

SPORT

INTERNATIONAL
SCIENTIFIC JOURNAL
OF KINESIOLOGY

SCIENCE

PROGRAMME
INNOVATIONS

SCIENCE
RESEARCH

SPORTS
TRAINING

EFFECTIVE
CONTROL

METRIC
SYSTEMS

QUALITY
EDUCATION

SPORTS
MANAGEMENT

NEW
TECHNOLOGIES



Association for
Research, Education
and Development

**VOL 9, ISSUE 2,
DECEMBER 2016**

SPORT SCIENCE

INTERNATIONAL
SCIENTIFIC JOURNAL
OF KINESIOLOGY



NIA
Association for
Research, Education
and Development
Travnik, Bosnia and Herzegovina

SPORT SCIENCE

INTERNATIONAL SCIENTIFIC
JOURNAL OF KINESIOLOGY
Vol. 9, Issue 2. December
2016 Print ISSN 1840-3662,
Web ISSN 1840-3670UDK 796,
Catalogued in: COBISS BH

Publisher

Association for Research,
Education and Development
"NIA" Aleja konzula 5, Travnik,
Bosnia and Herzegovina

Editor-in-Chief

Nihad Selimović
(Travnik, Bosnia and Herzegovina)

Consultant

Amra Tuzović
(Travnik, Bosnia and Herzegovina)

Executive Editor

Maid Omerović
(Travnik, Bosnia and Herzegovina)

Scientific Adviser

Hazim Selimović
(Travnik, Bosnia and Herzegovina)

Design

Haris Jusović
(Travnik, Bosnia and Herzegovina)

Technical Editors

Aldin Obućina
(Travnik, Bosnia and Herzegovina)
Jasmir Smajbegović
(Travnik, Bosnia and Herzegovina)

Public relations

Mersiha Beganović
(Travnik, Bosnia and Herzegovina)

Print:

Print d.o.o. Travnik
Circulation: 300 copies

Communication

Association for Research,
Education and Development
"NIA" Aleja Konzula 5, Travnik,
Bosnia and Herzegovina
Tel: +387 (0)30 540 876
GSM: +387 (0)61 475 922
Fax: +387 (0)30 540 876
info@sportscience.ba
www.sportscience.ba

Publishing

Sport Science publishes twice
a year in English with Bosnian
abstracts.
Full journal text available on
<http://www.sportscience.ba/>

Indexed in

'CAB Abstracts', 'CABI
Leisure Recreation and
Tourism Abstracts',
'CABI Leisure Tourism
Database', 'CABI Global
Health', 'CABI Nutrition
Abstracts and Reviews
Series A: Human and
Experimental', 'SafetyLit',
'FSO', 'CABI Abstracts on
Hygiene and Communicable
Diseases', 'Elsevier
Scopus', 'Open-J Gate',
'getCITED', 'ProQuest CSA
Physical Education Index',
'ProQuest CSA Natural
Sciences', 'ProQuest CSA
Social Sciences', 'Genamics
Journal Seek', 'Electronic
Journals Index (SJSU)',
'Directory of Open Access
Journals (DOAJ)', 'EBSCO
SPORTDiscus with Full
Text', 'EBSCO TOC Premier',
'EBSCO Current Abstracts',
'Index Copernicus', 'EZB
- Electronics Journals
Library', 'Scientific Journal
Impact Factor (SJIFactor)',
'Directory of Research
Journals Indexing (DRJI)',
'Universal Impact Factor
(UIF)', 'ROOT INDEXING -
Journal Abstracting and
indexing service', 'ESJI -
Eurasian Scientific Journal
Index', 'ROAD - Directory
of open access scholarly
resources', 'Academic
Keys', 'Academic Resource
Index - Research BIB',
'WCOSJ - World Catalogue
of Scientific Journals',
'DAIJ - Directory of Abstract
Indexing for Journals', 'I2OR
- International Institute
Of Organized Research',
'JournalIndex.net', 'OCLC -
WorldCat', 'SIS - Scientific
indexing service', 'IJIIF
- International Innovative
Journal Impact Factor', 'IFSIIJ
- Impact Factor Services
For International Journals',
'Open Academic Journals
Index - OAJI', 'Scholarsteer
- Scholarly Information',
'Scientific world index -
sciindex', 'Journal Impact
Factor - JIFactor', 'Journal
Factor'

