoj kulturi za vreme pandemije. Dvadeset tvrdnji (od ponuđenih dvadeset jedne) ima pozitivnu, a tek jedna negativnu valenciju (To je tvrdnja: „U slučaju ugrožavanja zdravstveno-higijenske bezbednosti u školskoj fiskulturnoj sali učenici nisu obavezni da poštuju preporuke u vezi nošenja sportske opreme.“). Prema četiri tvrdnje (stavovi pod rednim brojem u upitniku od 17-20; M=2,09 do M=2,94) ispitanici su iskazali neutralan odnos. Naime, za modalitet potpunog slaganja više od polovine ispitanih srednjoškolaca izjasnilo se u vezi tvrdnji pod rednim brojm 1,2,3.4,5,8 koje su prikazane u tabeli 2. . Ovo znači da ispitanici iskazuju visoke pozitivne valencije kada su u pitanju navedene tvrdnje vezane za zdravstvenu i sportsku kulturu. Trećina učenika prihvata modalitet neodlučnosti, tj. uglavnom se slažu ili neodlučni su kada su u pitanju tvrdnje pod rednim brojem 17 i 19 prikazane u tabeli 2. Ovakav raspored frekvencija slaganja u vezi poslednja dva stava ukazuju na činjenicu da učenici više vole da se takmiče, ali i da nisu voljni da nose maske dok vežbaju. Između ostalog preporuke za organizovanje nastave fizičkog i zdravstvenog vaspitanja u školi u kontekstu aktuelne epidemiološke situacije ukazuje na činjenicu da se učenicima ne preporučuje da nose zaštitne maske tokom fizičke aktivnosti, te verovatno zbog toga su zauzeli ovakav stav. Svetska zdravstvena organizacija (2020) zauzela je stav da prilikom vežbanja ne treba nositi masku, jer maska može smanjiti mogućnost nesmetanog disanja. Može se brže nakvasiti znojem, što otežava disanje i doprinosi razvoju mikroorganizama.

Samo prema jednoj tvrdnji ispitanici su iskazali najviši nivo modaliteta uglavnom neslaganja, a to je tvrtnja pod rednim brijem 18. Ovakav modalitet uglavnom neslaganja ispitanika verovatno je u vezi činjenice da učenici više vole da upražnjavaju sportske igre. Ovakav stav je u suprotnosti sa istraživanjima naučnika Univerziteta u Torinu koji su dokazali da se odbojka i košarka nalaze na vrhu lestvice po opasnosti od zaraze COVID-19 (https://www.hzjz.hr/priopcenja-mediji/koronavirus-najnoviji-podatci/).Uanalizi homogenosti zdravstvenih i sportskih stavova učenika posebnu važnost zaslužuju oni koji su zauzeli prva i poslednja mesta na rang listi zdravstvenih i sportskih stavova. Aritmetičke sredine prvih pet visoko rangiranih ajtema pokazuju visoke nivoe centralnih tendencija (od M=4,48 do M=4,28), dok je njihov nivo na primeru poslednjih pet tvrdnje znatno niži (od M=2,94 do M=1,98). Razlike u nivoima aritmetičkih sredina ne(slaganja) sa datim tvrdnjama su značajne. Raspon se kreće od M=4,48 do M=1,98.Na osnovu ovakvog rangiranja i uz pomoć vrednosti standardne devijacije moguće je utvrditi one ajteme u kojima postoji nizak nivo slaganja među ispitanicima i one ajteme o kojima postoji visok nivo saglasnosti. Ako posmatramo prvih pet rangiranih tvrdnji, uočavamo da se vrednosti njihovih standardnih devijacija kreću u granicama od SD=0,794 do SD=0,991. Kako je u pitanju petostepena skala, ovakav raspon standardnih devijacija ukazuje na relativnu visoku saglasnost u mišljenjima ispitivanih učenika o ponuđenim tvrdnjama. Kada su pitanju najniže rangirane tvrdnje(17-20), moguće je primetiti da su vrednosti standardnih devijacija relativno niske (kreću se u rasponu od SD=1,354 do SD=1,221). Raspon nam ukazuje da ipak postoji znatno nejedinstvo oko stepena slaganja sa ovim tvrdnjama. Najmanji stepen slaganja kod ove grupe zabeležena je kod tvrdnje koje se odnosi da u slučaju ugrožavanja bezbednosti usled COVID-19 za vreme vežbanja u fitnes centru korisnici programa treba da nose maske (SD=1,354) i sa tvrdnjom koja se odnosi na upražnjavanje sportsko-rekreativnih aktivnosti za vreme pandemije i sportove koji imaju prioritet – plivanje ili individualni trening u odnosu na odbojku i košarku (SD=1,400). Najveći nivo nejedinstva u slaganju sa tvrdnjama iskazana je kada je u pitanju sledeća tvrdnja: „Nakon završetka nastave osećam se umorno“ (SD=1,452). Ovo nam ukazuje na činjenicu da postoji mogućnost da oni koji vežbaju i bave se sportsko-rekreativnim aktivnostima lakše podnose

školske obaveze pa se ne osećaju umorni, a kod onih koji vode sedentarni način života umor je prisutan.

Prosečna vrednost ajtema zdravstvenog i sportskog stava posmatrani na nivou celokupne populacije iznosi PV_{sec}=3,57. Takva vrednost je iznad srednjeg skora Likertove skale. Ovakva iskazana mera proseka je izračunata kao totalna aritmetička sredina. To nam govori da stavovi o zdravlju i sportu ispitivanih učenika uglavnom imaju pozitivne valencije, ali da nemaju značajne intenzitete, što ukazuje na činjenicu da treba raditi i ulagati napore u cilju poboljšanja zdravstvene i sportske kulture učenika srednjih škola.

Vrednosti t-testa za nezavisne grupe pokauju značajnu statističku razliku kod ajtema pod rednim brojem 5,9,10,11,13,14,15,16,17,18,19 (t=2,156, p=0,031; t=2,254, p=0,035; t=2,389; p=0,016; t=2,399, p=0,017; t=2,158, p=0,033; t=2,369, p=0,014; t=3,839, p=0,014; t=3,832, p=0,00; t=3,628, p=o,o18; t=2,406, p=o,019; t=3,622, p=0,00). Kod ostalih ajtema nema značajnih statističkih razlika.

ZAKLJUČAK

Na temelju svega iznetog, a pre svega na osnovu problema istraživanja, rezultata ispitivanja i njihove interpretacije i analize, a u skladu sa ciljevima i zadacima možemo izdvojiti sledeće zaključke:

- očuvanje i unapređenje zdravlja, kao i razvijanje zdravstvene i sportske kulture učenika treba da bude jedan od glavnih strateških zadataka savremenog društva;
- problem promocije zdravlja srednjoškolske omladine i razvijanje raznih ideja o zdravom načinu života u uslovima pandemije predstavlja prioritet;
- ispitivana populacija srednjoškolske omladine ima pozitivan stav prema zdravstvenoj i sportskoj kulturi u vreme pandemije, a na to ukazuju uglavnom pozitivne valencije stavova, ali one nemaju značajne intenzitete, te zbog toga treba sistematski raditi na razvoju zdravstvene i sportske kulture omladine.

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THE ROLE OF THE MEDIA IN HEALTH CONSERVATION, PREVENTION AND PROMOTION OF PHYSICAL ACTIVITY AND HEALTHY LIFESTYLES

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Abstract: Periods of isolation and so-called "social and physical distancing" as a "product" of the corona virus pandemic both in our country and throughout the world have given us new insights into the importance of movement, physical activity and a balanced diet. In a situation in which we were referred only to media and internet content, the fact of the role of the media in everyday life, the decision-making process as well as important issues related to a healthy lifestyle, psychological well-being and health status of individuals and society as a whole, was reaffirmed. Social circumstances which further encouraged obesity and inactivity, fear, together with emotional and other insecurities confronting an unknown, unexplored disease - paved the way for us to significantly improve the quality of life through more active sports and physical activities. For example, overweight individuals have become a global social problem in recent decades, and in such social context, obesity is an increasingly common topic and subject matter of the studies on the importance of factors that can prevent and functionally improve the health status of a nation. In the cause-and-effect constellation of links that shape human psycho-physical apparatus, the most important thing is to timely and accurately inform the individual, primarily for preventive purposes, and in that context the role of the media is of utmost importance - which has been proven in the last decades; the only thing that changes is the presence of the media that is at that moment the most represented information channel - television, internet or newspapers. According to the World Health Organization (WHO), health means "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." The definition of "ability to lead an economically and socially productive life" includes physical, mental, emotional and social health of an individual or community; in order to implement the ideal theoretical construct as the basis of everyday healthy life and human functioning, the individual needs professional and scientific support, as well as timely quality update about the possibilities and potentials of the natural and social environment in order to preserve the healthy psycho-physical apparatus. Mass communication theories provide answers to important questions in this context. The paradox of a situation in which a proper, healthy diet is one of the most important links in a healthy life, although being overweight and the lack of physical activity are more and more seen as mortality factors in recent decades - leads us to analyze the available data on the impact of the media on people's lifestyles. The results of modern studies show that the input of important health information directly and indirectly affects not only the change of the personal value system and the formation of attitudes towards healthy lifestyles and habits, but also disease prevention, in general. Mastering appropriate life skills and habits – both in physical and psychological sense, would, in the future, result in responsible behaviour of the individual, which is an important requirement and a significant factor of a healthy life. Conservation of health and healthy lifestyles with continuous prevention as patterns of behaviour depend on the level of education and information available to society as a whole. The ideal of beauty is changeable through epochs, often conditioned by socio-economic factors, but the basic premises of health are a constant - which is why it is important that they are based on knowledge, education and timely, accurate information. In this, the importance of the media is unequivocal and exact.

Keywords: physical activity, health, media, prevention, lifestyle

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ULOGA MEDIJA U OČUVANJU ZDRAVLJA, PREVENCIJI I PROMOCIJI FIZIČKE AKTIVNOSTI I ZDRAVIH ŽIVOTNIH STILOVA

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Sažetak: Periodi izolacije i takozvanog "socijalnog i fizičkog distanciranja" kao „proizvod" pandemije korona virusa u zemlji i svetu doveli su nas do novih uvida o značaju kretanja, bavljenja fizičkom aktivnošću i izbalansirane kvalitetne ishrane. U situaciji u kojoj smo bili upućeni samo na medijske i internet sadržaje, iznova je potvrđena činjenica o ulozi medija u svakodnevnom životu, procesu donošenja odluka ali i važnim pitanjima vezanim za zdrav stil života, psihološko blagostanje i zdravstveni status pojedinca i društva u celini. Društvene okolnosti koje su dodatno podstakle gojaznost i neaktivnost, strah i emocionalnu i svaku drugu nesigurnost pred nepoznatom, neistraženom bolešću - trasirale su nam put kojim značajno možemo unaprediti kvalitet života kroz aktivnije bavljenje sportom i fizičkim aktivnostima. Na primer, prekomerna telesna težina pojedinaca poslednjih decenija postala je globalni društveni problem, a u takvom društvenom kontekstu gojaznost sve češća tema i predmet istraživanja o značaju faktora koji mogu preventivno i funkcionalno uticati na poboljšanje zdravstvenog statusa nacije. U uzročno-posledičnoj konstelaciji karika koje modeliraju psiho-fizički aparat čoveka najvažnija je pravovremena i tačna informisanost pojedinca, najpre u preventivne svrhe, i u tom kontekstu je uloga medija suverena – što je decenijama unazad i dokazano; menja se samo aktuelnost medijuma koji je u datom trenutku najzastupljeniji kanal informisanja – televizija, internet ili novine. Po definiciji svetske zdravstvene organizacije (SZO) zdravlje podrazumeva "stanje potpunog fizičkog, mentalnog i socijalnog blagostanja, a ne samo odsustvo bolesti i onesposobljenosti". Tako definisana „sposobnost za vođenje ekonomski i socijalno produktivnog života" uključuje fizičko, mentalno, emocionalno i socijalno zdravlje pojedinca odnosno zajednice; da bi se idealan teorijski konstrukt implementirao kao osnov svakodnevnog zdravog života i ljudskog funkcionisanja, neophodna je stručna i naučna podrška pojedincu, i pravovremena kvalitetna informisanost o mogućnostima i potencijalima prirodnog i društvenog okruženja u cilju očuvanja zdravlja psiho-fizičkog aparata. Teorije masovne komunikacije daju odgovore na važna pitanja u tom kontekstu. Paradoks situacije u kojoj je pravilna, zdrava ishrana jedna od najvažnijih karika zdravog života, ali su prekomerna telesna težina i nedostatak fizičke aktivnosti česti faktori smrtnosti poslednjih decenija - navodi nas na analizu dostupnih podataka o uticaju medija na životni stil ljudi. Rezultati savremenih istraživanja pokazuju da prijem važnih informacija o zdravlju direktno i indirektno utiče na modifikovanje ličnog sistema vrednosti i formiranje stavova prema zdravim životnim stilovima i navikama, ali i prevenciji bolesti, generalno. Razvijanje odgovarajućih životnih veština i navika - u fizičkom ali i psihološkom smislu, u budućnosti bi rezultiralo odgovornim ponašanjem pojedinca koje je značajna predispozicija za zdrav život, ali je i njegov značajan činilac. Očuvanje zdravlja i zdravih životnih stilova i kontinuirana prevencija kao obrasci ponašanja, zavise od nivoa obrazovanja, edukovanosti i informacija dostupnih društvu kao celini. Ideal lepote je promenljiv kroz epohe, često i uslovljen društveno-ekonomskim faktorima, ali su osnovne premise zdravlja konstanta – zbog čega je važno da su bazirane na znanju, obrazovanju i pravovremenoj, tačnoj informaciji. U tome je važnost medija nedvosmislena i egzaktna.

Ključne reči: fizička aktivnost, zdravlje, mediji, prevencija, životni stil

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UVOD

Jedna od najsnažnijih ali i najvažnijih uloga medija je u prenosu poruka o zdravlju: informisanje javnosti o zdravlju i bolesti i medicinskim dostignućima, promovisanje prevencije i zdravstvene kulture, izgrađivanje ili modifikovanje sistema vrednosti koji se odnosi na očuvanje zdravlja, naročito u populaciji dece i mladih. Takav koncept uticaja medija u kontekstu zdravog načina života i zdravlja treba sagledavati u mnogo širem smislu od medicinskog i društvenog dijapazona. Po definiciji svetske zdravstvene organizacije (World Health Organization, 2006a) zdravlje podrazumeva "stanje potpunog fizičkog, mentalnog i socijalnog blagostanja, a ne samo odsustvo bolesti i onesposobljenosti“. Tako definisana „sposobnost za vođenje ekonomski i socijalno produktivnog života" uključuje fizičko, mentalno, emocionalno i socijalno zdravlje pojedinca odnosno zajednice; da bi se idealan teorijski konstrukt implementirao kao osnov svakodnevnog zdravog života i ljudskog funkcionisanja, neophodna je stručna i naučna podrška pojedincu, i pravovremena kvalitetna informisanost o mogućnostima i potencijalima prirodnog i društvenog okruženja u cilju očuvanja zdravlja psiho-fizičkog aparata. Laička uverenja ljudi, njihov stil i način života i nedovoljno poznavanje rizika - mete su na koje se (i) medijski može ciljano delovati radi poboljšanja individualnog ali i globalnog zdravstvenog statusa nacije i smanjenju mortaliteta, u najdaljem. Zanimljivo je da se zdravlje, poslednjih decenija, više posmatra kao produkt bihejvioralnih i društvenih činilaca nego kao biološki fenomen usled čega javna politika ima značajnu ulogu u kreiranju promena načina života i usvajanju zdravih životnih navika i stilova (Dlaka, 2019).

Pandemija virusa Covid-19 nedvosmisleno je uticala na stil i način života ljudi, psihološku ne/stabilnost, način razmišljanja i alijenaciju kao nužnu posledicu zahteva za održavanjem distance u svakom smislu te reči. Imperativ zdravlja i zdravog načina života zauzeo je značajno mesto u hijerarhiji životnih prioriteta, a samim tim izmenjena je i uloga i značaj medija u promociji i očuvanju zdravlja. Za pravovremeno i tačno informisanje neophodna je brza i laka dostupnost relevantnih podataka, njihova adekvatna interpretacija ali i slobodan protok informacija; teren uticaja medijskih sadržaja na formiranje stavova o zdravlju i prevenciji veoma je osetljiv i podložan promenama i u kraćem vremenskom intervalu. Zato je važno edukovati pojedince o značaju formiranja kritičkog mišljenja i sposobnosti procene validnosti podataka koje primaju od strane medija, ali i o značaju vlastite selekcije i distinkcije bitnog i nebitnog plasiranog sadržaja u odnosu na listu ličnih prioriteta.

DISKUSIJA

Značaj fizičke aktivnosti

“Bolje sprečiti nego lečiti” je narodna poslovica koja ima specifičnu težinu važne životne mudrosti i pouke, iskustveno a i naučno dokazane. Stabilni patološki znakovi i simptomi kao znak disfunkcionalnosti ili oštećenja organa praćeni subjektivnim osećajem nesposobnosti i patnje čine kliničku sliku koja se, po medicinskom modelu, smatra bolešću (Nastasić, 2005). Postavljanje dijagnoze i nužnost sprovođenja lečenja nakon toga gotovo uvek dovode pojedinca do suočavanja sa stresom i uviđanja značaja prevencije u očuvanju zdravlja ali i značaja nekih “propuštenih” oblika ponašanja koji bi takodje preventivno mogli umanjiti rizike pojave bolesti – kao što je fizička aktivnost. Bavljenje fizičkom aktivnošću značajan je faktor za postizanje i održavanje psihičke, fizičke i fiziološke homeostaze organizma u svakom životnom dobu. Dakle, pozitivni efekti fizičke aktivnosti i vežbanja mnogo su više od vidljivog efekta, jer utičući na psihofizičku ravnotežu čoveka, ulogu u socijalizaciji i prirodnom okruženju - odražavaju se na opšte zdravstveno stanje individue. Fizička aktivnost integrisana je u aktivan stil života kao svakodnevna rutina (World Health Organization, 2006b), a koncept

„životni stil“ tesno je povezan sa pojmom zdravlja i njegovom promocijom u društvenom okruženju (Šabić, 2018). Pojmovi sport i rekreacija nisu sinonimi, mada se često tako poimaju, naročito u populaciji fizički neaktivnih ljudi: sport i rekreacija međusobno su tesno povezani isprepletanim uzročno-posledičnim uticajima, ali je suštinski značajno da je domen sporta širi i veći, a da rekreacija igra važnu ulogu u društvenom širenju i afirmaciji sporta čijem polju pripada. Iako rekreacija igra važnu ulogu u društvenom širenju sporta, sport pruža značajan spektar aktivnosti kako bi se zadovoljile potrebe ljudi za rekreacijom (Aydm et al., 2019), a može se definisati i kao isplanirana i kontinuirana aktivnost koja postaje nečiji životni stil sa većim intenzitetom fizičke aktivnosti od vežbanja (Blažević, 2017). Razumevanje značaja kontinuiranog bavljenja fizičkom aktivnošću, njeno definisanje i odnos prema aktivnosti u velikoj meri su determinisani dostupnim medijskim sadržajima, a utiču na psihološke parametre ljudske ličnosti, formiranje i oblikovanje stavova prema zdravim životnim stilovima i na poštovanje istih. Fizičko i psihičko zdravlje su neodvojivi entiteti kompleksnog aparata zvanog ljudski organizam, i njihova neraskidiva sprega govori u prilog tezi da jačanje fizičkih i mentalnih kapaciteta treba da budu simultane akcije koje će rezultirati pozitivnim zdravstvenim statusom.

Mediji i zdrav život

Savremeno društvo i kultura podrazumevaju da se uticaj masovnih medija ogleda u svim segmentima ljudskog života i egzistencije, u širokom dijapazonu okolnosti i situacija – u svakodnevnim, uobičajenim, a naročito u situacijama koje se smatraju kriznim, poput najsvežijeg i aktuelnog primera - pandemije Covid-19, u čijim su periodima izolacije tokom vanrednog stanja ljudi bili upućeni samo na sadržaje plasirane upravo u mass-medijima odnosno na internetu. Preventivni programi i programi za unapređenje mentalnog zdravlja imaju oslonce u nacionalnoj politici a to su, prevashodno, informisanje i edukacija (Milošević, 2011). Kritička valorizacija ponuđenih medijskih sadržaja trebalo bi da je pravilno uvremenjena u skladu sa temom na koju se odnosi ali i prilagođena starosnoj strukturi ciljne grupe kojoj je usmerena – jer, svaka starosna grupa ima individualne mehanizme selekcije informacija koje će usvojiti i primeniti u cilju poboljšanja zdravstvenog statusa i kvaliteta života, generalno. Javna sfera smatra se socijalnim prostorom između privatne sfere (porodice i ekonomije) i sfere javne vlasti (političke sfere); ključna uloga medija je u medijaciji, povezivanju ovih dveju sfera i premošćavanju singularnosti ukidanjem autonomija društvenih segmenata (Habermas, 1969, prema: Đukić, 2012), dok Bal (1997) o medijima govori u kontekstu „tehničke opreme“ ljudskog komuniciranja i prenosa misli. Uticaj i uloga mas-medija u očuvanju zdravlja, prevenciji i promociji fizičke aktivnosti i zdravih životnih stilova stoga predstavljaju kompleksno pitanje koje se može razložiti na širok dijapazon tema i potpitanja.

Pre dve decenije televizija je predstavljala najrasprostranjeniji i najpopularniji medij, suveren u plasiranju sadržaja i informacija o zdravlju; smatrana je ključnim izvorom zdravstvenog informisanja (Milošević, 2011). Međutim, treba imati u vidu da su se, pojavom i širenjem uticaja interneta i društvenih mreža poslednjih godina, okolnosti značajno promenile u odnosu na godinu realizacije pomenutog istraživanja. Ipak, s obzirom da je televizija i danas značajan izvor informacija i da stavovi i ponašanje ljudi u vezi sa zdravljem dobrim delom jesu pod uticajem plasiranih televizijskih sadržaja, nedvosmislena činjenica od krucijalnog značaja odnosi se na odgovornost medijskih radnika u kreiranju javnog mnjenja, proizvodnji medijskih sadržaja koji obuhvataju implementirane modele prevazilaženja predrasuda i stigmatizacije, u realizaciji preventivnih programa i sprovođenju projekata iz oblasti zaštite i unapređenja zdravlja nacije. Uticaj mas-medija ograničen je dometom u zavisnosti od toga da li je reč o lokalnom, regionalnom ili mediju sa nacionalnom frekvencijom, a u sva tri slučaja ključan

pojam je pozitivan publicitet (Radojković, 2004) - aspekt koji određuje efikasnost delovanja na definisane ciljne grupe.
Na persuazivnu (nagovaračku) moć medija mislimo kada govorimo o medijskom potencijalu da se, u pozitivne svrhe, koristi kao snažno sredstvo za ubeđivanje pripadnika jedne zajednice da se uključe u akciju sa ciljem ostvarivanja jasno definisanih, unapred određenih ciljeva (Radojković, 2004). Osim mas-medija postoje i drugi efikasni kanali kojima se može delovati na populaciju u cilju promocije oblika ponašanja koji su poželjni u prevenciji različitih bolesti i očuvanju zdravlja, a jedan od njih je upravo fizička aktivnost. U procesu delovanja i propagande najvažnije je izvršti blagovremenu i validnu procenu pravog momenta i sredstva kojim će se nekom porukom uticati na javnost, što je jedno od glavnih obeležja metode odnosa sa javnošću- PR (public relations). Efikasnost svake akcije afirmativnog i edukativnog delovanja na ljude zavisi od povoda koji bi trebalo da je zanimljivog sadržaja, od događaja poput javne, ulične kampanje ili korišćenja pozitivnih stavova poznatih, uticajnih javnih ličnosti ili autoriteta u cilju afirmacije određenih tema i pitanja (Radojković, 2004). Lubina i Brkić (2004) konstatuju da je "u savremenom društvu komunikacija između medija i publike, osobito televizije i interneta, usko povezana s proizvodnjom i utjelovljenjem kulturnih identiteta, jer su i mediji i publika u aktivnom odnosu razmjene - svojevrsnoga davanja i primanja".
Internet je danas jedan od najmoćnijih medijuma čijim posredstvom se svaka nacija informiše i edukuje o mnogim životnim pitanjima i temama. To je posebno, multidimenzionalno i opširno poglavlje koje bi zahtevalo puno prostora i vremena za obradu, analizu i diskusiju; naročito kada je o životnim stilovima reč – jer dostupni sadržaji kojima smo izloženi na internetu nisu uvek provereni, naučno utemeljeni i dokazani što se krajnje ozbiljno može odraziti na očuvanje zdravlja. Ideal zdrave ličnosti često promovisan na društvenim mrežama i internet portalima podrazumeva razvijenu fizičku kulturu na individualnom i društvenom nivou, koja dalje uslovljava opštu efikasnost pojedinca na svim nivoima životnog funkcionisanja. Grinfild (Greenfield, 2014) jednom od svojih početnih premisa navodi tvrdnju da bi svi trebalo da se zdravim razumom suprotstave savremenom trendu takozvane cyber-kulture, da ovladaju svakodnevnim ljudskim životom, kao i da se razumom i odgovornošću može kontrolisati vreme provedeno na internetu i sprečiti opsednutost dece ekranom. Video-igrice i društvene mreže, maskiraju prioritete zdravog života i pravilnog psiho-fizičkog razvoja, uvodeći najmlađe u virtuelni svet koji se u mnogome razlikuje od realnog, stvarnog, što može dovesti do trajnog negativnog uticaja na formiranje ličnosti dece i mladih (Kostić, 2020b).
Savremenost civilizacije uslovila je podelu medija na klasične i društvene; nove tehnologije dovele su do personalizacije javnog medijskog prostora i kreiranja virtuelnih identiteta u skladu sa sistemom vrednosti korisnika društvenih medija, tako da je danas njihova adaptibilnost najprijemčivija za potrebe društvene zajednice koja je njihov kreator (Vuković, 2019). Društveni mediji smatraju se izvorom „online" informacija ali i mestom razmena informacija o proizvodima, uslugama, markama i brendovima, mestom diskusija o mnogim važnim pitanjima iz svih sfera života (blogovi, mejl, forumi, itd). Ta komunikacija posredstvom interneta nije svojstvena samo mlađoj populaciji, već i stariji danas često razmenjuju mišljenja, stavove, norme i iskustva tim putem, čime se umanjuje osećaj društvene isključenosti u poznim godinama, a može se doći i do značajnih saznanja iz oblasti uvek aktuelnih tema očuvanja zdravlja, prevencije i značaja fizičke aktivnosti – kao teme uvek sadržane u prethodnim dvema navedenim.

Zdravi životni stilovi

Neke od osnovnih dimenzija kvaliteta života koji je u direktnoj vezi sa zdravljem (Health Related Quality of Life – HRQOL) su : fizičko funkcionisanje (manifestuje se kroz samobrigu, fizičke aktivnosti, društvene aktivnosti), simptomi povezani sa bolešću i lečenjem, psihičko funkcionisanje (podrazumeva emocionalni status i kognitivno funkcionisanje) i društveno funkcionisanje (aktivnosti i druženje sa prijateljima); njima definisan kvalitet života savremenog čoveka današnjice potvrđuje značaj redovnog bavljenja fizičkom aktivnošću (Bogojević, 2018). Zdravi životni stilovi smanjuju rizik od ozbiljnih bolesti i prerane smrti, dok redovna fizička aktivnost nije samo karakteristika životnog stila sportista već ima značajnu ulogu u očuvanju zdravlja i psiho-fizičkog blagostanja – svaka individua treba da održava svoje telo da bi ono zdravo funkcionisalo (World Health Organization, 1999). Brojne kliničke studije pokazuju da umerena i redovna fizička aktivnost ima snažan pozitivan uticaj na celokupno ljudsko zdravlje, povećanje i poboljšanje njegovih funkcionalnih kapaciteta, kvalitet života i učestvuje u prevenciji mnogih metaboličkih poremećaja poput gojaznosti, dijabetesa 2 i arterioskleroze (Kostić, 2017). Bessey (2011) u svom radu analizira uticaj učenja o zdravom načinu života tokom stručnog osposobljavanja ili univerzitetskih studija na verovatnoću usvajanja korisnih i štetnih stilova života poznatih kao „Alameda sedam“ (pušenje, prekomerno piće, prekomerna težina ili gojaznost, stres, zdrava ishrana, vežbanje i dovoljno spavanja). Ovih sedam životnih stilova izvedeni su iz epidemiološke studije na približno 7000 pojedinaca u okrugu Alameda, u Kaliforniji, 1965. godine, da bi naknadne analize otkrile da upravo ovih sedam faktora značajno utiču na fizičko i opšte zdravstveno stanje ljudi (Bessey, 2011). Tako je i dan-danas.

Čejni (2003) smatra da je društveni status neke grupe uslovljen načinom korišćenja privilegija i dostupnih bogatstava. U današnje vreme izraženih klasnih odnosno socio-ekonomskih razlika, privilegije i bogatstva vezuju se uglavnom za imućne slojeve društva, dok se red siromašnih retko bavi analizom medijskih sadržaja koji propagiraju proizvode, sportove ili aktivnosti koje zahtevaju velika finansijska ulaganja i troškove. Dalje, savremen, brz način života, nameće životni stil u kome se mnogi psiho-fiziološki simptomi tumače kao posledica stresa, često i bez adekvatnog stručnog, medicinskog sagledavanja i lekarskih analiza. Ako prihvatimo da su takve i slične ljudske, laičke subjektivne procene vlastitog psiho-fizičkog stanja u jednom delu tačne, treba naglasiti da stres ima značajnu specifičnu težinu i u medicinskom i u psihološkom kontekstu. Strategije prevladavanja stresa na širokom psihološkom kontinuumu od „suočavanja” do „pokušaja prevazilaženja problema i teškoća” prepoznaju se na polju psiholoških i misaonih procesa, osobina ličnosti i kontekstu mehanizama adaptacije pod „otežanim” uslovima savladavanja i objektivne opasnosti ali i sopstvene anksioznosti (Kostić, 2020a). Tu dolazimo do tačke u kojoj posebno treba naglasiti značaj prevencije i promocije pozitivnih oblika ponašanja i životnih stilova; prevencija i promocija su “circulus vitiosus” u lancu aktivnosti koje suštinski doprinose statusu organizma koji se naziva psiho-fizički “well-being”. Zapravo, može se konstatovati da prevencija podrazumeva programe za promociju zdravlja, programe za smanjivanje stigmatizacije i ukidanje prepreka za pristup lečenju (Nastasić, 2005).

Potrebno je svakom učeniku u školi približiti pojam zdravlja, da zna koji su njegovi elementi, dinamičnost i uzajamnu povezanost tih elemenata, kao i definiciju (zdravog) životnog stila; prepoznavanje njegovih uticaja na dimenzije zdravlja, kritička analiza tih uticaja životnih stilova na zdravlje i uočavanje svog ličnog preovlađujućeg stila – prioriteti su kojih se treba držati u edukaciji učenika na ovom polju (Vujović i sar, 2012).

ZAKLJUČAK

Obaveza medija je kontinuirano, pravovremeno i istinito obaveštavanje javnosti o aktuelnostima vezanim za zdravlje, najvažnijim dostignućima medicine, o značaju svake aktivnosti sprovedene u preventivne svrhe na individualnom i kolektivnom planu, bez širenja straha i pretnji, sa apsolutno objektivnim i kritičkim pristupom u cilju ohrabrivanja ljudi da preduzmu sve neophodne mere u zaštiti svog zdravlja i poštovanju zdravih životnih stilova što bi indirektno rezultiralo i produžavanjem životnog veka. Svi navedeni napori u pravovremenoj i adekvatnoj afirmaciji zdravlja i zdravih životnih stilova, realizacija preventivnih programa i edukacija - u konačnom, rezultiraće i donošenjem odgovarajuće zakonske regulative i obavezujućeg poštovanja individualnih i društvenih vrednosti u tom domenu. Najvažnije je deci i mladima predočiti da „zdrav životni stil“ nije apstraktna sintagma već realan životni entitet koji treba poštovati i negovati od malih nogu kako bi se benefiti odrazili na zdravstveni status – dugoročno. Zato je u procesu obrazovanja dece i mladih značajno da prosvetni radnici budu i dodatno edukovani po ovom pitanju kako bi kvalitetna znanja preneli mlađim naraštajima.

Poimanje značaja fizičke aktivnosti i negovanja zdravih životnih stilova individualni su i delom uslovljeni subjektivnom procenom vlastitog zdravstvenog statusa; determinisani su društveno-ekonomskim prilikama, navikama i ljudskim potrebama, ali i razvojnim, vaspitnim, obrazovnim, kulturološkim i drugim faktorima. Težnja idealnom zdravlju je ljudska konstanta bez obzira na ishod, ideal lepote je promenljiv kroz epohe, često uslovljen društveno-ekonomskim faktorima, dok su i osnovne premise zdravlja takođe konstanta – zbog čega je važno da su bazirane na znanju, obrazovanju i pravovremenoj, tačnoj informaciji. U tome je važnost medija nedvosmislena i egzaktna.

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THE EFFECT OF OF PHYSICAL ACTIVITY ON MENTAL HEALTH IN MEDICAL STUDENTS

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Abstract: Regular moderate physical activity is well known as a beneficial factor for maintaining and improving individual general health including mental health, especially in adolescents during crisis. The aim of the study was to assess the levels of anxiety, depression and perceived stress and their connection with the weekly amount of physical activity in junior medical students during December 2020 COVID 19 restrictive public health measures. The investigation was carried out on 73 medical students (57 females and 16 males) aged 20-22 years, from Medical Faculty, University "Ss. Cyril and Methodius", in Skopje. They answered questionnaires containing biographic data, Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Perceived Stress Scale (PSS) and International physical activity questionnaire (IPAQ) by e-mail. Female medical students showed significantly higher levels of anxiety and depression compared to males (p0.05). Pearson correlation between levels of depression and the amount of vigorous physical activity in males was r = - 0.898 while in females it was r= - 0.3251. There was moderate to strong negative correlation between levels of anxiety, depression and perceived stress and the amount of performed moderate physical activity in male medical students. Physical activity could have beneficial effects in male medical students.

Keywords: IPAQ anxiety depression stress

INTRODUCTION

Regular moderate physical activity is well known as a beneficial factor for maintaining and improving individual general health including mental health, especially in adolescents during crisis. It might improve mental health through a variety of psychosocial and biological mechanisms, such as increasing neurotrophic factor (BDNF) and endogenous opioids (endorphins), improving the immune system and promoting self-esteem (Manchevska & Pluncevic, 2014). General recommendations for student population are the same as for adult population, minimum 150 minutes moderate physical activity or 75 minutes vigorous activity weekly. Excessive level of inactivity is associated with higher health risks in all age groups. A recommended level of physical activity is a good predictor of better somatic and mental health. From a practical point of view there is little information on which design of an intervention will enable an optimal effect of physical exercise on mental health. Even though, self-reported measures are notoriously poor at capturing actual physical activity, even in the general population, as standardized questionnaires they are suitable for epidemiological studies. However, during major health crisis such as COVID-19 pandemic outbreak in 2020, the maintenance of regular life styles of all age groups is not possible. As a result, higher rates of anxiety and depression in general population and non-medical college population during COVID - 19 pandemic are frequently reported. This is underpinned by Salari and al, (2020) in a recent meta-analysis, where they reported a prevalence of anxiety of 31.9% and the prevalence of depression of 33.7% among the general population during the COVID-19 pandemic (Salari, Hosseinian-Far, Jalali, Vaisi-Raygani, Rasoulpoor, Mohammadi,

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Rasoulpoor, & Khaledi-Paveh, 2020). In recent studies, the prevalence of anxiety and depression and stress during COVID-19 pandemic was shown to be higher in women than in men. (Moghanibashi-Mansourieh, 2020; Ahmed, Ahmed, Aibao, Hanbin, Siyu, &Ahmad, 2020; Zhou, Zhang,Wang, Guo,Wang, Chen, Liu, Chen, & Chen, 2020).

Medical students are recognized as at-risk group for developing anxiety disorders with significantly larger rates than general population, even under normal circumstances. The second year is one of the most challenging in Medical faculties curricula all over the world. It refers to medical clerkship and preclinical courses. Academic burden along with financial and personal problems have been identified as risk-factors associated with high anxiety and depression in second-year medical students (Mancevska, Bozinovska, Tecce, Pluncevic-Gligoroska, & Sivevska-Smilevska, 2008). It is also a period of life fulfilled with many new obligations which are extremely overwhelming, time consuming and dissimulating for engagement in sports activity. During COVID - 19 pandemic a drastic change in medical education happened abruptly. Traditional face-to face courses and patient bed-side teaching were ordered to be replaced with distant online learning from home. This triggered immediate, forced and prolonged shift in medical students' lives and their learning strategies and techniques towards excessive sedentary behaviors and decreased levels of physical activity, while academic challenges of the "second year" did not change. Furthermore, due to COVID - 19 pandemic spring and autumn lockdown the chances for engagement in regular physical activity were dramatically reduced (Saraswathi, Saikarthik, Senthil Kumar, Madhan Srinivasan, Ardhanaari, & Gunapriya, 2020). Nevertheless, moderate and high levels of physical activity, as well as specific types of physical activity, such as household chores, stretching and resistance training, were found to be protective factors against anxiety or depression among college students during COVID-19 outbreak. (Xiang, Tan, Sun,, Yang, Zhao, Liu, Hou, & Hu, 2020; Saddik, Hussein, Sharif-Askari, Kheder,Temsah, Koutaich, Haddad, Al-Roub, Marhoon, Hamid, & Halwani, 2020).

The aim of the study was to assess the levels of anxiety, depression and perceived stress in junior medical students and to explore their relationship with the amount of regular physical activity during December 2020 COVID 19 restrictive public health measures.

MATERIALS AND METHODS

The study was performed at University "Ss. Cyril and Methodius", Faculty of Medicine in Skopje. It was part of a scientific research project entitled: The relationship between the parameters of body composition, the level of physical activity and the levels of anxiety and depression in medical students, which was approved by the Ethical Committee of the Faculty of Medicine, under administrative number 03-3152/11 in 2018. The activities were undertaken in the Student Counseling Service within the Institute of Physiology and Anthropology during December 2020. One hundred second year medical students, aged 20-22 years, from Medical Faculty, University "Ss. Cyril and Methodius", in Skopje, received questionnaires containing biographic info by e-mail. Macedonian versions of the following self-rating psychological instruments: the Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Perceived Stress Scale (PSS) and the International Physical Activity Questionnaire (IPAQ) were included. The response rate was 73 percent. Seventy three students (57 females and 16 males) gave informed consent to participate and completed and returned the questionnaires.

Beck Anxiety Inventory consists of 21 questions related to various behavioral, emotional, cognitive and physiological symptoms of anxiety. The intensity of perceived anxiety for every question in BAI is scored from 0 to 3, with 0 representing the least serious and 3 the most serious symptoms. It is a short, simple and very popular tool which is used as a pre-screen for presence of an anxiety disorder in both clinical and non-clinical population. It has excellent

internal consistency (alpha =0.92) and high test-retest reliability (Leyfer, Ruberg, & Woodruff-Borden, 2006). The sum of all items is calculated at the end. Scores of BAI from 0-7 were ranked as “normal anxiety level”; 8-25 as “moderate”; and 26-63were ranked as” high anxiety”. The degree of depressive symptoms was measured by the 21-item-revised form of Beck Depression Inventory (36). The BDI statements for each question are ranked from 0 to 3, with 0 representing the absence of symptom and 3 the most serious symptoms. The description of the symptoms includes mood change, social withdrawal, hopelessness, irritability, cognitions such as guilt or feelings of being punished, suicidal intentions, as well as physical symptoms such as fatigue, weight loss and lack of interest in sex. It is a simple, highly sensitive and one of the most widely used instruments for the evaluation of depressive symptoms in clinical as well as non-clinical population. It has excellent internal consistency (alpha =0.86). Similarly to BAI, the sum of all items was calculated at the end. Scores of BDI < 10 indicate “absence of depressive symptoms”, BDI scores from 11-20 indicate “mild depressive symptoms”, while BDI scores from 21-30 indicate “moderate depressive symptoms”. BDI scores higher than 31 indicate “clinically manifest depressive episode” (10).

The Perceives Stress Scale was introduced by Cohen and al, in 1983 (Cohen, Kamarck, & Mermelstein, 1983). It consists of ten questions; scoring by 5-point Likert scale (0 = Never, 1 = Rarely, 2 = Sometimes, 3 = Fairly often, and 4 = Always) is done. The scores of the four positively stated items 4, 5, 7, and 8 are reversed (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 and 4 = 0) and then add up the scores for each item to get a total. Individual scores on the PSS can range from 0 to 40 with higher scores indicating higher perceived stress (linear relation). Stress was stratified as follows: scores range from 0 to 13 indicated low-stress level, scores range from 14 to 26 indicated moderate stress level, scores range from 27 to 40 indicated high-stress level (Seedhom, Kamel, Mohammed, & Raouf, 2019).

The physical activity level was measured using the short form of the International Physical Activity Questionnaire (IPAQ-SF), which has been validated and recommended as an efficient method to assess physical activity. Participants reported the frequency and duration of their vigorous and moderate physical activities and walking per week. According to the official guideline criteria (Hagströmer, Oja, & Sjöström, 2006), the participants’ physical activity level could be categorized as high, moderate, or low as follows. (1) Category high: The pattern of activity was classified as high if it met either of the following criteria: (a) vigorous activity at least 3 days in a week achieving a minimum of 1500 METmin/week, or (b) 7 or more days of any combination of walking, moderate-intensity, or vigorous-intensity activities achieving a minimum of 3000 MET-min/week. (2) Category moderate: The pattern of activity was classified as moderate if it met any one of the following three criteria: (a) 3 or more days of vigorous activity of at least 20 min per day in a week, or (b) 5 or more days of moderate-intensity activity and/or walking of at least 30 min per day in a week, or (c) 5 or more days of any combination of walking, moderate-intensity, or vigorous activities achieving a minimum of at least 600 MET-min/week. (3) Category low: Those individuals who did not meet criteria for Categories 1 or 2 were considered to have a low physical activity level. Additionally, the prevalence of inadequate physical activity was also calculated according to recommendation that adults engage in at least 75 min of vigorous-intensity physical activity per week, at least 150 min of moderate physical activity, or any equivalent combination of the two.

Students who reported high scores on psychological instruments received feedback (by e-mail) with an advice how to reduce their anxiety levels and depression.

For statistical evaluation of the data, SPSS 16 software (SPSS Inc., Chicago, IL) was used. The results are represented by mean values and their standard deviations as measures of central tendency; the analysis was performed with the Student t test, Pearson coefficient of correlation and chi-square test. The level of significance was $p < 0.05$.

RESULTS

Mean value of BAI scores in second year medical students was 20.9 ± 14.3 with obtained minimal BAI score = 2 and maximal BAI scores = 55. Mean value of BDI scores was 13.9 ± 9.3 with obtained minimal BDI score = 1 and maximal BDI=40. Mean value of obtained scores on PSS scale were 21.4 ± 8 with minimal PSS score = 5 and maximal PSS=35. (fig1)

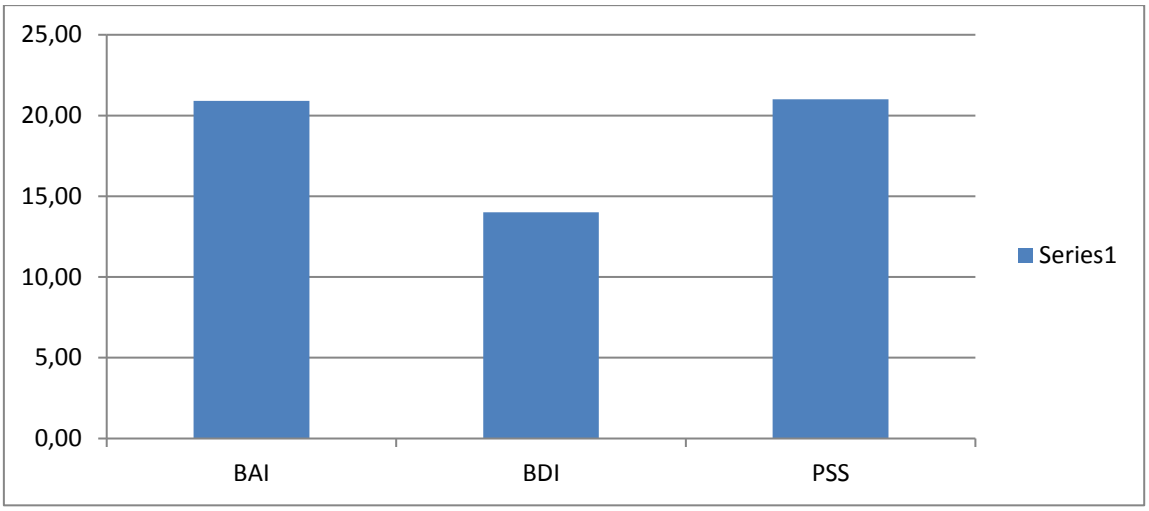

Figure 1. Mean values of parameters of anxiety, depression and perceived stress obtained in junior medical students during COVID 19 pandemic autumn lockdown

As can be seen from table 1, there was statistically significant difference between female and male students within our sample regarding anxiety and depression ($p<0.05$). Female students obtained higher mean values on anxiety and depression, however there was no gender difference in the levels of perceived stress ($p=0.23$). There were no differences in mean values of minutes engaged in different levels of physical activity (IPAG HL – vigorous activity, IPAQ ML – moderate activity, IPAG W- walking) and in sedentary behaviors (IPAQ S) between female and male students. Pearson correlation between BDI scores and the amount of vigorous physical activity in males was r = - 0.898 while in females it was r= - 0.3251. There was moderate to strong negative correlation between levels of anxiety, depression and perceived stress and the amount of performed moderate physical activity in male medical students. Fifty five percent of all students had inadequate physical activity, while 31.5% showed high level physical activity.

Table 1. Mean values and standard deviations of BAI, BDI, PSS scores and IPAQ parameters obtained in female and male second year medical students during COVID – 19 autumn lockdown

Subjects Variables	M2 2020 Females N=57	Males N=16	T-test
Mean BAI scores	23.2±14.3	12.3±10.3	p<0.005

Mean BDI scores	15.1± 9.8	9.6 ± 5.4	p=0.036
Mean PSS scores	22±8	19.2±7.6	p=0.23
Mean IPAQ HL (min)	196.5±158.7	260.8±158.5	p=0.24
Mean IPAQ ML (min)	252.1± 246.2	303 ± 354.4	p=0.47
Mean IPAG W (min)	346.9 ±300.9	241.8 ± 221.7	p=0.22
Mean IPAQ S (min)	3276 ±3000	2340 ±2500	p=0.14

The distribution of all second year medical students regarding gender and based on obtained individual BAI, BDI and PSS scores is shown in table 2. As can be seen only ten female students (17.5%) reported normal anxiety levels, compared to 31.2 % of male students. Eighty two percent of females were ranked moderate to high anxiety (BAI >7). Seventy nine percent of all second year medical students had anxiety. Twenty five female students showed high anxiety levels (BAI >25) compared to one of their male peers (chi square = 7.7322 df=2; N= 73; p= .0209).

Twenty four female students (42.1%) did not show any signs of depression compared to 56.3% of their male peers. Eighteen females showed considerable symptoms of depression (BDI>20) and six of them reported very high BDI scores which are equivalent to clinically manifest depression (BDI >30), while 6.2 % of males showed considerable depressive symptoms (chi square = 4.1756; df=2; N=73; p= .1239). Six students reported suicidal ideation and intention. Seventeen percent of females showed considerable depressive symptoms, by scoring in severely depressed range (mean BDI = 30.8 ± 5.6). Mean values of BAI scores in these students were 36.5± 5 and mean values of PSS scores were 31.1 ± 2.5. All ten used benzodiazepines during previous fortnight in order to cope with anxiety, high stress and depression (table 2).

Regarding individually acquired PSS scores, 17.5% of female students showed low levels of stress compared to 18.8 % of their male peers. Over eighty percent of all students showed moderate to high levels of perceived stress. Twenty seven percent of all students reported high levels of perceived stress with no gender difference (chi square = 1.1392; df=2; N=73; p= .565).There was a strong positive correlation between the degree of depressive symptoms and the levels of anxiety and perceived stress (r=0.736 and r=0.746) respectively (table 3).

Table 2. Distribution of second year medical students based on the obtained individual BAI, BDI and PSS scores during COVID - 19 pandemic autumn 2020 lockdown

Subjects Variables	Females N=57 N (%)	Males N=16 N (%)
BAI scores*		
0-7 Normal anxiety	10 (17.5)	5 (31.2)
8-25 Moderate anxiety	22 (38.6)	10 (62.5)
>25 High anxiety	25 (43.9)	1 (6.2)
BDI scores		
0-10 No depression	24 (42.1)	9 (56.3)
11-20 Mild depression	15 (26.3)	6 (37.5)
>20 Moderate and manifest depression	18 (31.6)	1 (6.2)
PSS scores		
0-13 Low stress	10 (17.5)	3 (18.8)
14-26 Moderate stress	28 (49.1)	10 (62.4)
27-40 High stress	18 (31.4)	3 (18.8)

*Chi square; $p<0.05$

As can be seen from table 3, there were statistically significant differences in time engaged in vigorous physical activity, walking and sedentary behaviors between the students who reported high anxiety, manifest depression and high levels of stress compared to sixteen students who showed low levels of anxiety, no depression and low levels of perceived stress. Students with manifest psychological distress did not engage in vigorous physical activity at all with modest engagement in walking, and significant engagement in sedentary behaviors. Nine of ten had

inadequate physical activity compared to 40% of LA group students who had inadequate physical activity (chi square = 5.5616 df=1; N= 26; p= .0183).

There was moderate to strong negative correlation between BDI scores and time engaged in vigorous physical activity in students with low anxiety (r= -0.647, p=0.05).

Table 3.Mean values and standard deviations of parameters of IPAQ for students with high psychological distress and for students with no psychological distress

Subjects Variables	All (HA+D+HS) N=10	LA (LA+ND+LS) N=16	t-test p
Mean IPAQ HL (min)	0	242.2 ± 166.7	
Mean IPAQ ML (min)	63.3 ± 40.3	317.7 ± 325.4	0.234
Mean IPAG W (min)	95 ± 102.2	417.5 ± 279.8	0.0071
Mean IPAQ S (hours/per week)	69.9 ± 30.8	41.8 ± 23.6	0.0252

DISCUSSION

Results obtained in our study, to our best knowledge, represent the first results regarding levels of anxiety, depression, levels of perceived stress among medical students and their relationship with their physical activity level during COVID - 19 pandemic autumn lockdown in our country. Almost 80% of second year medical students had anxiety. Almost 55% of all students had depressive symptoms and 81% of all perceived stress. The prevalence of high anxiety was 43.9% in females, while the prevalence of depression was 31.6 %. Thirty one percent of female students showed high levels of perceived stress. Seventeen percent of females showed high levels of stress. Seventeen percent of females showed strong psychological distress with high scores on all instruments. University students (especially females) in early stages of education are more prone to high anxiety and depression (Mancevska et al., 2014). Our findings on higher rates of anxiety, depression and high stress levels in female students are in accordance with the results from different epidemiological studies which show that women are more prone to psychological distress and anxiety disorders (Rotenstein, Ramos, Torre, Segal, Peluso, Guille, Sen, & Mata, 2016). A broad range of relevant factors, including biological influences (several structural or functional gender differences in anxiety-relevant brain regions, such as the prefrontal cortex, hippocampus, and extended amygdale complex, different serotoninergic circuits and hormonal fluctuations), behavioral and cognitive factors, as well as environmental factors have been proposed as underlying reasons for this findings (Donner, & Lowry, 2013).

The prevalence of depressive symptoms in our study was 55%. It was two times higher than the prevalence of depression in 27.5% in Iranian medical clerks. Twenty seven percent of all

students in our sample showed BDI scores >20, compared to 10.8% in Iranian medical clerks obtained during COVID - 19 pandemic with BDI (Nakhostin-Ansari, Sherafati, Aghajani, Khonji, Aghajani, & Shahmansouri, 2020). Furthermore, Bartoszek and al., (2020) reports on the prevalence of 23% of depression in healthcare workers and 33.7 % in general population. (Bartoszek, Walkowiak, Bartoszek, & Kardas, 2020). Thirteen percent of students in our sample showed moderate to severe depression accompanied by high levels of anxiety and perceived stress. High anxiety has been identified to be a risk factor for depression in medical students (Mancevska et al., 2008). Medical students show high levels of resilience which has been shown to prevent from development of anxiety disorders as well as depression. Home confinement and living with parents and social support have been addressed as a protective factor for anxiety during COVID - 19 pandemic (Lasheras, Gracia-García, Lipnicki, Bueno-Notivol, López-Antón, de la Cámara, Lobo, & Santabárbara, 2020). Nevertheless, students who show manifest depression and high anxiety and stress during prolonged COVID - 19 pandemic lockdown should receive strong pastoral support by faculty and be advised and encouraged to seek professional help and treatment.

Regular physical activity practice is considered an important factor in the population's health and life quality. The data derived from questionnaires are not so accurate like from movement sensors devices, but self-reported methods are cheaper, more available, and allow a great part of the population to be evaluated. The standardized questionnaires are suitable for epidemiological studies. Fifty five percent of students from this investigation had inadequate physical activity level, which is in accordance with the reports (52.3%) by Xiang and al, 2020 (Xiang et al., 2020). Although, as group, our students reported values for vigorous and moderate physical activity that were in accordance with the general recommendations for student population of minimum 150 minutes moderate physical activity or 75 minutes vigorous activity weekly, the standard deviation was very high or higher than mean values for most of the IPAQ parameters which indicates that the data points are spread out over a large range of values. Thirty one percent of all students had high level of physical activity, with 36% involved in vigorous activities, while only 16% were not engaged in walking during the last week.

Thirteen percent of all students showed considerably high levels of psychological distress manifested with high anxiety levels and clinically manifest depressive symptoms accompanied with suicidal intentions and very high levels of perceived stress. All had insufficient physical activity, with no engagement in vigorous and moderate physical activity and modest engagement in walking. All showed extreme sedentary behaviors, compared to their peers with no psychological distress. Depression involves reduction of all vital drives (lack of motivation, reduced initiative to start any activity, mood change, social withdrawal, hopelessness, irritability, cognitions such as guilt or feelings of being punished, suicidal intentions, as well as physical symptoms such as fatigue, weight loss) which make it very difficult for depressed person to start and endure in engagement in regular physical activity (Ghassab-Abdollahi, Shakouri, Aghdam, Farshbaf-Khalili, Abdolalipour, & Farshbaf-Khalili, 2020). A number of studies conducted to evaluate the physical activity, diet, and fitness status of university students have revealed that the physical condition and nutritional habits of students are very much associated with their own attitudes toward health promotion and illness prevention (Haase, Steptoe, Sallis, & Wardle, 2004; Nasui, & Popescu, 2014).

The mental health of medical students, who are future health care workers and seem to be a valuable support to health system during COVID - 19 pandemic is very important. Strategies and appropriate psychological interventions with an aim to improve individual mental health and to build resilience for the needs of management of future similar public health issues need to be planned. Regular moderate physical activity should be implemented within the medical

school curriculum as a part of such interventions with a certain future effect on general population lifestyles.

CONCLUSIONS

There was no difference in the amount of engagement in physical activity and the mean duration of performed vigorous, moderate physical activity, walking and sedentary behaviors between female and male second year medical students during December 2020 COVID 19 restrictive public health measures. More than half of students showed inadequate physical activity levels. The prevalence of high anxiety, depression and high levels of stress in junior medical students, particularly in females was very high. Thirteen percent of students (mainly females) showed manifest depression accompanied by high anxiety and high levels of perceived stress. They were not engaged in any type of vigorous and performed low amount of moderate physical activity. Instead they showed extreme sedentary behaviors. It is very important that ways of proper adequate, sustainable and successful involvement of students with depression in regular physical activity should be designed and implemented in medical schools curricula as well as in medical practice, especially during major health crises.

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NUTRITIONAL STATUS OF THE ELDERLY

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Abstract: The research included eleven original papers. All works satisfied the criteria for further analyze. The goal of this study is to determine the nutritional status of the elderly than 60 years. The selection of scientific papers in the period from 2000 to 2020 was taken as a method. By analyzing the works, we found a very high percentage of overweight and obese people. This fact indicates a large number of people who are prone to various diseases, whose predictor can be obesity itself. Based on the results of the selected works, 44% were overweight, and 17% obese. Every fifth person is obese while every second person is overweight. Nutrition and overweight can significantly affect the outcome, recovery from illness, length of hospital stay. Patients with an eating disorder should be identified and treated in a timely manner.

Keywords: nutritional status, elderly

STANJE UHRANJENOSTI OSOBA STARIJE DOBI

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Sažetak: Istraživanje je obuhvatilo jedanaest originalnih radova. Svi radovi su ispunili kriterijume za analizu . Cilj rada je da utvrdi stanje uhranjenosti osoba starijih od 60 godina. Kao metod uzeta je selekcija naučnih radova u vremenskom periodu od 2000. do 2020. godine. Analizom radova utvrdili smo veoma visok procenat prekomerno uhranjenih i gojaznih osoba. Sama ta činjenica ukazuje na dosta veliki broj osoba koje su sklone raznim bolestima, čiji i sam prediktor može biti gojaznost. Na osnovu dobijenih rezultata u odabranim radovima, 44% je prekomerno uhranjena, dok je 17% gojazno. Svaka peta osoba je gojazna dok je svaka druga osoba prekomerno uhranjena. Uhranjenost i prekomjerna tjelesna masa mogu značajno utjecati na ishod, oporavak od bolesti, dužinu boravka u bolnici. Bolesnike s poremećajem uhranjenosti treba na vrijeme prepoznati i lečiti.

Ključne reči: uhranjenost, gojaznost, starije osobe,

UVOD

Prekomerna telesna masa i gojaznost jedan su od glavnih zdravstvenih problema u mnogim razvijenim zemljama. Poslednjih nekoliko godina doslo je do znacajnog povećanja prevalencije prekomerne uhranjenosti i gojaznosti u mnogim zemljama sveta (WHO, 2000). U starosti se nivo fizičke aktivnosti značajno menja i doprinosi smanjenju (ukupnog) energetskog unosa,

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kompromitujući i unos esencijalnih nutrijenata. Prekomerna težina i gojaznost posebno su rašireni kod starijih ljudi u zemljama s visokim dohotkom. Trenutno se u SAD-u 69% osoba starijih od 60 godina i više identificira kao prekomjerna tjelesna težina ili gojazno (BMI ≥25), a 31% kao gojazno (Houston et al. 2009). U Australiji se 71% starijih od 65 do 74 godine, 60% od 75 do 84 godine i 42% starijih od 85 godina i više smatra prekomernom težinom ili gojazno (Australian Institute of Health, 2010). Starenjem stanovništva očekuje se da će se znatno povećati broj starijih ljudi s prekomjernom telesnom težinom i gojaznih (Elia, 2001). Prema podacima lnstituta za zdravstvenu zastitu Srbije, vise od polovine odraslog stanovnistva Srbije (54%) ima problem sa prekomernom uhranjenoscu pri černu je 36,7% sa prekomernom uhranjenoscu, dok je 17,3% gojazno (Micić, 2004).
Stare osobe su nesposobne da otkriju gubitak u telesnoj masi ili periode malnutricije u životnim situacijama pojačane funkcionalne, socijalne i psihološke zavisnosti, kao što su teška lišavanja, akutno oboljenje, hirurška intervencija i dr. (Markson, 1997). Stoga su stare osobe sklone nutritivnom riziku i stanje uhranjenosti starih osoba treba neizostavno procenjivati (Vasiljević et al. 2002; Mirilov, 1997). Što se tiče fizičkih i medicinskih ograničenja u odnosu na mlađe osobe, i zbog toga intenzitet vežbanja je uglavnom manji i količina vežbanja opada sa starenjem (Kallinen, & Markku, 1995; Taunton et al. 1997). Za procenu uhranjenosti i rizika od bolesti uslovljenih prekomernom telesnom masom, Svetska zdravstvena organizacija (WHO, 2000) preporučuje indeks telesne mase (BMI). Mnoga istraživanja u svetu i nekolicina u našoj zemlji (Jakovljević et al. 2005) potvrdila su njegovu korisnost za procenu uhranjenosti kod odraslih osoba. Broj pothranjenih starih osoba progresivno raste sa godinama života, a posle 70. godine 12−24% funkcionalno sposobnih starih ima BMI < 22 kg/m2 (Posner et al. 1994).

METOD ISTRAŽIVANJA

Za prikupljanje dosadašnjih naučnih radova o uhranjenosti osoba starije dobi bile su pretražene sledeće elektronske baze podataka: Google Scholar, PubMed, PEDro, SCIndeks, DOAJ, HRČAK, Sponet.
Pretraživani su bili naučni radovi u vremenskom periodu od 2000. do 2020. godine. Prilikom pretraživanja baze podataka smo koristili ključne reči: indeks telesne mase, BMI, nutrition, starije osobe, uhranjenost.

Tabela 1. Prikaz radova, sadrzi informacije o autorstvu, naveden je nosilac rada i godina publikacije, koautori su navedeni u referencama. Navedene su osnovne informacije o broju ispitanika, uzrasnim kategorijama i polu u okviru uzorka ispitanika. U rubrici problem istraživanja navedena je problematika, kao i šta se konkretno merilo u tom istraživanju. U rubrici rezultati istraživanja su rezultati autora i delimični zaključci iz kojih smo u daljim razmatranjima izvukli lični zaključak.

REZULTATI ISTRAŽIVANJA

Na osnovu ključnih reči je deteminisan izbor radova. Postavljena su dva kriterijuma selekcije.

• Prvi kriterijum je problematika uhranjenosti starijih osoba od 60 godina.

• Drugi je pregled literature i provodjenje analize radova od 2000 do 2020 godine.

Postupak prikupljanja, analize i eliminacije nadjenih radova je prikazan u Prikazu 1.

• Na osnovu ključnih reči je identifikovano 823 rada.

• Broj istraživanja koja su odmah isključena na osnovu perioda kada su izdati (stariji od 2000 godine) je 410, dok je broj istraživanja koja su odmah isključena na osnovu naslova, dupliranih radova je 371 a 42 rada je uključeno u dalju analizu.

• Pronadjeni naslovi istraživanja, abstrakti i celi tekstovi su zatim bili čitani i analizirani. Izdvojeno je 12 radova koji su zadovoljili kriterijume ili su bliski predmetu istraživanja.

Prikaz 1.

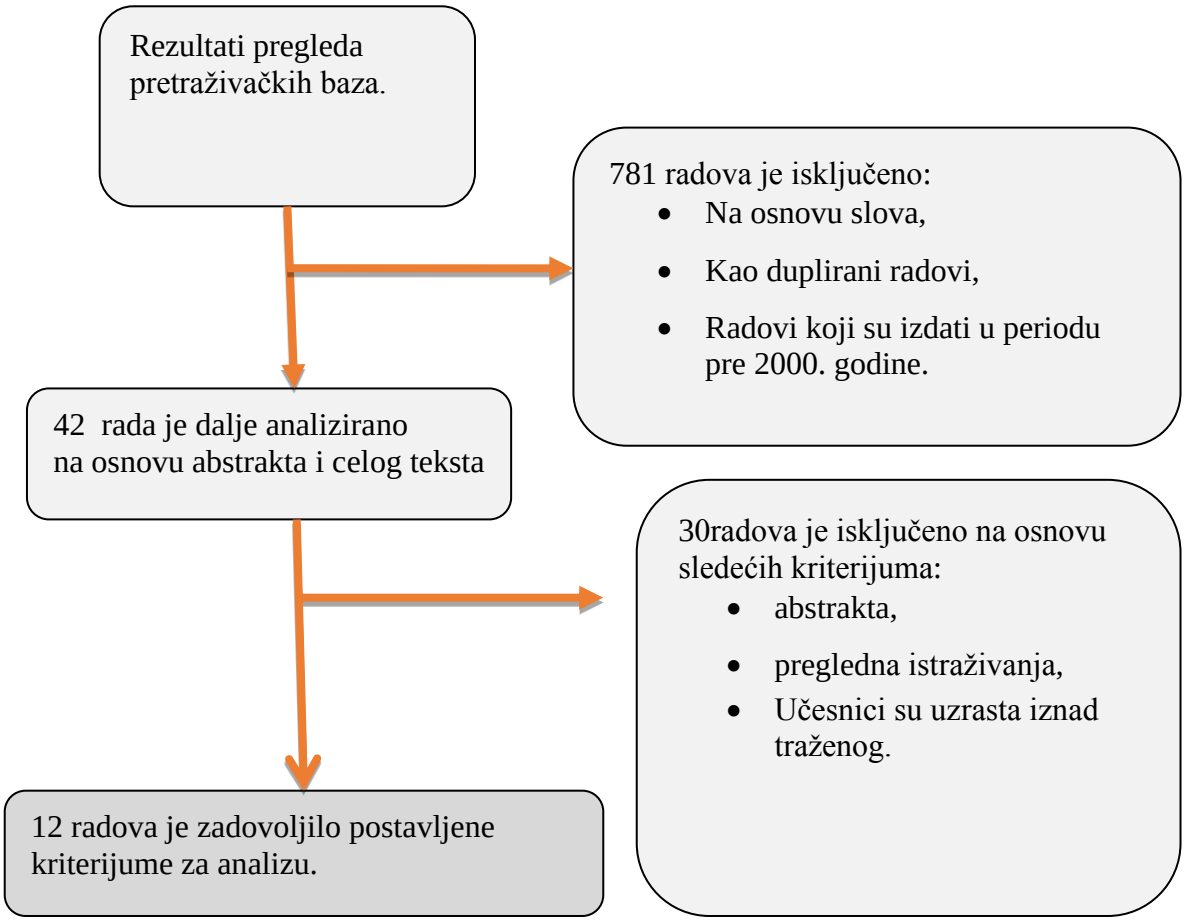

Tabela 1.

Reference	Uzorak ispitanika Broj	Uzrast	Pol	Metode istraživanja	Rezultati istraživanja
Kovačević & Prlić (2011)	100	♂♀	≥65	BMI, MNA	65 je bilo adekvatno uhranjeno, 29 bilo pod rizikom za pothranjenost, 6 ispitanika su bili pothranjeni.
Miškić (2019)	207	♂♀	≥65	BMI, MNA	Noramalno uhranjeno 143 69,1% rizik za pothranjenost 62 ispitanika (30%) pothranjenost 2 ispitanika (0,9%)
Pavlica et al. (2010)	730	♂♀	≥65	BMI, WHR	Muskarci prekomerno uhranjeni (49,85%), normalno uhranjeni (34,04%) i gojazni (15,8%), pothranjen (0,3%) Zene normalno uhranjene (52,52%). Prekomernom uhranjeno 31,92%, a gojaznih (13,22%). pothranjenost (BMI 17-18,4kg/m2) (0,25%; 1,99%).
Prašević-Koić, 2009	200	♂♀	≥65	BMI, MNA	5,5% pothranjeno 48,5% optimalnu tezinu 23,5% prekomernu tt 22,5 gojazno
Zvekić-Svorcan et al. (2013)	1323	♂♀	≥64	BMI	20% gojazno 35% normalno uhranjeno 2% pothranjeno 43% prekomerno uhranjeno
Matijević & Stokić (2012)	100	♂♀	≥65	BMI	Gojaznost 22% 37,93% muškarci 15,49% žene
Bahat et al. (2012)	254	♂♀	≥60	MNA	171 (67,3%)su bili dobro uhranjeni,

Sánchez-García et al. (2007)	1968	♂♀	≥60	BMI, WHR	62,3% populacije imalo prekomernu težinu, a 73,6% žena i 16,5% muškaraca imalo je visoku raspodelu masnog tkiva.
Courteney et al. (2020)	553	♂♀	≥65	BMI, MNA	113 muškaraca-64, 6% 251 žena- 70% pothranjenost
Gutiérrez-Fisac et al. (2004)	4009	♂♀	≥60	WHR, BMI	Muškaraci: Prekomerne težine 49%, Gojaznosti 31,5%. Žene: Prekomerne težine 39,8% Gojaznost 40,8%.
Fauziana et al. (2016)	2565	♂♀	≥60	BMI,WHR	Ukupna prevalencija pretilosti i prekomerne telesne težine iznosila je 8,7%, odnosno 33,4%, dok je premala težina iznosila 5,5%. Prevalencija normalnog BMI bila je 52,5%.
					58 (22,8%) je bilo pothranjeno 25 (9,8%) je neuhranjeno.
Bermudez & Tucker (2001)	1030	♂♀	≥60	BMI,WHR	Prekomerno uhranjenih: 311. Gojazno: 537.

Legenda: Mini Nutritional Assessment (**MNA**), Waist circumference (**WHR**), Body max index (**BMI**)

DISKUSIIJA

Tabela 1. sadrži prikaz naučnih radova koji se bave uhranjenošću starijih osoba. Analizom tabele uočava se da su radovi predstavljeni i analizirani kroz šest grupa parametara: referenca, uzrast ispitanika, broja ispitanika i pol ispitanika, metode i rezultati istraživanja.

Uzrast u radovima je od 60 godina pa naviše. Ukupan broj ispitanika u radovima je 12857. . Najmanje ispitanika je 100 u radovima (Kovačev & Prlić, 2011; Matijević & Stokić, 2012) a najveći broj 4009 (Gutiérrez-Fisac et al. 2004). Za procenu uhranjenosti i rizika od bolesti uslovljenih prekomernom telesnom masom, Svetska zdravstvena organizacija (SZO) preporucuje BMI, koji je u svim istraživanjima bio glavna varijabla za procenu.

Takođe i Mini Nutritional Assessment u radovima (Bahat et al. 2012; Miškić, 2019; Prašević-Koić, 2009; Kovačević & Prlić, 2011; Courteney et al. 2020). MNA upitnik može detektirati životne navike starijih osoba koje bi mogle dovesti do pothranjenosti, a da se pri tome BMI vrijednosti još uvijek nalaze unutar prihvatljivog raspona. WHR indeks koji se dobija iz

njihovog medusobnog odnosa korišćen je u radovima (Sánchez-García et al. 2007; Pavlica et al. 2010; Gutiérrez-Fisac et al. 2004). Istraživanja u svetu su ukazala na vaznost distribucije masnog tkiva u organizmu u pojavi zdravstvenog rizika (Pavlica et al. 2010; po: Lipowicz et al. 2002; Lovejoy et al. 2001).

Na osnovu ukupnog broja ispitanika kojih je bilo 12009, kao pothranjeno je 648 ispitanika, rizik od pothranjenosti ima 91 ispitanika. Normalno uhranjenih je 2686, prekomerna uhranjenost 5599 i gojaznih 2600. Na osnovu dobijenih rezultata u odabranim radovima, 44% je prekomerno uhranjena, dok je 17% gojazno. Svaka peta osoba je gojazna dok je svaka druga osoba prekomerno uhranjena.

Analizom radova utvrdili smo veoma visok procenat prekomerno uhranjenih i gojaznih osoba. Sama ta činjenica ukazuje na dosta veliki broj osoba koje su sklone raznim bolestima, čiji i sam prediktor može biti gojaznost. Povišeni indeks telesne mase (BMI) glavni je faktor rizika u nastanku kardiovaskularnih bolesti, dijabetesa tipa 2. Muškarci s prekomernom telesnom težinom imali su gotovo četiri puta veću verojatnoću da imaju dijabetes od skupine s najnižim BMI dok gojazni muškarci imali su samo dvostruko veću vjerojatnost da imaju dijabetes tipa 2 (Bermudez et al. 2001). Pokazatelji distribucije masnog tkiva jesu obim struka i obim kukova, kao i WHR indeks koji se dobija iz njihovog medusobnog odnosa. Istrazivanja u svetu su ukazala na vaznost distribucije masnog tkiva u organizmu u pojavi zdravstvenog rizika (Pavlica et al. 2010; po: Lipowicz et al. 2002; Lovejoy et al. 2001). Analizom utvrđeno je da nutritivni rizik od malnutricije ne postoji samo kod pothranjenih pacijenata prema BMI, nego i u grupi optimalno uhranjenih i gojaznih ispitanika, kao i pacijenata s dijabetesom (Prašević-Koić, 2001). Kao objašnjenje takve pojave navodi da MNA upitnik može detektirati životne navike starijih osoba koje bi mogle dovesti do pothranjenosti, a da se pri tome BMI vrijednosti još uvijek nalaze unutar prihvatljivog raspona te da BMI sam po sebi nije dovoljan u procjeni nutritivnog statusa starijih osoba (Valek et al. 2007 po Cook et al. 2003).

Uhranjenost i prekomerna telesna masa mogu značajno uticati na ishod, oporavak od bolesti, dužinu boravka u bolnici. Bolesnike s poremećajem uhranjenosti treba na vrijeme prepoznati i liječiti.

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MEDICAL ETHICS AND PUBLIC DISCOURSE DURING COVID-19

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Abstract: Infectious diseases that have decimated the population of our planet for centuries have always had medical specificities and required psychological and ethical analysis and demanded moral behaviour of healthcare professionals. The Hippocratic Oath has been maintained for centuries to this day as a key document reminding us of the obligations and duties of those who dedicate themselves to the medical profession. From Hippocrates, through Seneca and Largus, Florence Nightingale, the Geneva Revision of the Hippocratic Oath to the International Code of Medical Ethics, the aspect of advertising or publicity in medical morality has not been considered. The explosion of mass media is the principal feature of the modern civilisation. In times of crisis, such as the pandemic caused by the COVID-19 virus, the importance of the media in shaping and experiencing reality is especially growing. The first principle of the current code of journalists of Serbia says that the obligation of journalists is to report on events of interest to the public accurately, objectively, completely and timely, observing the right of the public to know the truth and adhering to the principal standards of the journalist profession. The current pandemic was, and still is, a real test of morality of the medical profession that can be said to have passed the test, acquiring the status of national heroes among the public. However, when it comes to the journalist profession, it can be said that the public is polarized in its assessment, to those who believe that they are comprehensively, timely and accurately informed – which is the key to informing the public especially during the health crisis, and to those who believe they are victims of "infodemic", which represents a new level of crisis in the circumstances of technologically based rapid and unlimited dissemination of information with a number of negative effects such as the spread of panic, misinformation and speculation.

Keywords: medical ethics, public, infodemic, COVID-19, social values

MEDICINSKA ETIKA I JAVNI DISKURS ZA VREME COVID -19

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Sažetak: Zarazne bolesti koje su vekovima desetkovale stanovništvo naše planete uvek su imale niz medicinskih specifičnosti i zahtevale su psihološko - etičku analizu i moralno ponašanje zdravstvenih radnika. Hipokratova zakletva se održala vekovima do današnjih dana kao ključni dokument podsećanja na obaveznosti i dužnosti onih koji se posvećuju lekarskoj veštini. Od Hipokrata, preko Seneke i Largusa, Florens Najtingejl, Ženevske revizije hipokratove zakletve sve do internacionalnog kodeksa lekarske etike nije bio razmatran aspekt reklamiranja ili publiciteta u medicinskom moralu. Danas u savremenoj civilizaciji kao njegovu osnovnu karakterizaciju imamo eksploziju sredstava masovne komunikacije.U kriznim vremenima poput pandemije izazvanje virusom COVID 19 – posebno raste značaj medija u oblikovanju i doživljaju stvarnosti. Prvi princip aktuelnog kodeksa novinara Srbije kaže da je obaveza novinara da tačno, objektivno, potpuno i blagovremeno izvesti o

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događajima od interesa za javnost, poštujući pravo javnosti da sazna istinu i držeći se osnovnih standarda novinarske profesije. Aktuelna pandemija bila je, i dalje je pravi test moralnosti, medicinske struke koja je može se reći položila test, proglasivši se od strane javnosti za heroje nacije. Međutim kada je u pitanju novinarska profesija može se reći da je javnost polarizovana u oceni iste, na one koji veruju da su sveobuhvatno, pravovremeno i tačno informisani, što jeste ključ informisanja javnosti naročito u vreme zdravstvena krize i na one koji smatraju da su žrtve "infodemije" koja predstavlja novi nivo krize u okolnostima tehnološki zasnovanog brzog i neograničenog širenja informacija sa nizom negativnih efekata kao što su širenje panike, dezinformacije i špekulacije.

Ključne reči: medicinska etika, javnost, infodemija, COVID -19, društvene vrednosti

UVOD

Novi korona virus i njegovo globalno širenje koje je proglašeno svetskom pandemijom promenilo je u mnogome aktuelni način života, način mišljenja i otvorilo niz etičkih pitanja. Svaki izlazak iz kuće bez poštovanja propisanih mera bezbednosti postavlja test etičnosti i lične odgovornosti osobe prema sebi, svojim bližnjima i celokupnoj društvenoj zajednici. Naravno stav i ponašanje koje pojedinac svakodnevno zauzima, počevši od 12. januara 2020. godine kada je Svetska zdravstvena organizacija potvrdila da je uzročnik respiratorne infekcije zabeležene kod određene grupe pacijenata u Vuhanu, u kineskoj provinciji Hubej, Covid – 19, stav pojedinca, zavisi od stava medicinske struke, odnosa države, političkih struktura i samih medija.

Zbog toga se etičko ponašanje za vreme svetske pandemije može preispitivati u odnosu na različite pojedince i društvene grupe. Kada su u pitanju zarazne bolesti, istorijski gledano, uvek je u fokusu medicinske etike bio odnos medicinskih radnika i pacijenata i pacijenata prema društvenoj zajednici. Danas se nameće potreba preispitivanja etičnosti odnosa medija prema građanima, države prema medijima i medicinskoj struci i povratno medija prema državnim i društvenim strukturama.

Zahvaljujući vremenu u kome živimo, koje je označeno erom interneta i društvenih mreža trebalo bi da krajnji cilj bude dostižan lakše i brže nego ikada do sada u istoriji. Krajnji cilj jeste zaustavljanje širenja zaraze na svetskom nivou i prevazilaženje krize. Zahvaljujući mogućnostima trenutačnog prenošenja informacija, za razliku od vremena kolere, kuge i velikih boginja, svaki deo sveta bi u jednom danu mogao da dobije iste informacije o merama zaštite, o načinima lečenja, o potrebi vakcinacije i svim ostalim informacijama. Idealan model komunikacije bio bi sastavljen od pošiljaoca poruke, medicinske struke, kanal komunikacije činili bi mediji, a primaoce poruke predstavljalo bi čitavo čovečanstvo. Međutim upravo ono što se smatralo najvećim doprinosom interneta kao medija, a to je dvosmerna komunikacija, mogućnost svih da budu i pošiljaoci i primaoci poruke, u ovoj specifičnoj situaciji svetske zaraze pokazalo se više kao mana nego kao prednost, zapravo dovelo je do "infodemije", do pojave da preterana količina informacija o nekom problem, sam problem čini još težim.

Prema aktuelnom istraživanju Rojtersa, zaključeno je da tradicionalne medijske kuće doživljavaju renesansu, da za vreme pandemije imaju mnogo veći kredibilitet od društvenih mreža. Isto istraživanje kaže da se ljudi sa nižim stepenom obrazovanja više oslanjaju na društvene mreže i mesindžer usluge, vajbera i drugih mreža (Nielsen et alia, 2020). Ovakva situacija preterane količine informacija i prevelikog broja izvora i kreatora informacija u velikoj meri je smanjila sposobnost odlučivanja pojedinaca. Da li je to uticalo na moralnost pojedinca, može se zaključiti iz same definicije moralnosti kao psihičke funkcije sposobnosti čoveka da sam sebi izriče norme kojih se pridržava i da sam sebe kažnjava za nepridržavanje tih normi. Forma moralnog rasuđivanja podrazumeva i način na koji se donosi neki moralni

sud, motive koji se uključuju prilikom analize određene moralne situacije.U najblažem smislu rečeno za vreme pandemije svi društveni akteri od medicinskih radnika, preko pacijenata i novinara do običnih građana nalaze se u specifičnom vrednosnom sistemu, gde je jedan deo sadržaja moralnog rasuđivanja, "zamagljen" ili "zagušen", viškom informacija. Sadržaj moralnog suda je uvek "vrhovno dobro" i to je cilj življenja koji je za vreme pandemije dodatno relatizovan jer je inače određen kulturom, društvenim uređenjem, vrednosnim sistemom sredine, uticajem religije, diferenciranim individualnim razvojem sada još podvrgnut društvenim medijima i svim globalnim informacionim trendovima.

DISKUSIJA

Brojni su aspekti proučavanja etike u periodima društvenih nepogoda: iz ugla medicinske struke, iz ugla pacijenta, iz ugla pojedinca, iz ugla određenog društva ili države, iz ugla medija, iz ugla zatečenog istorijskog momenta i na kraju globalno, čitavog čovečanstva na planeti. Istraživanja medicinske etike i etike javnog diskursa uzeti su, kao reprezenti najmasovnijih formi odnosa na ovom polju, koje zaokupljuju čovečanstvo u vreme aktuelne pandemije izazvane korona virusom, obavljena pomoću metoda: istorijske, deskriptivne, obrazloženja, uporedne analize i studija slučaja. Izabrani primeri se analiziraju kroz teorijske izvore i koncepte. Cilj je da se poređenjem nekih elemenata kroz istorijat, razvoj, kategorizaciju validnih istraživanja i problematika na polju etike, dođe do korisnih ideja u regulisanju etičkog ponašanja u javnoj sferi za vreme pandemija i ukaže na značaj unapređenja u regulisanju ovog segmenta društvenog života koji se po prvi put u istoriji susreće sa eksplozijom društvenih mreža i moćnim medijem kakav je internet.

Po izlasku iz pandemije izazvane korona virusom sve naučne oblasti biće pred izazovom da sagledaju negativne uticaje zarazne bolesti. Medicinska nauka prednjači sa istraživanjima i prvi rezultati istraživanja materijalizovani su u vakcinama, ključnom pronalasku za zaustavljanje pandemije. Paralelno sa poljem medicine rade se istraživanja u naučnom polju: ekonomije, psihologije, obrazovanja, sporta, turizma ali i komunikologije i etike što jeste predmet proučavanja ovog rada. U okolnostima pandemije mediji predstavljaju ključnu tačku u javnoj sferi sa obzirom na činjenicu, da postavljanjem određenog programa informisanja i prioriteta određenih pitanja, aspekata i aktera, grade okvir u kojem će se celokupna javnost odnositi prema najvažnijim pitanjima u vezi sa pandemijom. Mediji se u društvenim krizama nalaze na najisturenijim linijama odbrane demokratije jednog društva, gde su sloboda informisanja i pravo javnosti da "zna" neki od ključnih postulata demokratije. Važnost slobodnog pristupa informacijama nije odmah u startu prepoznata od strane vladajućih društvenih struktura, što je rezultiralo odlukum Vlade Srbije od 28. marta da usvoji Zaključak kojim se centralizuje informisanje u vezi sa pandemijom, a zatim je ova odluka ubrzo povučena. Godinu dana kasnije može se postaviti pitanje da li bi ova odluka možda bila ispravna u svetlu sprečavanja "Infodemije" čiji je rezultat, javnost izložena brojnim spekulacijama, dezinformacijama, teorijama zavere, što sve dovodi do jednog novog nivoa krize i nepredvidivog ponašanja javnosti, kome će verovati, koga će poslušati, da li će se vakcinisati, da li će poštovati propisane mere zaštite ili neće.

Prema jednom od prvih medijskih istraživanja Rojtersa, ljudi su se okrenuli više klasičnim medijima kada je u pitanju informisanje. Sa druge strane upravo ti klasični mediji označeni su u Ebartovom izveštaju iz maja 2020., ključnim krivcem za dominacijom političkog nad medicinskim u vreme zdravstvene krize, odnosno, mediji nisu uzimali u obzir nerelevantnost političkih aktera da tumače medicinske aspekte zdravstvene krize. Prema rezultatima ovog istraživanja interpretacija najrazličitijih aspekata pandemije bila je definisana zvaničnim gledištem, dok je glas građana i medicinskih radnika koji su se na terenu borili sa krizom, bio u velikoj meri ili u potpunosti zanemaren (Ebart, 2020). Klasični mediji nisu jedini ponuđeni

izvor informisanja od strane nadležnih državnih institucija, tako Ministarstvo zdravlja republike Srbije postavlja i nudi niz kontakt centara i internet platformi za informisanje građana o "COVID – 19". Ustanovljen je telefonski broj (19819) gde građani mogu dobiti savete i preporuke stručnjaka u borbi protiv korona virusa, zatim broj za pomoć starim licima (19920), oformljena je automatska viber aplikacija sa proverenim informacijama COVID 19, zatim internet stranica www. covid19.rs, pokrenuta je platforma za prijem volontera za pomoć starim licima u krizi: **www.budivolonter.gov.rs** i platforma za zaštitu građana od nezakonitog dizanja cena medicinske opreme i zaštitnih sredstava, www.inspektor.gov.rs. Ovi zvanični kanali ponuđeni su na tržištu informacija sa brojnim štampanim medijima, koji su (Blic, Danas, Informer, Kurir, Politika, Večernje novosti) prema Ebartovom izveštaju za četiri meseca, uspeli da objave 1.609 tekstova o korona virusu, tri televizije koje su činile uzorak istraživanja TV RTS, TV Pink i TV N1, objavile su 376 priloga. Koristeći rezultate Ebartovog istraživanja dolazimo do broja od 1.985 objavljenih informacija o koroni, a cilj ovog kvantitativnog prikazivanja broja jeste da se ukaže da prekomerne informacije mogu da izazovu zagušenost istim, dezinformisanost ali i dezorijentisanost u verovanjima, ponašanjima, odlukama i svim bitnim životnim aktivnostima u vreme krize.

Dok se javnost borila za pravu informaciju u moru ponuđenih medija i kanala, medicinska struka je ispitivala granice svoje individualne, profesionalne etičnosti. Tokom juna 2020. godine, objavljeno je saopštenje pravičnosti etičkih odluka u odnosu raspodele medicinskih resursa unutar pandemije COVID 19 (Raffay et alia, 2020). Sveopšti etički principi, kao što su maksimalni benefit i jednakost lečenja, uz davanje prioriteta onima sa najtežim stanjem je stvorilo potrebu stvaranja preporuka u etici koje su vezane za raspodelu medicinskih resursa u COVID-19 pandemiji. Grupa medicinskih naučnika je objavila šest načela koja se odnose na maksimalizovanje benefita, davanja prednosti zdravstvenim radnicima, na trijažu van okvira osnove "prvog stizanja", reagovanja na nalaze, prepoznavanje učešća u istraživanjima i primenu istovetnih principa kako kod COVID-19, tako i kod non-COVID-19 pacijenata. Prvi ustanovljeni etički princip odnosi se na maksimilizaciju benefita lečenja gde se jedan zauzeti princip mora dosledno primenjivati. Stručnjaci zaključuju da limitiranost vremena i informacija u COVID-19 pandemiji čini opravdano davanje prednosti tome da se maksimalizuje broj preživelih pacijenata uz razuman životni vek, uz maksimalno poboljšanja dužine života kao podređenog cilja, gde bi prioritet trebalo usmeriti na povećanje broja pacijenata koji će preživeti tretman sa razumnim životnim vekom. Primena vrednosti maksimalizacije benefita lečenja značila bi, da ljudi koji su oboleli, ali sa šansom da se oporave imaju prioritet nad onima koji se ne bi oporavili uprkos tretmanu. To bi značilo da se lekari nalaze pred izuzetno teškim etičkim odlukama gde pacijenta sa manje šansi za preživljavanje treba povući sa respiratora i dati šansu pacijentu sa većim izgledima za preživljavanjem.