Editorial Board

Dragan Milanović
(Zagreb, Croatia)
Milan Čoh
(Ljubljana, Slovenia)
Milan Žvan
(Ljubljana, Slovenia)
Franja Fratrić
(Novi Sad, Serbia)
Žarko Kostovski
(Skoplje, Macedonia)
Đorđe Stefanović
(Belgrade, Serbia)
Abas Asadi
(Iran)
Izet Rado
(Sarajevo, BiH)
Zvezdan Savić
(Niš, Serbia)
Branimir Mikić
(Travnik, BiH)
Edita Kastratović
(Belgrade, Serbia)
Ifet Mahmutović
(Sarajevo, BiH)
Branimir Inić
(Belgrade, Serbia)
Damir Ahmić
(Travnik, BiH)
Violeta Šiljak
(Belgrade, Serbia)
Hazim Selimović
(Travnik, BiH)
Andrej Švent
(Ljubljana, Slovenia)
Osmo Bajrić
(Travnik, BiH)
Milorad Džukić
(Novi Sad, Serbia)
Samir Mačković
(Tuzla, BiH)
Dragan Žvotić
(Belgrade, Serbia)
Munir Talović
(Sarajevo, BiH)
Shemsedin Vehapi
(Prishtina, Kosovo)
Nihad Selimović
(Travnik, BiH)
Branislav Mašić
(Novi Sad, Serbia)
Alen Kapiđić
(Tuzla, BiH)
Jovan Veselinović
(Belgrade, Serbia)
Rasim Dadić
(Travnik, BiH)
Vesna Čilerdžić
(Belgrade, Serbia)
Alija Biberović
(Tuzla, BiH)
Milan Nešić
(Novi Sad, Serbia)
Adisa Ahmić
(Tuzla, BiH)
Ivana Parčina
(Belgrade, Serbia)
Dževad Džibrić
(Tuzla, BiH)
Aleksandra Grbović
(Belgrade, Serbia)
Farid Ljuca
(Tuzla, BiH)

Zoran Mašić
(Belgrade, Serbia)
Fatmir Pireva
(Prishtina, Kosovo)
Amra Tuzović
(Travnik, BiH)
Milan Radosavljević
(Belgrade, Serbia)
Ismet Bašinac
(Travnik, BiH)
Vladan S. Perišić
(Novi Sad, Serbia)
Ivanka Gajić
(Belgrade, Serbia)
Maja Selimović
(Travnik, BiH)
Elena Plakona
(Solun, Greece)
Romana Romanov
(Novi Sad, Serbia)
Maid Omerović
(Travnik, BiH)
Marko Begović
(Podgorica, Montenegro)
Jasmin Delić
(Tuzla, BiH)
Nina Đukanović
(Belgrade, Serbia)
Nermin Mulaosmanović
(Tuzla, BiH)
Blerim Saiti
(Tetovo, Macedonia)
Jasmin Hrnjić
(Travnik, BiH)
Slađana Mijatović
(Belgrade, Serbia)
Elvis Vardo
(Tuzla, BiH)
Aleksandra Perović
(Belgrade, Serbia)
Marin Čorluka
(Mostar, BiH)
Georgios Fragkiadakis
(Athens, Greece)
Denysiuik Volodymyr
(Kyiv, Ukraine)
Jean Firica
(Craiova, Romania)
Edvin Dervišević
(Ljubljana, Slovenia)