Drugi etički princip naveden u saopštenju ili preporuka pod brojem dva, kaže da medicinski radnici trebaju imati prioritet u svim terapijskim postupcima vezano za COVID- 19, jer su upravo oni ti koji omogućavaju da sistem funkcioniše i da ukupna smrtnost bude manja. Treća preporuka ili etički princip odnosi se na važnost metode slučajne raspodele pacijenata za vreme pandemije, gde princip „ko prvi dođe" treba biti zamenjen principom lutrije, slučajnog izbora u okviru iste kategorije pacijenata, bez obzira ko živi bliže ustanovi, a ko dolazi iz udaljenih krajeva.

Četvrta preporuka je vezana za određivanje prioriteta koji bi se trebali razlikovati u odnosu na intervencije i podložni su promenama naučnih dokaza. Kao primer ovog etičkog principa data je činjenica da prednost pri vakcinaciji imaju stariji u odnosu na mlađe. Peti etički princip saopštenja odnosi se na ljude koji učestvuju u istraživanju efikasnosti i bezbednosti vakcina i koji bi trebalo imati prioritet u lečenju i intervencijama vezanih za COVID – 19. Ističe se da njihova izloženost riziku za opštedruštvenu dobrobit mora biti nagrađena. Šesti značajan etički princip ističe da ne bi trebala postojati razlika u podeli oskudnih resursa između bolesnika sa

COVID-19 i onih koji boluju od drugih bolesti. Ukoliko COVID-19 pandemija dovede do apsolutnog nedostatka svih sredstava, to će imati uticaj na sve pacijente uključujući one sa srčanim zastojem, malignitetom i drugim životno ugrožavajućim bolestima i stanjima koja zahtevaju urgentno medicinsko zbrinjavanje.

Stavljanje sveopštih etičkih principa u kontekst aktuelne pandemije od strane autora saopštenja imalo je za cilj da podstakne nadležne institucije da napišu uputstva i daju smernice nadležnih tela iz ove oblasti za situacije od vitalnog značaja. Nadležne institucije javljaju se kao odgovorne i u prethodnom kreiranju informacija u krizi pandemije ka građanima. Specifičan odnos države, političkih struktura, medicinske struke, drugih relevantnih aktera i samih medija, definisao je uslove za javno informisanje u vezi sa pandemijom u Republici Srbiji. Cilj ovog rada jeste da ukaže na sve relevantne faktore „infodemije" i „neetičnosti" izveštavanja i ponašanja ali etika kao nauka o moralu, mora ukazati da se rešenja nalaze i izvan institucija, van načela obaveznosti, a u načelima usvojenih standarda ponašanja, vrednosti i savesti. Tamo gde pravo ne stiže da reguliše odnose u ljudskoj zajednici nastupaju moralni zakoni. Sa obzirom na to da se živi u dobu potrošačkog društva, izvanrednog tempa, sjajnih tehničkih ostvarenja i otkrića, sve to novo čoveku donosi nove probleme i etička dimenzija čovekove ličnosti sve češće traži odgovor o smislu čovekovog bitisanja. Dehumanizovani odnosi u savremenom društvu tiču se svih društvenih aktera ali posebno medicinskih radnika koji osim stručne pomoći, bolesnom čoveku trebaju pomoći da vrati veru u ljude i nadu u dobrobit međuljudskog komuniciranja. Međutim i medicinski radnici su deo potrošačkog društva, zahvaćeni su groznicom posrednog komuniciranja, u struci kroz savremenu visokotehnologiziranu medicinu i izvan struke kroz sva dostupna najnovija komunikaciona sredstva današnjice. Rezultat svih ovih procesa jeste da se čovek alijenira, nastavlja se proces dehumanizacije pojedinca, društva u celini i medicine kao njegove najhumanije oblasti.

Jedna od prvih asocijacija kod današnjeg čoveka kada se govori o etici i medicini svakako je Hipokratova zakletva. To je opravdana situacija jer on zapravo i jeste osnivač medicinske etike. Pre njega svi odnosi bolesti i zdravlja pa i etički razmatrani su iz ugla magije, bazirani su na animizmu i na primitivnom mišljenju koje meša uzroke i posledice. Hipokratova zakletva nesumnjivo predstavlja začetak svetog principa medicinskog poziva: primum non (nil, nihil) nocere – najvažnije je ne naškoditi bolesniku (Nenadović, 2007). Hipokratova zakletva bavi se obavezama prema bolesniku i kolegama, a ne prema društvenoj zajednici što je danas u punom jeku globalizacije nezamislivo. U izvornom tekstu Hipokratove zakletve, medicinski radnici se kunu bogovima i vračkim kraljevima, Apolonom, Asklepijem, Higijejom i Panakejom da će se držati svih zakletva i obaveza. Od Hipokratove zakletve, četiri stotine godina pre nove ere pa do današnjih dana, medicinska profesija se razvijala oslanjajući se na dva bitna stuba, jedan je visoka stručnost i razvoj medicinske nauke, a drugi je visoka etičnost i načelo humanosti. Paralelno sa razvojem medicine kao nauke nastajala su i nova dokumenta o lekarskim dužnostima. Filozof Seneka pisao je o negativnom i pozitivnom tipu lekara ističući još na samom početku nove ere, značaj kvaliteta lekara kao čoveka i njegovog značenja za pozitivan uticaj na bolesnika. O nadčovečanskoj veštini lečenja pisao je i čuveni pisac i lekar Skribonijas Largus, a izgradnji moralnog lika medicinske sestre nemerljivi doprinos dala je širom sveta poznata utemeljivačica sestrinstva Florens Najtingejl, apostrofirajući da je za profesiju medicinske sestre najbitnije ispuniti dva uslova: medicinske veštine za dobro poznavanje nege bolesnika i moralnu zrelost.

Teško je razmatrati savremene trendove u etičkim kodeksima aktuelne društvene zajednice, profesija i pojedinaca, a da se ne napravi kratak istorijski osvrt na utemeljivače i osnovni tok razvoja. Brojne epohe i događaji gradili su pravila i kodekse ponašanja zdravstvenih radnika i ostalih članova društva. Karantinske bolesti poput kuge, kolere, velikih boginja, tuberkoloze, vekovima su harale i nanosile velike gubitke ljudskim zajednicama. To su bili istorijski periodi u kojima su posebno testirana moralna ponašanja zdravstvenih radnika i koji su zahtevali

posebne psihološko – etičke analize. Javljali su se strahovi od bolesti koji su podizani na nivo panike, razna depresivna stanja bolesnika kao i razna rizična agresivna ponašanja bolesnika. Kao što su visoko zarazne bolesti ostavile traga na modeliranju etičkih kodeksa tako su i ratovi, najpre I i II Svetski rat nametali potrebu dopunjavanja i proširivanja pravila medicinskih radnika. Tako nastaje Ženevska revizija Hipokratove zakletve koja uvodi pravila jednakog pristupa prema svakom bolesniku bez obzira na veru, nacionalnost, rasu, pol, etničko poreklo, političku ili seksualnu orijentaciju ili socijalni status. Značajna novina je i osuda učešća zdravstvenih radnika u pronalaženju novih načina vođenja biološkog rata sa agresivnim tendencijama (Marić, 2002). Poseban novi momenat u istorijatu etičkih kodeksa, za današnje društvo, predstavlja Internacionalni kodeks lekarske etike koji posebno ističe neetičke radnje reklamiranja i publiciteta koje se obavljaju na nestručan način. Ukoliko se zna da je ovaj kodeks sa kraja 19. veka već sagledao moguće etičke dileme nastale eksplozijom sredstava masovne komunikacije, može se postaviti pitanje kako smo danas u 21. veku zapali u „infodemiju“ na medicinskom polju. Danas, kodeks medicinske etike lekarske komore Srbije, sadrži 84 člana i već u prvih deset nalaze se dva ključna za aktuelnu pandemiju. Član devet odnosi se na rad u vanrednim okolnostima i kaže da je lekar dužan da učestvuje u organizaciji i pružanju medicinske pomoći u slučaju vanrednih okolnosti, epidemija na prvom mestu, a zatim i masovnih nesreća, elementarnih i drugih nepogoda. Primenu člana devet, medicinske etike lekarske komore Srbije, lekari potvrđuju svakog dana, širom planete, u periodu od gotovo godinu dana. U svetlu širenja dezinformacija i raznih špekulacija, više treba obratiti pažnju na implementaciju člana deset od strane lekara ka javnosti, a tiče se: Staranja o zdravstvenom vaspitanju i zdravstvenoj kulturi: “ Lekar treba da utiče na razvoj zdravstvenog vaspitanja i zdravstvene kulture stanovništva, delujući na svom radnom mestu i u javnom životu. Lekar učestvuje u planiranju i sprovođenju mera za poboljšanje zdravlja, prevenciju bolesti, kao i u suzbijanju zaostalosti, praznoverja i nadrilekarstva “ (Sl.glasnik RS, br.104/2016). Postavlja se pitanje svrsishodnosti ovakvih članova kodeksa, koji apostrofiraju važnost suzbijanja praznoverja i nadrilekarstva, danas kada gotovo svih sedam milijardi ljudi na planeti mogu istovremeno da pošalju ili prime informaciju o bilo čemu preko bilo kog kanala ili putem jedne od društvenih mreža i to ne samo Facebook-a kako se obično misli, tu su i We Chat u Kini i delovima Azije, Instagram, Snapchat,Tumbir, LinkedIn, Whats Up, You Tube...da li je uopšte moguće u ovakvim sitacijama očekivati da u jeku pandemije lekari brinu o zdravstvenom vaspitanju i zdravstvenoj kulturi. Svakako treba ih postaviti u poziciju medicinskih influensera za suzbijanje praznoverja i nadrilekarstva ali težište problema „infodemije“ i njen uticaj na etičko i neetičko ponašanje svih pripadnika društvene zajednice, treba tražiti i u drugim uzrocima i faktorima.

Kada govorimo o etici i društvenim mrežama u vremenu aktuelne pandemije, treba naglasiti potrebu pomirenja starih tradicionalnih vrednosti i potpuno novih koji nastaju na svetskoj platformi i najmoćnijem mediju globalno, a to je internet. „Tradicionalne etičke norme potekle su iz običaja, kao i sama reč „etika“, i tiču se pojmova „moralno dobro“ i „vrlina“. Međutim, Internet je sam po sebi jedna veoma netradicionalna stvar, gledano kroz sve njegove aspekte – od infrastrukture i tehničkih standarda, preko pravnih i ekonomskih aspekata, sve do društvenih i kulturoloških posledica i promena koje je izazvao. Ljudi koji su osmisli i stvorili internet su sve drugo samo ne tradicionalisti” (Parčetić, Mitić, 2015: 1). Ono našta treba ukazati jeste da virtuelni svet nastaje po ugledu na realni svet, da on nije ni bolji ni gori i baš kao što u realnom svetu treba raditi na podizanju svesti i morala i njegovoj primeni u svakodnevnom životu u svim odnosima isto je i sa odnosima na internetu. Postavlja se pitanje da li treba uvesti određene etičke kodekse i na ovim polju, baš kao što je na polju medicine, uveden etički kodeks još od Hipokratovih davnih dana. Da li je sada momenat da Internet dobije neki takav svoj kodeks? Jedan od takvih kodeksa je svakako: Etički kodeks RNIDS (Registra nacionalnog internet domena Srbije) koji se nažalost odnosi samo na fizička i pravna lica koja su ugovorno

povezana sa RNIDS-om, a ne i na obične korisnike Interneta u Srbiji. Iako je kodeks obuhvatio veliki broj opštih i posebnih načela koja se odnose na ponašanja na internetu, od 2014., godine kada je donet, danas sedam godina kasnije, nema se utisak da je išta od proklamovanog u dokumentu i primenjenog popout načela: zabrane zloupotrebe internet domena radi lažnog predstavljanja i sajber kriminala, nepoštovanje autorskih i srodnih prava i intelektualne svojine, nepoštovanje zaštite privatnosti i bezbednosti korisnika interneta, kao i zloupotreba lakovernosti korisnika interneta u profitne svrhe. Jedan od ključnih problema jeste složenost globalne upravljivosti internetom. Jedan od autora Etičkog kodeksa RNIDS, Lazar Bošković daje slikoviti primer da lični nedolični sadržaj američkog građanina može stajati na sajtu nevladine antiglobalističke organizacije u Venecueli, a da je sajt hostovan na serveru u Kini, na pitanje ko je odgovoran, etički odgovor bi bio jednostavan ali pravno bi ovo bio nerešiv slučaj (Parčetić -Mitić, 2015). Zbog situacije nemogućnosti jednostavne pravne regulacije interneta i njene svetske, globalne primene, posebno treba raditi na formiranju, promociji i primeni etičkih kodeksa, koji nisu obavezujući ali koji su dragocena primena običajnog prava i morala kako u relanom svetu tako i na internetu, naročito u periodima kriznih vremena za društvo kakvo je danas za vreme pandemije izazvane COVID-om 19. Pojam „ Netiquette“, kovanica od engleskih reči „network“ i „etiquette“, mora dobiti adekvatan prevod, mesto, promociju i primenu i na prostoru srpske države i nacionalnog internet domena, kako bise sama reč „etika“ koja se tiče pojmova “moralno dobro“ i „vrlina“ urezala u sve realne ali i virtuelne društvene faktore u cilju smanjenja “infodemije” izazvane u svim oblastima, a naročito u oblasti zdravlja zbog neregulisanog protoka informacija, kako po pitanju forme, tako i sadržine.

ZAKLJUČAK

Na kraju kratkog osvrta na civilizacijske tekovine, kodekse medicinske etike, kodekse novinarske etike, kodekse internet dometa Srbije na jednoj strani i razvoja medicine kao nauke i svih informaciono – tehnoloških pronalazaka na drugoj strani, dolazimo do zaključka da današnje savremeno društvo nije bilo spremno da odgovori na sve posledice nepogode koja ga je zadesila u 21. veku u obliku COVID-a 19. Rezultat brzog razvoja informacionih tehnologija koji proizveo mogućnost da svi istovremeno budemo kreatori informacija i primaoci istih, doveo je do „infodemije“ . Došlo je do opšteg nepoverenja u etičnost i humanost pojedinca i društva. Ne može se osporiti da snaga prevazilaženja nepogoda i kriza u društvu jeste u podizanju morala i etike. Jedan deo rešenja jeste u vraćanju poverenja u ljude, a ljudima verujemo i slušamo ih ako verujemo u njihovo znanje i dobrotu, ako verujemo da nam žele dobro i da znaju kako da to učine, bilo da se radi o zaustavljanju zarazne bolesti ili o ekonomskom preporodu države.

Drugi deo rešenje vanrednih situacija i katastrofa sa velikim brojem povređenih ili u slučaju COVID – 19 zaraženih leži u pripremljenosti odgovornih institucija. Nacionalna strategija zaštite i spasavanja u vanrednim situacijama RS usvojena je 2011. godine, sa ciljem zaštite života, zdravlja, imovine građana, životne sredine i kulturnog nasleđa (Službeni glasnik br.86/1, 2011). Nacionalna strategija definiše i određuje nacionalne mehanizme koordinacije i smernice programa za smanjenje katastrofa uzrokovanih prirodnim pojavama i svih drugih nesreća, a Zakon o vanrednim situacijama iz 2009., definiše i sve ostale elemente neophodne za funkcionisanje sistema zaštite i spasavanja (Jevtić, Jevtić, 2017). Nakon godinu dana borbe sa COVID 19, može se zaključiti da zdravstveni objekti u vanrednim situacijama u Srbiji jesu organizovani i rade na tri različita nivoa u skladu sa uputstvima SZO, na primarnom, sekundarnom i tercijarnom. Na prvom nivou odvija se medicinska nega pre hospitalizacije, na drugom nivou je opšta bolnička nega u bolnicama i na trećem nivou je visokospecijalizovana nega u medicinskim centrima. Menadžment u vanrednim situacijama u zdravstvu kakva je i ova izazvana COVID-om 19, traži primenu i unapređenje svih faza. Na prvom mestu je faza

mitigacije ili ublažavanja, svih aktivnosti u cilju smanjenja opasnosti. Druga faza – pripremljenosti odnosi se na aktivnosti izgradnje kapaciteta za odgovor na društvenu nepogodu. Treća faza odgovora, odnosi se na reagovanje u toku krize i nakon nje. Četvrta faza ovog menadžmenta koja će uslediti po završetku pandemije izazvane COVID-om 19., jeste faza oporavka, sa ciljem da se subjekat vrati u uobičajno stanje ili stanje „nove normalnosti". Ono što je COVID – 19 apostrofirao jeste i postojanje „virtuelne realnosti" što će takođe morati da postane deo menadžmenta u vanrednim situacijama, deo nacionalnih strategija zaštite i spasavanja u vanrednim situacijama baš kao i deo etičkih kodeksa. Trenutno je javnost svedok sudara jedne realne društvene krize koja se snažno reflektuje na virtuelnu stvarnost koja dodatno otežava rešavanje krizne situacije. Ne-etika na srpskom delu interneta rezultat je skoro dve decenije negovanja nekulture internet galamdžija „čija se jedina stručnost ogleda u brzim rukama na tastaturi, brzom prihvatanju naopakih pogleda na svet i brzoj internet zaradi bez obzira na legalnost posla" (Parčetić, Mitić, 2015:2). Na javni diskurs u Srbiji za vreme COVID – 19 snažno utiču brojne neetičke pojave na internetu poput domejnera, botova, trolova, spamera, hejtera i spin doktora. Da li je moguće i do koje mere kontrolisati ovakve neetičke pojave, vreme će pokazati. Aktuelna kriza izazvana COVID-om 19., možda je upravo ključni istorijski momenat, gde će ovaj segment biti mnogo ozbiljnije razmatran kako u pravcu podizanja nivoa svesti i etičke odgovornosti pojedinaca u plasiranju informacija, tako i o pravnim okvirima i nacionalnim strategijama virtuelnog i informacionog dela stvarnosti.

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ROLE AND IMPORTANCE OF HEALTH FITNESS IN PREVENTION OF OBESITY DURING COVID-19 PANDEMIC

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Abstract: As a relatively young area that represents a synthesis of modern scientific knowledge and achievements in the field of medicine on the one hand and physical culture on the other, health fitness found its place during the COVID19 pandemic. Bearing in mind that during the pandemic, and especially during curfew, most people were forced to reduce the amount of movement to a minimum, the fact that the number of obese people increased is not surprising. One of the modalities of physical activity that has been successfully applied during the curfew with the aim of preventing obesity is the application of circuit training at home without devices and props, except for the exercise mat. The mentioned model of physical activity was realized through the Cisko Webex application. The program involved 40 respondents divided into 2 groups of 20 respondents aged 30 to 45, including people of both sexes, who are healthy and who regularly engaged in various forms of physical activity before the pandemic, so they chose this program to avoid gaining body weight due to absence of exercising. The program was realized 3 times a week, on Mondays, Wednesdays and Fridays in the period from 19.00 to 20.30. The program included conducting a circuit training, where the practitioners performed a set of 10 to 12 exercises in 3 to 4 rounds. Exercises involving agonists and antagonists were performed alternately. In terms of dosing the load, the person who led the program also took into account the subjective assessment of the practitioners. A special indicator of the physiological response of the trainees to the given training loads is the heart rate, which the practitioners controlled by the palpation method. After the circuit training, circuit activities were realized in the lower training zones, i.e. at a heart rate of about 60% of the maximum heart rate. Each workout began with a warm-up and ended with a stretch. After the end of the 3-month program, all the practitioners felt well, had no injuries caused by training and were satisfied with the maintained body weight, which can be attributed to this physical activity, which is designed so that it can be carried out at home without investing money into devices and props. All of the above indicates that the offered training concept was a good solution in terms of maintaining body weight and that the results obtained justified its purpose. For these reasons, health fitness should play an even more important role in both regular and extraordinary life circumstances, as was the case during the COVID-19 pandemic.

Keywords: pandemic, physical activity, obesity, circuit training, dosage

ULOGA I ZNAČAJ ZDRAVSTVENOG FITNESA U PREVENCIJI GOJAZNOSTI TOKOM PANDEMIJE VIRUSA COVID 19

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Sažetak: Zdravstveni fitnes kao relativno mlada oblast koja predstavlja sintezu savremenih naučnih saznanja i dostignuća iz oblasti medicine sa jedne strane i fizičke kulture sa druge strane pronašla je svoje mesto tokom pandemije virusa Covid 19. Uvažavajući činjenicu da je tokom pandemije, a pogotovu za vreme trajanja policijskog časa kod najvećeg broja osoba

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količina kretanja svedena na minimum ne iznenađuje povećanje broja gojaznih osoba. Kao jedan od modaliteta fizičke aktivnosti koji je uspešno primenjen i tokom trajanja policijskog časa sa ciljem prevencije od gojaznosti je primena kružnog metoda treninga u kućnim uslovima bez sprava i rekvizita izuzev prostirke za vežbanje. Navedeni model fizičke aktivnosti realizovan je putem aplikacije Cisko Webex. U programu je učestvolao 40 ispitanika podeljenih u 2 grupe po 20 ispitanika starosti od 30 do 45 godina, oba pola, koji su zdravi i koji su se pre pandemije redovno bavili različitim oblicima fizičke aktivnosti, pa su se za ovaj program odlučili kako im se zbog odsustva treninga ne bi uvećala telesna masa. Program je realizovan 3 puta nedeljno, ponedeljkom, sredom i petkom u periodu od 19.00 do 20.30h. Program je podrazumevao sprovođenje kružnog treninga, pri čemu su vežbači set od 10 do 12 vežbi izvodili u 3 do 4 kruga. Naizmenično su bile realizovane vežbe koje angažuju agonoste i antagoniste. U pogledu doziranja opterećenja osoba koja je vodila program u obzir je uzimala i subjektivnu procenu vežbača. Poseban pokazatelj fiziološkog odgovora vežbača na zadata trenažna opterećenja je i srčana frekvencija koju su vežbači kontrolisali palpatornom metodom. Nakon sprovedenog kružnog metoda realizovane su ciklične aktivnosti u nižim trenažnim zonama tj. na srčanoj frekvenciji oko 60% od maksimalne srčane frekvencije. Svaki trening počinjao je zagrevanjem, a završavao se rastezanjem. Svi vežbači nakon završetka programa od 3 meseca dobro su se osećali, nisu imali povrede izazvane treningom i zadovoljni su bili zbog očuvanja telesne mase što se može pripisati navedenoj fizičkoj aktivnosti, a koja je koncipirana tako da se može sprovoditi u kućnim uslovima bez materijalnih ulaganja u sprave i rekvizite. Sve navedeno ukazuje da je ponuđeni trenažni koncept bio dobro rešenje u pogledu očuvanja telesne mase i da je dobijenim rezultatima opravdao svoju svrhu. Iz navedenih razloga zdravstveni fitnes treba da zauzme još značajnije mesto kada je u pitanju njegova uloga kako u redovnim, tako i u vanrednim životnim okolnostima kao što je bio slučaj tokom pandemije virusa Covid 19.

Ključne reči: pandemija, fizička aktivnost, gojaznost, kružni trening, doziranje

UVOD

Sa napredovanjem tehnologije i automatizacijom mnogobrojnih sredstava čovek savremenog sveta se pretvorio u pretežno sedentarno biće. Potreba čoveka da se fizički angažuje se znatno smanjila, usled čega se smanjila i njegova fizička radna sposobnost, što je postepeno doprinelo nastanku degenerativnih oboljenja kostiju i zglobova, telesnih deformiteta, gojaznosti, povišenog krvnog pritiska, bolesti srca i mozga itd. Savremena medicina ih kategoriše kao hronične nezarazne bolesti, a kao jedan od glavnih uzroka ovih bolesti navodi hipokineziju, koja se definiše kao nedovoljna količina kretanja tj. količina kretanja koja je hronično ispod praga nadražaja neophodnih za održavanje funkcionalnih kapaciteta organizma. Pored hipokinezije, kao glavni uzročnici tu su još neodgovarajuća ishrana, kao i prolongirani psihički stres.

Kako bi štetne posledice nedovoljne količine kretanja uklonio ili barem ublažio, savremeni čovek je primoran da se dodatno fizički angažuje van uobičajenih dnevnih aktivnosti, koje su zbog tehnološki olakšanog života količinski nedovoljne da bi se zadovoljila optimalna telesna potreba za energetskom potrošnjom putem mišićnog rada održavajući tako funkcionalnost telesnih sistema poput lokomotornog, kardiovaskularnog, respiratornog, nervnog i drugih. To dodatno fizičko angažovanje danas se najčešće sprovodi u slobodnom vremenu kroz ciljano, grupno ili samostalno, učešće u organizovanim, raznovrsnim oblicima fizičkih aktivnosti koje su na raspolaganju i koje imaju prevashodno za cilj poboljšanje opštih fizičkih sposobnosti organizma tj. povećanje nivoa fizičke radne spremnosti pojedinca. Na taj način sprečava se

nastanak mnogih bolesti modernog doba izazvanih sedentarnim načinom života, a takođe se vrši i afirmacija pozitivnih životnih vrednosti i stremljenja.
Rekreativno vežbanje prisutno je svugde u svetu. Svakim danom niče sve veći broj klubova koji pruža neki vid rekreacije sve većem broju zainteresovanih. Zbog razvoja tehnologije čovek dobija sve više slobodnog vremena koji, ako ne koristi za aktivnost brzo dovodi do pogoršanja zdravlja.
Bolesti nekretanja se najčešće javljaju u razvijenim zemljama u urbanim sredinama, ali sve je veći porast i u nerazvijenim zemljama. Kroz istoriju ljudi su primetili vezu između vežbanja i zdravlja. U današnje vreme sve češći su saveti lekara da se održava određeni nivo fizičke aktivnosti. Efekti fizičke aktivnosti na organizam u cilju prevencije mnogih bolesti su česta tema različitih istraživanja. U odnosu na lečenje po skupim medicinskim centrima fizička aktivnost je izuzetno jeftina. Sve veća ekspanzija vežbanja okrenutog ka zdravlju je dokaz koliko je ljudi shvatilo da sami mogu da utiču na svoje zdravlje.
Fizička aktivnost značajan je činilac zdravog načina života koji može uticati na prevenciju pojave različitih oboljenja i do 50%. SZO je u nekoliko navrata upućivala otvoreno pismo svim vladama sveta u kome je ukazivala na veliki značaj redovne fizičke aktivnosti za ukupno zdravlje populacije. Tom prilike definisane su i kategorije građana koje su posebno ugrožene nedovoljnom fizičkom aktivnošću i za koje bi trebalo da se napravi posebna strategija vežbanja radi zdravlja.
Posebno ugrožene kategorije građana su: deca, adolescenti, osobe izložene stresnim situacijama, osobe trećeg doba, osobe koje boluju od hroničnih nezaraznih bolesti (hipertenzija, gojaznost, dijabetas melitas, osteoporoza…) Bez obzira na životni vek ili uslove rada, svakom čoveku je potrebna redovna fizička aktivnost radi očuvanja zdravlja.
Podaci SZO ukazuju na brojne pozitivne efekte koji se postižu kroz redovnu fizičku aktivnost. Za oblast fizičke kulture je značajno što o tome govore istraživači iz oblasti medicine i to da oni ukazuju na neophodnost umerene fizičke aktivnosti. Analizirajući dejstvo redovne fizičke aktivnosti, lekari, a posebno fiziolozi, ukazuju da je u pitanju dozirana fizička aktivnost, u aerobnoj zoni rada, a da prevelika opterećenja u zoni vrhunskog sporta mogu da stvore određene rizike. Nesporni su pojedini efekti redovne fizičke aktivnosti na psihološkom planu. Evidentno je smanjenje anksioznosti i depresije, što povoljno utiče na raspoloženje, životnu vedrinu i ukupno stabilnije psihološko stanje. Verovatno da deo odgovora leži u lučenju endorfina koji se javlja tokom fizičke aktivnosti. Redovna fizička aktivnost podiže prag reagovanja na stres i olakšava oporavak iz stanja koje izazivaju stresne situacije.
Imajući u vidu sve navedeno kao i činjenicu da je pandemija virusa Covid 19 koja je u prethodnom periodu proizvela vidne „turbulencije“ u pogledu skoro svih životnih segmenata, jasno se može zaključiti da su rekreativci tokom pandemije, a pogotovu tokom trajanja vanrednog stanja i policijskog časa bili prinuđeni da iznalaze drugačije trenažne koncepte kako bi bili u prilici da i dalje upražnjavaju redovnu fizičku aktivnost. Iz tog razloga, cilj ovog rada bio je predstavljanje programa prevencije gojaznosti tokom pandemije virusa Covid 19, kao i uloga i značaj zdravstvenog fitnesa tokom vanrednog stanja.

METOD

U radu je korišćena bibliografsko spekulativna metoda. Navedenom metodom prikupljeni su podaci iz relevantnih bibliografskih izvora koji su u sintezi sa dosadašnjim iskustvima autora i aktuelnim okolnostima interpretirani i u ponuđeni kao konkretna rešenja.

DISKUSIJA O ZNAČAJU ZDRAVSTVENOG FITNESA TOKOM PANDEMIJE VIRUSA COVID 19

U programu koji je trajao tri meseca, a koji imao za cilj očuvanje telesne mase učestvolao 40 ispitanika podeljenih u 2 grupe po 20 ispitanika starosti od 30 do 45 godina, oba pola, koji su zdravi i koji su se pre pandemije redovno bavili različitim oblicima fizičke aktivnosti. Ispitanici su podeljeni u dve grupe isključivo zbog jednostavnijeg praćenja trenažnih aktivnosti na monitoru imajući u vidu da je kompletan program realizovan onlajn metodom preko interneta. Program je realizovan tri puta nedeljno sa razmakom između treninga od minimum 48 sati kako bi se vežbači što bolje oporavili. Cilj oporavka je uspostavljanje homeostaze, tj. Vraćanja sposobnosti na početni nivo (Koprivica, 2002). Treninzi trajali 90 minuta. Svaki trening imao je standardnu strukturu: uvodni glavni i završni deo (Vasović, 2016). Sa aspekta organizacije rada na treningu program je realizovan primenom kružnog metoda. Kružni metod podrazumeva izvođenje nekoliko krugova na treningu pri čemu se svaki krug sastoji od nekoliko vežbi, pri čemu se u svakom krugu radi po jedna serije od svake vežbe (Stojiljković i sar., 2012). Vežbači su set od 10 do 12 vežbi izvodili u 3 do 4 kruga. Naizmenično su bile realizovane vežbe koje angažuju agonoste i antagoniste. U pogledu doziranja opterećenja osoba koja je vodila program u obzir je uzimala i subjektivnu procenu zamora vežbača. Imajući u vidu da su vežbači vežbali kod kuće te da nisu koristili nikakve sprave i rekvizite izuzev prostirke za vežbanje, poseban problem predstavljala je mogućnost promene opterećenja u okviru svake vežbe ponaosob. Promena veličine opterećenja za svaku vežbu nezavisno od mase vežbača realizovana je na sledeće načine:

- Promenom tačke oslonca (promena segmenta tela kojim se vrši oslanjanje);
- Promene položaja tački oslonca (promena razdaljine između tački oslonca);
- Promenom visine oslonca (smanjenje ili povećanje visine površine oslonca, čime se menja ugao koji telo pravi u odnosu na tlo);
- Prebacivanjem težišta tela (neravnomerno raspoređena težina tela na tačkama oslonca);
- Promenom broja tački oslonca (smanjenje ili povećanje broja oslonaca).

Nakon sprovedenog kružnog metoda treninga realizovane su ciklične aktivnosti u nešto nižim trenažnim zonama tj. na srčanoj frekvenciji oko 60% od maksimalne srčane frekvencije. Navedeno opterećenje je prema Bergovoj skali subjektivne procene zamora označeno 11 stepenom i nalazi se između kategorije „umereno lagano“ i „umereno teško“ (Dikić i Živanić, 2003). Vežbači su puls nakon svake ciklične aktivnosti kontrolisali palpatornom metodom.

ZAKLJUČAK

Može se konstatovati da je opisani rekreativni program realizovan onlajn metodom postigao svoj cilj i opravdao svrhu imajući u vidu da su se svi vežbači nakon završetka programa od 3 meseca dobro osećali, nisu imali povrede izazvane treningom, a telesna masa u navedenom periodu im se nije uvećala. Sve navedeno ukazuje da je ponuđeni trenažni koncept dobro rešenje u pogledu očuvanja telesne mase kada je u pitanju vežbanje u kućnim uslovima, pri čemu se dobijeni rezultati mogu objasniti dobro izbalansiranim odnosom vežbi u parteru sa sopstvenom težinom sa jedne strane, kao i cikličnim aktivnostima umerenog intenziteta sa druge strane. Respektabilna energetska potrošnja koja je izazvana navedenim trenažnim konceptom obezbedila je da ne dođe do uvećanja telesne mase vežbača koju su imali pre pandemije virusom Covid 19 kada su isti ti vežbači pohađali svoje ustaljene rekreativne sadržaje. Iz svega navedenog može se zaključiti da su rekretivni programi koji bi se realizovali onlajn metodom u kućnim uslovima, pod uslovom da ih koncipira i vodi edukovana osoba dobro rešenje u vanrednim okolnostima i pored činjenice da ovakvi programi imaju određene

nedostatke (nemogućnost preciznog doziranja opterećenja, odsustvo instruktora koji bi na licu mesta korigovao vežbaču prilikom lošeg izvođenja vežbe...).

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THE IMPORTANCE OF EXCERCISE AFTER BIRTH DURING THE COVID-19 PANDEMIC

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Abstract: Continuous physical activity after childbirth is often absent, due to the new living conditions of the mother, however, exercising and physical activity during this period has significant health benefits for both mother and her newborn. As a result of the COVID-19 pandemic, with the imposed measures and restrictions that resulted from reducing the rate of virus infection, mothers experienced disturbances not only in everyday life but also in their experience regarding their health and the health of their newborn, which affected that when how and why they can engage in physical activity. From these facts arises the subject of this paper which deals with the importance of physical activity after childbirth during the COVID-19 pandemic. The content analysis method was used to study the literature and papers which deals from the differnt aspects with the activities of women in the postpartum period before and during the COVID-19 pandemic, while the descriptive method provided a concrete factual presentation of the most significant effects of physical activity on women's health after childbirth. The aim of this paper is to point out the needs of conducting physical activity after childbirth in living conditions during the COVID-19 pandemic, as well as ways to overcome the challenges and obstacles that prevent mothers in such conditions to be physically active as much as they need and want. The birth of a child is an event that significantly affects the life of the mother and the whole family, and many women talks about how difficult it was for them to adapt to all the changes that occurred after the birth. (Saligheh et al., 2016). The days and weeks that follow the birth of a woman - the postpartum period, are a critical phase in the life of mothers and newborns. During this period, adequate care and worry for mothers health is necessary. In one recent study, Evenson et al showed that the main effects of exercise after childbirth are reflected in improved mental health and mood, emotional well-being, and a reduction in depression and anxiety (Evenson et al., 2014). Due to the COVID-19 pandemic, all living conditions have changed. What has proven to be an advantage in such situations is the rapid transition of the fitness industry to online ways of training, which has made for mothers to have a greater choice of programs that are specific to that period, without leaving home or family. Working from home also allowed some mothers better flexibility in their daily exercise schedule. Some research on the topic of exercising at home has shown that mothers find this useful both for their mental health and for the limitations in finding time to exercise (Teychenne et al., 2018). In conclusion, the changes that occur in such conditions of crisis in people's lives can open opportunities for new ways of overcoming obstacles through greater acceptance and use of internet content and facilitating life at home with the aim for the physical activity of the whole family as much as possible. So in such life situations it is very important to take advantage of these short-term changes in long-term benefits, especially among such specific populations as mothers, who can benefit most from such an approach.

Keywords: exercise, physical activity, postpartum period, covid-19 pandemic

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ZNAČAJ VEŽBANJA NAKON POROĐAJA TOKOM COVID-19 PANDEMIJE

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Sažetak: Kontinuirana fizička aktivnost nakon porođaja često izostaje, zbog novonastalih uslova života majke, međutim upražnjavanje fizičke aktivnosti tokom tog perioda ima značajne zdravstvene benefite kako za majku tako i za novorođenče. Kao rezultat COVID-19 pandemije uz nametnute mere i ograničenja koja proizašla iz toga za smanjenje stope zaraze virusom, porodilje su iskusile remećenje ne samo u svakodnevnom životu već i u svom iskustvu po pitanju svog zdravlja i zdravlja svog novorođenčeta što je uticalo na to da kada, kako i zašto mogu da se bave fizičkom aktivnošću. Iz ovih činjenica proizilazi i predmet ovog rada koji se bavi značajem fizičke aktivnosti nakon porođaja tokom COVID-19 pandemije. Metoda analize sadržaja korišćena je za proučavanje literature i radova koja se sa različitog aspekta bavi aktivnostima žena u postporođajnom periodu pre i tokom COVID-19 pandemije, dok je deskriptivom metodom omogućen konkretan činjenički prikaz o najznačajnijim efektima fizičkih aktivnosti na zdravlje žena nakon porođaja. Cilj ovog rada je da ukaže na potrebe sprovođenja fizičke aktivnosti nakon porođaja u uslovima života tokom COVID-19 pandemije, kao i na načine svladavanja izazova i prepreka koje onemogućavaju u takvim uslovima porodiljama da budu fizički aktivne onoliko koliko bi to bilo potrebno i koliko bi želele. Samo rođenje deteta je događaj koji utiče značajno na život majke i cele porodice i mnoge žene govore o tome kako im je bilo teško da se prilagode svim promenama nastalim nakon porođaja. (Saligheh et al., 2016.). Dani i nedelje koji slede nakon porođaja žene - postporođajni period, jesu kritična faza u životu majki i novorođenčadi. Tokom ovog perioda neophodna je adekvatna nega i briga za zdravlje porodilje. U jednom o novijih istraživanja, Evenson i saradnici pokazali da su glavni efekti vežbanja žena nakon porođaja ogledaju u poboljšanju mentalnog zdravlja i raspoloženja, emocionalnom blagostanju te smanjenju depresije i anksioznosti (Evenson et al., 2014). Usled COVID-19 pandemije svi uslovi života su se promenili. Ono što se pokazalo kao prednost u ovakvim situacijama, jeste brzi prelazak fitnes industrije na onlajn načine treniranja, što je učinilo da porodilje imaju veći izbor programa koji su specifični za taj period, bez da napuste kuću ili porodicu. Rad od kuće omogućio je pojedinim majkama i bolju fleksibilnost u svom dnevnom rasporedu za vežbanje. Neka od istraživanja na temu vežbanja kod kuće pokazala su da porodilje ovo smatraju korisnim kako za svoje psihičko zdravlje tako i za ograničenja u nalaženju vremena za vežbanje (Teychenne et la., 2018). Kao zaključak se nameće da promene koje nastupaju u ovakvim uslovima kria u životima ljudi, mogu otvoriti prilike za nove načine pravazilaženja prepreka kroz veće prihvatanje i upotrebu internet sadržaja i olakšavanje života u kući sa ciljem što većeg upražnjavanja fizičke aktivnosti cele porodice. Tako da je u ovakvim životnim situacijama veoma važno iskoristiti ove kratkoročne promene u dugoročne benefite, posebno među ovakvim specifičnim populacijama kakve su porodilje, koje od takvog pristupa mogu najviše imati koristi.

Ključne reči: vežbanje, fizička aktivnost, postporođajni period, covid-19 pandemija

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UVOD

Od kako je krajem 2019. godine prvi put prepoznat teški akutni respiratorni sindrom koronavirus 2 (SARS-CoV-2), virus se veoma brzo proširio u svim zemljama sveta. U martu 2020. proglašena je zvanična COVID-19 pandemija. Da bi se sprečilo brzo širenje ovog virusa i da se ublaže njegovi razorni efekti, u većini zemalja širom sveta primenjene su različite mere zaštite. To je rezultiralo preporukom izbegavanja socijalnog kontakta licem u lice i ostajanjem kod kuće, uz izlaženje samo iz bitnih razloga. Kako ovaj virus izaziva ozbiljne zdravstvene posledice, trudnicama i porodiljama koje su u tom trenutku spadale u rizičnu grupu, savetovano je da se pridržavaju ovih mera. Radi utvrđivanja posledica socijalne distance i izloacije, neka od najranijih istraživanja u ovom periodu ukazuju na brojne štetne posledice među trudnicama i porodiljama, koje uključuju porast anksioznosti, depresije i smanjene fizičke aktivnosti (Davenport et al., 2020). U korist značaju fizičke aktivnosti u ovom teškom periodu za ovu populaciju, ista studija sugeriše da žene koje su ispunile smernice od najmanje 150 minuta nedeljno fizičke aktivnosti umerenog intenziteta, značajno su bile manje anksiozne i depresivne u ovom periodu, u odnosu na žene koje nisu. Svakako fizička aktivnost ima pozitivan i zaštitni efekat podjednako na mentalno i fiziško zdravlje kako opšte populacije tako i populacije majki (Atkinson et al., 2020). Fizička neaktivnost je jedan od faktora rizika za ozbiljno oboljevanje ili smrt usled COVID-19 virusa (Hammer et al., 2020). Rezultati ovakvih istraživanja sugerišu da je fizička aktivnost među populacijom majki poželjna, ali je takođe i izazov kako je sprovesti, a ne ugroziti zdravlje ove populacije u uslovima ciljanog smanjenog kretanja tokom COVID-19 pandemije. Zatvaranje teretana, fitnesa i rekreativnih centara, smanjena mogućnost aktivnijeg putovanja na posao, ograničenja u kretanju zbog rapidnog širenja virusa, uticalo je na smanjenje određenih načina vežbanja. Takođe, zatvaranje vrtića i škola i boravak dece kod kuće, otežalo je roditeljima sprovođenje programirane fizičke aktivnosti u okviru i van svojih domova. Međutim, i bez obzira na ograničeno kretanje usled zaštitnih mera, vežbanje i programirana fizička aktivnost nikada nije bila dostupnija putem online platformi, što je donelo i otkrilo nove mogućnosti za podršku porodiljama da budu dovoljno aktivne i u periodu pandemije. Iz ovih činjenica proizilazi i predmet rada koji se bavi značajem fizičke aktivnosti nakon porođaja tokom COVID-19 pandemije. Cilj ovog rada je da ukaže na potrebe sprovođenja fizičke aktivnosti nakon porođaja u uslovima života tokom COVID-19 pandemije, kao i na načine svaladavanja izazova i prepreka koje onemogućavaju u takvim uslovima porodiljama da budu fizički aktivne onoliko koliko bi to bilo potrebno i koliko bi želele.

METOD

Metoda analize sadržaja korišćena je za proučavanje literature i radova koji se sa različitog aspekta bave aktivnostima žena u postporođajnom periodu. Komparativnom metodom je omogućeno teorijsko, analitičko i sintetičko upoređivanje građe, literature i već poznatih činjenica o suštini i efektima fizičke aktivnosti na fiziško i psihičko zdravlje žena nakon porođaja. Deskriptivna metoda omogućila je konkretan činjenički prikaz o najznačajnijim efektima fizičkih aktivnosti na zdravlje žena nakon porođaja.

Karakteristike postoporođajnog perioda

Rođenje deteta je događaj koji utiče značajno na život majke i cele porodice i mnoge žene govore o tome kako im je bilo teško da se prilagode svim promenama nastalim nakon porođaja. (Saligheh et al., 2016.). Iz tih razloga dani i nedelje koji slede nakon porođaja žene - postporođajni period, jesu kritična faza u životu majki i novorođenčadi. Tokom ovog perioda neophodna je adekvatna nega i briga za zdravlje porodilje. Postporođajni period se može podeliti na tri podperioda, gde se prvim smatra period koja žena provodi nakon porođaja u

bolnici, drugi period se odnosi na 4-6 nedelja nakon porođaja, i to je rani postporođajni period. Treći period traje od šeste nedelje do jedne godine od porođaja, i naziva se kasni postporođajni period (Evenson et al., 2014). Glavna karakteristika celog postporođajnog perioda kod žena jesu značajne fiziološke, socijalne i emotivne promene koje im se događaju. Nakon porođaja i tokom postporođajnog perioda kod žena dolazi do značajnih hormonskih promena. Estrogen i progesteron, nakon izbacivanja posteljice, značajno padaju i dostižu svoj najniži nivo prve nedelju nakon porođaja. Pad estrogena omogućava porodilji izbacivanje viška tečnosti koja se nakupila tokom trudnoće. Humani horionski gonadotropin3 nestaje iz organizma žene relativno brzo nakon porođaja ali se ipak, zadržava u organizmu čak i 3-4 nedelje nakon porođaja (Alden et al., 2014). Smanjenje nivoa ovih i drugih hormona dovodi do promena u metabolizmu žene u smislu njegovog usporavanja. Pored toga dolazi do promena u urinarnom sistemu zbog izbacivanja viška tečnosti, koje se regulišu u periodu od 6 do 8 nedelja nakon porođaja, a dolazi do promena i u gastrointestinalnom sistemu u smislu povećanog osećaja gladi. Promene u abdomenu žene ostaju nakon porođaja iste kao tokom trudnoće, dajući porodilji osećaj kao da je još uvek trudna. Tokom prve dve nedelje dolazi do opuštanja trbušnog zida, a potrebno je oko 6 nedelja da se mišići trbušnog zida vrate u stanje u kakvom su bili pre trudnoće. Povraćaj prvobitnog tonusa mišića zavisi od niza faktora, među kojima su svakako najznačajniji količina masnog tkiva i adekvatno vežbanje (Pereira et al., 2019). Često se javljavaju i problemi sa gubitkom kose i pojavom vaskularnih abnormalnosti, koje nastaju kao rezultat drastičnog pada estrogena nakon porođaja. Poseban problem u postporođajnom oporavku predstavlja rizik od pojave depresije. Generalno se smatra da žene imaju 22 puta veću šansu da dožive psihotičnu epizodu u prvom mesecu po porođaju nego bilo kada u životu (Jovićević i Pavićević, 2016). Brze hormonske promene, intezivno fokusiranje pažnje prijatelja i porodice na porodilju, osećaj gubitka nakon porođaja i zamor mogu da dovedu do pojave depresije (Kattles et al., 2006). Pojavi depresije doprinose i smanjenje samovrednovanja usled telesnih promena koje se događaju tokom trudnoće, težak temperament novorođenčeta, stres u vezi sa brigom oko novorođenčeta i sl (Stewart et al., 2003).

Pored drastičnih promena koje se kod žena događaju u postporođajnom periodu koji se obično vezuje za period od 4 - 6 nedelja nakon porođaja, jedna od pratećih teškoća koja utiče na zdravlje žena nakon porođaja i tokom celokupnog postporođajnog perioda jeste i konstantan umor i iscrpljenost, koji doadtno doprinose mogućnostima stvaranja depresivnog stanja (Kattles i sar., 2006).

Fizička aktivnost i njen uticaj na kvalitet života porodilje

Kada se govori o kvalitetu života nakon porođaja, jasno je da fizička aktivnost ima svoje mesto u ukupnom kvalitetu života porodilja. Podjednako je važno da ljudi ostaju u formi tokom života i u njegovim različitim fazama, i to prvenstveno iz zdravstvenih razloga, koji dalje doprinose većem zadovoljstvu i blagostanju. Takođe, učešće u fizičkim aktivnostima porodiljama, pored zdravstvenih benefita, omogućava socijalnu interakciju sa drugim ljudima, što takođe doprinosi nihovom blagostanju. Tako su u jednom o novijih istraživanja, Evenson i saradnici pokazali da su glavni efekti vežbanja žena nakon porođaja ogledaju u poboljšanju mentalnog zdravlja i raspoloženja, emocionalnom blagostanju te smanjenju depresije i anksioznosti (Evenson et al., 2014). Tokom poslednje decenije raste interesovanje istraživača za kvalitet života porodilja. Hill je sa saradnicima razvio 2006. godine prvi upitnik za procenu života kod porodilja „Maternal postpartum quality of life tool“ (Hill et al., 2006). Rezultati ovog istraživanja pokazali su da kod porodilja dolazi do smanjenja kvaliteta života, uz mali uticaj sociodemografskih faktora, i ukazali na značaj fizičke aktivnosti porodilja za njihov kvalitet života. Danas nije upitan povoljan uticaj fizičke aktivnosti i vežbanja na zdravlje porodilja. Povoljni efekti fizičke aktivnosti na zdravlje porodilja ogledaju se pre svega u pozitivnom

uticaju na parametar telesne kompozicije, ali i do smanjenja rizika od hipertenzije i lumbalnog bola, te preventivnog uticaja na hronične nezarazne bolesti bolesti tokom trudnoće (Lerson-Meyer, 2002). Najčešće se u literaturi navodi pozitivan uticaj vežbanja na brže smanjenje telesne mase u postporođajnom periodu i vraćanje telesne mase na vrednosti pre trudnoće Produženo zadržavanje povećanja telesne mase u postporođajnom periodu povećava rizik od gojaznosti, metaboličkog sindroma, dijabetesa... (Alsobayel et al., 2020). U tom smislu, opšta preporuka za sve žene u postporođajnom periodu je da se sa fizičkom aktvnošću krene posle 4-6 nedelja od porođaja (Neels et al., 2017). Međutim, u literaturi je poznato da se jako mali procenat žena bavi fizičkom aktivnošću u ovom periodu (Alsobayel et al., 2020., Neels et al., 2017)). Takođe, preporuka je da u cilju smanjenja telesne mase, porodilja može da upražnjava srednji intezitet vežbanja koje uključuju bržu šetnju, vežbe jačanja muskulture abdomena i karlice (Neels, et al., 2017, Harrison et al., 2016). Studija sa naših prostora koja se sveobuhvatno bavila ispitivanjem uticaja specifično dizajniranog programa vežbanja pod nazivom Mamafit na kvalitet života porodilja ustanovila je da su ispitanice koje su vežbale po ovom programu zadovoljne sopstvenim zdravljem, sposobnosti brige o sebi, srećom i sveukupno životom, kao i jačine bola koji trenutno oseća nakon porođaja, zatim da su zadovoljne energijom koju poseduju za svakodne aktivnosti, svojom psihološkom stabilnošću i svojim fizičkim izgledom (Vranešević, 2019). Značaj ove studije ukazuje na višestruke benefite koje programirano vežbanje u postporođajnom periodu ima, zajedno sa ostvarivanjem cilja unapređenja kvaliteta života porodilja nakon takvog značajnog događaja kao što je rođenje deteta.

Izazovi vežbanja nakon porođaja tokom COVID-19 pandemije

Širom sveta svi uobičajeni uslovi života u vezi posla, škole i kod kuće, ozbiljno su bili uzdmani i izmenjeni merama globalnog zaključavanja kako bi se sprečilo širenje koronavirusa. Zatvaranje fitnes centara, rekreativnih objekata, manjak mogućnosti za aktivno putovanje u školu ili na posao, kao i opšta ograničenja u kretanju prilično su suzili izbor i dostupnost različitih modaliteta vežbanja. Zatvaranje škola i vrtića, skratilo je roditeljima vreme koje su imali na raspolaganju za fizičku aktivnost. Ovo ništa manje nije pogodilo ni porodilje koje već suočene da im je potreban specifičan i usmeren program vežbanja shodno potporođajnoj problematici, morale su da nađu načina da o sebi brinu u okviru svog doma u prisutsvu bebe, partnera ili ostalih ukućana. Ono što se pokazalo kao prednost ovakvih uslova života, jeste brzi prelazak fitnes industrije na onlajn načine treniranja, što je učinilo da porodilje imaju veći izbor programa koji su specifični za taj period, bez da napuste kuću ili porodicu. Rad od kuće omogućilo je pojedinim majkama i bolju fleksibilnost u svom dnevnom rasporedu za vežbanje. Neka od istraživanja na temu vežbanja kod kuće pokazala su da porodilje ovo smatraju korisnim kako za svoje psihičko zdravlje tako i za ograničenja u nalaženju vremena za vežbanje (Teychenne et la., 2018). Pristupačnost i raznovrsnost online sdražaja za vežbanje svakako može pomoći da raširi ovaj način upražnjavanja fizičke aktivnosti u kućnim uslovima, ali ključno za kontinuitet ovakvog vežbanja jeste da ponuđene usluge stvarno prevaziđu barijere koje mogu odbiti porodilje da ih iskoriste. Bitno je da sadržaj bude fleksibilan za pristup i učestvovanje, eventualno besplatni ili jeftiniji i da ih rade kvalifikovani fitnes stručnjaci za datu problematiku. Ako je sadržaju skupo pristupiti, ili je potrebno da obezbedi dodatna oprema, da ne obezbeđuje kvalitet i rad na rezultatu, mame koje vežbaju kod kuće, uz sve obaveze oko bebe, dece, ukućana, neće imati kontinuitet i pre će odustati (Atkinson et al., 2020). U Engleskoj je sprovedeno istraživanje od strane Fondacije za aktivnu trudnoću koje je pokazalo da je 75% trudnica i porodilja tokom pandemije tražilo besplatan online sadržaj za vežbanje (Atkinson et al., 2020). U Srbiji u prva dva meseca od proglašenja pandemije, ovakva vrsta sadržaja porodilje je bila poprilično upražnjavana ili u besplatnom obliku ili u finansijskim

okvirima dostupnosti. Portal Bebac, kao najaktuelniji internet portal je u saradnji sa različitim fitnes klubovima i njihovim sručnim trenerima koji se bave ovom problematikom, više puta nedeljno objavljivao besplatan sadržaj ovog tipa. U ovakvim situacijama fizička aktivnost cele porodice je od vitalnog značaja za uključivanje i kontinuitet vežbanja među porodiljama, jer je njima najčešća barijera da vežbaju aktivno i u kontinuitetu upravo briga oko bebe ili ostale dece. Pored toga porodilje će biti mnogo aktivnije ukoliko je i njihov partner fizički aktivan. Takođe deca će biti mnogo više fizički aktivnija u tom slučaju u odnosu decu roditelja koji nisu fizički aktivni (Rodriguez et al., 2018).

ZAKLJUČAK

Kontinuirana fizička aktivnost nakon porođaja često izostaje zbog novonastalih uslova života majke, međutim upražnjavanje fizičke aktivnosti tokom ovog perioda ima značajne zdravstvene benefite kako za majku tako i za novorođenče. Kao rezultat COVID-19 pandemije ovaj način vežbanja i nametnutih mera za smanjenje stope zaraze virusom, porodilje su iskusile remećenje i izazove ne samo u svakodnevnom životu već i po pitanju svog zdravlja i zdravlja svog novorođenčeta. Ovo je sve uticalo na to da kada, kako i zašto mogu da se bave fizičkom aktivnošću. Iako su se uslovi života značajno izmenili dostupnost materijala za vežbanje i brzi transfer fitnes industrije na online vežbanje je učinilo da porodilje mogu naći načine da sprovedu fizičku aktivnost za sebe i u uslovima COVID-19 pandemije. Kao zaključak se nameće da promene koje nastupaju u životima ljudi u uslovima kriza, mogu otvoriti prilike za nove načine pravazilaženja prepreka kroz veće prihvatanje i upotrebu internet sadržaja i olakšavanje života u kući sa ciljem što većeg upražnjavanja fizičke aktivnosti cele porodice. Tako da je u ovakvim životnim situacijama veoma važno iskoristiti ove kratkoročne promene u dugoročne benefite, posebno među ovakvim specifičnim populacijama kakve su porodilje, koje od takvog pristupa mogu najviše imati koristi.

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RELATIONSHIP BETWEEN THE PERCEIVED QUALITY AND THE USERS' AGE OF ANDALUCIAN SPORTS CENTRES

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Abstract: Perceived quality is understood as the satisfaction of users' demands. This is dependent on the comparison of the service expected with the perceived one in a continuous process of evaluation. The aim of the study was to analyse the incidence or relationship of the age of users of Andalusian sports organisations in the evaluation of the perceived quality of sports services. Method: 2.707 users of 78 Andalusian sports organisations with a mean age of 25.29±12.83 years participated in the study. 66.10% were men and 33.90% were women. The rating scale sports organizations, EPOD2, was used to obtain the results and a Cronbach's Alpha of 0.895 was obtained for the perceived quality scale. In the study, age has been grouped according to 5 age groups. Results: Significant differences were found in all the quality factors except for Service staff and Material, the most highly rated elements being Technicians and Activities. Discussion: It is the younger and older age groups that shows a better perceived quality. The younger ones are influenced by their lack of sports services knowledge and the adults because they have already selected the sports centre where they want to receive activities after several experiences. Conclusion: Quality is essential in the assessment of service, as it is an antecedent to future intentions. An attempt should be made to focus on optimal management of the Technical, Activities, Communication and Space factors, to increase the adherence or loyalty of the users of sports organizations.

Keywords: Management, Perceived Quality, Age.

INTRODUCTION

Quality is understood as the satisfaction of the needs or expectations of a service's users (Nicolás-López y Escaravajal-Rodríguez, 2020). According to Grönroos (1994, quoted by Duque, 2005), quality is dependent on the comparison between the expected service and the service received, consisting of a non-stop evaluation process. In other words, quality is considered as the satisfaction or the fulfilment of the expectations of the users (Criado y Calvo de Mora, 2004), expectations as a comparative referent and ranked by the level of desire and abstraction (Oliver, 1997).

Quality is primarily determined by the concrete elements of the installations and the employees' attitudes and skills (Kim & Trail, 2010), although recent studies relegate to a second level the aspects of social interaction between employees and users, granting a greater importance to the concrete elements (Rial, Varela, Rial y Real, 2010).

The application of this concept, as well as its control, will happen in the sports centres where services and physical activities have place and are commercialised. In the first place, a sports centre is a business that commercialises services of an intangible nature, which needs a deep knowledge of the features, interests and needs of the user for the survival of the business (Luna-Arocas, 2006). This knowledge of the user's profile focuses from a sociodemographic,

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attitudinal, or motivational point of view (Abalo, Varela & Rial, 2006; Martínez-Tur, Zurriaga, Luque & Moliner, 2005).

The study of the quality is put forward as a strategic goal of interest since it develops a competitive advantage regarding the competency for having the opportunity of understanding and predicting the costumers' needs, therefore having the ability of evolving and adapting to the new needs of the sports' market, accommodating their offer to the market's demand (Abad Acosta y Pincay-Díaz, 2014).

The commitment on the improvement of the quality perceived by the user is key in the development and consolidation of the different organisations (Afthinos, Theodorakis & Nassis, 2005), since it increases the loyalty and the fidelity of the users (Calabuig, Burillo, Crespo, Mundina & Gallardo, 2010), proving in the same manner its utility for increasing the success (Haro-González, Pérez-Ordás, Grao-Cruces, Nuviala & Nuviala, 2018).

The aim of the present study was to know the ratings of the factors of the quality perceived by the users of sports organizations from Andalusia according to their age.

MATERIAL AND METHOD

Participants

The population sample consisted of 2.707 users from 78 sports organisations that offer sports services in Andalusia. Regarding the size of the population, we can talk of a margin of error of ±1.92%, for a level of confidence of 95%. 66.10% of the people surveyed were male whereas the 33.90% were female, being the mean age of 25.29±12.83 years old. The sample has been divided in 5 groups: *15 and under, in between 16 and 25, in between 26 and 45, in between 46 and 65 and older than 65.*

Instrument

The data was compiled trough the questionnaire EPOD2 (Nuviala, Grao-Cruces, Pérez-Turpin & Tamayo, 2013). The questionnaire consists of 25 items of alternative answer Likert-type, which go from 1 (strongly disagree) to 5 (strongly agree). It is focused on 3 areas of evaluation: Perceived quality (20 items, 6 factors), Satisfaction (4 items) and Value of the service (1 item). When doing the factorial analysis of perceived quality's scale (EPOD) 6 resultant factors were found: Activities, Technic, Service staff, Spatial, Material and Communication/information offered by the centre.

Procedures

The field of work was done through a self-administered questionnaire in the presence of the surveyor and with the authorization of the different sports services. The participants were required to complete it and to ask any doubts regarding the items. Each participant was informed of the confidentiality of the data and spent around 15 minutes to complete it. The investigation followed the protocols stated in the Declaration of Helsinki.

Statistical Analysis

In order to analyse the data, after tabulating and computer mechanising it, the computer pack SPSS was used. The T test was done for the independent samples and Anova of a factor using the previous data pack, as well as an analysis of multiple lineal regression stablishing a level of signification of 95%.

RESULTS

The results of the research offer positive fate about the perceived quality by the users of the sports organisations of Andalusia about the different sports services that are offered, with a mean global rating of 3.72 ± 0.57 out of 5.

Technic and Service staff factors are those rated with the highest rating. On the other side, Spatial, Material and Communication are those with the lowest rating (table 1).

Table 1. Perceived quality of the sports organizations of Andalusia. Mean (M) and Standard deviation (SD)

	EPOD	TECHNIC	PPAS	COMMUNI	ACTIVITY	MATERIAL	SPATIAL
M	3.7222	3.9298	3.9172	3.2866	3.8457	3.6469	3.6903
SD	.57240	.77493	.86201	.87413	.64459	.86991	.83567

When analysing the perceived quality with the age, there were some significative differences in all the factors of quality except for the Service staff and Material. In general, the oldest and youngest groups present a better perceived quality of the service received.

Table 2. Ratings of the perceived quality of the service in sports organisations in Andalusia depending on the nature of the sport practice. Anova of a factor and level

		M	SD	ANOVA	
				F	Sig.
EPOD	<15	3.8327	.48084	7.399	.000
	16 a 25	3.6819	.59365		
	26 a 45	3.7377	.60847		
	46 a 65	3.7230	.58913		
	>65	3.9952	.43944		
TECHNIC	≤15	4.1777	.66201	20.516	. 000
	16 a 25	3.8617	.83581		
	26 a 45	3.8415	.73842		
	46 a 65	3.9157	.70355		
	>65	4.2800	.61373		
PPAS	≤15	3.9565	.87345	1.310	.264
	16 a 25	3.9215	.88535		
	26 a 45	3.9444	.84115		
	46 a 65	3.8780	.78419		
	>65	4.2708	.70679		
COMMUNI	≤15	3.3906	.84305	4.128	. 002
	16 a 25	3.2420	.92224		
	26 a 45	3.3360	.85281		
	46 a 65	3.3050	.82495		
	>65	3.6957	.70407		
ACTIVITY	≤15	4.0231	.55164	14.128	. 000
	16 a 25	3.7997	.65413		
	26 a 45	3.8071	.67969		
	46 a 65	3.8311	.65301		
	>65	4.1752	.51463		
MATERIAL	≤15	3.7203	.85241	1.831	.120
	16 a 25	3.6253	.90478		
	26 a 45	3.7028	.84023		
	46 a 65	3.5915	.86383		
	>65	3.6913	.78769		
SPATIAL	≤15	3.7390	.82800	.2.805	.024
	16 a 25	3.6381	.86434		
	26 a 45	3.7410	.81182		
	46 a 65	3.7863	.78710		
	>65	3.7945	.83667		

DISCUSSION

The rating of the perceived quality of the service is positive, obtaining a mean score for the total of the items of 3.72±.55 out of 5. The dimensions related to human resources were those with the best ratings: Technic and Service staff factor, followed by Activity, Spatial and Material, whereas Communication was the one with the worst rating. Similar findings to those obtained by Nuviala, Tamayo, Fernández, Perez-Turpin & Nuviala (2011) in school age participants of sports services, Rial Varela, Rial y Real (2010), in gyms in Pontevedra, in which the human resources exceed the rest of the dimensions, Boceta (2012) in his research about the rating of the perceived quality by the users of the IMD of Sevilla and Ruiz-Alejos (2015) in municipal sports services in Logrono.

These findings are similar to those obtained by Triadó, Aparicio and Rimbau (1999), who find statistically significative differences between the older groups and the younger groups regarding the satisfaction of their expectations of some municipal sports services. These differences are concentrated in the dimensions of the installations and the human resources.

Coinciding with the research, Afthinos, Theodorakis, Nassis (2005) in French sports services, it points that human factors and concrete elements received the highest ratings, in addition, there were differences regarding the age between the users that were younger and older than 60, therefore, the older users want bigger responsibility from the staff of the installation. Mañas, Giménez, Muyor, Martínez-Tur & Moliner (2008), compiled that aspects related to the human factor are usually better rated than other dimensions, results also found by Nuviala, et al., (2011) in young subjects.

Likewise, García-Fernández, Gálvez-Ruíz, Bernal-García & Vélez-Colón (2016) obtained results that revealed that those users over 50 had a better perception of the installation as well as of the services offered in the fitness low-cost companies, similar results to those from the research, where the group *in between 46 and 65* and *older than 65* obtained the best ratings regarding the installations as well as the third and the best rating in relation with the service staff, respectively.

Communication was the worst considered factor regarding the perceived quality in any of the group ages, similar findings to those obtained by Nuviala, Grao-Cruces, Pérez-Turpin and Nuviala (2012), or by Bernal-García (2013) in Andalusian sports centres of all the registered ages.

We attribute these results to the confirmation-disconfirmation paradigm (Oliver, 1997) in which the costumer establishes his expectations in the standard of the comparison. The expectation is understood as (Reeves, 1994) the mental structure based on the previous experience, with belief or desire shape that allows to predict the probability of an event happening, in other words, that works as a predictor. Fisk and Young, (1985) establish that the main component of the expectations are the personal experiences of consumption, including the commercial information and other people's.

Within this context, the older costumer, while having a wider experience, has consciously selected the service or the sports organisation. As we have previously demonstrated, they perceived with positivity these sports services, the older costumer is subject of a more detailed analysis and is a more loyal user comparing him to other age groups (García-Fernández et al., 2016). The results of the younger ones are explained on the lack of previous information and sports culture with which they have the ability of contrasting their experience in the service.

Nowadays, the influences of the expectations, being an ambiguous concept of doubtful rigour in the measuring for not knowing when or how they perform (Palacios, 2014; Martínez &

Martínez, 2008) is a main topic in the academic debate. One of the future threads of research must consist of setting the parameters of this concept and its influence in the perception of the quality of the user, detached from subjectivisms.

CONCLUSSION

As a conclusion, considering that the quality is the antecedent of the satisfaction and this of the future intentions, quality must be part of the evaluation of the service. The obtained findings can offer data that helps the sports manager to elaborate different strategies with the aim of improving the rating of the perceived quality of the offered activities by the sports organisations.

Therefore, considering that in developed countries with a population pyramid with a wider upper part, these findings allow us to reflect (García-Fernández et al., 2016) on that investing in a recruiter strategy for older costumers is an opportunity. For, as it was shown (García-Fernández et al., 2016; Fadge, 2018), the older the costumer is the less probability he has of abandoning the centre, whereas the younger customers are those who are subscribed, those who spent less money monthly and less time with a greater probability of quitting.

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MORPHOLOGICAL CHARACTERISTICS AND MOTOR ABILITIES OF UNTRAINED AND PUPILS WHO TRAIN TAEKWONDO

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Abstract: The aim of this study was to compare the morphological characteristics and motor abilities of untrained pupils with pupils that train taekwondo. On a sample of 60 subjects, divided into two groups: (1) untrained pupils aged 13 (n = 40), and (2) pupils practicing taekwondo at the age of 13 (n = 20), examination and comparison of morphological characteristics and motor abilities were performed. The following variables of morphological characteristics were measured: body height (BH), body mass (BM), body mass index (BMI), and fat percentage (F%). To assess the variables of motor abilities, the following tests were performed: flexibility – sit and reach (SNR), movement frequency – hand tapping (HT), balance – flamingo test (FLA), speed-strength of arm and shoulder muscles – throwing medicine ball of 3 kg (MED), explosive leg extensor strength – long jump (LJ), torso repetitive strength – crunches for 30 seconds (CRN), speed – flying run for 30 m (R30m), agility – t-test (TT), aerobic endurance – shuttle run test (SHRAN). To compare the results, descriptive statistics and "t-test" for independent samples with a level of statistical significance $p \leq 0.05$ were used. The results showed that in the morphological characteristics between the examined groups, there are no differences only in BH ($t = -2.55$; $p < 0.069$). In motor abilities, there are no differences only in the MED ($t = 3.22$; $p < 0.095$). The capacity of regular physical education classes is not sufficient to develop the necessary morpho-motor characteristics and abilities, so it is necessary to affirm additional sports activities among young people.

Keywords: anthropometry, motor abilities, pupils, taekwondo.

INTRODUCTION

Taekwondo can be defined as a highly intense, intermittent, martial sport (Bridge, Jones, & Drust, 2009; Santos, Franchini, & Lima-Silva, 2011), which characterizes the complex manifestation of motor abilities of athletes and the influence of morphological characteristics of competitors on the tactical and technical setting of combat.

Research in taekwondo is predominantly focused on determining the efficiency of techniques and parameters of energy ability of competitors, and only secondarily, and much less often, they analyze the impact of training activity on improving motor abilities (Fong, & Ng, 2011). In the context of taekwondo, there are still no adequately conducted studies on the relationship between morphological characteristics and technique. Theoretically, morphological characteristics can influence the manifestation of technical mastery (Norjali Wazir, et al., 2019). However, the relationship between technique and morphological characteristics has not yet been fully approved and explained.

The general course of human development during life is most often explained by the phenomena of growth and development, where growth implies anatomical and physiological changes, and development implies psychological events, improvement of sensory and motor abilities (Bogin, 1999). Changes in athletes' morphological characteristics and motor abilities

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caused by training activity depend on the specifics of the sports branch and the choice of applied methods and means, but they also largely depend on the athlete's genetic, i.e., innate potential. Specific morphological and functional characteristics of taekwondo play a significant role in determining the sport's potential of an individual and, therefore, can be considered factors of importance in the system of initial sports selection (Cular, Munivrana, & Katić, 2013). Following the requirements of each individual sport, it is necessary, if possible, systematically monitor and analyze the athletes who most often achieve success. Given the fact that in the context of top sport the ultimate goal is to achieve maximum results, long-term monitoring of morphological characteristics and motor abilities of athletes in this direction can be considered necessary and justified (Katić, & Čular, 2013; Malina, Bouchard, & Bar-Or, 2004).

Research in the field of sports has established significant differences in morphological characteristics in children involved in sports and non-athletes (Damsgaard, et al., 2001), and in addition, it was found that martial arts have a positive effect on the development of motor abilities of children of different ages (Stamenković, et al., 2016; Cicović, Stević, & Spasojević, 2016). Success in taekwondo primarily depends on anaerobic (lactate) power, explosive power, agility, and aerobic power (Valenzuela, et al., 2014; Marković, Mišigoj-Duraković, & Trninić, 2005). According to Pieter (1991), kicks and other movement structures in taekwondo are very demanding for most muscle groups of competitors, especially leg and torso muscles, so the presence of adaptive effects in terms of increased explosive power is expected in students involved in regular training. It is also determined by the increased activity of the torso musculature, which is considered to have a significant role in achieving sports results in general (Bompa, 1999).

Agility is especially important in taekwondo due to the large number of atypical competitive situations that require more abrupt changes of direction and direction in a relatively small space, while a high level of flexibility is imperative in line with the need to perform high kicks (Noorul, Pieter, & Erie, 2008; Arabac, Görgülü, & Çatıkkaş, 2010). Taekwondo combat is intermittent in nature, with periods of maximum intensity of 3-5 seconds, which alternate with periods of lower intensity in the ratio 1:3 to 1:4 (Heller, et al., 1998), which conditions the load of both physiological mechanisms of energy production. Based on all the above, it can be assumed that involvement in taekwondo training, in addition to the biological growth and development of body characteristic of this period, can have an integral contribution to the overall development of students of a given age.

Consistent with a small number of studies that have addressed the possible contribution of taekwondo to the morphological and motor status of young people (Nam, & Lim, 2019), the subject of this paper are morphological characteristics and motor abilities of untrained seventh graders and seventh graders classes that train taekwondo. The aim of this research is to examine the existence of differences between students who train taekwondo and untrained students in terms of morphological characteristics and motor abilities.

METHODS

Sixty male students, aged 13 ± 0.6 years, participated in this research, of which 40 students who do not train and 20 students who actively train taekwondo. The average training experience practicing taekwondo is 3 ± 0.4 years, with an average of 3 training sessions per week lasting approximately 1.45 hours. All students engaged in this research who do not engage in taekwondo are regular in physical education classes, and in addition to 3 hours of physical education, they do not participate in any other form of organized exercise.

In this study, four variables for the assessment of morphological characteristics and nine variables for assessing motor abilities were analyzed. To assess morphological characteristics,

following existing standards (Lohman, Roche, & Martorell, 1988; Norton, et al., 2000), body height and body mass were measured based on which the body mass index (BMI) was calculated, as well as the percentage of fat. Body height (TV) was measured with an anthropometer according to Martin, with an accuracy of 0.1 cm.

Bodyweight (TM) was measured with a digital scale (transportable), which allows a measurement accuracy of 0.1 kg. The percentage of body fat (PBF%) and the body mass index (BMI) were determined using the Body Composition Monitor model OMRON HBF-511 with the ability to measure from 5.0 to 60.0% and an increment of 0.1%.

Some tests from the EUROFIT test battery were used to assess motor abilities (Eurofit, 1993). During testing, two measurements were performed, with a better result used for analysis. The long jump test (LJ) was used to assess the explosive strength of the leg muscles, crunches for 30 seconds test (C30s) was used to assess the repetitive strength of the torso flexor muscles, and the throwing medicine ball test was used to assess the speed of the arm and shoulder muscles (MED). The sit and reach test (SNR) was used to assess flexibility, the t-test of agility (TT) was used to assess agility, the flamingo test (FLA) was used to assess balance, and the frequency of movement was applied hand tapping test (HT), a 30-meter sprint test (S30m) was used for running speeds, and a shuttle run test for aerobic endurance (SHRAN).

The data obtained in this study were processed using the statistical software package SPSS 20. After assessing the normality of the distribution (Shapiro Wilk test), the data were processed by descriptive statistics (arithmetic mean, standard deviation, minimum and maximum value, coefficient of variation) and comparative statistics test for independent samples). The level of statistical significance was set at $p \leq 0.05$.

RESULTS

Central and dispersion parameters were determined: arithmetic mean, standard deviation, minimum and maximum result, as well as coefficient of variation for age, body height, body mass, BMI (body mass index) as well as for fat percentage, then *p*-value was calculated for the following variables: body height, body weight, BMI and fat percentage of taekwondo and non-athletes, and the results obtained are shown in (Table 1).

Table 1: Descriptive parameters – arithmetic mean (AS), standard deviation (SD), coefficient of variation (cV%), minimum (Min) and maximum value (Max) and t-test result ($p \leq 0.05$) for morphological variables.

	taekwondo (*n* = 20)				**untrained** (*n* = 40)					
	AS ± SD	Max	Min	cV%	AS ± SD	Max	Min	cV%	t-test	*p*
Height (cm)	164.7 ± 10.1	178.0	146.0	6.20	165.6 ± 8.6	181.0	145.0	4.80	-2.55	0.69
Mass (kg)	50.3 ± 10.0	65.9	33.9	19.86	57.5 ± 13.3	89.3	34.1	23.15	-1.90	**0.02***
BMI (kg/m^2)	18.3 ± 1.7	20.8	15.3	9.16	21.1 ± 4.2	30.7	14.0	19.63	3.04	**0.00***
PBF (%)	8.3 ± 2.2	12.3	5.5	26.38	16.0 ± 8.6	36.6	5.1	53.49	-2.89	**0.00***

The obtained results of the average body height (TV) for both groups of subjects (for untrained students = 165.6 cm, and for students who train taekwondo = 164.7 cm) indicate the homogeneity of the groups for the examined morphological variable. There was no statistically significant difference between untrained and taekwondo students (t = -2.55; p < 0.069), which may exclude the impact of taekwondo practice on more affirmative growth. The values obtained for the average weight (TM) of both groups of subjects, for body mass index (BMI)

and fat percentage (PBF%), indicate that the differences are significant ($p < 0.05$) for the benefit of students who practice taekwondo.

Table 2: Descriptive parameters – arithmetic mean (AS), standard deviation (SD), coefficient of variation (cV%), minimum (Min) and maximum value (Max) and t-test result ($p \leq 0.05$) for motor abilities.

	taekwondo (n = 20)				**untrained** (n = 40)					
	AS ± SD	Max	Min	cV%	AS ± SD	Max	Min	cV%	t-test	*p*
SNR (cm)	30.9 ± 3.7	42.0	25.0	11.72	21.4 ± 7.6	38.0	6.0	35.37	-1.55	**0,00***
FLA (sec)	11.2 ± 4.4	22.6	5.5	38.80	5.7 ± 5.7	28.7	1.6	100	-2.98	**0.00***
LJ (m)	210.0 ± 12.8	250.0	194.0	6.10	171.7 ± 26.5	222.0	117.0	15.4	1.04	**0.00***
HT (sec)	10.2 ± 0.7	11.8	9.2	6.80	12.4 ± 2.0	17.9	9.7	15.86	2.11	**0.00***
C30s (rep)	31.8 ± 1.8	36.0	29.0	5.72	23.9 ± 4.3	33.0	14.0	17.90	-1.12	**0.00***
MED (m)	5.5 ± 1.0	7.9	3.9	18.39	5.5 ± 1.4	9.9	3.1	25.59	3.22	0.95
TT (sec)	11.1 ± 0.5	12.3	10.3	4.79	12.4 ± 1.4	16.1	10.3	10.95	2.22	**0.00***
S30m (sec)	4.5 ± 0.3	5.2	4.0	6.19	4.9 ± 0.6	6.5	3.9	12.17	-2.42	**0.00***
SHRAN (min)	1849 ± 166	2240	1520	8.99	1357 ± 588	3280	500	43.38	-1.09	**0.00***

Table 2 shows that there are statistically significant differences between taekwondo students and untrained students in the following observed variables: flexibility (SNR), balance (FLA), leg muscle strength (LJ), movement frequency (HT), agility (TT), running speed (S30m), aerobic endurance (SHRAN) and repetitive torso flexor muscle strength (C30s). The difference between taekwondo and untrained students was not statistically significant ($t = 3.22$; $p < 0.095$) in terms of speed-strength of arm and shoulder muscles (MED). The better results of students who train taekwondo in the balance test (FLA) are primarily based on the experience that taekwondo practitioners gained during training. The kicks that are performed require a good balance because they are performed on one leg. Such blows are performed in-place, moving back and forth in an equilibrium position.

DISCUSSION

The obtained data on morphological characteristics in this research are related to body weight and percentage of fat, which differ in relation to students who do not train taekwondo. The minimum values of body weight and percentage of fat are approximate, but the maximum values are different. Compared to untrained students, students who train taekwondo have lower body weight, and thus a lower percentage of fat. The percentage of fat that students who train taekwondo have is almost twice less than untrained ones. Morphological characteristics, primarily body weight and fat percentage of students practicing taekwondo, can be attributed to regular taekwondo training, a relatively high energy expenditure in training, which shows that even in the period of accelerated growth and development, there will be no sudden obesity or accumulation of internal fats. The results show that both groups of students go through a period of growth and development, which undoubtedly contributes to the change of morphological characteristics under the influence of training or sedentary activities.

The obtained results related to the morphological characteristics of untrained students (Table 1) do not differ much from the results obtained in similar studies (Jozić, & Hrženjak, 2001, Prskalo, et al., 2011), which indicate that children at this age are more focused on a sedentary lifestyle and pay less attention to physical activity. The range, which ranges from 34 kilograms to 89 for students of the same age, certainly deserves special attention.

The results shown in the flexibility test are in favor of taekwondoists. Such results were achieved primarily because within each training, special attention is paid to dynamic stretching exercises, i.e., development of the elastic component (necessary for fast and explosive movements), as well as static active and passive exercises, necessary for the development of the plastic component of flexibility (necessary for greater joint mobility – wide amplitudes of movement). Better development of leg muscle strength and torso flexor muscles in taekwondoists is attributed to the training process based on the predominant use of the lower extremities both in training and competition. The differences in the level of agility, which taekwondoists possess, could be explained by the intensity and spatial complexity of motor movements represented in the training process of taekwondoists. The better level of balance in taekwondoists can be exclusively attributed to the large capacity of proprioceptive stimuli (unbalanced positions), which are the specificity of this sport and a consequence of almost constant use of one of the extremities, both in training and competition. The significant difference in aerobic intensity in favor of taekwondoists can be explained by the character of energy transformations in this martial art, which places high anaerobic-aerobic requirements for maximum oxygen consumption (maxVO2), as well as lactate tolerance. It is known that in short and intense, highly anaerobic activities, which are characteristic of taekwondo, there is a need to repay the high oxygen debt, and whose efficiency is again responsible for high aerobic power (intensity). In almost all observed variables, significant differences in favor of taekwondoists indicate the current state in which the subjects were. The results obtained in this study are in line with previous research that has addressed this issue, in which there has been a statistically significant improvement in morphological and motor skills through the application of taekwondo training (Jozić, & Hrženjak, 2001).

This research is another in a series that drew attention to the importance of regular sports among young people. The indicator of the results of the subjects who train taekwondo in relation to the untrained ones can be attributed to daily exercise and improvement of motor skills in different periods of development. In most tests, students who train taekwondo showed a greater competitive orientation in achieving the best possible results. Based on the research results and during the testing process itself, a greater focus on achieving the best results by students practicing taekwondo could be observed, as well as greater motor experience in mastering more complex motor tasks. This research showed that the motor development necessary for a taekwondo fighter to achieve success in competitive activity has particular benefits in terms of overall development and motor competence in relation to peers of the same age and sex, which is confirmed by the findings of other authors (Heller, et al., 1998).

The rules in taekwondo that encourage attractiveness direct the training process to a path in which the trainer in the process of creating a motor-complete fighter must pay attention to a wide range of motor abilities in this sensitive period. Therefore, by encouraging the development of strength, coordination, balance, and dexterity, but also flexibility, practitioners are directed to be creative in their performance. In relation to the level of development of motor abilities necessary for attractive taekwondo techniques, the development of other motor abilities that are in the function of performing a kick is influenced. The task of the coach is to use the equipment and props in the most creative way to realize their exercise programs so that the athletes have approximately equal development of all motor abilities. (Haddad, et al., 2011). A higher level of competence in terms of motor abilities brings the student a higher level of self-confidence and satisfaction, and in that way, a complete healthy young person is formed.

The obtained results are an indicator of more intensive development of taekwondo practitioners under the influence of training, aimed at creating the basis for achieving a top result (Thompson, & Vinueza, 1991).
Lack of movement and muscular activity (sedentary lifestyle) in young students can cause stagnation in the functioning not only of certain systems in the body but also to the disruption of general health.
Extensive measures are being implemented in many countries to provide regular, programmed, and systematic physical exercise to the school population. Changes in sedentary lifestyle and culture of life are imposed as the primary factor of health prophylaxis. The capacity of regular physical education classes is not sufficient for the development of the necessary morpho-motor characteristics and abilities, so it is necessary to affirm additional sports activities among young people. Therefore, the above is supported by the statement that fifth-grade students have physical education classes twice a week, which is insufficient if the developmental characteristics of that age are taken into account.

CONCLUSION

Based on the presented results, it can be concluded that statistically significant differences were found between trained and untrained students, as well as that practical implications for further research arise from them. If the development of an athlete in the preadolescent period is carefully and patiently influenced, a competitor in junior and senior competition can be created with a high probability. The results of this study showed that the exercise of physical activity through taekwondo greatly affects the positive changes in the morphological characteristics and motor abilities of exercisers. Therefore, this period should be used to apply as diverse training operators as possible and to acquire new motor abilities.
The obtained results showed that at the treated age, a combination of physical education and additional sports activities could be crucial for proper growth and development. Also, it should be emphasized that the obtained results were probably influenced by some other parameters such as lifestyle, the structure of free time, psychological, social, and economic living conditions. The idea of this paper was to check whether regular physical education classes, combined with additional sports extracurricular activities of students, lead to statistically significant changes in some elements of growth and development of the current age.

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PREVALENCE OF OBESITY AMONG HIGH SCHOOL CHILDREN

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Abstract: The aim of this study was to determine the prevalence of obesity in children of secondary school ages in several randomly selected High schools in Belgrade. The data presented in this paper were gathered using anthropometric measurement of 341 pupils (178 boys and 163 girls) attending all four grades of High schools in the Belgrade area. The Measurement of morphological characteristics was conducted by standard procedures of anthropomorphic measuring and body composition analysis. A laser anthropometer of high precision and "Body composition" monitor with accompanying software was used to assess variables from the age of six up. Software analysis of the gathered data was realized by standard statistical methods with the aid of statistical program SPSS/20 and application software "Morfo-2". Results achieved in this study are slightly different in certain variables, while in other variables they are in accordance with the results achieved in other studies. The results show that 22% of children were in the state of before-obesity, while 8% were obese. Data analysis according to the subject's sex showed that 31% of boys and 11% of girls had increased body mass (before-obesity – BMI ≥ 85th% percentile), while 13% of boys and 2% of girls were obese (BMI ≥ 95th % percentile). Since this is connected with numerous risk factors for the development of widespread non-contagious diseases, the trend of obesity among children must be carefully and continuously monitored. Attention should be paid to the prevention of obesity, through educational programs on nutrition and good quality physical education.

Keywords: BMI, obesity, monitoring.

INTRODUCTION

Obesity is often defined as the state of pathological or excessive accumulation of fat in fatty tissues, up to a point when it can jeopardize health (Garrow, 1988). The prevalence of obesity in children and adolescents is increasing both in developed and developing countries (Doll et al. 2002, Molarius et al, 1999, WHO, 2003). The degree of obesity increased by as much as 300% during the period from 1989 to 2009 (WHO, 2000a). It is assumed that 10% of the total number of school children in the world are overweight, one-quarter of them being obese (Lobstein, Baur, & Uauy, 2004; Ogden, et al, 2002; Ebbeling, et al, 2002). The increase of prevalence of obesity in children is especially present in economically developed countries of Northern America and Europe, and it amounted to 0.5% to 1% per year during the last two decades (Lobstein, Baur, & Uauy, 2004). The highest increase was registered in the USA (Kimm, & Obarzanek, 2002; Troiano, et al, 1995; Ogden, et al, 2002). Since 1960, the incidence of obesity in children aged from 6 to 11 has increased by 54%, and in the young ages from 12 to 17 for almost 40% (Nelms, 2001). The experiences from the USA show that, together with the increase of prevalence, obese children suffer from severer degrees of obesity (Freedman, et al, 2004). In the USA, obesity of adults increased from 12% in 1991 to 18.9%

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in 1999 i.e. for 57% during eight years (Mokdad, et al, 2000). The prevalence of obese school children amounted to 20% in the UK, and 10% in Japan (Dkhar, & Singh, 2012).
According to the data from the year 2000 for the Republic of Serbia, 54% of adults were overweight – 36.7% of those fell into the category of before-obese, and 17.3% into the category of obese, while about 15% of children were obese. The average BMI in the school-children population was 26+/- 4,74kg/m^2 (Ministry of Health Republic of Serbia, 2004). This problem has not been researched much in Serbia, and it is necessary to conduct more current studies. This is the reason why there are no clear national standards of growth and development, which makes monitoring much more difficult. Recognizing the incidence of this health problem in this population should enable us to introduce and improve the prevention methods.
The aim of this study was to establish the degree of prevalence of obesity in children of secondary school ages in Belgrade, as well as to point out the necessity of prevention methods that could be carried out to solve this problem.

METHOD

The sample consisted of 341 (178 boys and 163 girls) pupils attending all secondary school grades. Schools were randomly selected and situated in the Belgrade area. The sample of children is presented in Table 1. There was no statistically significant difference in the distribution of subjects according to either their sex or age. Subjects agreed to participate in this study.

Table 1. *Structure of subjects according to sex and grades*

Age (grade)	*Male*	*Female*	***Total***
I	40	35	**75**
II	46	42	**88**
III	47	39	**86**
IV	45	47	**92**
Total	178	163	**341**

This research was carried out in December 2014. Measuring of morphological characteristics of children was conducted according to standard procedure. Subjects were measured during the morning hours. The evaluation and analysis of body composition were done by means of a bioelectrical impedance analyzer (Body-impedance system OMRON – body composition monitor for body fat, muscle, BMI (kg/m^2) – clinically validated, Japan). Special options of this analyzer were used for the following: measuring of body mass with the increase of 0.1 kg, software calculations of body mass index (BMI) and evaluation and analysis of basic energetic transformations in the organism (tests of energy expenditure). A laser anthropometer with high precision of ± 0.1 cm was used for the evaluation and analysis of longitudinal dimensional (Schoenle, Germany). Adequate software analysis of measured data was done by using appellative software "Morfo-2". The results were compared with the corresponding standards according to age. These were taken from the world's most prestigious organizations dealing with the current issues connected with children (*WHO – World Health Organization, NCHS – National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion, ECOG- European Childhood Obesity Group).* It is recommended by World Health Association that the nutritional status should be calculated by applying BMI with referential values for children aged between 6 and 18.
Based on the credibility of the consulted institutions, the definition and comparison of the results for each subject in this study were based on the application of the basic standard, the referential percentile value of body mass index in children. According to this standard, obesity in children according to age is diagnosed when the values of body mass index are equal to or

above P95%ile or > 2 SD, i.e. moderate obesity (overweightness) when the value of the index is above P85%ile. Body height and mass of children with desirable weight, as well as their BMI, fall between the 25th and 75th percentile, while children whose height and/or mass are under 5th and above 95th percentile should be additionally monitored. According to the recommendation of WHO, referential values of BMI for children between 6 and 18 ages were used.

The data were processed by applying statistical program SPSS/20, using standard statistical methods of descriptive statistics (minimum, maximum, average and standard deviation). For calculating the percentile values of the achieved results, special applicative software was used.

RESULTS

The results of descriptive statistics of morphological variables for male and female samples are presented in Tables 2 and 3.

Table 2. *Results of descriptive statistics of morphologic variables for male sample*

	N	**Rank**	**Minimum**	**Maximum**	**Mean**	**SD**
Height (cm)	78	42.0	162.0	204.0	183.0	6.4
Weight (kg)	78	58.50	52.80	111.30	79.00	11.69
BMI (kg/m^2)	78	81.30	**17.80**	**29.10**	**25.10**	9.15
% body fat	78	31.00	**5.30**	**36.30**	**18.90**	7.50
% muscle mass	78	17.60	**31.40**	**49.00**	**40.00**	3.72

Table 3. *Results of descriptive statistics of morphological variables for female sample*

	N	**Rank**	**Minimum**	**Maximum**	**Mean**	**SD**
Height (cm)	63	31.0	152.0	183.0	167.5	5.9
Weight (kg)	63	43.40	43.00	86.40	60.7	8.24
BMI (kg/m^2)	63	17.90	**15.40**	**33.30**	**21.60**	2.96
% body fat	63	32.70	**10.90**	**43.60**	**28.50**	7.31
% muscle mass	63	26.80	**17.40**	**44.20**	**30.50**	3.87

The results gained in this study are in most cases only slightly different when compared to the results gained in similar studies. Specific differences in measured variables cannot be noticed when compared with the usual standards. However, certain maximum results for BMI and total body fat are alarming. For example, the body fat of some girls was as high as 43.6% and of some boys 36.3%. Also, in some girls, BMI reached values up to 33.3, which is high above the desirable level. High average values of fatty tissue have been recorded in 28.5% of the sample of girls. By applying a specially designed applicative software for the calculation of percentile values of analyzed results, the following percentile distribution was acquired (Table 4).

Table 4. *Percentile distribution of BMI of male and female samples*

	Male	Female	Total
Number of subjects:	78	63	**141**
Malnutrition (< 5th %ile)	0%	6%	**3%**
Normal BMI (5th - 85th %ile)	69%	83%	**75%**
before-obesity (≥ 85th %ile)*	**31%**	**11%**	**22%**
Obesity (≥ 95th %ile)	**13%**	**2%**	**8%**

A more transparent insight into the states of before-obesity and obesity of the treated sample was gained by applying percentile distribution analysis of the incidence of before-obesity and obesity in both male and female samples. The results showed that 22% of the total sample were before-obesity and that 8% of children were obese. Analyses according to sex indicated that 31% of boys and 11% of girls were overweight (before-obesity – BMI ≥ 85th %ile), as well as that there were 13% of boys and 2% of girls who were obese (BMI ≥ 95th %ile). It can be noticed that there were by far more boys in the state of both before-obesity and obesity than girls. Several other studies from India and various parts of the world have reported a higher incidence of overweightness and obesity among boys (Tremblay, Katzmarzyk, & Williams, 2002; Sharma, Sharma, & Mathur, 2007) according to Dkhar, & Singh, 2012. If we view the total picture, about 30% of children from this age group from the studies sample have problems with excessive body mass (they are either overweight or obese). In Serbia, about 15% of children are obese, which means that their body mass increased the ideal by 20% (Ministry of Health Republic of Serbia, 2004). It is known that 5% of children in Serbia are undernourished. The results of our study indicate that there are 6% of undernourished girls in the secondary school population (< 5th %ile), which almost equals the average of undernourished children in Serbia, while boys do not show signs of undernourishment.

DISCUSSION

As in many other countries, obesity of children and adolescents in Serbia is a serious socio-medical problem of enormous sociological and demographic, as well as health importance. Numerous studies indicate that the incidence of obesity in European countries has been on the increase during the last two to three decades (Luciano, et al 2001; Mirilov, & Mirosavljev, 2004). In Europe, the prevalence of obesity in children under the age of five amounts to 1-4%, unlike the older generation (7-11 years old) where it ranges from 2-23%. In adolescents aged between 12 and 18 prevalence amounts to 2-19%. There are certain differences according to the area of Europe. The highest degrees are in Hungary, southern Italy, Spain (27%) and Greece (24%), and the lowest in the countries of western Europe (WHO, 2000). In the Bogaluza study (Weber, Wattignen, & Srinivasan, 1995), which dealt with the appearance and development of cardiovascular diseases, in the research conducted in 1990 it was established that the number of children with BMI above 85 percentile is 22% higher than the number of such children in similar research done in 1980. A global increase in the prevalence of obesity during childhood in some countries can be seen in Table 5.

Table 5. *Global increase of obesity prevalence during childhood in some countries (adapted according to Janssen, Katzmarzyk, & Ross, 2002).*

Country	Criterion for obesity	Period of monitoring	Age group (years)	Increase in prevalence	
				%	Index*
USA	BMI > P95	1971-1999	6-11	4-13	**3.3**
			12-19	6-14	**2.3**
England	BMI > 30kg/m2 Adjusted to age	1984-1994	4-11	Male 0.6-1.7	**2.8**
				Female 1.3-2.6	**2.0**
Scotland	BMI > 30kg/m2 Adjusted to age	1984-1994	4-11	Male 0.9-2.1	**2.3**
				Female 1.8-3.2	**1.8**
Japan	Mass than > 120% standard	1970-1996	10	Male 4-10	**2.5**
				Female 4-9	**2.3**

Based on the results of this study, as well as on the results of other regional studies, it can be estimated that the incidence of obesity in children and adolescents in Serbia is slightly lower in comparison with other countries of southern Europe (Mirilov, & Mirosavljev, 2004). Since the results of the national study of monitored growth and development are still not available, and since there are not enough comparable data from other parts of Serbia, at this moment it is impossible to reach conclusions about the differences in results of this study, in comparison with other regions. When compared with some studies conducted in Vojvodina (Mirilov, & Bjelica, 2004; Mirosavljev, et al, 1999), the number of overweight children is on the serious increase. This part of Serbia is traditionally considered as the one with unhealthy eating habits and with a high percentage of obese people in many population groups, significantly higher in comparison with other regions (Table 6).

Table 6. *Prevalence of before-obesity and obesity in adult population of Serbia (Ministry of Health Republic of Serbia, 2004).*

Nutrition categories according to BMI	**Belgrade**		**Vojvodina**		**Serbia total**	
	N	%	N	%	N	%
Malnutrition	172	8.7	170	7.3	699	7.4
Normal	810	41.0	789	34.1	3641	38.6
before-obesity	716	**36.2**	820	**35.5**	3455	**36.7**
Obesity	264	**13.4**	492	**21.3**	1531	**16.2**
Total	1974	100	2311	100	9432	100

Since there were some warnings on the high prevalence of nutrition disorders of children in Serbia a few decades ago (Mirilov, 1971; Radovanović, Mirilov, & Monarov, 1975), more frequent monitoring on both national and regional levels would be useful. Results of this research indicate that the problem of obesity is also present among secondary school children in Belgrade. They indicate that practically every third child attending secondary school is overweight and every eighth child – obese.

However, studies dealing with body composition in Serbia have usually been done on the sample of primary school children, while data on secondary school pupils are scarce, although it is a known fact that this is the period of lesser physical activity. In a paper done on pupils aged 14 and 15 by Macura, et al., (2010), a 2% higher prevalence was recorded in fifteen-year-olds than in fourteen-year-olds. Đorđević-Nikić, et al. (2013) researched attitudes of Belgrade adolescents about diet and physical activity, knowledge about food and diet, beliefs and self-efficiency about diet and health (N = 707 adolescents, 377 girls and 330 boys). It was registered that 27% of adolescents had satisfactory eating habits, 31% very active lifestyles, 7% good knowledge about nutrition, 6-12% satisfactory knowledge about the safety of food and hygienic habits. Significant deviations from the necessary knowledge and recommended habits for a healthy lifestyle were thus recorded in adolescents. It can, therefore, be concluded that it is necessary to launch unique, wholesome and long-term behavioral multi-component lifestyle programs.

CONCLUSION

The results of this study indicate an increased prevalence of obesity in school children in Belgrade, as well as that it is becoming a more and more significant socio-medical problem. It is known that obesity is a health problem, but it also increases the risks for developing other serious health problems, like high blood pressure, diabetes mellitus, psychological disturbances

etc. Gained results indicate the necessity of taking planned actions in order to prevent the obesity of schoolchildren in Belgrade. This implies obligatory inclusion of all children with BMI ≥ 85th into specific programs for reducing obesity, and according to our results, there are about 22% of them. It is highly likely that complicated obesity would be found in these children, and it would be possible to prevent and exclude the appearance of other diseases by taking urgent measures. If non-general and, if possible, even individual programs (which schools could introduce with some effort) should be applied, the result would be prophylactic therapy which would, first of all, include the change of lifestyle, i.e. the change in eating habits and introduction of regular programmed physical activity.Programs for promoting this significant sociomedical problem of the young, as well as education of target groups (adolescents, parents, teachers, professors etc.) could be based on the conclusions presented in this paper. This study has also shown that there is a considerable need to form national standards for evaluation of the state of nutrition (tables of growth and development) of children in Serbia.

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MIŠIĆNI UMOR I MIŠIĆNO ZAPALJENJE: ETIOLOGIJA, MEHANIZMI I PREVENCIJA

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Sažetak: Mišićni umor je privremena i prolazna nesposobnost mišića da razvije maksimalnu mišićnu silu i nesposobnost mišića da ostvari rad sa određenim intenzitetom. Nekoliko mehanizama su predloženi kao fiziološka osnova za pojavu mišićnog umora: strukturalne i funkcionalne promene koje se javljaju u sarkomeri, promena sarkoplazmatske pH vrednosti, inhibicija ciklusa poprečnih mostova, blokiranje procesa ekscitacija - kontrakcija, nedostatak energetskih supstanci. Česta pojava koja prati mišićni umor je mišićno zapaljenje. Ovaj fenomen može da dovede do narušavanja integriteteta mišićne ćelije i do privremenog poremećaja njene funkcije. Akutno mišićno zapaljenje je kratkotrajno i manjeg intenziteta i izaziva neznačajne neprijatnosti kod sportiste. Pojava odloženog mišićnog zapaljenja (DOMS) često ima značajan uticaj na sportske sposobnosti: ograničen raspon pokreta, smanjena mišićna snaga i promenjen način kretanja. Preporuke za sprečavanje ili smanjenje mišićnog zapaljenja su izvodjenje vežbi istezanja, postupno povećanje intenziteta treninga, primena fizikalnih metoda i upotreba antiiflamatornih lekova. Naučna i empirijska saznanja o etiologoji i mehanizmima koji su osnova mišićnog umora i mišićnog zapaljenja mogu pomoći prevenciju njihove pojave i slabije simptome ovih neželjenih procesa kod sportista i rekereativaca.

Ključne reči: mišićni umor, mišićno zapaljenje, kontrakcija, snaga

MUSCLE FATIGUE AND MUSCLE SORENESS: ETIOLOGY, MECHANISMS AND PREVENTION

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Abstract: Muscle fatigue is a temporary and transient muscle incapacity to develop muscle force, and inability of muscle to perform work or maintain a certain level of physical activity. Several mechanisms are proposed as physiological base of the muscle fatigue: structural and functional changes that occurred in the sarcomera, reduced sarcoplasmic pH value, inhibition of the cross bridges cycle, blocking the process of excitation and contraction coupling, and depletion of energy reserves. Common consecutive process of muscle fatigue is muscle soreness. This phenomenon can lead to a disturbance of the integrity of muscle cells or temporary disruption of muscle function. Acute muscle soreness causes insignificant inconvenience in the athlete because it is short-term and quickly retreat. The delayed onset of muscle soreness (DOMS) often affect sport's performance by limiting the range of motion, decreasing the muscle force and alternating the movement pattern. Recommendations for the prevention of muscle soreness include stretching exercises, gradually increasing of the training intensity and consumption of anti-inflammatory supplements. The scientific and empiric

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knowledge of the etiology and mechanisms of muscle fatigue and muscle soreness will allow better understanding how to alleviate and attenuate these adverse phenomena in athletes.

Keywords: muscle fatigue, muscle soreness, contraction, force.

INTRODUCTION

The reduced capacity of a muscle to develop strength and speed of contraction is defined as muscle fatigue, it occurs as a result of muscle activity, and passes after a period of rest. Muscle fatigue is a temporary inability of a muscle to develop strength, to perform or to maintain a certain level of work intensity. The muscle is not damaged and it can regenerate. Muscle fatigue is the result of great physical effort, of physical activity that exceeds the physical capacities of the individual. Fatigue passes after a period of rest. Muscle fatigue caused by exercise should not be confused with fatigue caused by diseases that affect the nervous and muscular system, this type of fatigue does not pass after a period of rest (Kent-Braun, et al., 2012; Gruet, et al., 2013).

Muscle fatigue is the body's defense mechanism in case of excessive level of muscle work. As a result of fatigue, muscle contractions become weaker, slower and longer (Gandevia, 2001). Within a single muscle contraction, in addition to decreasing the amplitude and increasing the duration of the contraction phase, the phase of decontraction, i.e. relaxation of the muscle, is prolonged. The first logical cause of fatigue can be considered a lack of ATP in the muscle cell, which may not always be true (Allen, et al., 2008). Examinations of the ATP concentration in the muscle cell show that in tired muscle the level of ATP is slightly lower than at rest. Fatigue is thought to occur as a defensive reaction of the muscles against possible damage that would occur if the muscle activity lasted so long as to cause a very low concentration of ATP (Westerblad, et al., 2002). Deficiency or absence of ATP in cells will lead to muscle rigidity, inability to relax, and risk of muscle fiber rupture.

Physiological mechanisms of muscle fatigue

The physiological mechanisms underlying muscle fatigue differ from those that occur after prolonged or short-term activity. Fatigue after physical activity with high intensity and short duration occurs due to the following mechanisms:

1. Decreased muscle cell conduction as a result of accumulation of K ions in the T tubules, during repolarization after a series of successive stimuli, which reduces permeability to Na ions and complicates depolarization, i.e. the creation of new action potential along the sarcolemma.
2. The production of lactic acid contributes to the acidification of muscle cells (higher concentration of hydrogen ions) and the difficult functioning of some cellular proteins. Changes in cell acidity are thought to particularly affect the function of calcium ATP pumps in the sarcoplasmic reticulum, which affects the process of muscle relaxation.
3. Inhibition of the transverse bridge cycle. The creation of large amounts of ADP and Pi in muscle fibers has an inhibitory effect on muscle fiber relaxation, which prolongs the cycle of transverse bridges and makes it difficult to start a new cycle. Prolonged transverse bridge prolongs the contraction phase and disrupts the relaxation phase causing a reduced contractile ability of the muscle (Westerblad, et al., 1997).

Fatigue that occurs after prolonged physical activity with low intensity has a different physiological basis than fatigue after short activity with high intensity. In addition to the above mechanisms that may play a minor role, two additional mechanisms dominate around this type of fatigue:

1. During prolonged physical activity, the ryanodine receptors on the sarcoplasmic reticulum cisterns remain open for a longer time, allowing for more intense calcium leakage into the sarcoplasm. Prolonged high concentrations of calcium in the cytosol activate proteases that break down contractile proteins. These changes cause muscle weakness and a feeling of pain (muscle inflammation) that lasts until the fibers are repaired by creating new proteins.
2. Decreased muscle glycogen stores, hypoglycemia and dehydration are directly related to fatigue. It is essential to provide good glycogen stores, with adequate carbohydrate intake, to prevent or delay fatigue in the event of prolonged low-intensity activity.

Topography of muscle fatigue

Despite numerous studies on muscle fatigue and the causes of its occurrence, it is still a controversial phenomenon in the scientific and professional community. Current research suggests that the primary site of fatigue is the muscle itself. The factors causing fatigue are complex, interconnected and dependent on the muscles involved in the activity. The topography of the etiology of muscle fatigue shows where the cause of the reduced ability of the muscle to contract may occur. A major classification of the causes of fatigue is central and peripheral fatigue (Bigland-Ritchie, et al., 1978). Central fatigue refers to neurons in the brain and the spinal cord, inhibitory input signals from afferent muscle neurons to the CNS, or alterations in motor neurons. Central fatigue can be influenced by psychological factors and motivation including a person's individual capacity to withstand physical exertion, especially when continued activity causes pain. Peripheral fatigue refers to fatigue that occurs outside the CNS, at any level from the neuromuscular junction to the muscle itself. Neuromuscular blockade, at the level of sarcolemma - T tubules - sarcoplasmic system and myofilaments. At the level of the neuromuscular junction, axonal terminals may be inhibited, neurotransmitters may be deficient, or postsynaptic receptor blockade may occur. At the level of cellular organelles, an inability to release calcium from terminal cisterns or to bind calcium to troponin C may occur. At the level of contractile elements, lack of ATP, creatine phosphate deficiency, glycogen deficiency, or accumulation of lactate, phosphate, or hydrogen ions can cause fatigue. The theory of fatigue related to the contractile mechanism refers to the process of lack of necessary substances (depletion) and the process of accumulation of harmful substances (Kent, et al., 2016).

Lack of creatine phosphate leads to fatigue of the fast muscle fibers that rely most on the phosphagen system for obtaining energy for activities that require explosiveness, speed and power. Glycogen deficiency leads to fatigue of slow muscle fibers that rely on aerobic ATP synthesis for long-term activity. Accumulation of lactate and hydrogen ions can cause fatigue through interference in several places within the contractile process: reducing the amount of calcium released, preventing the binding of calcium to troponin, disruption of Na-K pump function, inhibition of anaerobic glycolysis by limiting the production of enzymes (PFCs) or inhibiting the formation of transverse bridges. The detrimental effects of the accumulation of hydrogen ions are particularly pronounced in fast oxidative fibers (FOG fibers) which produce large amounts of lactate from anaerobic glycolysis (Metzger & Moss, 1990). The role of lactates in the development and course of muscle fatigue is not entirely clear. According to some researchers, lactates contribute to fatigue, but they are not the only factor that influences this process. Some authors have suggested that lactates play a beneficial role in muscle function (Westerblad, et al., 2002).

Neurotransmitters in the central nervous system have an important influence on the muscle fatigue process. 5- HT decreases the physical performance, while DA-realising enhancer produces positive effects on physical performance (Swart, et al., 2009).
Fatigue can be defined as cellular fatigue and general fatigue. General physical fatigue is defined as a disturbance of homeostasis caused by physical work. The basis of discomfort and even pain depends on several factors, lowering blood glucose levels and accumulation of metabolites. The function of the motor system in the CNS is not impaired. Therefore, highly motivated individuals can endure discomfort and fatigue pain while exercising until motor units become exhausted. Motivational factors are very important for improving physical performance, i.e. delaying the onset of fatigue (Cheung, et al., 2003).

Muscle soreness

A common occurrence after a period of intense physical activity is a subjective feeling of discomfort, pain, and limited mobility known as muscle inflammation. In English terminology the phenomenon of muscle inflammation is called muscular soreness, which could be translated as muscle hypersensitivity or muscle pain. In sports science, this phenomenon is classified into two forms, acute muscle inflammation and delayed muscle inflammation.

Acute muscle soreness

Acute muscle hypersensitivity or soreness occurs during or immediately after training. Acute muscle inflammation is thought to be due to decreased blood flow, muscle ischaemia. Numerous experiments over a period of decades have shown that pain occurs and increases not only during the contraction but also in the minute after the contraction (Cheung, et al., 2003). Mechanisms that are a physiological basis for the occurrence of acute inflammation:

- During muscle contraction, pain occurs when the muscle tension is so great that it can cause occlusion (closure) of a blood vessel.
- Decreased blood flow to the active muscle causes decreased removal of metabolic products that are intense during exercise, and increased retention of lactic acid and potassium. These metabolites stimulate muscle pain receptors, causing a subjective feeling of pain.
- The sensation of pain persists even after the cessation of contractions, until the harmful metabolites are removed by establishing normal blood flow.

Acute muscle inflammation causes minor discomfort to the athlete because it is short-lived and resolves quickly. Delayed muscle inflammation has a greater detrimental effect on the process of sports preparation and sports performance.

Delayed Muscular Soreness - DOMS

Symptoms of Delayed Muscular Soreness (DOMS) appear and persist for 24 to 96 hours (1 to 4 days) after an intense training session. One of the most common and popular misunderstandings about the DOMS phenomenon is that it results from the accumulation of lactate (lactic acid) in the muscle cell. This theory was developed in the mid-twentieth century (Asmussen, 1956; Edington and Edgerton, 1976, according to Veqar, 2013) and has long been widely accepted in both scientific and professional circles. Numerous studies and evidence contradict this simple theory with the following facts: People with inherited McArdle's syndrome who do not have the ability to produce lactic acid develop DOMS. DOMS occurs more frequently and with greater intensity when performing eccentric contractions, although during eccentric contractions a much smaller amount of lactic acid is produced than during concentric contractions (Stupka, et al, 2001). Lactic acid has a half-life of 15 to 25 minutes,

and is completely removed from the muscles in one hour, and the strongest symptoms of DOMS appear within 24-48 hours after exercise and lasting 96 hours post activity or longer (Yu, et al., 2004).

The process or phenomenon of muscle inflammation goes through the following stages:

1. Unusually high-intensity activity, eccentric muscle contractions, causes the rupture of structural proteins in muscle fibers, especially along the Z line of the sarcomere. At the same time, there is damage to the connective tissue in the muscle-tendon connection (Yu, et al., 2004).
2. Damage to the sarcolemma leads to the accumulation of calcium, which in turn inhibits the production of ATP and disrupts calcium homeostasis. Without ATP, calcium cannot be returned to the tanks. High calcium concentrations lead to further Z line damage, tropomyosin, and eventually muscle tissue necrosis (cell death) (Allen, & Trajanovska, 2012).
3. Structural damage triggers an inflammatory and immune response. Fluid enters the muscle and swelling forms.
4. Accumulation of metabolic byproducts, cellular debris, and edema pressure irritate the nerve endings for pain causing the subjective sensation of pain which is the main symptom of the phenomenon of muscle inflammation (Stupka, et al., 2001).

The experience of athletes and the knowledge of scientists from experimental procedures have shown that the intensity of DOMS depends on the type of muscle contractions. Muscle inflammation is most pronounced after performing eccentric contractions, and weakest after performing isotonic contractions. Isometric concentrations cause stronger DOMS than isotonic, but still much weaker than eccentric contractions. During DOMS after eccentric contractions the muscle strength decreases and lasts throughout the DOMS. This is not the case with DOMS after isotonic and isometric contractions. The theories that explain the occurrence of delayed muscle inflammation are the following:

- Theory of muscle fiber rupture - during exercise muscle tissue damage occurs, i.e. muscle fiber rupture. Proof of muscle fiber rupture theory is the high level of creatine kinase (CC) in the blood, an enzyme that is indicative of muscle fiber rupture (Armstrong, et al., 1991).
- Theory of muscle spasm which proposes three stages through which the muscle goes during intense exercise: phase of ischemia of the active muscle; phase of accumulation of pain-causing substances (P substances), they irritate the nerve endings and cause a phase of muscle spasm. (MacIntyre, et al., 2001).
- Connective tissue theory, according to which damage occurs in the ligamentous structures of the muscle. During concentric contraction, isokinetic and isotonic, the muscle shortens its length, and the greatest stretching occurs in the ligament structures. During eccentric contractions, especially during maximal eccentric contraction, so much tension develops that damage to the connective tissue can occur (Friden, & Lieber, 2001).

Some recent research claims that pain during DOMS is not caused from damaged muscle cells and secondary induced inflammatory processes, but from the reinforcement process. The muscle develops bigger strength as response to extensive effort, to protect its self from eventual injury. The muscle responds to training by reinforcing itself up to and above its previous strength by adding new sarcomeres in miofibrils, process called sarcomerogenesis (Pavlic-Gulan, et al., 2007).

Muscle fatigue and the contributory mechanisms are specific not only to the demands of the task but also to the physical characteristics of the population being assessed, including the sex of the individual. Researches indicate that the sex difference in muscle fatigue is task specific.

Contractile mechanisms that reflect a higher proportion of slower and more fatigue-resistant muscle in women compared with men are responsible for the sex difference in muscle fatigue of the isometric and dynamic contractions. There was no evidence for a sex difference in the reduction in voluntary activation (i.e. central fatigue) (Hunter, 2016) .

Recommendations for preventing muscle soreness

If the athlete applies some of the recommendations, there is a possibility to reduce the degree of muscle soreness.

1. Stretching can both prevent inflammation and reduce pre-existing inflammation. It is important that the stretching is static, not performed with dynamic movements (bouncing or jerking) so as not to cause additional damage to the connective tissue. (Apostolopoupolis, et al., 2013)
2. Exercise showed therapeutic effects on pain relief and minimizes the sensation of DOMS probably via mechanisms of increased removal of noxious metabolic waste products and increased realizing of endorphin during exercise (Connolly, et al., 2003).
3. Gradual increase in training intensity. In strenuous training, the load, the weight, should be increased gradually if we want to avoid muscle inflammation.
4. Anti-inflammatory drugs or nonsteroidal anti-inflammatory drugs an oral analgetics with their pharmacological mechanisms induce decreased inflammatory response, swelling, oedema, and production of paracrine and prostaglandin substances (Stone, et al., 2002; Schoenfeld, 2012).
5. Consumption of vitamin C, 100 mg per day for a month, which is twice the recommended daily allowance, has been shown to have a good effect in preventing muscle inflammation, but these experiences have not been scientifically confirmed (Connolly, et al., 2006).
6. Cryotherapy, known as part of RICE protocol against soft tissue's trauma. The stimulation of cold termoreceptors increases sympathetic activity which results with reduction of swelling and inflammatory process (Meussen, & Lievens, 1986).
7. Massage as mechanical intervention increases local blood flow and reduces prostaglandin production and the inflammatory process. Studies examining the effects of massage on the symptoms of DOMS showed different level of positive effects or even no effect at all (Hilbert, et al., 2003).

Numerous strategies for prevention and treatment of DOMS are proposed in scientific literature. There are still questions to answer: is DOMS preventable prior to exercise, is stretching a valid preventive measure, are there temporary alterations in joint kinematics and muscle activations patterns ect. Still sports related researches may serve in the battle for better sport performance.

CONCLUSION

This manuscript is humble attempt to present general knowledge about causal mechanisms for muscle fatigue and consequent phenomenon of muscle soreness. These processes are common experience in all athletes and physically active people. They are reason for reducing the intensity and duration of training. The proposed mechanisms of DOMS have allowed the sport experts and scientists to develop various preventive and treatments strategies aimed to neutralize and decrease the symptoms of muscle fatigue and soreness and restoring the capacity for muscle work. The understanding of underlying mechanisms of muscle fatigue and soreness could help to prevent their occurrence or decrease their lasting period which would influence the sport performance.

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EFFECTS OF GLUTEN-FREE AND GLUTEN INTERVAL FASTING WITH TRAINING PROCESS ON MORPHOLOGICAL CHARACTERISTICS

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Abstract: In intermittent fasting or more popularly autophagy, a natural-regulatory physiological process takes place with the mechanism of disintegration of non-functional and unnecessary parts of cells (Klionsky DJ 2008). Physical exercise alters biochemical activities in muscle, liver, and other adipose tissue (Hong HC, Hwang SY, Choi HY 2014). The combination of autophagy with physical activity can contribute to the positive health benefits of an individual. The aim of this paper is to observe the effects on morphological characteristics in the training process and possible differences between gluten-free and gluten diets. A case study involving one subject 35 years of age, height 188 cm in good health, with 4 to 5 aerobic and anaerobic workouts per week lasting between 45 and 60 minutes. Examination of an 8-month training cycle on autophagy divided into 4 months on a diet that excludes gluten and sugar foods and a 4-month period that includes these foods. The parameters are obtained using Tanita BC-601 bioimpedance, while an inextensible tape with a precision of 0.1 cm was used to measure the circular dimensions. In the first 4-month cycle, a decrease in body weight (-14.5 kg), fat percentage (-5.7%), water percentage (+ 3%), muscle mass (-6.5 kg) and abdominal volume (-13.5 cm). The obtained results indicate the continuity of weight loss averaging 906 grams per week, which is the upper limit for healthy weight regulation according to the criteria of the American Center for Obesity Control and Prevention. In the second 4-month cycle, an increase in body weight (+3.1 kg), fat percentage (+ 0.4%), water percentage (+ 0.1%), muscle mass (+ 2.2 kg) was observed, and abdominal circumference (+3 cm). As far as body weight is concerned, there is an increase of 187.5 grams on a weekly basis. Within 8 months of the transition from a gluten-free to a gluten diet, there are significant changes in morphological characteristics. The study showed that a gluten-free diet normalizes body weight, namely overweight people lose weight, while people with reduced weight gain weight (Cheng J, Brar PS, Lee AR, Green PH.2010). In this study, a gluten-free diet proved to be an effective means of reducing body weight, while a gluten-free diet proved to be a good method for maintaining body weight, or adding it during higher calorie intake without negative effects on physical shape.

Keywords: Activities, Bioimpedance, Nutrition, Measurement, Weight.

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EFEKTI BEZGLUTENSKOG I GLUTENSKOG INTERVALNOG POSTA SA TRENAŽNIM PROCESOM NA MORFOLOŠKE KARAKTERISTIKE

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Sažetak: U intervalnom postu ili popularnije autofagiji odvija se prirodno-regulatorni fiziološki proces sa mehanizmom raspadanja nefunkcionalnih i nepotrebnih delova ćelija (Klionsky DJ 2008). Fizičko vežbanje menja biohemijske aktivnosti u mišićima, jetri i ostalim masnim tkivima (Hong HC, Hwang SY, Choi HY 2014). Kombinacija autofagije sa fizičkim aktivnostima može doprineti pozitivnim benefitima po zdravlje pojedinca. Cilj ovog rada je uočiti efekte na morfološke karakteristike u trenažnom procesu i eventualne razlike između bezglutenske i glutenske ishrane. Studija slučaja koja uključuje jednog ispitanika 35 godina starosti, visine 188 cm dobrog zdravlja, sa 4 do 5 treninga aerobnog i anaerobnog karaktera nedeljno u trajanju između 45 i 60 minuta. Ispitivanje 8-mesečnog trenažnog ciklusa na autofagiji koji je podeljen na 4 meseca sa ishranom koja isključuje namirnice sa glutenom i šećerom i 4-mesečni period koji uključuje ove namirnice. Parametri su dobijeni pomoću bioimpedance marke Tanita BC-601, dok je za merenje cirkularnih dimenzija korišćena nerastegljiva traka sa preciznošću od 0.1cm. U prvom ciklusu od 4 meseca uočeno smanjenje telesne mase (-14,5 kg), procenta masti (-5,7%), procenat vode (+3%), mišićna masa (-6,5kg) i obima abdomena (-13,5 cm). Dobijeni rezultati ukazuju na kontinuitet skidanja telesne težine u proseku od 906 grama na nedeljnom nivou što je gornja granica za zdravo regulisanje težine po kriterijumu Američkog centra za kontrolu i prevenciju gojaznosti. U drugom ciklusu u trajanju od 4 meseca primećen je porast telesne mase (+3,1 kg), procenta masti (+0,4%), procenat vode (+0,1 %), mišićna masa (+2,2 kg), i obima abdomena (+3 cm). Što se telesne težine tiče ovde postoji porast od 187,5 grama na nedeljnom nivou. U toku 8 meseci od prelaska sa bezglutenske na glutensku ishranu postoje značajnije promene u morfološkim karakteristikama. Studija je pokazala da bezglutenska dijeta normalizuje telesnu težinu, odnosno osobe sa preokomernom težinom smanje telesnu masu, dok osobe sa smanjenom telesnom masom povećaju telesnu masu (Cheng J, Brar PS, Lee AR, Green PH.2010). Bezglutenska ishrana se u ovom istraživanju pokazala kao efikasno sredstvo u smanjenju telesne mase, dok se ishrana sa glutenom pokazala kao dobra metoda za održavanje telesne težine, ili dodavanje iste prilikom većeg kalorijskog unosa bez negativnih uticaja na fizičku formu.

Ključne reči: Aktivnosti, Bioimpedanca, Ishrana, Merenje, Težina.

UVOD

Fitnes industrija je danas veoma popularna. Kao takva 2019. godine završila je deceniju sa rekordnim prihodom od 96,7 miliardi dolara. (IHRSA 2020). Razlog njene popularnosti je težnja populacije za boljim zdravljem i formom. Savremen način života dovodi do prekomerne težine i gojaznosti koji ubijaju više ljudi nego neuhranjenost (WHO 2016). Rezultat toga su prognoze da će do 2030. godine prekomerna težina i gojaznost dostići nivo 89% kod muškaraca i 85% kod žena (Keaver et al, 2013; Engin, 2017). Uz veliki broj programa treninga sa ciljem regulisanja telesne mase uključen je i veliki broj dijeta. Ono što je sve popularnije u opštoj populaciji pa i kod sportista jeste intervalni post koji dovodi jačanje imuniteta procesom

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autofagije (Hannan A, Rahman A, Rahman S, Al Mamun Sohad A, Dash R, Hossain K. S, Farjana M, Uddin J, et al. 2020). Koncept autofagije poznat je još iz 1960-ih godina, ali njen osnovni fiziološki i medicinski značaj danas je poznat zahvaljujući japanskom nobelovcu Yoshinori Ohsumi.(Nobel Media AB 2021). Fizički trening pozitivno utiče na procese i kontrolu kvaliteta proteina u skeletnim mišićima i na taj način poboljšava uslove starenja kod ljudi (Mancini A, Daniela Vitucci D, Randers M.B,Schmidt J,F, Hagman M, Andersen T.R, Imperlini E, Mandola A, Orrù S, Krustrup P, Buono P. 2019).
Konzumiranje žitarica predstavlja potencijalne probleme vezane za gluten i izazivanje nespecifičnih simptoma kao što su nadimanje, nelagodost u stomaku i dijareju (Roszkowska A, Pawlicka M , Mroczek A, Bałabuszek K, Nieradko-Iwanicka B. 2019). Dijeta bez glutena predstavlja efikasan trentman za uklanjanje pomenutih simptoma. U poslednjim decenijama u naučnim krugovima postoji sumnja u nutritivni sadžaj bezglutenskih prehrambenih proizvoda (Melini V, Melini F, 2019).
Cilj ovog rada jeste uočiti razlike intervalnog posta u dva 4- mesečna trenažna ciklusa. Primenom ishrane koja isključuje gluten i šećere u prvom, odnosno primenom ishrane koja uključuje ove namirnice treba utvrditi efekte i eventualne razlike na morfološke karakteristike rekreativca.

METOD

Ispitanik

U ovoj 8- mesečnoj studiji slučaja bio je uključen jedan ispitanik starosti 35 godina, visok 188 cm, dobrog zdravlja sa redovnim fizičkim aktivnostima. Tokom ispitivanja trajao je kontinuirani trenažni proces sa primenom treninga aerobnog i anaerobnog karaktera 4 do 5 puta nedeljno.

Ishrana

U prvom 4-mesečnom ciklusu bio je primenjen intervalni post. U tom periodu najčešće su bili primenjeni 16-časovni intervali bez hrane i 8-časovni intervali sa unosom hrane koje isključuju gluten, šećere, industrijsko prerađenu hranu. U ovoma ciklusu, takođe su bili primenjeni intervali od 20, odnosno 24-časovnog intervala bez unosa hrane i 4-časovni i 2 časovni intervali sa unosom hrane.
U drugom 4-mesečnom ciklusu bila je primenjena indentična metoda intervalnog posta. Razlika u ovom ciklusu od predhodnog je u tome što je krajem nedelje bio primenjen intervalni post od 36 sati. Ovaj ciklus podrazumeva primenu hrane koja sadrži gluten, šećere.

Procena morfoloških parametera i stanja uhranjenosti

U cilju procene stanja uhranjenosti kod ovog ispitanika urađeno je testiranje morfoloških karakteristika visina, težina, volumen i potkožno masno tkivo. Stanje uhranjenosti (kg/m^2) i stanje abdominalne gojaznosti vršeno je po preporukama Svetske zdravstvene organizacije (WHO, 1998). Granične vrednosti indeksa telesne mase (pothranjenost manje od 18,5; normalna uhranjenost 18,5-24,9; predgojaznost 25-29,9...). Za abdominalnu gojaznost korišćene su granične vrednosti obima struka jednak ili veći od 102 cm kod muškaraca) (WHO, 1998).
Morfološke karakteristike merene su jednom u četiri nedelje u jutarnjim časovima. Inicijalno testiranje bilo je 22.3.2020, drugo 19.4; treće 17.5; četvrto 14.6; i peto (središnje) merenje između dva ciklusa 12.7.2020. godine. Počev od ovog datuma kreće drugi ciklus testiranja i šesto testiranje je rađeno 9.8; sedmo 6.9; osmo 4.10 i poslednje deveto 1.11.2020. godine.

Parametri telesna težina (TT), procenat masti (M), mišićna masa (MM), procenat vode (V), koštana masa (KM), viscelarne masti (VM), bazalni metabolizam (BM), metaboličke godine (MG), indeks telesne mase (ITM), procenat masti desne ruke (MDR), mišićna masa desne ruke (MDRkg), procenat masti leve ruke (MLR), mišićna masa leve ruke (MLRkg), procenat masti desne noge (MDN), mišićna masa desne noge (MDNkg), procenat masti leve noge (MLN), mišićna masa leve noge (MLNkg), procenat masti trupa (MT), mišićna masa trupa (MTkg) dobijeni su pomoću bioimedance marke Tanita BC-601.
Cirkularne dimenzije abdomena merene su na tri pozicije. Odmah ispod najniže tačke rebarnog luka *(arcus costalis)* (ORL), prednje gornje bedrene karlične kosti *(spina iliaca anterior superior)* (OBK) i na sredini između ovih tačaka, odnosno oko pozicije pupka (OP). Cirkularne dimenzije sedelne regije (OG) na poziciji zgloba kuka, obim butina (OB) 10 cm ispod zgloba kuka, i obim nadlakta (ON) na središnjoj poziciji u toku kontrakcije mišića *(biceps brahi)*. Cirkularne dimenzije testirane su su nerastegljivom trakom sa preciznošću 0,1 cm.

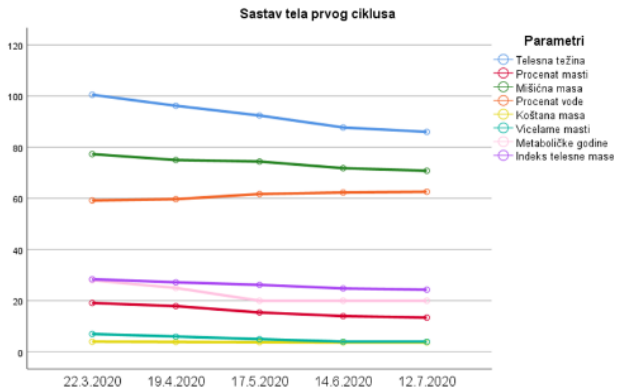
Analiza parametara

Analiza parametara ova dva ciklusa i poređenje efekata intervalnog posta sa ishranom sa i bez glutena u trenažnom ciklusu izvršena je jednostavnom numeričkom statistikom.

REZULTATI

Rezultati sastava tela prvog ciklusa

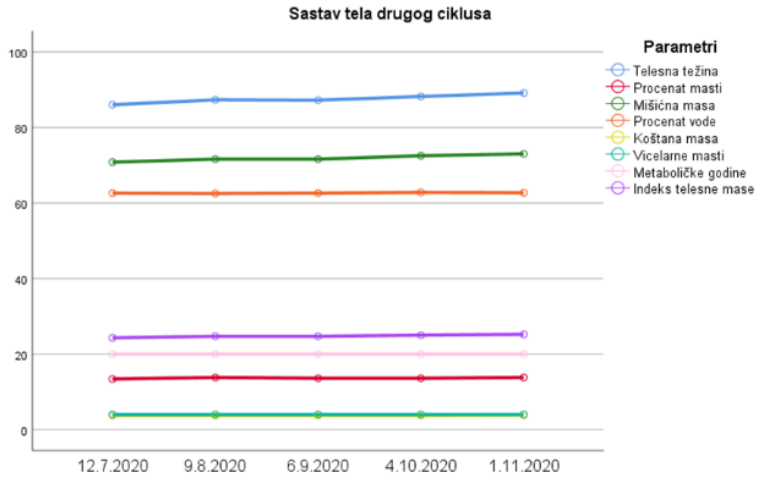
Rezultati prvog 16-nedeljnog ciklusa počev od 22.3.2020. kretali su se sledećom dinamikom. Telesna težina 100,5 kg; M= 19,1%; MM= 77,1 kg; V= 59,2%; KM= 4; VM= 7%; BM= 2145 kcal; MG= 28; ITM= 28,4. Parametri drugog testiranja koje je bilo rađeno 19.4.2020. pokazali su pozitivan efekat u regulisanja telesne mase. TT= 96,2 kg; M= 17,9%; MM= 75 kg; V= 59,7%; KM= 3,9; VM= 6; BM= 2086; MG= 25; ITM= 27,2. Kontinuitet u regulisanju telesnog sastava pokazalo je i treće merenje 17.5.2020. TT= 92,4 kg; M= 15,4%; MM= 74,4 kg; V= 61,7%; KM= 3,8; VM= 5; BM= 2034; MG= 20; ITM= 26,2. Četvrto merenje 14.6.2020. i dalje pokazuje silaznu putanju rezultata. TT= 87,7 kg; M= 14 %; MM= 71,8 kg; V= 62,3; KM= 3,7; VM= 4; BM= 1969; MG= 20; ITM= 24,8. Nakon 12 nedelja stepen uhranjenosti ispitanika po preporukama Svetske zdravstvene organizacije spao je sa prekomerne uhranjenosti na normalnu uhranjenost (WHO, 1998). Poslednje merenje nakon 16 nedelja 12.7.2020. ukazuje na sledeće rezultate. TT= 86 kg; M= 13,4 %; MM= 71,8 kg; V= 62,3; KM= 3,7; VM= 4; BM= 1969; MG= 20; ITM= 24,8.



Grafikon 1. Poređenje parametara sastava tela prvog ciklusa na 4-nedeljnom nivou.

Rezultati sastava tela drugog ciklusa

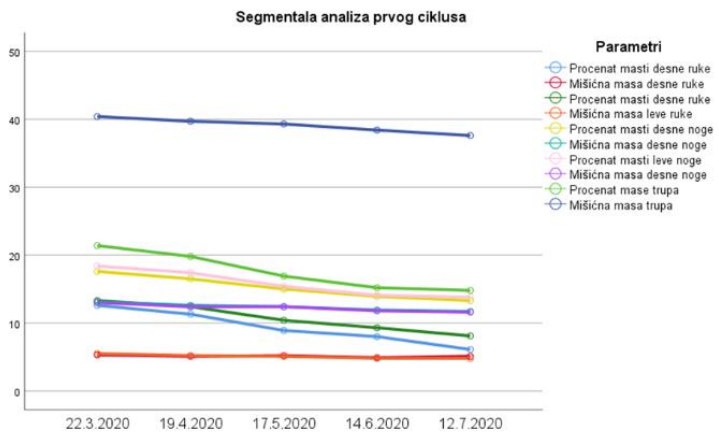
Drugi 16-nedeljni ciklusa počinje i nadovezuje se na merenje rađeno 12.7.2020. Nakon 4 nedelje parametri su sledeći. Telesna težina 87,3 kg; M= 13,8%; MM= 71,6 kg; V= 62,5%; KM= 3,7; VM= 4; BM= 1964 kcal; MG= 20; ITM= 24,7. Rezultati sedmog testiranja koje je bilo rađeno 6.9.2020. pokazalo je indentične rezulatate u odnosu na prethodno. TT= 87,2 kg; M= 13,6%; MM= 71,6 kg; V= 62,6%; KM= 3,7; VM= 4; BM= 1963; MG= 20; ITM= 24,7. Osmo testiranje rađeno 4.10.2020. ukazuje na porast telesne težine i mišićne mase. TT= 88,2 kg; M= 13,6%; MM= 72,5 kg; V= 62,8%; KM= 3,7; VM= 4; BM= 1976; MG= 20; ITM= 25. Poslednje deveto merenje 1.11.2020. ukazuje na trend povećanja telesne težine i mišićne mase. TT= 89,1 kg; M= 13,8 %; MM= 73 kg; V= 62,7; KM= 3,8; VM= 4; BM= 1989; MG= 20; ITM= 25,2.



Grafikon 2. Poređenje parametara sastava tela drugog ciklusa na 4-nedeljnom nivou.

Rezultati segmentalne analize prvog ciklusa

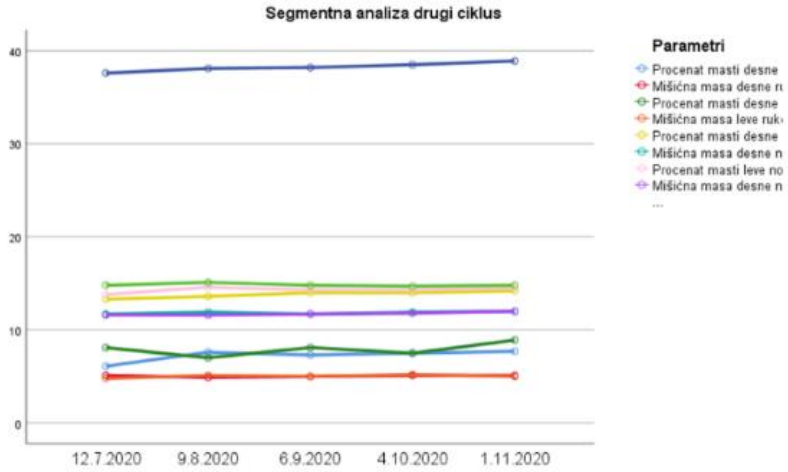
Ovi rezultati su dobijeni u istim terminima i na istoj bioimpedanci kao gore navedeni. U prvom merenju rezultati analize procenata masti i mišićne mase gornjih, donjih ekstremiteta i trupa su sledeći. Procenat masti desne ruke 12,6; MDRkg= 5,3; MLR= 13,3 %; MLRkg= 5,5; MDN= 17,6%; MDNkg= 13,1; MLN= 18,4%; MLNkg= 13; MT= 21,4%; MTkg= 40,4. Rezultati drugog segmentalnog merenja pokazuju gubitak masne i bezmasne mase segmenata. MDR=11,3%; MDRkg= 5,1; MLR= 12,4 %; MLRkg= 5,2; MDN= 16,5%; MDNkg= 12,6; MLN= 17,4%; MLNkg= 12,4; MT= 19,8%; MTkg= 39,7. U trećem merenju zabeležen je značajan pad procenata masti i minimalni pad mišićne mase segmenata tela: MDR=8,9%; MDRkg= 5,2; MLR= 10,4 %; MLRkg= 5,1; MDN= 15%; MDNkg= 12,4; MLN= 15,4%; MLNkg= 12,4; MT= 16,9%; MTkg= 39,3. Četvrto merenje ukazuje na kontinuirani pad i procenata masti i mišića uzajamno. MDR=8%; MDRkg= 4,9; MLR= 9,3 %; MLRkg= 4,8; MDN= 13,9%; MDNkg= 11,9; MLN= 14,1%; MLNkg= 11,8; MT= 15,2%; MTkg= 38,4. Poslednje peto merenje segmenata karakteristično je po tome što parametri desne ruke pokazuju skoro ujednačavanje masti i mišića. Tu je zabeležen pad od 1,9% masti na desnoj ruci, a porast mišićne mase u odnosu na prethodno merenje za 0,2 procenata. MDR=6,1%; MDRkg= 5,1; MLR= 8,1 %; MLRkg= 4,8; MDN= 13,3%; MDNkg= 11,7; MLN= 13,8%; MLNkg= 11,6; MT= 14,8%; MTkg= 37,6.



Grafikon 3. Poređenje parametara segmentalne analize prvog ciklusa na 4-nedeljnom nivou.

Rezultati segmentalne analize drugog ciklusa

U šestom merenju 9.8.2020. rezultati analize procenata masti i mišića gornjih, donjih ekstremiteta i trupa su sledeći. Procenat masti desne ruke 7,6; MDRkg= 4,9; MLR= 7 %; MLRkg= 5,1; MDN= 13,6%; MDNkg= 11,9; MLN= 14,6%; MLNkg= 11,6; MT= 15,1%; MTkg= 38,1. Sedmo merenje segmenata od 6.9. 2020. MDR=7,3%; MDRkg= 5; MLR= 8,1 %; MLRkg= 5; MDN= 14%; MDNkg= 11,7; MLN= 14,3%; MLNkg= 11,7; MT= 14,8%; MTkg= 38,2. Rezultati osmog merenje 4.10.2020. MDR=7,5%; MDRkg= 5,1; MLR= 7,5 %; MLRkg= 5,2; MDN= 14%; MDNkg= 11,9; MLN= 14,3%; MLNkg= 11,8; MT= 14,7%; MTkg= 38,5 slični su rezultatima prethodnog merenja. Poslednje deveto merenje 1.11.2020.pokazuje indetične vrednosti u odnosu na prethodne osim kod preocenta masti leve ruke koje su osetnije skočile MDR=7,7%; MDRkg= 5,1; MLR= 8,9 %; MLRkg= 5,0; MDN= 14,2%; MDNkg= 12; MLN= 14,5%; MLNkg= 12; MT= 14,8%; MTkg= 38,9.

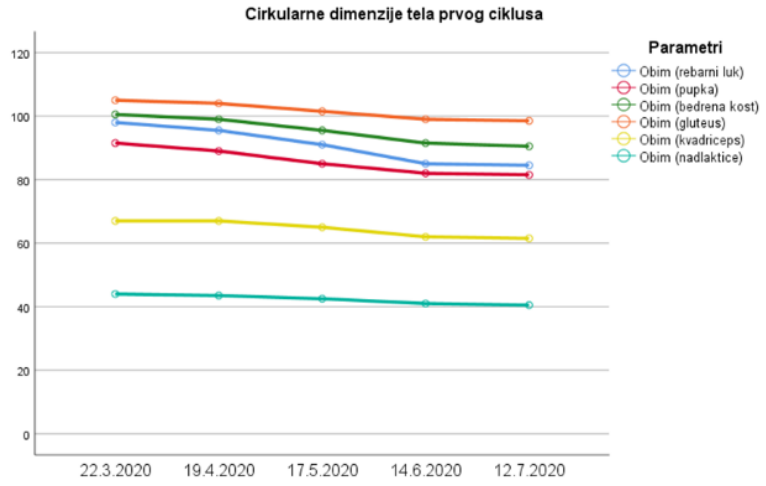


Grafikon 4. Poređenje parametara segmentalne analize drugog ciklusa na 4-nedeljnom nivou.

Rezultati cirkularnih dimenzija prvog ciklusa

Merenje cirkularnih dimenzija abdomena na prvom merenju pokazalo je sledeće rezultate: OP= 98 cm; ORL= 91,5 cm; OBK= 100,5 cm. Sedelna regija bila je obima od 105 cm, OB= 67 cm, ON=44 cm. Na drugom merenju: OP= 95,5, cm; ORL= 89 cm; OBK= 99 cm.OG= 104 cm, OB= 67 cm, ON=43,5 cm. Treće merenje pokazuje na duplo smanjenje centimetara u obimu

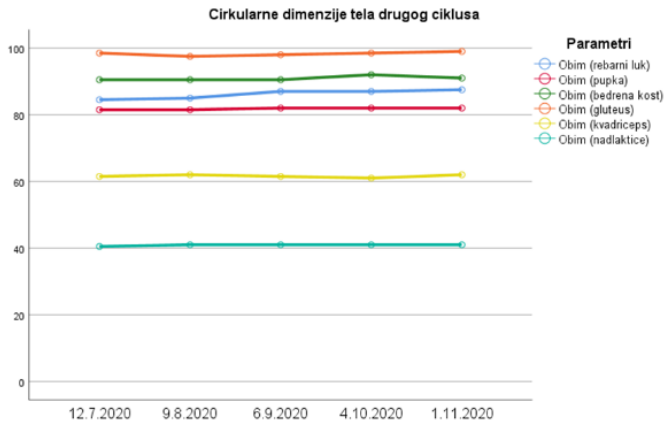
nego što je to bio slučaj između prvog i drugog testiranja. OP= 91 cm; ORL= 85 cm; OBK= 95,5 cm; OG= 101,5 cm, OB= 65 cm, ON= 42,5 cm. Na četvrtom merenju se vidi nastavak osetnijeg kontinuiranog pada cirkularnih dimenzija na šta ukazuju sledeći rezultati: OP= 85 cm; ORL= 82 cm; OBK= 91,5 cm.OG= 99 cm, OB= 62 cm, ON= 41 cm. Peto poslednje testiranje ukazuje na minimalno smanjenje obima tela: OP= 84,5 cm; ORL= 81,5 cm; OBK= 90,5 cm.OG= 98,5 cm, OB= 61,5 cm, ON= 40,5 cm.



Grafikon 5. Poređenje parametara cirkularnih dimenzija prvog ciklusa na 4-nedeljnom nivou.

Rezultati cirkularnih dimenzija drugog ciklusa

Merenje cirkularnih dimenzija abdomena na šestom merenju 9.8.2020 pokazalo je sledeće rezultate: OP= 85 cm; ORL= 81,5 cm; OBK= 90,5 cm. Sedelna regija bila je obima od 97,5 cm, OB= 62 cm, ON=41 cm. Rezultati sedmog merenja: OP= 87, cm; ORL= 82 cm; OBK= 90,5 cm. OG= 98 cm, OB= 61,5 cm, ON=41 cm. Rezultati osmog merenja 4.10.2020. OP= 87 cm; ORL= 82 cm; OBK= 92,5 cm. OG= 98,5 cm, OB= 61 cm, ON= 41 cm. Rezultati poslednjeg devetog merenja 1.11.2020. pokazuju blagu tendenciju rasta obima i indentične cirkularne dimenzije kao na merenju iz juna u prvom ciklusu. OP= 87,5 cm; ORL= 82 cm; OBK= 91 cm. OG= 99 cm, OB= 62 cm, ON= 41 cm.



Grafikon 6. Poređenje parametara cirkularnih dimenzija drugog ciklusa na 4-nedeljnom nivou.

DISKUSIJA

Rezultati ispitivanja pokazuju da je metoda prvog ciklusa intervalnog posta efikasnija u odnosu na metod drugog ciklusa u cilju smanjenja telesne mase i njenih komponenti. Pretragom baze podataka o efikasnosti dijeta sa veoma niskim procentom ugljenih hidrata i uobičajnih dijeta gde je primarni ishod bila telesna težina došlo se do zaključka da niski unos ugljenih hidrata može biti dobro alternativno sredstvo protiv viška kilograma (Bueno N , Vieira de Melo I, Lima de Oliveira S, Ataide T, 2013). Prvi ciklus intervalog posta sa bezglutenskom i ishranom bez šećera pokazuje efikasnost u rekulisanju telesnih masti, kako potkožnih tako i viscelarnih. Ovi rezultati se podudaraju sa tvrdnjama naučnog istraživanja da se razumevanje mahanizma autofagije u fiziologiji i patofiziologiji masnog tkiva mogu predložiti novi tretmani u borbi protiv gojaznosti (Cairó M, Villarroya J, 2020).

Najefikasniji period prvog ciklusa bio je između 2 i 4 nedelje. Metaanaliza prospektivnih studija dokazala je da povećanjem volumena i broja masnih ćelija gornjeg dela tela povećava rizik od metaboličkog sindroma i od razvoja šećerne bolesti tipa 2 (DM2) (Galassi et al, 2006). Takođe je dokazano da ITM, centralna adipoznost i porast telesne mase ukazuje na povećani rizik za nastanak DM2 (Bray et al, 2018, DeFronzo et al, 2015). Rezultati ovog istraživanja ukazuju na gubitak od 14,5 kg i 13,5cm cirkularnog obima abdomena (9mm/kg) i prelaska iz stanja predgojaznosti u normalnu uhranjenost. Kao takva može predsavljati potencijalno efikasno sredstvo u regulisanju telesnog sastava i prevencije zdravlja.

Drugi 16-nedeljni ciklus u odnosu na prvi pokazuje suprotan efekat na morfološke karakteristike. Signalizacija insulina u skeletnim mišićima glavni je faktor rasta mišića i homoestaze glukoze (Jaiswal N, Gavin M G, W J Quinn W J, Luongo T S, Gelfer R F, Baur J A, Titchenell P M, 2019). Rezultati ovog rada ukazuju na povišenu telesnu težinu u ovom periodu. Ono što je pozitivno, to je da porast težine proističe iz povećanja mišićne mase. Nema jasnih dokaza o uticaju glutena na gojaznost. U jednom istraživanju se nisu pokazale razlike na telesnu kompoziciju i bazalni metabolizam kada je ispitivana glutenska i bezglutenska ishrana, Međutim, kada je u istraživanju uzet u obzir i genotip Hp, onda je zaključeno da kod unosa glutena dolazi do oslobađanja zonulina. Rezultat toga je potencijalno smanjenje bazalnog metabolizma i povećanje infalamntornih markera (Silva R B, Rodrigues E, Coelho B S, Andrade K, Fonseca L, Fernandes-Braga W, Ferreira A, Shivappa N, Hébert J R, Silvestre S C, Fasano A, Freire R H, Alvarez-Leite J I, 2020) što u ovom istraživanju nije moglo da se zaključi, sem porasta cirkularnog obima abdomena od 3 cm i procenta masti na ekstremitetima. Intervalni post potencijalno predstvalja efikasnu metodu koja može pomoći osobama koje žele da smanje telesnu masu ili da zadrže željenu telesnu masu (Johnstone A, 2014). S obzirom da se radi o jednom ispitaniku ne može se sa sigurnošću zaključiti da bi ovakvi efekti bili potvrđeni na većem broju ispitanika, populaciji koja nije u trenažnom procesu, drugih starosnih kategorija i pola.

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EFFECTS OF VEGAN DIET ON HEALTH AND PHYSICAL ABILITIES

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Abstract: The vegan diet absolutely excludes all animal foods, ie meat, fish, dairy products, eggs, and even honey. Nowadays it is especially popular among the general population and athletes. Attitudes towards the vegan diet are divided, so on the one hand the exclusion of animal foods is considered healthy and noble, while on the other hand it is stated that such a restrictive approach can lead to a deficiency of certain macro and micronutrients. This paper aims to investigate the effects of a vegan diet on health and physical ability. The paper used a descriptive and analytical method, while the following electronic databases were used to collect literature: KoBSON, Google Scholar, MEDLINE, PEDro, DOAJ, and PubMed. The keywords used to find the literature: vegan diet, cardiovascular diseases, physical abilities, maximum oxygen consumption. Most studies show that vegans have a lower mortality rate, are less likely to develop malignancies, and have a lower risk of obesity. Also, vegans generally have lower blood pressure, lower levels of total and low-density lipoprotein cholesterol - LDL, and are less likely to suffer from hypertension, coronary heart disease, and have a lower risk of cardiovascular disease. A vegan diet has positive effects on the regulation of metabolic diseases, such as diabetes and insulin resistance. Although it is widely believed that the vegan diet is low in iron, most studies do not show its reduced serum levels. It is likely that the high intake of vitamin C, which is characteristic of a vegan diet, facilitates the absorption of iron. On the other hand, a vegan diet can have some negative effects on health. In particular, due to the exclusion of animal food, vegans generally have lower levels of cyanocobalamin (vitamin B12). Also, due to lower values of high-density lipoprotein - HDL and higher values of serum homocysteine, which is an indicator of deficiency of vitamins B12 and folic acid, the risk of atherosclerosis in vegans might be increased. However, with proper nutrition and vitamin B12 supplementation, these side effects can be prevented. Based on the analysis of only a few studies that have examined the effects of a vegan diet on physical abilities, we can say that vegans in terms of maximum oxygen consumption (VO2max) generally show better results while in terms of power (Pmax) and strength (kg/kg LBM), do not lag behind vegetarians and omnivores. The high VO2max values in vegans can be explained by lower BMI values and high carbohydrate intake that allow replenishment of glycogen stores. In addition, since many vegetables, fruits, and other plant foods are rich in antioxidants, they further help speed up the athlete's recovery by reducing oxidative stress and inflammation, which are caused by intense training and competition. A vegan diet shows many health benefits, but vitamin B12 supplementation is needed to avoid side effects. Compared to people who consume animal foods, vegans generally achieve higher values of maximum oxygen consumption.

Keywords: vegan diet, cardiovascular diseases, physical abilities, VO2max

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EFEKTI VEGANSKE ISHRANE NA ZDRAVLJE I FIZIČKE SPOSOBNOSTI

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Sažetak: Veganska ishrana apsolutno isključuje sve životinjske namirnice, odnosno meso, ribu, mlečne proizvode, jaja, pa čak i med. Ona je naročito popularna u poslednje vreme, kako u opštoj populaciji tako i među sportistima. Stavovi po pitanju veganske ishrane su podeljeni pa se sa jedne strane isključivanje životinjskih namirnica smatra zdravim i plemenitim dok se sa druge strane navodi da ovako restriktivan pristup može da dovede do deficita određenih makro i mikronutrijenata. Cilj ovog rada je da pregledom naučnih istraživanja ispita efekte veganske ishrane na zdravlje i fizičke sposobnost. U radu su korišćeni deskriptivni i analitički metod, dok su za prikupljanje literature korišćene sledeće elektronske baze podataka: KoBSON, Google Scholar, MEDLINE, PEDro, DOAJ i PubMed. Ključne reči koje su korišćene za pronalaženje radova su: veganska ishrana, kardiovaskularne bolesti, fizičke sposobnosti, maksimalna potrošnja kiseonika. Većina studija pokazuje da vegani imaju nižu stopu mortaliteta, ređe oboljevaju od malignih bolesti i imaju manji rizik od nastanka gojaznosti. Takođe, vegani generalno imaju niži krvni pritisak, niže vrednosti ukupnog i holesterola lipoproteina niske gustine – LDL, te ređe oboljevaju od hipertenzije, koronarne bolesti srca i imaju manji rizik od nastanka kardiovaskularnih bolesti. Veganska ishrana ostvaruje pozitivne efekte na regulisanje metaboličkih oboljenja, kao što su dijabetes i insulinska rezistencija. Iako je ustaljeno mišljenje da je veganska ishrana siromašna gvožđem, većina studija ne pokazuje njegove smanjene vrednosti u serumu. Verovatno da visok unos vitamina C, koji je karakterističan za vegansku ishranu olakšava apsorpciju gvožđa. Sa druge strane, veganska ishrana može imati i neke negativne efekte na zdravstveno stanje. Konkretno, zbog isključivanja namirnica životinjskog porekla, vegani uglavnom imaju niže vrednosti cijanokobalamina (vitamin B12). Pored toga, zbog nižih vrednosti lipoproteina visoke gustine – HDL i viših vrednosti homocisteina u serumu što je pokazatelj deficita vitamina B12 i folne kiseline, rizik od ateroskleroze kod vegana može biti povećan. Međutim, uz pravilno sprovođenje ishrane i suplementaciju vitamina B12 ove neželjene efekte je moguće sprečiti. Na osnovu analize svega nekoliko studija koje su do sada ispitivale uticaje isključivo veganske ishrane na fizičke sposobnosti možemo da kažemo da vegani ne zaostaju za vegeterijancima i osobama koje konzumiraju raznovrsnu ishranu u pogledu ispoljavanja snage (Pmax) i jačine (kg/kg LBM), dok u pogledu ispoljavanja maksimalne potrošnje kiseonika (VO2max) uglavnom pokazuju bolje rezultate. Visoke vrednosti VO2 max kod vegana mogu se objansiti nižim vrednostima BMI i visokim unosom ugljenih hidrata koji omogućavaju popunjavanje skladišta glikogena. Pored toga budući da je mnoštvo povrća, voća i drugih biljnih namirnica bogato antioksidantima, oni dodatno pomažu ubrzanom oporavku sportista tako što smanjuju oksidativni stres i inflamacije, koje izazivaju intenzivni trenizi i takmičenja. Veganska ishrana pokazuje brojne zdravstvene benefite, međutim potrebna je suplementacija vitaminom B12 kako bi se izbegli neželjeni efekti. U poređenju sa osobama koje konzumiraju namirnice životinjskog porekla vegani uglavnom ostvaruju veće vrednosti maksimalne potrošnje kiseonika.

Ključne reči: veganska ishrana, kardiovaskularne bolesti, fizičke sposobnosti, maksimalna potrošnja kiseonika

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UVOD

Danas je prisutan veliki broj različitih načina ishrane, koju su uglavnom nastali iz potrebe da se regulišu neka od danas veoma učestalih oboljenja (dijabetes, insulinska rezistancija, hipotireoza, metabolički sindrom, gojaznost...), redukuje telesna masa ili dostigne idealna telesna forma. Međutim, od svih načina ishrane jedna se po svojoj specifičnosti posebno razlikuje i ističe, a to je veganska ishrana. Veganska ishrana osim što isključuje sve namirnice životinjskog porekla, odnosno meso, ribu, mlečne proizvode, jaja, pa čak i med (Kahleova, Levin, & Barnard, 2017), ona u svojoj osnovi predstavlja posebnu filosofiju života koja podrazumeva altruistički, humani i etički odnos prema životnoj sredini i zaštiti životinja (Greenebaum, 2012). Prema tome razlozi za prelazak na ovakav vid ishrane pored gore pomenutih zdravstvenih mogu još biti i etički, ekološki i verski (Greenebaum, 2012). S obzirom da je i među osobama koje se profesionalno ili rekreativno bave sportom odnosno fizičkim vežbanjem takođe povećan broj vegana (Rogerson, 2017), pored već pomenutih razloga možemo dodati i razloge koji se odnose na unapređivanje svojih fizičkih i funkcionalnih sposobnosti. Oakav način ishrane izaziva dosta polemika, kako u opštoj populaciji tako i u stručnoj javnosti. Sa jedne strane se navodi da je čovek po svojoj anatomiji biljojed i ističu se isključivo pozitivi efekti ovakvog načina ishrane na zdravlje čoveka. Posebno se skreće pažnja na to da veliki broj profesionalnih sportista postiže vrhunske rezultate zahvaljujući veganskoj ishrani. Sa druge strane se navodi da ovakav način ishrane može dovesti do malnutricije, neuhranjenosti, deficita vitamina B12, gvožđa, te pada mišićne mase i fizičkih sposobnosti sportista i rekreativaca. S obzirom na veliku popularnost ovakvog načina ishrane i na veliki broj kontradiktornih stavova koji su za njega vezani, cilj ovog rada je da pregledom literature i analizom odabranih radova ispita, kako pozitivne tako i negativne efekte veganske ishrane na gojaznost, metaboličke bolesti, kardiovaskularno zdravlje i fizičke sposobnosti čoveka.

METOD RADA

U radu su korišćeni deskriptivni i analitički metod, dok su za prikupljanje literature korišćene sledeće elektronske baze podataka: KoBSON, Google Scholar, MEDLINE, PEDro, DOAJ i PubMed. Ključne reči koje su korišćene za pronalaženje radova su: veganska ishrana, krvni pritisak, lipidni profil, metaboličke bolesti, dijabetes, vitamin B12, fizičke sposobnosti, sila, snaga, VO2max. Studije su odabrane i detaljno analizirane na osnovu postavljenih kriterijuma.

Inkluzivni kriterijumi:

- Studije koje su u istraživanju koristile isključivo vegansku ishranu
- Studije koje su poredile vegansku ishranu sa drugim vidovima ishrane
- Studije koje su pratile promene pokazatelja faktora rizika kardiovaskularnih i metaboličkih oboljenja (lipidni profil, glukoza, insulin, HbA1c i dr.)
- Studije koje su ispitivale uticaj veganske ishrane na fizičke sposobnosti
- Studije pisane na engleskom

Kriterijumi za isključivanje:

- Studije koje su u ishrani uključivale namirnice životinjskog porekla, uključujući i vegetrijansku ishranu sa njenim varijantama (upotreba mleka, jaja i ribe)
- Studije koje nisu pisane na engleskom

Efekti veganske ishrane na gojaznost i metaboličke bolesti

Gojaznost je jedan od najrasprostranjenijih zdravstvenih problema, jer dostiže razmere epidemije i dovodi do velikog broja kardiovaskularnih, metaboličkih i drugih oboljenja. Danas je popularan veliki broj dijeta koje se koriste za tretiranje ovih problema, a među njima je svoje mesto našla i veganska ishrana. Nekoliko istraživanja je do sada pokazalo da veganska ishrana može imati pozitivne efekte na gojaznost i pridružene metaboličke bolesti. Kahleova i sar. (2018) su u periodu od 16 nedelja kod gojaznih ispitanika poredili efekte veganske ishrane sa standardnom ishranom. Rezultati su pokazali da se Indeks telesne mase (BMI) i telesna masa značajno smanjila samo u grupi vegana (- 2.0 i -6,5 kg $p<0.001$). Masna komponenta telesnog sastava i volumen visceralnih masti, je takođe redukovan samo u grupi vegana (-4,3 i - 224; $p<$ 0,001). Pored toga ovo istraživanje je imalo za cilj da ispita efekte veganske ishrane u poređenju sa standradnom ishranom na stanje insulinske rezistencije. Za ovu analizu je korišćen HOMA – IR model. HOMA – IR je značajno smanjen jedino u grupi vegana (-1.0; p=0,004). (Kahleova, Dort, Holubkov, & Barnard, 2018). Takođe, ovo istraživanje je pokazalo da je veći unos ugljenih hidrata (UH) i vlakana povezan sa manjim vrednostima telesnih masti, visceralnih masti, BMI, kao i sa manjim vrednostima HOMA – IR. Ovi nalazi su u suprotosti sa određenim stavovima po kojima se visok unos ugljenih hidrata dovodi u vezu sa povećanjem telesne mase, masne mase i insulinske rezistencije. Pored same količine ugljenih hidrata potrebno je voditi računa i o njihovom kvalitetu. Vegani generalno unose zdrave integralne izvore ugljenih hidrata, sa niskim vrednostima glikemijskog indeksa i glikemijskog opterećenja, a visokim vrednostima vlakana. Pored toga konzumiraju dosta salata, salatnog povrća i voća. Ove namirnice imaju malo kalorija na veliku količinu, a visok procenat vlakana i na taj način doprinose osećaju sitosti i smanjenom unosu kalorija (Kahleova i sar., 2018a; Kahleova i sar., 2017). Slična grupa autora je u drugim istraživanjima pokazala da je kod vegana smanjen unos zasićenih masnih kiselina i trans masti, a povećan unos polinezasićenih masnih kiselina, posebno linoleinske i alfa linoleinske kiseline (Kahleova i sar., 2019), kao i povećan unos biljnih proteina (Kahleova, Fleeman, Hlozkova, Holubkov & Barnard, 2018*)* povezan sa smanjenjem masne mase, smanjenom insulinskom rezistencijom i povećanom sekrecijom insulina. Dodatno, pokazalo se da je kod vegana smanjen unos aminokiseline histidina, koji je nezavistan od promena u BMI ili energetskog unosa, poboljšao osetljivosti ćelija na insulin. Takođe, smanjeni unos treonina, leucina, lizina, metionina i tirozina bio je povezan sa smanjenjem insulinske rezistencije. Međutim, ova povezanost je uglavnom bila uslovljena gubitkom težine. U poređenju sa raznovrsnom ishranom kod veganske ishrane ne-esencijalne aminokiseline u biljnim proteinima podstiču veću aktivnost glukagona što doprinosi smanjenju telesne mase i LDL holesterola. Sa druge strane visoke vrednosti aminokiselina račvastog lanca – BCAA povezane su sa povećanim rizikom za nastanak dijabetesa tipa 2. BCAA i visoke vrednosti leucina dovode do smanjenog transporta glukoze u masnim i mišićnim ćelijama i doprinose aktivnosti mTOR signalnog puta. Leucin se nalazi u visokim koncentracijama u jajima i mesu a preterana stimulacija mTOR – a posredstvom ovih namirnica može dovesti do gojaznosti i insulinske rezistencije (Kahleova i sar., 2018b). Prema tome, pomenute studije pokazale su da je povećan unos ugljenih hidrata, dijetalnih vlakana i biljnih proteina, a smanjen unos životinjskih proteina i zasićenih masnih kiselina, povezan sa smanjenom telesnom težinom, masnom masom i optpornošću na insulin kod osoba sa prekomernom težinom. Dalje, u radu Yu-Mi Lee i sar. (2016) se pokazalo da veganska ishrana može imati pozitivne efekte i kod osoba obolelih od dijabetesa tipa 2 (T2D). U ovom istraživanju su se srednje vrednosti HbA1c u periodu od prve do dvanaeste nedelje kretale od 7.7% do 7.1% u grupi vegana i od 7.4% do 7.2% u grupi gde je primenjivana konvencionalna ishrana za dijabetes. Iako su obe dijete dovele do pada HbA1c, ovo smanjenje je bilo veće u grupi vegana, prema tome veganska ishrana dovela je do bolje kontrole nivoa glukoze. Ono što

je značajno istaći jeste da su pomenuti efekti bili nezavisni od energetskog unosa i obima struka. Prema tome ovi rezultati ukazuju na to da veganska ishrana ostvaruje dodatne prednosti koji su nezavisni od kalorijskog deficita i gubitka težine. Drugi potencijalni mehanizmi mogu da uključuju veći unos dijetalnih vlakana. Dijetetska vlakna mogu smanjiti glikemijski indeks ugljenih hidrata usporavanjem apsorpcije glukoze iz creva. Pored toga, dijetalna vlakna mogu poboljšati kontrolu glikemije povećavanjem izlučivanja žučne kiseline i povećanjem proizvodnje masnih kiselina kratkog lanca putem bakterijske fermentacije vlakana. Smanjenje intramiocelularnih koncentracija lipida može predstavljati još jedan mogući mehanizam. Drugo objašnjenje može uključivati smanjenu izloženosti organiskim zagađivačima – POP (persistent organic pollutants) isključivanjemhrane životinjskog porekla. Nedavno je utvrđeno da je izlaganje malim dozama POP važan faktor rizika za razvoj T2D. Pored toga vegani su više fizički aktivni i upražnjavaju zdraviji stil života u odnosu na osobe koje konzumiraju meso. Ovo su neki od faktora koji objašnjavaju redukciju telesne mase i bolje metaboličko stanje na veganskoj ishrani (Yu-Mi Lee i sar., 2016).

Efekti veganske ishrane na kardiovaskularno zdravlje

Generalne preporuke kod regulisanja određenih kardivaskularnih stanja kao što su visok krvni pritisak, dislipidemija, ateroskleroza itd. se upravo odnose na povećanje upotrebe integralnih žitarica, povrća i vlakana, a smanjenje upotrebe mesa i zasićenih masnih kiselina. Prema tome nije iznenađujuće što veganska ishrana kod koje je nivo masti značajno redukovan, a meso potpuno isključeno pokazuje pozitivne efekte na parametre i faktore rizika kardiovaskularnih oboljenja.. Šta više u određenim studijama se pokazalo da su ovi efekti značajniji u poređenju sa drugim tipovima ishrane. Appleby i sar. (2002) poredili su krvni pritisak vegana sa grupama ispitanika koju su bili na različitim tipovima ishrane. Odnosno između vegana, vegeterijanaca, peskovegeterijanaca i mesojeda. Prevelanca hipertenzije značajno se razlikovala između grupa, krećući se od 15% kod muškaraca mesojeda do 5,8% kod muškaraca vegana, i od 12,1% kod žena mesojeda do 7,7% kod žena vegana, dok su peskovegeterijanci i vegeterijanci imali vrednosti koje su se kretale između ovog raspona. Takođe, srednja vrednost sistolnog i dijastolnog krvnog pritiska bila je značajno različita između četiri grupe, gde su mesojedi imali najviše vrednosti a vegani najniže vrednosti krvnog pritiska (Appleby, Davey, & Key, 2002). Vegani su imali nižu prevelenciju hipertenzije i niži sistolni i dijastolni krvni pritisak, uglavnom zbog razlika u BMI. Takođe se pokazalo da je grupa koja je konzumirala meso unosila najviše zasićenih masti i soli, dok su vegani unosili najmanje. Dodatno ovo studija je pokazala da je u grupi koja je konzumirala meso, veći unos energije i zasićenih masti bio povezan sa većim krvnim prtiskom. Sa druge strane u grupi vegana visok unos ugljenih hidrata bio je povezan sa nižim krvnim pritiskom. Pored toga grupa koja je konzumirala meso je unosila više alkohola i bila najmanje fizički aktivna, što je takođe bilo povezano sa povećenjem krvnog pritiska. Suprotno tome, gotovo potpuno isključivanje alkohola i visok nivo fizičke aktivnosti kod vegana bio je povezan sa smanjenjem krvnog pritiska. Konačno, grupa koja je konzumirala meso je unosila najviše medikamenata, a vegani najmanje. Na osnovu ove studije možemo da kažemo da pored samih efekata veganske ishrane, adekvatnim vrednostima krvnog pritiska doprinosi i zdraviji stil života koji vegenai generalno upražnjavaju (Appleby i sar., 2002). Dodatno vegani unose dosta više kalijuma, koji se pokazao veoma efikasnim u smanjenju krvnog pritiska (Fontana i sar., 2007). Sa druge strane u meta anlizi Lopeza i sar. (2019) koja je obuhvatala 983 učesnika pokazalo se da u poređenju sa manje restriktivnom ishranom, veganska ishrana nije dovela do značajne promene u sistolnom (-1.33 mmHg; p=0.230) ili dijastolnom (-1.21 mmHg; p=0,203) krvnom pritisku. Međutim, specifična analiza podgrupa studije sa osnovnim sistolnim krvnim pritiskom ≥130 mHg pokazala je da veganska dijeta rezultira smanjenjem srednjih vrednosti sistolnog (-4,10 mmHg; p = 0,047) i dijastolnog

(-4,01 mmHg; p = 0.005) krvnog pritiska. Na osnovu rezultata ove studije možemo da kažemo da su promene krvnog pritiska izazvane veganskom ishranom bez kalorijskog deficita značajne, ali da su uporedive sa onima izazvanim dijetalnim pristupima koje preporučuju konvencionalna medicinska udruženja (Lopez i sar., 2019). Ono što objašnjava sličnost efekata u ovoj studiji jeste što konvencionalna udruženja kao preduslov zahtevaju regulisanje telesne mase i preporučuju smanjenje crvenog mesa, masnoća i soli, a povećanu upotrebu povrća, vlakana i kalijuma (Lopez i sar., 2019). Izveštaji pokazuju da je današnja ishrana prosečnog čoveka prebogata masnoćama (WHO), koje pored krvnog pritiska mogu povećati i nivo lipida u serumu. Narušene vrednosti lipida odnosno postojanje dislipidemije povećava rizik za nastanak kardiovaskularnih bolesti. Studije na veganima su pokazale da vrednosti lipidnog profila ostaju u okviru referentnih i da su vrednosti određenih parametara niže u odnosu na osobe na standardnoj ishrani. Yokoyama i sar. (2017) su u svojoj meta analizi koje je obuhvatala 1484 ispitanika pokazali da je konzumacija veganske ishrane bila povezana sa nižim srednjim koncentracijama ukupnog holesterola, holesterola lipoproteina niske gustine - LDL i holesterola lipoproteina visoke gustoće – HDL, u poređenju sa konzumiranjem standardnih dijeta (p <0.001). Iako su vegani imali i niže vrednosti triglicerida razlika nije bila statistički značajna. (Yokoyama, Levin, & Barnard, 2017). Rezultati ovih nalaza se objašnjavaju time što vegani kroz svoju ishranu unose najmanje zasićenih masnih kiselina i holesterola. Ipak, postoji bojazan da na veganskoj ishrani zbog deficita određenih vitamina i minerala može doći do hematoliških problema. Tako zbog visokih koncentracija fitata, tanina i fosfata, te zbog nižih vrednosti gvožđa u namirnicama biljnog porekla, kod vegana može postojati povećan rizik za nastanak sideropenijske anemije, koja se odlikuje niskim brojem i volumenom eritrocita i niskom količinom hemoglobina (Hazell, 1988). Međutim, istraživanja su pokazala da nivoi eritrocita i hemoglobina ostaju u okviru referentnih kao i da vegani unose adekvatne količine gvožda i da nemaju njegove snižene vrednosti u serumu (Ilić, Dobrijević & Rebić, 2020; Dong, & Scott, 1982). Najverovatnije da visok unos vitamina C koji je karakterističan za vegansku ishranu olakšava apsporpiciju gvožda iz creva, čime se mogu objasniti njegove adekvatne količine u serumu. Međutim, sa druge strane pokazalo se da veganska ishrana koje je deficitna u vitaminu B12 može imati i neke negativne efekte na kardiovaskularno zdravlje o čemu će se diskutovati u narednom poglavlju.

Vitamin B12

Vitamin B12 funkcioniše kao koenzim u metabolizmu nukleinskih kiselina, utiče na sintezu proteina, ima ulogu u sazrevanju eritrocita, stvaranju nervnog omotača i dr (Rizzo i sar., 2016). S obzirom da se B12 nalazi u iskoristljivoj formi isključivo u namiricima životinjskog porekla, veganska ishrana može biti povezana sa njegovim nižim vrednostima, što se pokazalo u velikom broju studija (Gilsing i sar., 2010; Gallego Narbón i sar., 2019; Waldmann i sar., 2005). Niske vrednosti vitamina B12 mogu izazvati hematološke probleme, koji se manifestuju kroz povećanje srednjeg volumena krvnih ćelija (MCV), anamiju i promenu ertropoeze. B12 takođe igra ključnu ulogu u zdravlju neurona, pa ozbiljan nedostatak može inhibirati fiziološku formaciju mijelinskog omotača, i ometati pravilnu transmisiju nerava (Rizzo i sar., 2016). Pored toga nizak nivo B12 u serumu može izazvati porast homocisteina, što je supstanca koja može imati negativne efekte na kardiovaskularni sistem i izazvati pojavu ateroskleroze. Zanimljivo je da se pokazalo da posledično povećanje homocisteina ima jednako neželjeno dejstvo na kardiovaskularni sistem kao i upotreba cigareta ili dislipidemija (To, Case, & Nineteen, 1997). Gallego-Narbón i sar. (2019) su ispitivali status homocisteina i vitamina B12 kod vegana. Deficit vitamina B12 je detektovan kod 11%, a hiperhomocistenemija kod 33% ispitanika. Uvođenje suplemenata vitamina B12, poboljšao je njegov nivo u serumu. (Gallego-Narbón i sar., 2019). Takođe, u radu Ilića i sar. (2019) je primećen deficit kod onih vegana

koji nisu uzimali suplemetaciju, dok su oni koji su uzimali B12 imali njegove adekvatne količine u serumu. Upotreba suplementacije vitamina B12 se pokazala kao pozitivna u prevenciji ali i terapiji kardiovaskularnih bolesti. Tako su Balazs & Laszlo Debreceni (2014) pokazali da upotreba folne kisleine, vitamina B6 i vitamina B12, smanjuje rizik od nastanka kardiovaskularnih bolesti, tako što ova grupa vitamina smanjuje vrdnosti homocisteina, a pored toga imaju i antioksidativno dejstvo (Debreceni, B., & Debreceni, L., 2014). Na osnovu svega navedenog možemo da kažemo da se veganima savetuje izimanje suplementa vitmina B12, kako bi se izbegli negativni efekti njegovog deficit.

Efekti veganske ishrane na mišićnu masu

Generalno se smatra da je zbog isključivanja namirnica životinjskog porekla veganima dosta teže da unesu dovoljnu količinu proteina i sve neophodne aminokiselina za izgradnju mišićne mase. U pilot studiji Vanacore i sar. (2018) se pokazalo da je jedino u grupi vegana došlo do značajnog smanjenja bezmasne telesne mase – LMB u poređenju sa vegeterijancima i svaštojedima. Rezultati ove studije se objašnjavaju nedostatkom određenih aminokiselina, naročito leucina. Leucin ima značajnu ulogu u aktivaciji metaboličkog puta mTOR - a odgovornog za sintezu proteina i dodavanje mišićne mase. Usled nedostatka leucina rad ovog metaboličkog puta je otežan i može doći do degradacije mišićnog tkiva. Međutim, kao što smo naveli ranije viši unos biljnih proteina, a niži unos leucina povezan je smanjenjem masne mase, što takođe može unaprediti telesnu kompoziciju (Kahleova, i sar., 2018b). Takođe, smatra se da deficit vitamin B12, koji je karakterističan za vegane može dovesti do pada mišićne mase. Međutim, određene studije su pokazale da kada su vegani unosili nešto niže vrednosti ovog vitamina u odnosu na preporučeni dnevni unos oni se u nivou LBM nisu razlikovali od osoba na standardnoj ishrani. U studiji Nebl i sar., (2019) vrednosti LBM – a su za svaštojede, vegeterijance i vegane bile 53.7 ± 9.21; 52.6 ± 8.75 i 53.2 ± 11.2, redom; p=0.866. Dok je u studiji Boutrosa i sar. (2020) LBM kod vegana bio 41.8 ± 3.5 a kod svaštojeda 41.5 ± 4.3; p= 0.8. (Boutros i sar.,2020). S obzirom da se često navodi da je potrebno da prođe duži vremenski period kako bi se ispoljili negativni efekti deficita vitamin B12 na mišićnu masu važno je da napomenemo da su vegani u ovim studijama bili na veganskom režimu ishrane najmanje 2 odnosno 3 godine. Međutim, ove studje nisu uključivale hematološku analizu, već samo podakte o nutritivnom unosu, tako da nije nam poznato da li je niži unos vitamin B12 kroz ishranu doveo i do njegovih nižih vrednosi u serumu. Optimalan nivo LBM u ovim studijama objašnjava se dovoljnim unosom svih ostalih nutrijenata. Na primer vegani su u ovim studijama unosili dovoljne količine proteina, koje su bile oko 1,1 g/kg. Prema generalnim preporukama odrasloj populaciji se preporučuje da unosi 1-1,5 g/kg proteina dnevno (Clark, N., 2019).