TABLE OF CONTENTS

Alen Kapidžić, Adnan Salkić, Muris Đug (Original scientific paper) Differences in kinematic parameters between successful and unsuccessful instep kicks in Soccer	8	Nermin Mulaosmanović, Hazim Selimović (Original scientific paper) Stress and Sports activities	64
Jasmin Hrnjić (Original scientific paper) Effects of the motor ability levels on result efficiency in 60 meters sprint with adolescents aged 17-19	14	Petar Karadžić, Dragan Doder, Biljana Savić, Branko Đukić, Lana R. Doder (Original scientific paper) Differences in physical development of the female students tested in 1995 and 2010	72
Maslyak I.P., Shesterova L.Ye, Kuzmenko I.A., Bala T.M., Mameshina M.A., Krivoruchko N.V., Zhuk V.O. (Original scientific paper) The Influence of the vestibular analyzer functional condition on the physical fitness of school-age children	20	Lejla Šebić, Adriana Ljubojević (Original scientific paper) Construction and validation of specific flexibility tests in rhythmic gymnastics	78
Nermin Mulaosmanović, Irmela Mujkić, Jasmin Hrnjić, Zehrina Selimović (Original scientific paper) Perfectionist tendencies in Athletes	28	Nela Tatar, Mirza Mulešković (Original scientific paper) A comparative analysis of the students' awareness regarding University sports in Montenegro and Serbia	84
Izet Rado, Izet Bajramović, Slavenko Likić, Haris Alić, Eldin Jelešković, Camil Habul, Amel Mekić (Original scientific paper) The effects of an additional 10-weeks strength training on isokinetic knee joint potential of young Athletes	34	Miroslav Smajić, Branko Đukić, Senida Saldum (Original scientific paper) The differences between particular anthropological characteristics of Football players from different competition	92
Seryozha Gontarev, Lence A. Velickovska, Ruzdija Kalach, Ivan Anastasovski (Original scientific paper) The effects of specially programmed classes in physical education on some secondary school second grade schoolgirls' fitness skills	38	Marko Begović, Damir Ahmić, Ivana Parčina (Original scientific paper) The initial discussion on Social media and Sports relationship nature	98
Amel Mekić, Haris Alić, Izet Bajramović, Izet Rado (Original scientific paper) Effects of experimental training program on value of special Judo fitness test in young judokas	46	Marijana Podrug Arapović, Lejla Šebić, Izet Rado (Original scientific paper) Differences between traditional programs and training through game on performance in learning ice skating	102
Branimir Mikić, Vesna Bratovčić, Žarko Kostovski, Nedeljko Petrović, Nedeljko Stankvić, Jovana Bozoljac (Original scientific paper) The effects of a programmed kinesiology treatment on the primary school fourth to sixth grade pupils' postural status and transformation of some motor skills	52	Patrik Drid, Tatjana Trivi, Sergey Tabakov (Original scientific paper) Planning and designing top sambo athletes' training sessions	108
Nedžad Vuk, Ekrem Čolakhodžić (Original scientific paper) Socio-demographic structure and the managers' level of perfectionism in the city of Mostar sports clubs	58	Amir Avdagić, Nihada Ahmetović (Original scientific paper) World Anti-doping agency blood collection guidelines as an effective athletes testing programme support	114

SADRŽAJ

Alen Kapidžić, Adnan Salkić, Muris Đug (Izvorni znanstveni članak) Razlike u kinematičkim parametrima između preciznog i nepreciznog šutiranja punim u nogometu	8	Nermin Mulaosmanović, Hazim Selimović (Izvorni znanstveni članak) Stres i sportske aktivnosti	64
Jasmin Hrnjić (Izvorni znanstveni članak) Utjecaj nivoa motoričkih sposobnosti na rezultatsku efikasnost sprinta na 60 metara kod adolescenata uzrasta 17-19 godina	14	Petar Karadžić, Dragan Doder, Biljana Savić, Branko Đukić, Lana R. Doder (Izvorni znanstveni članak) Razlike u fizičkom razvoju djevojčica testiranih 1995 i 2010. godine	72
Maslyak I.P., Shesterova L.Ye, Kuzmenko I.A., Bala T.M., Mameshina M.A., Krivoruchko N.V., Zhuk V.O. (Izvorni znanstveni članak) Utjecaj funkcionalnog stanja vestibularnog aparata na fizičke sposobnosti školske djece	20	Lejla Šebić, Adriana Ljubojević (Izvorni znanstveni članak) Konstrukcija i validacija specifičnih testova fleksibilnosti u ritmičkoj gimnastici	78
Nermin Mulaosmanović, Irmela Mujkić, Jasmin Hrnjić, Zehrina Selimović (Izvorni znanstveni članak) Perfekcionističke težnje kod sportista	28	Nela Tatar, Mirza Mulešković (Izvorni znanstveni članak) Komparativna analiza informiranosti studenata Srbije i Crne Gore o univerzitetskom sportu	84
Izet Rađo, Izet Bajramović, Slavenko Likić, Haris Alić, Eldin Jelešković, Čamil Habul, Amel Mekić (Izvorni znanstveni članak) Efekti 10-sedmičnog dodatnog treninga snage na izokinetički potencijal zgloba koljena mladih sportista	34	Miroslav Smajić, Branko Đukić, Senida Saldum (Izvorni znanstveni članak) Razlike u nekim antropološkim karakteristikama fudbalera različitog ranga takmičenja	92
Seryozha Gontarev, Lence A. Velickovska, Ruzdija Kalach, Ivan Anastasovski (Izvorni znanstveni članak) Efekti posebno programirane nastave fizičkog vaspitanja u nekim fitness vještina učenika II. razreda srednje škole	38	Marko Begović, Damir Ahmić, Ivana Parčina (Izvorni znanstveni članak) Početna razmatranja o prirodi odnosa društvenih medija i sporta	98
Amel Mekić, Haris Alić, Izet Bajramović, Izet Rađo (Izvorni znanstveni članak) Efekti eksperimentalnog trenažnog programa na vrijednosti specifičnog džudo testa mladih džudista	46	Marijana Podrug Arapović, Lejla Šebić, Izet Rađo (Izvorni znanstveni članak) Razlike tradicionalnog programa i obučavanja kroz igru na uspješnost učenja klizanja na ledu	102
Branimir Mikić, Vesna Bratovčić, Žarko Kostovski, Nedeljko Petrović, Nedeljko Stankvić, Jovana Bozoljac (Izvorni znanstveni članak) Efekti programiranog kineziološkog tretmana na transformaciju motoričkih sposobnosti i posturalnog statusa stopala učenika IV – VI razreda osnovne škole	52	Patrik Drid, Tatjana Trivi, Sergey Tabakov (Izvorni znanstveni članak) Planiranje i programiranje treninga vrhunskih sambista	108
Nedžad Vuk, Ekrem Čolakhodžić (Izvorni znanstveni članak) Sociodemografska struktura i nivo perfekcionizma kod menadžera u sportskim klubovima grada Mostara	58	Amir Avdagić, Nihada Ahmetović (Izvorni znanstveni članak) Smjernice svjetske antidoping agencije za prikupljanje uzoraka krvi kao podrška efektivnim programima testiranja sportista	114

DEAR READER,

We are introducing a new, redesigned issue of the scientific journal SPORT SCIENCE. From this point on, it will be published by NIA, The Association for Research, Education and Development.

The Management Board has made a strategic decision to change the publisher with the goal to expand the journal further which NIA can achieve through its work. Since the publication of the first issue in 2008, we have been extremely successful in promoting the work quality, exchanging scientific achievements through selected articles in the journal and presenting authors, who, not only come from Bosnia and Herzegovina, but also from the region, Europe and the world. Thus, the journal has become noticeable and promoted at a global level, which was, indeed, the Management Board's strategic plan.

We are pleased to present a new cover as well as the interior technical and graphic design creating a new visual identity. This is just the beginning of creating a new SPORT SCIENCE identity which will, in the following year, be promoted in a completely new design. As the next step towards improving the quality of expertise and segmenting the areas belonging to scientific research promoted in this journal, we plan on reorganizing the Editorial, and Editorial staff boards, following the next issue. The Management and Editorial Board's primary task is placing the journal at the top of the scientific community and making sure it is recognised by its quality and excellence.

This issue of the journal focuses on the authors of the articles who participated at the prestigious conference InSSSED 2016 (International Sports, Science, Education and Development Conference) and, with their papers in the area of transformation processes in kinesiology, sports management, psychology and medicine, presented new activities and achievements worthy of your attention and time spent reading it.

We believe you will like the new design, follow the expansion, and be a part of our story in making a journal which will quickly, along with all the accomplished changes we made in its strategic development, become a part of the greatest scientific references in the area of kinesiology, sports, sports training and management, education and sports development at the global level.

Our goal is EXCELLENCE, while quality is a PRESTIGE SPORT SCIENCE offers you, our faithful readers and followers of our vision. Together we create new values which will, following the latest technological advances, change the world and philosophy of science. We would like to be a part of these changes and offer you the best vision with which you will change the world around you.

Dr. Nihad Selimović, MSc
Editor in chief



DRAGI ČITATELJU,

Pred Vama je novi broj časopisa SPORT SCIENCE koji predstavljamo u novom izdanju. Od ovog broja časopis će izdavati NIA, udruženje za istraživanje, edukaciju i razvoj.