Efekti veganske ishrane na fizičke sposobnosti

Danas sve veći broj sportista prelazi na vegansku ishranu i pri tome postiže vrhunske rezultate. Ipak, još uvek se generalno smatra da veganska ishrana može dovesti do deficita određenih nutrijenata i posledično do negativnih efekata na fizičke sposobnosti. Međutim, suprotno ustaljenom mišljenju studije su pokazale da veganska ishrana ne samo da može dovesti do porasta određenih sposobnosti već da ima naročit efekat i na zdravstveno stanje vrhunskih sportista. Iako se generalno smatra da sportisti imaju bolje funkcionalne sposobnosti i zdravstveno stanje u poređenju sa prosečnom i sedentarnom populacijom ipak se pokazalo da to nije uvek slučaj. Tako su Barnard i sar. (2019) pokazali da sportisti nisu imuni na aterosklerozu ili na srčana oboljenja. Iznenađujuće, sportisti po tipu izdržljivosti mogu imati napredniju aterosklerozu i veće oštećenje miokarda, u poređenju sa sedentarnim pojedincima, posebno se ove razlike ispoljavaju sa povećanjem broja godina (Barnard i sar., 2019). Dodatno u studiji iz 2017 godine u Velikoj Britaniji, koronarni plakovi nađeni su kod 44% osoba

srednjih godina i starijih sportista koji su se bavili biciklizmom ili trčanjem, u poređenju sa 22% sedentarnih ispitanika kontrolne grupe (Merghani i sar., 2017). Upravo se pokazalo da veganska ishrana dovodi do ubrzanog protoka krvi, povećanja kapaciteta antioksidanasa i smanjenja sistemskih upala, što smanjuje rizik od nastanka kardiovaskularnih kompilacija kod vrhunskih sportista i rekreativaca. (Bernard i sar., 2019). Dodatno, s obzirom da smo ranije pokazali da veganska ishrana dovodi do smanjenje masne komponenete telesnog sastava i generalno povezana je sa manjim unosom nezdravih masnoća, važno je da napomenemo da su ovi efekti usko povezani sa fizičkim i funkcionalnim sposobnostima. Bernard i sar. (2019) u svom istraživanju navode da uklanjanje viška masnog tkiva ne samo da smanjuje rizik za pojavu ateroskleroze i metaboličkih oboljenja, već povećava izdržljivost. Konkretno, smanjena telesna masnoća povezana je sa povećanim submaksimalnim i maksimalnim aerobnim kapacitetom. Prema tome sportisti sa većom maksimalnom potrošnjom kiseonika - VO2max u odnosu na njihovu telesnu težinu će imati bolju izdržljivost i nadmašiće sportiste sa nižom vrednošcću, a uticaj ishrane na VO2max u odnosu na telesnu težinu je važan, ne samo za profesionalne sportiste, već i za pojedince koji rekreativno treniraju. Upravo je nekoliko eksperimentalnih studija ispitujući efekte veganske ishrane na fizičke sposobnosti utvrdilo da vegani imaju veće vrednosti VO2max u poređenju sa ispitanicima koji su unosili namirnice životinjskog porekla. U studiji Boutrosa i sar. (2020)_vegani su u poređenju sa svaštojedima ostvarili značajno veći VO2 (44,5 ± 5,2 vs. 41,6 ± 4,6 ml/kg/min; *p*=0,03) i takođe su ostvarili duže vreme u testu submaksimalne izdržljivosti do iscrpljenosti (12,2 ± 5,7 vs. 8,8 ± 3,0 min; *p*=0,007). Sličini rezultati nalaze se u studiji Króla i sar. (2020) gde_su vegani ostvarili veći VO2 max u poređenju sa osobama na standardnoj ishrani (54.08 vs. 50.10 ml/kg/min, $p < 0.05$) (Krol i sar., 2020). U obe studije veći VO2 max bio je povezan sa većim unosom ugljenih hidrata. U studiji Ilića i sar. (2019) iako statistički neznačajna, prisutna je slična razlika u VO2max u korist vegana. (54.70 ± 8.28 vs 47.42 ± 12.21, razlika ~7 ml/kg/min, $p>0.05$). Takođe, i u ovoj studiji vegani su unosili značajno više ugljenih hidrata. Prema tome veće vrednosti VO2 max mogu se objasniti većim unosom ugljenih hidrata i većim skladištenjem glikogena. Takođe, pokazalo se da u pogledu ispoljavanja sile i snage vegani ne zaostaju za svaštojedima. U studiji Boutrosa i sar. (2020) vegani i svaštojedi su pokazali sličan nivo sile (potisak sa nogama (kg/kg LBM) 2.4 ± 0.4 vs 2.5 ± 0.5 $p = 0.5$; potisak sa grudi (kg/kg LBM) 1.3 ± 0.2 vs 1.4 ± 0.3 $p = 0.06$), a u stidji Nebl i sar. (2019) sličan nivo snage (Pmax) (svaštojedi: 4.15 ± 0.48 W/kg, ovo-lakto vegeterijanci: 4.20 ± 0.47 W/kg, vegani: 4.16 ± 0.55 W/kg; $p = 0.917$). Kao što smo naveli u prethodnom delu teksta vegani iz ovih studija nisu se razlikovali od svaštojeda i vegeterijanaca u nivou LBM. Pored toga, analizom nutritivnog unosa ustanovljeno je da su vegani uglavnom unosili sve neophodne mikro i makronutrijente, kao i njihvu adekvatu količinu. Što su faktori koji bi mogli da objasne odsustvo razlike u pogledu ispoljavanja sile i snage između vegana i osoba koje konzumiraju namirnice životinjskog porekla. U skladu sa navedenim možemo reći da vegani u pogledu ispoljavanja sile i snage ne zaostaju za osobama koje konzumiraju namirnice životinjskog porekla, dok u pogledu ispoljavanja maksimalne potrošnje kiseonika uglavnom pokazuju bolje rezultate. Pored toga veganska ishrana ostvaruje pozitivne efekte na kardiovaskularno zdravlje spotista i rekreativaca.

ZAKLJUČAK

Veganska ishrana ostvaruje značajne efekte u redukciji telesne mase i regulisanju metaboličkih bolesti. Ovi efekti se objašnjavaju visokim unosom integralnih izvora ugljenih hidrata, vlakana i biljnih proteina, kao i smanjenim unosom proteina životinjskog porekla, zasićenih masnih kiselina i trans masnih kiselina. Vegani imaju niže vrednosti krvnog ptitiska, ukupnog holesterila, LDL – a i HDL – a, što se može objasniti manjim unosom holesterola i zasićenih

masnih kiselina na veganskoj ishrani. Adekvatne količine gvožđa vegani mogu obezbediti isključivo putem biljne hrane. Sa druge strane, veganima se savetuje suplementacija vitamina B12, kako bi se izbegli negativni efekti njegovgo deficita (anemija, smanjena sinteza proteina, kardiovaskularni i neurološki problemi). Vegani ostvaruju isti nivo sile i snage kao osobe na standardoj ishrani i viši nivo maksimalne potrošnje kiseonika. Više vrednosti VO2max – a objašnjavaju se visokim unosom ugljenih hidrata i skladištenjem glikogena. Pored toga veganska ishrana ostvaruje pozitivne efekte na kardiovaskularno zdravlje spotista i rekreativaca, tako što dovodi do ubrzanog protoka krvi, povećanja kapacitet antioksidanasa i smanjenju sistemskih upala.

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ADAPTED PHYSICAL ACTIVITY AND DISABILITY

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Abstract: Adapted physical activity (AFA) is an individually adapted activity that takes into account a person's physical, psychosomatic and psychosocial abilities, on the one hand, and the goal to be achieved, on the other hand (Bošković et al., 2013). . Disability (incapacity, impotence) is a condition of an organism in which due to a congenital anomaly, illness or trauma there is no possibility of performing activities of daily living or special forms of functioning (WHO, Disability 2005). In such a situation, it is necessary to adapt the protocol of adapted physical activity to each condition of the person individually. By reviewing the literature in the last ten years, determine and define the concepts of adapted physical activity and disability. The gross division of disability is physical disability (people with reduced mobility), sensory disability (sensory impairment, hearing and vision) and intellectual disability (persons with mental disabilities, autism, etc.). Adapted physical activity can be carried out at any age, with reference to the primary disease, ie. dysfunction and gender of the person (Crnković et al. 2013). It is estimated that 15% of the world's population are people with disabilities, ie. over 800 mil. men, half of whom are women (WHO, Disability 2005). Before starting physical activity, it is necessary to perform a medical assessment of a person's health condition and determine restrictions and guidelines regarding activities and exercise. That interprofessional coperation which is in some way initiated by the patient, that is. a person with a disability, goes through a doctor, nurse, physiotherapist, physiatrist to a personal trainer, should not discourage the patient but motivate him to be persistent for the sake of his health. That is why social support is important in the early phase of physical activity. In Serbia, professional and scientific papers on the topic of AFA are directed within one profession. It can be said with certainty that this form of interprofessional education and cooperation is imperative for improving the quality of life of persons with disabilities and society as a whole (Javorina et all 2020).

Keywords: physical activity, disability, personal trainer, quality of life

ADAPTIRANA FIZIČKA AKTIVNOST I INVALIDITET

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Sažetak: Adaptirana fizička aktivnost – AFA, (Adapted physical activity - PA) je individualno prilagođena aktivnost koja uzima u obzir fizičke, psihosomatske i psihosocijalne mogućnosti osobe, sa jedne, i cilja koji treba da se postigne, sa druge strane (Bošković i sar, 2013). Invaliditet (nesposobnost, nemoć) je stanje organizma kod kog usled kongenitalne anomalije, bolesti ili traume ne postoji mogućnost izvršavanja aktivnosti dnevnog života ili posebnih oblika funkcionisanja (WHO, Disability 2005). U takvoj situaciji neophodno je se svakom

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stanju osobe ponaosob prilagodi protokol adaptirane fizičke aktivnosti. Pregledom literature u poslednjih deset godina utvdi i definisati pojmove adaptirane fizičke aktivnosti i invaliditeta. Gruba podela invalidnosti je fizička invalidnost (ljudi sa otežanom pokretljivošću), senzorna invalidnost (oštećenje senzorijela, sluh i vid) i intelektualni invaliditet (osobe ometene u mentalnom razvoju, autizam i sl.). Adaptirana fizička aktivnost može da se sprovodi u svakom životnom dobu, sa osvrtom na primarno oboljenje tj. disfunkciju i na pol osobe (Crnković i sar. 2013). Procenjuje se da 15% svetske populacije čine osobe sa invaliditetom, tj. preko 800 mil. ljudi, od čega polovinu čine žene (WHO, Disability 2005). Pre početka fizičke aktivnosti neophodno je obaviti medicinsku procenu zdravstvenog stanja osobe i utvrditi ograničenja i smernice u pogledu aktivnosti i vežbanja. Ta interprofesionalna saradnja koja je na neki način inicirana od pacijenta tj. osobe sa invaliditetom, ide preko lekara, medicinke sestre, fizioterapeuta, fizijatra do personalnog trenera, ne treba da obeshrabri pacijenta već da ga motiviše da bude istrajan zarad svog zdravlja. Zato je i bitna socijalna podrška ua ranoj fazi fizičke aktivnosti. U Srbiji su stručni i naučni radovi na temu AFA usmereni u okviru jedne profesije. Može se sa sigurnošću reći da je ovakav oblik interprofesionalne edukacije i saradnje imperativ za unapređenje kvaliteta života osoba sa invaliditetom i društva u celini (Javorina et all 2020).

Ključne reči: fizička aktivnost, invalidnost, personalni trener, interprofesionalna edukacija, kvalitet života

UVOD

Prva Međunarodna klasifikacija definiše oštećenje, invalidnost i hendikep, kao najvažnija stanja. Oštećenje je svaki gubitak ili abnormalnost psihološke, fiziološke ili anatomske strukture ili funkcije. Oštećenje može da postoji ali i da se ne primećuje, niti da smeta osobi u njenom svakodnevnom funkcionisanju, ili obavljanju posla kojim se bavi. Invalidnost je svako ograničenje ili nedostatak sposobnosti (izazvanih oštećenjem) za obavljanje aktivnosti na način ili do nivoa koji se smatra normalnim za ljudska bića. Hendikep je teškoća ili nedostatak mogućnosti (usled oštećenja ili invalidnosti) koje pojedinac ima u obavljanju životnih aktivnosti koje su normalne za njegovu dob, političku, socijalnu i kulturnu sredinu. Može se reći da je za hendikep zaduženo društvo, jer ograničava prilagođavanje, postavlja velika očekivanja i norme (WHO, 1980). Gruba podela invalidnosti:

- fizička invalidnost (ljudi sa otežanom pokretljivošću),
- senzorna invalidnost (oštećenje senzorijela - sluh i vid),
- intelektualni invaliditet – sa teškoćama u učenju (osobe ometene u mentalnom razvoju, autizam i sl.).

Invaliditet (nesposobnost, nemoć) je stanje organizma kod kog usled kongenitalne anomalije, bolesti ili traume ne postoji mogućnost izvršavanja aktivnosti dnevnog života ili posebnih oblika funkcionisanja (WHO, 2005). U suštini, invaliditet nije isto što i bolest. Bolest se može da se završi smrću, ozdravljenjem ili oštećenjem određenih organa i smanjenjem sposobnosti za rad i samostalan život, odnosno gubitkom radne sposobnosti, zavisnošću od drugih lica tj. invaliditetom. Dakle, invaliditet je stanje, tj. posljedica bolesti ili oštećenja (Dadić, 2018). Rehabilitacijom (kroz adaptiranu fizičku aktivnost) osoba sa invaliditetom mogu se ponovo osposobiti za rad na poslovima koje su radili i pre nastanka invaliditeta. Invaliditet je društveni fenomen koji se menjao sa razvojem ljudskog društva, a rezultat je interakcije osoba sa fizičkim, senzornim ili intelektualnim oštećenjima sa okruženjem. Osobe sa invaliditetom (OSI) su, usled različitih životnih uslova (fizičkih, ekonomskih, psiholoških, socijalnih) dovedene u neravnopravan položaj, potpuno onemogućene ili delimično ograničene u vršenju životnih aktivnosti i punom učešću u svim sferama društvenog života (Šušnjević, 2015).

Invaliditet je nastao kao interakcija ljudi koji imaju zdravstveni problem i njihove okoline, kako ta okolina ima više uglova posmatranja tako i sam problem ima više dimenzija, odnosno modela po kojima se sagledava. U medicinskom modelu stanje invalidnosti se posmatra kao medicinska i biološka poteškoća. Ispravljanje lošeg stanja je istaknuto, umesto da se spreči loše i promoviše blagostanje. Suprotno tome, u socijalnom modelu invalidnost se posmatra kao razlika i ne ocenjuje se. Ovaj model bi naglasio prepreke kao što su strukturni faktori ili diskriminatorno ponašanje koje sprečavaju adaptiranu fizičku aktivnost (AFA). I medicinski i socijalni model kritikuju se zbog isticanja ekstremnih stavova (Martin, 2013). Iz njih je razvijen biopsihosocijalni model koji treba da udruži različite perspektive zdravlja sa biološkog, socijalnog i individualnog aspekta (WHO, 2001).

ZAKONSKI OKVIR

U Republici Srbiji nekoliko članova Ustava regulišu probleme osoba sa invaliditetom (OSI), a detaljnije zakonima i podzakonskim aktima, ali ne postoji jasna definicija invalidnosti i invaliditeta.
Član 23. Ustava RS: „Ljudsko dstojanstvo je neprikosnoveno i svi su dužni da ga poštuju i štite. svako ima pravo na slobodan razvoj ličnosti, ako time ne krši prava drugih zajemčena Ustavom.“
Savremeni zakonski okvir je postavljen i 2006. godine u obliku preporuka pod okriljem Ujedinjenih nacija, kada je usvojena Konvencija o pravima osoba sa invaliditetom, bitno čl. 25, 26 i 30. Značajno za ovu priču je čl. 25. Zdravlje.
„Države strane ugovornice priznaju osobama sa invaliditetom pravo na ostvarivanje najvišeg mogućeg zdravstvenog standarda bez diskriminacije zasnovane na invaliditetu. Države strane ugovornice će preduzeti sve odgovarajuće mere kako bi osobama sa invaliditetom omogućile pristup zdravstvenim uslugama, vodeći računa o polu, uključujući rehabilitaciju u vezi sa zdravljem.“

EPIDEMIOLOGIJA INVALIDNOSTI

Invaliditet predstavlja jedan od najvećih problema u javnom zdravstvu, ekonomiji i socijalnom funkcionisanju. Obzirom na predikcije da će se produžavati životni vek ljudi, doći će i do porasta broja osoba sa invaliditetom (OSI) (Brain, 2010).
Prema procenama Svetske zdravstvene organizacije (SZO) preko 800 mil. ljudi su osobe sa invaliditetom, što predstavlja oko 15% svetske populacije (polovinu čine osobe ženskog pola). Među njima oko 200 miliona osoba sa invaliditetom ima ozbiljne probleme u funkcionisanju (WHO, 2011). Prema poslednjem popisu stanovništva iz 2011. godine u Srbiji je živelo je blizu 600 miliona ljudi sa invaliditetom, što znači oko 8% stanovništva. Danas se procenjuje da je broj osoba sa invaliditetom (OSI) veći, čak do 800 hiljada ljudi (Marković, 2014). U Sjedinjenim Državama 20% stanovništva ima invaliditet, što je 56 miliona odraslih Amerikanaca (NCHPAD, 2015). Dok u Australiji 42% odraslih osoba sa invaliditetom ocenjuje da je njihovo zdravlje loše, u poređenju sa 7% ljudi bez invaliditeta. Njih 32% odraslih osoba sa invaliditetom doživljava visoki i vrlo visoki psihološki stres, u poređenju sa 8% stanovništva bez invaliditeta. Radno sposobni ljudi sa invaliditetom (10%) imaju dvostruko veću verovatnoću da će biti nezaposleni od onih bez invaliditeta (5%) (AIHW, 2019). Globalno nedovoljna fizička aktivnost identifikovana je kao četvrti vodeći faktor rizika za smrtnost, što je prouzrokovalo oko 3,2 miliona smrtnih slučajeva širom sveta. Posebno u zemljama sa visokim nacionalnim dohodkom, gde je visok ili rastući bruto nacionalni proizvod često povezan sa niskim ili opadajućim nivoom fizičke aktivnosti. Fizička neaktivnost je ključni faktor rizika za nezarazne bolesti kao što su kardiovaskularne bolesti, karcinomi, hronične respiratorne bolesti i dijabetes. Mi spadamo u zemlje sa niskim nacionalnim dohodkom

(WHO, 2015). A zbog smanjene fizičke sposobnosti 57% je verovatnoća da će osobe sa invaliditetom biti gojaznije od odraslih osoba bez invaliditeta (USDHHD, 2017). Gojaznost je važan faktor rizika za odrasle osobe sa invaliditetom sa 33% većom šansom da imaju hronično stanje, npr. bolesti srca, dijabetes, moždani udar ili rak (CDC, 2016). Uticaj ovih hroničnih bolesti može se smanjiti aerobnom fizičkom aktivnošću, ali odrasli sa invaliditetom se redovno bave fizičkom aktivnošću otprilike upola manje od odraslih bez invaliditeta (12% u poređenju sa 22%), (slika 1) (USDHHD, 2017). Invaidnost utiče na čovekov vid, sluh, motilitet, razmišljanje, sećanje, učenje, komunikaciju, mentalnozdravlje, društvene odnose (CDC, 2015).

ADAPTIRANA FIZIČKA AKTIVNOST

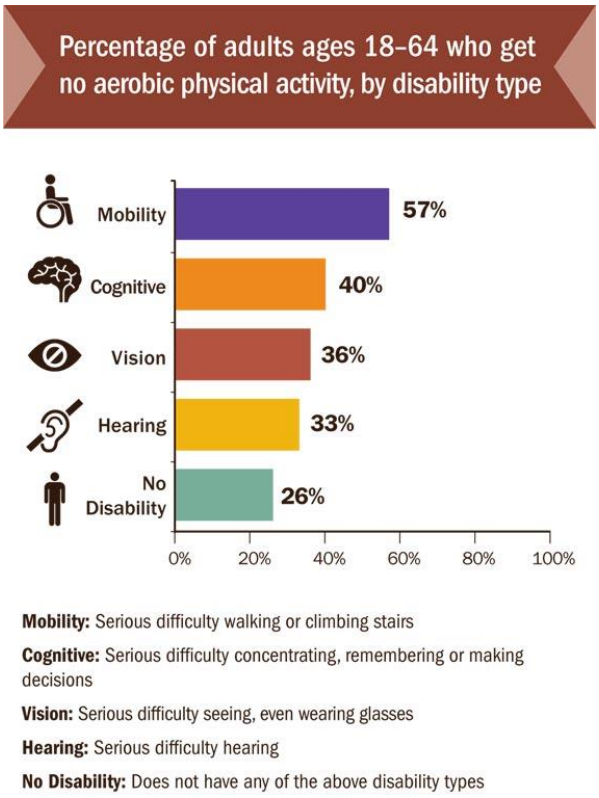
Postoji mnogo definicija o tome šta je adaptirana fizička aktivnost (AFA). Većina ovih definicija je vrlo opšta kako bi obuhvatila što više slučajeva i situacija, čime se smanjuje suština pojma. Pojednostavljena definicija AFA treba da približi pojam i terapeutu (praktičaru, treneru) i pacijentu.

Adaptirana fizička aktivnost (AFA) je grana kineziologije, fizičkog vaspitanja, nauke o sportu i ljudskom kretanju, koja je usmerena na osobe kojima je potrebna adaptacija u smislu fizičke aktivnosti.

AFA je definisana kao skup praktičnog i teorijskog znanja usmerenog na oštećenja, ograničenja aktivnosti i ograničenja učešća u fizičkoj aktivnosti. To je profesija koja pruža uslugu i akademsko polje studija koje podržava stav o prihvatanju individualnih razlika, zagovara pristup aktivnom načinu života i sportu i promoviše inovativno i kooperativno pružanje usluga, podršku i osnaživanje. Adaptirana fizička aktivnost uključuje, ali nije ograničena na, fizičko vaspitanje, sport, rekreaciju, ples, umetnost, ishranu, medicinu i rehabilitaciju (IFAPA, 2004).

Prilagođavanje opreme kod adaptirane fizičke aktivnosti najčešće se odnosi na dizajniranu i modifikovanu opremu (proteze, invalidska kolica, mono-ski, veličina lopte itd.), kriterijume zadatka (npr. menjanje kriterijuma kvaliteta veštine ili korišćenje druge veštine), uputstva (korišćenje lične podrške, vršnjačkih tutora, neverbalnih uputstava, motivacionih strategija), fizičkog i socijalnog okruženja (povećanje ili smanjenje sudskih zahteva; saradničko ili konkurentno socijalno okruženje; stepen podrške vršnjaka i roditelja) i pravila (npr. pravilo dvostrukog odbijanja u tenisu u invalidskim kolicima). Učešće u kontekstu fizičke aktivnosti podrazumeva uključivanje u personalizovane i opšte programe fizičke aktivnosti u različitim oblastima primene, uključujući, ali ne ograničavajući se na: inkluzivno i posebno fizičko vaspitanje, rekreacija i slobodno vreme, takmičarski i elitni sportovi, rehabilitacija i vežbanje.

Fizička aktivnost (FA) se definiše kao svako telesno kretanje koje proizvode skeletni mišići i koje zahteva potrošnju energije. Uključene su aktivnosti preduzete tokom rada, igranja, putovanja, obavljanja kućnih poslova i bavljenja rekreacijom. SZO preporučuje odraslima da



Slika br 1. Procenat odraslih koji nemaju fizičku aktivnost prema vrsti invaliditeta
Izvor: CDC, 2014.

imaju najmanje 150 minuta fizičke aktivnosti umerenog intenziteta tokom nedelje, odnosno 30 minuta umerene fizičke aktivnosti svakog dana i aerobik 20 minuta, 2-3 x nedeljno (WHO, 2017). U poređenju sa onima koji ispunjavaju te kriterijume, ljudi koji su nedovoljno fizički aktivni imaju 20% do 30% povećan rizik od smrtnosti od svih uzroka (WHO, 2017). Fizička aktivnost doprinosi očuvanju obima pokreta, smanjenje bola u zglobovima i mišićima, poboljša koordinaciju pokreta i balans tela, povećava se mišićna snaga i izdržljivost, doprinosi održavanju idealne telesne mase (ITM), rasterećuje-smanjuje stres, doprinosi pravilnom disanju, poboljšanje opšteg zdravstvenog stanja. Adaptirana fizička aktivnost može da se sprovodi u svakom životnom dobu, sa osvrtom na primarno oboljenje tj. disfunkciju i na pol osobe. Pre početka fizičke aktivnosti neophodno je obaviti medicinsku procenu zdravstvenog stanja osobe i utvrditi ograničenja i smernice u pogledu aktivnosti i vežbanja. Važno je da OSI poznaje prirodu svoje bolesti, da sluša savete lekara i redovno uzima svoju medikamentoznu terapiju. Dobro edukovani pacijenti lakše se suočavaju sa izovima zbog bolesti, bolje sarađuju i manje prate od depresije (Crnković, 2013).

Prednosti adaptirane fizičke aktivnosti za pojedince sa invaliditetom

Osobe sa invaliditetom koje su AFA prihvatile kao svoj način života učestvuju na Paraolimpijskim igrama. Kod osoba sa invaliditetom AFA ima veći značaj na osnovu veće stope hroničnih bolesti na koje AFA može uticati. Osim tih metaboličkih prednosti, osobe sa invaliditetom mogu imati još koristi od fizičke aktivnosti koja se odražava na;
Zdravlje:

- Značaj za kognitivne, emocionalne i socijalne poteškoće,
- Psihološke koristi poput poboljšane samopercepcije kroz dobrobiti od AFA,
- AFA može smanjiti stres, bol i depresiju → Smatra se da su svakodnevne aktivnosti lakše.

Socijalni kontakt:

- AFA može smanjiti stigmatizaciju i negativne stereotipe,
- AFA može doprineti poboljšanju socijalnog statusa; osobe sa invaliditetom vide pozitivno fizički aktivne osobe sa invaliditetom od neaktivnih ljudi,
- Socijalne beneficije kao priroda mnogih sportskih aktivnosti dovode do povećane socijalne integracije, vezivanja i prijateljstva.

Opšte dobrobiti:

- AFA dovodi do poboljšanaja raspoloženja,
- Uživanje kroz socijalnu interakciju kako fitnes osoblja, tako i ostalih učesnika (CDC, 2016).

Prepreke za fizičku aktivnost

Uprkos zdravstvenim i socijalnim prednostima, i druge dobiti, postoje prepreke koje neke osobe sa invaliditetom ne mogu da prevaziđu:

- Pojedinac: nedostatak znanja o tome gde da vežba; strah od pada; priroda oštećenja može proizvesti bol; manjak energije;
- Socijalni: deca sa invaliditetom više zavise od roditelja nego zdrava deca, nastavnicima fizičkog vaspitanja nedostaje profesionalna priprema ili oprema i ne mogu da uključe u rad učenike sa invaliditetom, nekad lekari podržavaju đake sa invaliditetom da ne učestvuju aktivno na časovima fizičkog vaspitanja, nedostatak drugara za igranje za decu sa invaliditetom, zdravstveni radnici potcenjuju fizičke sposobnosti OSI.

- Životna sredina: invalidska kolica, nedostatak mesta za igru dece, nedosotupnost udruženja OSI u mestu prebivanja, prepreke na otvorenom (npr. slabo osvetljene ili šumovite staze za šetnju, semaforima nedostaju zvučni signali, raskopani i uski trotoari) (Jaarasma, 2014) (Martin, 2013).

Smernice za povećanje fizičke aktivnosti

Neophodno je da fizioterapeuti i drugi zdravstveni radnici znaju opšte smernice za fizičku aktivnost, jer se one primenjuju i na pojedince sa invaliditetom. Odrasli sa invaliditetom imaju veću verovatnoću da budu fizički aktivni ako to preporuče lekari. Dakle, ako su dobili preporuku za vežbanje, 82% je veća verovatnoća da će biti fizički aktivni od onih koji je nisu dobili. (CDC, 2014). Fizioterapeuti i drugi zdravstveni radnici mogu da koriste 5 koraka (slika 3) za povećanje fizičke aktivnosti među osobama sa invaliditetom;

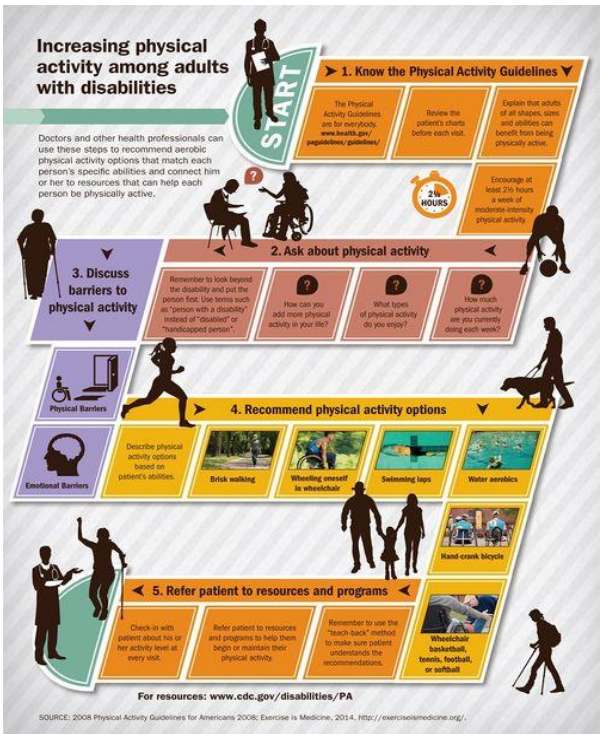
1. Upoznajti se sa smernicama za fizičku aktivnost
- Smernice za fizičku aktivnost su za svakoga.
- Pre svake posete pregledati zdravstveni karton pacijenta.
- Objasniti da odrasli svake konstitucije, starosti i sposobnosti mogu imati koristi od fizičke aktivnosti.
- Savetovati najmanje 150 minuta nedeljno fizičke aktivnosti umerenog intenziteta.

2. Pitati o trenutnoj fizičkoj aktivnosti
- Koliko fizičke aktivnosti sprovode svake nedelje?
- U kojim vrstama fizičke aktivnosti uživaju?
- Kako mogu da povećaju fizičku aktivnosti?
- Ne zaboravite da prvo posmatrate osobu a potom invaliditet. Koristiti izraze kao što su „osoba sa invaliditetom“.

3. Razgovarati o preprekama za fizičku aktivnost
- Fizičke barijere
- Emocionalne barijere

4. Preporučiti opcije fizičke aktivnosti
- Zajedno zapisati moguće fizičke aktivnosti na osnovu sposobnosti pacijenta.
- Brzo hodanje
- Vožnja u kolicima
- Plivački klub
- Akvarobik
- Bicikl sa ručnim pedalama
- Košarka za invalidska kolica, tenis, fudbal ili softbol

5. Uputiti pacijenta na resurse i programe
- Koristiti metod „povratnog podučavanja“ kako biste bili sigurni da pacijent razume preporuke.
- Uputiti pacijenta na resurse i programe koji će im pomoći da započnu ili održe fizičku aktivnost.
- Pri svakoj poseti proveriti sa pacijentom nivo njegove aktivnosti.



Slika br. 2. Smernice za povećanje fizičke aktivnosti, CDC 2014.

AFA I ZDRAVSTVENA NEGA

Zdravstveni sistem ima obavezu da kao efikasno, isplativo i izvodljivo sredstvo, promoviše AFA za prevenciju, lečenje i rehabilitaciju bolesti. Zdravstvene ustanove, uključujući primarnu zdravstvenu zaštitu, identifikovane su kao važne za promociju fizičke aktivnosti iz više razloga. Prvenstveno zbog mogućnosti uključivanja medicinskih sestara primarne zdravstvene zaštite, što zauzvrat pruža šansu za procenu zdravstvenog stanja, potreba i motiva pacijenata. Stalni kontakt sa pacijentima takođe olakšava kontinuitet nege i mogućnost praćenja pacijenata, udruživanje podataka o fizičkoj aktivnosti i podatakao o bolestima i lečenju. Ono što je najvažnije, profesija medicinske sestre je poštovana i saveti o zdravom stilu života mogu da motivišu veliki deo populacije koji može imati koristi od dodatnih fizičkih aktivnosti. U svetu su usvojene strategije koje bi medicinske sestre u Srbiji mogle da implementiraju zarad promocije fizičke aktivnosti (Vishnubala, 2020).

Prema Svetskoj Zdravstvenoj Organizaciji kvalitet života definiše se kao percepcija pojedinca sopstvenog položaja u kontekstu kulture i sistema vrednosti u kojima žive, kao i prema svojim ciljevima, očekivanjima, standardima i interesovanjima (WHO, 2012). To je širok koncept koji čine fizičko zdravlje pojedinaca, psihološki status, materijalna nezavisnost, socijalni odnosi i njihovi odnosi prema značajnim karakteristikama spoljašnje sredine (Horgan, 2004). Suština pojma kvaliteta života kod osoba sa invaliditetom je poboljšanje i unapređenje celokupnog življenja, koje se ostvaruje kroz tri nivoa.

- Ostvarenje osnovnih ljudskih potreba.
- Doživljavanje satisfakcije u aspektima koji su važni za neku osobu.
- Postizanje viših nivoa ličnog uživanja i ispunjenosti (Šušnjević, 2015).

Kako je višedimenzionalan tako se iz uglova stručnjaka vidi kvalitet života definisan sa različitih aspekata. Ekonomisti vide kvalitet kroz merljive pokazatelje (bruto nacionalni dohodak, visina ličnih primanja, materijalna bogatsva i druge ekonomske vrednosti). Sociolozi smatraju da je kvalitet života dobar sa postojanjem dobrih društvenih odnosa. Psiholozi opisuju kvalitet života kao subjektivan doživljaj zadovoljstva životom. U zdravstvenoj nezi bi se moglo reći da je kvalitet života sistemski okvir kroz koji se može videti rad usmeren ka poboljšanju života pojedinca uz uvažavanje potreba i želja pacijenta.

Fizička aktivnost je esencijalna za dobar kvalitet života, a ujedno je i glavna spona tj. komponenta svih upitnika o kvalitetu života. Iz tog aspekta kvaliteta života potvrđuje se da su zdravstvene koristi AFA ogromne i zdravstveni radnici, na prvom mestu medicinske sestre oi fizioterapeuti imaju važnu ulogu u pomaganju pojedincima da usvoje i zadrže naviku bavljenja redovnom fizičkom aktivnošću. Ta interprofesionalna saradnja koja je na neki način, indirektno inicirana od pacijenta tj. osobe sa invaliditetom, ide preko lekara, medicinke sestre, fizioterapeuta, fizijatra do personalnog trenera, ne treba da obeshrabri pacijenta već da ga motiviše da bude istrajan zarad svog zdravlja. Može se sa sigurnošću reći da je ovakav oblik interprofesionalne edukacije i saradnje imperativ za unapređenje kvaliteta života osoba sa invaliditetom i društva u celini (Javorina, 2020).

ZAKLJUČAK

Fizička aktivnost OSI je ključna u njihovom lečenju, oporavku i održavanju dobrog prilagođenog zdravstvenog stanja. AFA i invalidnost kao jedan pojam zahteva interdisciplinarni pristup u nezi OSI radi što boljeg kvaliteta života, što može da bude tema nekih drugih istraživanja s obzirom na to da je očekivano trajanje života sve duže i da je sve veći akcenat na proceni i unapređenju kvaliteta života ne samo zdravih ljudi nego i osoba sa invaliditetom.

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CLUSTER SET IN THE PLYOMETRIC TRAINING: A SHORT NARRATIVE REVIEW

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Abstract: Resistance training programs can be modulated by manipulating one or more of a series of variables session (sets, reps, load, exercise selection, and rest periods). An alternative training setup to traditional resistance strength training for the practitioner is called cluster training, or inter-repetition, rest training. This training structure involves the manipulation of work and rest periods, breaking sets into small clusters of repetitions, which may alter. This short narrative review aims to describe the use of the cluster set in the plyometric training. Methods: For the bibliographic search PubMed and Sport Discuss databases were used selecting articles published between 01/01/2011 and 01/03/2021. Two keyword groups were identified, using synonyms and similar terms, using the operator "OR":1)"cluster set" OR "plyometric training" 2)"cluster set" OR "jump training". Subsequently, all the categories were combined together using the "AND" operator. Results: The initial database search produced 24 results. After removing the studies and reviews on resistance training (9), endocrine/biomechanical aspects (4), studies on the effects of cluster set resistance training on the jump performance (3) and other aspects not related to cluster set training (4), 4 studies were selected, analyzed and included in the narrative review. Discussion and conclusions: The training organization with traditional sets (TS) and with cluster set (CS) allows for different benefits in performance. TS allow you to obtain advantages in straight sprinting, while CS are more advantageous for increasing jumping and agility performance (power values, take-off velocity, ump height). Furthermore, CS allow to control ground reaction force values.

Keywords: cluster set, plyometric training, jump training

INTRODUCTION

The resistance training program must consider several factors such as the choice of exercise, training load, number of repetitions and sets performed, the exercise order, frequency, and length of rest periods. Traditionally, the completion of a set occurs without any rest being taken between repetitions that are contained within the set. Once the set is completed, a predetermined rest interval is provided to allow recovery before the initiation of a subsequent set, and this basic set configuration is repeated for the targeted number of sets prescribed in the training session. This traditional method of resistance training set prescription can be described as training using traditional set (TS).

However, in recent years the focus of the training methodology has been oriented to understand if other organizations in the set can be identified capable of returning better benefits in performance. One alternative training configuration to traditional resisted strength training for the strength and conditioning coaches is termed cluster or cluster set (CS), or inter-rep, rest training. This training structure involves the manipulation of work and rest periods, breaking sets into small clusters of repetitions.

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Mechanical and metabolic stresses play a decisive role in increasing muscle strength and power. It is possible to hypothesize, in fact, that acute accumulation of metabolites during strength training is a precursor of endocrine and neural responses to training (Schlumberger et al., 2001; Hansen et al., 2011; Gonzalo-Skok et al., 2019). These mechanical and metabolic stimuli may also be important for high-speed ballistic training for the development of muscle power (Hansen et al., 2011; Morales-Artacho et al., 2018; Makaruk et al., 2020). It has been hypothesized that CSs allow for a certain supply of phosphocreatine (Hff et al., 2008; Tufano et al., 2017), which is vital for strength and power production (Davies et al., 2021; Tufano et al., 2017; Willardson, 2006).

Some researchers have suggested that performance characteristics, such as PW output peak, bar speed and displacement, will decrease with each subsequent repetition in a traditional set with no inter-rep pause (Haff et al., 2008; Tufano et al, 2017). Furthermore, other researchers suggest that it is important to avoid fatigue when trying to maximize power output, and that by performing a low number of repetitions, with an adequate rest interval will optimize power training (Moreno et al., 2014; Baker and Newton, 2005; Tufano et al, 2017).

In most team sports, brief, short, high-intensity actions, such as sprints, accelerations, decelerations, changes of direction, and jumps are required to players (Ben Abdelkrim et al., 2007; Póvoas et al., 2012; Ramirez-Campillo et al., 2020); these high-intensity actions represent a fundamental component of the player's physical preparation. Add to this that these actions require the lower limbs to move the whole body very quickly in various directions. In all these actions prevails the muscle recruitment that involves the stretch-shortening cycle, or SSC (Gruber et al., 2019; Lichtwark et al., 2007).

The plyometric training is commonly used to develop the efficiency of an athlete's SSC (Turner and Jeffreys, 2010). The SSC is described as the successive combination of eccentric and concentric actions, which is used in most sport movements, such as throwing, running, and jumping. Efficient SSC mechanics can result in energy conservation and enhanced power output (PW), ultimately, leading to improved performance (Turner and Jeffreys, 2010; Jeffreys et al., 2019; Makaruk et al., 2020).

Why choose plyometric training rather than one with overloads?

The researchers have suggested that ballistic training programs are able to achieve comparable or superior training outcomes in terms of power development in short term training periods with less total work than high load training schemes (Mc Bride et al., 2002; Loturco et al., 2017; Snyder et al., 2018). For example, a research showed improved power and velocity adaptation following a training program using ballistic jump squats at 30% of 1RM compared with 80% of 1RM even though the total work performed over the training period was significantly greater in the 80% load group (Mc Bride et al., 2002). This research also ensured minimal fatigue during training by terminating training sets if a 15% drop in power output was observed. In addition, there is some evidence that adaptation to ballistic performance may be principally mediated by neural mechanisms, with intramuscular and intermuscular neural adaptations contributing to performance improvements following high velocity training (Loturco et al., 2017; Papla et al., 2020).

In the literature there are numerous studies that have found an improvement in vertical and horizontal jumping performance after a period of vertical jumping training by incorporating ballistic and plyometric exercises (Chandler et al., 2018; Cherif et al., 2012; Stojanović et al., 2017; Ramirez-Campillo et al., 2018; Hammami et al., 2020).

Considering the advantages deriving from the organization of the session with cluster set and the increases in performance resulting from plyometric training, this short narrative review aims to describe the use of the cluster set in the plyometric training.

METHODS

For the bibliographic search PubMed and Sport Discuss databases were used selecting articles published between 01/01/2011 and 01/03/2021. Two keyword groups were identified, using synonyms and similar terms, using the operator "OR": 1) "cluster set" OR "plyometric training" 2) "cluster set" OR "jump training". Subsequently, all the categories were combined together using the "AND" operator.

RESULTS

The initial database search produced 24 results. After removing the studies and reviews on resistance training (9), studies on endocrine/biomechanical aspects (4), studies on the effects of cluster set resistance training on the jump performance (3) and other aspects not related to cluster set training (4), 4 studies were selected, analyzed and included in the narrative review.

DISCUSSION

This short narrative review aims to describe the use of the cluster set in the plyometric training. Plyometric training, as well as training that uses light load, is what allows you to achieve higher levels of muscle power output. The literature in fact highlights that the use of ballistic exercises with loads ranging from 0% to 50% of one-repetition maximum (1RM) and/or weightlifting exercises performed with loads ranging from 50% to 90% of 1RM appears to be the most potent loading stimulus for improving maximal power in complex movements (Cormie et al., 2011; Suchomel et al., 2018).

The 4 studies selected by the review added additional information for achieving muscle power output during plyometric training.

The first study in the literature investigates the effects of different set configurations in the execution of 24 repetitions of Squat Jump (SJ). The first involved a traditional configuration (TR) of 4 × 6 repetitions with 3 min of rest between sets, the second (C1) 4 × 6 × singles (1 repetition) with 12 s of rest between repetitions, the third (C2) 4 × 3 × doubles (2 repetitions) with 30 s of rest between pairs, and the third (C3) 4 × 2 × triples (3 repetitions) with 60 s of rest between triples (Hansen et al., 2011). The research points out that there are significant effects for power peak and displacement speed: the peak power was significantly lower ($p < .05$) for the TR condition when compared with C1 and C3 for repetition 4, and all cluster configurations for repetitions 5 and 6. The peak velocity was significantly lower ($p < .05$) for the TR condition compared with C3 at repetition 4, significantly lower compared with C2 and C3 at repetition 5, and significantly lower compared with all cluster conditions for repetition 6 (Hansen et al., 2011).
Later another research group tried to compare the effects of other different set configurations in the execution of SJ for a total volume of 20 repetitions on the parameters of power (peak), ground reaction force, take off velocity and jump height (Moreno et al., 2014). The three observed configurations were: the traditional (2 sets of 10 with 90-second rest between sets), cluster 1 (4 sets of 5 with 30-second rest between sets), and cluster 2 (10 sets of 2 with 10-

second rest between sets). The power peak shows a trend in favor of the first repetitions compared to the last repetitions in all the conditions observed; the take-off velocity and jump height parameter remains substantially constant in cluster 1 and cluster 2 indicating that these values can be kept high using CSs.

The constancy of the GRF value in the cluster set is very interesting (Moreno et al., 2014): it is known how fatigue negatively affects this parameter which is associated with the injury risk (Seymore et al., 2019; Pappas et al., 2007).

Later another interesting study describes the relationships between CS applied to depth jumps and specific performances in team sports (Asadi and Ramírez-Campillo, 2016). The study compared the CS and traditional sets during 20 repetitions of depth jumps: the traditional group completed 5 sets of 20 repetitions with 2 min of rest between sets each session, while the cluster group completed 5 sets of 20 (2 x 10) repetitions with 30/90- s rest each session. Subjects were evaluated for countermovement jump (CMJ), standing long jump (SLJ), T test, 20-m and 40-m sprint test performance before and after the intervention. The study showed that both groups had similar improvements ($P < 0.05$) in CMJ, SLJ, t test, 20-m, and 40-m sprint. However, the magnitude of improvement in CMJ, SLJ and t test was greater for the CS group (effect size = 1.24, 0.81 and 1.38, respectively) compared to the traditional set group (ES = 0.84, 0.60 and 0.55). Conversely, the magnitude of improvement in 20-m and 40- m sprint test was greater for the traditional set group (ES = 1.59 and 0.96, respectively) compared to the CS group (ES = 0.94 and 0.75, respectively). The authors concluded that the traditional sets methods resulted in greater adaptations in sprint performance, while the CS method resulted in greater jump and agility adaptations (Asadi and Ramírez-Campillo, 2016).

Finally, a few years later there is a study that adds a further knowledge on the CS theme applied to plyometric training: the research analyzes the effects of CS applied to ballistic movements with overload compared to traditional sets (Koefoed et al., 2018). The exercise session with traditional set structure consisted of 4 sets of 6 repetitions of loaded (40% body weigth) jump squat (180 sec rest between sets), while the CS structure (also consisted of 4 sets) was split into 3 clusters of 2 repetitions. The repetitions within each cluster were performed in a consecutive way without rest. Between the clusters, the participant rested for 20 s. After each set, the participant rested for 140 s. The values calculated as averages across the entire exercise sessions showed peak power higher in the session with cluster set structure (4.1% ± 4.9%, $p=0.005$), as compared to the session with traditional set structure (Koefoed et al., 2018).

A possible mechanism for the higher peak power output during exercise with cluster set structure could be better conditions for regeneration of intramuscular phosphocreatine (PCr) and adenosine triphosphate (ATP). Briefly, ATP regeneration from PCr breakdown takes place during the rest periods and is important for production of power output during short term (< 30 s) maximal efforts (Smilios et al., 2013; Koefoed et al., 2018). Phosphocreatine depletion starts almost immediately at the onset of muscle contractions, and depletion continues as the contractions are continued (Miller et al., 1987; McMahon and Jenkins, 2002). During repeated contractions, as in dynamic resistance exercise, PCr is depleted more the further the set is continued. It has been reported that PCr in the vastus lateralis muscle was depleted significantly less after 5 repetitions than after 10 repetitions with the same load in the bilateral leg press exercise (Gorostiaga et al., 2012; Koefoed et al., 2018). Furthermore, Miller et al. showed that regeneration of PCr stores was initiated almost immediately following the cessation of exercise (Miller et al., 1987; McMahon and Jenkins, 2002). When applying a cluster set structure, fewer repetitions are performed before rest is allowed. In addition, rest is allowed more frequently.

Thus within each set, small windows of ATP and PCr regeneration is allowed, which eventually may allow higher peak power output to be performed.
In conclusion, these physiological responses lead to suggest that plyometric training through the CS configuration is more advantageous if you want to increase the peak power output, the executive speed and the take-off velocity of the jump.
Similar performance advantages derive from the CS configuration when pursuing performance increases in jump performance and agility such as CMJ, SLJ and T test.

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STUDENTS ATTITUDES ON THE IMPACT OF SPORT ON HEALTH AND IMPROVEMENT OF MENTAL HYGIENE

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Abstract: The aim of this study was to investigate the attitudes of first- and fourth-year students about the impact of sports on health and the improvement of mental hygiene. Method: 80 first and fourth year students of the Technical Faculty in Cacak, University of Kragujevac. Of these, 47 students were male, while 33 were female. For the purposes of this research, a survey questionnaire was used as a measuring instrument. The survey consists of 60 questions divided into 10 groups. The obtained data were entered and analyzed using the statistical program "SPSS 19". Results: The average response of all variables in first year students is 3,665, while the average response in fourth year students is 3,686. Analysis of the "Mann-Whitney U" test yielded a value of 0.317 for all ten variables. Conclusion: The obtained results indicate that there are no differences in the attitudes of students between I and IV years regarding the impact of sports on health and mental hygiene. The data we obtained confirm the fact that there are no differences in attitudes both in general about sports on the impact of health, and about other segments of sports based on the obtained results.

Keywords: Sport, Health, Mental Hygiene, Mental Health, Sociology

INTRODUCTION

Health is always complete, physical, mental and friendly well-being, and not just the absence of disease. Modern science is definitely quantitatively healthy as too much "reserve capacity" of standard functional systems. In that sense, we listen and we should take into account that we are just getting lost and changing our reserves in health care and that we are working satisfactorily on reading and adoring health care. Health is not just our property. Not only have we inherited the health of each of our ancestors, but we have also taken it from our streams. With its attempt, way of life and unique first of all healthy, not usable not only on our health, but also on many ways of life and health of our children, grandchildren and work. Life expectancy and a healthy niche reserve are just definitions of our heritage. They are also influenced by other factors, in all ways and conditions of life and work. The health of modern man is mainly over-researched and inadequate nutrition, insufficient physical activity, excessive stress, transformation of the environment and the workplace and bad habits (Tahiraj et al., 2012).

The World Health Organization defines mental health as social and emotional well-being, in which staff enjoy all their possibilities, can withstand all the arrows of life, work productively and fruitfully, and accept their tasks (WHO, 2005). Mental health implies the ability to establish harmonious relationships with other people and the ability to realize one's own intellectual and emotional potentials in constructively changing the social and physical environment, subjective sense of well-being, self-efficacy, independence and competence (Vlajkovic, 1990).

The student population has suitable adolescent residential land which is prepared during schooling for the establishment of integrated and creative strata of society (Visnjic, 2010). The period of study represents the visited life separation in which, in addition to biological and

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psychological maturation, separation and the process of inclusion of individuals in the social cooperative. During this animal, you get younger, it is obvious that they will develop skills and abilities with the help of which they will be able to invest in the most significant investments in the space region, and that is a different action. The process of mitigating events in society is usually required until a degree of social autonomy, bias and independence is achieved. The youth population (whose application is also the student population) is usually considered a healthy group, but this research is overused by 30% of students who are taken annually and have a mental health problem. It should be borne in mind that up to three quarters of cases of mental disorders in humanity begin 24 years ago (Ministry of Youth and Sports of the Republic of Serbia, 2006).

Sociology of sport as a special sociological discipline deals with issues of context and social conditioning of sport. The development of sociology sport as a theoretical and empirical discipline is not only a simple consequence of the development of modern sociology, ie its spread to more recent phenomena, but this sociological discipline indicates a close interdependence between the development of sports and the development of certain areas of social life (Kokovic, 2007). Contemporary research in the sociology of sport views sport as a form of culture, consider the importance of sport in everyday life, but also the unstoppable trend of commercialization of sport, and consider sport as a spectacle. The sociology of sport studies the influence of society on sport, but also the reciprocal influence of sport on society, therefore, issues of context and society conditioned by sport. The sociology of sport indicates the place and importance of sport in modern society, its social nature and cultural value and conditionality.

As the sociology of sport is interesting for the whole society, the burning will be at the forefront of sporting events played by players (actors), mediators (coaches, judges, sports journalists, sponsors) and publications. He also states that sports sociologists mostly think about the sociology of sports by studying sports while he learned more from friends (Kuljic, & Kokovic, 2012).

METHODS

Sample of respondents

In this research, the total sample of respondents was 80 first and fourth year students of the Technical Faculty in Cacak, University of Kragujevac. Of these, 47 students were male, while 33 were female. Respondents were divided into two groups, the first group consisted of first-year students of 40 faculties, the second group consisted of fourth-year students also 40. First-year students consisted of 29 male respondents and 11 female respondents. Student fourth year were 18 male subjects and 22 female subjects. The age of the respondents in the entire sample ranges from 18 to 31 years of age. Respondents of the first year ranged in age from 18 to 23 years, and respondents of the fourth year ranged in age from 21 to 31 years. All respondents agreed to participate voluntarily in this research.

Sample of measuring instruments

For the purposes of this research, a survey questionnaire was used as a measuring instrument. The survey consists of 60 questions that are divided into 10 groups, and are randomly distributed so that the respondent could not find out which questions relate to a group of specific questions. Areas of research as well as the issues themselves are attached to this paper. In addition to the questions on the survey, there are also variables such as gender, age of the respondents and years of study. Respondents had the opportunity to answer by circling one answer out of a total of five offered. In this research, which refers to the attitudes of the respondents towards sports and mental health, the Likert scale was used (Madic, Nikolic, & Stojiljkovic, 2015).

Experimental design
The research was conducted at the Technical Faculty in Cacak, University of Kragujevac. Prior to the survey, consent was obtained from professors and students, all participants were informed about the anonymity of the survey, instructions on how to fill it out correctly, as well as the purpose of the research.
Data processing method
The obtained data were entered and analyzed using the statistical program SPSS 19. The analyzed results were related to the entire sample, gender and the difference between first and fourth year of study. From the statistical parameters, descriptive statistics were used to obtain the arithmetic mean and standard deviation. The Mann-Whitney U test was used to determine the difference between the attitudes of first and fourth year students, as well as the difference between the male and female population.

RESULTS

Table 1 shows the parameters of descriptive statistics by year of study. The table contains the mean, standard deviation, and segment of a group of questions related to a particular topic. The mean value of all variables except the age of students in the first year is 3,665 (standard deviation 0.9625), the mean value of all variables except the age of students in the fourth year is 3,686 (standard deviation 0.9444). The highest average value for first year students occurs with the variable sports and health and is 4.05, while the lowest value with the variable sports and violence is 2.87. The highest average value for fourth year students occurs with the variable sports and mental hygiene and is 4.01, while the lowest value with the variable sports and violence is 2.57. The average age of first year students is 19.52, and for fourth year students 23.32.

Table 1. Descriptive statistics by year of study

	Year of study	**First year**		**Fourth year**	
	Name of variables	**Mean**	**St. deviation**	**Mean**	**St. deviation**
1.	Age	19.52	0.933	23.32	2.28
2.	Sports and health	4.05	0.926	4	0.96
3	Sport as socializing and fun	3.6	1.11	3.67	0.938
4.	Sport and behavioral learning	3.77	0.932	3.9	0.801
5.	Manipulation of sports	3.43	1.024	3.57	1.017
6.	Sport and attitude towards other people	3.82	0.983	3.57	0.949
7.	Sport and violence	2.87	0.984	2.57	1.021
8.	Sports and money	3.7	0,928	3.75	0.88
9	Sport and work	3.59	0.943	3.66	0.985
10.	Sports and education	3.82	0.955	3.9	1.044
11.	Sport and mental hygiene	4	0.84	4.01	0.849
12.	**Average of all variables**	**3.665**	**0.9625**	**3.686**	**0.9444**

Table 2 shows us whether there are differences in the attitudes of first and fourth year students to the impact of sports on health and mental hygiene. To determine if there were differences in attitudes, we used the Mann-Whitney U test. For all variables, the same value was obtained, which is 0.317, based on this value, which is not less than or equal to the value 0.05, we concluded that there is no difference in attitudes between students of first and fourth year, that is the values obtained are above statistical significance.

Table 2. Mann-Whitney U test of differences in attitudes between first and fourth year

	VAR1	VAR2	VAR3	VAR4	VAR5	VAR6	VAR7	VAR8	VAR9	VAR10
Mann-Whitney U	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Wilcoxon W	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Z	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000
Asymp. Sig. (2-tailed)	**.317**	**.317**	**.317**	**.317**	**.317**	**.317**	**.317**	**.317**	**.317**	**.317**
Exact Sig. [2*(1-tailed Sig.)]	1.000[a]	1.000[a]	1.000[a]	1.000[a]	1.000[a]	1.000[a]	1.000[a]	1.000[a]	1.000[a]	1.000[a]

Note: VAR1-sport and health, VAR2-sport as socializing and entertainment, VAR3-sport and learning behavior, VAR4 manipulation of sport, VAR5-sport and relationship with other people, VAR6-sport and violence, VAR7-sport and money, VAR8-sport and work, VAR9 sport and education, VAR10-sport and mental hygiene.

DISCUSSION

Most research shows that sport is a very popular term in the world, and that the majority of the population has had or has some form of contact with sport or physical activity. It has long been known that sport has a positive effect on human health and psychological well-being. Sports and physical activity are very common among young people, especially children and students of different faculties. However, there is not much research describing the differences between students' attitudes about the impact of sports and physical activity on health and mental hygiene. The aim of this research was to determine the differences in the attitudes of students between the first and fourth year of the Technical Faculty in Cacak on the impact of sports on health and mental hygiene.

Jankovic (2009) investigated predictors that affect students' perceptions of health, as well as the extent to which risk factors affect health self-assessment. The research was conducted at 55 faculties and five faculties in five university cities of the Republic of Serbia. After analyzing the obtained results, students in the whole sample are in good health in 26.4%, medium in 62.5%, and weak in 9.5%. When they are correlated with students' self-assessments and health behavior, associations with different values are obtained, which indicate the existence of a relationship between the self-perception of health about health and the health behavior of students. Of all the subgroups, the self-assessment of health is most influenced by the individual, ie his health behavior, which depends on the health condition of the person in question.

Another study conducted in Croatia (Bercic & Donlic, 2009) on students shows that, although the vast majority believe that exercise has a positive impact on health (92%) and has a number of positive effects (73%), most of them (59%) does not engage in physical activities in their free time, and believes that physical education should not be mandatory (60%). The reason for

that is probably in the fact that, although many know the consequences of not engaging in physical activity, they also want to live a comfortable life.

An interesting study (Brown, & Blanton, 2002) was conducted on two groups of respondents, one group consisted of students engaged in any physical activity including sports, while the other group consisted of students who do not engage in any physical activity or are completely inactive. The conclusion of this study is that: the results of the "active" group of respondents show less suicidal behavior compared to the "inactive" group of students. Studies have also shown that regular participation in physical activity can be equally effective in various forms of psychotherapy, especially in cases of mild and moderate depression. Participation in various sports activities affects socialization as well as understanding of the social environment (McCall, & Craft, 2002).

Another study (Kovacs, 2019) analyzed the factors that influence and determine the sports activity of students in Hungary, Romania, Slovakia, Ukraine, the research included 2017 respondents. The findings show that students in the mentioned countries, as a whole, do little sports and physical activity, mostly once a week.

McGee et al. (2006) point out that participation in sports and physical exercise in general, associated with positive habits such as better diet, higher levels of physical activity, reduced delinquent behavior, and safer sexual activities. It can be concluded that the multiple positive effects of physical exercise on the quality of life of children and youth on the one hand, on the other hand because it contributes to improving the capacity to cope with stress and other mental problems, because it strengthens individual strength and adaptive functioning in various aspects of everyday life. Research shows that children and adolescents who play sports show higher self-esteem, that is their participation in sports activities can lead to a feeling of satisfaction with physical appearance, a sense of competence and positive acceptance of what leads to increased self-esteem (Bowker, 2006).

Physical activity is very important in the life of students because it affects all aspects of life and affects not only their physical appearance, but also mental well-being and improves the quality of life. Sport is an important factor in a positive state and also mainly raises self-esteem and mood, strengthens self-confidence and reduces psychosocial stress, depression and anxiety. This shows that physical activity and sports facilitate the functioning in different areas of life and make it more complete because sports meet health and other needs that are very important in everyday activities.

CONCLUSION

The subject of this transversal research was to determine the attitudes of students regarding the impact of sports on general health and mental hygiene in the student population. The main task of the research was to determine the differences in attitudes between first and fourth year students of the Technical Faculty in Cacak, University of Kragujevac. The obtained results indicate that there are no differences in the attitudes of students between first and fourth year regarding the impact of sports on health and mental hygiene. The data we obtained confirm the fact that there are no differences in attitudes both in general about sports on the impact of health, and about other segments of sports based on the obtained results. From all the above, it can be concluded that there are no differences in the attitudes of students between the first and fourth year of the Technical Faculty from Cacak on the impact of sports on health and mental hygiene in the student population.

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PHYSICAL ACTIVITY AND MENTAL HEALTH

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Abstract: This review study aimed to determine the impact of physical activity on mental health. The following electronic databases were used to search the literature: PubMed, Medline, Google Scholar from 1999 to 2019. The search was performed using the following keywords: physical activity, physical exercise, mental health, psychological health. After selecting papers related to the criteria, 20 studies were selected to meet the needs of this systematic review. This research included a total of 26,940 respondents of different genders and ages, which is a very large sample of respondents. All research has confirmed that physical activity affects the mental health of people of different health status, gender, and age. A detailed analysis of all these studies has shown that there is an impact of physical activity on mental health, as well as what types of physical activities affect the psychological state of both persons with mental disorders and the healthy population.

Keywords: physical activity, physical exercise, mental health, psychological health

INTRODUCTION

Physical activity is any form of body movement that increases energy expenditure. Physical activity includes exercise, training and competition, intensive professional work, housework, and other activities that require physical exertion (Ostojić, 2006). Physical activity has been associated with health and longevity since ancient times. The first data on physical activity organized for health promotion originate from China as early as 2500 BC. Hippocrates (460-370 BC) points out that physically active everybody segment remains healthy, developed, and ages more slowly. Pioneering knowledge of the importance of physical activity from the 1950s showed that London bus conductors (who exceed 600 degrees a day) were twice as likely to have a heart attack as drivers who sat 90% of the time (Morris & Raffle, 1954).

Physical activity can be a cheap and effective solution for those who do not want to rely on medication, and at the same time has a positive effect on reducing the risk of many diseases. Several studies have indicated that engaging in physical activity for several years can reduce the risk of developing depression by 22% (Dunn, Trivedi & O'Neal, 2001).

The availability of virtual games, the increase in the speed of the Internet, and the mass viewing of TV, have led to houses becoming the place where people spend the most time. As a result, it is becoming increasingly difficult to find the time and motivation to engage in physical activity and maintain the level of fitness needed for a healthy life. The data show that 60-70% of the population of developed countries do not achieve the minimum level of physical activity recommended to maintain health and energy balance (Sports Council and Health Education Authority, 1992; WHO, 1995; USDHHS, 1996).

Several well-designed studies have shown that physical activity can reduce the symptoms of clinical depression (Mutrie, 2000; Lawlor & Hopker, 2001). There is evidence from four perspectives of an epidemiological study that those who become or remain active are less susceptible to the clinical state of depression. The odds ratio for 9 years for those who remained low-active was 1.22 and for those who were inactive, 1.61 (Camacho, Roberts, Lazarus, Kaplan

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& Cohen, 1991). Paffenbarger & Leung (1994) noted a relationship between activity duration and depression in men aged 23 to 27 years. In those who engage in the long-term activity (>2500 kcal/week) the risk is reduced to 28%, while in those where moderate activity (1000-2499 kcal/week) to 17% the risk of depression compared to those where activity was low.

There are several narratives and meta-analytical reviews in this area, such as Calfas & Taylor (1994) with adolescents, McDonald & Hodgdon (1991), Petruzzello, Landers, Hatfield, Kubitz & Salazar (1991). The research was conducted in three approaches. First, the effect of exercise on general anxiety, research has shown moderate effects of reducing anxiety after exercise with most studies testing the effects of aerobic forms such as running. Second, the effects of including a few weeks of exercise program on the state of anxiety have been shown to provide a moderate reduction in anxiety. Third, the effect of one exercise and exercise program tested on psychosocial and psycho-physiological reactivity to later psychological stressors as a complex mental task or public speech. This literature has yielded ambiguous results with only half of the studies showing the benefit of exercise or improved fitness, although this may be as much of a measurement difficulty as a lack of effect.

Boutcher (2000) and Etnier, Salazar, Landers, Petruzzello, Han & Nowell (1997) investigated the impact of exercise on cognitive functions (reaction time, memory, and fluid intelligence) in the elderly. Boutcher concluded that cross-sectional studies showed that older people functioned better cognitively than unsuitable older people, evidence from experimental studies remains ambiguous with 5 intervention studies showing improvements but no significant change.

Fox (2001), Spence & Poon (1997) conducted studies to determine the impact of exercise on self-esteem. Based on the results, they concluded that there is an inconsistent and weak link between physical activity and global self-esteem. Spence's meta-analysis showed a weak mean effect size of 0.22. Fox identified 36 randomized controlled trials and 44 controlled trials since 1971 and found that about 50% indicated positive changes in self-esteem. However, this finding is consistent with theoretical conclusions that suggest that self-esteem is a stable construct and cannot be easily changed by success in one domain of life.

Kandola, Hendriks, Lucassen & Yücel (2016) aimed to compare the effects of aerobic training and mental training on cognitive function and to determine whether the action of these two techniques leads to a better result. The subject was given aerobic training (walking) twice a week for two months. The specific aerobic training and mental training used in this study can cause an improvement in cognitive function, both as a combination of training and as an individual.

Telenius, Engedal & Bergland (2015) conducted a study to examine the effect of a functional program of high-intensity exercise on performing balance in nursing home residents with dementia. The secondary objective was to examine the effect of this exercise on muscle strength, mobility, daily life activities, quality of life, and neuropsychiatric symptoms. The results of this study show that a functional high-intensity exercise program improves balance and muscle strength as well as reduced apathy in patients with dementia in nursing homes.

METHOD

Data sources and search strategies

The following electronic databases were used to search the literature: PubMed, Google Scholar, from 1999 to 2019. The search was performed using the following keywords: physical activity, mental health. The search strategy was modified for each electronic database, where possible, to increase sensitivity. All titles and abstracts have been reviewed for potential papers to be included in the systematic review. Also, the lists of references to the previous review and

original research were reviewed. A literature search was performed by two authors. Relevant studies were obtained after a detailed review if they met the inclusion criteria.

INSERT Figure 1. Flow diagram of the analysis of studies

Inclusion criteria
Type of study - Controlled randomized and non-randomized studies on the effects of physical activity on mental health written in English are included in the analysis. Sample of respondents - Included respondents are men and women of any age, regardless of lifestyle, body mass index-BMI (obese/normally fed), health status (schizophrenia, stress, depression, various mental illnesses). Type of intervention - Research that determines the effect of physical exercise on mental health. Type of output - Studies were included if the impact of physical activity on mental health was shown.
Exclusion criteria
Exclusion criteria were: 1) studies written in a language other than English; 2) if the respondents are athletes.

RESULTS

The search identified 1755 potentially relevant studies and 8 more by reviewing references. After reviewing the title and abstract, 58 papers remained. After reviewing the entire text according to the inclusion criteria, 20 papers remained. A detailed analysis of all the above studies in Table 1 found that there is an impact of physical activity on human mental health, as well as which types of physical activity affect the psychological state of both persons with mental disorders and the healthy population. This research included a total of 26,940 respondents of different sexes and ages. The study with the most respondents since 19842 (Hamer et al. 2009) while the least respondents out of 23 had the study (Ray et al. 2009). The analysis of this research, in addition to the respondents who were medically fit, included the following psychological diseases: depression, schizophrenia, multiple sclerosis, anxiety, and a sedentary lifestyle. This study was mostly related to healthy subjects and their total number was 23001 (Hamer et al. 2009; Pretty et al. 2005; Brosnahan et al. 2004; Parker et al. 2008; Mummery et al. 2004; Reijneveld et al. 2003; Barnes et al. 2013; Thøgersen-Ntoumani et al. 2005; Ray et al. 2009; Smits et al. 2008; Wallman et al. 2004; Szabo, 2003). A study dealing with the impact of physical activity on depression had 156 respondents in Blumenthal et al. (1999), a study dealing with schizophrenia had 143 subjects (Vancampfort et al. 2013; Scheewe et al. 2013), a study related to multiple sclerosis had 2995 subjects (Turner et al. 2009), while a study dealing with multiple sclerosis studied a sedentary lifestyle had 534 respondents (McGale et al. 2011; Martin et al. 2009). The research included 9 transversal studies and 11 experimental studies, in the exercise program low-intensity exercises such as running, walking, and jogging were mainly used, while in one research we found that the exercise intensity was high. In transversal studies, results were obtained using the exercise questionnaire and the SF-12 and SF-36 questionnaires. The exercise program in the longitudinal study was most often used from 2 to 4 workouts per week for a period of two to 24 weeks, the duration of each workout ranging from 20 to 60 minutes. A total of 20 articles are included in this systematic review.

Table 1. Systematic overview and characteristics of the included research

Study	Health status	Gender	BMI (kg/m^2)	Age	Number of respondents	Duration (days/ weeks)	Training duration (min)	Type of activity	Results	Conclusion
Hamer et al. (2009)	healthy	M/W	26.4	45.02	19842	X	X	Physical activity questionnaire GHQ-12	PA associated with lower risk of MD (OR 0.59, 95% CI 0.52 to 0.66, p=0.001). PA resulted in a moderate decrease in PS (OR 0.67, 95% CI 0.61 to 0.75). Different types of activities associated with lower prospects for PS (OR 0.67, 95% CI 0.54 to 0.82)	MH benefits have been observed in individuals who have spent a minimum of at least 20 minutes per week on any PA.
Pretty et al. (2005)	healthy	M/W	X	24.6± 0.99	100	1/1	20	Jogging, running	Increased self-esteem (from 19.4+0.4 to 18.1+0.4; p=0.001), decreased in two of the six mood measurements (confusion, p.50.01; tension, p=0.001), and improved mood (energy, p.50.001)	PE in a pleasant environment can have a greater effect than PE alone on blood pressure, cardiovascular, and MH.
Brosnahan et al. (2004)	healthy	M/W	23.82	15.4	1870	X	X	Physical activity questionnaire	Students who had PA 3-5 days were less prone to sad feelings than students 0-2 days of PA per week. PA 3-5 with one sport associated with a lower risk of suicide.	Beneficial effects of PA on the feeling of sadness. PA can be considered part of an intervention strategy to improve adolescent health as a whole.
Vancampfort et al. (2013)	schizophrenia	M/W	26.3±5.5	36.8± 10.0	80	X	X	Eurofit test and Physical activity questionnaire	IP showed worsening condition on most Eurofit tests than AP who walked for at least 30 minutes a day. Low PC was associated with disease duration, smoking, the presence of MetS, and more severe depressive and cognitive symptoms. Fewer AP who smoke and suffer from high depressive and/or cognitive symptoms may benefit from PA treatment	Low PC was associated with psychological problems. Moderate PA is associated with a better psychological state in schizophrenia.
Mummery et al. (2004)	healthy	M/W	X	65.2	337	X	X	Active Australian questionnaire and SF-12	Participants classified as moderately active (150-420 minutes per week) and highly active (>420 minutes per week) showed significantly higher mental health status than those classified as inactive (<150 minutes per week) when controlling physical and health status	There is an increased association between PA and MH, individuals who exercised 150 minutes per week showed a better mental picture than those who did not exercise at all.
Reijneveld et al. (2003)	healthy	M/W	X	45-54	126	X	X	(SF)-12, SF-36, Voorrips questionnaire	EG achieved improvement in mental health (effect size: 0.38 SD (confidence interval 95% from 0.03 to 0.73), p=0.03), the oldest subgroup also in mental health (effect size 0.75 SD (0.22 to 1.28), p=0.01).	PA leads to an important improvement in mental health and in general to the mental well-being of those aged 55 and over.
Parker et al. (2008)	healthy	M/W	27.9±5.2	71.3± 8.4	84	X	X	PANAS and SWL scale	The relationship between PED and SWL was significantly stronger than the relationship between PASE and SWL. The relationship between PA and MH may depend on the PA measure used.	These results suggest that, depending on the measurement technique, a higher PA volume is associated with a favorable MH profile.
Scheewe et al. (2013)	schizophrenia	M/W	26.6	29.2	63	3/24	60	Strength exercises	Analyzes according to the protocol showed that physical therapy reduced the symptoms of schizophrenia (p=0.001), depression (p=0.012), the need for care (p=0.050), and increased cardiovascular capacity (p<0.001) compared to occupational therapy.	Exercise therapy, when performed once or twice a week, improves mental health, the cardiovascular system, and reduces the need in patients with schizophrenia.

Barnes et al. (2013)	healthy	M/W	X	73.4+ 5.9	126	3/12	60	Aerobics	Global cognitive outcomes improved significantly over time (0.16 SD; p<.001) but did not differ between groups compared between MA-I and MA-C (ignoring exercise, p=0.17), comparison between EX-I and EX -C (ignoring mental activity, p=0.74) or in all 4 randomization groups (p=0.26).	In inactive elderly adults with cognitive impairment, 12 weeks of PA and MA were associated with significant improvements in global cognitive function with no evidence of a difference between EG and active CG.
Thøgersen-Ntoumani et al. (2005)	healthy	M/W	X	34.11	312	X	X	Exercise quintiles, self-esteem	Direct connections between PE and levels of enthusiasm at work. Indirect links between PE and global well-being components. The results of the alternative model of PA use, as opposed to PE, are generally similar.	Results related to PA indicate that workplace PE promotion programs should incorporate and promote PA life
Blumenthal et al. (1999)	major depression	M/W	X	57±6.5	156	3/16	45	Walking and jogging	There was no difference in HAM-D or BDI results (p=.67). All groups had statistically and clinically significant reductions in HAM-D and BDI scores. Patients receiving medication alone showed the fastest initial response; in patients receiving combination therapy, those with less severe DS initially showed a faster response than those with severe DS.	An exercise training program can be considered an alternative to antidepressants to treat depression in the elderly. After 16 weeks of PE therapy, it was equally effective in reducing depression in patients with MDD.
Turner et al. (2009)	multiple sclerosis	M/W	26.17± 4.82	55.30± 12.22	2995	X	X	Physical functionality scale SF-36, mental health scale VR-36.	Demographic variables make up 9% of the unique variation in PF (F(change) 4.214=50.73; p<0.001). Medical comorbidity accounted for 5% of the unique variance in PF (F(change) 3.214=42.65; p<.001), with higher pain levels associated with lower PF levels (β=-.23; p<.001). PE accounted for 16% of the unique variation in PF above and beyond all other variables (F(change) 1.214=491.79; p<.001), with the presence of any PE associated with higher levels of PF (β=.42; p<.001).	In the context of chronic disease care, the identification of PE patterns and the promotion of PA can represent an important opportunity to improve MH and quality of life among people with MS. Intervention should include factors associated with lower exercise rates, including age, education, and pain.
Lincoln et al. (2011)	type 2 diabetes	W	31.1±5.8	66.3± 7.6	58	3/16	45	Endurance exercises	GDS and MCS did not differ between groups at baseline. However, after a 16-week intervention, there were strong statistically significant differences between PRT and CG, showing a mean improvement in both GDS (3.1±3.5 vs. 12.4±8) and MCS scores (54.4±6.9 vs. 44.5±10.1) of PRT participants.	Involving PE in treatment planning for the elderly can have significant benefits for their MH. More work is needed to understand the mechanisms by which this happened, as well as their applicability
McGale et al. (2011)	sedentary	M	X	18-40	104	2/10	55	Sport games	Participants in the BTN and IE condition showed a significant reduction in BDI-II scores compared to the control condition after the intervention and after 8 weeks. The IE condition showed significantly higher perceived social support than the BTN condition in the fifth week and the control group after 8 weeks.	Exercise-based interventions were effective in reducing the symptoms of depression in a non-clinical sample of young men. The BTN program has shown the potential to improve the mental health of young men,

Ray et al. (2009)	healthy	M/W	24.75± 1.5	25±1	23	4/8	60	HIIT training	ET significantly increased Vo2 peak (Δ18±1%; p<0.001) and decreased resting RBFV (60±4 to 48±3 cm/s; p<0.01), while EC did not change V02 peak or RBFV. ET did not alter resting MSNA (11±1 to 9±1 rpm) or MAP (84±2 to 83±2 mmHh). MS caused an increase in MSNA (2A2 rpm; p<0.05), MAP (ΔΔ15 mmHh; p<0.001), and HR (20Δ20 rpm; p<0.001).	The effects of aerobic exercise training on MSNA responses and renal blood flow to psychological stress were examined. New findings from this study are that aerobic exercise alters MSNA and vascular responses to psychological stress.
Tonacio et al. (2006)	obese	W	33±05	34±1.5	53	3/16	60	Aerobics and stretching exercises	Weight loss was similar between groups D and D+ET (87±2 vs 79±2 and 85±2 vs 76±2 kg, p<0.05) with a significant decrease in MSNA during MS (58±2 vs 50±2, p=0.0001, and 59±3 vs 50±2 rpm, p=0.0001), although the magnitude of the response is unchanged. Vascular conduction in the forearm during MS was significantly increased only in D+ET.	Weight loss has been found to reduce MSNA levels during MS in obese individuals. Also, dietary weight loss is associated with PE, in contrast to weight loss by diet alone, which increases vascular conduction during MS.
Smits et al. (2008)	healthy	M/W	X	20.68	60	3/2	26	Treadmill	Post-treatment results were significantly lower for two exercise conditions than for WL (ASI, t (57) 5 6.99, Po.001, d 5 2.15; BAI, t (57) 5 2.99, Po.005, d 5.96; and BDI , t (57) 5 3.16, Po.005, d 5.95). Outcome variables over time were significantly steeper (more negative) for exercise conditions relative to WL group (ASI, t (57) 5 8.29, Po.001, d 5 6.83; BAI, t (57) 5 3.63, p 5.001, d 5 4.76; t (57) 5 3.94, Po.001, d 5 2.06).	Changes in sensitivity to anxiety were mediated by the beneficial effects of exercise on anxiety and depressed mood.
Wallman et al. (2004)	healthy	M/W	X	16-74	82	3/12	5-15	Walking, swimming, cycling	Results were improved for resting systolic blood pressure (p=0.018), work capacity (V·kg-1) (p=0.019), net blood lactate production (p=0.036), depression (p=0.027)) and performance on a modified Stroop Color Word (p=0.029). The evaluation of the observed results of the effort is lower after gradual PE (p=0.013).	The graded exercise was associated with improved physical performance, as well as specific psychological and cognitive variables. Improvements may be associated with the abandonment of avoidance behavior.
Martin et al. (2009)	sedentary	W	25.0-43.0	45-75	430	3-4/24	X	Ergometer and treadmill	The level of PA is a significant predictor of quality of life change (p=.05). A higher level of PA was associated with greater improvements in the mental and physical aspects of QoL.	Positive response to the relationship between the amount of exercise performed and improvement in physical and mental measures of QoL.
Szabo, A. (2003)	healthy	M/W	X	20-23	39	2/3	20	Running, jogging	The results of the percentage changes gave a significant main effect (Wilks Lambda=.572, F(8,146)=5.88, p<0.001). Significant differences between these three conditions in all four dependent measures; anxiety (F(1.5, 58.3)=5.32, p<.01), positive well-being (F(1.S, 48.2)=7.43, p<.005), PS (F (1.8, 69.8)=10.0, p<.001), and physical fatigue (F(1.6, 61.0)=5.60, p<.01).	The study also found that changes in PS and positive well-being after humor and exercise were similar.

Note AP-active patients; ASI-Anxiety Sensitivity Index; BAI-Beck Anxiety Inventory; BDI-Beck Depression Inventory; BTN Back of the net psychosocial intervention; CG control group; D-diet group; D+ET- diet plus exercise training; DS-depressive symptoms; EG-experimental group; ET-exercise training; EX-C exercise control; EX-I exercise intervention; HAM- Hamilton rating scale for depression; GDS-Geriatric Depression Scale; IE-individual exercise; M-man; MA-mental activities; MA-C mental activities control; MA- I mental activity intervention; MAP-mean arterial pressure; MCS-mental component summary score; MH-mental health; MS-mental stress; MSNA-muscle sympathetic nerve activity; IP-inactive patients; PANAS-scale of positive and negative effect; MD-mental disorder; MDD-major depressive disorder; PS-psychological stress; SWL-scale of life satisfaction; PA-physical activity; PE-physical exercise; PC-physical condition; PF-physical functioning; PRT- progressive resistance exercise training; RBVF-renal blood flow velocity; QoL-quality o life; GHQ-General Health Questionnaire; SPS-Social Provisions Scale; H-no data specified; rpm-beats per minute; n-number of respondents; W-women; WL- waitlist.

DISCUSSION

For both clinical and non-clinical populations, physical activity appears to have certain benefits. Yet, despite great public health, the significance of this potential benefit is surprising. Several studies that meet acceptable standards of methodology have been reported to explain how physical activity and exercise can help reduce mortality in psychiatric populations, alleviate depression-related symptoms, improving self-concept and self-esteem, reducing anxiety symptoms, and improving mood.

Regular physical activity is considered to be associated with better mental health, although there is a lack of consensus on the optimal amount and type of activity to achieve these benefits. In the study that included the largest number of respondents, Hamer et al. (2009) examined the relationship between behavior, mental health, and physical activity in a representative sample of men and women from Scottish health surveys. Physical activity measured by the respondents themselves and completed by the General Health Questionnaire (GHQ-12) was measured to obtain information on the topicality of mental health. The participants were 19842 persons of both sexes. Risk assessments by category of physical activity were calculated weekly using the logistics of the regression model. Psychological stress (based on scores 4 or 3) more about GHQ-12 was recorded in 3200 participants. Any form of daily physical activity was associated with a lower risk of mental disorder after adjusting for age, gender, socioeconomic group, marital status, BMI, long-term illness, smoking, and age (OR 0.59, 95% CI 0.52 to 0.66, p=0.001). The dose-response relationship was evident, with a moderate reduction in psychological stress with less frequent activities (OR 0.67, 95% CI 0.61 to 0.75). Different types of activities, including homework (housework and gardening), walking, and sports were all independently associated with less chance of psychological stress, although the strongest effects were observed in sports (OR 0.67, 95% CI 0.54 to 0.82). Mental health benefits were observed in subjects who performed a minimum of 20 min/week of physical activity of any type.

Vancampfort et al. (2013) systematically assessed physical fitness compared to the appropriate control group of patients with schizophrenia. Eighty patients with schizophrenia were included in the study. All participants took the "Eurofit" test and filled out a questionnaire for international physical activity. Patients with schizophrenia showed decreased whole-body balance ($p<0.001$), explosive leg muscle strength ($p=0.003$), abdominal muscular endurance ($p<0.001$), and running speed ($p<0.001$). Inactive patients had low scores on most "Eurofit" of these tests than patients who walked for at least 30 minutes a day. Low physical fitness was associated with disease duration, smoking, the presence of MetS, and more severe negative, depressive, and cognitive symptoms. Less physically active patients who smoke and suffer from high levels of negative, depressive, and/or cognitive symptoms may benefit from a specific rehabilitation intervention such as physical activity.

The prevalence of cognitive impairment and dementia predicts a dramatic increase in the next 40 years and strategies to maintain cognitive functions with age are needed. Physical or mental activity alone leads to relatively small improvements in cognitive function in older adults; combined interventions can have multiple global effects. Barnes et al. (2013) examined the combined effects of physical plus mental activity on cognitive functions in older adults. A total of 126 inactive elderly people living with cognitive problems. All participants participated in a mental activity at home (1 h/d, 3 d/wk) and physical activity (1 h/d, 3 d/wk) for 12 weeks and were classified for any mental activity intervention (MA- I, intensive computer) or mental activity control (MA-C; educational DVD) plus exercise intervention (EX-I; aerobic) or exercise control (EX-C; stretching and toning). Participants had an average age of 73.4 years, and 62.7% of respondents were women. Global cognitive outcomes improved significantly

over time (mean, 0.16 SD; p <.001) but did not differ between groups compared between MA-I and MA-C (ignoring exercise, p=0.17), comparison between EX- I and EX-C (ignoring mental activity, p=0.74), or in all 4 randomization groups (p=0.26). In inactive elderly with cognitive impairment, 12 weeks of physical plus mental activity was associated with significant improvements in global cognitive function with no evidence of a difference between intervention and active control groups. These findings may reflect the effects of practice or may indicate that the amount of activity is more important than the species in this population.
McGale et al. (2011) investigated the effectiveness of sport/psychosocial intervention (Back of the net, BTN) with individual exercise (IE) and the control condition for the mental health of young men. 10-week randomized follow-up and 8 weeks post-intervention. 104 sedentary men aged between 18 and 40 years were randomly classified into EG and CG. The BTN program was accompanied by integrated team sports (ie football) and cognitive-behavioral techniques. The IE program included aerobic training and endurance training. The control group refrained from exercising. Participants completed the "Beck Depression Inventory- 2nd Edition" (BDI-II), the Social Provisions Scale (SPS), and a short qualitative questionnaire before the intervention, 5 weeks, and 8 weeks after the intervention. Participants in the BTN and IE condition showed a significant reduction in BDI-II scores compared to the control condition after the intervention and after 8 weeks. The IE condition proved to be significantly higher in perceived social support than the BTN condition in the fifth week and the control group after 8 weeks. Exercise-based interventions were effective in reducing the symptoms of depression in a non-clinical sample of young men. The BTN program has shown the potential to improve the mental health of young men.
Our knowledge in this area can be best advanced through different studies dealing with different populations and combining excellent psychological and physiological methodology with equally careful description and assessment of physical activity and exercise.

CONCLUSION

The impact of physical activity on mental health was discussed in this systematic review. A lot of papers on this topic were reviewed and 20 papers were taken for detailed analysis. Each study confirmed that physical activity affects the mental health of people of different health status, gender, and age.
Analyzing the data confirms the positive impact of physical exercise on mental health. Dealing with any type of physical activity leads to a reduction in the symptoms of psychological illnesses such as anxiety, depression, schizophrenia, and a sedentary lifestyle. Physical activity as an independent tool in the treatment of mental illness can be combined with other activities such as mental exercises and thus would contribute to faster and better healing. Exercise should be an integral part of not only the clinical population but also healthy people should regularly use physical activity to maintain mental well-being. The general conclusion is that physical activity has a positive effect on a person's mental health.

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DISCRIMINANT ANALYSIS OF GAME-RELATED STATISTICS BETWEEN NBA AND EUROLEAGUE PLAYERS IN WORLD CUP 2019

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Abstract: Teams from NBA and Euroleague have a long history of pre-season friendly games and the winning records of NBA teams still indicate their dominance. Game-related statistics of 92 games during World Championship 2019 were gathered from official box score for two groups of players: NBA (n = 54, age: 27.8 ± 3.4 years; weight: 102.3 ± 11.5 kg; height: 202.7 ± 8.8 cm) and Euroleague (n = 62, age: 29.4 ± 3.0 years; weight: 95.2 ± 9.5 kg; height: 199.7 ± 8.6 cm). Factorial ANOVA was used to determine individual differences between two groups. Discriminant analysis was then performed to identify the game-related statistics that differentiate between NBA and Euroleague players and interpreted based on structure coefficients matrix (SC). Results revealed that NBA players significantly overcome their peers in body weight ($F = 14.90$; $p < 0.001$) and minutes played ($F = 11.11$; $p < 0.004$) throughout the championship. Furthermore, NBA players overcome Euroleague players in variables mostly related with body size such as blocks (SC = 0.35), defensive rebounds (SC = 0.48), free-throws made (SC = 0.30), free-throws attempted (SC = 0.31), two-points made (SC = 0.38), two-points attempts (SC = 0.52). On the other hand, variables associated with cognitive factors and technical skills such as turnovers or assists were not determined to differentiate between NBA and Euroleague players. Coaches and scouts may take into account these results when scouting players for certain leagues and optimizing the training process by emphasizing the actions identified as very discriminant.

Keywords: game-related statistics, discriminant analysis, basketball

INTRODUCTION

The best basketball players in the world are featured in National basketball association (NBA) and also it is the place where the top level of basketball is played. However, 21st century brought important changes to European basketball and many experts argue that the differences between NBA teams and top European teams that play Euroleague, are decreasing (Mandić et al., 2019).

Teams from NBA and Euroleague have a long history of pre-season friendly games and the winning records of NBA teams still indicate the dominance of NBA over Euroleague (Paulauskas et al., 2018). However, majority of these games are played for promotional purposes and lacking competitiveness (Mandić et al., 2019). Therefore, any comparison of the two competitions would be inaccurate and based only on expert opinions. Furthermore, comparing the two competitions may be complicated due to essential differences in rules such as game duration, three-point shot arc distance, defensive three second violation in the NBA, different schedule, competitiveness, or psycho-social environment (Mandić et al., 2019).

There have been several studies that compared NBA and Euroleague performance from different point of views and similarities were found in shooting patterns, game dynamics and shot success (Mandić et al., 2019; Selmanovic et al., 2015). On the other hand, NBA players

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including all positions not just centers, tends to play more frequently in post-up positions than in Euroleague (Mandić et al., 2019). Consequently, more inside plays occur in the NBA. Furthermore, another study found that dunks are more frequent in NBA whereas hook shots are more frequent in European basketball (Erčulj & Štrumbelj, 2015). This finding may be attributed to better athleticism of NBA players.