Promjena izdavača je strateška odluka menadžerskog odbora sa ciljem da se unaprijedi razvoj časopisa a što NIA kroz segmente svoga rada može ostvariti. Prvi broj časopisa izdat je 2008. godine i u proteklom periodu postignut je zavidan upjeh u promociji kvaliteta rada, razmjene naučnih dostignuća kroz odabrane članke u kategorijama časopisa i po kvaliteti autora koji dostavljaju svoje članke a koji su ne samo iz Bosne i Hercegovine već iz zemalja regiona, Evrope i svijeta. Časopis je na taj način postao vidljiv i promovisan na globalnom nivou što je i strateški plan menadžerskog odbora.

Od ovog broja sa zadovoljstvom predstavljamo i novi dizajn naslovne stranice i unutrašnje tehničko i grafičko uređenje koje je praćeno novim vizuelnim identitetom. Ovo je samo početak stvaranja novog identiteta časopisa SPORT SCIENCE koji će u narednoj godini biti promovisan u potpuno novom izdanju. Već od narednog broja predviđeno je i novo uređenje uredničkog kolegija i uredničkog odbora što će biti naredni korak ka unapređenju kvalitete stručnog rada i segmentiranju oblasti koje pripadaju području naučnih istraživanja koje časopis promovira. Zadatak glavnog menadžerskog odbora i uredničkog kolegija je pozicioniranje časopisa u sami vrh naučnog svijeta i prepoznatljivost po kvaliteti i izvrsnosti.

U ovom broju časopisa data je prednost autorima članaka koji su bili učesnici prestižne konferencije InSSED 2016 (Međunarodna konferencija iz oblasti Sporta, Nauke, Edukacije i Razvoja) koji su sa svojim radovima iz oblasti transformacionih procesa u kineziologiji, sportskog menadžmenta, sportske psihologije i sportske medicine, prezentirali nove sadržaje i dostignuća vrijedna pažnje i Vaše čitanosti.

Vjerujemo da će Vam se novi dizajn časopisa dopasti i da ćete pratiti naš dalji razvoj i biti dio naše priče u stvaranju časopisa koji će veoma brzo, uz sve promjene koje smo osmislili u strategiji razvoja časopisa, dostići svoj cilj i biti dio najvećih naučnih referenci iz svijeta kineziologije, sporta, sportskog treninga i menadžmenta, edukacije i sportskog razvoja na globalnom nivou.

Naš cilj je IZVRSNOST a kvalitet je PRESTIŽ koji SPORT SCIENCE želi Vama ponuditi, vjernim čitaocima i pratiocima naše vizije. Zajedničkom energijom stvaramo nove vrijednosti koje će prateći tehnološke napretke mijenjati svijet i svijest nauke a mi upravo želimo biti dio promjena i Vama ponuditi bolje vizije sa kojima ćete mijenjati svijet oko sebe.

Dr. Nihad Selimović, MSc
Editor in chief

DIFFERENCES IN KINEMATIC PARAMETERS BETWEEN SUCCESSFUL AND UNSUCCESSFUL INSTEP KICKS IN SOCCER

Alen Kapidžić, Adnan Salkić, Muris Đug

Faculty of Physical Education and Sports, University of Tuzla, Bosnia and Herzegovina

In the following study, we wanted to determine which of the applied kinematics variables make a significant difference between successful and unsuccessful instep kicks. For the purposes of this research, we designed an examinee sample consisting of 30 boys, of the average age 11 ± 0.8 , the average height 146.17 ± 7.23 and the average weight 38.53 ± 6.18 . The boys are members of the FC Sloboda Soccer School. Each participant performed five kicks that were video recorded with two synchronized cameras (Casio Ex-F1) positioned 12 meters away from the place of the kick. The data were collected by analysing the video recording of each kick. Data processing was completed by using the APAS motion analysis system (ASriel Dynamics Inc., San Diego, CA). The difference between the "successful" and "unsuccessful" group was found in the following variables: HCGL- height of the body focus in the last step before positioning the standing leg to the ball ($p=.05$), Aknee1- angle in the knee joint kicking leg in the initial phase of the impact ($p=.05$) and Aknee4 – angle in the hip joint landing leg at the moment of contact with the ball ($p=.05$). The results of the study indicate that for a successful performance of this technical element, athletes and coaches must pay attention to three important elements. First, the heights of the body focus in the last step before positioning the standing leg on the ball. Second, the lower swing phase that does not contribute to a higher speed of the ball, precisely, determination of the contact kicking leg and the ball. Third, greater inclination of the torso forward when it comes to successful kicks.