One of the mostly used methods to analyse the basketball game is through game-related statistics also known as a box-score. Obtained information from box-score provides coaching staff with valuable information during the game or entire season and help them to prepare for the next game, analyse previous games or evaluate performance of players or teams (Mandić et al., 2019). The investigation in this area has been exploring the variables between winning and losing teams in different contextual factors. Previous research has shown that variables that have mostly the ability to discriminate between winning and losing teams in NBA and in Europe are 2-point field-goals and defensive rebounds (Gómez, Lorenzo, Sampaio, Ibáñez, & Ortega, 2008; Ibáñez et al., 2003; Trninić, Dizdar, & Lukšić, 2002).

Several authors tried to compare players from NBA or Euroleague with other leagues (Erčulj & Štrumbelj, 2015; Sampaio et al., 2006). However, these comparisons were mostly performed in different competitions but contrasting NBA and Euroleague players in the same competition such as World or Olympic Championships would be more appropriate and may provide better insight into the key differences between these two leagues (Paulauskas et al., 2018).

In fact, Paulauskas et al. (2018) compared game-related statistics of Euroleague and NBA players in European championship 2015. However, the number of NBA players was low in comparison with Euroleague players. We hypothesize that the number of NBA players may be greater and results more credible in World championships where would compete countries with probably more players competing in NBA such as USA, Argentina etc… Thus, the aim of the present study was to identify variables that discriminate between NBA and Euroleague players in the World championship 2019 in China.

METHODS

Data were gathered from official box score for men's basketball World Cup 2019 (available at www.fiba.basketball/basketballworldcup/2019). Game-related statistics were obtained from 92 games for two groups of players: NBA (n = 54, age: 27.8 ± 3.4 years; weight: 102.3 ± 11.5 kg; height: 202.7 ± 8.8 cm) and Euroleague (n = 62, age: 29.4 ± 3.0 years; weight: 95.2 ± 9.5 kg; height: 199.7 ± 8.6 cm). Players were included in one of the groups if they participated in NBA or Euroleague season 2018/2019. The NBA sample was constituted by 35% of guards, 41% of forwards and 24% of centers whereas Euroleague sample was composed of 44% of guards, 42% of forwards and 15% of centers. The game-related statistics for each game included: 2- and 3-point field-goals (both successful and unsuccessful), free-throws (both successful and unsuccessful), defensive and offensive rebounds, blocks, assists, fouls, steals, turnovers, and minutes played. All game-related statistics were normalized to the time they spent on the court.

STATISTICAL ANALYSIS

A statistical analysis was performed using the data analysis software Statistica 13 (Stat Soft, Inc., Tulsa, OK, USA). Data were expressed as means (M) ± standard deviation (SD) for all groups. The prerequisites of normality and homogeneity of variance were verified using the Shapiro-Wilks and Levene's tests, respectively. Factorial ANOVA was used to determine the differences between NBA and Euroleague players and post differences ($p \leq .05$). Discriminant

analysis was then performed to identify the game-related statistics that differentiate between NBA and Euroleague players and interpreted based on structure coefficients matrix (SC) greater than |0.30| (Tabachnick & Fidell, 2007). Finally, results from the classification matrix showed how precise was the smallest variable set obtained from each discriminant function in recovering the original grouping of all teams.

RESULTS

Descriptive results for NBA and Euroleague players are presented in Table 1. Results revealed that NBA players significantly overcome their peers in body weight ($p < .001$) and minutes played ($p<.001$) throughout the championship. On the other hand, differences in body height were not found significant ($p > .05$) between NBA and Euroleague players.

Variable	NBA (n = 54)	Euroleague (n = 62)	F	p
Age	27.80 ± 3.41	29.35 ±3.02	2.8	.097
Height	202.72 ± 8.84	199.24 ± 8.55	3.2	.076
Weight	102.28 ± 11.51	95.24 ±9.46	14.9	.001*
Min played	146.02 ±58.05	114.82 ±54.92	11.11	.001*

Table 1. Characteristics of NBA and Euroleague players

Note: (*) p<.05

Table 2 reports descriptive results and discriminant analysis which shows the best smaller set of the game-related statistics that best discriminates the two groups are presented in Table 2. NBA players overcome their Euroleague peers in several variables mostly related with body size such as blocks, defensive rebounds, free throws made, free throws attempted, two-points made, two-points attempts. On the other hand, variables associated with cognitive factors and technical skills such as turnovers or assists were not determined to differentiate between NBA and Euroleague players. Classification matrix (Table 3) revealed that discriminant functions correctly classified 75% of all players in their original groups. Particularly, 80.65% of Euroleague players were correctly reclassified whereas only 68.52% NBA players were correctly classified.

Table 2. Descriptive results and univariate differences for NBA and Euroleague players

Game-related statistics	NBA (n= 54)	Euroleague (n= 62)	Structure matrix
2pts attempts	0.24 ± 0.10	0.10 ± 0,05	0.52*
2pts made	0.13 ± 0.05	0.11 ± 0,07	0.38*
3pts attempts	0.12 ± 0.07	0.04 ± 0,03	0.06
3pts made	0.04 ± 0.03	0.10 ± 0,06	0.12
FT attempts	0.12 ± 0.06	0.07 ± 0,04	0.31*
FT made	0.09 ± 0.04	0.04 ± 0,04	0.30*
Ofensive rebounds	0.06 ± 0.04	0.12 ± 0,06	0.27
Defensive rebounds	0.15 ± 0.06	0.16 ± 0,09	0.48*
Assists	0.10 ± 0.07	0.10 ± 0,04	0.08
Personal fouls	0.09 ± 0.04	0.06 ± 0,03	-0.25
Turnovers	0.06 ± 0.03	0.04 ± 0,02	0.08
Steals	0.04 ± 0.02	0.02 ± 0,02	-0.03
Blocks	0.03 ± 0.02	0.19 ± 0,31	0.35*

Additionally, factorial ANOVA showed that players' anthropometric data including weight ($F = 80.23$; $p < 0.000$) and height ($F = 115$; $p < 0.000$) are position (Guard, Forward and Center) dependent in the game of basketball.

DISCUSSION

The purpose of the present study was to identify variables that discriminate between NBA and Euroleague players in the World championship 2019 in China. Main results of the study suggest that NBA players played significantly more minutes and had greater body mass than their peers from Euroleague. Further, discriminant analysis revealed several variables where NBA players outperformed Euroleague players – 2pts attempts, 2pts made, FT attempts, FT made, defensive rebounds and blocks.

Results of the present study confirm that anthropometrics data are one of the key variables in the game of basketball and may decide whether the player will reach the top level of basketball (Apostolidis & Emmanouil, 2015). In particular, our results identified body weight to differentiate between NBA and Euroleague players. This finding is in line with Paulauskas et al. (2018) who identified that NBA players have substantial advantage in body weight over their peers from Euroleague during European championship. This anthropometric variable

allows players to withstand physical contact from strong opponents when fighting for rebounds or playing in the areas close to the basket.

Paulauskas et al. (2018) also revealed body height as a key variable where NBA players exceed their Euroleague counterparts. Body height gives players the ability to play in areas close to the basket and fight for easy two points and rebounds. However, our study did not confirm body height to differentiate between the two groups. Perhaps, different results may be due to lower number of NBA players in the study of Paulauskas et al. (2018) compared with the present study. Another explanation for body height being unable to differentiate between NBA and Euroleague players may be that differences of body size between the two leagues are getting smaller and coaches and scouts in Euroleague also started to employ body height requirements when selecting players for their teams similar to NBA.

Discriminant analysis revealed that NBA players overcome their Euroleague peers in defensive rebounds which are often identified as a key variable that may decide about winning or losing the game and also that give the team opportunities for primary and secondary fast breaks and score easy baskets (Conte et al., 2018; Gómez et al., 2008; Ibáñez et al., 2008). Players with greater body weight may have slightly advantage in securing the balls close to the basket. In line with Mandić et al. (2019) and Paulauskas et al. (2018), NBA players performed better also in another defensive task – blocked shots which are closely related with defensive pressure and especially with jumping ability of the players which could be further attributed to greater athleticism previously identified in NBA players compared to players from other leagues (Erčulj & Štrumbelj, 2015).

Considering the offensive effectiveness, NBA players performed better in 2pts attempts, 2pts made, FT attempts and FT made. Obviously, NBA players were more aggressive and efficient in the offense than their Euroleague counterparts. Higher number of FT made, and FT attempts may be also closely related to NBA players' greater offensive pressure that gives them the ability to draw more fouls and score from the free-throw line. Scoring from the free-throw line is a crucial variable especially in close games where most of the games are decided (Csataljay et al., 2009; Sampaio & Janeira, 2003). All identified game-related statistics that differentiate between NBA and Euroleague coincides with the study of (Paulauskas et al., 2018), except suffered fouls and free throws missed that were not similarly recognised in the present study and Paulauskas et al. (2018).

In summary, present study analysed game performance of NBA and Euroleague players during World Championship 2019 in China. Analysing players during one big event gives the results more credibility since variables that may affect the players' performance such as rules, court dimensions, schedule, competitiveness were not present in this scenario. The results confirmed significant differences in body weight between NBA and Euroleague players. However, no significant differences were found in body height. It could be argued that Euroleague is becoming qualitatively and quantitively more similar to NBA. However, the absolute quality is more problematic to measure. In fact, NBA players still dominated over their Euroleague counterparts in several important game-related statistics indirectly related to body size.

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COMPARATIVE ANALYSIS OF THE POSTURAL STATUS OF PRESCHOOL- AND YOUNGER SCHOOL-AGE CHILDREN

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Abstract: The term *posture* describes the relative position of body segments during rest or activity. Proper posture of the body is conditioned by the proper functioning of the active part of the locomotor system (LS). If a load of external forces is too large and/or one-sided, the weakness of the muscle groups will lead to incorrect posture and deviations of the segments of the LS. The most critical period for the development of postural disorders is the period of growth and development of the children, primarily the period of starting school, when children change their daily habits, and from an environment where they could move freely, moves to an environment where they are forced to spend a much time in a sedentary position. Given that in recent decades there has been an increase in postural disorders in children, and taking into account the most critical period for their occurrence, the aim of this study was a comparative analysis of the postural status of preschool- and younger school-age children. The sample consisted of 46 children of both boys [M] and girls [Ž], divided into two subsamples: preschool-age (PRU; N = 23, M = 11, Ž = 12) and younger school-age (MŠU; N = 23, M = 13, Ž = 10). The research was conducted in the primary school in Lazarevac, which includes a preschool institution within the educational system. Before the start of the examination, the parents were informed in detail about the procedure and protocol of the research, and they gave written consent for the participation of their child in the research. For the examination, the following variables were monitored: head position (PG), shoulder position (PR), shoulder blade position (PL), stature triangles (LT), pelvic position (PK), knee position observed from behind (PKN), Achilles tendon position (PAT), neck curve (VK), chest curve (GK), lumbar curve (SK), lateral knee position (XK), foot position (PS) and chest position (GK). As a measuring instrument, a modified method of somatoscopy according to Napoleon Volanski was applied. The results of the research showed the absence of differences concerning gender for both subsamples, respectively so the results for boys and girls were combined and to assess the postural status and possible differences between subsamples, a chi-square independence test was applied. Differences in the postural status of children of two different age categories were not found. Analyzing the results of the overall sample a good postural status of all observed segments was recorded, except for the status of the feet, where the largest number of children (56.5%) have a lowered foot. Comparing the differences in postural status concerning individual segments, the research showed that the variables used to assess the status of the feet (PAT and PS) differ from other assessed variables ($x^2_{(14)} = 148{,}65$; $p = 0{,}000$). However, it is important to emphasize that all disorders of physical status recorded in this study fall into the category of functional disorders (grade 1). The presence of structural disorders was not found. Starting from the fact that the foot is an important link in the kinetic chain of the LS, whose normal status is extremely important for complete posture, both static and dynamic, the prevention of this deformity should be given special attention from the earliest childhood.

Keywords: posture, deformity, hypokinesia, locomotor system, foot.

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UPOREDNA ANALIZA POSTURALNOG STATUSA DECE PREDŠKOLSKOG I MLAĐEG ŠKOLSKOG UZRASTA

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Sažetak: Termin *postura* predstavlja stav, položaj ili držanje tela i opisuje relativnu poziciju telesnih segmenata u toku mirovanja ili aktivnosti. Pravilno držanje tela uslovljeno je pravilnim funkcionisanjem aktivnog dela lokomotornog aparata. Ukoliko je opterećenje spoljašnjih sila preveliko i/ili jednostrano slabost mišićnih grupa dovešće do nepravilnog držanja i promena u vidu odstupanja segmenata aparata za kretanje od pravilnog položaja. Najkritičniji period za nastajanje posturalnih poremećaja jeste period rasta i razvoja deteta, i to prvenstveno period polaska u školu, kada dete menja svoje dnevne navike i iz sredine u kojoj je moglo slobodno da se kreće, prelazi u sredinu gde je prinuđeno da znatan deo vremena provede u sedentarnom položaju. S obzirom na to da se poslednjih decenija beleži porast posturalnih poremećaja kod dece, a uzimajući u obzir najkritičniji period za njihov nastanak, cilj ovog rada bio je uporedna analiza posturalnog statusa dece predškolskog i mlađeg školskog uzrasta. Uzorak istraživanja činilo je 46-oro dece oba pola podeljenih u dva subuzorka: predškolski uzrast (PRU; N = 23, dečaci [M] = 11, devojčice [Ž] = 12) i mlađi školski uzrst (MŠU; N = 23, M = 13, Ž = 10). Istraživanje je sprovedeno u osnovnoj školi u Lazarevcu koja u okviru obrazovnog sistema obuhvata i predškolsku ustanovu. Pre početka ispitivanja roditelji su detaljno informisani o proceduri i protokolu istraživanja, a potom su dali pisani pristanak za učestvovanje njihovog deteta u istraživanju. Za potrebe ispitivanja praćene su sledeće varijable: položaj glave (PG), položaj ramena (PR), položaj lopatica (PL), trouglovi stasa (LT), položaj karlice (PK), položaj kolena posmatrano otpozadi (PKN), položaj Ahilovih tetiva (PAT), vratna krivina (VK), grudna krivina (GK), slabinska krivina (SK), položaj kolena posmatrano sa strane (XK), položaj stopala (PS) i grudni koš (GK). Kao merni instrument primenjena je modifikovana metoda somatoskopije po Napoleonu Volanskom. Rezultati istraživanja zabeležili su odsustvo razlika u odnosu na pol za oba subuzorka pojedinačno, tako da su rezultati za dečake i devojčice spojeni i u svrhu procene posturalnog statusa i utvrđivanja eventualnih razlika između subuzoraka primenjen je hi-kvadrat test nezavisnosti. Razlike u posturalnom statusu dece dve različite uzrasne kategorije nisu zabeležene. Posmatrajući celokupan uzorak kod najvećeg broja dece zabeležen je dobar posturalni status svih posmatranih segmenata osim za status stopala, gde najveći broj dece (56,5%) ima spušteno stopalo. Upoređujući razlike u posturalnom statusu u odnosu na pojedinačne segmente istraživanje je pokazalo prisustvo razlika između varijabli kojima je procenjivan status stopala (PAT i PS) i ostalih procenjivanih varijabli ($x^2_{(14)} = 148{,}65$; $p = 0{,}000$). No, značajno je naglasiti da svi poremećaji telesnog statusa koji su zabeleženi ovim istraživanjem spadaju u kategoriju funkcionalnih poremećaja (ocena 1). Prisustvo strukturalnih poremećaja nije zabeleženo. Polazeći od činjenice da stopalo predstavlja značajnu kariku aparata za kretanje čiji je normalan status od izuzetnog značaja za kompletnu posturu, kako statičku tako i dinamičku, prevenciji nastajanja ovog deformiteta treba posvetiti naročitu pažnju od najranijeg detinjstva.

Ključne reči: držanje tela, deformitet, hipokinezija, lokomotorni aparat, stopalo.

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UVOD

Biomehanički parametri tela kojima se definiše njegovo držanje i podrazumeva stav i opisivanje relativne pozicije telesnih segmenata u toku mirovanja ili aktivnosti, objedinjeni su pojmom *postura* (Đorđić, 2007). Posturalna kontrola se razvija segmentalno u cefalo-kaudalnom smeru, najpre uspostavljanjem kontrole glave, zatim trupa i na kraju postizanjem posturalne stabilnosti pri stajanju (McEvoy, & Grimmer, 2005). Za posturalnu stabilnost zadužen je motorički i senzorni sistem koji prolazi kroz tranziciju u uzrastu od četvrte do šeste godine, dok zrelost dostiže između sedme i desete godine. Evolucija posture u sagitalnoj ravni javlja se u periodu između četvrte i dvanaeste godine, što se smatra posledicom normalnog muskulo-skeletnog sazrevanja, tj. rezultatat je procesa adaptacije u smislu održavanja ravnoteže u sagitalnoj ravni. (Lafond, et al., 2007).

Za pravilno držanje tela, kretanje i rad, pre svega je odgovoran lokomotorni aparat (LA), dok vanzglobno vezivno tkivo povezuje i daje mehaničku potporu svim organima i formacijama tela (Bošković, 2003). U svakodnevnim aktivnostima aktivni (mišići) i pasivni (ligamenti i koštano-zglobni sistem) tenzori aparata za kretanje suprotstavljaju se konstantnom uticaju zemljine teže, kao i različitim egzogenim mehaničkim faktorima. Za obezbeđivanje dobre posture, tenzori LA-a moraju uspostavljati ravnotežu koja je značajna za održavanje normalnih fizioloških krivina kičmenog stuba. Ova ravnoteža postiže se međusobnim balansom mišića prednje, bočne i zadnje strane tela (Milinković i Stevanović, 2004).

Odstupanje od normalnog posturalnog (telesnog) statusa (TS) karakteristično je za period rasta i razvoja (dečji i adoliscentni period) pri čemu je naročito kritičan period polaska deteta u školu (Ilić & Đurić, 2014; Milićev, 2014). Dete, koje je do tada većinu vremena provodilo u igri, a samim tim upražnjavajući različite oblike fizičke aktivnosti, najednom je prinuđeno da tu aktivnost u velikoj meri zameni sedenjem, kako u školi, tako i kod kuće (Cardon 2004, prema Đorđić, 2007). Kao rezultat toga, kod značajnog broja dece dolazi do pojave funkcionalnih i morfoloških poremećaja (Kosinac, 2008), među kojima se loše držanje tela smatra jednim od najčešćih (Ilić, 2012). Uzimajući u obzir navedeno, cilj ovog rada bila je procena TS dece, odnosno uporedna analiza posturalnog statusa dece predškolskog i mlađeg školskog uzrasta.

METODE

Ispitanici

U istraživanju je ucestvovalo 46-oro dece oba pola, uzrasta od 7-11 godina. Ukupan uzorak podeljen je na dva subuzorka jednaka po veličini (N = 23): predškolski uzrast (PRU) i mlađi školski uzrast (MŠU). Strukturu PRU činila su deca uzrasta 7 godina, od čega 12 devojčica i 11 dečaka, dok su MŠU činila deca prosečne starosti 10,5 godina, pri čemu 13 dečaka i 10 devojčica.

Pre započinjanja istraživanja dobijena je saglasnost od ustanove u kojoj je studija sprovedena, nakon čega su roditelji obavešteni o protokolu, a potom su dali pisanu saglasnost za učestvovanje njihovog deteta u istraživanju.

Instrumenti i varijable

Procena posturalnog statusa izvršena je metodom somatoskopije, tj. kliničkog pregleda, prema modifikovanoj metodi Napoleona Volanskog (Radisavljević, 2001).

U istraživanju su praćene sledeće varijable: položaj glave (PG), položaj ramena (PR), položaj lopatica (PL), trouglovi stasa (LT), položaj karlice (PK), položaj kolena posmatrano otpozadi (PKN), položaj Ahilovih tetiva (PAT), vratna krivina (VK), grudna krivina (GK), slabinska krivina (SK), položaj kolena posmatrano sa strane (HK), položaj stopala (PS) i grudni koš (GKŠ).

Protokol i procedura
Istraživanje je izvršeno u osnovnoj školi u Lazarevcu koja u sklopu svog obrazovnog sistema sadrži i predškolsku ustanovu. Kompletno istraživanje sprovedeno je na redovnim časovima fizičkog vaspitanja za decu MŠU, odnosno na rekreativnim časovima za decu PRU, u prisustvu nastavnika fizičkog vaspitanja (MŠU) i vaspitača (PRU), koji su vodili računa o disciplini dece. Celokupno ispitivanje TS obe uzrasne kategorije izvršeno je od strane istog ispitivača.
Istraživanje je realizovano kroz dve identične sesije u intervalima od sedam dana. Tokom prve sesije ispitivana su deca PRU grupe, dok je druga sesija obuhvatala MŠU grupu. Ispitanici su ulazili jedan po jedan u prostoriju namenjenu ispitivanju. Tokom pregleda su bili bosi i minimalno obučeni. Neposredno pred svaki pojedinačni pregled, detetu su davana jasno uputstva.

Prikupljanje i obrada podataka

Podaci prikupljeni procenom unošeni su u klinički list i analizirani su za svaku varijablu posebno, za svakog ispitanika pojedinačno.
U cilju ispitivanja potencijalnih razlika u posturalnom statusu dece u odnosu na uzrast primenjen je hi-kvadrat test nezavisnosti. Za utvrđivanje razlika u posturalnom statusu pojedinačnih segmenata primenjen je Fridmanov test. Prag značajnosti statističkih analiza bio je na nivou poverenja od $p = 0,05$, a u svrhu obrade podataka korišćen je softer SPSS 20.2 (SPSS Inc, Chicago, IL).

REZULTATI

S obzirom na to da nisu zabeležene razlike u odnosu na pol, ni za jednu procenjivanu varijablu, ni jednog od dva subuzorka, rezultati za dečake i devojčice su spojeni i primenjene su dalje statističke procedure.

Rezultati istraživanja pokazali su da ne postoje razlike u posturalnom statusu ispitivanje dece između dva različita uzrasta. Posmatrajući celukupan uzorak, najveći broj dece ima dobar posturalni status (ocena 0) svih posmatranih segmenata, osim za status stopala, gde najveći broj dece (56,5%) ima spušteno stopalo. Sledi prikaz dobijenih rezultata po segmentima, posmatrano otpozadi (Tabela 1), sa strane (Tabela 2) i spreda (Tabela 3).

Tabela 1. Rezultati uporedne analize posturalnog statusa dece predškolskog (PRU) i mlađeg školskog uzrasta (MŠU) po segmentima, posmatrano otpozadi.

Segment	Ocena	PRU	MŠU	CU	x^2	*p*
PG	Dobar	22	22	95,7%	2,00	0,368
		95,7%	95,7%			
	D	0	1	2,2%		
		0,0%	4,3%			
	L	1	0	2,2%		
		4,3%	0,0%			
PR	Dobar	19	19	82,6%	0,00	1,000
		82,6%	82,6%			
	D	2	2	8,7%		
		8,7%	8,7%			
	L	2	2	8,7%		
		8,7%	8,7%			
PL	Dobar	21	20	89,1%	0,36	0,836
		91,3%	87%			
	D	1	2	6,5%		
		4,3%	8,7%			
	L	1	1	4,3%		
		4,3%	4,3%			
ULK	Dobar	22	23	97,8%	1,02	0,312
		95,7%	100%			
	Odst.	1	0	2,2%		
		4,3%	0,0%			
KL	Dobar	22	19	89,1%	2,02	0,155
		95,7%	82,6%			
	Odst.	1	4	10,9%		
		4,3%	17,4%			
LT	Dobar	18	16	73,9%	2,06	0,357
		78,3%	69,6%			
	D	1	4	10,9%		
		4,3%	17,4%			
	L	4	3	15,2%		
		17,4%	13,0%			
PK	Dobar	22	18	87,0%	3,20	0,202
		95,7%	78,3%			
	D	1	4	10,9%		
		4,3%	17,4%			
	L	0	1	2,2%		
		0,0%	4,3%			
PKN	Dobar	17	16	71,7%	0,73	0,694
		73,9%	69,6%			
	X	3	5	17,4%		
		13,0%	21,7%			
	O	3	2	10,9%		
		13,0%	8,7%			
PAT	Dobar	9	8	37,0%	0,39	0,822
		39,1%	34,8%			
	S	13	13	56,5%		
		56,5%	56,5%			
	I	1	2	6,5%		
		4,3%	8,7%			

PG – položaj glave, PR – položaj ramena, PL – položaj lopatica, LT – trougovi stasa, PK – polozaj karlice, PKN – polozaj kolena, PAT – polozaj Ahilovih tetiva, Dobar – noramalan posturalni status, D – odstupanje udesno, L – odstupanje ulevo, X – „iks“ noge, O – „oks“ noge, S – spušteno stopalo, I – izdignutono stopalo, PRU –

predškolski uzrast, MŠU – mlađi školski uzrast, CU – celukupan uzoruk, x^2 – rezultat hi-kvadrat testa nezavisnosti, *p* - nivo značajnosti razlika.

Tabela 2. Rezultati uporedne analize posturalnog statusa dece predškolskog (PRU) i mlađeg školskog uzrasta (MŠU) po segmentima, posmatrano sa strane.

Segment	Ocena	PRU	MŠU	CU	x^2	*p*
VK	Dobar	22	18	87,0%	3,07	0,080
		95,7%	78,3%			
	Po.	1	5	13,0%		
		4,3%	21,7%			
	Sm.	0	0	0,0%		
		0,0%	0,0%			
GK	Dobar	18	19	80,4%	0,17	0,919
		78,3%	82,6%			
	Po.	4	3	15,2%		
		17,4%	13,0%			
	Sm.	1	1	4,3%		
		4,3%	4,3%			
SK	Dobar	21	20	89,1%	0,22	0,636
		91,3%	87%			
	Po.	2	3	10,9%		
		8,7%	13,0%			
HK	Dobar	22	23	97,8%	1,02	0,312
		95,7%	100%			
	Hip.	1	0	2,2%		
		4,3%	0,0%			
PS	Dobar	9	8	37,0%	0,39	0,822
		39,1%	34,8%			
	S	13	13	56,5%		
		56,5%	56,5%			
	I	1	2	6,5%		
		4,3%	8,7%			

VK – vratna krivina, GK – grudna krivina, SK – slabinska krivina, HK – hiperekstenzija kolena, PS – položaj stopala, Dobar – noramalan posturalni status, Po. – povećana, Sm. – smanjena, Hip. – hiperekstenzija, S – spušteno, I – izdignuto, PRU – predškolski uzrast, MŠU – mlađi školski uzrast, CU – celupan uzoruk, x^2 – rezultat hi-kvadrat testa nezavisnosti, *p* – nivo značajnosti razlika.

Tabela 3. Rezultati uporedne analize posturalnog statusa dece predškolskog (PRU) i mlađeg školskog uzrasta (MŠU) po segmentima, posmatrano spreda.

Segment	Ocena	PRU	MŠU	CU	x^2	*p*
GKŠ	Dobar	22	20	91,3%	3,07	0,080
		95,7%	87,0%			
	Po.	1	1	4,3%		
		4,3%	4,3%			
	Sm.	0	2	4,3%		
		0,0%	8,7%			

GKŠ – grudni koš, Dobar – noramalan posturalni status, Po. – povećana, Sm. – smanjena, PRU – predškolski uzrast, MŠU – mlađi školski uzrast, CU – celupan uzoruk, x^2 – rezultat hi-kvadrat testa nezavisnosti, *p* – nivo značajnosti razlika.

Treba naglasiti da svi poremećaji telesnog statusa koji su zabeleženi ovim istraživanjem spadaju u grupu funkcionalnih poremećaja (ocena 1), dok prisustvo strukturalnih poremećaja – deformiteta (ocena 2) nije zabeleženo.

Upoređujući razlike u posturalnom statusu u odnosu na pojedinačne segmente, istraživanje je pokazalo da se varijable kojima je procenjivan status stopala – položaj Ahilovih tetiva (PAT) i položaj stopala posmatrano sa strane (PS) značajno razlikuju od ostalih procenjivanih varijabli ($x^2_{(14)}$ =148, 65; p = 0,000).

DISKUSIJA

Rezultati ovog istraživanja pokazali su da najveći broj dece, u obe uzrasne kategorije ima dobar status procenjivanih segmenata. Na ispitivanom uzorku nisu zabeležene razlike u TS u odnosu na pol, što ne iznenađuje s obzirom na to da do puberteta ne postoje razlike u rastu i razvoju između dečaka i devojčica (Pavličević i Stanišić, 2007). S druge strane, jedan od kriznih perioda za nastajanje posturalnih poremećaja jeste period polaska deteta u školi (Ilić & Đurić, 2014; Milićev, 2014), te je za očekivati bilo da će deca MŠU pokazati lošiji TS od dece PRU, što ovim istraživanjem nije zabeleženo. Takvi nalazi ohrabruju, jer upućuju na to da ispitivana deca MŠU verovatno imaju zdrave navike po pitanju sedenja (sede pravilno), nošenja školskih torbi, upražnjavanja dopunskih oblika fizičke aktivnosti itd,

Ono što ne ohrabruje, a takođe je zabeleženo ovim istraživanjem, jeste činjenica da se već kod dece PRU beleže poremećaji statusa stopala (SS) u vidu spuštenog stopala, što se zadržava i u kasnijem uzrastu. Polazeći od činjenice da "stopalo predstavlja značajnu kariku lokomotornog aparata čiji je normalan status od izuzetnog značaja za kompletnu posturu (kako statičku, tako i dinamičku)" (Jovčić, 2019), prevenciji nastajanja ovog deformiteta treba posvetiti naročitu pažnju. Istraživanja su pokazala da deca koja se bave organizovanim oblicima fizičkog vežbanja imaju bolji SS u odnosu na decu koja to ne čine (Jovčić, 2019) čime se, po ko zna koji put, u literaturi ističe značaj fizičke vežbe u očuvanju zdravlja.

Treba istaći da svi poremećaji TS koji su zabeleženi ovim itraživanjem spadaju u kategoriju funkcionalnih poremećaja, što znači da se primenom adekvatnih vežbi mogu ispraviti, loše navike korigovati i steći zdrave navike pravilnog držanja tela, kao preduslova za normalno funkcionisanje svih sistema organizma.

Naposletku treba naglasiti, da tumačeći rezultate ovog istraživanja treba uzeti u obzir strukturu i veličinu uzorka. Naime, uzorak ispitanika činila su deca jedne osnovne škole, te se rezultati istraživanja ne mogu generalizovati na celokupnu populaciju. Nadalje, u razvijenim zemljama postoje instituti za preventivni rad sa decom, koji su opremljeni savremenim dijagnostičkim instrumentima i kojima se na vreme otkrivaju posturalni poremećaji i izrađuju terapijski i preventivni programi. U isto vreme na našim prostorima nedostatak takvih centara i dijagnostičkih aparata otežava procenu deformiteta na efikasan, brz i objektivan način. (Protić-Gava i Krneta, 2010). Kod nas se još uvek, kao metoda za rano otkrivanje promena na kičmenom stubu i stopalu najčešće primenjuje metoda somatoskopije, tj. klinički pregled, koja je manje diskriminativna u odnosu na savremene uređaje koji su znatno osetljiviji na beleženje razlika između normalnog i narušenog TS-a.

ZAKLJUČAK

U periodu intenzivnog rasta i razvoja dece kada je lokomotorni sistem podložan različitim deformitetima, sistematski pregledi i otkrivanje poremećaja telesnog statusa od izuzetnog je značaja, s obzirom na to da nije završen koštani rast, te se može očekivati uspešan efekat kineziterapije. U cilju prevencije nastajanja telesnih deformiteta fizička vežba ima značajnu ulogu. Iz tog razloga, od najranijeg detinjstva decu treba podsticati na fizičku aktivnost, a posebno na programirane oblike fizičkog vežbanja (najpre na simetrične sportove i plivanje).

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VISUAL-MOTOR INTEGRATION IN CHILDREN WITH AND WITHOUT DEVELOPMENTAL DISORDERS

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Abstract: Visual-motor integration is a complex process that arises by merging motor output and visual input. This is the ability that connect eye and hand movements with visual information. Children with visual-motor integration problems may have difficulty with motor activities that require visual input and feedback. The aim of the research was to evaluate the visual-motor integration in children with and without developmental disorders, who attend the first grade of elementary school. The research sample was formed of 105 participants of both sexes. The average age of participants was *Mdn* = 7.7 years. In relation to the type of development, there were 28.6% of children with typical development and 71.4% of children with developmental disorders (children with motor, sensory and cognitive disorders). Subtest 2, Fine Motor Integration from the Bruininks-Oseretsky Test of Motor Proficiency, 2nd edition (*BOT-2; Bruininks & Bruininks, 2005*) was used to assess visual-motor integration. Counting measures, measures of central tendency and measures of variability were applied in statistical data processing, and one-factor analysis of variance with subsequent Post-hoc tests was used to determine the difference between groups. The results showed that all groups of participants achieved lower average achievements compared to the maximum possible achievement. At the same time, a statistically significant difference ($p \leq .05$) was detected between participants with typical development and all groups of participants with developmental disorders, while between groups of participants with developmental disorders this difference was not at the level of statistical significance. These results indicate the importance and need to stimulate visual-motor integration, both in children with developmental disorders and in children of typical development. If this ability is not subjected to preventive and corrective programs in time, it can affect the reduced physical activity and participation of children in peer games, but it can also have consequences for the acquisition of reading and writing skills.

Keywords: visual integration, motor integration, motor activities, academic skills

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VIZUOMOTORNA INTEGRACIJA KOD DECE SA I BEZ SMETNJI U RAZVOJU

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Sažetak: Vizuomotorna integracija je složeni proces koji nastaje spajanjem motoričkog izlaza i vizuelnog ulaza, odnosno to je sposobnost povezivanja pokreta oka i ruke sa vizuelnim informacijama. Deca sa problemima vizuomotorne integracije mogu da imaju teškoće sa motoričkim aktivnostima koje zahtevaju vizuelni input i povratnu spregu. Cilj istraživanja je bio da se proceni vizuomotorna integracija kod dece sa i bez smetnji u razvoju, koja pohađaju prvi razred osnovne škole. Uzorak istraživanja je formiran od 105 učenika oba pola. Prosečan uzrast učenika je *Mdn* = 7,7 godina. U odnosu na tip razvoja bilo je 28,6% učenika tipičnog razvoja i 71,4% učenika sa smetnjama i poremećajima u razvoju (učenici sa motoričkim smetnjama i poremećajima, učenici sa senzornim smetnjama i poremećajima i učenici sa kognitivnim smetnjama i poremećajima). Za procenu vizuomotorne integracije korišćen je subtest 2, Fina motorička integracija iz baterije testova Bruininks-Oseretsky Test of Motor Proficiency, 2nd edition (BOT-2; Bruininks & Bruininks, 2005). U statističkoj obradi podataka primenjene su mere prebrojavanja, mere centralne tendencije i mere varijabilnosti, a za utvrđivanje razlike između grupa primenjena je jednofaktorska analiza varijanse sa naknadnim Post-hoc testovima. Rezultati pokazuju da sve grupe ispitanika ostvaruju niža prosečna postignuća u odnosu na maksimalno moguće postignuće. Istovremeno, statistički značajna razlika ($p \leq .05$) je otkrivena između ispitanika tipičnog razvoja i svih grupa ispitanika sa smetnjama u razvoju, dok između grupa ispitanika sa smetnjama u razvoju ta razlika nije na nivou statističke značajnosti. Ovi rezultati upućuju na značaj i potrebu stimulacije vizuomotorne integracije, kako kod dece sa smetnjama u razvoju, tako i kod dece tipičnog razvoja. Ukoliko ova sposobnost ne bude na vreme podvrgnuta preventivno – korektivnim programima može da utiče na smanjenu fizičku aktivnost i participaciju dece u vršnjačkim igrama, ali i da ostavi posledice na usvajanje akademskih veština, poput čitanja i pisanja.

Ključne reči: vizuelna integracija, motorna integracija, motoričke aktivnosti, akademske veštine

UVOD

Koordinacija vizuelne percepcije i fine motoričke kontrole predstavlja vizuo-motornu integraciju (VMI). VMI je složeni proces koji nastaje spajanjem motoričkog izlaza i vizuelnog ulaza, odnosno to je sposobnost povezivanja pokreta oka i ruke sa vizuelnim informacijama. Koordinisano korišćenje oka i ruke omogućava adekvatno izvršavanje zadatka, kako u oblasti svakodnevnog života (briga o sebi, korišćenje kućnih aparata, korišćenje pribora za jelo, šivenje, i slično), preko usvajanja akademskih veština (na prvom mestu pisanja, čitanja, te računanja), do participacije u sportskim i rekreativnim aktivnostima u kojima je fokus na korišćenju vizuelnog inputa i motoričkog autputa (npr. pikado, bejzbol, druge aktivnosti poput hvatanja ili udaranja lopte, itd.) (Cho et al., 2015; Kurtz, 2006).

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Ovaj članak predstavlja deo rezultata istraživanja koji su dobijeni tokom rada na doktorskoj disertaciji: Sretenović, I. (2019). *Nivo motoričkog razvoja kod učenika sa poremećajima u razvoju* (Doktorska disertacija). Univerzitet u Beogradu - Fakultet za specijalnu edukaciju i rehabilitaciju

Prema Šamvej-Kuk i Vulakot (Shumway–Cook & Woollacott, 2001) vizuo–motorna integracija u finim motoričkim veštinama uključuje: motoričke procese (oko, glavu i pokrete rukama), senzorne procese (vizuelne, vestibularne i somatosenzorne sisteme), unutrašnje pojave senzorne percepcije i akcije i procese višeg nivoa za adaptivne i preuranjene fine motoričke funkcije. Studije razvoja vizuo–motorne integracije, pokazale su vezu između vizuelnih i motoričkih aspekata razvoja kod beba prilikom posezanja za igračkama. Bebe posežu za igračkama kada ih prethodno vizuelno lociraju. Kada slučajno dotaknu igračku, bebe okreću glavu i pogled prema tom objektu, što upućuje na važnost somatosenzorne informacije prilikom pokreta oko–ruka (Shumway–Cook & Woollacott, 2001). Uzrast, prvi susret i složenost zadatka, zajedno sa učestalošću vežbe, su važne determinante koje menjaju ulogu vizuelnim elementima u motoričkim zadacima (Von Hofsten & Rosander, 2007).
Istraživački nalazi pokazuju da vizuo-motorna integracija predstavlja prediktor akademskih veština. Naime, grupa autora je na uzorku od 259 dece predškolskog uzrasta utvrdila da vizuo-motorna integracija i egzekutivne funkcije imaju tendenciju odlaganja, odnosno sporijeg razvoja kod dece koja potiču iz porodica nižeg socioeknomskog statusa što na školskom uzrastu dovodi do nižih čitalačkih i matematičkih veština (Brock & Grissmer, 2018). Takođe, vizuo-motorne sposobnosti imaju važnu ulogu u razvoju pisanja i rukopisa, tj. VMI je povezana sa sposobnošću čitkog kopiranja slova (Daly et al., 2003), te problemi VMI dovode do loše prostorne organizacije pisanog rada (Barnhardt et al., 2005). Mekdonald i saradnici (MacDonald et al., 2016) navode da su VMI i veštine manipulacije objektima povezane sa egzekutivnim funkcijama i socijalnim ponašanjem.
Na osnovu navedenog, možemo primetiti značaj i ulogu VMI u različitim aspektima života svake jedinke, te je cilj ovog deskriptivnog istraživanja bio da se proceni vizuo-motorna integracija kod dece sa i bez smetnji u razvoju, koja pohađaju prvi razred osnovne škole.

METOD

Mesto i vreme istraživanja. Istraživanje je realizovano u jednoj beogradskoj osnovnoj školi i u školama za obrazovanje učenika sa smetnjama u razvoju i invaliditetom koje se nalaze u Republici Srbiji, tokom 2017. godine.
Uzorak. Uzorak istraživanja je formiran od 105 učenika, oba pola. Prosečan uzrast učenika je *Mdn* = 7,7 godina. U odnosu na tip razvoja bilo je 28,6% učenika tipičnog razvoja i 71,4% učenika sa smetnjama i poremećajima u razvoju (učenici sa motoričkim smetnjama i poremećajima, učenici sa senzornim smetnjama i poremećajima i učenici sa kognitivnim smetnjama i poremećajima). Primenom χ^2 testa utvrđeno je da su ispitanici ujednačeni u odnosu na polnu strukturu ($p > .05$). Detaljan prikaz strukture ispitivanog uzorka dat je u Tabeli 1.

Tabela 1. *Struktura ispitanika u odnosu na tip razvoja, pol i uzrast*

Karakteristike	N (%)	Uzrast 7.0 - 7.11 (*Mdn*)
Tip razvoja		
Tipičan razvoj	30 (28.6)	7.6
Motoričke smetnje i poremećaji	15 (14.3)	7.9
Oštećenje vida	15 (14.3)	7.9
Oštećenje sluha	15 (14.3)	7.7
Umerena IO	15 (14.3)	7.5
Višestruka ometenost	15 (14.3)	7.8
Pol		
Muški	60 (57.1)	
Ženski	45 (42.9)	

Postupak i instrument istraživanja. Nakon dobijenog informisanog pristanka direktora škola i nakon potpisanih saglasnosti roditelja ili staratelja učenika, pristupilo se istraživanju. Učenici su testirani u matičnim školama, u prostoriji koja je odgovarala testovnim zadacima. Za procenu vizuo-motorne integracije korišćen je subtest 2, Fina motorička integracija iz baterije testova Bruininks-Oseretsky Test of Motor Proficiency, 2nd edition (BOT-2; Bruininks & Bruininks, 2005). Ovaj subtest sadrži zadatke reprodukovanja zadatih modela, od prostih ka složenijim, te omogućava procenu povezivanja vizuelnog stimulus sa motornom kontrolom, što predstavlja vizuo-motornu integraciju. Vrednost Kronbahovog koeficijenta pouzdanosti α, za subtest 2 iznosi 0.93, što je u skladu sa nalazima u literaturi (Gan et al., 2008; Wuang & Su, 2009). Više o samom instrument videti u radu Sretenović (2019).
Statistička obrada podataka. U obradi podataka korišćen je statistički paket za društvene nauke (SPSS for Windows, v. 21.0, 2012). U delu preliminarnih analiza izračunat je Kronbahov koeficijent α, kao i normalnost distribucije rezultata pomoću Kolmogorov-Smirnov testa. Na osnovu ovih podataka primenjene su metode deskriptivne statistike (mere prebrojavanja, mere centralne tendencije i mere varijabilnosti) i inferencijalne statistike (χ^2 test, jednofaktorska analiza varijanse i naknadne Post-hoc analize pomoću Bonferroni testa). Za sve statističke analize zadat je nivo od .05.

REZULTATI I DISKUSIJA

Prosečna postignuća ispitanika na subtestu Fina motorička integracija prikazana su u Tabeli 2. Rezultati našeg istraživanja pokazuju da učenici tipičnog razvoja postižu najbolja prosečna postignuća na subtestu za procenu fine motoričke integracije, a da ih slede učenici sa oštećenjem vida. Najniže postignuće ostvaruju učenici sa motoričkim poremećajima i višestrukom ometenošću. Ovakvi rezultati su delimično u skladu sa podacima iz literature, koji kažu da je vizuo-motorna integracija sastavni deo intelektualnog funkcionisanja (Lotz et al., 2005). Na uzorku od 144 dece, uzrasta šest do 10 godina, utvrđeno je da deca kod kojih je motorička sposobnost ispod uzrasnih normi, imaju i nižu sposobnost vizuo-motorne integracije, odnosno pokazano je da postoji značajna razlika u vizuo-motornoj integraciji između onih sa visokim i niskim nivoom motoričkih sposobnosti, ali bez uticaja ovih sposobnosti na perceptivne veštine (Bonifacci, 2004).
Primenom jednofaktorske analize varijanse, u cilju utvrđivanja razlika između grupa, evidentirano je postojanje statistički značajne razlike ($F (5, 99) = 13{,}013$, $p = .000$). Kako bismo tačno utvrdili između kojih grupa je razlika na nivou statističke značajnosti primenili smo Bonferroni pos-hoc test. Utvrđeno je da statistički značajna razlika postoji između ispitanika tipičnog razvoja i ispitanika sa motoričkim smetnjama i poremećajima ($p = .000$), oštećenjem vida ($p = .016$), oštećenjem sluha ($p = .011$), umerenom intelektualnom ometenošću ($p = .004$) i višestrukom ometenošću ($p = .000$), dok između grupa ispitanika sa smetnjama u razvoju ta razlika nije na nivou statističke značajnosti.
Alsejdi (Alsaedi, 2020) je u svojoj studiji nastojao da utvrdi prevalenciju, težinu i prirodu motoričkih deficita kod dece sa poremećajem autističkog spektra uzrasta šest do 12 godina, pomoću BOT-2 kraće forme. Između ostalog, utvrdio je da postoje razlike između dece sa poremećajem autističkog spektra i dece tipičnog razvoja na svim subtestovima, te i na subtestu za procenu fine motoričke integracije. Prosečno postignuće dece sa poremećajem autističnog spektra na ovom subtestu iznosi 7.43 (2.17), što je rezultat najpribližniji našim ispitanicima sa motoričkim poremećajima i višestrukom ometenošću. Ovakvi rezultati se možda mogu dovesti u vezu sa pogođenim delovima mozga za koje se sumnja da su uključeni u neuronske osnove autizma, a ujedno mogu biti oštećeni i kod dece sa motoričkim poremećajima (npr. mali mozak, bazalne ganglije, itd).

Deficiti u vizuo-motornoj integraciji mogu da budu posledica senzornih problema, jer kao što smo već naveli VMI zahteva asimilaciju nekoliko vrsta senzornih inputa kako bi se pokret usmerio ka cilju (Abdel Karim & Mohammed, 2015). Deca sa cerebralnom paralizom pokazuju značajno lošije rezultate u vizuo–motornoj integraciji, zajedno sa senzornom, perceptivnom, motoričkom i kognitivnom funkcijom za razliku od njihovih vršnjaka tipičnog razvoja. Problemi vizuo–motorne integracije pokazali su se perzistentnim u zadacima crtanja i vizuo-konstruktivnim zadacima (Tükel, 2013).

U literaturi se nailazi na podatke koji govore da deca sa razvojnim poremećajem koordinacije imaju teškoće u koordinisanju svojih pokreta, usporenost i nepreciznost pri učenju i izvođenju motoričkih veština, te generalno imaju slabije performanse u zadacima koji zahtevaju manipulativnu spretnost i vizuo-motornu koordinaciju u poređenju sa vršnjacima tipičnog razvoja (Coutinho et al., 2011, prema Valverde et al., 2020). Ujedno, deca sa ovim poremećajem imaju teškoća u obavljanju aktivnosti svakodnevnog života, korišćenju pribora u školi (npr. upotreba olovke, šestara, lenjira…), i participaciji u svakodnevnim zabavnim i sportskim aktivnostima. Ukoliko se porede dečaci i devojčice sa razvojnim poremećajem koordinacije, uočava se da dečaci imaju veće poteškoće sa veštinama fine motoričke koordinacije, a devojčice u zadacima koji zahtevaju korišćenje lopte (Coutinho et al., 2011, prema Valverde et al., 2020). Ako se ovakvi podaci postave u sociokulturalni kontekst, onda bi se dečaci podsticali na trčanje, skakanje, penjanje, igranje fudbala, što bi uticalo na veću stimulaciju i razvoj grubih motoričkih sposobnosti, dok bi se devojčice podsticale da se igraju smirenijim igrama, sa manjim predmetima, što više zahteva korišćenje manipulativne spretnosti i vizuo-motorne integracije (Guerra et al., 2014).

Tabela 2. *Prosečna postignuća ispitanika na subtestu Fina motorička integracija u odnosu na tip razvoja*

Tip razvoja	N	Max	AS	SD
Tipičan razvoj	30	40	26.00	5.54
Motoričke smetnje i poremećaji	15	40	7.67	6.53
Oštećenje vida	15	40	16.60	11.94
Oštećenje sluha	15	40	16.27	9.62
Umerena intelektualna ometenost	15	40	15.47	11.33
Višestruka ometenost	15	40	7.67	8.95
Ukupno	105	40	16.52	11.08

ZAKLJUČAK

Na osnovu prikazanih rezultata može se reći da sve grupe ispitanika postižu znatno niža postignuća u odnosu na maksimalno moguće postignuće na subtestu za procenu fine motoričke integracije, te ovakvi rezultati upućuju na značaj i potrebu stimulacije vizuo-motorne integracije, kako kod dece sa smetnjama u razvoju, tako i kod dece tipičnog razvoja. Ukoliko ova sposobnost ne bude na vreme podvrgnuta preventivno – korektivnim programima može da utiče na smanjenu fizičku aktivnost i participaciju dece u vršnjačkim igrama, ali i da ostavi posledice na usvajanje akademskih veština, poput čitanja i pisanja što je i empirijski dokazano prethodnim istraživanjima. Drugim rečima, razumevanje uticaja koji VMI ima na veštine pisanja i čitanja, kao i na veštine manipulacije loptom, recimo, treba da ukaže svim stručnjacima koji se bave ovom problematikom na pravovremenu detekciju i uključivanje dece u odgovarajuće programe podrške. Neka od budućih istraživanja bi mogla da obuhvate i druge uzrasne kategorije, ali i druge razvojne, pa i stečene poremećaje posebno tokom ranih godina.

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SPORTS AND NON-SPORTS-RELATED NOSE FRACTURES: ETIOLOGY, DIAGNOSIS, CLASSIFICATION AND TREATMENT

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Abstract: The nose is the most protruding part of the face and is most often exposed to the effect of trauma in head injuries. It is in the third place in terms of the frequency of injuries to certain parts of the human body and among the 10 most common sports injuries in general. Nasal injuries are of special importance due to the frequency of their occurrence, different diagnostics, treatment and assessment of their severity. Due to a strong blow to the area of the outer nose, there is a fracture of the nasal bones, frontal processes of the upper jaw, lateral cartilage of the nose, and in most cases, the nasal septum, both in the cartilaginous and in the bone area. In the case of a nasal fracture, the integrity of the nasal bone pyramid is violated with or without movement of the bone fragments. In the case of a fracture of the nasal septum, a bruise is noticed on the mucous membrane with a possible rupture, microhematomas are formed which can cause extensive hematoma of the nasal septum with the formation of an abscess. They are mostly in males. The most common causes are the injuries in sports, in the household, falls from heights, falls in epileptic seizures or alcohol poisoning, traffic accidents, as well as voluntary injuries. Treatment of nasal injuries depends on the type and severity of the injury. Treatment should be team-based, with close collaboration between otorhinolaryngologists, ophthalmologists, maxillofacial surgeons, neurosurgeons, and neurologists.

Keywords: nose fractures, joint fractures of adjacent bones, sports injuries, male, team treatment

SPORTSKI I VANSPORTSKI PRELOMI NOSA: ETIOLOGIJA, DIJAGNOSTIKA, KLASIFIKACIJA I LEČENJE

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Sažetak: Nos je najistureniji deo lica i najčešće je izložen dejstvu traume kod povrede glave. Nalazi se na trećem mestu po učestalosti povređivanja pojedinih delova ljudskog tela i među 10 najčešćih spotskih povreda uopšte. Povrede nosa imaju poseban značaj zbog učestalosti njihovog nastajanja, različite dijagnostike, lečenja i procene njihove težine. Usled snažnog udara u područje spoljašnji nosa, dolazi do preloma nosnih kostiju, frontalnih procesusa gornje vilice, lateralnih hrskavica nosa, a u većini slučajeva, nosnog septuma, kako u hrskavičnom, tako i u koštanom području. Kod preloma nosa dolazi do povrede integriteta koštane piramide nosa sa ili bez pomeranja koštanih fragmenata. U slučaju preloma nosnog septuma primećuje se modrica na sluzokoži sa mogućom rupturom, formiraju se mikrohematomi koji mogu izazvati opsežan hematom nosnog septuma sa formiranjem apscesa. Prelomi nosa većinom su kod osoba muškog pola. Najčešći uzroci nastanka su povrede u sportu, u domaćinstvu, padovi sa visine, padovi kod epileptičkog napada ili alkoholnog trovanja, saobraćajne nesreće, kao i

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voljne povrede. Lečenje povreda nosa zavise od vrste i težine povrede. Lečenje bi trebalo da bude timsko, zu tesnu saradnju između otorinolaringologa, oftalmologa, maksilofacijalnog hirurga, neurohirurga i neurologa.

Ključne reči: prelomi nosa, udruženi prelomi susednih kostiju, povrede u sportu, muški pol, timsko lečenje

UVOD

U svakodnevnim sportskim aktivnostim povrede nosa imaju poseban značaj. To proizilazi iz učestalosti nastajanja ovih povreda, različitog pristupa njihove dijagnostike, lečenja, kao i potrebe objektivne ocene njihove težine. U praksi su često prisutni neujednčeni, različiti, pa i potpuno suprotni stavovi po pitanju njihove klasifikacaije i kvalifikacije težine telesne povrede. Nos, kao najistureniji deo lica, najčešće je izložen dejstvu traume kod povrede glave i nalazi se na trećem mestu po učestalosti povređivanja pojedinih delova ljudskog tela. Kod preloma nosa dolazi do povrede integriteta koštane piramide nosa sa ili bez pomeranja koštanih fragmenata. Prelomi nosnih kostiju ili oštećenje hrskavice mogu dovesti do edema, bola, abnormalne pokretljivosti, krepita, krvarenja iz nosa i modrica u periokularnom regionu. Dijagnoza se obično postavlja na osnovu kliničke slike. Tretman uključuje repoziciju, stabilizaciju sa unutrašnjom tamponadom ili splintovanjem. Ove povrede se uvršćuju među 10 najčešćih spotskih povreda uopšte (1,2).

Epidemiologija

Po mišljenju različitih autora, od 43% do 53% svih povreda ORL organa su povrede nosa i paranazalnih sinusa. Ove povrede većinom su kod osoba muškog pola, u starosnoj dobi od 15 do 40 godina (3,4,5,6,7,8).

Etiologija

Prelom nosa može biti rezultat različitih vrsta povreda. To su povrede u sportu (uglavnom u boksu, kod raznih vrsta borilačkih veština, kao i u derugim sportovima); razne povrede u domaćinstvu; povrede kod pada sa visine; povrede usled pada kao rezultat epileptičkog napada ili alkoholnog trovanja; povrede kod saobraćajnih nesreća uglavnom uz nepoštovanje sigurnosnih propisa; voljne povrede; povrde povezane sa fizičkim napadom (9,10).

Patogeneza

Među kostima skeleta lica, nosne kosti su najosetljivije na prelome zbog njihove centralne lokalizacije i protruzije iznad lica. U zavisnosti od mehanizma povrede, mogući su i prelomi gornje vilice, očnih duplji, etmoidne ploče i oštećenja nazolakrimalnog kanala.
Kao rezultat snažnog udara u područje spoljašnjeg nosa, dolazi do preloma nosnih kostiju, frontalnih procesusa gornje vilice, lateralnih hrskavica nosa i, u većini slučajeva, nosnog septuma, kako u hrskavičnom, tako i u koštanom području. Najčešće posmatrane lateralne pomake spoljašnjeg nosa praćene su odvajanjem šava između nosnih kostiju i frontalnih procesusa gornje vilice ili frakture nosnih kostiju. Čak i ako nema pomeranja piramide nosa, onda se skoro uvek posmatra svako drugo pomeranje koštanih fragmenata u odnosu na svaki drugi. U svim slučajevima takođe primećen jedan ili drugi stepen edema, modrica i abrazija mekih tkiva nosa. U slučaju preloma nosnog septuma primećuje se modrica na sluzokoži sa mogućom rupturom. U toku linije frakture nosnog septuma, formiraju se mikrohematomi koji mogu izazvati opsežan hematom nosnog septuma sa formiranjem apscesa (11,12,13,14).

FUNKCIONALNA ANATOMIJA I BIOMEHANIKA NOSNIH KOSTIJU

Nosna kost (*os nasale*) je pljosnata kost koja čini podlogu nosnog grebena. Rubovima komunicira sa čeonom, viličnom, suprotnom nosnom kosti, te nosnom hrskavicom. Hrskavica kao anteroinferiorni deo nosa, štiti od udaraca u nos sve dok oni nisu toliko jaki da uzrokuju prelome nosne kosti.

Anatomski, nos delimo na: spoljašnji nos koji je najizbočeniji deo lica i nosnu duplju (*cavitas nasi*), koja leži pozadi spoljašnjeg nosa i ispred nosnog dela ždrela (*pars nasalis pharyngis*). U gornjem delu nosne duplje, i to u sluzokoži njenog oflaktivnog dela (*pars olfactoria tunicae mucosae nasi*), smešten je receptivni deo čula mirisa (*organum olfactorium*).

Skelet spoljašnjeg nosa sastoji se iz tri dela: koštanog, hrskavičavog i vezivnog.

Koštani deo spoljašnjeg nosa čine nosne kosti (*ossa nasalis*). Nosne kosti se sa ostalim kostima spajaju putem šavova, koji funkcionlno spadaju u nepokretne spojeve (*synarthrosis*). *Sutura frontalis* spaja gornju ivicu nosne kosti sa *margo nasalis ossis frontalis. Sutura nasomaxillaris* predstavlja spoj spoljašnje ivice nosne kosti sa prednjom ivicom *processus frontalis maxillae*. Obe nosne kosti spojne se međunosnim šavom (*sutura internasalis*); unutrašnja ivica nosne kosti, pošto se spoji sa svojom paricom, produžuje se unazad u vertikalni greben, koji podupire nosna bodlja čeone kosti (*spina nasalis ossis frontalis*). Donja ivica nosnih kostiju je slobodna; na maceriranoj lobanji ova ivica učestvuje zajedno sa nosnim usekom gornjih vilica (*incisura nasalis maxillae*) u formiranju kruškastog otvora (*apertura piriformis*), koji predstavlja prednji otvor nosne duplje (14,15).

Hrskavičavi deo čine: bočne hrskavice nosa (*cartilagines nasi laterales*), velike hrskavice nosnog krila (*cartilagines alares majores*), male hrskavice nosnog krila (*cartilagines alares minores*), pomoćne hrskavice nosa (*cartilagines nasi accessoriae*) i hrskavica nosne pregrade (*cartilago septi nasi*).

Vezivni deo je predstavljen jakom fibroznom opnom koja drži hrskavičavu piramidu, dajući joj oblik: ova opna povezuje međusobno hrskavičavi i koštani deo spoljašnjeg nosa. Deo fibrozne opne iznad perihondrijuma bočnih nosnih hrskavica i periosta nosnih kostiju je u obliku kišobrana tj. baldahina (*canopy system*) i ima ulogu da održava dorsum nasi.

Spoj nosnih kostiju i bočnih hrskavica nosa je izuzetno važan sa stanovišta nosne statike. To je zona glavnog potpornog luka (*Keystone area* ili skraćeno *K area*). U ovoj zoni gornja ivica bočnih nosnih hrskavica se podvlači pod donju ivicu nosnih kostiju: spoj je pojačan vlaknima *canony system-a*.

Drugi važan spoj, sa morfofunkcionalnog aspekta, je spoj bočne hrskavice nosa sa hrskavicom nosne pregrade. U gornje 2/3 ovaj spoj je slabije pokretan, čvrst i bez prisustva vezivnih vlakana. Ugao između bočne i pregradne hrskavice u *K arei* iznosi oko 90° , dok je u središnjem delu bočne hrskavice oko 40°. Donja trećina spoja je slobodna, tj. nema direktnog kontakta između bočne i pregradne hrskavice, već se izneđu njih nalazi pukotina premoštena fibroznom opnom.

Nosna piramida obuhvata područje spoljašnjeg nosa, ali i dela nosne duplje ispred prednjih krajeva srednje i donje nosne školjke.

Sa stanovišta fiziologije disanja, veoma je važan medijalni spoj bočne hrskavice nosa sa velikom hrskavicom nosnog krilca. Naime, donja ivica *cartolago nasi lateralis* se podvlači pod gornju ivicu *crus laterale cartilaginis alaris majoris nas*i, podupirući ga. Taj spoj je pojačan vlaknima fibrozne opne, koja sprečava prijubljivanje donje ivice bočne hrskavice nosa uz

nosnu pregradu za vreme inspirijuma. Ovaj deo predstavlja valvulu sa pokretnim uglom od oko 10° . Fibroziranje valvule ili njena deformacija u obliku promene ugla uzrokuje smetnje disanja (14,15).

MEHANIZMI NASTANKA FRAKTURA NOSA

Prelomi nosnih kostiju i hrskavičavog skeleta nosne piramide nastaju najčešće kada je glava tj. lice meta napada, pri čemu je ova regija često pogođena pesnicom (borilački sportovi, boks) ili tupo- tvrdim oruđem. Prelomi nosne regije se sreću kod politraumatskih povreda, kao posledica saobraćajnih nezgoda, prilikom rukovanja mašinama i u drugim situacijama. Često su udruženi sa povredama ostalih kostiju lica ili glave, a kao izolovani prelomi obično su kombinovani sa povredama mekotkivnim struktura u vidu nagnječenja, oguljotina, krvnih podliva ili razderotina i nagnječenih rana. Kod povrede vatrenim oružjem, nos je često razoren sa posledičnim potpunim ili delimičnim morfofunkcionalnim gubitkom. Kao posebna grupa povreda izdvajaju se i jatrogene povrede nosa. Na prvom mestu su tu povrede koje su nastale kao posledica estetskih i estetsko-funkcionalnih operativnih zahvata. U sklopu ovih zahvata najčešće dolazi do pada vrha nosa, fibroziranja nosne valvule, itd. sa posledičnim oštećenjem u funkcionalnom smislu (16).

Nastanak i oblik preloma nosnih kostiju zavise od lokalizacije udarca, količine kinetičke energije predate na mestu udarca i od pravca delovanja sile. Delovanje sile iz lateralnog smera, dominantno u odnosu na ostale dejstvujuće sile, dovodi do preloma nosnih kostiju i hrskavica sa diskoloracijom.

U odnosu na stepen prekida koštanog tkiva, prelom može da bude nepotpun ili potpun. Nepotpun prelom nosnih kostiju je pukotina (fissura), kod koje je kost prelomljena samo u delu svoje debljine, pri čemu je oblik kosti očuvan. U potpune prelome ubrajaju se prosti prelomi, gde jedna linija deli kost na dva dela i komunutivni prelomi pri čemu nastaje više od 2 fragmenta (14).

KLASIFIKACIJA DEFORMACIJA SPOLJAŠNJEG NOSA

Postoje više klasifikacija povreda nosa u zavisnosti od patološkog nalaza. Najprihvatljivija je modifikovana *kategorizacija povreda nosa po Harisonu* (17,18).
0- povreda nosa bez fraktura nosnih kostiju tj. kontuzija mekotkivnih struktura;
I- povreda nosa sa lateralnim pomakom tj. utisnućem zida jedne nosne kosti bez frakture nosne pregrade;
II-povreda nosa sa lateralnim pomakom tj. utisnućem zida jedne nosne kosti sa frakturom nosne pregrade;
IIIa- fraktura nosa sa povredom obe nosne kosti, a bez frakture nosne pregrade;
IIIb- fraktura nosa sa povredom obe nosne kosti i sa frakturom nosne pregrade;
IV- povrede nosa po tipu „ otvorene knjige“ ili povreda nosa sa multifragmentarnim prelomom nosnih kostiju.
Deformacije spoljašnjeg nosa obuhvataju:
rinoskolioza - lateralno pomeranje nosa; rinokifoza - deformacija nosa sa formiranjem grbe; rinolordoza - retrakcija nosnog mosta (sedlo nos); platirinin - širok i relativno kratak nos; brahirinia- preterano širok nos; leptorinijum - preterano uski (tanak) nos.
Postoje i razne komplikacije i posledice povrede nosa.
Komplikacije uključuju kozmetičke deformacije i funkcionalnu opstrukciju nosne šupljine.
Hematoma septum može dovesti do aseptične nekroze hrskavice, praćene deformacijom.
Lomovi etmoidne ploče mogu uzrokovati meningitis i apsces mozga (19).

SIMPTOMI FRAKTURA NOSA

Kao rezultat neke traume, pacijenti uvek primećuju bol u nosnom području, pogoršan palpacijom nosa. U većini slučajeva otkriva se i kremasti fragment. Kod kombinovane frakture nosnih kostiju i etmoidnog lavirinta, u periorbitalnom regionu formira se potkožni emfizem, o čemu svedoči prisustvo krepita pri palpaciji. U slučaju rupture nosne sluznice u vreme povrede, uvek dolazi do krvarenja nosa, koje se po pravilu zaustavljaju samo od sebe. Međutim, kod ozbiljnih oštećenja, može doći do obilnog, non-stop i ponavljajućeg krvarenja iz nosa.
Traumatska deformacija nosa može biti predstavljena pomeranjem zadnjeg dela nosa na desno ili levo (češće na desno), recesija uboda nosa na desno ili levo (češće levo), recesija kosti i / ili hrskavičnog dela zadnjeg dela nosa sa formiranjem "otvorene knjige" . Prilikom izuzetno jakim direktnim udarcem, moguće je potpuno zapaliti zadnji deo nosa, takozvani nos pug.
Kada se rešetkasta ploča prelomi sa rupturom dure mater, javlja se nazalna likorija, koja se otkriva kada se glava naginje napred. Istovremena krvarenja iz nosa može otežati dijagnozu isticanja cerebrospinalne tečnosti. Prvi dan se karakteriše simptom "duple tačke", koji se izražava pojavom spoljašnjeg svetlog prstena oko tačke krvi. Nakon prestanka krvarenja iz nosa, nazalni iscedak u nazalnom alkoholu postaje lak.
U slučaju traume lica, često se javlja krvarenje u prednju komoru oka (hyperaemia), pomeranje očne jabučice (enophthalmos), kompresija okulomotornih mišića (diplopia), uz smanjenje vida do potpunog gubitka (amaurosis).
U zavisnosti od jačine delovanja i karakteristika traumatičnog faktora, njegove orijentacije i dubine prodiranja, povrede nosa, mogu biti otvorene (s oštećenjem kože) ili zatvorene (bez oštećenja kože).
Potrebno je razlikovati akutni i konsolidovani prelom kostiju nosa, kod kojih dolazi do deformacije piramide nosa, ali ne dolazi do oticanja mekih tkiva i sluzokože nosne šupljine i jačanja koštanih fragmenata tokom palpacije (20,21).

DIJAGNOSTIKA FRAKTURA NOSA

Dijagnostika povrede nosa podrazumeva klinički pregled, radiološku dijagnostiku i endoskopiju nosa. Sve više se rade i razni laboratorijski testovi. Klinički pregled podrazumeva spoljašnji pregled kože nosa, oblika nosne piramide (prisustvo deformacije nosne piramide), palpaciju nosnih kostiju (krepitacije kao znak preloma nosnih kostiju) i rinoskopiju uz upotrebu topičkih vazokonstriktora, kojim se registruje stanje nosne sluznice (laceracije, krvarenje tj. koagulumi) i pozicija nosne pregrade. Radiološka dijagnostika uključuje standardni radiografski snimak nosa i paranazalnih sinusa okcipito-mentalnom projekcijom i lateralnom bitemporalnom projekcijom (profilni snimak). Kod udruženih preloma nosa sa kostima lica i glave, koristi se kompjuterizovana tomografija (CT).

Prilikom prikupljanja podataka o povredi, postoji formular u kome se upisuje: ko i kojim predmetom je naneo povredu (rukom, stopalom, štapom, itd.); priroda povrede (sport, domaćinstvo, transport itd.); težina i trajanje krvarenja iz nosa, mogući gubitak svesti, mučnina i povraćanje. Pored toga, otkrivaju se i srodne bolesti i prisustvo povreda nosa u prošlosti (22,23).

TRETMAN FRAKTURA NOSA

Lečenje frakture nosa zavise od vrste i težine povrede.

Oštećenje mekotkivnih struktura bez preloma nosnih kostiju sanira se primarnom hiruškom obradom sa pokrivanjem defekata kože slobodnim režnjem i/ili slobodnim transplantom. Krvarenje iz nosa tj. epistaksa se zbrinjava prednjom tamponadom. Ukoliko povreda nosa

obuhvata prelom nosnih kostiju, u zavisnosti da li se radi o nepotpunom prelomu, tj. pukotini, potpunom linearnom prelomu sa ili bez dislokacijama ili kominutivnom tj. multifragmentarnom prelomu, pristupa se repoziciji nosnih kostiju. Prelomi nosnih kostiju sa dislokacijom, obavezno zahtevaju repoziciju. Repozicija nosnih kostiju može biti zatvorena (manuelna i instrumentalna), koja se primenjuje kod zatvorenih preloma nosnih kostiju sa dislokacijama i otvorena ili „krvava“, koja podrazumeva kompletnu rekonstrukciju nosa kod otvorenih preloma tj. IV tip povrede nosa po navedenoj klasifikaciji. Otvorena repozija tj. rekonstrukcija nosa je hiruški zahvat koji zahteva rad u opštoj anesteziji. Nakon repozicije nosnih kostiju radi se obostrana prednja tamponada sa ekstranazalnim fiksiranjem nosne piramide maskom tj. flasterom, plastičnom maskom-akrilatom, metalnom pločom ili gipsom.
Hitan tretman frakture nosa sastoji se od simpomatskog tretmana sa hladnim i bolnim olakšanjem. Smanjenje je naznačeno samo kod preloma sa vidljivom deformacijom nosa ili opstrukcijom nosnih prolaza. Osnova za prestanak mera repozicioniranja je obnova oblika nosa ili poboljšanje disanja. Zbog toga je u nekim slučajevima repozicija odložena za 3-5 dana, što omogućava da se smanji oticanje.
Prelomi nosa kod odraslih se obično popravljaju u lokalnoj anesteziji, a kod dece se primenjuje opšta anestezija. Lift tupog kraja se unosi u nosni prolaz i postavlja se pod udubljenu nosnu kost, podižući ga spreda i na stranu, pritiskanjem na drugu stranu nosa, dajući zadnjem delu nosa položaj duž srednje linije. Nos se može stabilizovati postavljanjem tampona u nosne prolaze (trake gaze navlažene se antibioticima), stavljajući ih visoko na prag nosa, ili spoljašnjim udlagama. Unutrašnja tamponada traje 4-7 dana, spoljašnje trljanje je do 7-14 dana. Ako je hrskavica oštećena, često nije potrebna repozicija. Ako se deformacija nastavi nakon što edem splasne, radi se repozicioniranje i udlaga pod lokalnom anestezijom. Hematom nazalnog septuma mora se odmah isprazniti da bi se sprečila infekcija i nekroza hrskavice. Slomljenu pregradu nosa je teško popraviti u ispravnom položaju i često je potrebno da se operiše kasnije (14).
Ciljevi lečenja preloma nosa su obnavljanje oblika spoljašnje i unutrašnje funkcije nosa.
Indikacije za hospitalizaciju su: lomljenje kostiju nosa sa teškim spoljašnjim deformacijama, fraktura kostiju nosa kombinovana sa oštećenjem paranazalnih sinusa, očne duplje, mozga i fraktura kostiju nosa, praćena teškim ili rekurentnim traumatskim nazalnim krvarenjem.
Taktika lečenja zavisi od prirode i dubine povrede, ozbiljnosti opštih i neuroloških simptoma. U prisustvu modrica i povreda mekih tkiva, abrazije bez oštećenja koštanih struktura kostura lica, vrši se primarno hirurško lečenje i zaustavlja se krvarenje. Istovremeno, potrebno je težiti maksimalnom očuvanju tkiva i uklanjati samo ona tkiva koja nisu održiva. Zbog obilnog dotoka krvi u lice, zarastanje rana je dobro.
Ako je došlo do preloma nosnih kostiju sa pomeranjem fragmenata kosti bez oštećenja nosnog septuma i spoljašnjih kozmetičkih defekata, glavni način lečenja je repozicija (kontrakcija) nosne kosti sa naknadnom unutrašnjom i ređe spoljašnjom fiksacijom koštanih fragmenata. Najboljim metodom se smatra repozicioniranje prvog dana, ali se može izvršiti i u roku od tri sedmice nakon povrede. Ako se, prema anamnezi i objektivnim istraživanjima, dijagnostikuje stepen potresa mozga (glavobolja, mučnina, povraćanje, slabost, neurološki simptomi), repozicija kostiju nosa se odlaže za kasnije (nakon 5-6 dana).
Fragmenti nosnih kostiju se postavljaju u položaj pacijenta koji sedi ili leži uz primenu anestezije (podmazivanje sluzokože sa 10% rastvorom lidokaina, 2% rastvorom tetrakaina, itd.) Ili infiltraciona anestezija ubrizgavanjem 1% rastvora prokaina (2% rastvor lidokaina) u dozi od 2-3 ml u području preloma.
Premeštanje na lateralnom pomeranju spoljašnjeg nosa vrši se metodom tzv. repozicije prsta, tj. Pritiska palca desne ruke kada je zakrivljen ulevo i, shodno tome, leve ruke - kada je zakrivljen udesno. Pritisak prsta može biti značajan. U vreme pomeranja fragmenata u normalan položaj, obično se čuje karakteristična kriza.

Za depresivne frakture nosne kosti, nosni liftovi prema Iu. N. Volkovu. Nakon adekvatne anestezije, desni ili levi nosni lift se unosi u nosnu šupljinu, odnosno na unapred određenoj dubini, a anatomski položaj nosne dorzije se vraća na prednju i gornju trakciju.
Kada se dijagnostikuje istovremeno pomeranje koštanih fragmenata posteriorno i sa strane, palcem se vrši repozicioniranje prednjeg podizanja prsta sa odgovarajućim liftom, a istovremeno palac pomera bočni pomak. U odsustvu liftova, premeštanje nosnih kostiju se vrši ravnim pincetama ili stezaljkom, čiji se krajevi umotavaju u gazu ili se stavljaju na gumenu cevčicu.
Nakon repozicioniranja nosnih kostiju, ponekad je potrebno popraviti fragmente kostiju pomoću tamponade nosa, što ukazuje na pokretljivost fragmenata kostiju, koja se određuju palpacijom. U slučaju višestrukog preloma nosne kosti, potrebna je jača i duža fiksacija, koja se može obezbediti tamponadnim turundom natopljenim neposredno pre injekcije u nos rastopljenim parafinom (tačka topljenja 50-54 ° C). Posle primene anestezije, zbijeni su gornji i srednji deo nosne šupljine, parafin se brzo stvrdne i dobro fiksira nosne kosti, dok se nosno disanje kroz donje delove nosa može održati. Parafinski tampon se uklanja nakon 7 dana, ali može biti u nosu i do 12 dana, što je važno za pravilno zarastanje fragmenata.
U većini slučajeva, prelom nosnih kosti je kombinovan sa prelomom nosne pregrade. Postojeće tehnike za lečenje akutnih preloma nosnih kostiju bez uzimanja u obzir preloma nosnog septuma, rezultiraju visokom učestalošću posttraumatske deformacije nosa (14-50%) i nosnog disanja, što primorava pacijente da ponovo potraže medicinsku pomoć u odloženom periodu.
Ova okolnost objašnjava nedostatak efikasnosti zatvorene repozicije nosnih kostiju kod bolesnika sa kombinovanim prelomom nosne kosti i nosnog septuma i ukazuje na potrebu da se razvije adekvatan algoritam lečenja kod pacijenata sa akutnom frakturom nosnih kostiju.
U slučaju povrede nosa, praćene deformacijom spoljašnjeg nosa i frakturom zakrivljenosti nosnog septuma koja narušava nosno disanje, preporučuje se primjena taktika jednofazne korekcije intranazalnih struktura i uklanjanje kozmetičkog defekta spoljašnjeg nosa - akutna rinoseptoplastika. Operacije se, po pravilu, izvode pod intubacijskom anestezijom. U prvoj fazi se izvode endonazalne operacije kako bi se povratilo disanje kroz nos (razne opcije septoplastije). U drugoj fazi eliminišu se kozmetički defekti spoljašnjeg nosa. Pristup za operaciju na spoljašnjem nosu može biti i otvoren i zatvoren: za eliminaciju defekata, široko se koristi implantacija raznih materijala (auto zrna, konzervirana hrskavica, polimerni materijali, silikon itd.). Povrede nosa, praćene upornim defektima i deformitetima, zahtevaju hiruršku (kozmetičku, plastičnu, estetsku) korekciju, koja se danas izvodi u mnogim otorinolaringološkim klinikama (24, 25, 26).

INDIKACIJE ZA KONSULTACIJE SA DRUGIM SPECIJALISTIMA

Svaka povreda nosa podrazumeva konsultovanje neurohirurga kako bi se isključila potvrda mozga. To je neophodno u slučaju teškog stanja pacijenta sa gubitkom svesti i sa drugim neurološkim simptomima.
U slučaju kombinovanog oštećenja orbite i zigomatične kosti neophodna je konsultacija sa oftamologom i maksilofacijalnim hirurgom.
U slučaju povrede nosa usled pada tokom epileptičkog napada ili gubitka svesti, potrebna je konsultacija sa neurologom.
Ukoliko postoji i prateća patologija od strane kardiovaskularnog sistema, neophodna je konsultacija i kardiologa (27).

ZAKLJUČAK

Od svih kostiju lica, nosne kosti su najosetljivije na prelome zbog njihove centralne lokalizacije i protruzije iznad lica. Ove povrede se nalaze na trećem mestu po učestalosti povređivanja pojedinih delova ljudskog tela. U zavisnosti od mehanizma povrede, mogući su prelomi i okolnih kostiju: gornje vilice, očnikosti nosah duplji, etmoidne ploče kao i oštećenja nazolakrimalnog kanala.

Povrede mekotkivnih struktura nosa, prelomi nosnih kostiju, iščašenja ili delimična iščašenja međusobnih spojeva nosnih kostiju i/ili hrskavice, treba ocenjivati u svakom konkretnom slučaju, u zavisnosti od njihove prirode, lokalizacije, obimnosti i narušenja funkcije.

Dijagnostika povrede nosa obuhvata klinički pregled, radiološku dijagnostiku i endoskopiju nosa. Kod udruženih preloma nosa sa kostima lica i glave, koristi se i kompjuterizovana tomografija (CT).

Uglavnom prelomi nosa imaju povoljnu prognozu. Kod teških pratećih povreda nosa, ukoliko postoje, prognoza zavisi i od stepena oštećenja mozga. Invalidnosti kod preloma nosa su 14-28 dana od dana povrede, ukoliko se i jave.

Lečenje povreda nosa zavisi od vrste i težine povrede. Lečenje treba da bude timsko, jer nekada propušteno vreme može da ima neoprostive i nenadoknadive posledice koje mogu i fatalno da se završe po povređenog. Otuda je potrebna vrlo tesna saradnja između otorinolaringologa, oftalmologa, maksilofacijalnog hirurga, neurohirurga i neurologa.

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THE EFFECTS OF AEROBIC, RESISTANCE OR COMBINED TRAINING ON METABOLIC SYNDROME CLINICAL BIOMARKERS: A SHORT REVIEW

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Abstract: Metabolic Syndrome (MetS) is a common metabolic disorder characterized by a cluster of factors include dysglycaemia, elevated blood pressure, elevated triglyceride levels, low high-density lipoprotein cholesterol levels, and central obesity. Sedentary lifestyle and low physical activity levels increased the interrelated risk for cardiovascular diseases and metabolic disorders. The aim of this short review was to analyse the effects of aerobic, resistance and combined training on MetS clinical biomarkers. Following the Preferred Reporting Item for Systematic Reviews and Meta-analyses (PRISMA), a systematic search of relevant English-language articles was performed from earliest record to March 2020. The literature search was performed by seven online databases specifically Web of Science (WoS), PubMed and SCOPUS. The literature search returned 14,912 articles (WoS=2,359; PubMed=1,392 and SCOPUS=11,161); 21 full-text articles were reviewed after screening procedures. From the reviewed studies, aerobic exercise was reported in nine studies and the resistance exercise was reported in five studies. The combined training (or multicomponent exercise) was reported in seven studies. Overall exercise modes decreases the MetS clinical biomarkers, however, the aerobic training seemed to be the most efficient exercise mode. Moreover, the resistance exercise appears to have a positive effect on MetS prevention when associated with aerobic exercise. Aerobic and resistance exercises can contribute significantly to metabolic syndrome prevention and reduce the associated risk of cardiovascular disease and metabolic disorders. Combining exercise modes (i.e. combined or multi-component training) could be a valid strategy to control the metabolic syndrome clinical biomarkers.

Keywords: metabolic syndrome; cardiovascular disease; physical activity; exercise.

INTRODUCTION

Metabolic syndrome (MetS) is a common metabolic disorder characterized by a cluster of factors including dysglycemia, elevated systolic (SBP) or diastolic blood pressure (DBP), elevated triglyceride levels (TG), low high-density lipoprotein cholesterol (HDL-C) and increased waist circumference (WC) (Alberti et al., 2009; Raposo et al., 2017). The combination of these factors increase the risk of cardiovascular disease and metabolic disorders such as type 2 diabetes mellitus (T2DM) (Li et al., 2018; Shin et al., 2018).

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Several MetS definitions and clinical guidelines have been developed for the respective diagnosis (Alberti et al., 2009; Huang, 2009). First, MetS definition was proposed in 1998 by the World Health Organization (WHO) with the insulin resistance as the major underlying risk factor as well as two additional risk factors, including microalbuminuria and reduced glucose tolerance (WHO, 1999). In 1999, the European Group for the Study of Insulin Resistance (EGIR) proposed an amendment for WHO's definition (Huang, 2009). In addition, in 2001, the guidelines from the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III) required these major criteria, but not the insulin resistance per se (Grundy Scott M. et al., 2005).

The International Diabetes Federation (IDF) and the American Heart Association/National Heart, Lung and Blood Institute (AHA/NHLBI) presented different MetS criteria, regarding risk factors and cohort values (Zimmet et al., 2005). Presently, there are efforts to harmonize MetS criteria by framing the main differences between definitions: elevated WC (i.e. population- and country-specific delimitations), elevated TG (i.e., ≥150 mg/dL or 1.7 mmol/L), reduced HDL-C (i.e., <40 mg/dL or 1.0 mmol/L in males; <50 mg/dL or 1.3 mmol/L in females), elevated SBP (i.e., ≥130 mmHg), elevated DBP (i.e., ≥85 mmHg) and elevated fasting glucose (i.e., ≥100 mg/dL or 5.6 mmol/L) (Alberti et al., 2009).

The prevalence of MetS has been increasing in all age/ethnic populations (Li et al., 2018; Raposo et al., 2017), primarily due to modifiable factors, such as increased sedentary lifestyle, physical inactivity and hypercaloric diet (Myers et al., 2019; Pérez-Martínez et al., 2017). Effectively, exercise and physical activity are recommended to manage and prevent individual risk factors for MetS (Pérez-Martínez et al., 2017). Current researches reported that there is an inverse correlation between the increase of physical activity levels and cardiorespiratory fitness and MetS prevalence (Myers et al., 2019). In fact, previous meta-analyses have identified the benefits of aerobic exercise, combined exercise and resistance exercise in people diagnosed wtih MetS in order to reduce cardiovascular risk (Wewege et al., 2018), sarcopenic obesity (Dieli-Conwright et al., 2018) and anti-inflammatory process (Yousefabadi et al., 2021). However, these studies did not focused on the associations between exercise mode (i.e., aerobic, resistance and combined) and cardiovascular fitness, obesity and risk of MetS.

Therefore, the primary purpose of this short review was to analyse the current literature about the effects of aerobic, resistance or combined training on MetS clinical biomarkers. Additionally, we aimed to verify the associations between exercise and cardiorespiratory fitness, obesity and MetS.

METHODS

Literature Search Strategy

The preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines and the population-intervention-comparators-outcomes (PICOS) design were followed to conduct this short review (Moher et al., 2009). The literature search was based on five databases: PubMed/Medline, Web of Science (Core Collection: Citation Indexes) and SCOPUS/ScienceDirect. The eligibility criteria were assured by PICOS approach and the following search strategy was defined: (1) population: individuals with MetS; (2) intervention: current research about effects of exercise on individuals with MetS; (3) comparison: aerobic, resistance or combined training; (4) outcomes: MetS clinical biomarkers; and (5) study design: experimental/quasi-experimental cross-sectional and longitudinal trials (e.g., crossover, controlled trial and randomised controlled trial).

According to the search strategy, studies April 2000 to April 2020 were included for relevant publications using keywords with a Boolean phrase: (("Metabolic Syndrome") AND ("Physical Activity" OR Exercise OR Training)). Duplicated articles were identified and eliminated prior

to application of the selection criteria (inclusion and exclusion). Titles and abstracts were initially selected and excluded according to selection criteria.

Selection Criteria

The included studies in the present review followed these inclusion criteria: (1) studies with screening procedures based on MetS clinical biomarkers; (2) studies that provide the exercise mode for the associations between combined cardiovascular fitness, obesity and the risk of MetS through clinical biomarkers; (3) cross-sectorial or longitudinal cohort, case-control, and/or randomized controlled trials; (4) studies in humans with Sport Science and as Scope; (5) original article published in a peer-review journal; (6) full text available in English; and (7) article reported data collection, study design, procedures, and outcomes. The exclusion criteria were articles with bad quality screening by Downs Black checklist; and reviews, abstract/papers conference, surveys, opinion pieces, commentaries, books, periodicals, editorials, case studies, non-peer-reviewed text, or master's/doctoral thesis.

Quality Assessment and data extraction

The methodological quality was assessed using Dows and Black checklist for assessing the methodological quality of randomized and nonrandomized healthcare interventions. This checklist was used in previous reviews due their accuracy in the cross-sectional and longitudinal studies (Fox et al., 2018). Each item is scored as "1" (yes) or 0" (no/unable to determine), and the scores for each item provide the total quality score. The selection of full texts was based on a selection to determine the selection criteria: inclusion or exclusion. Dataset from the reviewed articles were organized according to: reference (year), country, gender, sample (N), age, exercise intervention (duration, frequency and intensity), outcomes, MetS criteria and quality assessment (QS). Sample characterization was reported as mean ± standard deviation, CI, and effect size (ES) wherever possible.

Disagreements were resolved through discussion between two authors, or via a third researcher if required. Each author performed the classification independently with subsequent inter-observer reliability analysis: kappa index (0.93) and confidence interval (CI): 0.92–0.95). In the evaluation of methodological quality, the mean quality score was 90.14 (min: 0.65, max: 0.89).

RESULTS

The literature search returned 14,912 articles (WoS=2,359; PubMed=1,392 and SCOPUS=11,161); 21 full-text articles were reviewed after screening procedures. From the reviewed studies, aerobic exercise (AE) was reported in nine studies (*n* = 9), the resistance exercise was reported in five studies (*n* = 5) and the combined training (AE/RT) was reported in seven studies (*n* = 7).

The reviewed articles were published between 2007–2020. The present review analysed a total of 1893 participants (min: 16, max: 453). The population of reviewed samples were from Australia (*n* = 1), Brazil (*n* = 3), Finland (*n* = 3), Italy (*n* = 1), Korea (*n* = 2), Norway (*n* = 2), Portugal (*n* = 1), Spain (*n* = 2), Sweden (*n* = 1), Iran (*n* = 1), United State of America (*n* = 5). The mean and standard deviation for age was 58.11 ± 4.37 years; the exercise intervention ranged 8-52 weeks (duration) and 3-7 day per week (frequency). The training intensity was reported using maximum heart rate (HRmax); heart rate reserve (HRR); lactate threshold (LT); repetition maximum (RM), rate of perceived exertion (RPE); maximum oxygen uptake (VO_2max), and peak aerobic capacity (VO_2peak). The reviewed studies used different MetS criteria's following AHA/NHLBI (*n* = 1), NCEP-ATP III (*n* = 9), IDF (n = 2) and harmonizing MetS definition by Alberti et al. (2009) (*n* = 2). Seven studies did not specify MetS definition to define the clinical biomarkers. Table 1 showed the main findings by the studies included in this review.

Table 1- Summary sampling representativeness, methodological procedures, outcomes and quality assessment about reviwed articles.

Reference (year)	Country, Gender	Sample (N)	Age	Exercise intervention				Outcomes	MetS Criteria	QS
				Duration (Wks)	*Frequency (Days/Wk)*	*Intensity*	*Training mode*			
Alvarez et al. (2018)	Brazil, F	43	45.6 ± 11	16	3	8 to 14 bouts - 30 to 58s jogging or running at 90% HRreserve (96-120 s rest, 70% HRreserve)	Aerobic	AE (HIIT) improved BG, HDL-C, LDL-C, BMI and cardio-respiratory fitness	IDF	0.87
Anderssen et al. (2007)	Sweden, M/F	137	45.9 ± 2.5	52	3	60 to 80% HRmax for 40 min 5 times a week	Aerobic	Both exercise and dietaryintervention reduced metabolic syndrome prevalence.	NCEP-ATP III	0.87
Irving et al. (2008)	US, M/F	27	51 ± 9	16	5	3d/wk between LT and VO_2 peak (RPE 15-17); 2 days at or below LT (RPE 10-12).	Aerobic	Body composition changeds with AE (i.e. HIIT) that was more effective for reducing total and sub-cutaneous abdominal fat.	NCEP-ATP III	0.78
Kang et al. (2016)	Korea, F	23	49.85 ± 11.0	12	5	60 to 80% HRmax or 40 min 5 times a week.	Aerobic	AE had beneficial effects on the resting heart rate, physical fitness, and arterial stiffness.	IDF	0.74
Lima et al. (2012)	Brazil, F	44	47.4 ± 1.8	12	3	60 to 70% HRmax (RPE 11-14)	Aerobic	AE proved MS components, but did not alter resting blood pressure or the BP response.	ND	0.65
Mora-Rodriguez et al. (2017)	Spain, M	40	54 ± 9	24	3	4 bouts – 4 min, pedalling at 90% HRmax (3min rest, 70% HRreserve)	Aerobic	AE (HIIT) significant decresased the WC, DBP. No significant differences were found for BG, HDL-C and TG levels.	Alberti et al. (2009)	0.87
Morales-Palomo et al. (2017)	Spain, M/F	49	54 ± 8	16	3	4 bouts – 4 min, pedalling at 90% HRmax (3min rest, 70% HRreserve)	Aerobic	AE (HIIT) significant decresead BG, SBP, DBP, WC, BMI and body weight.	ND	0.83
Stensvold et al. (2010)	Norway, M/F	22	50.2 ± 9.5	12	5	4 min intervals – walking/running at 90% HRmax (3min rest, 70% HRreserve)	Aerobic	AE (HIIT) descresead SBP and DBP; no changes in body weight, fasting plasma glucose, or HDL levels.	NCEP-ATP III	0.78
Straznicky et al. (2010)	Australia, M/F	40	50.2 ± 9.5	12	20	60% Hrmax (125-145 bpm)	Aerobic	BD, baroreflex sensitivity, and metabolic parameters improved significantly.	NCEP-ATP III	0.78
Cardoso et al. (2016)	Brazil, F	43	48.28 ± 6	12	3-5	10 to 12 repetitions - 50 to 80% 10RM	Resistance	RT do not affect glycaemia, BMI or MetS markers and lipidic peroxidation; however, increasing reduction BP.	NCEP-ATP III	0.74
DeVallance et al. (2016)	US, M/F	57	46 ± 11	8	3	60% 1RM (wk 1-2); 70% 1RM (wk 3-4); 80% 1RM (wk 5-6); 85%1RM (wk 7-8)	Resistance	RT did not decrease the group mean values of arterial stiffness in individuals with MetS or healthy controls	NCEP-ATP III	0.83
Mager et al. (2008).	Finland, M/F	57	46 ± 11	8	3	1x16 60% 1RM (month 1); 1x12 70% 1RM (months 2-5); 2x10-12 70%1RM (months 6-8)	Resistance	Weight, BMI or waist circumference and acute insulin response were stronger predictors of the ghrelin concentration.	NCEP-ATP III	0.83
Dadrass et al. (2019)	Iran, M	48	53.9 ± 7.11	12	3	60% 1RM (wk 1-2); 70% 1RM (wk 3-4); 80% 1RM (wk 5-6); 85%1RM (wk 7-8)	Resistance	Vitamin D supplementation in addition to RT had positive effects on some inflammatory markers,	ND	0.87
Venojarvi 2013	Finland, M/F	313	40-65	12	3-5	55% to 75% of HRreserve (wk 1 – 4 at 55%, wk 5 – 8 at 65%, and wk 9 – 12 at 75%).	Resistance	Weight, BMI or waist circumference and acute insulin response were stronger predictors of the ghrelin concentration.	ND	0.83
Annibalini et al. (2017)	Finland, M/F	16	55-70	12	3	**AE:** intensity (40% to 65% HRreserve) and duration (30 to 60 minutes); **RT:** 12 to 20 repetitions - 40 to 60% 10RM.	Combined	AE/RT has the potential to reduce the deleterious health effects associed to diabetes-related inflammation.	ND	0.78
Balducci et al. (2010)	Italy, M/F	82	62.1 ± 4.3	52	2	**AE:** intensity **(**40% to 65% HRreserve) and duration (30 to 60 minutes); **RT:** 12 to 20 repetitions - 40 to 60% 10RM.	Combined	AE/RT significant reduce the sensitivity-C reactive protein (hs-CRP) and other inflammatory biomarker, as wel the insulin resistance (independent weight loss).	AHA/NHLBI	0.89
Potteiger et al. (2012)	US, M/F	82	27-48	13	4	**AE:** 65 to 80% of HRmax; **RT:** high intensity days: 5 to 7 repetitions with 100% 5–7 RM; moderate intensity days: 8 to 10 repetitions with 80% of their 8–10 RM.	Combined	Both RT and AE exercise, with equal training frequency, session duration and energy restriction, improve the MetSyn clinical biomarkers.	NCEP-ATP III	0.89
Bateman et al. (2011)	US, M/F	196	49.5 ± 3.3	17	≥2	**AE:** ~120 minutes/week at 75% VO_2max; **RT:** 3 days/week, 3 sets/day of 8 to 12 repetitions of 8 different exercises targeting all major muscle groups.	Combined	Combined AT and RT was similarly effective but not different from AT alone that was the most efficient exercise mode for improving cardiometabolic health.	NCEP-ATP III	0.87
Choi et al. (2013)	Korea, M/F	453	52.3 ± 14.3	12	5	**AE:** intensity of 60–75% of the age-predicted HRmax (300 kcal/session); **RT:** to 20 repetitions - 40 to 60% 10RM	Combined	Combined exercise program significantly decreased CTRP 3 levels and modestly increased CTRP-5 levels.	ND	0.78
Da Silva et al. (2020)	Portugal, M/F	39	67.0 ± 6.7	12	3	**AE:** between 60 and 70% of the Hrmax (RPE 2-5); **RT:** 8–15 repetitions, with a 1–2 min a rest interval.	Combined	Short-term exercise mode and intensity may differently impact the metabolic profile of individuals with MetS, particularly RT with HIIT.	Alberti et al. (2009)	0.82
Dieli-Conwright et al. (2014)	US, M/F	82	62.1 ± 4.3	16	3-4	**AE:** 30 minutes at 65-80% HR maximum; **RT**: 3 sets of 10 repetitions, 45 second rest between sets.	Combined	Metabolic-related effects for combined AE and RT reduces the metabolic syndrome and prevent cardiovascular disease and diabetes.	ND	0.78

AE –Aerobic exercise; AE/RT – Combined exercise; AHA/NHLBI – American Heart Association/National Heart, Lung, and Blood Institute; BG – Blood glucose; BMI – Body Mass Index; CTRP – C1q/tumor necrosis factor-related protein; DBP – diastolic blood pressure; F – Female; HDL-C - low high-density lipoprotein; *HIIT – High intensity; interval training;* HRmax – maximum Heart Rate; HRR – Heart Rate reserve; IDF – International Diabetes Federation; LDL-C – low-density lipoprotein; LT – lactate threshold; M - Male; MetS – Metabolic Syndrome; NCEP-ATP III – National Cholesterol Education Program Adult Treatment Panel III; ND – not described; RM – repetition maximum; RPE – rate of perceived exertion; RT – Resistance exercise; SBP – systolic blood pressure; TG – triglyceride; US – United State of America; VO_2max – maximum oxygen uptake; VO_2peak – peak aerobic capacity; WC – Waist Circumference; *Wk – Week (s)*

DISCUSSION

The present short review was focused on two purposes: (1) to analyse the current literature about the effects of aerobic, resistance or combined training on MetS clinical biomarkers; (2) to verify the associations between exercise and cardiorespiratory fitness, obesity and MetS. Results showed that the three exercise modes decrease MetS clinical biomarkers. Nevertheless, there were some differences among them.

Aerobic exercise displayed marked benefits concerning MetS prevalence. Particularly, high intensity interval training (HIIT) improved BG, HDL-C, LDL-C, body composition (i.e. body weight, total and sub-cutaneous abdominal fat). Additionally, a baroreflex sensitivity was also verified in aerobic exercise, with influence in MetS clinical biomarkers (Alvarez et al., 2018; Irving et al., 2008; Mora-Rodriguez et al., 2017; Morales-Palomo et al., 2017; Stensvold et al., 2010). However, the influence of HIIT remains controverse. Mora-Rodriguez et al. (2017) verified a significant decrease in WC and DBP but no significant differences in BG, HDL-C and TG levels. Moreover, Stensvold et al. (2010) found a decrease in SBP and DBP but no changes in body weight, fasting plasma glucose or HDL levels. Contrarily, Mora-Rodriguez et al. (2017) presented a significant decrease in BG, SBP, DBP and WC concerning body mass index (BMI) and body weight.

The influence of resistance training benefits in MetS prevention was not as robust as if there was an aerobic component. Effectively, two studies revealed no interaction effects between resistance exercise and glycemia, BMI, MetS markers and lipid peroxidation, with a small reduction in BP (Cardoso et al., 2016; DeVallance et al., 2016). In addition, BP values did not decrease significantly comparing individuals with MetS to healthy individuals (DeVallance et al., 2016). Indeed, the weight, BMI, WC and acute insulin responses were stronger predictors for MetS clinical biomarkers (Mager et al., 2008). Resistance exercise appears to have a positive effect on MetS prevention when associated with aerobic exercise. Both resistance and aerobic exercise, with equal training frequency, session duration and energy restriction, improve MetS clinical biomarkers (Da Silva et al., 2020; Dieli-Conwright et al., 2014; Potteiger et al., 2012). Nevertheless, combined exercise proved to be an effective strategy to reduce MetS clinical biomarkers but not significantly different than isolated aerobic training, which seemed to be the most efficient exercise mode to improve cardiometabolic health in different target populations (i.e. diabetics, menopausal women, patients with overweight/obesity and cancer) (Bateman et al., 2011).

There are some limitations that should be addressed in the practical application of this review. First, there were many different methodological approaches in the reviewed studies, particularly in exercise intervention. Exercise duration, frequency and intensity were different between follow-ups, as well as sampling representitiveness. Second, future investigations should consider a meta-analytic procedure to clarify the extent of the effects. Third, we have only considered full-text articles available in English, which constitutes a language limitation in the literature search strategy. More important, further investigation should be more focused on the target population (e.g diabetes, woman menopause, overweight/obesity and cancer).

CONCLUSION

Physical activity and exercise are positive cost-effective interventions to reduce MetS prevalence. Moreover, aerobic and resistance exercise can contribute significantly to MetS prevention and to reduce the associated risk of cardiovascular disease and metabolic disorders. This way, combining aerobic and resistance exercise with different intensities could be a valid strategy to control MetS clinical biomarkers.

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AN INVESTIGATION OF INDIVIDUAL INNOVATIVENESS LEVELS OF TEACHERS DURING THE COVID-19 PANDEMIC

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Abstract: This study aims to determine the individual innovativeness levels of Physical Education and Sports Teachers and other branch teachers during the COVID-19 Pandemic and to examine whether there is a difference in individual innovativeness perceptions in terms of branch type and doing sport. The research is a quantitative study carried out in a descriptive survey model. The research sample consists of 317 teachers working in schools affiliated with the national education directorate Kahramanmaraş, Turkey. The data of the research were analyzed using the Jamovi 1.6.12 statistical software program. Arithmetic mean and standard deviation values were determined for data analysis and t-test and One-Way Analysis of Variance (ANOVA) tests were used to determine the differentiation of scores obtained for variables. As a result of the research, it was determined that most of the teachers are in the "skeptical" and "inquisitive" groups in terms of the individual innovativeness scale scores of the participants. Significant differences were found on the individual innovativeness scale and sub-dimensions of the participants in terms of the variables of the branch type and doing sport. Conducting this research during the pandemic process reveals the significance of the research. The results of this research are expected to provide contributions to researchers in the field.

Keywords: COVID-19, innovativeness, physical education, sport, teacher

INTRODUCTION

The emergence and spread of the COVID-19 pandemic have put all societies in a difficult position. All education and training activities have also been suspended in Turkey to prevent the spread of the virus.

During the pandemic, education systems have switched to technology-based education practices. In this context, many countries have developed innovative e-learning platforms within the scope of distance education based on ICT (Information and Communication Technologies) (Atasoy, Özden, & Kara, 2020). With the introduction of technology into our lives, individual skills and competencies have changed in line with the demands expected from people. As technology adoption increases, analytical thinking, critical thinking, problem-solving, flexibility, stress tolerance, and innovation skills become more important. Looking from the past to the present, it is observed that innovation has changed our lives in all fields including education. Başaran and Keleş (2015) report that innovations in different fields have affected the field of education over time and led to the emergence of new approaches that improve teaching environments. According to Rogers (1983), innovation is defined as the emergence of an idea, practice, and object perceived as new by the individual or society. Bülbül (2010) reports that broadly speaking; innovation refers to the production and sharing of information and its transformation into new technologies, products, services, or processes.

Individuals' understanding of innovativeness is important for establishing a healthy balance between social-cultural values and changes occurring at the universal level (Adıgüzel et al., 2014). In this sense, innovativeness is the degree to which individuals or institutions in a social

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system adopt an innovation earlier than others (Rogers, 1995). It is emphasized that innovativeness includes “positive reaction to the new” and “being in favour of innovation” (Kılıçer, 2011). Gardner (1990) defines innovativeness as individuals' innovative characteristics that differ from person to person. Hurt, Joseph, and Cook (1977) define it as an individual's willingness to change, and Midgley and Dowling (1978) define it as a central personality trait more or less possessed by individuals. The "Individual Innovativeness Theory" put forward by Rogers (1995) suggests that individuals tend to react differently to changes due to certain characteristics or predispositions.

In regards to the use of innovation, information, and communication technologies in education by teachers in the wake of the COVID-19 pandemic, teachers need to know how to use technology in their work to be a successful guide in learning and teaching processes in line with innovations (Uşun, 2006). The COVID-19 outbreak shows that it is essential to seek innovative solutions to reveal different ways of thinking about the future of education on a global scale (Can, 2020). The rapid increase in the amount of knowledge and innovation in the age of information and technology requires individuals to have an innovative identity, which does not resist innovations, and which accepts innovations (Yavuz Konakman, Yokuş & Yanpar Yelken, 2016). Therefore, innovative teachers with an awareness that the quality of education and training is likely to increase, are expected to strive to achieve their goals and objectives and to contribute to teaching by accessing up-to-date information through technology (Kumar, Rose, & D'Silva, 2008).

In regards to the COVID-19 pandemic and education, how teachers are affected by the COVID-19 and how they view new educational methods and renewed opportunities in digital technology are important. In such a period of change, there are limited studies on the innovativeness levels of teachers. Thus, the study is expected to provide important contributions for the future.

This study examines the individual innovativeness levels of Physical Education and Sports Teachers and teachers of other branches without experience in the transition to the distance education system during the COVID-19 pandemic and whether there is a significant difference in perceived individual innovativeness in terms of variables including the type of branch and participation in sports.

METHOD

Research Model

The research is a quantitative study carried out in a descriptive survey model. Approval was obtained from all teachers participating in this study with the "Informed Voluntary Consent Form".

Population and Sample

The population of the study consists of the teachers working in the District Directorates of National Education of Dulkadiroğlu and Onikişubat located in the centre of Kahramanmaraş. Teachers working in secondary schools were included in the sample. The online scale forms were sent to the participants and usable feedback was provided from 317 participants for the data.

Table 1. Information related to the participants included in the sample

Demographic Variables		N	%
Type of branch	Physical Education	148	46.7
	Other Branches	169	53.3
Participation in sports	Not at all	57	18
	Sometimes	189	59.6
	Regularly	71	22.4

DATA COLLECTION TOOLS

Individual Innovativeness Scale

The scale was first developed by Hurt, Joseph, and Cook (1977) and adapted into Turkish by Kılıçer and Odabaşı (2010). The scale, which consists of 20 items, was arranged as a five-point Likert scale rated between 1 = strongly disagree and 5 = strongly agree to determine the individual innovativeness level of the participants. The scale has 4 dimensions: "resistance to change, opinion leadership, openness to experience, and risk-taking". Kılıçer and Odabaşı (2010) report that individual innovativeness score is calculated by subtracting the total of negative items in the scale from the total of positive items and adding 42 points to the score obtained.

The lowest and highest scores taken from the scale are 14 and 94, respectively, and individuals can be categorized in the context of innovativeness according to the scores calculated on the scale. It is also possible to evaluate the innovativeness levels of individuals in general according to the score calculated by the scale. This indicates that individuals who score above 68 are considered highly innovative while individuals who score below 64 have a low level of innovativeness. Kılıçer and Odabaşı (2010) calculated the Cronbach's Alpha coefficient as .82 for the overall scale, and as .82, .71, .70, and .63 for the dimensions of resistance to change, opinion leadership, openness to experience, and risk-taking, respectively, as a result of their reliability analysis. In this study, the Cronbach's Alpha coefficient was found to be .85 for the overall scale and .84, .76, .78, and .71 for the dimensions, respectively.

Confirmatory Factor Analysis was conducted within this study to verify the four-dimensional structure of the scale. As a result of the analysis, it was seen that the four-dimensional structure of the scale was confirmed and the fit indices of the model were at acceptable levels (x^2/sd=2.64, CFI= .91, TLI=.90, RMSEA= .060, SRMR= .054).

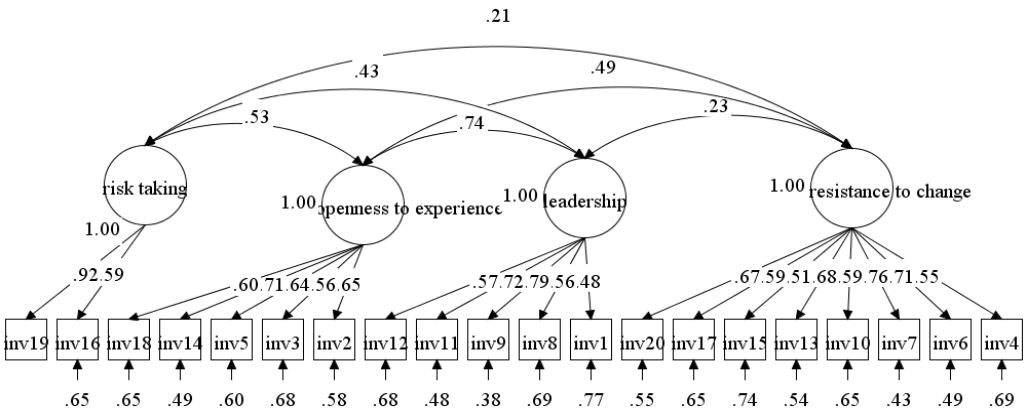

Figure 1. The Diagram Model of the Dimensions of the Individual Innovativeness Scale

DATA ANALYSIS

The data were analysed using the Jamovi 1.6.12 statistical software program. Whether the scores obtained show normal distribution or not was analysed by the skewness coefficient method to determine the tests to be used in the study (Büyüköztürk, 2018). The skewness values obtained as a result of the analysis were ".490" for the overall "Individual Innovativeness" Scale and "-.391", "-.212 ","- .241 ","- .392" for resistance to change, opinion leadership, openness to experience, and risk-taking, respectively, and all values ranged between +1 and -1 and the distribution was normal for all dimensions. Then, the arithmetic mean and standard deviation values were determined for data analysis, and the t-test and One Way Analysis of Variance (ANOVA) tests were used to determine the differentiation of the participants' views in terms of demographic variables.

FINDINGS

Table 2. Score distribution according to the individual innovativeness levels of the participants

Individual Innovativeness Level			**N**	%
Score Ranges	Laggards	(0-45)	5	1.58
	Late Majority	(46-56)	115	36.28
	Early Majority	(57-68)	174	54.89
	Early Adopters	(69-80)	21	6.62
	Innovators	(80 and over)	2	0.63
	Individual Innovativeness General Average: 59.03		317	100

The individual innovativeness levels of the participants reveal that the general average score of the individual innovativeness is 59.03 and that the majority of the participants 91.17% (n=289) are ranged into groups of 'Late Majority' and 'Early Majority'.

Table 3. Arithmetic means and standard deviations of participants' individual innovativeness scale scores

Scales	**Dimensions**	**N**	**Min-Max**	$\overline{X}$	**SS**
Individual Innovativeness	Individual Innovativeness General	317	1-5	3.26	.32
	Resistance to change	317	1-5	3.51	.63
	Opinion leadership	317	1-5	3.67	.58
	Openness to experience	317	1-5	3.98	.52
	Risk-taking	317	1-5	3.43	.80

Table 3 reveals that the mean score of the participants in the individual innovativeness scale ($\overline{X}$= 3.26) is moderate while it is high for the dimensions of resistance to change ($\overline{X}$= 3.51), opinion leadership ($\overline{X}$= 3.67), openness to experience ($\overline{X}$= 3.98), and risk-taking ($\overline{X}$= 3.43).

Table 4. Independent group t-test results related to the participants' differentiation in the individual innovativeness scale and its dimensions according to the type of branch variable

Scales/Factors	Branch	N	$\bar{X}$	SS	sd	*t*	*p*
Individual Innovativeness General	Physical Education	148	3.30	.33	315	2.39	.017*
	Other Branches	169	3.22	.31			
Resistance to change	Physical Education	148	3.47	.64	315	-.929	.354
	Other Branches	169	3.54	.62			
Opinion Leadership	Physical Education	148	3.74	.58	315	2.03	.042*
	Other Branches	169	3.61	.57			
Openness to Experience	Physical Education	148	4.02	.46	315	1.02	.306
	Other Branches	169	3.96	.57			
Risk-taking	Physical Education	148	3.50	.72	315	1.28	.200
	Other Branches	169	3.38	.86			

*(p<0,05)

Table 4 reveals that as a result of the t-test, there is no statistically significant difference in resistance to change, openness to experience, and risk-taking dimensions according to the type of branch variable while there is a statistically significant difference between the general individual innovativeness scale $t(315)$=2.39; p<0.05. and opinion leadership t(315)=2.03; p<0.05. Physical Education and Sports teachers are observed to have significantly higher scores than teachers of other branches in the general individual innovativeness scale and opinion leadership dimension.

Table 5. One-way analysis of variance (ANOVA) results related to the scores of the individual innovativeness scale and its dimensions according to the participants' participation in sports

Scales/Factors	Participation in Sports	N	$\bar{X}$	SS	*F*	*p*	Groups with a difference (Post-Hoc Test)
Individual Innovativeness General	Not at all (a)	57	3.23	.42	6.57	.002*	c - a, b
	Sometimes (b)	189	3.22	.28			
	Regularly (c)	71	3.37	.31			
Resistance to change	Not at all (a)	57	3.35	.69	2.38	.094	-
	Sometimes (b)	189	3.55	.57			

	Regularly (c)	71	3.51	.70			
Opinion leadership	Not at all (a)	57	3.53	.63			
	Sometimes (b)	189	3.61	.53	13.05	.000*	c - a, b
	Regularly (c)	71	3.96	.57			
Openness to experience	Not at all (a)	57	3.88	.56			
	Sometimes (b)	189	3.98	.49	2.87	.058	-
	Regularly (c)	71	4.09	.57			
Risk-taking	Not at all (a)	57	3.13	.91			
	Sometimes (b)	189	3.46	.74	6.33	.002*	b, c - a
	Regularly (c)	71	3.62	.77			

*(p<0.05)

Table 5 reveals that there is no statistically significant difference in resistance to change and openness to experience dimensions according to participation in sports while there are statistically significant differences among the general individual innovativeness scale (F=6.57; p=.002), opinion leadership (F=13.05; p=.000), and risk-taking (F=6.33; p=.002) dimensions (p<0.05). Those regularly participating in sports are observed to have significantly higher scores of perceived individual innovativeness than those occasionally participating or failing to participate in sports at all in the general individual innovativeness scale and opinion leadership dimension. On the other hand, those regularly or occasionally participating in sports are observed to have significantly higher scores than those failing to participate in sports at all in the risk-taking dimension.

DISCUSSION AND CONCLUSION

This study was aimed at examining the individual innovativeness levels of physical education and sports teachers and teachers of other branches during the COVID-19 pandemic and whether there is a difference in perceived individual innovativeness in terms of the type of branch and participation in sports variables.

In this study conducted during the COVID-19 pandemic, it was determined that the individual innovation general mean score of the participants was 59.03 and the majority of them were grouped in “late majority” and “early majority” 91.17% (n = 289). As distance education was launched due to the COVID pandemic, teachers act cautiously, depending on their knowledge and interest in using digital technologies. In fact, before the pandemic, most of the technologies were already used by early adopters, that is, by innovators. The COVID-19 crisis has accelerated the forced adaptation to innovation for cautious ones (Heidenreich & Talke, 2020), leading them to make use of online learning tools. The literature supports the result of this study (Atılgan & Tükel, 2020; Yapıcı & Seval, 2020; Aslan & Kesik, 2018; Çetin & Bülbül, 2017; Kılıçer, 2011). According to Rogers (1983), individuals in the early majority category behave carefully against innovations and evaluate the superior and weak aspects of innovation before adopting the innovation. However, Fredrickson (2001) pointed out the fact that what makes teachers open to new ideas and encourages them to take more initiative are positive emotions and to activate these emotions.

The calculation of the arithmetic mean scores reveal that the mean score of the participants for the overall individual innovativeness scale was at a medium level, on the other hand; the participants' views on the dimensions of resistance to change, opinion leadership, openness to experience, and risk-taking were at a high level. It can be argued that the high scores of individual innovativeness views of teachers in the sample group in all dimensions possibly arise from their different personal characteristics. Rogers (1983) divided individual innovativeness into five categories based on the assumption that they vary from person to person in terms of individual differences, past experiences and personal qualities, the level of desire and interest towards innovations, acceptance of innovations, and risk-taking situations. Besides, the innovative atmosphere of the teacher increases the students' interest in learning and improves their success (Khikmah, 2019). The reason for this result is that the innovativeness feature is dependent on different variables, but individual differences play a role in adopting innovation.

In terms of the type of branch variable, no statistically significant difference was found in the scores of the dimensions of resistance to change, openness to experience, and risk-taking. It was concluded that Physical Education and Sports teachers had significantly higher scores than teachers of other branches in the scores of the overall individual innovativeness score and opinion leadership dimension. This result is because physical education teachers exercise to protect the physical and mental health of students after the students have been forced to stay home more during the COVID-19 pandemic. In this context, it can be implied that they exhibit "behavioural perspective of innovativeness" in this difficult period on platforms using the internet, technology, and digital tools. In this approach, the processes of individuals' adoption of innovation are important. The process of adopting an innovation starts with the innovative individuals' use and adoption of that innovation and the late adopters are gradually influenced by the innovators and begin to use that innovation (Goldsmith and Foxall, 2003). Mülhim and Murat (2020) emphasized that physical education and sports teachers and trainers should combine teaching methods and techniques with the technology considering the changing and renewed conditions in their education or lessons.

No statistically significant difference was found in the dimensions of resistance to change and openness to experience in terms of participation in sports. Those who regularly participate in sports, in general, had significantly higher scores compared to those who sometimes participate in sports or fail to participate in sports at all in the individual innovativeness scale and opinion leadership dimension in terms of perceived individual innovativeness. On the other hand, in the risk-taking dimension, it was found that the risk-taking scores of those who regularly and sometimes participate in sports had significantly higher scores than those who do not participate in sports at all.

It can be argued that doing sports during the pandemic process not only contributes to the physical and mental health of the individual, but also increases the level of individual innovativeness. Lippi et al., (2020) and Chen et al., (2020) reported that staying active and doing physical activity during quarantine has mental, spiritual, and physical benefits, thus it is important for a healthy life. Tejedor et al. (2021) reported that the COVID-19 crisis created the opportunity to evaluate the technological skills of teachers and students in this sense.

In conclusion, teachers show a sceptical and careful approach towards innovations during the pandemic process, doing sports has a positive effect on individual innovativeness, and physical education teachers are open to scientific innovations and use technology actively and efficiently.

Teachers need time to develop their individual innovativeness and new teaching skills. However, principals need to develop effective projects to increase the motivation of teachers for innovative teaching practices that allow teachers to use resources specific to their field.

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THE IMPORTANCE OF SPORTS AND RECREATIONAL PROGRAMS IN CHILDREN'S TOURISM ON THE EXAMPLE OF BUKOVICKA BANJA

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Abstract: Children in today's times are not spared the demands of modern society and the speed of technology development and are therefore exposed to stress. Since young people spend a large part of the day indoors, it is desirable to perform freely selected activities outside the classroom in the open space, clean and fresh air. Children within the camp that is realized in Bukovicka Banja at 270 m above sea level pass through various polygons that are of different character in the natural environment. The subject of the paper is the analysis and comparison of children and youth in the natural environment at sports and recreational camps and their significance from 2017 to 2020. The main goal is to present the importance and role of recreational activities for children and youth, where the focus is on animation, recreation, education of children, learning various sports skills, and above all their stay in nature and a healthy environment. Empirical procedures such as observation, conversation, survey were used. The method of theoretical analysis and bibliographic method of data collection were used. The survey and scaling technique was used as a research technique. A five-point Likert scale was used. The survey involved collecting, analyzing and presenting data. The results are shown as a percentage. Basic statistical data processing of 800 respondents was performed. The results of the research lead us to conclude that the trend of sports and recreational activities, ie animation of children through them, is gradually growing. Parents and children understand the essence of the importance of the natural environment and increasingly participate in organized actions where they are animated through their stay in nature. Equally interested is the female and male population when it comes to animation with recreational programs in nature.

Keywords: camp, recreation, stay in nature

ZNAČAJ SPORTSKO REKREATIVNIH PROGRAMA U DEČJEM TURIZMU NA PRIMERU BUKOVIČKE BANJE

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Sažetak: Deca u današnjim vremenima nisu pošteđena zahtevima savremenog društva i samom brzinom razvoja tehnologija te su samim tim izložena stresu. Pošto veliki deo dana mladi provode u zatvorenom prostoru, poželjno je van časovne slobodno izabrane aktivnosti izvoditi na otvorenom prostoru, čistom i svežem vazduhu. Deca u okviru kampa koji se realizuje u Bukovičkoj Banji na 270m nadmorske visine prolaze kroz razne poligone koji su različitog karaktera u prirodnom okruženju. Predmet rada predstavlja analizu i komparaciju dece i mladih u prirodnom okruženju na sportsko rekreativnim kampovima i njihovo značaj od 2017. do 2020. godine. Osnovni cilj je predstavljanje značaja i uloge rekreativnih aktivnosti za decu i mlade, gde je usmerenje na animaciju, rekreaciju, edukaciju dece, učenje raznovrsnih sportskih

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veština, a pre svega njihovom boravku u prirodi i zdravom okruženju. Korišćeni su empirijski postupci kao što su posmatranje, razgovor, anketa. Koristila se metoda teorijske analize i bibliografska metoda prikupljanja podataka. Kao istraživačka tehnika korišćena je tehnika anketiranja i skaliranja. Korišćena je petostepena Likertova skala. Anketa je podrazumevala prikupljanje, analiziranje i prikazivanje podataka. Rezultati su prikazani u procentima. Urađena je osnovna statistička obrada podataka anketiranih 800 ispitanika. Rezultati istraživanja dovode nas do toga da zaključimo da je trend sportsko rekreativnih aktivnosti, tj animacije dece putem istih u postepenom rastu. Roditelji i deca shvataju suštinu značaja prirodnog okruženja i sve češće participiraju u organizovanim akcijama gde se animiraju kroz boravak u prirodi. Podjednako interesovanje pokazuje i ženska i muška populacija kada je u pitanju animacija rekreativnim programima u prirodi.

Ključne reči: kamp, rekreacija, boravak u prirodi

UVOD

Deca u današnjim vremenima nisu pošteđena zahtevima savremenog društva i samom brzinom razvoja tehnologija te su samim tim izložena stresu. Zaboravljamo da je jedna od osnovnih potreba koju deca žele da zadovolje potreba za igrom, kao i raznovrsno kretanje koje omogućava pravilan rast i razvoj. Prema Mitiću „rekreacija u najširem smislu te reči podrazumeva sve aktivnosti namenjene pasivnom i aktivnom odmoru ljudi. Sama reč *recreatio* znači odmor, oporavak, okrepljenje, osveženje, igra, zabava, radost, slobodno vreme". (Mitić 2001). Pošto veliki deo dana mladi provode u zatvorenom prostoru, poželjno je van časovne slobodno izabrane aktivnosti izvoditi na otvorenom prostoru, čistom i svežem vazduhu. Deca u okviru kampa koji se realizuje u Bukovičkoj Banji na 270m nadmorske visine prolaze kroz razne poligone koji su različitog karaktera u prirodnom okruženju. Planina Bukulja obrasla je listopadnom šumom, a njen vrh štiti Aranđelovac od jakih vetrova, čini klimu blagom i pogodnom za izvođenje sportova i rekreacije. (Ivanovski, Mitić i Prebeg 2021).

PREDMET I CILJ RADA

Predmet rada predstavlja analizu i komparaciju dece i mladih u prirodnom okruženju na sportsko rekreativnim kampovima i njihovo značaj od 2017. do 2020. godine.
Osnovni cilj je predstavljanje značaja i uloge rekreativnih aktivnosti za decu i mlade, gde je usmerenje na animaciju, rekreaciju, edukaciju dece, učenje raznovrsnih sportskih veština, a pre svega njihovom boravku u prirodi i zdravom okruženju.

METOD

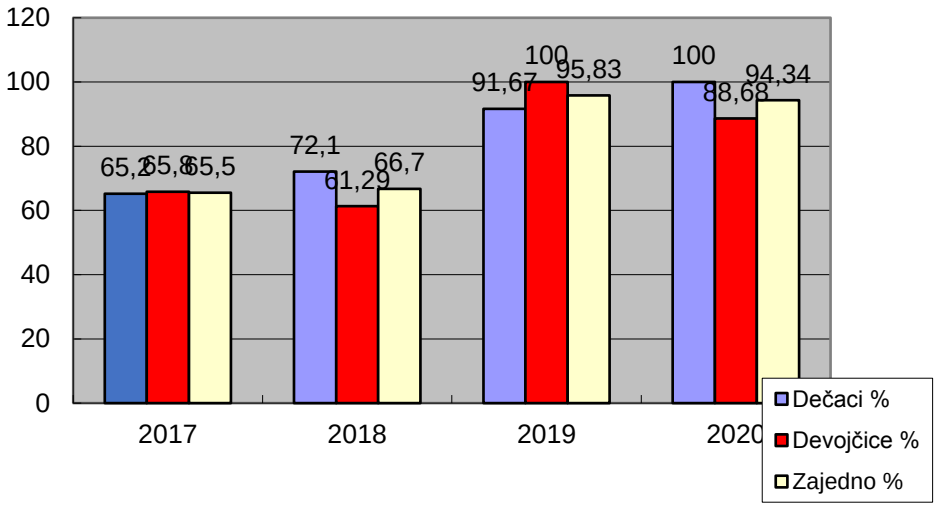
Korišćeni su empirijski postupci kao što su posmatranje, razgovor, anketa. Koristila se metoda teorijske analize i bibliografska metoda prikupljanja podataka.
Kao istraživačka tehnika korišćena je tehnika anketiranja i skaliranja. Korišćena je petostepena Likertova skala. Anketa je podrazumevala prikupljanje, analiziranje i prikazivanje podataka. Rezultati su prikazani u procentima. Urađena je osnovna statistička obrada podataka anketiranih 800 ispitanika.

REZULTATI SA DISKUSIJOM

Jutarnje vežbanje „POZDRAV SUNCU''

Jutarnje vežbanje od velikog je značaja za očuvanje zdravlja i predstavlja pripremu celokupnog organizma za predstojeće aktivnosti tokom dana. Sastoji se od okupljanja u određeno vreme na dogovorenom mestu u zavisnosti koja je grupa u pitanju, šetnje ili laganog trčanja i kompleksa vežbi oblikovanja. (Ugrinić i Ivanovski 2015).

Grafikon – jutarnje vežbanje.



Na grafikonu – jutarnje vežbanje. su prikazani rezultati za visoke ocene 4 i 5 iz ankete, izražene u procentima, gde možemo videti da iz godine u godinu imamo tendenciju rasta za učestvovanjem i vrednovanjem jutarnjeg vežbanja. Približno je podjednak procenat ispitanika i dečaka i devojčica.

Rekreativne igre

- **Boćanje**

Igra se sastoji od kugla (boća) i male kugle. Cilj igre je da takmičari približe što više kugli iz svoje ekipe, maloj kugli. Sledeći takmičar može da izbaci protivničku kuglu svojom kuglom. Pobednik je ekipa čije su kugle bliže maloj kugli.

- **Pločice**

Igra slična predhodnoj igri boćanje, u ovoj igri imamo umesto kugli gumene pločice. Cilj igre je da pločica bude što bliža maloj pločici.

- ***Bag go***

Igra se sastoji od četiri drvene ploče koje su u gornjem delu postavljene na nogice a na sebi imaju otvore u obliku kruga i vrećica za pogađanje. Cilj igre je da se ubaci vrećica u otvor na tabli i osvoji oderđeni broj poena, poen nosi i pogodak na određeni deo table. Igra se u paru i protivnik uzvraća udarac.

- **Pikado**

Meta je okačena na drvetu i cilj igre je da pojedinac iz tri gađanja strelicom u metu postigne što veći broj poena. Ova igra se može igrati i ekipno.

- **Frizbi**

Jedan od rekvizita koji je uvek dobro imati, može koristiti za razne igre ali pre svega može napraviti dobru zabavu dodavanjem drugara između sebe.

- **Badminton**

Igra koja se sastoji od reketa i lagane kupaste loptice. Loptica se prebacuje preko mreže i cilj je poentirati, igra se na označenom terenu.

- **Spidmiton**

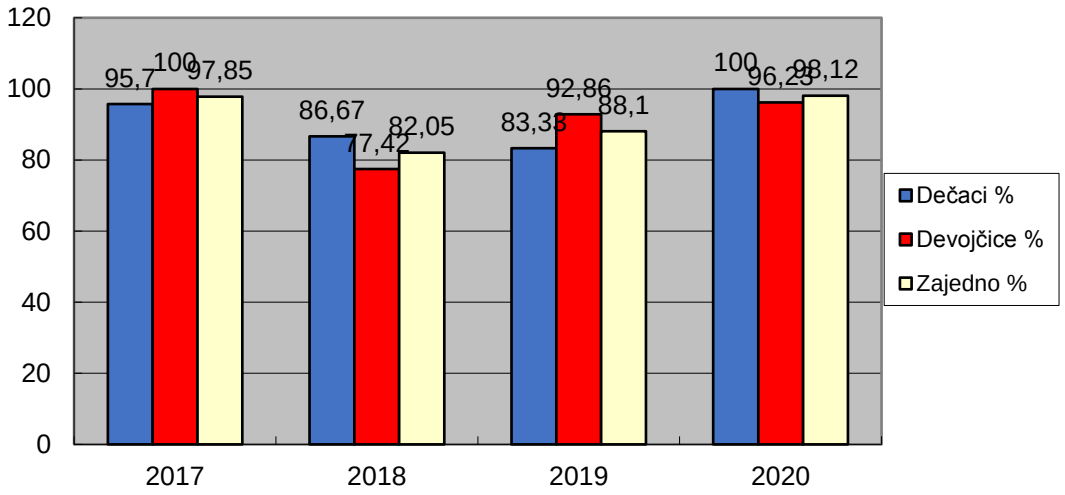
Igra vrlo slična prethodnoj. Malo je veći reket i teža loptica, samim tim je i igra brža, eksplozivnija. Loptica se prebacuje u suprotno označeno polje, potrebno je pogoditi i poentirati.

- **Gate ball**

  Sastoji se od velikog obeleženog terena, tri kapije, palica i loptica. Igra se u dve ekipe, cilj igre je da belom lopticom pogodiš crvenu i da pritom ona prođe kroz kapiju. Igrač ima prava na jedan pokušaj, ako pogodi igra ponovo.

Pobednik je ona ekipa koja prva prođe sve tri kapije i pogodi klin.

Grafikon- Rekreativne igre.



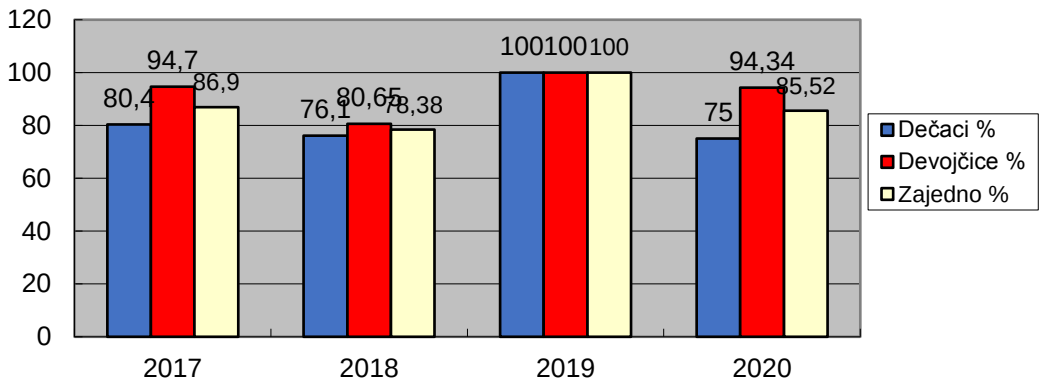
Na grafikonu – rekreativne igre su prikazani rezultati za visoke ocene 4 i 5 izražene u procentima, gde možemo zaključiti da kod devojčica preovladava veće interesovanje za rekreativne igre.

Sportski poligoni

Takmičenje se vrši ekipno, sve prepreke moraju preći kao tim. Postavljena su tri poligona i pobednici su oni koji imaju najbolje prolazno vreme, kao i turniri po sistemu svako sa svakim od prijavljenih učesnika.

Neke od igara koje su postavljene kroz poligone i turnire: palice, skije, prenošenje lopte, cevi, obručevi, fudbal, košarka, odbojka...

Grafikon – Sportski poligoni.



Na grafikonu – sportski poligoni su prikazani rezultati za visoke ocene 4 i 5 izražene u procentima, gde možemo videti iz godine u godinu trend rasta interesovanja za sportskim poligonima kako kod devojčica tako i kod dečaka.

Popodnevne društvene igre

- **Ples**

Radionice plesa podrazumevaju učenje osnovnih koraka latino plesova salse, sambe, rumbe, ča ča, kao i učenje koreografija

- **Čoveče vežbaj ne ljuti se**

Na velikom iscrtanom terenu sa poljima kao čoveče ne ljuti se figure su deca. Takođe se mogu i na velikom hamer papiru iscrtati kreativna polja za veliki čoveče ne ljuti se. Bacanjem velike kockice pomera se nekoliko koraka napred gde staje na broj koji ima specijalni zadatak. Svako polje je obeleženo brojem i nosi sa sobom neki od zadataka.

- **Muzička radionica ‘’čaše’’**

Cela grupa učestvuje u komponovanju muzike pomoću čaša, uče pokrete po segmentima i kada uvežbaju sa animatorom kao dirigentom sviraju tj udaraju ritam.

- **Kranovi**

Igra u kojoj je potrebno da tim sarađuje, da bude kocentracija na nivou, svi za jednog jedan za sve. Zajedničkim snagama sagraditi zgradu, pritom voditi računa jer jedna mala greška i zgrada pada. Zgrada se gradi od drvenih delova koji čine spratove, a spratovi se nižu jedan na drugi pomoću kanapa za koje je sprat prikačen. Svaki takmičar u ruci drži po jedan kanap koji je vezan za centralnu kuku.

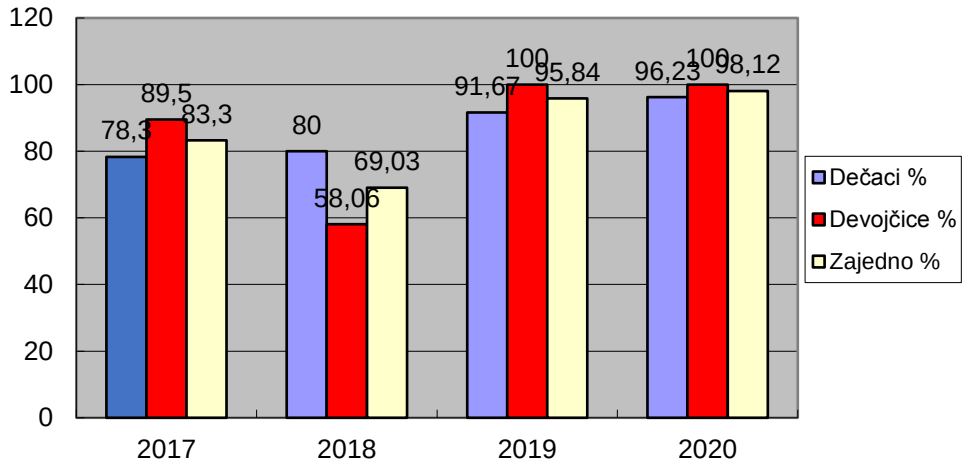
- **Pantomima**

Ekipe dobijaju list na kome se nalaze nazivi filmova, serija, turističkih destinacija koje oni moraju da odglume. Ekipa dobija pet minuta da pogodi što više naziva, na početku biraju ko će biti glumac. Spisak ostaje kod animatora da ekipa ne bi došla u iskušenje da pročita nazive.

- **Kontakt klub**

Radi se sa partnerom kojeg je odabrao i pažljivo sluša animatora koji zadatak im postavlja. Nakon svakog drugog zadatka na znak animatora menja se partner, ali vodeći računa da se ne ponavljaju radi boljeg upoznavanja i ostvarenja novih kontakata.

Grafikon – Popodnevne društvene igre



Na grafikonu – popodnevne društvene igre. su prikazani rezultati za visoke ocene 4 i 5 izražene u procentima, gde možemo primetiti da je 2018. godine interesovanje kod devojčica za popodnevne društvene aktivnosti bilo slabije. Već sledeće godine se rezultat popravlja sa učinkom čak od 100%.

ZAKLJUČAK

Na osnovu dugogodišnjeg iskustva i rezultata istraživanja možemo da zaključimo da je trend sportsko rekreativnih aktivnosti, tj animacije dece putem istih u postepenom rastu. Roditelji i deca shvataju suštinu značaja prirodnog okruženja i sve češće participiraju u organizovanim akcijama gde se animiraju kroz boravak u prirodi. Podjednako interesovanje pokazuje i ženska i muška populacija kada je u pitanju animacija rekreativnim programima u prirodi. (Ugrinić i sar. 2016)

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CHARACTERISTICS OF SPORTS AND RECREATIONAL FACILITIES IN THE TOWN OF ZAJEČAR

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Abstract: With an over-a-century-long sports tradition and a great number of sports events in the second half of 20th century, the Municipality of Zaječar proved that it had great potential for sports and recreational development. Unfortunately, the circumstances have significantly changed lately. The Municipality has a large number of sports courts and facilities, and there are a few large sports and recreational centers in the town itself. However, a small number of these places meet the requirements for the organization of large international events because most of them are small and not fully equipped. There is an obvious lack of separate facilities for some types of sports. As for recreation, there is no adrenaline park with any sports activities. Also, the abovementioned facilities are mostly meant for individual recreation, children sports trainings, etc., but not for professional sports activities. Cultural, educational and other types of events take place in these sports and recreational centers. But people mostly spend a short period of time in these areas. The goal of this paper is to provide an overview on sports and recreational facilities in the Municipality of Zaječar and to explain their purpose and potential. The data has been collected directly from the abovementioned facilities, the reports of sports organizations and teams, and from the Sports Federation of the Municipality of Zaječar.

Keywords: sports facilities, recreation, Zaječar

KARAKTERISTIKE SPORTSKO – REKREATIVNIH OBJEKATA U ZAJEČARU

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Sažetak: Sa sportskom tradicijom koja traje više od jednog veka i velikim brojem sportskih događaja u drugoj polovini XX veka opština Zaječar je dokazala da ima potencijala za razvoj sporta i rekreacije. Nažalost, poslednjih godina ta činjenica se u velikoj meri promenila. Grad Zaječar raspolaže velikim brojem sportskih terena i objekata, a u samom gradu postoji i nekoliko većih sportsko-rekreativnih centara. Može se zaključiti da mali broj objekata zadovoljava uslove za organizovanje većih međunarodnih događaja, jer se u većini slučajeva radi o manjim, slabije opremljenim objektima i terenima. Uočava se nedostatak objekata za specifične vrste sportova, dok na polju rekreacije nedostaje zabavni (adrenalinski) park sa sportskim sadržajima. Uglavnom su to objekti koji nisu namenjeni profesionalnom sportu već rekreaciji ljudi, treninzima dece i sl. U ovim sportsko – rekreativnim centrima održavaju se kulturne, edukativne i druge manifestacije. Boravak ljudi na ovakvim prostorima je u većini slučajeva kratkotrajnog karaktera. Cilj ovog rada je da se napravi pregled sportsko – rekreativnih objekata u Zaječaru, objasni njihova namena i potencijal. Podaci su prikupljeni direktno iz ovih sportskih objekata, izveštaja sportskih organizacija i klubova i Sportskog Saveza grada Zaječara.

Ključne reči: sportski objekti, rekreacija, Zaječar

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UVOD

U opštini Zaječar postoji veliki broj rekreativnih resursa koji privlače posetioce iz mnogih mesta Srbije. Sve veći broj turista, izletnika, planinara i ljubitelja prirode, smatra privlačnim prirodne lepote ovog dela Srbije, te se odlučuje da svoje slobodno vreme posveti planinarenju, skijanju, avanturističkim sportovima, skupovima i drugim sportskim događajima. Rekreativci najviše posećuju planine i uzvišenja u okolini Zaječara, kao i skijalište i sportsko - rekreativne centre u samom gradu.

Opština Zaječar raspolaže ravničarskim, brdovitim i niskoplaninskim reljefom. Ovakav reljef, u gradu i okolini, omogućava bavljenje najrasprostranjenijim sportskim aktivnostima, kao što su pešačenje, trčanje i biciklizam. Navedene sportske discipline, kada se praktikuju na ravnom terenu, ne zahtevaju velike fizičke napore.

Niskoplaninsko područje opštine Zaječar pogodno je za varijante sportskih disciplina koje ne zahtevaju veći napor i fizičku spremnost (blaži oblik trekinga, trčanje po šumskim stazama, biciklizam i slično), uz to, moguće je planinariti i obavljati druge lakše rekreativne aktivnosti na otvorenom. Za pojedine sportske aktivnosti uređeni su pojedini sportsko-rekreativni centri i izgrađeni objekti u samom gradu Zaječaru.

Velike mogućnosti za razvoj rekreativnog turizma pružaju i vodeni tokovi reka Crni i Beli Timok, koji imaju idealne uslove za sportsko-rekreativne aktivnosti. U današnje vreme, u toku letnjih meseci, na obalama ovih reka najviše ima ribolovaca i kupača.

Postojeći sportski sadržaji koji se u današnje vreme organizju u opštini Zaječar privlače brojne posetioce ne samo iz samog grada i okolnih naselja, već i iz ostalih mesta Srbije (Beograda, Niša, Jagodine, Bora, Negotina), a zbog blizine granice sa Bugarskom i brojne posetioce iz te zemlje. Nažalost, njihov broj uglavnom niko ne beleži i ne mogu se izdvojiti iz ukupne mase turista koji posećuju ostale događaje i turistička mesta u opštini Zaječar. Izuzetak čine samo manji sportski događaji i manifestacije.

Pozitivane primere efekata sportsko-rekreativnog turizma opštine Zaječar predstavljaju organizacija skijanja na Kraljevici i Timočki maraton.

Osim sportskih aktivnosti koje su se u Zaječaru održavale poslednjih decenija XX veka, uvedeni su i novi sadržaji i manifestacije koje su vremenom počele da okupljaju sve veći broj sportista i rekreativaca. U okviru Sportskog saveza Grada Zaječara proteklih godina održavale su se tradicionalne manifestacije kao što su: Dečija školska olimpijada, Kros Radio Televizije Srbije, Novogodišnji turnir u malom fudbalu, Mini maksi liga Timočke krajine, Fer plej liga Timočke krajine, Večernji turnir u malom fudbalu, Dođi na basket, Otvorena letnja škola sporta i mnoge druge akcije sa sportskim sadržajima. Na ovim sportskim manifestacijima godišnje učestvuje više stotina mladih sportista iz cele Srbije.

Opština Zaječar raspolaže dečijim igralištima i sportskim terenima u sklopu stambenih naselja, a u samom gradu postoje i tri veća sportsko-rekreativna centra, kao i dve teretane na otvorenom. Jedan centar za sportske aktivnosti se nalazi ispod uzvišenja Kraljevica i dugo godina je nosio naziv po njoj (Sportsko - rekreativni centar „Kraljevica“), drugi se nalazi u samom gradu na obalama reke Crni Timok (Sportsko - rekreativni centar „Popova plaža“), a treći u naselju Kotlujevac (Sportsko – rekreativni centar ‚Kablovi“). Na izlazu iz grada prema selu Zvezdan desetak godina postojao je i Sportski centar „Milenijum“ koji je imao u zatvorenom prostoru travnate terene za fudbal, mali fudbal, tenis kao i stolove za stoni tenis. Zatvoren je početkom marta meseca 2021. godine.

Slika 1. Teretena na otvorenom u naselju „Ključ 3“

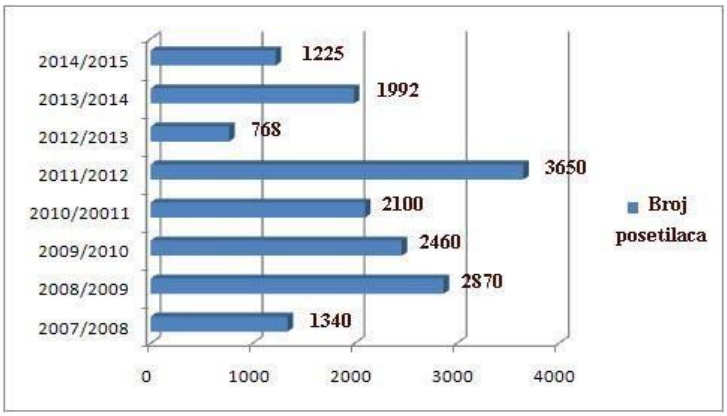
Sredinom XX veka grad Zaječar je imao oko 12.000 stanovnika i veliki broj sportskih organizacija. Savez organizacija za fizičku kulturu (danas Sportski savez Grada Zaječara) počeo je sa radom 1950. godine, a skoro u isto vreme osnovana su i dva planinarska društva (Planinarsko društvo „Ljuba Nešić“, 1950. g. i Omladinsko- planinarsko smučarsko društvo „Dragan Radosavljević, 1955. godine). Tih godina je u blizini „Paviljona“ na Kraljevici napravljena i prva skijaška staza prilagođena tadašnjim potrebama i tehnikama skijanja, kao i savezno priznata i registrovana staza za moto kros trke. Na prostoru Hipodroma, više puta u toku godine, održavale su se konjičke trke, a na prostoru Vašarišta počelo je da se aktivno razvija i avio sport. Nakon Prvog svetskog rata, 1919. godine, osnovan je i prvi fudbalski klub u Zaječaru „Timok“, a nakon njega i mnoge druge sportske organizacije i klubovi (Velojić, 2016,311).

Sportsko- rekreativne aktivnosti na Kraljevici

Uzvišenje Kraljevica je spomen park-šuma i izletište koje se nalazi južno od grada Zaječara. Zasađena je pretežno četinarskim i listopadnim šumama krajem XIX veka i od tada predstavlja izuzetno mesto za sve oblike izletničkih i sportsko- rekreativnih aktivnosti. Na Kraljevici se nalaze sportski tereni, vašarište, hipodrom, stadion fudbalskog kluba „Timok, trim i ski staza, olimpijski i dečiji bazen, Dom izviđača i Planinarski dom.
Sportski centar na Kraljevici je osnovan 1976. godine kao ustanova koja u svom sastavu objedinjuje kompleks sportskih terena i objekata različite namene. Raspolaže aktivnom površinom od 55.000 kvadratnih metara koja je na raspolaganju sportskim organizacijama, kao i svim građanima za bavljenje rekreativnim sportovima. Sportski kompleks ovog Centra podeljen je na pet celina, koje predstavljaju posebne sportske objekte. To su: sportska hala, bazen, fudbalski stadion, otvoreni tereni sa tvrdom podlogom i park-šuma Kraljevica. Pored bazena napravljeni su otvoreni tereni sa tvrdom podlogom: rukometni teren sa tribinom (osvetljen), odbojkaški teren, teniski tereni i košarkaški teren koji takođe stoje na raspolaganju zainteresovanim rekreativcima.
Kraljevica je poznata i po tome što se na njoj održava najveći broj sportskih i kulturnih manifestacija (Kros takmičenja, Ski takmičenja, Timočki maraton, Rok festival „Zaječarska gitarijada”, moto skupovi i drugi). Ona je i uređeno šetalište, sa prosečenim i obeleženim trim i pešačkim stazama i klupama za odmor.
Poslednjih godina, na nekadašnjem zaječarskom hipodromu organizuje se jedno od najmasovnijih sportskih takmičenja u Srbiji – kros Radio Televizije Srbije.
U drugoj polovini XX veka na Kraljevici je izgrađena sportska hala, gradski stadion, bazen i brojni tereni za male sportove.

Slika 2. Skijaška staza na Kraljevici
(Izvor: http://tkmagazin.rs/zajecar-otvorena-ski-sezona-na-kraljevici-radno-vreme-cenovnik/)

U okviru sportskog centra na Kraljevici od 2007. godine postoji i jedinstveno skijalište na kojem je moguće i noću skijati. Staza se nalazi u blizini samog centra grada, duga je 650 m i ima ski lift kapaciteta 1.200 skijaša na sat. Sastoji se iz dve skijaške staze i odvojenog dela za sankanje. Po potrebi veštački sneg na stazi proizvode dva topa, a samu stazu priprema ratrak koji se nalazi na skijalištu. Osvetljenje na stazi je dobro projektovano i ravnomerno osvetljava celu stazu. Na stazi su se organizovala razna skijaška i takmičenja u snoubordu na kojima su učestvovali sportisti iz mnogih mesta Srbije i inostranstva. U zavisnosti od klimatskih faktora (broja snežnih dana i visine snega) skijanje na ovoj stazi je moguće samo nekoliko meseci u toku godine. Na broj dana pogodnih za skijanje utiče i nadmorska visina samog skijališta (180 do 210 m n.v.). Najveći broj posetilaca na ski stazi bio je 2011/12. godine, a najmanji 2012/13. godine.



Slika 3: Broj posetilaca ski staze na Kraljevici u periodu od 2007/08. do 2014/15. godine
(Izvor: Podaci dobijeni od stručnih službi JKP Timok - održavanje Zaječar)

U park šumi Kraljevica postoji i dobro opremljena trim staza za rekreativce. Staza je dužine 4 km, sa preprekama i radnim mestima obeleženim tablama sa uputstvom. Godine 2014. renovirano je 1.360 metara ove staze i postavljeno 15 novih stanica za vežbanje.
U decembru mesecu 2020. u ovoj park šumi postavljen je kamen temeljac za novi gradski stadion. Stari stadion FK Timoka biće pretvoren u atletski stadion za istočnu Srbiju. Novi Gradski stadion u Zaječaru imaće 8.186 mesta i biće izgrađen u skladu sa UEFA standardima, u sklopu postojećeg sportsko-rekreativnog kompleksa na obroncima Kraljevice. Na ovom prostoru priprema se i projekat izgradnje jedne od najboljih, i najlepših, profesionalnih, karting staza na Balkanu. Takođe, projektuju se i nove staze za šetanje sa spravama kao i "Adrenalin park".

„Popova plaža“

Popova plaža je sportsko-rekreativni kompleks napravljen na obalama reke Crni Timok. Izgrađen je 2006. godine, na oko 5 hektara, ima izgrađene pešačke staze, staze zdravlja pored reke (u dužini od 1500 m i 2500 m) i kupalište na reci Crni Timok (u dužini od 300 m). Celokupni prostor je osvetljen i prilagođen potrebama svih uzrasta. U okviru ovog centra nalaze se teniski tereni, tereni za odbojku na pesku, mali fudbal (na travi i betonu), fudbal na vodi, košarku, poligon za rolere i skejbord, šah na otvorenom prostoru i tereni za mini golf.
Od 2018. godine i Sportsko – rekreativni centar „Kraljevica“ i Sportsko rekreativni centar „Popova plaža“ pripadaju firmi koja nosi naziv Javno komunalno preduzeće Timok – održavanje Zaječar.

Slika 4. Šetalište na Popovoj plaži Slika 5. Kupalište na Popovoj plaži
(Izvor: http://aurora.ekof.bg.ac.rs/~s110189/popova%20plaza.htm)

„Sportsko – poslovni centar Timok” DOO Zaječar

Odlukom Skupštine Grada Zaječara, 12.10.2013. godine osnovan je “Sportsko poslovni centar Timok” DOO Zaječar kao dvodomno privredno društvo sa ograničenom odgovornošću. Ovaj sportsko – poslovni centar upravlja mnogim sportskim objektima, terenima i dečijim igralištima na teritoriji Grada Zaječara.
Sportski objekti u sastavu “Sportsko poslovnog centra Timok” jesu :

- Sportska hala, ukupne površine 5500 kvadrata, predviđena je za takmičarski i rekreativni sport, kao i za kulturno – zabavne i druge programe. Na tribinama ima 2200 mesta.
- Gradski bazen, olimspijskih razmera 50x25 metara na prostoru od 10.000 kvadrata pruža sve uslove za plivačke sportove kao i obuku neplivača i mali dečiji bazen.
- Gradski stadion, sa 5 pomoćnih travnatih terena, upravnom zgradom i pratećim objekatima, u fazi je dogradnje kako bi bili obezbeđeni optimalni uslovi za fudbal i atletiku.
- Hipodrom, na površini od oko 5,5 hektara, odnosno 36 hekatara sa okolinom, obuhvata sam objekat sa restoranom, terasom i prostorom za čuvanje konja, koral, manjež, prostor za čuvanje hrane i hipodrom stazu.
- Popova plaža, na površini od 5 hekatara, ima 12 sportskih terena, 2 poligona za skejt, teren za mini golf, 2 dečija igrališta i kupalište.
- Skijalište “Kraljevica” ima 2 ski staze dužine od 500 do 600 metara, ski lift dužine 500 metara kao i sistem za veštačko osnežavanje. Ukupna njena površina je oko 8 hekatara.

Osim sportskih terena i objekata u ovim centrima, za organizaciju sportskih događaja koriste se i sportski tereni i sportske hale u osnovnim školama, srednjim školama i mnogi drugi manji tereni.

Sportsko – rekreativni centar Kablovi

Sportsko – rekreativni centar Kablovi nalazi se u naselju „Ključ 3”. Sadrži terene za fudbal i mali fudbal na otvorenom, sa svlačionicama za igrače. Na ovim terenima treniraju deca iz fudbalskog kluba „Kablovi”. U sklopu centra nalazi se i dečija igraonica na otvorenom i zatvorenom prostoru.

Slika 6: Sportsko – rekreativni centar „Kablovi”

ZAKLJUČAK

Posmatrano u celini, u Gradu Zaječar postoji relativno veliki broj sportskih objekata i terena, ali se u njihovoj strukturi uočavaju mnogi sadržajni nedostaci. Mali je broj objekata koji zadovoljavaju uslove za organizovanje većih međunarodnih događaja, jer se u većini slučajeva radi o manjim, slabije opremljenim objektima i terenima. Dok se na polju rekreacije uočava nedostatak zabavnog (adrenalinskog) parka sa sportskim sadržajima.

U okviru programa razvoja sporta u opštini Zaječar, Sportski savez Grada Zaječara donosi i svoje akcione planove u kojima se, radi poboljšanja i unapređenja sportske rekreacije, postavljaju i odgovarajući ciljevi koje je potrebno ostvariti. Oni se pre svega odnose na poboljšanje uslova za bolju i uspešniju realizaciju rekreativnog sporta u čitavoj opštini Zaječar (preko osavremenjavanja postojećih i izgradnje novih sportskih objekata), uspostavljanjem odgovarajućeg redovnog finansiranja rekreativnog sporta iz javnih i privatnih izvora i kontrole dodeljenih sredstava, unapređenje postojećeg stučnog i naučnog kadra za potrebe rekreativnog sporta i turizma i promocije rekreacije kao zdravog načina života (Sportski savez Grada Zaječara). Ukoliko bi se većina ovih postavljenih ciljeva ostvarila, to bi se u velikoj meri odrazilo i na sveukupni razvoj sporta i rekreacije u ovoj sredini.

S obzirom na to da se u sportskim objektima Grada Zaječara organizuju turniri za različite uzrasne kategorije dece iz cele Srbije u košarci, fudbalu, odbojci, tenisu i drugim sportovima, a radi većeg broja učesnika, neophodno je pojačati marketing, obezbediti veću podršku javnosti i veći broj sponzora. Sa povećanjem broja učesnika i jačim marketingom i efekti koje sa sobom nose ove manifestacije bili bi znatno veći i pozitivniji.

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HEALTH AND RECREATIONAL TOURISM IN THE DEVELOPMENT PROCESS OF EASTERN SERBIA SPAS

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Abstract: Recently, all over the world, there has been an increase in the demand for places that offer health treatment, rehabilitation and recreation, all together. These locations have huge natural and ecological potential, intact historical and archaeological values, a climate good for treatment of certain diseases and ailments, clean air, drinkable water or thermo-mineral springs. They also offer various possibilities for recreation, be it physical or psychological. Such places are extremely valuable for a country and it is absolutely necessary to make them known to the public. Due to the abovementioned increase and demands of modern tourists, this paper focuses on highlighting the significance of health and recreational tourism and its role in the development process of popular and less popular spas in Eastern Serbia. Also, it deals with the fact that the current offer of these places, above all based on using natural healing resources for health and recreational purposes, has to be replaced by modern development concepts. These concepts are based on offering various activities for different purposes, which can attract a considerable number of users.

Keywords: health and recreational tourism, Eastern Serbia

ZDRAVSTVENO - REKREATIVNI TURIZAM U PROCESU RAZVOJA BANJSKIH MESTA U ISTOČNOJ SRBIJI

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Sažetak: Poslednjih godina u svetu sve više raste potražnja za specijalizovanim mestima koja nude kombinaciju lečenja, rehabilitacije i rekreacije. Mestima gde postoje očuvani prirodno-ekološki potencijali, koja imaju očuvane istorijske i arheološke vrednosti, posebnu klimu, čist vazduh, zdravu pijaću vodu ili termomineralne izvore. Mestima koja omogućuju savremenim turistima potpunu rekreaciju u fizičkom i psihološkom smislu. Takva mesta su za svaku državu izuzetno vredna i neophodno ih je isticati i apostrofirati u svakoj prilici. Zbog pomenutih tendencija i zahteva savremene turističke klijentele i ovaj rad ima za cilj da ukaže na značaj zdravstveno-rekreativnog turizama i njegovu ulogu u procesu razvoja poznatih i manje poznatijih banjskih mesta u istočnoj Srbiji. Zaključuje se da postojeća ponuda ovih banjskih mesta, zasnovana pre svega na korišćenju prirodnih lekovitih resursa u zdravstvene i rekreativne svrhe, mora biti zamenjena savremenim konceptima razvoja baziranih na ponudi niza atraktivnih programa različite namene, koji mogu privući daleko veći broj potencijalnih korisnika.

Ključne reči: zdravstveno-rekreativni turizam, Istočna Srbija

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UVOD

Zdravlje je jedan od najstarijih, trajnih i u savremenim uslovima jedan od najjačih motiva turističkih kretanja. Zbog toga, turizam u svim svojim oblicima više-manje uvek vrši zdravstvenu funkciju. Zdravstveni turizam predstavlja putovanje sa ciljem dobijanja, pre svega, zdravstvene nege. To je naziv za jedan potpuno novi i rastući vid turizma koji ljudima omogućava da reše svoje zdravstvene probleme, dok istovremeno putuju na odmor i uživaju u lepotama odabrane destinacije. Osim zdravstvenog, u današnjem vremenu i rekreativni turizam dobija sve više pristalica, tako da u svetu permanentno raste trend tražnje za specijalizovanim zdravstveno-rekreativnim centrima koji nude kombinaciju lečenja, rehabilitacije i rekreacije. U većini slučajeva zdravstveno-rekreativni centri se nalaze u banjskim mestima neke države, u mestima gde postoji specifička klima, lekovita voda i blato, ali i čist vazduh i netaknuta priroda. Putovanja koja se organizuju do takvih centara u cilju održavanja, stabilizovanja i očuvanja zdravstvenog stanja pojedinaca, korišćenjem prirodnih lekovitih faktora, medicinskih usluga, sportsko–rekreativnih i wellness sadržaja, van mesta stalnog boravka, predstavljaju poseban vid turizma koji se u današnje vreme naziva *zdravstveno-rekreativni turizam*.

Zdravstveno-rekreativni turizam - savremeni vid turističkih kretanja

Zdravstveni turizam predstavlja noviji vid turističkih aktivnosti u kojoj bitno mesto zauzima stručno i kontrolisano korišćenje prirodnih lekovitih elemenata, postupaka fizikalne medicine i programiranih fizičkih aktivnosti u svrhu održavanja i unapređenja fizičkog, psihičkog i/ili duhovnog zdravlja turista, a sve u cilju poboljšanja kvaliteta njihovog života (*Kuns, Tomljenović, 2011*). U njegovom određivanju polazi se od potreba i težnje pojedinca za oporavkom zdravlja, psihičkih i fizičkih sposobnosti, koje mu se javljaju i postaju turistička potreba, odnosno ciljevi tih istih pojedinaca koji se mogu ostvariti uživanjem u lekovitoj vodi, u specifičnim aktivnostima i tretmanima koje on ostvaruje turističkom tražnjom. Uslovi koji se moraju ispuniti za aktiviranje ove vrste turizma su: prirodni lekoviti faktori, zdravstveno-turistički objekti, ugostiteljski objekti, medicinski i drugi sadržaji, nadzor lekara i drugi slični faktori. Pojedini autori (*Zečević, 2004*) smatraju da postoje tri vrste zdravstvenog turizma: *lečilišni* (samo lečenje i jedan vid oporavka), *kurativni* (rehabilitacija posetilaca) i *wellness turizam* (usmeren ka izreci *u zdravom telu zdrav duh*, aktivnosti koje doprinose dobrom stanju tela i duha). U savremenim uslovima, destinacija zdravstvenog turizma jeste ona koja u svojoj ponudi ima takav integralni turistički proizvod koji motiviše turiste da je posete pre svega iz zdravstvenih razloga, bez obzira da li je to zbog preventive, kurative ili rehabilitacije.
Rekreativni turizam predstavlja vid turizma pod kojim se podrazumeva aktivan odmor uz zadovoljavanje različitih želja i potreba za igrom, kretanjem na Suncu, vazduhu, vodi ili snegu i koji ima značajnu psihofizičku vrednost. To su takve aktivnosti van profesionalnog rada, koje se realizuju po vlastitoj želji klijenata.
Savremeni turistički centri stvaraju sve šire i sadržajnije programe rekreativne razonode, naročito one koje su pristupačne širem krugu zaposlenih u turizmu i to u oblasti kulturno-umetničkog rada, društveno zabavne delatnosti, boravka u prirodi i sportske aktivnosti. Na taj način i postojeća banjska mesta, sa svojom povoljnom klimom i lekovitim vodama, predstavljaju takva mesta gde se mogu odvijati savremena turistička kretanja, odnosno mesta gde se zdravstveno-rekreativni turizam najbolje može razvijati, kako u današnjem vremenu tako i u budućnosti.

Banje kao prirodni lekoviti potencijali

Zdravstveni turizam se razvio iz banjskog turizma koji je baziran na termalnim izvorima i lekovitom potencijalu mineralnih voda. Prema definiciji ESPA (*The European Spas*

Association – Evropsko udruženje banja) sama reč *banja* može se prevesti kao *mineralni izvor*, odnosno *lekovito mesto gde postoji mineralni izvor* (*Hrabovski, Tomić, 2009*). U engleskom jeziku reč *spa* označava *oazu zdravlja* ili *mesto termalnih izvora*, ali je manje poznato da ona dolazi i od imena jednog belgijskog gradića sa istim imenom (*Spa*) u kome se nalaze brojni termalni izvori i lečilišta. *Banje* su zapravo takva mesta koja imaju niz prirodnih specifičnosti, ali pre svega termalne i mineralne izvore i nastojanja da se vrednosti tih izvora iskoriste za potrebe lečenja i rekreacije (Stanković, 2000). Razvijene evropske turističke zemlje imaju bogato iskustvo, dugo čak dva veka, u korišćenju prirodnih faktora u banjskim mestima, namenjenim ne samo domaćoj već sve više i inostranoj klijenteli. U Evropi postoji preko hiljadu hidrotermalnih mesta, od kojih je oko 30 % locirano u Nemačkoj, oko 10 % u Francuskoj, dok se značajan broj beleži i u Italiji, Austriji i Švajcarskoj, koji danas čine značajan segment turističke ponude zdravstvenog turizma (*Geić, Geić, Čmrčec, 2010*). U pojedinim banjama lekovite termomineralne vode korišćene su od davnina. Pored mnogih banja, posebno u istočnoj Srbiji, pronađeni su ostaci praistorijskih, rimskih ili srednjevekovnih naselja, pa postoje indicije da su i njihovi tadašnji stanovnici koristili blagodeti koja su ta banjska mesta još tada nudila, odnosno da su ti isti stanovnici (ili neki drugi, iz udaljenijih krajeva) empirijskim putem otkrivali nove puteve isceljenja upotrebom pojedinih prirodnih materija i vode ili njihovom kombinacijom. Pretpostavlja se da su oni u prvo vreme na to bili prinuđeni, jer i sama tadašnja medicina nije raspolagala boljim saznanjima i lekovima, a kada su se medicinske nauke razvile savremeni čovek je ostao dosledan i posvećen tim istim toplim i hladnim mineralnim vodama koje su znatno uticale na njegovo zdravlje. Osim zdravstvenih i banjskih efekata, banje mogu da utiču i na lepotu, ponašanje, održivi razvoj, modu, hranu, *fitness,* ali i na komplementarnu konvencionalnu i savremenu medicinu (*Cohen, Bodeher, 2008*). Njihovo funkcionalno usmerenje u savremenim uslovima odnosi se pre svega na razvoj zdravstveno-lečilišnog turizma, kao najvažnijeg i najznačajnijeg oblika turizma u njima, pre svega zbog njihove postojeće, već izgrađene, receptivne infrastrukture i suprastrukture i bogatstva različitih prirodnih i antropogenih atraktivnosti njihove okoline. U novije vreme u njima dolazi do razvoja i drugih vrsta turizma (izletnički, tranzitni, eskurzioni, kulturno-manifestacioni, kongresni i drugi) koji samo dopunjuju njihovu postojeću turističku ponudu. Za karakteristike termomineralnih voda vezana je ne samo lečilišna, već i rekreativna funkcija banja. Terapeutski efekat banjskih voda je ogroman i njihova primena moguća je tokom cele godine. Stoga se slobodno može reći da banjski lečilišni i rekreativni turizam nema izrazito sezonsko obeležje i povoljno utiče na ekonomsku stabilnost takvih mesta. Selektivna i kompleksna turistička ponuda banja u današnje vreme zahteva sveobuhvatniji i svestraniji pristup sadašnjem i budućem korisniku, a definiše se kao *wellbeing* i obuhvata obnavljanje uma, tela i duše, što u suštinu čini orijentaciju savremenih evropskih banja, ali i poseban tržišni i turistički segment.

Banjski i zdravstveni turizam u istočnoj Srbiji

Kako je u Republici Srbiji registrovano oko 300 izvora mineralnih, odnosno termomineralnih voda i na njima napravljeno 45 zvaničnih banja i lečilišta (Stanković, 2000), tako je ona zbog svog velikog broja, duge tradicije i opšte poznatosti banja, stekla i popularni naziv *država banja*. Sva banjska mesta čine dragoceni prirodni i rekreativno-turistički potencijal, ali sa turističkog i zdravstvenog aspekta, posebno mesto u razvoju banjskog i zdravstvenog turizma zauzimaju banje i banjice koje se nalaze u istočnom delu Srbije. Na ova mesta ljudi već godinama dolaze radi zdravlja, rekreacije i rehabilitacije, odmora, kulturnih i sportskih sadržaja, a u novije vreme i radi druženja, zabave i naučnih i stručnih skupova.
Na teritoriji istočne Srbije nalazi se više termomineralnih voda, koje imaju dugu tradiciju zdravstvenog turizma (Momirović, 2007). Medju njima se posebno izdvajaju *Brestovačka*

banja kod Bora i *Gamzigradska banja* kod Zaječara kao i veći broj seoskih banja i banjica: *Rgoška banja* u naselju Rgošte kod Knjaževca, *Nikoličevska banja* u naselju Nikoličevo kod Zaječara, *Šarbanovačka banjica* u naselju Šarbanovac kod Bora i *Krivovirska banjica* u naselju Krivi vir kod Boljevca.

Topli i lekoviti izvori Brestovačke banje privlačili su turiste i srpske vladare još u prvoj polovini XIX veka. Prvi zvanični gost ove banje bila je knjeginja Ljubica Obrenović (žena kneza Miloša Obrenovića) koja je leta 1834. godine sa svojim sinovima Milanom i Mihailom u njoj boravila, u pratnji Jevrema Obrenovića (brata kneza Miloša) i Milutina Petrovića Ere (starijeg brata Hajduk Veljka Petrovića). Knjeginja je iz ove banje putovala i do tadašnje Turske carevine (do grada Vidina, danas u Bugarskoj) kako bi uspostavila političke veze sa vidinskim vezirom Husein–pašom i ugovorila njegov susret sa knezom Milošem. O prvom boravku srpske knjeginje u ovoj banji, bio je sačuvan i zapis uklesan u steni, sa nazivom *Ljubičin kamen*. Ta njena prva poseta računa se i kao prva turistička poseta jednom banjskom mestu u Srbiji. Te iste 1834. godine za knjeginjom je u Brestovačku banju stigao i knez Miloš radi susreta sa turskim pašom. Po naredbi kneza Miloša tada su i prvi uzorci banjske vode poslati u Beč na ispitivanje, a poštujući njegovu izričitu želju, baron Herder (tadašnji načelnik saksonskih rudokopa) je naredne (1835.) godine ponovo ispitao i potvrdio lekovitost vode ove banje, sugerišući u njoj izgradnju kupatila i smeštaja za goste, *kako bi ona bila što pristupačnija bolesnicima* (Velimirović, 1969). Među prvim zdanjima u banji izgrađen je 1837. godine (i do danas sačuvan) „Konak kneza Miloša", a preko puta njega i „Hamam kneza Miloša". Iz prvih godine razvoja potiče i Okružna zgrada (restoran „Srpska kruna") kao i kafana „Izletnik" za koju se tvrdi da je prvi hotel izgrađen u Srbiji. Knez Aleksandar Karađorđević je u ovoj banji 1856. godine podigao raskošni dvorac, koji je po lepoti i skladu i do danas ostao izvandredan primer romanske arhitekture. Kada je knez u njoj boravio, banja je više ličila na letnju prestonicu Srbije. Početkom 20. veka Kralj Petar I Karađorđević je radi lečenja boravio u ovoj banji i 1905. godine u njoj podigao letnjikovac takve lepote i veličine da i danas (pod nazivom „Vila Toplica") predstavlja srce banjskog medicinskog bloka. U banji su poslednjih godina u funkciji sledeći smeštajni kapaciteti: „Srpska kruna", „Klub RTB-a" i vile „Toplica", „Lucija", „Košuta" i „Biljana". Svi oni su treće kategorije, nalaze se u središtu banje i većina njih ima interesantne lokacije sa veoma dobrim prilazom (Stanković, 1979). Turistička ponuda ove banje nije namenjena samo gostima koji dolaze radi lečenja, već i onima koji žele relaksaciju i rekreaciju u prirodnom okruženju. Sa razvojem kvalitenih i raznovrsnih dopunskih sadržaja, pre svega manifestacije pod nazivom „Dani Brestovačke banje" u mnogome je obogaćena njena turistička ponuda (Velojić i saradnici, 2017).

Na drugom mestu sa zdravstveno-lečilišnom tradicijom u istočnoj Srbiji nalazi se Gamzigradska banja. Njeni lekoviti izvori evidentirani još u turskim popisima u XV i XVI veku. Prva zvanična kupanja u svrhu lečenja započeta su u njoj 1890. godine u improvizovanim bazenima, čija je temperatura vode iznosila od 38^0 do 42^0 C. Od okolne rečne vode bazeni su ograđivani blatom, kamenjem, koljem i šašom, a preko njih su prebacivane grane i pruće koje su kupače koliko-toliko skrivale od očiju prolaznika. Prva značajnija kaptaža izvora u ovoj banji napravljena je 1915. godine. Milan Đ. Milićević zapisao je (1876. g) podatak da je u Gamzigradsku banju narod *u gomilama dolazio na vodu da se leči*, dok je M. T. Leko sa svojim saradnicima (1922. g) zapisao da je posle Prvog svetskog rata u ovu banju *narod dolazio u vrlo velikom broju* (*više od 1.000*). Od 1930. godine, pod upravom Moravske banovine, Gamzigradska banja postaje organzovano banjsko naselje i u njoj dolazi do izgradnje prvih zidanih kuća. Po objavljenim podacima, Gamzigradska banja je 1957. godine za prijem bolesnika raspolagala sa 250 postelja u banjskom smeštaju i 6 u ugostiteljstvu, a 1967. godine (bez tada izgrađenog hotela „Kastrum") sa 247 ležaja. Godine 1978. u Banji je izgrađena i otpočela sa radom Specijalizovana bolnica za rehabilitaciju pod nazivom „Gamzigrad". U njoj se i danas obavlja rehabilitacija oboljenja perifernih krvnih sudova i vibracione bolesti, opšta

rehabilitacija bolesti vezivnog tkiva, različitih oblika reumatizma, ortopedskih bolesti i posttraumatskih stanja. Najviše noćenja u ovoj banji (55.578) ostvareno je u 1977. godine, dok je najviše turista (8.180) u njoj boravilo 1986. godine. Poslednjih decenija XX veka u Gamzigradskoj banji počinju da se organizuju i prve kulturne manifestacije („Dani božura“, „Zlatne ruke“, „Đurđevdanski sabor“, Međunarodna likovna kolonija „Gamzigrad“, „Dani Gamzigradske banje“) koje i danas okupljaju više stotina učesnika i gostiju. Na kulturno-sportskoj manifestaciji „Dani božura“ organizovani su sportski sadržaji (takmičenje u malom fudbalu, odbojci i drugim sportovima) koji su samo u jednom vikendu okupljali oko 300 takmičara i posetilaca. Krajem XX veka Turističko-ugostiteljsko preduzeće „Romuliana“ iz Gamzigradske banje je na prostoru između nekadašnjeg hotela „Kastrum“ i reke Crni Timok, izgradilo više sportskih terena za rekreaciju, pripreme i boravak sportista (koji već desetak godina nisu u funkciji), a godinama je imalo i svoj fudbalski klub. U Gamzigradskoj banji i danas radi jedna od najstarijih hidroelektrana u Srbiji (izgrađena 1909. g), a nedaleko od nje nalazi se i istorijski značajno i zakonom zaštićeno arheološko nalazište – ostaci rimske carske palate Feliks Romuliane, objekat svetske baštine sa liste UNESCO-a. Iako su u ovoj banji zastupljeni i drugi vidovi turizma, njena zdravstveno-lečilišna funkcija je bila i ostala najstarija i najznačajnija. To potvrđuje i odnos broja posetilaca i noćenja, koji ukazuju na dug boravak turista, pre svega radi lečenja, a odmah zatim i radi sportsko-rekreativnih, kulturnih i drugih sadržaja (Velojić, 2016).

Rgoška banja u Rgoštu kod Knjaževca poslednjih godina ima sve veći broj posetilaca. Nalazi se na desnoj obali Svrljiškog Timoka, na mestu gde postoje i tragovi naselja iz perioda praistorije, antike i srednjeg veka. Vode ove banje imaju temperaturu od 26 do 28^0 C i koriste se kod bolesti lokomotornog aparata, neuroloških oboljenja i kožnih bolesti, dok se njeni sporedni efekti manifestuju kod akutnih bolesti, infektivnih bolesti, tuberkuloze pluća, malignih, hroničih i srčanih oboljenja kao i dugih bolesti. Od termalnih uređaja u banji su u upotrebi 2 manja kupatila i česma sa vodom za piće, dok se posetioci najviše kupaju u samom izvorištu i viru koji je oko njega napravljen. Voda iz ove banje koristi se i u gradskom bazenu „Banjica“, koji se nalazi nedaleko od nje. S obzirom na njene osnovne prirodne i zdravstvene vrednosti, Rgoška banja u budućnosti može postati značajan visokofunkcionalni zdravstveno-rekreativni turistički centar (Simić, 2011).

U Nikoličevskoj banji postoji više izvora termomineralne vode temperature od 26 do 34^0 C. Iako postoje indicije da je voda sa ovih izvora korišćena u terapijske svrhe i mnogo vekova ranije, tek krajem XIX veka dolazi se do prvih podataka o njoj. U periodu između dva svetska rata u ovoj banji su postojala tri kamena korita u kojima su se bolesnici kupali i jedna zgrada za smeštaj gostiju, dok 60-tih i 70-tih godina XX veka dolazi do njenog detaljnijeg istraživanja, pravilnijeg kaptiranja vode uz pomoć bušotina, izgradnje česama i otvorenog bazena. Mineralne vode iz ove banje koriste se kao osnovno i dopunsko sredstvo kod lečenja hroničnih reumetskih oboljenja, očnih, kožnih i drugih bolesti. U toku letnjih meseci ona ima veliki broj posetilaca, kako iz Zaječara i okolnih mesta, tako i iz udaljenijih naselja (Velojić, 2005).

Vode Šarbanovačke banjice pripadaju pukotinskim izvorima koji se izlivaju u razbijenom izvorištu sa nekoliko grupa izvora i leče reumatska, stomačna i očna oboljenja. Temperature im se kreću od 20 do 37 ^{0}C, a izdašnost od 0,5 do 2 litra vode u sekundi. Njihov hidrotermalni mehanizam bio je poznat još u drugoj polovini XIX veka, dok je u periodu između dva svetska rata u samoj Banji napravljen betonski bazen u kome su se posetioci kupali, a stanovnice okolnih naselja prale svoje rublje. Po tom vidu praktično-primenjene funkcije Šarbanovačka banja je bila i ostala najpoznatija banja u Srbiji (Kostić, 1974). Kako u ovu seosku banjicu retki posetioci dolaze ponajviše iz radoznalosti, njena rekreativno-turistička funkcija je još uvek samo potencijalna mogućnost.

Krivovirska banjica se nalazi u samom naselju Krivi vir, u neposrednoj blizini izvorišta reke Crni Timok. Njeni termalni izvori locirani su pored obala pomenute reke, na mestima koja se nazivaju Vrelo i Vrelce, dok vode sa tih izvora, sa temperaturama od 15 do 34 ^{0} C, leče reumatska i druga oboljenja. Osim zdravstvene, Krivovirska banjica je imala i praktično-primenjenu i rekreativno-turističku funkiju. Njene termalne vode koristile su se za rad jedne vodenice, za pranje i beljenje rublja i kao pijaća voda, dok se radi rekreacije meštani i posetioci banje kupali ponajviše na nekaptiranim termalnim izvorima (Kostić, 1974). U toku letnjih meseci u samom naselju i njegovoj banjici boravi veliki broj posetilaca iz mnogih naselja Srbije.
Veliki broj banja i banjica nedvosmisleno potvrđuje činjenicu da je prirodna osnova u ovom delu Srbije bila veoma izdašna i da u velikoj meri obiluje prvorazrednim prirodnim resursima, ali da oni nisu na pravi način valorizovani i da je više nego neophodno da se u novoj politici turističkog razvoja osmisli pravi način kako što bolje iskoristiti njihove raspoložive resurse u svrhu razvoja zdravstveno-rekreativnog turizma.

Savremeni koncepti budućeg razvoja

Budući razvoj turizma u ovim banjama mora se zasnivati na tržišnoj specijalizaciji, što znači da svaka od ovih banja i banjica mora proširiti svoj koncept razvoja i prilagoditi turističkoj tražnji i zahtevima turističke klijentele, pa se na taj način mogu nadati i većoj profitabilnosti na tržištu. Njihova određena specijalizacija može ubrzati diferenciranje lečilišne od rekreativne funkcije banjskih mesta, ponegde i potpuno transformisati postojeću lečilišnu u rekreativnu funkciju, ali će zasigurno u svakom pogledu povećati turističku potrošnju (Jovičić, 2008). Mnoge od ovih banja već se nalaze u procesu privatizacije i transformacije, pa će i to sigurno doprineti njihovom ubrazanijem razvoju. Osim dosadašnjih programa, za njihov uspešniji razvoj potrebno je i proširenje postojeće ponude, obogaćivanje sadržaja boravka posetilaca i stvaranje čitavog niza drugih programa (prevencija, rehabilitacija, *wellness* i slično) koji se najbolje mogu ostvariti preko zdravsveno-rekreativnog turizma. Osnovne zdravstveno-rekreativne aktivnosti u ovim banjama mogu biti programi sportske rekreacije, programi prirodne uravnotežene i specifične ishrane, programi druženja u prirodi, programi zdravstvenih pregleda i kontrole, programi iz oblasti kulture ili zdravstvene edukacije i slično. Ti isti programi mogu biti namenjeni velikim grupama korisnika ili pojedincima, zdravim osobama izloženim prekomernom stresu, psihofizičkim opterećenjima i drugim nepovoljnim faktorima sredine; osobama sa prekomernom telesnom težinom, blažim oblicima hipertenzije, dijabetesom i drugim regulatornim metaboličkim i funkcionalnim poremećajima; starijim osobama, bolesnicima u fazi rekonvalescencije, nakon preležanih težih oboljenja ili hirurških intervencija; sportistima u fazama priprema i oporavka, kao i drugim licima. Zdravstveno-rekreativni turizam će zasigurno doneti i značajnu ekonomsku vrednost svim mestima u kojima se takav vid turističkih aktivnosti bude organizovao. Ta ekonomska vrednost, odnosno finansijski efekti biće direktni i indirektni. Direktni finansijski efekti odnosiće se na neposredno plaćanje usluga u turističkim destinacijama, dok će indirektne efekte činiti povećanje prodaje postojećih kapaciteta, opreme i rekvizita, produženje trajanja sezone i drugi slični faktori (*Gligorijević, Novović, 2014*).

ZAKLJUČAK

Zdravstveno-rekreativni turizam u velikoj meri može uticati na ubrzaniji razvoj banjskih mesta u istočnoj Srbiji, ponajviše preko proširenja već postojećih ponuda, obogaćenja sadržaja boravka posetilaca i stvaranja čitavog niza različitih programa koji mogu podmiriti mnogobrojne zahteve i potrebe izbirljivih turista. Zdravstveno-rekreativni programi koji se u njima mogu organizovati, osim bolesnika, treba da privuku i one posetioce koji sami mogu

investirati u svoj odmor, rekreaciju i oporavak, unapred svesni činjenice da će im se ta investicija, preko sačuvanog zdravlja, mnogostruko isplatiti. Višestruke koristi od upražnjavanja programa neposredno će se odraziti na preventivu i zaštitu zdravlja korisnika, na povećenje otpornosti njihovih organizama, na sprečavanje i otklanjanje profesionalnih oboljenja, na otklanjanje simptoma hipodinamičnih bolesti, uravnoteženje energetske potrošnje, kao i na održavanje normalne telesne težine samih korisnika. Da bi se svi ti programi ostvarili, moraju se doneti različite strategije, kako planiranja turizma, tako i njegovog razvoja, koje će na različite načine integrisati turizam i spojiti zdravstvene i druge potrebe. Treba ulagati u razvoj i formiranje zdravstveno-rekreativnih centara svuda gde je to moguće, finasirati izgradnju potrebnih objekata i izgraditi odgovarajuću infrastrukturu. Za sve to je potrebno obezbediti državni i privatni kapital, odgovarajuće stručnjake i školovane kadrove. Ne treba dozvoliti da se razvojna šansa koju nudi zdravstveno-rekreativni turizam za razvoj pojedinih banjskih mesta u ovom delu Srbije tako olako propusti zbog nečije samovolje ili ličnih interesa. Činjenica je da ova vrsta turizma, u uslovima današnjih globalnih turističkih kretanja, jedina može ubrzati njihov razvoj, povećati broj turista i učiniti da one budu prepoznatnjive u celokupnom turističkom i privrednom razvoju Srbije.

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ANALYSIS OF DIFFERENCES OF DRAFTED AND UNDRAFTED NBA PLAYERS IN SOME ANTHROPOMETRIC AND MOTOR PARAMETERS

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Abstract: NBA Draft Combine is annually event where anthropometry, athletic and technical-tactical skills of college level basketball prospects are being assessed. The main aim of this study was to validate an existing set of Combine anthropometric and motor tests as a tool to distinguish drafted and undrafted basketball players. This study included 36 participants that went through whole testing protocol that include anthropometric measurements consisted (body height, body weight, body fat and wingspan) and motoric tests measuring speed (¾ court sprint), agility (lane agility and shuttle run) and power (standing vertical leap and maximal vertical leap). Student T-test was used to identify differences between drafted and undrafted players on NBA Draft 2020. Results showed no significant differences between observed groups for any of measured variables. Authors assumed that the players entering NBA Draft Combine already have an adequate level of motor skills and body dimensions and therefore the main criterion for selection on the Draft are basketball skills. In order to get more detailed and precise results, in future studies participants from all Combines (year 2000-2020) should be included and differences should be observed regarding to specific playing positions.

Keywords: NBA Draft Combine, morphology, speed, agility, power

INTRODUCTION

Basketball is one of the most popular sports around the world. The best and most competitive basketball league in the world is the National Basketball Association (NBA) in the USA and it is consisted of 30 clubs. Modern NBA basketball is characterized by a dynamic, fast and aggressive game in defence and attack (Ranisavljev, Mandic, Cosic, Blagojevic, & Dopsaj, 2020). Most activities during the game take place in high intensity and include sprinting, lateral and backward movements, jumps, and many technical elements such as dribbling, shooting and passing (Abdelkrim, Chaouachi, Chamari, Chtara, & Castagna, 2010) (Abdelkrim et al., 2010; Cui et al., 2019).

Basketball game requires a high level of athletic ability which implies optimal morphology, physical fitness, technical and tactical skills and mental abilities (Köklü, Alemdaroğlu, Koçak, Erol, & Fındıkoğlu, 2011; Ostojic, Mazic, & Dikic, 2006). During the basketball selection process, morphological characteristics, especially height and arm span, play a crucial role (Vaquera, Santos, Villa, Morante, & García-Tormo, 2015). Researches have confirmed that these parameters, along with body weight and standing reaching height can be good predictors of basketball success (Apostolidis & Emmanouil, 2015; Garcia-Gil et al., 2018). Also, the physical capacities of athletes are considered an essential factor of situational efficiency (Cui et al., 2019). The performance of all technical and tactical elements of the basketball game is directly influenced by motor skills such as speed, agility, strength, power and coordination (Fort-Vanmeerhaeghe, Montalvo, Latinjak, & Unnithan, 2016; Hoare, 2000).

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The evaluation of prospective players is extremely important in professional sports, especially in the USA system where professional clubs select the best university players for their teams through draft. The most popular sports organizations in the USA, such as the NBA and the National Football League (NFL) annually organize "*Combine*" events which, through a series of tests, provides teams with objective players' evaluation data. Players come from different college conferences and competition levels and mention data help in talent assessment and identification (Teramoto, Cross, Rieger, Maak, & Willick, 2018). "*NBA Draft Combine"*, organized annually in Chicago since 2000, consists of anthropometry, athletic skills and technical-tactical skills assessment. The protocol was developed by the National Basketball Conditioning Coaches Association (NBCCA) testing committee, with purpose to establish valid and reliable test protocols that are directly related to basketball performance and required physical capacity (Foran & Pound, 2007; Teramoto et al., 2018). University players, with the goal of playing in the NBA, come to "*Combine*" to present themselves to scouts and team coaches. After the "*Combine*", the NBA League organizes Draft in which each of the 30 teams selects two university players based on their scout reports.

Previous studies showed that "*NBA Draft Combine*" has some predictive validity for future performance of players and that it can help with players' evaluation (Milan et al., 2019; Teramoto et al., 2018). Also, study analysing *Combine* participants in the 2000–2018 period find that height, wingspan and leg power are determinants for being drafted as guards and agility and speed for power forwards and centres (Cui et al., 2019). Regardless of *Combine* measurements, studies also confirmed differences between elite and non-elite basketball players, mainly in explosive power, agility, isokinetic strength of knee muscles and the absolute strength of upper body (Delextrat & Cohen, 2008).

Therefore, the main aim of this study was to validate an existing set of anthropometric and motor tests as a tool to distinguish drafted and undrafted basketball players.

METHODS

Participants in this study were 36 basketball players (average 21.47 years old) that conducted all anthropometric and motor test on *NBA Draft Combine*. Participants were divided in two group regarding their *Draft status* with 19 players selected on official *NBA Draft* 2020(drafted) and 17 non-selected (un-drafted). Participants of the *Combine* with missing data in some tests, were excluded from the study. According to the propositions, all participants had to be over 19 years old. At the moment of *Combine*, participants were university basketball players, all clinically healthy and without locomotor injuries. NBA Draft Combine was held from 21st – 24th of May, 2020, in Chicago, Illinois, USA. All data are publicly available and were collected at the official NBA's *Draft Combine* website.

Set of variables included (i) anthropometric measurements consisted of; body height (BH), body weight (BW), body fat (BF) and wingspan (WS) and (ii) motoric tests that measured speed – ¾ court sprint (S), agility – lane agility (LA), shuttle run (SR) and power – standing vertical leap (SL), maximal vertical leap (ML). All variables measured with United States customary system were transformed to metric system.

BH and BW were measured with physician scale, WS with measuring tape and BF was assessed by measuring the skinfold thickness of pectoral, abdomen, and quadriceps using a skinfold calliper. In SL participants stands with both feet on the floor and jumps vertically as high as possible and taps the Vertec device (Sports Imports, Hilliard, OH, USA). In ML participant performs vertical jump after non-specified number of steps in 4.6 meters approach distance. In

both tests the final result is calculated as difference between the standing reach and the no step vertical reach. LA is performed with a cone placed at each of four corners of the lane. Participants move around the cones with combination of forward running, side-shuffle and backpedal. The result is the time to cover the distance. In S participant sprints from the baseline to the three-quarter length of the court as fast as possible, and their time is measured. Finally, participants in SR stay in the middle of the key and react to visual external stimuli and run to left or right side of the key, followed by the run to the opposite side and return in the middle.

For all variables descriptive statistic parameters were calculated (mean, standard deviation, maximum and minimum). To identify differences in observed variables between group of drafted and un-drafted players, Student T-test was used. Statistica 13.0 (TIBCO Software Inc, USA) was used for all analysis, and a p-level of 95% was applied.

RESULTS

Results of descriptive statistic analysis and Student T-test are shown in Table 1. As presented, drafted players achieved better values in most of the variables, but there are no any significant differences between them and undrafted players.

Table 1. Descriptive parameters and T-test

VARIABLE	DRAFTED		UN-DRAFTED		T (p)
	MEAN	SD	MEAN	SD	
BH (cm)	196.55	7.94	195.32	8.01	0.75
BW (kg)	97.98	12.41	96.02	9.45	0.86 (0.40)
BF%	7.03	2.01	7.68	2.94	0.66 (0.52)
WS	208.38	11.07	208.28	10.98	1.48 (0.16)
LA	11.27	0.46	11.26	0.55	-0.55 (0.59)
SR	2.66	0.29	2.62	0.23	0.86 (0.40)
S	3.25	0.15	3.26	0.17	-1.13 (0.27)
SL	31.05	3.57	28.59	4.12	0.88 (0.39)
ML	37.29	4.02	34.65	4.03	0.67 (0.51)

Legend: BH - body height, **BW -** body weight, **BF% -** body fat percentage, **WS –** wingspan, **LA -** lane agility, **SR -** shuttle run, **S -** ¾ court sprint, **SL -** standing vertical leap, **ML -** maximal vertical leap.

DISCUSSION

The aim of this study was to determine the differences in the observed set of variables between drafted and non-drafted players and therefore to determine the discriminant value of the existing NBA Draft Combine test protocol. The results indicate that there is no significant difference between the observed groups of basketball players in none of the variables that assessed morphological characteristics and motor abilities.

The most probable explanation for these results can be in fact that on this competitive level, the main criterion for selection on the Draft is basketball skill. It can be assumed that, given that participants are the best young basketball players across the country, and top talents from the rest of the world, who have been given the opportunity to present themselves at Combine, they already have a satisfactory level of motor skills and dimensions of morphological status. We can speculate that leg power, speed and agility, along with body dimensions, are fundamental physical attributes qualifying players to enter the Combine. The results of previous research have shown that elite and non-elite basketball players differ in explosive power, agility and strength of leg and upper body muscles (Delextrat & Cohen, 2008). Since this is the strongest and most competitive basketball league, in which approximately 500 best basketball players in the world compete, it is possible that those who are taken into consideration to be elected, already have sufficient motor capacities, and then technical-tactical skills will prevail in selection process. Indeed, in addition to anthropometric and motor assessments, the *Combine* participants are also tested for technical skills through two groups of tests – *Sport Up Shooting* and *Non-Stationary Shooting*. Also, it is known that clubs' scout departments analyse in detail the performance of individual basketball players through National College Athletic Association (NCAA) games, and it is to be consider that these will be the main criteria in selecting players.

It can be assumed that the set of morphological and motor variables used serves only as a control, whether the players have the capacities in accordance with the model values. When we take into consideration that multiple tests measure same or similar dimensions of motor ability area, and give overlapping information about basketball performance as determined by the authors of the study on participants of *Combine* from 2010 to 2017, there is a clear need to revise the existing protocols (Milan et al., 2019).

These results are not in accordance with similar study that included larger sample of participants (Cui et al., 2019). In brief, major difference between these studies was in fact that Cui et al. divided players in five groups regarding their playing positions. Results showed that the drafted players from five positions outperformed the undrafted in height, wingspan, vertical jump height and reach, line agility and three-quarter sprint test (Cui et al., 2019). Also, studies have shown that players in different positions have different morphological dimensions, primarily in terms of body height and weight and different technical and tactical requirements and, consequently, different levels of motor skills (Crawford, Kasmidi, Korompis, & Pollnac, 2006; Sella, McMaster, Beaven, Gill, & Hébert-Losier, 2019; Svilar, Castellano, Jukic, & Casamichana, 2018). This suggests that differences should be observed position-specific.

CONCLUSION

Results of this study showed no significant differences between observed groups for measured anthropometric and motoric variables. We can conclude that the players entering NBA Draft Combine already have an adequate level of motor skills and body dimensions and therefore the main criterion for selection on the Draft are basketball skills. Certainly, in future studies a larger sample of basketball players should be included, with participants from all Combines held so far. Also, as mentioned above, position-specific analysis should be done for a more complete picture.

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THE IMPACT OF SPORTS ON THE PHYSICAL DEVELOPMENT OF PRESCHOOL AND EARLY SCHOOL AGE CHILDREN

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Abstract: Physical growth and development are the backbone and material basis of whole development and because of this achieving the goals of upbringing and education in this aspect of development is tke main condition of every other development (Spasojević, Pribišev-Beleslin, Nikolić, 2007).Potential positive role may have the participation in sports activities in terms of making friendships, feelings of contentment and happiness, enthusiasm and inspiration, which all contributes to increasing the quality of life (Shapiro, Martin, 2010). The sport is valuable and perspective mechanism for improving physical and emotional health, and also building valuable and important social relations (Wilhite, Shank, 2009). The research will determine how sport affects the development of motor skills of a child of that age. The goal is to prove the connection between engaging in physical activities and the proper development of fine and gross motor skills in a child. The research sample was formed of 17 children of typical development, both sexes (58.8 % of boys), aged 6.1-7.7 years (Md = 7.2), who completed the first grade of primary school, and were also users service of JPU "Dječiji vrtić" Gacko, group-extended stay. The following questionnaires were used: Questionnaire for collecting general demographic data, Questionnaire for assessing physical development and Questionnaire on engaging in sports activities (author's questionnaires). Descriptive and inferential statistics were used in data processing. The results of the research showed that there are differences between boys and girls in the aspect of physical development in the overall average achievements - boys (M = 42.60, SD = 2.951) and girls (M = 42.43, SD = 2.820), but that these differences are not at the level of statistical significance ($p > 0.05$). Then, the results between the younger and older age group also do not show statistical significance (younger age 6.1-6.9 years (M = 41.88, SD = 2.167) and older age 7.2-7.7 years) (M = 43.11, SD = 2.934)). At the same time, the results showed that there is a statistically significant correlation between sports activities and physical development of children of both sexes of the specified age. Based on the above results, it can be concluded that first grade students who are in the preschool facility do not fully follow the physical aspects provided by the program of preschool education that is implemented in the institution "Dječiji vrtić" Gacko. Yet, there is significant positive impact doing sports on the development of physical abilities, also on improving motor skills of children of both sexes of the specified age. Due to the presented results, the conclusion is that the first grade students who attend the extended stay should be additionally stimulated through activities within the support program, in order to better encourage the development of abilities on which the educational work relies. The recommendation for future research on this and similar topics would be to include a larger number of children, to increase the sample. Also, it would be good to conduct a longitudinal research, which would include the assessment of children at the beginning and end of the stay, and thus linking the impact that the stay has on their development.

Keywords: sport, physical development, preschool and early school age children.

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UTICAJ SPORTA NA FIZIČKI RAZVOJ DJECE PREDŠKOLSKOG I RANOG ŠKOLSKOG UZRASTA

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Sažetak: Fizički rast i razvoj su okosnica i materijalna osnova celokupnog razvoja i zbog toga je ostvarivanje ciljeva vaspitanja i obrazovanja u ovom aspektu razvoja osnovni uslov svakog drugog razvoja (Spasojević, Pribišev-Beleslin, Nikolić, 2007). Potencijalno pozitivnu ulogu može imati učestvovanje u sportskim aktivnostima u smislu ostvarivanja prijateljstva, osećaja zadovoljstva i sreće, entuzijazma i inspiracije što sve doprinosi povećanju kvaliteta života (Shapiro, Martin, 2010). Sport je vrijedan i perspektivan mehanizam za jačanje fizičkog i emocionalnog zdravlja, kao i izgradnju vrijednih i važnih društvenih odnosa (Wilhite, Shank, 2009). Kroz istraživanje će se utvrditi na koji način sport utiče na razvoj motorike djeteta navedenog uzrasta. Cilj je da se dokaže povezanost bavljenja fizičkim aktivnostima i pravilnog razvoja fine i grube motorike kod djeteta. Uzorak istraživanja je formiran od 17 djece tipičnog razvoja, oba pola (58,8% dečaka), uzrasta 6,1-7,7 godina (Md = 7,2), koji su završili prvi razred osnovne škole, a ujedno su bili korisnici usluga JPU "Dječiji vrtić" Gacko, grupa-produženi boravak. Korišćeni su sljedeći upitnici: Upitnik za prikupljanje opštih demografskih podataka, Upitnik za procjenu fizičkog razvoja i Upitnik o bavljenju sportskim aktivnostima (autorski upitnici). U obradi podataka je korišćena deskriptivna i inferencijalna statistika. Rezultati istraživanja su pokazali da između dječaka i djevojčica na aspektu fizičkog razvoja postoje razlike u ukupnim prosečnim postignućima-dječaci (M=42,60, SD=2,951) i djevojčice (M=42,43, SD=2,820), ali da te razlike nisu na nivou statističke značajnosti ($p > 0,05$). Zatim, rezultati između mlađe i starije uzrasne grupe takođe ne pokazuju statističku značajnost (mlađi uzrast 6,1-6,9 godina (M=41,88, SD=2,167) i stariji uzrast 7,2-7,7 godina (M=43,11, SD=2,934)). Istovremeno, rezultati su pokazali da postoji statistički značajna korelacija između sportskih aktivnosti i fizičkog razvoja djece oba pola navedenog uzrasta. Na osnovu navedenih rezultata može se zaključiti da učenici prvog razreda koji se nalaze u dnevnom boravku razvojno ne prate u potpunosti fizičke aspekte predviđene programom predškolskog vaspitanja i obrazovanja koji se sprovodi u ustanovi "Dječiji vrtić" Gacko. Ipak, postoji značajan pozitivni uticaj bavljenja sportom na razvoj fizičkih sposobnosti, kao i jačanja motorike djece oba pola navedenog uzrasta. Zbog prikazanih rezultata, zaključak je da učenike prvog razreda koji pohađaju produženi boravak treba dodatno stimulisati kroz aktivnosti u okviru programa podrške, kako bi se bolje podstakao razvoj sposobnosti na kojima se oslanja vaspitno-obrazovni rad. Preporuka za buduća istraživanja ove i sličnih tema bi bila obuhvat većeg broja djece, odnosno povećanje uzorka. Takođe, bilo bi dobro da se sprovede longitudinalno istraživanje, koje bi obuhvatilo procjenu djece na početku i na kraju pohađanja boravka, a time i dovođenje u vezu uticaja koji boravak ima na njihov razvoj.

Ključne reči: sport, fizički razvoj, djeca predškolskog i ranog školskog uzrasta.

UVOD

Djete, kada je samostalno i kompetentno uključeno u interakciju sa socijalnim okruženjem, razvija svoju samosvest, samokontrolu, tolerantnost, saosećajnost, empatiju, odgovornost,

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kooperativnost, sposobnost djelovanja u timu, rešavanja problema i preuzimanja odgovornosti, pregovaranja i dijeljenja znanja. Odrasli mu pomažu i osnažuju ga u tome kroz ciljeve vaspitanja i obrazovanja u ovom aspektu. Prilikom podsticanja intelektualnog razvoja i učenja djece, za odrasle je bitno da znaju da je za učenje potrebna određena zrelost i predispozicija što predstavlja donju granicu učenja, dok gornja ili optimalna granica (koja se nalazi u zoni narednog razvoja djeteta) učenja kod deteta zavisi od vođenja onih koji su iskusniji (roditelji, staratelji ili nastavnici). Svako učenje ima neki osnovni začetak mnogo pre nego što se to može primjetiti. To je predučenje (prema Vigotskom) i u skladu sa tim dete ima akumulirano saznanje i iskustva koja su još intuitivna i neizreciva, ali predstavljaju osnov za dalje učenje. Mnoštvo jezika kojima se dete izražava, stupa u interakciju i komunikaciju sa okruženjem, omogućava mu da svoje misli, interesovanja, ideje, planove, saznanja, kreacije odnosno svoj unutrašnji svijet predoči spoljašnjem svijetu očekujući odgovor od njega. Aspekti razvoja su podržani sistemom učećih i igrolikih aktivnosti, kao i mrežom ishoda učenja u okviru integrisanog kurikuluma, što odgovara prirodi djeteta i njegovom pogledu na svijet. Ishodima se definišu razvojne promene i postignuća u pojedinim aspektima razvoja na određenim uzrasnim nivoima, govoreći o znanjima, veštinama i stavovima djeteta kao kompetencijama sa kojima djete korača ka narednom nivou razvoja (Spasojević, 2013).

Prema Pijažeu, definisani su sljedeći stadijumi razvoja deteta: senzomotorni, preoperacioni, stadijum konkretnih operacija i stadijum formalnih operacija Preoperacioni stadijum obuhvata uzrast od 2. do 6. godine života i čine ga dva podstadijuma: prekonceptualni (uzrast od 2. do 4. godine) i intuitivni (uzrast od 4. do 6. godine) (Matejić-Đuričić, Stojković, 2011).

Obrazovanje u ranom djetinjstvu je formativni proces koji je usmjeren prema aspektima razvoja djeteta: fizičkom, socio-emocionalnom, intelektualnom i govorno-jezičkom, kako bi se ono od ranog djetinjstva uključivalo i pripremalo za sve životne funkcije koje ga očekuju. Važnost psiho-fizičke zrelosti djeteta za polazak u školu se ogleda u karakteristikama navedenih aspekata razvoja (Spasojević, 2013).

Potencijalno pozitivnu ulogu može imati učestvovanje u sportskim aktivnostima u smislu ostvarivanja prijateljstva, osećaja zadovoljstva i sreće, entuzijazma i inspiracije što sve doprinosi povećanju kvaliteta života (Shapiro, Martin, 2010).

Vrtić je sigurna i podsticajna sredina u kojoj svako djete ima jednake mogućnosti za razvijanje potencijala, prilagođavajući se potrebama svakog djeteta, kao i radeći na otklanjanju fizičkih i socijalnih barijera za učenje i sam boravak djeteta u vrtiću. Predškolsko vaspitanje i obrazovanje je proces ranog učenja i formiranja ličnosti djeteta od rođenja do polaska u školu, usmjeren prema svim aspektima razvoja deteta. Cilj predškolskog vaspitanja i obrazovanja u Republici Srpskoj je da obezbjedi celovit razvoj svakom predškolskom djetetu kroz odgovarajuću podršku porodici, a u skladu sa djetetovim sposobnostima i mogućnostima (Spasojević, Pribišev-Beleslin, Nikolić, 2007).

Postizanje i održavanje dobrog zdravlja je značajan prostor koji se istražuje i u svetlu primjene sportskih sadržaja u očuvanju zdravlja. Benefiti od sporta su višestruki, naročito kada je u osnovi sportskih aktivnosti poboljšanje funkcionalnih sposobnosti, ali i promocija zdravlja, razvoj međuljudskih odnosa, jačanje optimizma, kao i poboljšanje svakodnevnog funkcionisanja osoba (Wilhite, Shank, 2009).

Fizičke aktivnosti povoljno utiču na opšti razvoj organizma, pri čemu vežbanje i kretanje podstiču rast i razvoj, ali i predupređuju posledice fizičke neaktivnosti. Fizičkim vežbanjem se razvijaju koordinacioni elementi kretanja povećavajući postignuća u pogledu snage , brzine, izdržljivosti, okretnosti, kao i učvršćivanja motornih veština. Šesta i sedma godina su period ubrzanog rasta i razvoja telesne visine i težine, a ujedno su i preduslov za dalji rast i razvoj svih ostalih organskih sistema. Bitan uslov za polazak u školu jeste upravo fizička zrelost koja je povezana sa rastom i razvojem početkom školovanja, jer školski rad deluje na lokomotorni aparat stvarajući fizičku sposobnost (Kamenov, Spasojević, 2008).

Osnovni ciljevi učenja koji su usmereni ka fizičkom razvoju su: da se stvori zdravo, jako i skladno razvijeno dete, zatim da dete treba da stekne raznovrsna i bogata motorička iskustva o svetu oko sebe, da treba da upozna sopstveno telo i njegove funkcije, kao i funkcije čula, da usavrši voljno usmeravanje pokreta, koordinaciju ruku i nogu sa razvojem vizuelno-prostorne sposobnosti, kao i sposobnost prostorne orjentacije (Spasojević, 2013).

METOD

Osnovni cilj istraživanja je bio da se utvrdi na koji način sport utiče na razvoj motorike djeteta navedenog uzrasta, odnosno da se dokaže povezanost bavljenja fizičkim aktivnostima i pravilnog razvoja fine i grube motorike kod djeteta. Ovaj cilj je realizovan kroz sljedeće zadatke:

1. utvrditi nivo fizičkog razvoja prema polu
2. utvrditi nivo fizičkog razvoja prema uzrastu

Uzorak istraživanja je formiran od 17 djece tipičnog razvoja, oba pola (58,8% dečaka), uzrasta 6,1-7,7 godina (Md = 7,2), koji su završili prvi razred osnovne škole, a ujedno su bili korisnici usluga JPU "Dječiji vrtić" Gacko, grupa-produženi boravak.

Za prikupljanje podataka su korišćeni sljedeći upitnici: Upitnik za prikupljanje opštih demografskih podataka, Upitnik za procjenu fizičkog razvoja i Upitnik o bavljenju sportskim aktivnostima (autorski upitnici), a zatim je za obradu podataka korišćena deskriptivna i inferencijalna statistika.

Upitnik za prikupljanje opštih demografskih podataka sadrži informacije o ličnim podacima ispitanika: pol, datum i godina rođenja, razred koji učenik pohađa…

Upitnik za procjenu fizičkog razvoja proistekao je iz Programa predškolskog vaspitanja i obrazovanja (2007) koji je odobren od Ministarstva prosvjete i kulture Republike Srpske sa autorskim timom u sastavu Spasojević, Pribišev-Beleslin i Nikolić. Pomenuti program je koncipiran tako da su ciljevi predškolskog vaspitanja i obrazovanja na aspektu fizičkog razvoja sastavljeni od 16 ajtema. Procena se vrši kroz individualno praćenje svakog deteta, odnosno praćenje njihovih sposobnosti i mogućnosti pri izvođenju fizičkih aktivnosti.

Upitnik o bavljenju sportskim aktivnostima sastoji se od pitanja sa višestrukim izborom i pitanja na dopunjavanje u vezi sa sportom (da li se bave sportom, kojim, koliko često…).

U Tabeli 1. prikazana je struktura ispitanika prema polu. Primeno $\chi 2$ testa utvrđeno je da nema statistički značajne razlike između dječaka i djevojčica, te je uzorak ujednačen u odnosu na polnu strukturu ($\chi 2(1) = 0,529$, $p = 0,467$).

U Tabeli 2. prikazana je struktura ispitanika prema uzrastu. Kalendarski uzrast ispitanika je u rasponu od 6,1 do 7,7 godina (Md = 7,2).

Tabela 1. Struktura ispitanika prema polu

Pol	N	%
Muško	10	58,8
Žensko	7	41,2
Ukupno	17	100,0

Tabela 2. Struktura ispitanika prema uzrastu

	Min	Max	Md
Uzrast	6,1	7,7	7,2

Na osnovu postavljenog cilja definisane su sljedeće varijable:
Nezavisne- Pol (muški i ženski), Uzrast (6. i 7. godina),
Zavisne- Fizički razvoj, Sportske aktivnosti.

REZULTATI SA DISKUSIJOM

Rezultati istraživanja su pokazali da između dječaka i djevojčica na aspektu fizičkog razvoja postoje razlike u ukupnim prosečnim postignućima-dječaci (M=42,60, SD=2,951) i djevojčice (M=42,43, SD=2,820), ali da te razlike nisu na nivou statističke značajnosti (p > 0,05).
Tabela 4. prikazuje prosječna postignuća ispitanika muškog i ženskog pola u oblasti fizičkog razvoja. Prosječna postignuća na ajtemima aspekta fizičkog razvoja kreću se od 1,82 (0,393) do 3,00 (0,000). Maksimalni mogući skor je 48. Ukupno prosječno postignuće je 42,53 (2,601).
Tabela 5. Prikazuje postignuća ispitanika u oblasti fizičkog razvoja u odnosu na kalendarski uzrast. Ispitanici starijeg uzrasta su ostvarili ukupno prosječno postignuće 43,11 (2,934),dok je ukupno prosječno postignuće mlađih ispitanika bilo 41,88 (2,167).
Rezultati između mlađe i starije uzrasne grupe takođe ne pokazuju statističku značajnost (mlađi uzrast 6,1-6,9 godina (M=41,88, SD=2,167) i stariji uzrast 7,2-7,7 godina (M=43,11, SD=2,934)).
Rezultati su pokazali da postoji statistički značajna korelacija između sportskih aktivnosti i fizičkog razvoja djece oba pola navedenog uzrasta.

Tabela 4. Postignuća ispitanika u oblasti fizičkog razvoja u odnosu na pol

Fizički razvoj	N		Min		Max		M (SD)		Ukupno
	M	Ž	M	Ž	M	Ž	M	Ž	M (SD)
Ajtem 1	10	7	3	2	3	3	3,00 (0,000)	2,86 (0,378)	2,94 (0,243)
Ajtem 2	10	7	2	2	3	3	2,90 (0,316)	2,86 (0,378)	2,88 (0,332)
Ajtem 3	10	7	3	2	3	3	3,00 (0,000)	2,71 (0,488)	2,88 (0,332)
Ajtem 4	10	7	2	2	3	3	2,50 (0,527)	2,71 (0,488)	2,59 (0,507)
Ajtem 5	10	7	2	2	3	3	2,80 (0,422)	2,86 (0,378)	2,82 (0,393)
Ajtem 6	10	7	3	2	3	2	3,00 (0,000)	2,86 (0,378)	2,94 (0,243)
Ajtem 7	10	7	3	2	3	3	3,00 (0,000)	2,86 (0,378)	2,94 (0,243)
Ajtem 8	10	7	2	2	3	3	2,90 (0,316)	2,71 (0,488)	2,82 (0,393)
Ajtem 9	10	7	2	2	3	3	2,60 (0,516)	2,71 (0,488)	2,65 (0,493)
Ajtem 10	10	7	2	2	3	3	2,20 (0,422)	2,43 (0,535)	2,29 (0,470)
Ajtem 11	10	7	1	2	3	3	2,40 (0,699)	2,43 (0,535)	2,41 (0,618)
Ajtem 12	10	7	1	2	2	2	1,80 (0,422)	2,00 (0,000)	1,88 (0,332)
Ajtem 13	10	7	1	1	2	2	1,80 (0,422)	1,86 (0,378)	1,82 (0,393)
Ajtem 14	10	7	3	3	3	3	3,00 (0,000)	3,00 (0,000)	3,00 (0,000)
Ajtem 15	10	7	3	3	3	3	3,00 (0,000)	3,00 (0,000)	3,00 (0,000)
Ajtem 16	10	7	2	2	3	3	2,70 (0,483)	2,57 (0,535)	2,65 (0,493)
Ukupno	10	7	39	37	46	45	42,60 (2,951)	42,43 (2,820)	42,53 (2,601)

Tabela 5. Postignuća ispitanika u oblasti fizičkog razvoja u odnosu na kalendarski uzrast

Fizički razvoj	N		Min		Max		M (SD)		Ukupno
	M	S	M	S	M	S	M	S	M (SD)
Ajtem 1	8	9	3	2	3	3	3,00 (0,000)	2,89 (0,333)	2,94 (0,243)
Ajtem 2	8	9	2	2	3	3	2,88 (0,354)	2,89 (0,333)	2,88 (0,332)
Ajtem 3	8	9	3	2	3	3	3,00 (0,000)	2,78 (0,441)	2,88 (0,332)
Ajtem 4	8	9	2	2	3	3	2,50 (0,535)	2,67 (0,500)	2,59 (0,507)
Ajtem 5	8	9	2	2	3	3	2,75 (0,463)	2,89 (0,333)	2,82 (0,393)
Ajtem 6	8	9	3	2	3	3	3,00 (0,000)	2,89 (0,333)	2,94 (0,243)
Ajtem 7	8	9	3	2	3	3	3,00 (0,000)	2,89 (0,333)	2,94 (0,243)
Ajtem 8	8	9	2	2	3	3	2,75 (0,463)	2,89 (0,333)	2,82 (0,393)
Ajtem 9	8	9	2	2	3	3	2,50 (0,535)	2,78 (0,441)	2,65 (0,493)

Ajtem 10	8	9	2	2	2	3	2,00 (0,000)	2,56 (0,527)	2,29 (0,470)
Ajtem 11	8	9	1	2	3	3	2,25 (0,707)	2,56 (0,527)	2,41 (0,618)
Ajtem 12	8	9	1	1	2	2	1,88 (0,354)	1,89 (0,333)	1,88 (0,332)
Ajtem 13	8	9	1	1	2	2	1,88 (0,354)	1,78 (0,441)	1,82 (0,393)
Ajtem 14	8	9	3	3	3	3	3,00 (0,000)	3,00 (0,000)	3,00 (0,000)
Ajtem 15	8	9	3	3	3	3	3,00 (0,000)	3,00 (0,000)	3,00 (0,000)
Ajtem 16	8	9	2	2	3	3	2,50 (0,535)	2,78 (0,441)	2,65 (0,493)
Ukupno	8	9	39	37	45	46	41,88 (2,167)	43,11 (2,934)	42,53 (2,601)

ZAKLJUČAK

Na osnovu navedenih rezultata može se zaključiti da učenici prvog razreda koji se nalaze u dnevnom boravku razvojno ne prate u potpunosti fizičke aspekte predviđene programom predškolskog vaspitanja i obrazovanja koji se sprovodi u ustanovi "Dječiji vrtić" Gacko. Ipak, postoji značajan pozitivni uticaj bavljenja sportom na razvoj fizičkih sposobnosti, kao i jačanja motorike djece oba pola navedenog uzrasta.

Zbog prikazanih rezultata, zaključak je da učenike prvog razreda koji pohađaju produženi boravak treba dodatno stimulisati kroz aktivnosti u okviru programa podrške, kako bi se bolje podstakao razvoj sposobnosti na kojima se oslanja vaspitno-obrazovni rad.

Preporuka za buduća istraživanja ove i sličnih tema bi bila obuhvat većeg broja djece, odnosno povećanje uzorka. Takođe, bilo bi dobro da se sprovede longitudinalno istraživanje, koje bi obuhvatilo procjenu djece na početku i na kraju pohađanja boravka, a time i dovođenje u vezu uticaja koji boravak ima na njihov razvoj.

Razvoj podrazumjeva sled promjena u osobinama, sposobnostima i ponašanju djeteta tokom kojih se ono mijenja te postaje sve veće, sposobnije, spretnije, društvenije i prilagodljivije. Zbog važnosti redosljeda razvojnih stadijuma, svako djete daje individualni pečat određenom razdoblju, prateći određene promjene u razvoju. Temelj dječje psihologije je poznavanje dječjeg razvoja, gdje je djete aktivni nosilac vlastitog razvoja. Najvažniji razlog poznavanja karakteristika dječjeg razvoja, kao i značaja djeteta u razvojnim stadijumima jeste mogućnost stvaranja optimalnih uslova za razvoj u samoj okolini djeteta (Starc i sar., 2004).

Djecu treba posmatrati , upoznati njihove sklonosti i interesovanja, otkriti šta privlači njihovu pažnju, kako bi se odabrali sadržaji i postupci koji će ih angažovati na način koji je najkorisniji za njihov razvoj. Različite faze fizičkog i mentalnog razvoja odvijaju se sopstvenim tempom i u različito vrijeme dospijevaju do zrelosti. Razumijevanje opštih karakteristika dječjeg razvoja značajno je za onoga ko se bavi vaspitanjem, tako da postupak prema djetetu bude prilagođen njegovim sposobnostima i mogućnostima sa odmjerenim zahtevima koji nisu ni preteški ni prelaki (Kamenov, Spasojević, 2008).

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GUIDELINES FOR PHYSICAL ACTIVITY AT HOME DURING THE COVID-19 PANDEMIC

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Abstract: The spread of the COVID-19 virus worldwide has disrupted the normalcy of everyday life, forcing the population to physically distance themselves and self-isolate, and thus reducing physical activity. At the same time, insufficient physical activity is the main risk factor for the development of conditions and diseases that are at the same time risk factors for COVID-19 infection. Exercise therapy is a well-known non-pharmacological treatment in developed and developing countries, primarily in people who suffer from physical, physiological or psychological problems. However, given that a large percentage of precautionary measures also apply to sports activities, home training has remained one of the few opportunities to engage in physical exercise and maintain activities during a pandemic. For this reason, this paper aimed to theoretically consider the consequences of (self)isolation during the COVID-19 pandemic on an individual's health and to provide guidelines for physical activity at home. For this purpose, a multi-component recommended exercise program for training at home is described, which includes aerobic training, resistance training and stretching training. Each component of this program meets the recommendations for the frequency, intensity, time, and type of exercise ((FITT). Even if an individual cannot meet the recommended goals, performing the exercises is useful, especially for inactive people, and for that reason, they should be encouraged, except in cases when there are contraindications for that. Exercising at home should help alleviate obesity and reduce the occurrence of musculoskeletal pain, better control of psychological problems and strengthen mental health.

Keywords: isolation, quarantine, training, exercise, FITT.

SMERNICE ZA FIZIČKU AKTIVNOST U KUĆNIM USLOVIMA U VREME KOVID-19 PANDEMIJE

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Sažetak: Širenje virusa KOVID-19 na globalnom nivou poremetilo je normalnost svakodnevnog života primoravajući stanovništvo na fizičko distanciranje i samoizolaciju, a samim tim i na smanjenu fizičku aktivnost. Ujedno, nedovoljna fizička aktivnost glavni je faktor rizika za razvoj stanja i bolesti koje su istovremeno faktori rizika i za KOVID-19 infekciju. Terapija vežbanjem poznat je nefarmakološki tretman u razvijenim zemljama i zemljama u razvoju, prvenstveno kod ljudi koji pate od fizičkih, fizioloških ili psiholoških problema. No, s obzirom na to da se u velikom procentu mere predostrožnosti tiču i sportskih aktivnosti, kućni trening je ostao kao jedna od retkih mogućnosti bavljenja fizičkim vežbanjem

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i održavanja aktivnosti tokom pandemije. Iz tog razloga cilj ovog rada bio je teorijsko razmatranje posledica (samo)izolacije tokom KOVID-19 pandemije na zdravlje pojedinca i davanje smernica za fizičku aktivnost u kućnim uslovima. U tu svrhu opisan je višekomponentni preporučeni program vežbanja za trening u kućnim uslovima koji uključuje aerobni trening, trening otpora i trening istezanja. Svaka komponenta ovog programa udovoljava preporukama za učestalost, intenzitet i obim vežbanja i vrstu vežbi (FITT preporuke - *frequency, intensity, time, and type of exercise*). Čak i ako pojedinac ne može da ispuni preporučene ciljeve, izvođenje vežbi je korisno, posebno kod neaktivnih osoba, te ih iz tog razloga treba podsticati, osim u slučajevima kada postoje kontraindikacije za to. Vežbanje u kućnim uslovima treba da pomogne u ublažavanju gojaznosti i smanjenju pojave mišićno-koštanog bola, boljoj kontroli psiholoških problema i jačanju mentalnog zdravlja.

Ključne reči: izolacija, karantin, trening, vežbanje, FITT.

UVOD

Fizička neaktivnost identifikovana je kao jedan od četiri vodeća faktora prerane smrtnosti (Shariat, et al., 2020). Zasnovano na činjenicama epidemioloških dokaza o svojim preventivnim/ terapijskim blagodetima i uzimajući u obzir glavne biološke medijatore koji su uključeni u sam proces, vežbanje se smatra multiterapijom. Potpuno prekidanje aktivnosti i promena načina života ljudi tokom karantina nastalog usled globalne pandemije SARS-Cov 2 virusom, signifikantan je uzrok stresa, povećanja telesne težine i pojave drugih poremećaja. Nameće se zaključak da je održavanje aktivnog načina života u kućnim uslovima tokom pandemije vrlo važno za održavanje zdravlja celokupne populacije, posebno one sa pridodatim faktorima rizika (Jiménez-Pavón, Carbonell-Baeza, & Lavie, 2020). Različitim istraživanjima je potvrđeno da je neadekvatna fizička aktivnost glavni faktor rizika za nastanak kardiovaskularnih bolesti, hipertenzije, dijabetesa i respiratornih oboljenja, a samim tim i faktor rizika za nastanak KOVID-19 infekcije (Patterson, et al., 2018; Young, et al., 2016; Chow, et al., 2020). Fizička aktivnost i vežbanje ispostavili su se sveobuhvatnom i svrsishodnom terapijom za većinu hroničnih bolesti čineći istovremeno izuzetne efekte i na mentalno i fizičko zdravlje. Istovremeno pokazali su delotvornost za održavanje fiziološke funkcije i rezerve većine organskih Sistema, a što zajedno može doprinieti borbi protiv mentalnih i fizičkih posledica i težine same KOVID-19 bolesti (Jiménez-Pavón, Carbonell-Baeza, & Lavie, 2020). Usled smanjenja fizičke aktivnosti, mišići (posebno mišići leđa) slabe i mogu atrofirati, što može uzrokovati mišićno-koštane bolove kičmenog stuba, bolove u vratu i ramenom pojasu (Shariat, et al., 2020).

S druge strane, nasuprot očitim blagodatima vežbanja, prekomerna upotreba i nepravilna forma vežbanja mogu dovesti i do pojave muskuloskeletnih oboljenja (eng. *musculosceletal diseases*, MSD) kao i do upale zglobova usled prekomerne upotrebe. Neosnovano postoji uverenje (koje predstavlja i glavnu prepreku za vežbanje) da će osobama s artritisom, bolovima u krstima i drugim oblicima MSD-a vežbe sa opterećenjem pogoršati simptome. Stoga, lekari na polju fizikalne i sportske medicine ovakve pacijente treba da uvere da je prikladan opseg vežbanja, ne samo siguran već i da uopšteno smanjuje bol i upalu zahvaćenih zglobova (Memari, Shariat, & Anastasio, 2020). Pored navedenog, neizostavan je osvrt i na svakodnevicu modernog i industrijalizovanog sveta u kom se podrazumeva svakodnevno korišćenje kompjutera ili pametnih telefona u različite svrhe, a usled čega značaj fizičke aktivnosti dobija još više na težini. Razumno je pretpostaviti da se ovakav sedentaran način života intezivno produbljuje u uslovima koje nameću pandemija i mere karantina.

U studiji Kina i saradnika (Qin, et al., 2020) sprovedenoj među kineskim stanovništvom, izneto je da je tokom perioda karantina broj ispitivanih državljana sa neadekvatnom fizičkom

aktivnošću bio više nego dvostruko veći u odnosu na globalni nivo, a vreme provedeno ispred ekrana iznosilo je više od četiri sata dnevno. Došlo se do zaključka da fizička aktivnost može biti delotvoran način smanjenja sedentarno provedenog vremena, posebno za mlade odrasle osobe; da terapija vežbanjem, kao poznati nefarmakološki tretman u razvijenim zemljama i zemljama u razvoju, ima pozitivne efekte na ljude koji pate od fizičkih, fizioloških ili psiholoških problema (Alizadeh, 2018).
Mere koje ograničavaju kretanje ljudi zbog korona-virusne krize ne moraju nužno značiti da se fizička aktivnost mora ograničiti ili da se svi oblici vežbanja moraju u potpunosti eliminisati. Postoji jaka veza između stepena fizičke aktivnosti i "spremnosti" našeg imunološkog sistema za susret sa virusom. Studija koja je sprovedena nad italijanskom populacijom (Maugeri, et al., 2020), putem internet ankete podrazumevala je istraživanje u vidu upitnika koji je merio ukupni nedeljni utrošak energije za telesnu aktivnost pre i za vreme karantina. U ispitivanju je jednom nedeljno meren broj koraka, telesna aktivnost umerenog intenziteta i telesna aktivnost snažnog intenziteta u metabolički ekvivalentnim vremenskim intervalima (MET – min/sedmica) koristeći prilagođenu verziju Međunarodnog upitnika za fizičku aktivnost i njenu psihološku dobrobit pomoću Psihološkog indeksa opšte koristi. U pomenutoj studiji od 2524 ispitanika, 1426 su bile osobe ženskog pola (56,4%) i 1098 osobe muškog pola (43,6%). Kao zaključak studije navedeno je da se ukupna telesna aktivnost značajno smanjila u odnosu na period pre pandemije.

FITT smernice i protokol vežbanja

Osnovni elementi programa vežbanja koji je ograničen na kućno okruženje su modalitet, učestalost, volumen i intenzitet vežbi (Shariat, et al., 2020). Odnosno, treba imati u vidu da u osnovi protokola vežbanja postoji pravilo da komponente programa udovoljavaju FITT preporukama, odnosno povećanju fizičkog vežbanja putem porasta učestalosti (eng. *frequency*), intenziteta (*intensity*), trajanja vežbanja (*time of exercise*) i vrste vežbi (*type of exercise*) (Blair, et al., 2012) Višekomponentni program dalje podrazumeva zastupljenost nekoliko oblika treninga u svom protokolu: aerobni trening, treninga otpora i vežbe istezanja, a koji podležu pomenutim FITT smernicama. Ukoliko osoba ne može da ispuni preporučene ciljeve, izvođenje vežbi svejedno je korisno, posebno kod neaktivnih ili osoba koje su van kondicije. Iz tog razloga treba ih podsticati na fizičku aktivnost, sem ako ne postoje opravdane kontraindikacije za to. Program treba da bude bezbedan, kakoza osobe sa dijagnostikovanim oboljenjima, takao i za zdrave osobe koje iz određenog razloga treba posebno da budu obazrive. Pre nego što se započne vežbanje, mora se utvrditi dovoljna fizička spremnost za ovakve treninge uz eventualnu konsultaciju lekara. Ne započinje se ni jedan od programa ukoliko postoji bilo kakva nesigurnost za izvođenje istih. U cilju lakšeg i bezbednijeg sprovođenja fizičke aktivnosti i treninga u ovakvim specifičnim uslovima, pojedinac se može osloniti na određeni program vežbanja koji ima već pomenute elemente i karakteristike (učestalost i intenzitet vežbanja, trajanje i vrstu vežbi) (Shariat, et al., 2020). Kao jedna od osnova fizičke aktivnosti, aerobni trening deluje na poboljšanje kardiorespiratorne kondicije, kardiometaboličkih biomarkera i drugih fizioloških varijabli povezanih s kondicijom i zdravljem, posebno ako uključuje ponavljanje vežbanja do nekoliko puta tokom sedmice. Mišićno-koštane povrede tokom treninga su moguće, ali se taj rizik smanjuje uvođenjem vežbi zagrevanja (najmanje 5-10 minuta kardiorespiratornih i mišićnih vežbi izdržljivosti, laganog do umerenog intenziteta) i vežbi hlađenja (najmanje 5-10 minuta lagane kardiorespiratorne i mišićne aktivnosti izdržljivosti, do umerenog intenziteta), vežbe istezanja (najmanje 10 min) i postepeno povećavanje obima i intenziteta vežbanja. Reč je o vežbama koje uključuju velik broj ponavljanja, trening pod malim opterećenjem, kao i male pauze između ponavljanja. Izvođenjem aerobnih vežbi, telo već nakon 20 minuta počinje da koristi masti kao pogonsko

gorivo. Redovno aerobno vežbanje može doprineti boljem radu metabolizma. Istovremeno poštujući smernice za fizičku aktivnost Američkog koledža sportske medicine (American College of Sports Medicine, ACSM) i Američkog udruženja za srce (American Heart Association, AHA), može se reći da bi sve zdrave odrasle osobe starosti od 18 do 65 godina trebalo da se bave aerobnim aktivnostima najmanje 3-5 dana sedmično. Pod merama karantina i sa smanjenjem svakodnevne aktivnosti, ove bi se preporuke mogle prilagoditi i povećati tako da program može uključivati sve dane u nedelji, uz usklađivanje u obimu i intenzitetu vežbanja. Minimalni intenzitet vežbanja koji bi bio delotvoran varira zavisno od trenutne kardiorespiratorne kondicije, ali i drugih činilaca kao što su starost, zdravstveno i fiziološko stanje, genetika, uobičajena fizička aktivnost i psiho-socijalni faktori (Shariat, et al., 2020; Sisson, et al., 2009; Swain, & Leutholtz, 1997). Smernice sugerišu da u toku jedne sedmice treba sprovesti najmanje 150 do 300 minuta aerobnih vežbi i minimum 2 treninga otpora. Vežbe za očuvanje i povećanje pokretljivosti bi trebalo izvoditi tokom svih dana treninga, a vežbe ravnoteže i koordinacije bi trebalo rasporediti između različitih dana treninga (najmanje dva puta nedeljno) (Shariat, et al., 2020; Caspersen, Powell, & Christenson, 1985; Garber, et al., 2011; Haskell, et al., 2007). Preporukama se dalje implicira umereni intenzitet za većinu sesija i određena količina intezivnog treninga nedeljno. Poznato je da vežbanje umerenim intenzitetom poboljšava imunološki sistem, dok visok intenzitet vežbanja može čak da ga inhibira. To posebno dolazi do izražaja ukoliko su u pitanju ranije slabo aktivni, do neaktivni ljudi. Iz tog razloga bi, tokom ovog specifičnog perioda, umereni intenzitet koji iznosi 40–60% rezerve srčane frekvence (heart rate reserve, HRR) ili rezervi kiseonika (O2R) i lagani (30-39% HRR ili O2R), do umereni intenzitet mogli biti idealan izbor za one koji nisu u kondiciji, a koji žele na taj način da pojačaju zaštitnu uloga vežbanja (Shariat, et al., 2020).

Iako preporuke govore da je za većinu odraslih osoba bolje da vežbanje umerenim intenzitetom traje 30-60 min dnevno (≥ 150 min nedeljno) u jednom aktu (Shariat, et a.l, 2020; Garber, et al., 2011), sa mogućnošću produženja na 200-400 minuta nedeljno, raspoređeno na 5-7 dana, i manje od 20 minuta vežbanja dnevno može biti korisno, posebno kod prethodno neaktivnih osoba. Pored toga, učesnici mogu izvoditi aerobne aktivnosti u nekoliko intervala od po 10 minuta, a da njihovo ukupno trajanje na kraju iznosi najmanje 30 minuta. Preporučuje se redovna, svrsishodna vežba koja uključuje glavne mišićne grupe i koja je ritmična i kontinuirana. I kada pojedinac nema pristup opremi ili određenim sredstvima za trening, postoje izvesne mogućnosti za izvođenje fizičkih aktivnosti koje su dostupne u bilo kojoj kući, kao što su hodanje na prstima ili petama, preskakanje užeta, penjanje stepenicama i druge vežbe otpora kroz vežbe sa sopstvenom telesnom težinom, poput čučnjeva, sedenja i ustajanja sa stolce, prenosa predmeta s laganim i umerenim teretom (povrće, pirinač, voda itd.), aerobne vežbe poput hodanja unutar kuće, ples ili vežbe ravnoteže, poput hodanja po liniji na podu, prelazak preko prepreka i sl.

Već ranije spomenuto, sedentarni način života povezan je i sa lošim zdravstvenim ishodima, a povećanje fizičke aktivnosti povezano je sa poboljšanjima u kontroli glukoze u krvi i HDL holesterola, uz istovremeno smanjenje obima struka i sistolnog krvnog pritiska. Jednostavni trening snage zasnovan na osnovnim pokretima iz ljudskog života (guranje, povlačenje, čučanj-ustajanje i sl), može biti od koristiti za poboljšanje zdravlja i poboljšanje imunološkog statusa. Uobičajena zabluda je da trening snage ne doprinosi razvoju kardiovaskularnog sistema i da ne pruža iste prednosti kao strogi aerobni trening ili “kardio". Poznato je da “zamaranjem” miocita dolazi do nakupljanja mlečne kiseline u sistemskoj cirkulaciji, pri čemu se ovaj nusprodukt plućnim sistemom mora očistiti, što dovodi do povećane kardiovaskularne funkcije. Udovoljavajući FITT preporukama, neke od opštih smernica koje treba naglasiti, a od značaja su za izvođenje ove vrste vežbi, tj treninga snage, su sledeće: potrebno je primeniti tri nivoa težine vežbi; proporcija koja se primenjuje pri izvođenju vežbi treba da bude u sazmeri 3:1 ili 2:1 sekunde za udeo ekscentričnog i koncentričnog izvođenja pokreta; potrebno je sprovesti

određen broj serija i ponavljanja (3-5 serija koje se sastoje od 1-15 ponavljanja sa pauzom između). Takođe, treba izdvojiti, da se svi pokreti i vežbe mogu izvesti sa minimalnom opremom koja se može pronaći u kancelariji i kući: zid, okvir vrata, sto ili stolica i sl. (Shariat, et al, 2017; Shariat, et al, 2020).

Od izuzetne važnosti kao deo celokupnog programa fizičke aktivnosti jeste trening istezanja. Ovaj vid fizičkog treninga je od ključne koristi u sprečavanju povreda i ukočenosti zglobova i mišića. Takođe, istezanje pomaže u pružanju hranjivih sastojaka mekim tkivima i ligamentima. Sedentaran način života povezan s karantinom može potencijalno rezultirati smanjenom fleksibilnošću koja je vitalna za održavanje celokupne kondicije i držanja tela (Shariat, et al., 2020), pri čemu smanjene aktivnosti istezanja mogu dovesti i do oštećenja tkiva. Studije su pokazale da vežbe istezanja mogu sprečiti ukočenost, ali da tek treba utvrditi odgovarajuće doziranje kako bi se povećala fleksibilnost (Coggon, et al., 2013). Trenutni preporučeni režim vežbanja predložen od srane ACSM-a jeste nov i specifičan po tome što se može izvoditi u bilo kojoj kancelariji/ kući, i za njega nije potrebna posebna oprema, a vežbe su jednostavne i lako se izvode. Treba napomenuti da je pomenuti program za ovaj tip vežbi u kućnim uslovima specijalno modifikovan i prilagođen od strane Mekenzija i Vilijama (Hosseinifar, et al., 2013) s namerom da se poveća fleksibilnost ljudi u kućnom okruženju. Po preporukama iz pomenutog programa, sve vežbe treba da se izvode u proseku 10-15 minuta i tri puta nedeljno. Vežbe se sastoje od 10 ponavljanja (ili traju 10-15 sekundi) i treba ih izvoditi polako i kontrolisano, tri puta dnevno (uz odmor od 60-90 sekundi između serija). Vežbe istezanja izvode se tako što se ciljni efekat na mišiću ostvaruje na kraju obima pokreta, što treba da se oseti kao blaga nelagoda (American College of Sports Medicine, 2013).

Uzimajući u obzir navedene smernice i poštujući zakonitosti datih preporuka potrebno je voditi računa da trening bude usmeren na individualni pristup i prilagođen svakom pojedincu u skladu sa njegovim mogućnostima, ograničenjima i potrebama, a ujedno da zadovoljava sve izdvojene kvantitativne i kvalitativne komponente vežbanja.

ZAKLJUČAK

Vreme tokom karantina i uslovi samoizolacije i fizičkog distanciranja dovode do značajnog smanjenja ukupne fizičke aktivnosti i potrošnje energije u svim starosnim grupama. Vežbanje u kućnim uslovima tokom ove situacije trebalo bi da bude od pomoći u sprečavanju/ublažavanju povećanja telesne mase i smanjenju rizika za nastanak mišićno-koštanog bola. Uz to, vežbanjem se jača i podstiče samopouzdanje i otpornost na stres, a ujedno umanjuje nivo depresije i teskobe. Takođe, održavanje telesne aktivnosti tokom pandemije KOVID-19 korisno je i u cilju smanjenja psihološke simptomatologije i jačanja fizičkog i mentalnog zdravlja stanovništva tokom ovog izazovnog vremena.

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RELATIONSHIPS BETWEEN GLUCOSE REGULATION, DIABETES AND COVID-19

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Abstract: Diabetes is one of the most common chronic non-communicable diseases and is a major public health problem. The World Health Organization estimates that about 425 million people worldwide suffer from diabetes, with a further tendency to increase in prevalence, especially type 2 diabetes. With the advent of the 2019 coronavirus disease pandemic (KOVID-19), awareness of the impact of diabetes on infectious diseases, including the risk of various infections, complications and mortality of infection. Previous research has shown that diabetes, in addition to obesity, cardiovascular disease, and chronic obstructive pulmonary disease, is the most common comorbidity in patients with KOVID-19. For that reason, this paper aimed to theoretically consider the current knowledge about the relationship between the regulation of blood glucose levels, diabetes and Kovid-19. Data on glucose regulation and pathophysiology of diabetes and Kovid-19 were reviewed and analyzed. The findings indicate a two-way effect between diabetes and Kovid-19. Patients with diabetes belong to the category of people at increased risk for developing serious forms of Kovid-19 disease, while KOVID-19 could have an effect on the pathophysiology of diabetes. On the other hand, patients with diabetes who do not have complications and whose blood sugar level is well regulated, do not have a higher risk of developing more severe forms of KOVID-19 than the general population. Considering the results of previous research, it can be concluded that the regulation of blood glucose levels is of great importance for the prevention of complications from Kovid-19. In this regard, innovations such as telemedicine are useful for the treatment of patients with diabetes during the KOVID-19 pandemic.

Keywords: insulin, immunity, comorbidities, diabetes mellitus, obesity.

POVEZANOST REGULACIJE GLUKOZE, ŠEĆERNE BOLESTI I KOVID-19

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Sažetak: Šećerna bolest (dijabetes) jedno je od najčešćih hroničnih nezaraznih oboljenja i predstavlja veliki javnozdravstveni problem. Svetska zdravstvena organizacija procenjuje da u svetu od dijabetesa boluje oko 425 miliona ljudi, s daljom tendencijom porasta prevalence, posebno dijabetesa tipa 2. S pojavom pandemije koronavirusne bolesti 2019 (KOVID-19), povećala se svest o uticaju dijabetesa na zarazne bolesti, uključujući povećani rizik od različitih infekcija, komplikacija i mortaliteta od infekcija. Prethodna istraživanja su pokazala da je dijabetes, pored gojaznosti, kardiovaskularnih bolesti i hronične opstruktivne bolesti pluća najčešći komorbiditet kod pacijenata obolelih od KOVID-19. Iz tog razloga cilj ovog rada bio je teorijsko razmatranje dosadašnjih saznanja o vezi između regulacije nivoa glukoze u krvi, dijabetesa i Kovid-19. Pregledani su i analizirani podaci o regulaciji glukoze i patofiziologiji

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bolesti dijabetesa i Kovid-19. Dosadašnji nalazi ukazuju na dvosmerni uticaj između dijabetesa i Kovid-19. Osobe sa dijabetesom spadaju u kategoriju osoba sa povišenim rizikom za razvoj ozbiljnih formi oboljenja Kovid-19, dok bi KOVID-19 mogao imati efekat na patofiziologiju dijabetesa. S druge strane, osobe obolele od dijabetesa koje nemaju komplikacije i čiji je nivo šećera u krvi dobro regulisan, nemaju veći rizik od razvoja težih oblika KOVID-19 od opšte populacije. Sagledavši rezultate dosadašnjih istraživanja izvodi se zaključak da je za prevenciju komplikacija od Kovid-19 od velikog značaja regulacija nivoa glukoze u krvi. S tim u vezi inovacije poput telemedicine korisne su za lečenje pacijenata sa dijabetesom u vreme pandemije KOVID-19.

Ključne reči: insulin, imunitet, komorbiditeti, diabetes mellitus, gojaznost.

UVOD

Šećerna bolest jedna je od najčešćih hroničnih nezaraznih bolesti i predstavlja veliki javnozdravstveni problem. Svetska zdravstvena organizacija procenjuje da u svetu od šećerne bolesti (*diabetes mellitus*) boluje oko 425 miliona ljudi, s daljom tendencijom porasta prevalencije, posebno dijabetesa tipa 2 (usled povećanja gojaznosti i fizičke neaktivnosti) (WHO, 2020; IZJZS, 2018). Pacijenti s dijabetesom imaju znatno povećan rizik od razvoja komplikacija, teških infekcija i oštećenja plućne funkcije (Chee, Tan, & Yeoh, 2020). Odnos dijabetesa i infekcije odavno je klinički prepoznat. Infekcije su češće i ozbiljnije kod starijih ljudi s dijabetesom tipa 2. Ipak, dokazi ostaju kontroverzni u vezi s tim da li sam dijabetes povećava osetljivost prema infekciji i da li utiče na ishode infekcija, ili su pak kardiovaskularni i bubrežni komorbiditeti glavni faktori koji na te ishode imaju uticaj (Hussain, Bhowmik, & Moreira, 2020).

S velikom prevalencijom dijabetesa važno je razumeti posebne aspekte infekcije KOVID-19 kod osoba s dijabetesom. Iz tog razloga cilj ovog rada bio je teorijsko razmatranje dosadašnjih saznanja o vezi između regulacije nivoa glukoze u krvi, dijabetesa i Koronavirusne bolesti (KOVID-19). Za potrebe ovog rada izvršeno je pretraživanje PubMed elektronske baze podataka. Pregledom publikacija za analizu su odabrani radovi objavljeni do 24. aprila 2021. godine, koji su bili dostupni u punom tekstu i na engleskom jeziku. Prilikom pretraživanja elektronske baze podataka korišćene su sledeće ključne reči: „koronavirus", „SARS-CoV-2", „KOVID-19", „dijabetes", „faktori rizika" i „komorbiditeti". Pregledane su preporuke za upravljanje bolestima dijabetes i KOVID-19 koje su objavili Svetska zdravstvena organizacija (*World Health Organization – WHO*) i Međunarodna federacija za dijabetes (*International Diabetes Federation – IDF*). Konačni popis referenci izvršen je na osnovu relevantnosti za temu obrađenu u ovom radu, naglašavajući višestruke izazove u lečenju pacijenata s dijabetesom, koji su u riziku od KOVID-19 infekcije ili sa KOVID-19 infekcijom i dajući praktične preporuke za brigu o ovoj ranjivoj grupi pacijenata.

Povezanost dijabetesa s akutnim virusnim epidemijama u prošlosti

Poznato je da su osobe s dijabetesom izložene većem riziku od raznih akutnih i hroničnih infekcija u poređenju s osobama bez dijabetesa, zbog smanjenih urođenih i humoralnih imunoloških funkcija. Prethodne virusne epidemije svedoče o povezanosti dijabetesa i povećanog morbiditeta i mortaliteta. Dijabetes je smatran nezavisnim faktorom rizika za komplikacije i smrtni ishod tokom izbijanja epidemije Teškog akutnog respiratornog sindroma (SARS) 2002. i 2003. godine (Yang, et al., 2006; Singh, Gupta, Ghosh, & Misra, 2020). Tokom SARS epidemije stopa prijema u jedinicu intenzivne nege, potreba za mehaničkom ventilacijom i smrtnost pacijenata s dijabetesom bila je oko 3 puta veća nego kod pacijenata bez dijabetesa (Zhou, Chi, Lv, & Wang, 2021). Takođe, prijavljeno je da je dijabetes povećao

tri puta rizik od hospitalizacije i četiri puta rizik od prijema na intenzivnu negu tokom pandemije izazvane virusom gripa A (H1N1) 2009. godine (Zhou, et al., 2021; Singh, et al., 2020). U epidemiji Bliskoistočnog respiratornog sindroma (MERS) u toku 2012. godine, dijabetes je bio dominantan komorbiditet u 50% obolelih (Badawi & Ryoo, 2016; Singh, et al., 2020). Takođe, dijabetes je smatran važnim faktorom rizika za razvoj teških slučajeva MERS infekcije (Zhou, et al., 2021), a stopa smrtnosti u MERS bolesnika koji su imali dijabetes iznosila je 35% (Singh, et al., 2020).

Povezanost dijabetesa i KOVID-19

Krajem 2019. godine, novi Koronavirus (Teški akutni respiratorni sindrom koronavirus 2; engl. *Severe Acute Respiratory Syndrome Coronavirus 2*; SARS-CoV-2) izolovan je kao uzročnik upala pluća u gradu Vuhanu, u Kini. Od tada se pandemija KOVID-19 proširila svetom. Od početka pandemije do 24. aprila 2021., prijavljeno je više od 145 miliona potvrđenih slučajeva KOVID-19, uključujući više od 3 miliona smrtnih slučajeva u celom svetu. Pri tome, u Srbiji je prijavljeno više od 675 000 potvrđenih slučajeva KOVID-19, dok je umrlo više od 6000 ljudi (WHO Coronavirus Dashboard, 2021). Procenjuje se da stopa smrtnosti za KOVID-19 iznosi 0,5-1,0% (Lim, Bae, Kwon, & Nauck, 2021).

Koronavirus SARS-CoV-2 je pozitivni, jednolančani RNK virus koji ima sličnost (82%) sa ljudskim virusom SARS-CoV, prouzrokovačem SARS-a. U ljudskim ćelijama glavni receptor za SARS-CoV-2 je enzim koji pretvara angiotenzin 2 (ACE 2), koji je visoko izražen u plućnim alveolarnim ćelijama, srčanim miocitima, endotelu krvnih sudova i u raznim drugim vrstama ćelija. Glavni put prenosa je putem respiratornih kapljica koje sadrže virus. Oboleli od KOVID-19 razvijaju simptome bolesti najčešće 5-6 dana nakon infekcije. U većini slučajeva klinička slika infekcije je blaga (ispoljava se simptomima sličnim gripu) i ljudi se u tim slučajevima oporavljaju u kućnim uslovima. S druge strane, pojedini zaraženi ljudi nemaju nikakve simptome ili imaju samo blage simptome prehlade. Ipak, infekcija ima potencijala da se razvije u tešku bolest (u oko 14% slučajeva), a u manjem broju (u oko 5% slučajeva) može doći do nastanka kritične bolesti, uključujući sistemski sindrom upalnog odgovora, akutni respiratorni distres sindrom (ARDS), zahvaćenost više organa, šok i smrtni ishod (Lim, et al., 2021).

Ovakvi ishodi češći su kod ljudi koji imaju određene karakteristike, uključujući stariju dob, muški pol, hronične zdravstvene probleme poput kardiovaskularnih bolesti, hipertenzije, gojaznosti i hroničnih plućnih bolesti. Osobe s dijabetesom, takođe spadaju u kategoriju osoba sa povišenim rizikom za razvoj ozbiljnih formi oboljenja (Lim, et al., 2021). Većina dostupnih istraživanja ne pravi razliku između tipova dijabetesa i uglavnom su fokusirana na dijabetes tipa 2, zbog njegove velike prevalencije.

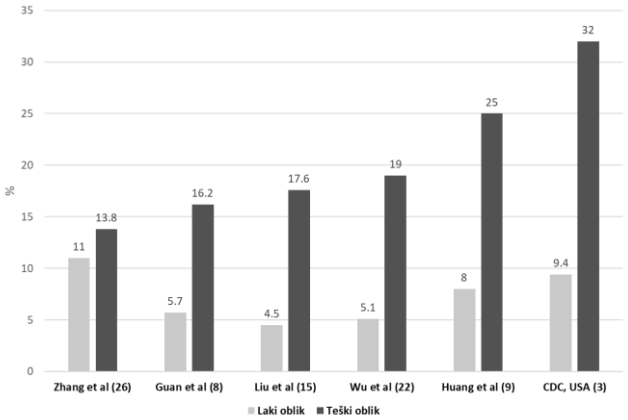
Razumevanje i upoznavanje s ovim novim virusom i dalje je u toku, brzo se pojavljuju nove informacije na ovom polju, kao i novi napredak u povezanosti regulacije glukoze, dijabetesa i KOVID-19.

Uticaj dijabetesa na KOVID-19 (morbiditet i mortalitet)

Prethodna istraživanja su pokazala da je dijabetes, pored gojaznosti, kardiovaskularnih bolesti i hronične opstruktivne bolesti pluća najčešći komorbiditet kod pacijenata obolelih od KOVID-19 (Singh, et al., 2020; Yang, et al., 2020). Još uvek nije u dovoljnoj meri razjašnjeno da li pacijenti s dijabetesom imaju veću osetljivost za KOVID-19, ali postoji zapažanje da je povećani rizik i za infekciju i za težinu bolesti.

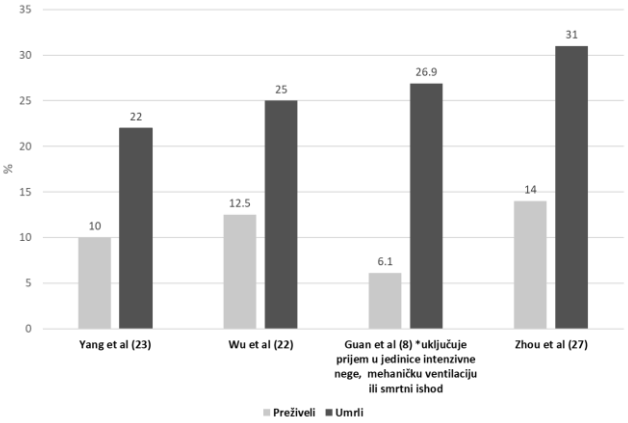
Sa izbijanjem KOVID-19 pandemije, kod velikog procenta obolelih je zabeležen dijabetes (Zhou, et al., 2021), pri čemu procenat ovakvih bolesnika među obolelim od KOVID-19 varira od 3% do 21% (Tadic, Cuspidi, & Sala, 2020). Međutim, treba napomenuti da postoji visok nivo heterogenosti između objavljenih studija koje se međusobno razlikuju u veličini uzorka,

starosnoj dobi pacijenata, težini oblika KOVID-19 oboljenja, istraženim pridruženim bolestima, terapijskom pristupu i konačno, ishodu. U dve objavljene meta-analize koje su uključile 46248 i 76993 KOVID-19 obolelih, dijabetes je otkriven u 8,6% i 7,9% (Li, et al., 2020; Yang, et al., 2020). Takođe, u još jednoj od do sada objavljenih studija (n = 1099) dijabetes je bio prisutan u 7,4% bolesnika s KOVID-19, a značajno je bio učestaliji kod bolesnika s teškim oblikom bolesti (16,2%) i onih koji su iskusili krajnju tačku primarnog ishoda – prijem u jedinice intenzivne nege, upotrebu mehaničke ventilacije ili smrtni ishod (26,9%) (Guan, et al., 2020). Ista grupa autora u većem uzorku bolesnika s KOVID-19 (n = 1590) prijavila je dijabetes u 8,2% slučajeva, a pokazano je i da je značajnije raširen među bolesnicima sa teškim oblikom KOVID-19 (34,6%) u odnosu na bolesnike sa lakšim oblikom bolesti (14,3%). Takođe, istraživanje koje je obuhvatilo 1012 nekritičnih KOVID-19 bolesnika izvestilo je o dijabetesu u samo 3% bolesnika (Wang, et al. 2020), međutim iako je prevalencija dijabetesa bila niska, tokom praćenja bolesnici s pogoršanjem KOVID-19 češće su bili dijabetičari u poređenju s onima koji nisu imali komplikacije tokom KOVID-19 (Tadic, et al., 2020). Istraživanja u različitim studijama (Slika 1) su pokazala da su pacijenti oboleli od KOVID-19 s dijabetesom češće povezani s teškim ili kritičnim oblikom bolesti KOVID-19 (14-32%) (Singh, et al., 2020).



Slika 1. Prevalencija (%) lakog i teškog oblika KOVID-19 u bolesnika s dijabetesom (modifikovano prema Singh, et al., 2020).

Rezultati su pokazali (Slika 2) i da je prevalencija umrlih, takođe bila veća u dijabetičara s KOVID-19 i varirala je od 22 do 31% u različitim studijama (Singh, et al., 2020).



Slika 2. Prevalencija (%) preživelih i umrlih KOVID-19 bolesnika s dijabetesom (modifikovano prema Singh, et al., 2020).

Iako trenutni dokazi ne sugerišu da su osobe s dijabetesom u većem riziku od infekcije SARS-CoV-2 virusom (Fadini, Morieri, Longato, & Avogaro, 2020), dijabetes je naveden kao treći najzastupljeniji komorbiditet, iza hipertenzije i drugih kardiovaskularnih bolesti, a povezan je i sa dva do tri puta većom zastupljenošću nepovoljnih ishoda (Li, et al., 2020). Slično tome, gojazne osobe s indeksom telesne mase > 35kg/m^2 imaju gotovo sedam puta veći rizik za korišćenje mehaničke ventilacije. Imajući u vidu navedeno, kao i to da gojaznost pogađa gotovo jednu trećinu svetske populacije, može se zaključiti da istovremeno postojanje gojaznosti i dijabetesa predstavlja još jednu veliku pandemiju s kojom se svet trenutno suočava. Uz to, utvrđeno je da su pacijenti sa mikrovaskularnim i makrovaskularnim komplikacijama dijabetesa, kao i opstruktivnom apnejom tokom spavanja, u znatno većem riziku od težih oblika bolesti, kao i smrtnosti (Ong, Young, Leo, & Lye, 2020).

Povezanost regulacije glukoze, dijabetesa i KOVID-19 (patofiziološki mehanizmi)

Patofiziološki mehanizami koji osobe s dijabetesom predisponiraju za povećanu težinu KOVID-19 bolesti su različiti. Dijabetes je povezan s imunološkom disfunkcijom i povećanom osetljivošću na zapaljenje. Takođe, moguća povezanost između SARS-CoV-2 i sistema renin-angiotenzin-aldosteron (RAAS) može povećati vezivanje virusa SARS-CoV-2 za ciljne ćelije i pogoršati ozbiljnost bolesti KOVID-19 (Chee, et al., 2020).

3.2.2. Metabolizam glukoze i imunomodulacija

U ljudskim monocitima povišene vrednosti glukoze direktno povećavaju replikaciju SARS-CoV-2, a glikoliza održava replikaciju SARS-CoV-2 proizvodnjom mitohondrijskih reaktivnih vrsta kiseonika i aktivacijom faktora 1α indukovanog hipoksijom. Prema tome, hiperglikemija može podstaći proliferaciju virusa. Prepoznato je da se mehanizmi koji povezuju KOVID-19 i dijabetes preklapaju s putevima koji regulišu imunološku funkciju (Lim, et al., 2021).

3.2.3. Pojačana inflamatorna oluja kod dijabetesa

Oboleli od dijabetesa pogođeni su hroničnom upalom niskog stepena, koja bi mogla olakšati nastanak citokinske oluje, što se dovodi u vezu sa ozbiljnim ishodima KOVID-19 i smrtnim slučajevima. Prethodna istraživanja su pokazala promene u bihemijiskim analizama KOVID-19 pacijenata s dijabetesom. Apsolutni broj limfocita u dijabetičara značajno je niži od onih bez dijabetesa, dok je broj neutrofila izrazito veći. Vrednosti pojedinih biomarkera povezanih s upalom, takođe su značajno povišene kod dijabetičara (C-reaktivni protein (CRP), prokalcitonin, interleukin 6 (IL-6), laktat-dehidrogenaza (LDH), fibrinogen, i D-dimer) (Lim, et al., 2021; Zhou, et al., 2021). Osim toga, značajno povećanje feritina u serumu takođe ukazuje na aktivaciju monocitno-makrofagnog sistema, koji je ključni deo upalne oluje (Zhou, et al., 2021). Prema tome, navedeni rezultati ukazuju na to da su pacijenti s dijabetesom podložni razvoju upalne oluje, koja na kraju dovodi do brzog pogoršanja KOVID-19.

3.2.4. Imunodeficijencija u dijabetesu (poremećeni urođeni i stečeni imuni odgovor)

Istraživanja su pokazala da, broj ukupnih T ćelija, kao i CD4+ i CD8+ T ćelijskih podgrupa su značajno smanjene i funkcionalno iscrpljene u pacijenata s KOVID-19 i dijabetesom, posebno među teškim slučajevima, što ukazuje na ulogu neregulisanih imunoloških odgovora u patogenezi KOVID-19. Odnosno, u osoba s dijabetesom, trajna hiperglikemija mogla bi dovesti do niza abnormalnih promena metaboličkih procesa, koji zajedno povećavaju proizvodnju superoksida i aktiviraju puteve upale, izazivajući disfunkciju imunološkog sistema. Nespecifična i brzo delujuća urođena imunološka obrana, koja pruža početni odgovor domaćina na invaziju SARS-CoV-2, na više načina je oslabljena kod dijabetesa. Posebno, neutrofili pokazuju nedostake u gotovo svim funkcijama, uključujući migraciju na mesto upale, oslobađanje litičkih proteaza, fagocitozu, proizvodnju reaktivnih vrsta kiseonika (ROS) i apoptozu. Fenotipovi i aktivnost ćelija prirodnih ubica (NK) takođe su promenjeni u šećernoj bolesti. Osim toga, CD8+ T ćelije su takođe bitne za adaptivni imunološki sistem i odgovor na

infekcije, izlučivanjem citokina poput interferona (IFN-γ) i faktora tumorske nekroze (TNF-α), kao i ekspresijom proupalnih citokina poput interleukina (IL-17) (Lim, et al., 2021; Zhou, et al., 2021).

3.2.5. Oštećenje pluća udruženo s dijabetesom

Dokazano je da je dijabetes povezan s fiziološkim i strukturnim poremećajima plućnog tkiva, kao i sa slabljenjem plućne funkcije. Dijabetičari pokazuju niži forsirani vitalni kapacitet (FVC), niži forsirani ekspiracijski volumen u jednoj sekundi (FEV1) i manji difuzijski kapacitet (DLCO) u odnosu na pojedince bez dijabetesa. Pretpostavlja se da su oksidativni stres, koji je posledica trajne hiperglikemije i mikroangiopatija glavni uzročnici oštećenja intersticijuma pluća (Zhou, et al., 2021). Međutim, do danas nije u potpunosti razjašnjen patofiziološki mehanizam koji bi potpuno objasnio interakciju između dijabetesa i plućne funkcije.

3.2.6. Povećana infektivnost i virulencija SARS-CoV-2 kod dijabetesa

Moguća je povezanost između SARS-CoV-2 i sistema renin-angiotenzin-aldosteron (RAAS) (Chee, Tan, & Yeoh, 2020; Lim, et al., 2021; Zhou, et al., 2021). Sve više je dokaza da virus SARS-CoV-2 koristi humani enzim koji pretvara angiotenzin 2 (ACE2), kao receptor za ulazak u ćeliju (Gheblawi, et al., 2020). Enzim ACE2 je član porodice sistema RAAS, koji razgrađuje angiotenzin II (Ang II) u angiotenzin 1-7. Ekspresija ACE2 je pronađena u više organa, uključujući pluća, bubrege, srce, krvne sudove, gušteraču, jetru, želudac, tanko crevo, testise i mokraćnu bešiku, što može biti uzrok višestrukog popuštanja funkcije organa viđenog kod nekih pacijenata s KOVID-19 (Zhou, et al., 2021). ACE2 ima zaštitnu ulogu prvenstveno u zapaljenjenskim reakcijama. Ipak, klinički značaj povezanosti ACE2, dijabetesa i infekcije KOVID-19 ostaje kontroverzan. Infekcija KOVID-19 smanjuje ekspresiju ACE2 što izaziva ćelijska oštećenja, hiperinflamaciju i respiratorni arest. Dokazano je da akutna hiperglikemija pojačava ekspresiju ACE2 na ćelijama što može olakšati ulazak virusa. Međutim, poznato je da hronična hiperglikemija smanjuje ekspresiju ACE2 što ćelije čini osetljivijim na zapaljenje (Bornstein, et al., 2020). S druge strane, zanimljivo je da su stručnjaci otkrili da dijabetes značajno povećava ekspresiju ACE2 u cirkulaciji i u mokraći, kao i enzimsku aktivnost. Posmatrano u tom svetlu, prekomerna ekspresija ACE2 uzrokovana dijabetesom, kao funkcionalnog receptora za invaziju SARS-CoV-2, mogla bi povećati osetljivost na KOVID-19 (Zhou, et al., 2021). Dalja istraživanja u pravcu ACE2, bi mogla pomoći u razumevanju virusne patogeneze SARS-CoV-2 i progresije KOVID-19.

Osim ACE2, dijabetes je takođe povezan s povećanjem nivoa plazminogena i furina za koji se pretpostavlja da povećavaju virulenciju i infektivnost SARS-CoV-2 (Zhou, et al., 2021). Fadini i saradnici (2020) su sproveli metaanalizu u vezi uticaja dijabetesa kod ispitanika s KOVID-19, zaključeno je da ispitanici nisu pokazali povećanu osetljivost, već samo značajni porast prema pogoršanju kliničke slike i progresiji KOVID-19 u pacijenata s dijabetesom u poređenju s onima bez dijabetesa. Do danas nema definitivnih dokaza koji potvrđuju da dijabetes povećava sklonost prema infekciji KOVID-19, stoga su potrebne dodatne studije kako bi se istražila ta mogućnost.

3.2.7. Komorbiditeti povezani s dijabetesom

Uz prethodno navedene štetne uticaje hronične hiperglikemije i dijabetesa, prisutni hronični komorbiditeti povezani s dijabetesom poput gojaznosti, hipertenzije, koronarne bolesti arterija i hronične bolesti bubrega, mogu dodatno pogoršati prognozu KOVID-19 (Zhou, et al., 2021). Prethodno su navedeni pojedini patofiziološki mehanizmi koji objašnjavaju povezanost regulacije glukoze, šećerne bolesti i KOVID-19, a koji dovode do povećanja kardiovaskularnog i ošteg mortaliteta nakon infekcije SARS-CoV-2 u bolesnika s dijabetesom.

Infekcija SARS-CoV-2 može dovesti do povećanih vrednosti medijatora zapaljenja u krvi, uključujući lipopolisaharide, zapaljenske citokine i toksične metabolite. Modulacija aktivnosti NK ćelija i stvaranje IFNγ mogu povećati intersticijsku i/ili vaskularnu propustljivost za

prozapaljenske medijatore. Uz to, infekcija SARS-CoV-2 dovodi do povećane proizvodnje reaktivnih vrsta kiseonika (ROS). Ti faktori dovode do fibroze pluća, akutnog oštećenja pluća i ARDS-a. Proizvodnja ROS-a i virusna aktivacija sistema RAAS (putem povećane ekspresije Ang II) uzrokuju rezistenciju na insulin, hiperglikemiju, povećanje komponenata zgrušavanja krvi fibrinogena i D-dimera, što dovodi do povećanja viskoznosti krvi i oštećenja vaskularnog endotela, kao i posledičnih kardiovaskularnih događaja, tromboembolije i diseminovane intravaskularne koagulacije (DIK) (Lim, et al., 2021).

Uticaj KOVID-19 na dijabetes

Virusna infekcija može izazvati poremećaj regulacije glukoze mehanizmom začaranog kruga u već postojećem dijabetesu, ili čak uzrokovati novonastalu pojavu dijabetesa u onih osoba koje ga nemaju.

U osoba s dijabetesom u prisustvu infekcije, dolazi do oslobađanja brojnih hormona koji učestvuju u odbrambenim mehanizmima tokom infekcije. Hormoni koji se oslobađaju tokom bolesti mogu dovesti do dodatnog povećanja nivoa glukoze u krvi, kada su potrebne veće doze insulina za korekciju glikoregulacije. Za osobe s dijabetesom i najmanja infekcija može dovesti do hiperglikemija, koje ako se na adekvatan način ne koriguju mogu dovesti do akutnih komplikacija, kao što su dijabetesna ketoacidoza i hiperosmolarno neketogeno stanje (IDF, 2021). Nedavna klinička istraživanja pokazala su da se povećala vrednost glukoze u krvi kod dijabetičara zaraženih SARS-CoV-2 virusom, da se glukoza teško regulisala, kao i da se povećala doza insulina u terapiji ovih bolesnika (Bornstein, et al., 2020; Lim, et al., 2021; Zhou, et al., 2021). U prethodnom istraživanju primećeno je da je 37,5% dijabetičara uzimalo oralne antidijabetike pre prijema, a nakon prijema u bolnicu zbog infekcije KOVID-19 se započelo sa insulinskom terapijom, dok je 29,2% pacijenata uzimalo insulin pre prijema i povećalo dozu insulina nakon prijema (Zhou, et al., 2021). Tokom KOVID-19 pandemije i socijalne izolacije, sve veći broj dijabetičara otkazuje posete savetovalištu i klinikama za lečenje dijabetesa. Ovaj trend, zajedno sa pojačanim stresom povezanim s bolešću i izolacijom, smanjenom telesnom aktivnošću, nepravilnom ishranom i gastrointestinalnim simptomima povezanih sa bolešću, pruža pogodno tlo za pogoršanje kontrole glikemije (Slika 3.). Pod stresnim stanjem povišeno je lučenje hiperglikemijskih hormona poput kateholamina ili glukokortikoida, koji mogu dodatno da povećaju nestabilnost glikemije. Osim toga, korišćenje sistemskih kortikosteroida u lečenju KOVID-19, izazvaće nagli porast glukoze u krvi (Lim, et al., 2021; Zhou, et al., 2021).

S druge strane, pokazano je da su neki virusi dijabetogeni. Utvrđeno je da SARS uzrokuje sekundarnu hiperglikemiju u pacijenata koji nisu imali anamnezu dijabetesa i nisu koristili glukokortikoide tokom bolesti. Istraživanja su otkrila da virus SARS-CoV može da uđe u pankreasna ostrvca koristeći ACE2 kao svoj receptor i da oštećenjem pankreasnih ostrvaca uzrokuje akutni dijabetes (Yang, et al. 2010; Yang, et al., 2006). Slično, sekundarna hiperglikemija je takođe nađena u pacijenata zaraženih virusom SARS-CoV- 2, bez dijabetesa u anamnezi. Uočeno je oštećenje pankreasa (potvrđeno procenom nivoa amilaze i lipaze u plazmi) u 17,3% pacijenata s KOVID-19, a 66,7% pacijenata je pokazalo umereno povećanje glikemije. Potencijalna povezanost oštećenja pankreasa i SARS-CoV-2 je u skladu sa ekspresijom ACE2 receptora u egzokrinom i endokrinom pankreasu. Stoga se pretpostavlja da bi SARS-CoV-2 mogao da se veže na ACE2 u vitalnim organima, uključujući jetru i gušteraču, s potencijalnom ulogom u razvoju insulinske rezistencije i oslabljenom lučenju insulina, uzrokujući akutni dijabetes ili pogoršavajući prognozu dijabetesa (Zhou, et al., 2021). Međutim, do danas, nijedna studija nije dokazala da li KOVID-19 izaziva novi dijabetes i koje signalne puteve usvaja, zbog toga su u budućnosti potrebne dodatne studije kako bi se istražila ta mogućnost.

Klinička važnost prethodno navedenih mehanizama trenutno je neizvesna, ali zdravstveni radnici i oboleli od dijabetesa trebalo bi da budu svesni posledica pandemije KOVID-19 za pacijente s dijabetesom.

Opšte preporuke

Pod epidemijom KOVID-19, svi životni stilovi, strategije lečenja i terapijski efekti kod osoba s dijabetesom mogli bi biti ozbiljno narušeni, povećavajući poteškoće u regulisanju glukoze u krvi. S tim u vezi, sastavljene su pojednostavljene opšte preporuke za osobe s dijabetesom u toku trajanja KOVID-19 pandemije.

Opšte preporuke za prevenciju KOVID-19 kod bolesnika s dijabetesom

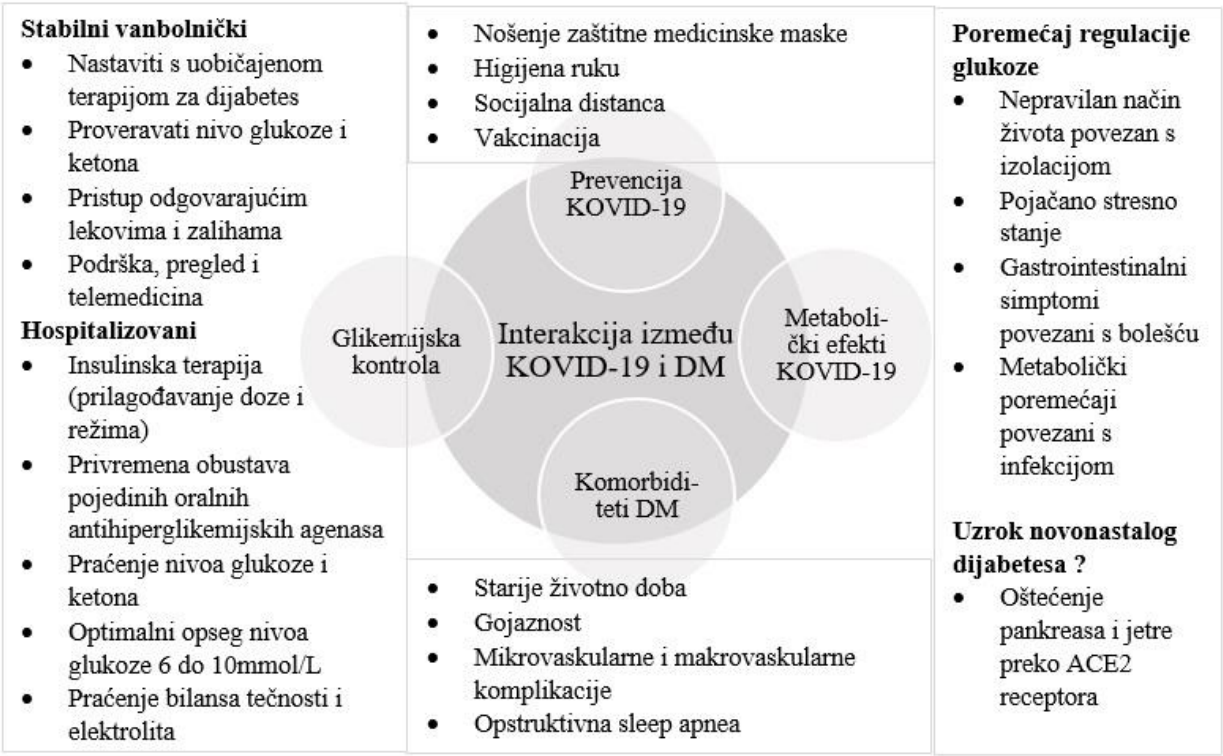
Prevencija KOVID-19 uključuje nošenje zaštitne medicinske maske, održavanje dobre higijene ruku, poštovanje mera fizičke distance i izbegavanje bliskog kontakta s osobama koje se ne osećaju dobro. Pacijente s dijabetesom treba podsticati da nastave s redovnom samokontrolom glukoze u krvi, pravilnom ishranom, fizičkom aktivnošću, kao i da imaju odgovarajuće zalihe i pristup lekovima. S obzirom na njihov povećani rizik od loših zdravstvenih ishoda kao posledice KOVID-19, važno je da osobe s dijabetesom budu uključene u prioritetne grupe za programe vakcinacije (IDF, 2021).

Opšte preporuke za lečenje osoba s dijabetesom tokom bolesti KOVID-19

U slučaju bolesti KOVID-19, u osoba s dijabetesom savetuju se: adekvatna rehidratacija, redovni obroci, kontrola vrednosti glikemija, kontrola telesne temperature i kontrola telesne težine. Nastavlja se uobičajena terapijom za dijabetes i ne obustavlja se terapija insulinom. Cilj je održavanje optimalnog nivoa glukoze 6 do 10mmol/L. Ako je osoba na insulinskoj terapiji, potrebna je kontrola urina na ketone. Savetuje se da osobe s dijabetesom i članovi njihove porodice prate preporuke i savete lekarskog tima u cilju formiranja individualnog plana za terapiju dijabetesa u toku KOVID-19 bolesti (IDF, 2021).

Telemedicina

Jedna od novina koje su dale dobre rezultate jeste i upotreba daljinskog savetovanja koje je omogućilo pružanje nege bolesnicima s dijabetesom, istovremeno smanjujući njihovu izloženost virusu SARS-CoV-2. Pre pandemije KOVID-19, pokazano je da interaktivna telemedicina može da pomogne lekarima u upravljanju dijabetesom (Flodgren, Rachas, Farmer, Inzitari, & Shepperd, 2015). Nedavno se pokazalo da je upotreba telemedicine delotvorna u lečenju, čak i visoko rizičnih bolesnika s dijabetesom, poput onih s novootkrivenim dijabetesom tipa 1. Pacijenti usmereni na telemedicinske konsultacije imali su niži HbA1c u poređenju sa pacijentima koji su imali uobičajenu negu. Očekuje se da će pandemija KOVID-19 ubrzati transformaciju pružanja zdravstvene zaštite i povećati upotrebu telemedicine u lečenju hroničnih bolesti (Chee, et al., 2020).
Na Slici 3. prikazane su različite interakcije između dijabetesa i KOVID-19 oboljenja



Slika 3. Interakcija između koronavirusne bolesti 2019 (KOVID-19) i diabetes mellitus-a (DM). ACE2- enzim koji pretvara angiotenzin 2.

ZAKLJUČAK

Dosadašnji nalazi ukazuju na dvosmerni uticaj između dijabetesa i KOVID-19. Prisustvo hiperglikemije i dijabetesa je nezavisno povezano s povišenim rizikom za razvoj ozbiljnih formi oboljenja KOVID-19 i povećanim mortalitetom. U osoba s dijabetesom, hronična izloženost abnormalnom metaboličkom okruženju može dovesti do trajnih poremećaja urođenog i stečenog imuniteta, upalne oluje, poremećaja u fiziologiji pluća i kardiovaskularnog sistema, povećane infektivnosti i virulencije virusa, koji zajedno povećavaju rizik za lošu prognozu KOVID-19. Za odgovor, povećava li dijabetes osetljivost prema infekciji KOVID-19 još uvek nedostaju dokazi. KOVID-19 mogao bi imati efekat na patofiziologiju dijabetesa. Infekcija KOVID-19 mogla bi podstaći hiperglikemiju i rezistenciju na insulin, pogoršati već postojeći dijabetes ili čak izazvati novonastali dijabetes stvarajući tako začarani krug. Takođe, prisustvo tipičnih komorbiditeta i komplikacija šećerne bolesti dodatno povećava mortalitet od KOVID-19. S druge strane, osobe obolele od dijabetesa koje nemaju komplikacije i čiji je nivo šećera u krvi dobro regulisan, nemaju veći rizik od razvoja težih oblika KOVID-19 od opšte populacije. Sagledavši rezultate dosadašnjih istraživanja izvodi se zaključak da je za prevenciju komplikacija od KOVID-19 od velikog značaja regulacija nivoa glukoze u krvi. Tokom pandemije KOVID-19, pridržavanje preventivnih mera, stroga kontrola glikemije i upravljanje kardiovaskularnim faktorima rizika presudni su za bolesnike s dijabetesom. Inovacije poput telemedicine korisne su za lečenje pacijenata s dijabetesom u vreme pandemije KOVID-19, jer mogu pomoći u boljem upravljanju dijabetesom, boljoj regulaciji glukoze, kao i smanjenju rizika od infekcije zbog direktnog fizičkog kontakta između pacijenata i medicinskog osoblja.

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INFLUENCE OF COVID-19 PANDEMIA ON THE LEVEL OF FREQUENCY OF PHYSICAL ACTIVITY OF POPULATION OF DIFFERENT GENDER AND AGE AND REASONS FOR POTENTIAL CHANGE

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Abstract: Physical activity is repeatedly useful for maintaining and developing psychophysical abilities. The factors that influence physical activity can be divided into three main groups: biological, psychological and social. When it comes to biological factors, age and gender are among the most important. The drastic measures taken because of the COVID-19 virus pandemics have had a significant impact on people's daily lives. The closure of sports and recreation centers and the prohibition of outdoor recreation have caused changes in the type, extent, intensity and frequency of physical activity. From a sample of 175 subjects (116 female, 59 male) aged up to 65 years from the city of Belgrade, questionnaire data were obtained and processed with appropriate statistical procedures to obtain information on the impact of COVID-19 pandemic on the frequency of physical activity of population of different sex and age as well as identifying the reasons for potential changes. The results of the study confirm that gender and age are factors of particular importance when there is a change in the frequency of physical activity during the COVID-19 pandemic. Also, it was found that the main reasons for the fall in the frequency of physical activity at both sexes of different ages during social isolation were „lack of motivation“ as well as „lack of equipment and space“. On the other hand, it was found that the main reason for increasing physical activity was more „free time“.

Keywords: health, gender, age, epidemic, recreation

UTICAJ PANDEMIJE COVID-19 NA NIVO UČESTALOSTI FIZIČKE AKTIVNOSTI POPULACIJE RAZLIČITOG POLA I UZRASTA

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Sažetak: Fizička aktivnost je višestruko korisna za očuvanje i razvijanje psihofizičkih sposobnosti. Faktore koji utiču na fizičku aktivnost možemo podeliti na tri glavne grupe: biološki, psihološki i socijalni. Kada je reč o biološkim faktorima među najvažnijim su uzrast i pol. Drastične mere koje su preduzete zbog pandemije virusa COVID-19 su značajno uticale na svakodnevni život ljudi. Zatvaranje sportsko-rekreativnih centara i zabrana boravka na otvorenim mestima za rekraciju su prouzrokovale promene u vrsti, obimu, intenzitetu i učestalosti fizičke aktivnosti. Iz uzorka od 175 ispitanika (116 žena, 59 muškaraca) uzrasta do 65 godina iz grada Novog Pazara, dobijeni su podaci upitnikom i obrađeni su sa odgovarajućim statističkim postupcima, radi dobijanja informacija o uticaju COVID-19 pandemije na nivo učestalosti fizičke aktivnosti populacije različitog pola i uzrasta kao i utvrđivanje razloga

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potencijalnih promena. Rezultati istraživanja potvrđuju da su pol i uzrast faktori od posebnog značaja kad dolazi do promena u nivou učestalosti fizičke aktivnosti za vreme pandemije. Takođe, utvrđeno je da su glavni razlozi za pad nivoa učestalosti fizičke aktivnosti kod oba pola različitih uzrasta za vreme društvene izolacije „nedostatak motivacije“ kao i nedostatak „rekvizita i prostora“. Sa druge strane, utvrđeno je da je glavni razlog za povećanje fizičke aktivnosti više „slobodnog vremena“.

Ključne reči: zdravlje, pol, uzrast, epidemija, rekreacija

UVOD

U Srbiji je zabeležen prvi slučaj COVID-19 virusa 06. marta 2020. godine. Nakon devet dana od pojave prvog slučaja korona virusa, uvedeno je vanredno stanje koje ograničava kretanje u određenom vremenskom periodu i nameće zatvaranje sportsko-rekreativnih objekata. Poznato je da je uloga fizičke aktivnosti višestruko korisna za očuvanje i razvijanje psihofizičkih sposobnosti čoveka. Široko prihvaćena naučna definicija fizičke aktivnosti određuje fizičku aktivnost kao „svako telesno kretanje proizvedeno skeletnim mišićima koje rezultira kalorijskom potrošnjom” (Caspersen et al., 1985). Ova definicija fizičke aktivnosti ima osetljive posledice kad je reč o merenju nivoa učestalosti fizicke aktivnosti. U ovom istraživanju fizička aktivnost se određuje kao kontinuirani fizički rad od najmanje 30 minuta što je bilo dovoljno za povećanje frekvencije disanja i srčanog pulsa. Fizička aktivnost je prisutna u rekreaciji, sportu, fizičkom vaspitanju kao i u svakodnevnom životu i ima mnogobrojne pozitivne efekte kad dolazi do razvijanja biodinamičkih i biohemijskih sposobnosti čoveka, održavanje dobre posture, učenje motornih veština kao i na celokupno fizičko, mentalno i socijalno zdravlje. Prema Svetskoj Zdravstvenoj Organizaciji (SZO), fizička aktivnost, zajedno sa zdravom ishranom i ne konzumacijom cigareta, predstavlja glavnu komponentu u prevenciji hroničnih bolesti (Waxman, 2004). Procenjenuje se da fizička neaktivnost i sedentaran način života godišnje uzrokuju 1.9 miliona smrtnih slučajeva širom sveta (World Health Organization, *Physical activity: direct and indirect health benefits).* Skoro četvrtina ishemijskih bolesti srca (22%) i 10%-16% slučajeva kancera grudi i debelog creva, te dijabetesa, uzrokovano je fizičkom neaktivnošću tj. sedelačkim načinom života. Faktori koji utiču na fizičku aktivnost možemo podeliti u tri glavne grupe: biološki, psihološki i socijalni faktori. Ova tri faktora značajno utiču na vrstu, obim, intenzitet i učestalost fizičke aktivnosti, kao i na to da li fizička aktivnost prisustvuje kao deo rekreacije, fizičkog vaspitanja ili profesionalnog sporta u životu čoveka. Uzrast i pol su između najznačajnijih kad dolazi do bioloških faktora. Iako ne postoji puno istraživanja koja ispituju kako COVID-19 pandemija utiče na nivo učestalosti fizičke aktivnosti kod različitih polova i uzrasta, postoji nekoliko istraživanja koja utvrduju da uzrast i pol su značajni faktori koji utiču na fizičku aktivnost (Sallis, 2000; Corbin et al., 2004; Rowland, 1999; Heath et al., 1994).
Cilj rada je utvrditi uticaj pandemije COVID-19 na nivo učestalosti fizičke aktivnosti populacije različitog uzrasta, kao i predstavljanje komparativne analize koja prikazuje kako mesec dana karantina utiče na nivo učestalosti fizičke aktivnosti kod aktivne populacije različitog pola i uzrasta, do 65 godina, u gradu Novom Pazaru.

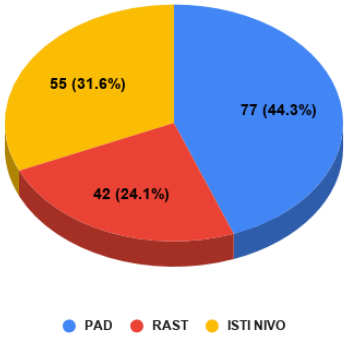
MATERIJAL I METODE

Deskriptivnim statističkim procedurama utrvđena je veličina istraživačkih pojava, njihovi međusobni odnosi i ostali numerički pokazatelji. Uzorak ispitanika u ovom istraživanju može se definisati kao 175 ispitanika (116 žena, 58 muškaraca) do 65 godina iz grada Novog Pazara. Uobičajena učestalost fizičke aktivnosti ispitanika različitog pola i uzrasta pre i u toku

karantina kao i razlozi za potencijalne promene u učestalosti fizičke aktivnosti je ispitivana pomoću upitnika. Ispitanici su odgovarali na pitanje koliko puta su tokom jedne tipične nedelje bili aktivni (fizička aktivnost od 30 minuta ili više, što je bilo dovoljno za povećanje frekvencije disanja i srčanog pulsa) pre i posle karantina, kao i na pitanja koja se odnose na razloge za potencijalnu promenu u nivo učestalosti fizičke aktivnosti u toku COVID-19 pandemije.

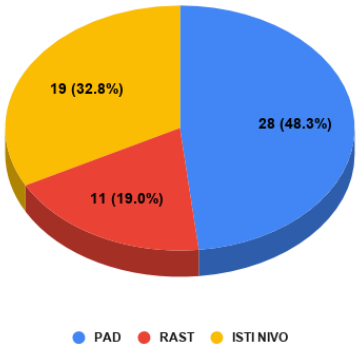
REZULTATI

Grafikon 1. *Promena u nivou fizičke aktivnosti-ukupno za sve kategorije*



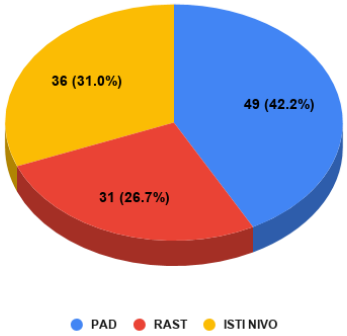
Na Grafikonu 1. prikazani su rezultati nivoa učestalosti fizičke aktivnosti kod ispitanika. 44,3% ispitanika izjasnilo se da tokom perioda društvene izolacije/karantina trenira manje nego što je treniralo pre ovog perioda. Njih 24,1%, iz različitih razloga, treniraju više nego što im je to bilo uobičajeno, dok čak 31,6% trenira u nepromenjenom nivou učestalosti.

Grafikon 2. *Promena u nivou fizičke aktivnosti kod muškaraca*



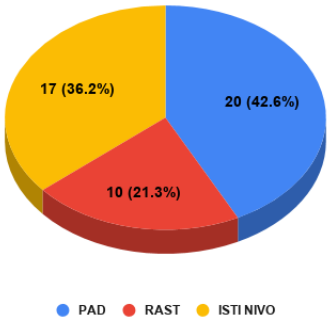
Na Grafikonu 2. prikazani su rezultati nivoa učestalosti fizičke aktivnosti kod muškaraca. 48,3% ispitanika izjasnilo se da tokom perioda društvene izolacije/karantina trenira manje nego što je treniralo pre ovog perioda. Njih 19%, iz različitih razloga, treniraju više nego što im je to bilo uobičajeno, dok čak 32,8% trenira u nepromenjenom nivou učestalosti.

Grafikon 3. *Promena u nivou fizičke aktivnosti kod žena*



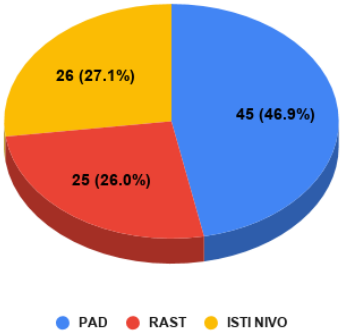
Na Grafikonu 3. prikazani su rezultati nivoa učestalosti fizičke aktivnosti kod žena. 42,2% ispitanika izjasnilo se da tokom perioda društvene izolacije/karantina trenira manje nego što je treniralo pre ovog perioda. Njih 26,7%, iz različitih razloga, treniraju više nego što im je to bilo uobičajeno, dok čak 31,0% trenira u nepromenjenom nivou učestalosti.

Grafikon 4. *Promena u nivou fizičke aktivnosti starosne grupe ispod 18 godina*



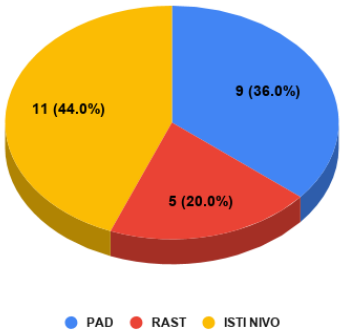
Na Grafikonu 4. prikazani su rezultati nivoa učestalosti fizičke aktivnosti starosne grupe ispod 18 godina. 42,6% ispitanika izjasnilo se da tokom perioda društvene izolacije/karantina trenira manje nego što je treniralo pre ovog perioda. Njih 21,3%, iz različitih razloga, treniraju više nego što im je to bilo uobičajeno, dok čak 36,2% trenira u nepromenjenom nivou učestalosti.

Grafikon 5. *Promena u nivou fizičke aktivnosti starosne grupe od 18 do 34 godina*



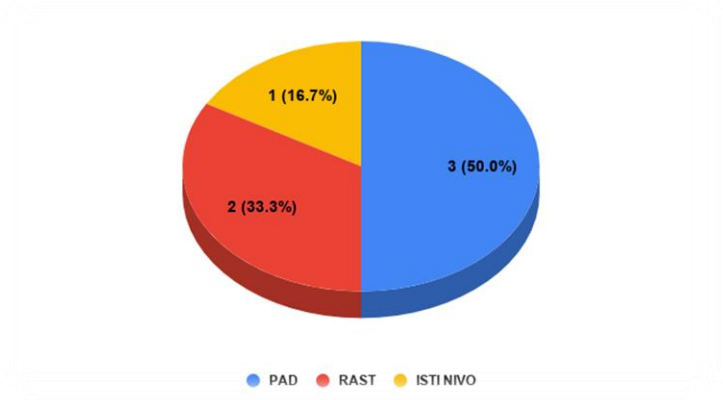
Na Grafikonu 5. prikazani su rezultati nivoa učestalosti fizičke aktivnosti kod starosne grupe od 18-34 godina. 46,9% ispitanika izjasnilo se da tokom perioda društvene izolacije/karantina trenira manje nego što je treniralo pre ovog perioda. Njih 26%, iz različitih razloga, treniraju više nego što im je to bilo uobičajeno, dok čak 27,1% trenira u nepromenjenom nivou učestalosti.

Grafikon 6. *Promena u nivou fizičke aktivnosti starosne grupe od 35 do 50 godina*



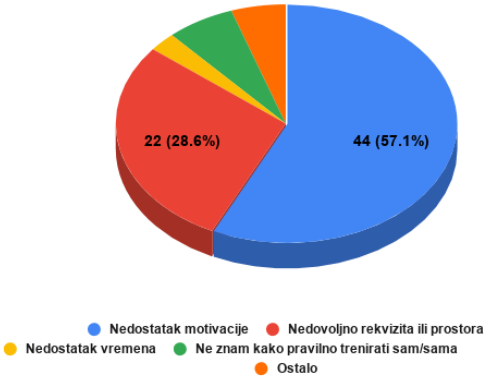
Na Grafikonu 6. prikazani su rezultati nivoa učestalosti fizičke aktivnosti kod starosne grupe od 35-50 godina. Samo 36,0% ispitanika izjasnilo se da tokom perioda društvene izolacije/karantina trenira manje nego što je treniralo pre ovog perioda. Njih 20%, iz različitih razloga, treniraju više nego što im je to bilo uobičajeno, dok čak 44,0% trenira u nepromenjenom nivou učestalosti.

Grafikon 7. *Promena u nivou fizičke aktivnosti starosne grupe od 51 do 65 godina*



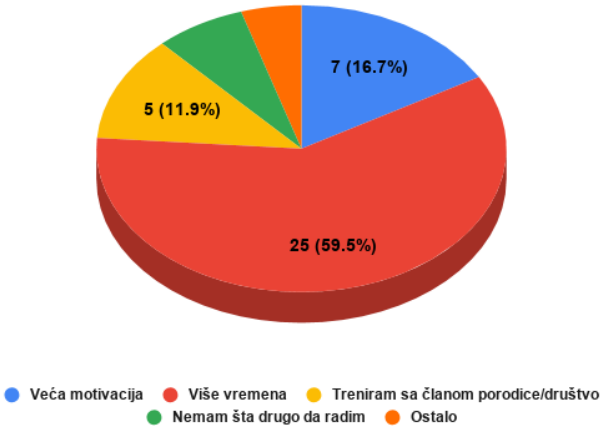
Na Grafikonu 7. prikazani su rezultati nivoa učestalosti fizičke aktivnosti kod starosne grupe od 51-65 godina. 50,0% ispitanika izjasnilo se da tokom perioda društvene izolacije/karantina trenira manje nego što je treniralo pre ovog perioda. Njih 33,3%, iz različitih razloga, treniraju više nego što im je to bilo uobičajeno, dok čak samo 16,7% trenira u nepromenjenom nivou učestalosti.

Grafikon 8. *Razlozi za smanjenje nivoa fizičke aktivnosti u toku karantina*



Na Grafikonu 8. su prikazani razlozi koji su uticali na smanjenje nivoa učestalosti fizičke aktivnosti kod ispitanika. 57,1% od njih se izjasnilo da je glavni razlog koji je uticao na smanjenje nivoa učestalosti fizičke aktivnosti jeste "nedostatak motivacije" dok "nedovoljno rekvizita ili prostora" zauzima drugo mesto sa 28,6%. „nedostatak vremena" i „ne znam kako pravilno trenirati sam/sama" su takođe neki od odgovora.

Grafikon 9. *Razlozi za povećanje nivoa fizičke aktivnosti u toku karantina:*



Na Grafikonu 9. su prikazani razlozi koji su uticali na povećanje nivoa učestalosti fizičke aktivnosti kod ispitanika. 59,5% od njih se izjasnilo da je glavni razlog koje je uticao na povećanje nivoa učestalosti fizičke aktivnosti jeste „više vremena" dok „veća motivacija" zauzima drugo mesto sa 16,7%. „treniram sa članom porodice" i „nemam sta drugo da radim" su takođe bili neki od odgovora.

DISKUSIJA

Deskriptivnom statističkom analizom na uzroku N=175, urađena je analiza svih varijabli. Ispitivano je kako društvena izolacija/karantin utiče na nivo učestalosti fizičke aktivnosti kod aktivne populacije različitog pola i uzrasta kao i koji su razlozi za potencijalne promene. Dobijeni rezultati u okviru ovog istraživanja pokazuju da postoji heterogenost rezultata kad dolazi do promena u nivou učestalosti fizičke aktivosti kod aktivne populacije različitog pola i uzrasta, a najveća homogenost se primećuje u rezultatima koji ispituju razloge za potencijalne promene. Podaci nam ukazuju, da se kod većine ispitanika primećuje pad u nivou učestalosti fizičke aktivnosti u toku karantina (44,3%), dok je više ispitanika koji su održali isti nivo (31,6%), nego onih koji su povećali nivo fizičke aktivnosti (24,1%). Kada je reč o polu, utvrđeno je da je kod većeg procenta žena povećan nivo učestalosti fizičke aktivnosti (26,7%) nego kod muškaraca (19%). Što se uzrasta tiče, najveća razlika u nivou učestalosti fizičke aktivnosti se primećuje kod starosne grupe od 18 do 34 godina, gde samo kod (27,1%) populacije ne postoje promene. Zanimljiva je činjenica da se u istoj starosnoj grupi takođe primećuje najveći pad i najveći rast u nivou učestalosti fizičke aktivnosti. Sa druge strane, najmanja promena se primećuje kod ispitanika od 35 do 50 godina (44%). Starosna grupa od 51 do 64 godine se smatra kao statistički neznačajna s obzirom da se sastoji samo od 6 od ukupnih 175 ispitanika.

Kad se radi o razlozima koji su najviše uticali na smanjenje nivoa učestalosti fizičke aktivnosti najčešće se navodi „nedostatak motivacije" sa (57,1%) kao i „nedovoljno rekvizita ili prostora" sa (28,6%). Sa druge strane, kada je reč o povećanju nivoa učestalosti fizičke aktivnosti, daleko najdominantniji razlog je „više vremena" koji je zauzeo (59,5%).

ZAKLJUČAK

Slično sportu i u nastavi fizičkog vaspitanja i rekreaciji neophodno je znati kako pol i uzrast utiče na vrstu, obim, intezitet i učestalost fizičke aktivnosti, kako bi se na osnovu dobijenih rezultata mogla predvideti i sprečiti ili ohrabriti potencijalna ponašanja.

S tim u vezi, predmet ovog rada je bila komparativna analiza kako mesec dana karantina utiče na nivo učestalosti fizičke aktivnosti kod aktivne populacije različitog pola i uzrasta, do 65 godina, u gradu Novom Pazaru.

Informacije su dobijene pomoću upitnika, a na osnovu dobijenih rezultata proizilaze sledeći zaključci:

Kod većine ispitanika se primećuje pad u nivou učestalosti fizičke aktivnosti. Takođe, zabeležen je veći broj ispitanika koji su održali isti nivo aktivnosti u odnosu na one koji su uvećali nivo fizičke aktivnosti.

Kad je reč o polu, primećuje se veći pad u nivou fizičke aktivnosti kod muškaraca nego kod žena (48% u odnosu na 42%). Procentualno približno isti broj ispitanika muškog i ženskog pola je održao isti nivo fizičke aktivnosti.

Kada analiziramo uticaj karantina na nivo fizičke aktivnosti po starosnim kategorijama, procentualno najveće promene su zabeležene kod starosne grupe od 18 do 34 godina (istovremeno i najveći pad i najveći rast), dok je najmanja promena zabeležena kod ispitanika u starosnoj grupi od 35-50 godina.

Najveća homogenost u rezultatima je zabeležena u razlozima koji su najviše uticali na promenu u nivou učestalosti fizičke aktivnosti ispitanika različitog pola. Kao glavni razlozi za smanjenje u nivou učestalosti fizičke aktivnosti kod muškaraca kao i kod žena je naveden „nedostatak motivacije" i „nedovoljno rekvizita ili prostora", dok je kod oba pola kao glavni navedeni razlog za povećanje u nivou učestalosti fizičke aktivnosti „više vremena".

Kako bi se imala šira slika o tome kako karantin utiče na nivo učestalosti fizičke aktivnosti ispitanika istog grada, buduća istraživanja bi trebalo da obuhvate veći broj ispitanika što u ovom istraživanju nije bio slučaj. S obzirom da je uzorak činilo samo 175 ispitanika, ne može se nikako govoriti o globalnim rezultatima. Istraživanja ovog tipa mogu biti veoma značajna i korisna za svakog stručnjaka iz oblasti zdravlja, sporta i fizičkog vaspitanja, jer mu omogućavaju da ima uvid kako pandemije utiču na tendencije populacije različitog pola i uzrasta kada se radi o fizičkoj aktivnosti kao i koji su glavni razlozi koji dovodu do te promene.

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WOMEN'S FOOTBALL AND GENDER EQUALITY

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Abstract: In the very beginning, sport was available only to men, but it found its place in that segment a few years later. Today, football has become one of the most popular activities that people do. Nowadays, more and more women are turning to that sport, precisely because of the popularization of women's football in society, but also encouraging positive changes between women's and men's football. Throughout the history of women, they have had little rights in sports, despite visible positive changes, there is still obvious discrimination between the sexes (Vojković 2017). Women's underrepresentation in the structure of sports is not just for the greater and far-reaching consequences of women's participation in sports, claim Key and Jones (2018, 136). Inequality that is present between the financing of men and women, transfers that are significantly less, then training and even media coverage and observation. The popularization of sports has contributed to the growing number of women who play sports, or in this case football. Self-participation in this sport is connected with numerous prejudices and inequalities. A sample (N0 40, aged 16 to 32) was examined in order to determine the current situation in women's football in terms of equality and representation in the media. The survey, and then the analysis of the results of the research on this city, was conducted in three first league Croatian women's football clubs. In the research, the basic method used was the method and method of scaling. The Chisk test of statistical technique was used to process the research results. The results of the research showed that most women come from rural areas and that the educational structure does not significantly affect teaching and sports choices. With the inequality of closely related media, which in football pay less attention to women and men. All hypothetical assumptions have been confirmed and that there is still no national equality, especially in football, that the representation in the media is very small as well as the income of football players.

Keywords: gender equality, sports, women's football

ŽENSKI FUDBAL I RAVNOPRAVNOST POLOVA

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Sažetak: U samom početku sport je bio dostupan samo muškarcima, dok su žene svoje mesto u tom segment pronašle nekoliko godina kasnije. Fudbal je danas postao jedna od najpopularnijih aktivnosti kojima se ljudi bave. U današnje vreme sve se više ženao kreće ka tom sportu, upravo zbog popularizacije ženskog fudbala u društvu, ali i podsticanju na pozitivne promene između ženskog i muškog fudbala. Kroz istoriju žene godinama nisu imale

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nikakva prava u sportu, uprkos vidljivim pozitivnim pomacima još uvek postoji očigledna diskriminacija između polova (Vojković 2017). Ženska nezastupljenost u strukturama sporta nije samo nepravedna već ima i daleko sežne posledice na učestvovanje žena u sportu, tvrde Key i Jones (2018, 136). Neravnopravnost koja je prisutna između finansiranja muškaraca i žena, transferi koji su znatno manji, zatim uslovi treniranja pa čak i medijske popraćenosti i zapaženosti. Popularizacija sporta doprinela je sve većem broju žena koje se bave sportom, ili u ovom slučaju fudbalom. Samo učešće žena u ovom sportu povezano je sa brojnim predrasudama i nejednakostima. Ispitan je uzorak žena (N0 40, starosti od 16 do 32 godine) kako bi se utvrdila trenutna situacija u ženskom fudbalu u pogledu jednakosti i zastupljenosti u medijima. Anketa, a zatim i analiza rezultata istraživanja na temu ovog rada sprovedena je u tri prvoligaška hrvatska ženska fudbalska kluba. U istraživanju su kao osnovna metoda korišćeni servei metoda i metoda skaliranja. Za obradu rezultata istraživanja korišćen je Chisk test statističke tehnike. Rezultati istraživanja pokazali su da većina žena dolazi iz ruralnih područja i da obrazovna struktura ne utiče značajno na stavove i izbor sporta. Sa nejednakošću su usko povezani mediji koji u fudbalu manje pažnje posvećuju ženama nego muškarcima. Sve hipotetičke pretpostavke su potvrđene i da još uvek ne postoji rodna ravnopravnost, posebno u fudbalu, da je zastupljenost u medijima vrlo mala kao i prihod i žena fudbalerki.

Ključne reči: rodna ravnopravnost, sport, ženski fudbal

UVOD

Sport je bio dostupan samo muškarcima, dok su žene svoje mesto u tom segmentu pronašle nekoliko godina kasnije. Ženska nezastupljenost u strukturama sporta nije samo nepravedna već ima i dalekosežne posledice na sudelovanje žena u sportu, tvrde Key i Jones (2018, 136). Neravnopravnost koja je prisutna između finansiranja muškaraca i žena, transferi koji su znatno manji, zatim uslovi treniranja pa čak i medijske popraćenosti i zapaženosti.

Mediji spretno izbegavaju publikaciju pa je samim time i javnost manje zainteresovana za nogomet ali i ostale sportove u kojima su žene aktivne. Prema dosadašnjim istraživanjima, fudbal je nesumnjivo najpopularniji „muški“ sport. Ova se tvrdnja lako može potkrepiti brojem aktivnih igrača, brojem klubova i liga, medijskim interesom, brojem stadiona, količinom novca koji se ulaže i zarađuje. Istovremeno, ženski fudbal je vrlo slabo razvijen (Bosnar i Kovačević, 2013, 108). Status ženskog fudbala u Hrvatskoj moguće je objasniti na dva načina, prvi važni faktor razvoja mogao bi biti otpor, ili jednostavno nemar lokalnih i sportskih institucija zaduženih za razvoj sporta. Dok je drugi mogući razlog postojanje rodnih stereotipa koji svrstavaju fudbal u „muške aktivnosti“ jer još uvijek prevladavaju tradicionalne društvene i kulturološke predrasude o muško-ženskim razlikama s obzirom na pol i njihovu sposobnost bavljenja sportom (Grgić, 2018, 557)

Kako navode Planinić i Ljubičić (2020. 136) u svom istraživanju sport je oduvijek smatran muškom teritorijom. Naime, muškarci su sport kreirali vođeni rodnom ideologijom. Premda su se određene ideje i uverenja o polu s vremenom promenile, nasleđe ljudi koji su formirali savremeni sport i oblikovali sportsku kulturu ostaje uticajno i danas. Kako bi ženski fudbal dobio više na važnosti i značenju Union of European Football Associations (UEFA) je 2019. godine predstavila svoju prvu strategiju za razvoj ženskog fudbala. Strategija koja nosi ime „Zajedno za budućnost fudbala“ predstavljena je za razdoblje između 2019. i 2024. godine (Olimp, 2018). Cilj je ovim istraživanjem dobiti uvid u formiranje neposrednih zaključaka o mogućim razlikama u trenutnom nivou ravnopravnosti polova u ženskom fudbalu. Posebno u demografskoj i obrazovnoj strukturi fudbalerki te zastupljenost od strane medija i ravnopravnost u materijalnom statusu.

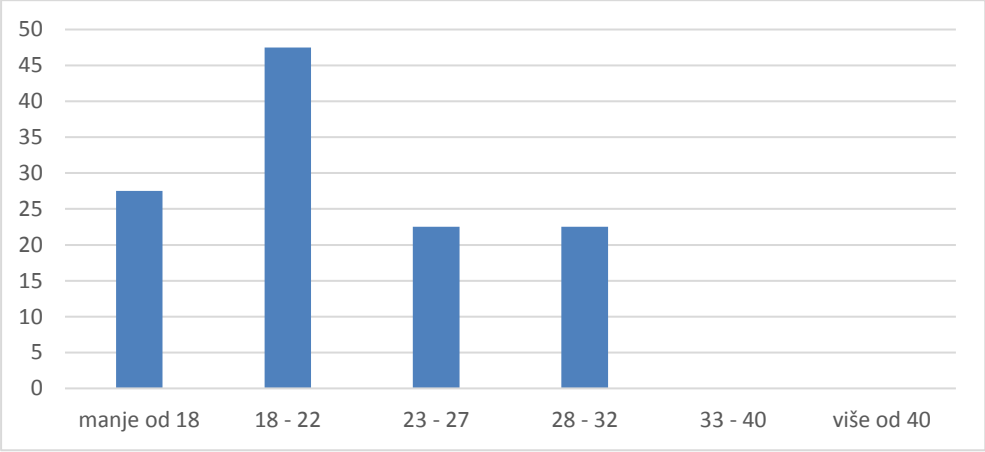
METOD

U ovom istraživanju uzorak ispitanika činile su osobe ženskog pola starosti od 16 do 32 godine članice fudbalskih ekipa ŽNK Pregrada, Pregrada, ŽNK Viktorija (Slavonski Brod) te ŽNK Katarina Zrinski (Čakovec). Podaci su prikupljeni od igračica koje se bave aktivno fudbalom. U istraživanju je sudelovalo 40 igračica koje se takmiče u 1. Hrvatskoj fudbalskoj ligi za žene. Za maloletne igračice tražio se pristanak njihovih roditelja u skladu sa Zakonom o maloletnim osobama, a u svrhu istraživanja. Kao istraživačke tehnike korišćene su, tehnika anketiranja, anketa je posebno konstruirana za ovo istraživanje. Skaliranjem i Chisq Test statističkom tehnikom obrađeni su rezultati istraživanja.

REZULTATI ISTRAŽIVANJA

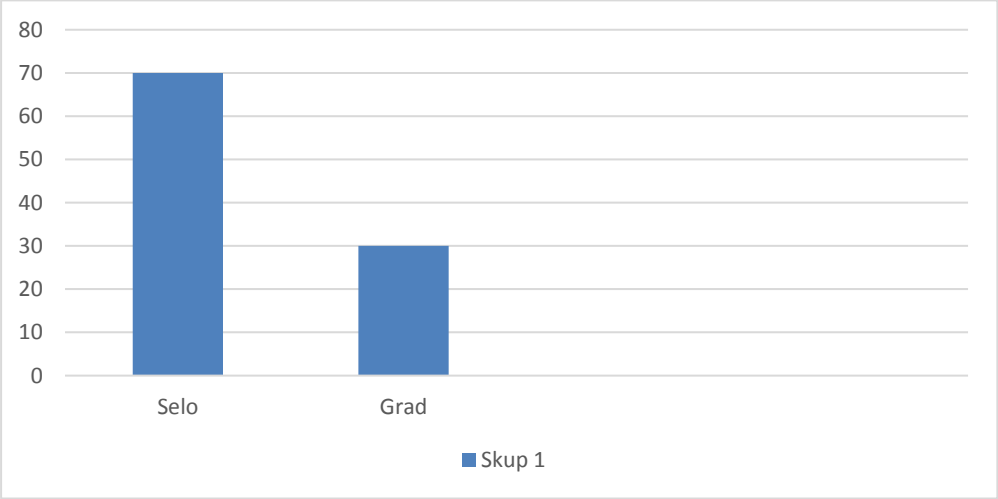
Uzorak varijabli ovog istraživanja podijeljen je u dve grupe pitanja, i to pitanja vezana za demografsku i obrazovnu strukturu i pitanja vezana za ravnopravnost, zastupljenost u medijima i materijalnom statusu.
Analizom dobijenih rezultata vidljivo je da 27,50 % su ispitanice koje imaju manje od 18 godina. Da bih mogle igrati za klub koji se takmiče u 1. HNLŽ moraju pre početka prvenstva napraviti i specijalistički pregled.

Grafikon 1. Dob



Demografska zastupljenost ispitanica pokazuje da njih 70 % živi u ruralnoj sredini, dok njih 30 % živi u urbanoj sredini, što je vidljivo na grafikonu 2.

Grafikon 2. Demografska zastupljenost



Rezultati u tabeli 1. opaženih frekvencija s obzirom na mesto stanovanja potvrdili su statističku značajnost da je obrazovna struktura povezana sa interesom za fudbal. Na samom kraju računice prisutna je pozitivna korelacija, odnosno kao i u prethodnom slučaju obrazovna struktura ne zavisi o demografskoj. U demografskoj strukturi koja prikazuje veliku statističku zastupljenost u korist ruralne sredine koja nije od velike važnosti već je sama njihova zainteresiranost za sport

Tablica 1. Tablica opaženih frekvencija

Opažene frekvencije					
	osnovna škola	srednja škola	VŠS	VSS	Ukupno
selo	0	21	3	4	**28**
grad	0	8	2	2	**12**
Ukupno:	0	**29**	**5**	**6**	**40**

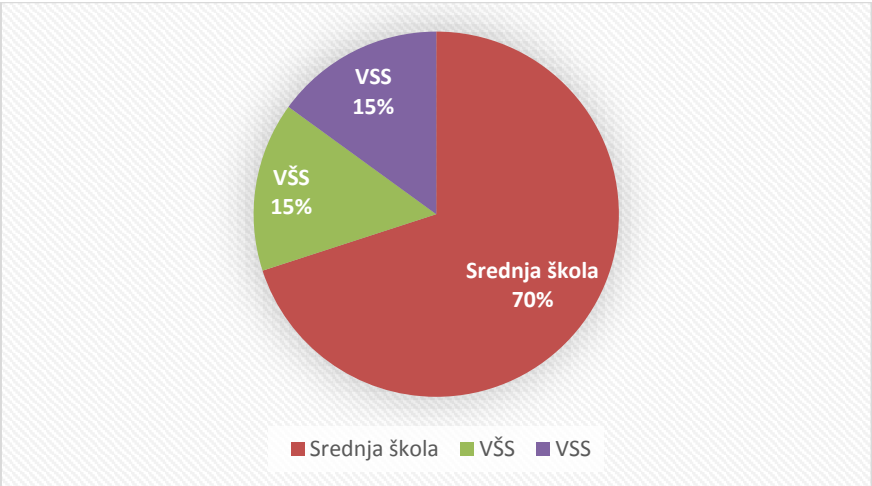
Nakon dva statistička testa hi kvadrata i korelacijske analize, rezultati (tablica br. 2) su jednaki te oni prikazuju da obrazovna struktura ne zavisi o demografskoj strukturi. Prema čemu se može zaključiti da su obrazovanje i demografija inkompatibilni sa koeficijentom prema Spearmanovoj formuli koji u ovom slučaju iznosi Rs= 0,95 što znači da je RS > 0.

Tablica 2. Tablica očekivanih frekvencija

Očekivane frekvencije					
	osnovna škola	srednja škola	VŠS	VSS	Ukupno
selo	0	20.3	3.5	4.2	**28**
grad	0	8,7	1.5	1.8	**12**
Ukupno:	0	**29**	**5**	**6**	**40**

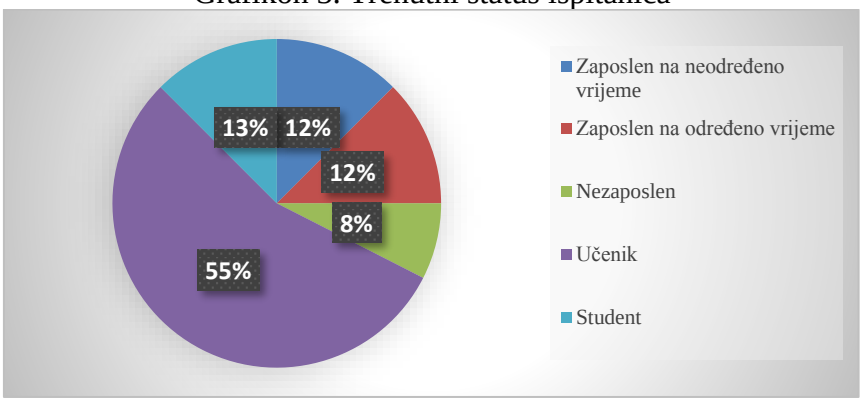
Obrazovna struktura koja je prethodno spomenuta, vidljivo je da uz veliki postotak igračica – učenica pojavljuje se i veliki postotak zaposlenih igračica.

Grafikon 2. Obrazovna struktura



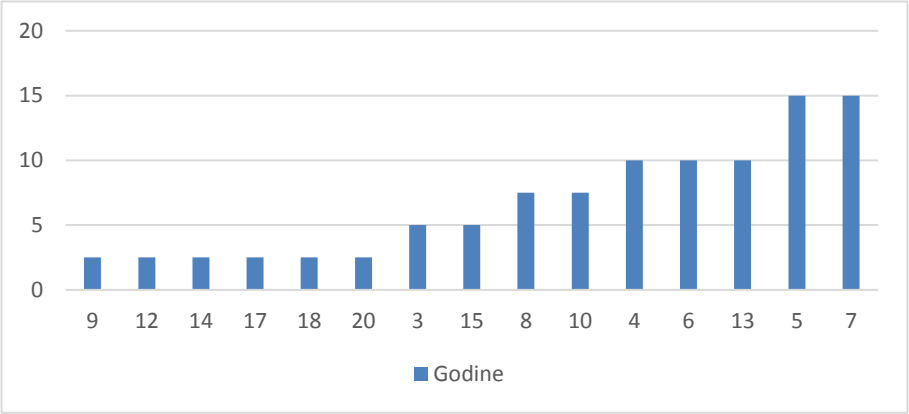
Istraživanje je takođe pokazalo da je većina igračica zaposlena na neodređeno vreme 13% te 12% na određeno vreme. Usprkos njihovim obvezama koje imaju vezano za posao uspevaju pronaći slobodnog vremena za odlaske na fudbalski trening i utakmicu.

Grafikon 3. Trenutni status ispitanica



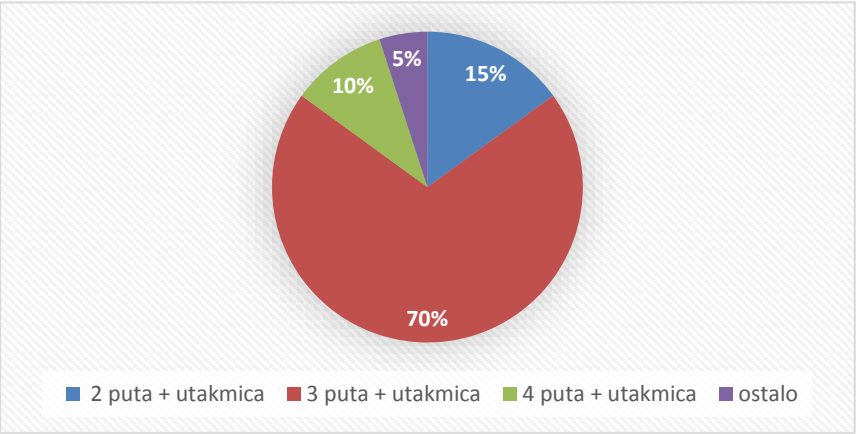
Na pitanje u anketi, Koliko dugo se bavite sportom?, nailazi se na razne odgovore. Najviše odgovora bilo je da se sportom bave 5 i 7 godina čiji postotak iznosi 15%. Što se tiče ostalog broja godina, najveći broj je 20 godina.

Grafikon 4. Koliko se dugo bavite sportom?



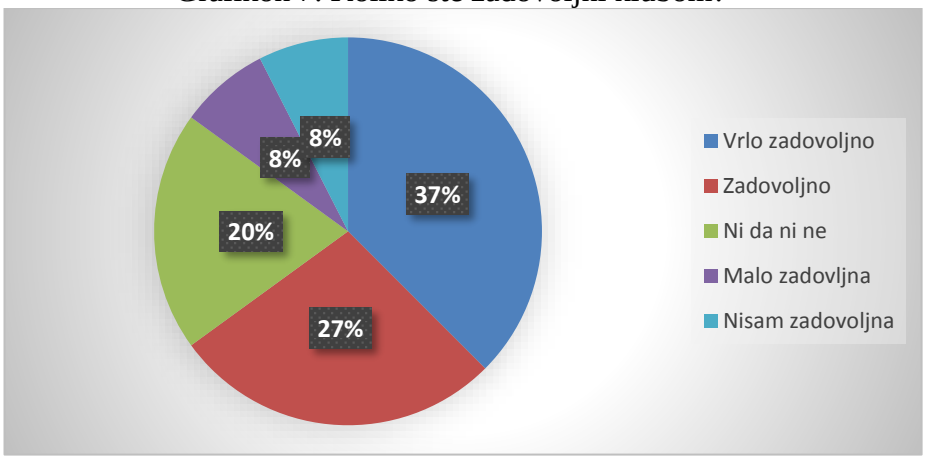
Rezultatima koji su prikazani u grafikonu 6 može se utvrditi da ispitanice svoje slobodno vreme provode aktivno i posvećuju ga fudbalu. Njih 70 % trenira 3 puta nedeljno.

Grafikon 6. Koliko puta nedeljno trenirate?



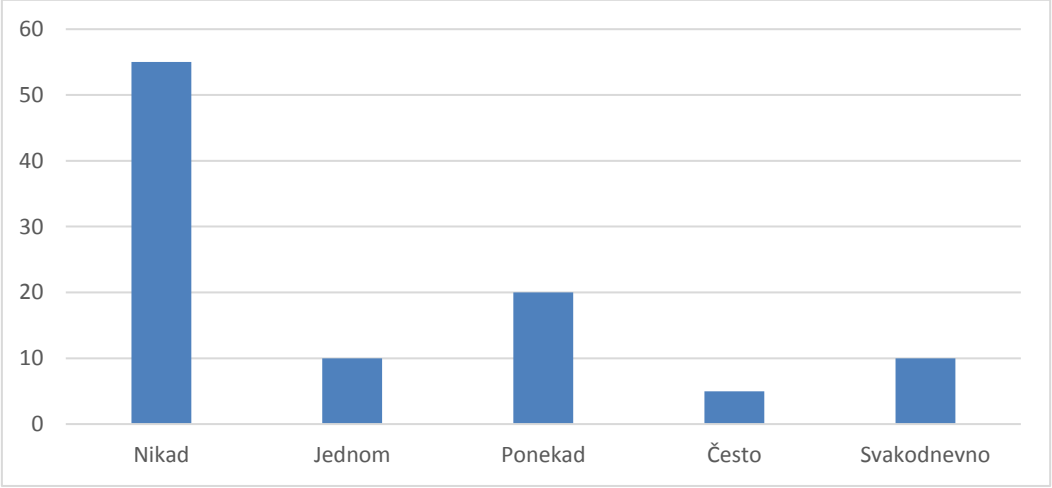
Kada bi sumirali zadovoljstvo u klubu sa odgovorima zadovoljna (27%) i vrlo zadovoljna (37 %) rezultat izgleda vrlo optimističan. No postavlja se pitanje zbog čega je nezadovoljno 34 % ispitanica.

Grafikon 7. Koliko ste zadovoljni klubom?



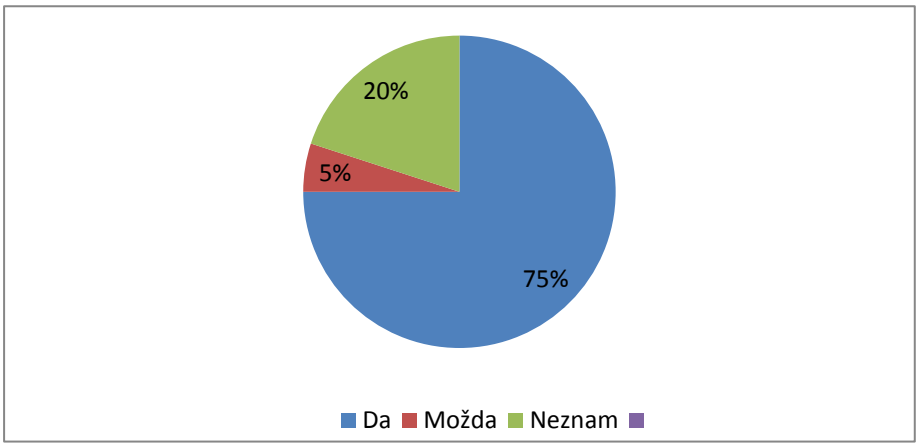
Na pitanje jeste li se ikad susretali s bilo kojim oblikom zlostavljanja, vređanja, ponižavanja, 55% ispitanika odgovorilo je nikad, 10 % jednom, 20% ispitanika se ponekad susrelo s ovim oblikom, 5 % se često susreće, dok se 10 % ispitanika susreće svakodnevno s nekim od ovih oblika.

Grafikon 8. Jeste li se susreli s bilo kojim oblikom zlostavljanja, vrijeđanja, ponižavanja?



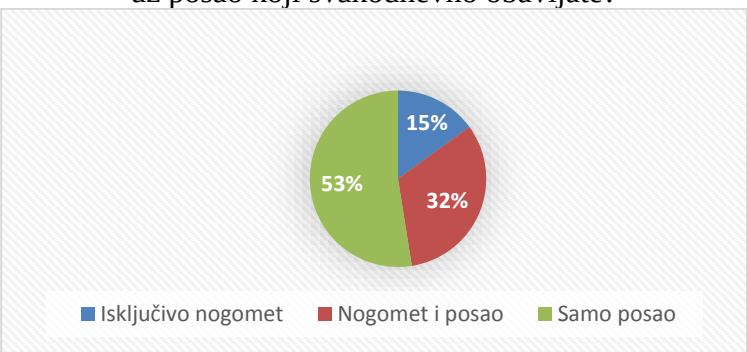
Kad se govori o medijima i rodnoj ravnopravnosti, neosporno je da mediji više pažnje posvećuju muškarcima u sportu što je vidljivo u grafikonu broj 9 gde se 75% žena izjasnilo da mediji daju premalo pažnje ženama u sportu, naročito u ženskom fudbalu.

Grafikon 9. Smatrate li da mediji daju premalo pažnje ženama u sportu?



Na pitanje o izvorima prihoda vidljivo je da 52,50% što je 21 ispitanica ostvaruje prihode isključivo od svog rada kojeg obavljaju van sportskih aktivnosti, njih 32,50 % ostvaruje prihode od bavljenja fudbalom i svakodnevnog rada, dok 15% odnosno 6 ispitanica ostvaruje prihode isključivo od fudbala.

Grafikon 10. Jesu li Vaši izvori prihoda isključivo od igranja fudbala ili su to dodatni prihodi uz posao koji svakodnevno obavljate?



DISKUSIJA

Rezultati u ovom istraživanju komparirani s nekim ranijim sličnim istraživanjima pokazuju da su žene što se tiče obrazovne i demografske strukture vrlo slični. Razlozi zbog kojih se žene uključuju u sport su najčešće poboljšanje zdravlja, zatim kvalitetan način života, bolji izgled pa i sam takmičarski deo (Gmajnić 2015, 18). Međunarodni olimpijski odbor je proglasio povećano učešće žena u sportu jednim od važnih ciljeva olimpizma i preduzeo je značajne korake u promovisanju i povećanju udela žena u sportu na svim nivoima od takmičenja do stručnih i upravljačkih pozicija.

Žene u Hrvatskoj nemaju mogućnosti zarađivati i živeti od fudbala, te stoga često vrlo perspektivne mlade igračice zbog nerazvijenog sistema praćenja i školovanja odustaju od sporta i posvećuju se obrazovanju. U muškom fudbalu prisutno je više sponzora te su stoga njihovi ugovori daleko veći kao motivacija za treninge i utakmice (Gregurić, 2018.).

Analizom istraživanja i obradom podataka utvrđeno je koliko često ispitanice treniraju, od njih 40, 15 % trenira 2 puta nedeljno plus utakmica, čak 70 % trenira 3 puta nedeljno plus utakmica; 10 % trenira 4 puta nedeljno plus utakmica te 5 % se izjasnilo pod ostalo. Pokazalo se da se nailazi na pozitivne i negativne strane sa kojima se klub susreće pa je tako 37,50% ispitanica vrlo zadovoljno klubom, dok njih 7,50% trenutno nije zadovoljno. Pitanje se

postavlja, u kojim segmentima rada u klubu dolazi do nezadovoljstva. Kao u svakom sportu tako je i u nogometu važno zadovoljstvo u klubu u kojem se trenira. Pozitivna atmosfera u klubu i okruženje daju dodatnu motivaciju za dolazak na treninge kao i prilikom igranja utakmica. Nekorektno ponašanje je nešto čime se žene svakodnevno susreću. Podaci dobijeni u pitanju, Jeste li se susreli s bilo kojim oblikom zlostavljanja, vrijeđanja, ponižavanja? zapravo su vrlo zabrinjavajući te bi im trebalo posvetiti dublju analizu kroz neki drugi oblik validnog upitnika. Nasilje danas nije prisutno samo u školi, porodici, na poslu ili javnim mestima, ono je prisutno i u sportu, samim tim žene imaju manjak samopouzdanja. Uprkos znatnom povećanju učešća devojčica i žena u sportu i rastućoj zainteresiranoj publici za ženski fudbal i vrhunski sport, još uvijek postoje velike razlike u medijskim prenosima utakmica ženskih i muških sportova (HOO, 2018). Iako sve više ženske populacije učestvuje u sportu, mediji ga manje prenose i prate u odnosu na sport kojim se bave muškarci.

Ženski fudbal postao je atrakcija koja se svakodnevno razvija te privlači sve više žena koje će možda postati igračice, sudije, članice uprave ženskih klubova ili prisutne u publici kao obožavateljice ženskog fudbala. Mediji odlučuju koji se sportovi mogu gledati u televizijskim rasporedima, a u onim sportovima u kojima učestvuju žene, daje se niska medijska pokrivenost (Stead, 2010. 339). Žene u Hrvatskoj nemaju mogućnosti zarađivati i živeti od fudbala, te stoga često vrlo perspektivne mlade igračice zbog nerazvijenog sistema praćenja i školovanja odustaju od sporta i posvećuju se obrazovanju. U muškom fudbalu je obrnuta situacija, prisutno je više sponzora te su stoga njihovi ugovori daleko veći kao motivacija za treninge i utakmice (Gregurić, 2018.).

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TREND OF CHANGES OF FITNESS PARAMETERS IN OBESE GIRLS

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Abstract: Previously conducted researches on a sample of obese girls and boys indicate the presence of discontinuous form of growth and development, both in fitness parameters and morphological characteristics (Ђорђевић, 2015). Body fat values in children are inversely related to the level of cardiorespiratory fitness, speed, and explosive power (Pantelić et al., 2012; Aphamis et al., 2015; Cattuzzo et al., 2016). This study aimed to determine the trend of changes in certain fitness parameters in obese girls of younger school age. **Method:** The sample of subjects was composed of lower grades primary school students from the cities in Southeast Serbia. The sample consisted of 213 girls aged seven to ten, who were included in the study based on the degree of nutritional status determined by BMI (Cole, Bellizzi, Flegal, & Dietz, 2000). The sample was divided into four subsamples, in relation to age (1st grade, N=63; 2nd grade, N=104; 3rd grade, N=22; 4th grade, N=24). Muscle fitness was assessed based on the Abalakov test and the lean forward - bend backward - throw test. Flexibility was assessed based on the lean on the bench test, while cardiorespiratory fitness was assessed based on the values of VO_2max (ml/kg/min), heart rate (HR) in load, and resting heart rate (RHR). **Results:** Trends of changes in muscle fitness and flexibility are continuous, with obesity being a disruptive factor only for performing activities that require the whole body dislocation in space. The results show that the trend of changes in RHR and HR in the load is discontinuous, while the trend of changes in VO_2max is continuous and decreases in time. **Discussion:** The results indicate that the heart rate values increase by two beats per minute (96.6 - 98.8 bpm) from the first to the fourth grade, and it can be concluded that the trend of changes in the RHR variable is positive, discontinuous, and deviates from the physiological development curve. Deviation from the normal development curve can be attributed to obesity, but also to some limitations of the study such as sample size. The stress response of the subjects during the testing could also speed up the heart rate. The values of HR in load have a positive trend from the age of seven to the age of nine (160.3 - 170.6 bpm), but between the age of nine and the age of ten the trend is negative (170.6 - 168.4 bpm). The heart rate in load shows the extent to which the child's organism is adapted to physical effort and is directly related to physical activity. The results of the research may indirectly indicate that obese girls are physically inactive, i.e. insufficiently adapted to physical activity.

Keywords: obesity, trends, cardiorespiratory fitness, muscular fitness, flexibility.

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TREND PROMENA FITNES PARAMETARA GOJAZNIH DEVOJČICA

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Sažetak: Istraživanja koja su sprovedena na uzorku gojaznih devojčica i dečaka ukazuju na diskontinuiranu formu rasta i razvoja, kako fitnes parametara, tako i morfoloških karakteristika (Ђорђевић, 2015). Vrednosti telesnih masti u organizmu obrnuto su proporcionalne nivou kardiorespiratornog fitnesa, brzini i eksplozivnoj snazi (Pantelić et al., 2012; Aphamis et al., 2015; Cattuzzo et al., 2016). Cilj ovog istraživanja bio je da se utvrdi trend promena određenih parametara fitnesa kod gojaznih devojčica mlađeg školskog uzrasta. **Metod:** Uzorak ispitanika sačinjen je od učenica nižih razreda osnovnih škola sa teritorija gradova u jugoistočnoj Srbiji. Uzorak je činilo 213 ispitanica uzrasta od sedam do deset godina, koje su u istraživanje uvrštene na osnovu stepena uhranjenosti određenog pomoću BMI (Cole, Bellizzi, Flegal, & Dietz, 2000). Uzorak je podeljen na četiri subuzorka u odnosu na uzrast (I razred, N=63; II razred, N=104; III razred, N=22; IV razred, N=24). Mišićni fitnes je procenjen na osnovu Abalakovog testa i testa pretklon-zaklon-izbačaj. Fleksibilnost je procenjena na osnovu testa pretklon na klupi, dok je kardiorespiratorni fitnes procenjen na osnovu vrednosti VO_2max (ml/kg/min), srčane frekvence (HR) pri opterećenju i srčane frekvence u mirovanju (RHR). **Rezultati:** Trendovi promena mišićnog fitnesa i fleksibilnosti su kontinuirani, pri čemu se uočava da je gojaznost remeteći faktor samo za izvršavanje aktivnosti koja zahteva dislokaciju celog tela u prostoru. Rezultati pokazuju da je trend promena RHR i HR u opterećenju diskontinuiran, dok je trend promena VO_2max kontinuiran i beleži pad vrednosti. **Diskusija:** Rezultati ukazuju da su vrednosti srčane frekvence od sedme do desete godine povećane za dva otkucaja u minutu (96.6 – 98.8 bpm) pa se zaključuje da je trend promena varijable RHR pozitivan i diskontinuiran i da odstupa od fiziološke krive razvoja. Odstupanje od normalne krive razvoja može se pripisati gojaznosti, ali i nekim ograničenjima studije, kao što je veličina uzorka. Stresogena reakcija ispitanica tokom testiranja takođe bi mogla da ubrza srčanu frekvencu. Vrednosti pulsa u opterećenju kod devojčica imaju pozitivan trend između sedme i devete godine (160.3 – 170.6 bpm), a između devete i desete godine trend je negativan (170.6 – 168.4 bpm). Srčana frekvenca u opterećenju pokazuje u kojoj meri je organizam deteta adaptiran na fizički napor i u direktnoj je vezi sa fizičkom aktivnošću. Rezultati istraživanja indirektno mogu da ukažu da su gojazne devojčice fizički neaktivne, odnosno nedovoljno adaptirane na fizičku aktivnost.

Ključne reči: gojaznost, trendovi, kardiorespiratorni fitnes, mišićni fitnes, fleksibilnost.

UVOD

U poslednjih nekoliko decenija doslo je do povećanja indeksa telesne mase i smanjenja motoričkih sposobnosti dece (Kopecký & Přidalová, 2008). Nedovoljan broj motoričkih iskustava može usporiti motorički i intelektualni razvoj, i negativno uticati na vrednosti fitnes parametara kod dece (Humphrey, 1991). Gojaznost, kao posledica nedovoljne fizičke aktivnosti smatra se značajnim faktorom opadajućeg trenda aerobnih sposobnosti u periodu detinjstva (Macfarlane & Tomkinson, 2007). Sekularni trendovi fizičkog fitnesa beleže pad od 0.4 do 2% godišnje (Cadenas-Sánchez, Artero, Concha, Leyton, & Kain, 2015). Povećanje

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telesne mase povezuje se sa smanjenjem fitnes parametara koji su u vezi sa sportskim postignućem, kao i sa smanjenjem vrednosti parametara zdravstvenog fitnesa (Delaš, Tudor, Ružić, & Šestan, 2008; Cadenas-Sánchez et al., 2015; Thivel, Ring-Dimitriou, Weghuber, Frelut, & Omalley, 2016).

Zdravstveni fitnes (engl. health-related physical fitness) je skup specifičnih elemenata fizičkog fitnesa koji su povezani sa optimalnim zdravstvenim statusom (ACSM, 2007). Elementi zdravstvenog fitnesa su: kardiorespiratorni fitnes, mišićna snaga, mišićna izdržljivost, fleksibilnost i telesna kompozicija. Kardiorespiratorni fitnes se definiše kao sposobnost kardiovaskularnog i respiratornog sistema da dopreme kiseonik do aktivne muskulature tokom kontinuirane fizičke aktivnosti (ACSM, 2007). Mišićna izdržljivost je sposobnost mišića da izvršavaju ponovljene kontrakcije dovoljno da dovedu do mišićnog zamora ili da izdrže visok nivo maksimalne kontrakcije u dužem vremenskom intervalu (ACSM, 2007). Fleksibilnost (gipkost, elastičnost) je sposobnost izvođenja pokreta sa velikom amplitudom (Зациорски, 1975). Fleksibilnost mišića zavisi od dužine i poprečnog preseka mišića, mišićnog tonusa, tetiva, fascija, vezivnog tkiva i kože. Studije sprovedene na uzorku normalno uhranjene dece nižih razreda osnovnih škola ukazuju na kontinuirani oblik rasta i razvoja dece, odnosno njihovih fitnes parametara, dok su istraživanja koja su za uzork ispitanika imala gojazne devojčice i dečake utvrdila diskontinuiranu formu razvoja i rasta, kako fitnes parametara, tako i antropometrijskih karakteristika (Ђорђевић, & Костић, 2015).

Rezultati u studiji Pereira i saradnika (Pereira, Seabra, Siva, Yhu, Beunen, & Maria, 2011) pokazuju da deca sa prekomernom telesnom masom imaju slabije rezultate u testovima za procenu aerobnog kapaciteta u odnosu na normalno uhranjenu decu. Ovakvi rezultati navode se i u drugim istraživanjima (Aphamis, Giannaki, Tsouloupas, Ioannou, & Hadjicharalambous, 2015).

Potreba da se problemi fitnes parametara detaljnije rasvetle proizilazi iz činjenica da se broj gojazne dece povećava svake godine, da je nedovoljno objašnjen uticaj gojaznosti na pojedine fitnes parametre, kao i da postoji nedoslednost u rezultatima dosadašnjih istraživanja koja su se bavila ovom tematikom. Cilj ovog istraživanja bio je da se utvrdi trend promena određenih parametara fitnesa kod gojaznih devojčica mlađeg školskog uzrasta.

METOD

Uzorak je činilo 213 devojčica nižih razreda osnovnih škola iz gradova u jugoistočnoj Srbiji, uzrasta od sedam do deset godina. Ispitanice su u istraživanje uvrštene na osnovu stepena uhranjenosti određenog pomoću BMI (Cole, Bellizzi, Flegal, & Dietz, 2000). Uzorak ispitanika deo je istrazivanja u okviru projekta „Antropološke karakteristike dece jugoistočne Srbije-stanje, promene i trend“, koji sprovodi Fakultet sporta i fizičkog vaspitanja Univerziteta u Nišu. Ispitanice su podeljene u četiri subuzorka u odnosu na uzrast (I razred, N=63; II razred, N=104; III razred, N=22; IV razred, N=24). Kardiorespiratorni fitnes je procenjen na osnovu vrednosti VO_2max (ml/kg/min), srčane frekvence (HR) pri opterećenju i srčane frekvence u mirovanju (RHR). Mišićni fitnes je procenjen na osnovu Abalakovog testa i testa pretklon-zaklon-izbačaj, dok je fleksibilnost utvrđena na osnovu testa pretklon na klupi. Za utvrđivanje razlike između uzrasnih grupa korišćena je univarijantna analiza varijanse (ANOVA) i LSD Post Hoc test. Testiranje razlika izvršeno je F-testom. Trend promena utvrđen je na osnovu prosečnih vrednosti, pomoću kojih su se utvrdili grafički oblici krive, dok je njihova statistička značajnost utvrđena univarijantnom analizom varijanse (ANOVA).

REZULTATI

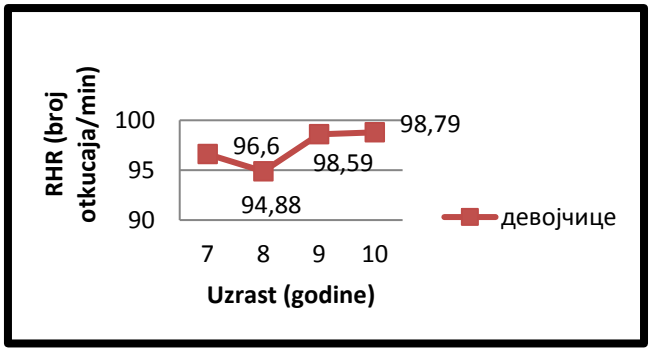
Deskriptivna statistika je potvrdila homogenizovanost uzorka i normalnu distribuciju podataka. Rezultati su prikazani u Tabeli 1. Rezultati u našem istraživanju ukazuju da se vrednosti VO_2max kod gojazne dece smanjuju za ~3 ml/kg/min između sedme i desete godine, što je u saglasnosti sa drugim istraživanjima (Pereira et al., 2011). Kod gojaznih devojčica uočava se izraženiji negativni trend rasta, koji iznosi -3.32 ml/kg/min, što je u saglasnosti sa dosadašnjim rezultatima istraživanja (Rowland, 2007). Dobijene vrednosti VO_2max kod gojazne dece (39.97 - 43.29ml/kg/min) niže su od prosečnih vrednosti koje se navode u dosadašnjim istraživanjima kod dece uzrasta od 8 do 11 godina (Ostojić, Stojanović, Stojanović, Marić, & Njaradi, 2011).

Tabela1. *Prikaz uzorka po grupama u odnosu na uzrast*

		Mean	SD	Min	Max	Range	Skew	Kurt
HR u opterećenju	**Sedam godina**	160.35	7.17	136.00	176.00	40.00	-0.43	0.87
VO_2max		43.29	1.32	40.43	47.79	7.36	0.47	0.93
RHR		96.60	14.49	67.00	130.00	63.00	-0.17	-0.40
Abalakov test		14.60	4.12	3.00	26.00	23.00	0.23	0.78
PZI suma		39.54	14.34	13.00	92.00	79.00	0.72	1.76
Pretklon na klupici		37.73	7.36	14.00	57.00	43.00	-0.77	2.43
HR u opterećenju	**Osam godina**	161.77	7.24	138.00	170.00	32.00	-0.73	0.27
VO_2max		41.03	3.36	33.69	50.91	17.22	0.29	0.37
RHR		94.88	13.78	57.00	127.00	70.00	0.08	-0.13
Abalakov test		16.44	4.52	3.00	31.00	28.00	0.00	0.98
PZI suma		45.07	15.99	19.00	86.40	67.40	-0.12	0.56
Pretklon na klupici		37.27	10.11	18.00	62.00	44.00	-0.01	-0.79
HR u opterećenju	**Devet godina**	170.64	4.72	162.00	176.00	14.00	-0.35	-1.21
VO_2max		40.05	2.50	36.34	44.41	8.07	-0.10	-1.19
RHR		98.59	7.54	82.00	110.00	28.00	-0.48	-0.40
Abalakov test		17.64	4.79	9.00	26.00	17.00	0.00	-0.71
PZI suma		50.36	19.46	26.00	97.00	71.00	0.76	-0.36
Pretklon na klupi		35.27	9.50	21.00	56.00	36.00	0.74	-0.36
HR u opterećenju	**Deset godina**	168.42	7.15	150.00	176.00	26.00	-0.91	0.17
VO_2max		39.97	3.28	32.23	48.29	16.06	0.38	1.54
RHR		98.79	9.41	80.00	123.00	43.00	0.37	0.89
Abalakov test		18.50	5.01	10.00	27.00	17.00	-0.09	-1.26
PZI suma		58.83	15.29	31.00	94.00	62.00	-0.13	-0.91
Pretklon na klupi		34.46	6.04	20.00	43.00	23.00	-1.18	1.07

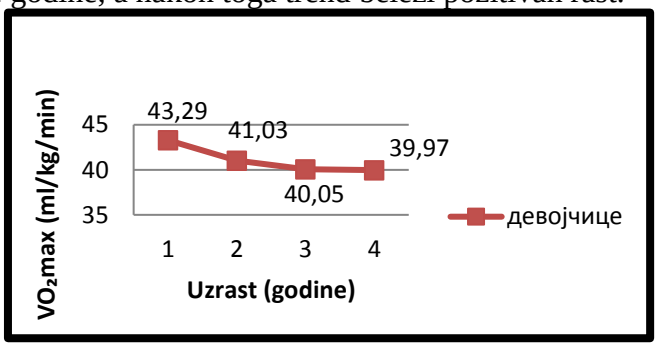
Legenda: Mean – srednja vrednost; Min – najmanja vrednost; Max – najveća vrednost; Range – razlika između maksimalne i minimalne vrednosti (opseg); SD – standardna devijacija; Skew - skjunis; Kurt – kurtozis

Rezultati u studiji Pereira i saradnika (Pereira, Seabra, Siva, Yhu, Beunen, & Maria, 2011) pokazuju da deca sa prekomernom telesnom masom imaju slabije rezultate u testovima za procenu aerobnog kapaciteta u odnosu na normalno uhranjenu decu što je potvrđeno i u našem istraživanju. Relativne vrednosti VO_2max su u relaciji sa količinom i kvalitetom bezmasne komponente telesne mase.



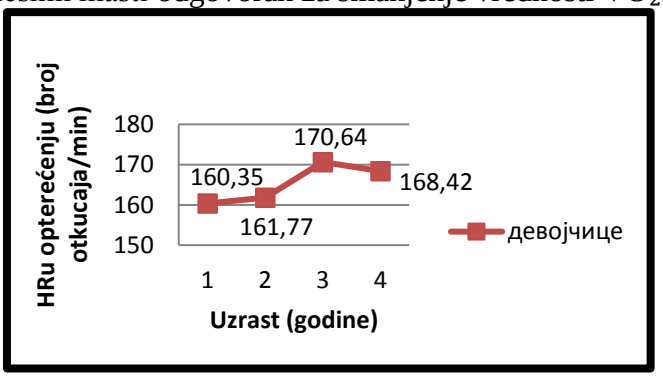
Grafikon1. *Vrednosti srčane frekvence*

Ha grafikonu 1 utvrđeno je da srčana frekvenca u miru kod devojčica ima negativan trend između sedme i osme godine, a nakon toga trend beleži pozitivan rast.



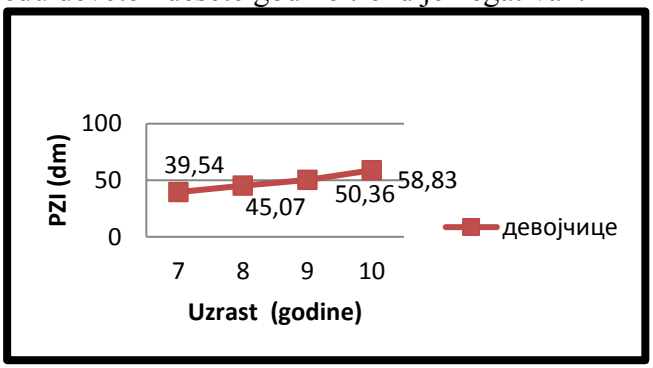
Grafikon 2.*Vrednosti maksimalna potrošnja kiseonika (VO_2max)*

Rezultati na grafikonu 2 ukazuju da VO_2max ima negativan i kontinuiran trend rasta. Povećanje VO_2max je uslovljeno rastom, posebno dimenzija srca, pluća i skeletnih mišića, dok je povećani prirast telesnih masti odgovoran za smanjenje vrednosti VO_2max.



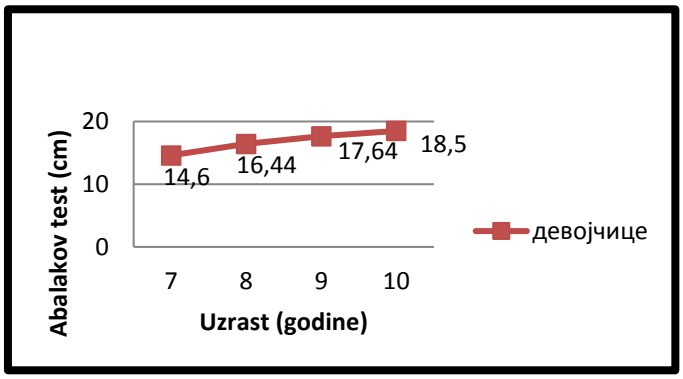
Grafikon 3. Vrednosti pulsa u opterećenju

Vrednosti pulsa u opterećenju kod devojčica (grafikon 3) imaju pozitivan trend između sedme i devete godine, a između devete i desete godine trend je negativan.



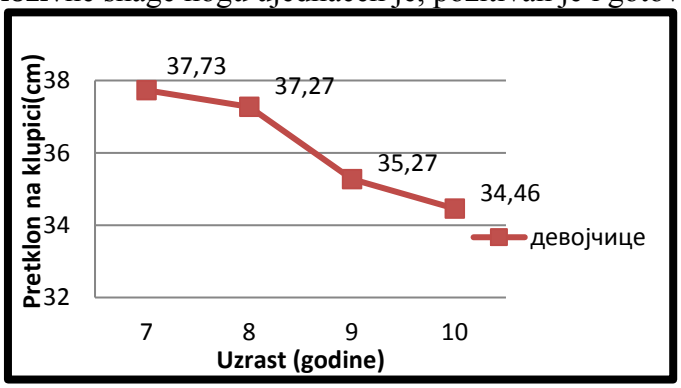
Grafikon 4. *Vrednosti eksplozivne snage ruku i ramenog pojasa*

Trend promena eksplozivne snage ruku i ramenog pojasa kontinuitran je i pozitivan. Postignuta daljina u bacanju medicinke, biomehanički posmatrano, zavisi od mera longitudinalnih dimenzionalnosti, odnosno telesne visine i dužine ruku ispitanika, kao i od poprečnog preseka mišića.



Grafikon 5. *Vrednosti eksplozivne snage nogu*

Trend promena eksplozivne snage nogu ujednačen je, pozitivan je i gotovo linearan.



Grafikon 6. *Fleksibilnost kod dečaka i devojčica*

Rezultati prikazani na grafikonu 6 pokazuju da se fleksibilnost smanjuje u periodu od sedme do desete godine.

DISKUSIJA

Svrha istraživanja bila je da se utvrdi trend promena određenih parametara fitnesa kod gojaznih devojčica mlađeg školskog uzrasta. Istraživanja uglavnom pokazuju da je trend razvoja velikog broja fitnes parametara i motoričkih sposobnosti linearan od predškolskog uzrasta, pa do početka puberteta, kako kod dečaka, tako i kod devojčica (Bala, Jakšić, & Popović, 2009). Smatra se da je trend razvoja motoričkih sposobnosti kod dečaka intenzivniji nego kod devojčica. Istraživanja koja su za ispitanike imala gojaznu decu mlađeg školskog uzrasta, ukazivala su da razvoj fitnes parametara i motoričkih sposobnosti kod gojazne dece kasni u odnosu razvoj normalno uhranjene dece (Graf, Koch, Kretschmann-Kandel, Falkowski, Christ, et al., 2004).

Rezultati pokazuju da su vrednosti pulsa u miru u sedmoj godini iznosile 96.6, dok su u desetoj iznosile 98.8 bpm. U istraživanju Fleminga i saradnika, u periodu od šeste do jedanaeste godine zabeležene su vrednosti od 75 do 118 otkucaja u minuti (Fleming, Thompson, Stevens, Heneghan, Plüddemann, et al., 2011). Negativan rast srčane frekvence nije zabeležen. Rezultati su utvrdili da su vrednosti srčane frekvence od sedme do desete godine povećane za 2 otkucaja u minutu, pa se zaključuje da je trend promena varijable RHR pozitivan i diskontinuiran i da odstupa od fiziološke krive razvoja. Odstupanje od normalne krive razvoja

može se pripisati gojaznosti, ali i nekim ograničenjima studije, kao što je veličina uzorka. Stresogena reakcija ispitanica tokom testiranja takođe bi mogla da ubrza srčanu frekvencu. Srčana frekvenca u opterećenju pokazuje u kojoj meri je organizam deteta adaptiran na fizički napor i u direktnoj je vezi sa fizičkom aktivnošću. Rezultati ukazuju da su gojazne devojčice uzrasta od sedme do devete godine fizički neaktivne, odnosno nedovoljno adaptirane na fizičku aktivnost.

Rezultati u našem istraživanju ukazuju da se vrednosti VO_2max kod gojazne dece smanjuju za ~3 ml/kg/min između sedme i desete godine, što je u saglasnosti sa drugim istraživanjima (Pereira et al., 2011). Kod gojaznih devojčica uočava se izraženiji negativni trend rasta, koji iznosi -3.32 ml/kg/min, što je u saglasnosti sa dosadašnjim rezultatima istraživanja (Rowland, 2007). Dobijene vrednosti VO_2max (39.97 - 43.29 ml/kg/min) kod gojazne dece niže su od prosečnih vrednosti koje se navode u dosadašnjim istraživanjima kod dece uzrasta od 8 do 11 godina (Ostojić, 2011). Rezultati u studiji Pereira i saradnika (Pereira et al., 2011) pokazuju da deca sa prekomernom telesnom masom imaju slabije rezultate u testovima za procenu aerobnog kapaciteta u odnosu na normalno uhranjenu decu, što je potvrđeno i u našem istraživanju. Relativne vrednosti VO_2max su u relaciji sa količinom i kvalitetom bezmasne komponente telesne mase.

Kod devojčica je trend promena eksplozivne snage ruku i ramenog pojasa ujednačen i linearan. Biomehanički posmatrano, daljina hica zavisi od longitudinalnih dimenzionalnosti, kao i od mišićne mase. Potkožno masno tkivo ne predstavlja remeteći faktor prilikom izvođenja ovog motoričkog zadatka. Smanjena fleksibilnost se može pripisati povećanim vrednostima kožnih nabora (Matton et al., 2006). Rezultati u istraživanju su pokazali da se fleksibilnost kod devojčica smanjuje proporcionalno uz starenje.

ZAKLJUČAK

Rezultati ovog istraživanja pokazuju da trend promena fitnes parametra gojaznih devojčica odstupa od vrednosti koje beleže normalno uhranjene devojčice mlađeg školskog uzrasta. Vrednosti srčane frekvence u miru i pri opterećenju ukazuju na odstupanje od fiziološke krive razvoja. Vrednosti srčane frekvence u uzrastu od deset godina su za 13 bpm više od normalnih vrednost, odnosno trend beleži rast. Pored toga, krivulja trenda srčane frekvence u miru i opterećenju je diskontinuirana. Maksimalna potrošnja kiseonika se u posmatranom uzrastu smanjuje. Trend promena fleksibilnosti je takođe negativan. Vrednosti parametara eksplozivne snage gornjih i donjih ekstremiteta imaju pozitivan i linearan trend rasta. Primena fizičke aktivnosti kod gojazne dece doprinela bi smanjenju indeksa telesne mase, poboljšanju vrednosti zdravstvenih parametara i omogućila pravilan rast i razvoj gojaznih devojčica.

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