Keywords: Precision, technique, swing phase, angle, body focus, leg.

INTRODUCTION

Instep kick and its variations are often used in soccer, when passing at medium and long distances, shooting at the goal, performing penalty kicks and other standard situations (Kellis and Katis, 2007). Given the large number of situations in which it is used, the high technical performance is important as to scoring, as well as for implementation of tactical variations that include the use of this technical element. Therefore, kicking is the most offensive technique in the game, and the team with the most kicks has bigger chances of winning the game (Gheidi and Sadeghi, 2010). Most studies that are focused toward biomechanical analysis of this impact are aimed at defining the variables that are the main contributors in successful performance of this impact, which is usually defined by the ball velocity (Barfield et al., 2002; Katis and Kellis, 2010; Ismaili et al., 2010; Scurr and Hall 2009; Shinkai et al., 2009). However, the precision of passing and kicking is of great importance in the soccer game, according to some authors, and can be defined as the ability of hitting the ball into a certain area (Finnoff et al., 2002). Therefore, the definition of the precise kicks' biomechanical features in relation to imprecise ones greatly contributes to defining factors that will improve the accuracy of the kicking technique (Gheidi and Sadeghi, 2010; Dorge et al., 2002). In some studies, smaller angle values, angular velocities, as well as the foot speed of successful kicks in relation to unsuccessful kicks were established (Gheidi and Sadeghi, 2010; Dorge et al., 2002). Also, some studies have established differences in the kinematic parameters of the lower extremities within successful and unsuccessful kicks in angle values of standing feet (Dichiera et al., 2006). All

the mentioned parameters are also closely related to the speed of the ball. For the fastest kick, the foot must be given maximum speed in order to transfer a high momentum to the ball (Wesson, 2002). Given the above mentioned, as well as previous studies, it is possible to say that successful kicks have a lower angular and linear velocity as opposed to strong and (inaccurate) unsuccessful kicks (Gheidi and Sadeghi, 2010). So, based on the above, we can conclude that a large number of factors determine the success when performing this kicking technique. The results of some studies suggest that even the body posture at the moment of contact with the ball has an impact, on both, the speed of the ball and the kicking accuracy (Dorge et al., 2002; Baqrfield et al., 2002; Stanković et al., 2004; Meamarbashi and Hossaini, 2010). Performing the instep kick is a three phase skill including the swing, the ball impact and the follow through phases (Goktepe et al., 2010). Precise kicking depends on the right technical performance in all the mentioned phases. Due to the high complexity of the instep kick, it is necessary that young players and coaches pay more attention to this technical element during the training process (Kapidžić et al., 2014; Petrone et al., 2006). Biomechanical analysis of the movement is necessary to improve the instep kick performance, understand the results of the kick, and develop new and more efficient movement techniques (Meamarbashi and Hossaini, 2010). In accordance with the complexity of the impact, a large applicability in the game and a very few studies of this type in our country, we have chosen to analyse exactly this technical element. Therefore, the main objective of this study was to determine whether there are differences in applied kinematic parameters between successful and unsuccessful instep kicks in soccer. Based on the obtained information, we will be able to accurately determine kinematic parameters that differentiate between precise and imprecise instep kicks. Also, the obtained information through this study can be used in terms of a more efficient training process of this technique with young players. Ultimately, the above mentioned, will result in rationalization of movement while performing the instep kick technique in soccer, which makes and enables the effective implementation of the technique in a more complex term.

MATERIALS AND METHODS

Participants

For the purposes of this research, we designed an examinee sample consisting of 30 boys, of the average age 11 ± 0.8 , the average height 146.17 ± 7.23 and the average weight 38.53 ± 6.18 . All participants were members of the FC Sloboda Soccer School. Each of the participants performed five strokes with the dominant leg into the right side of the

target. The main criterion was that the examinee is a member of the club for a minimum of twelve months. The students were members of the school's competitive soccer teams and, therefore, all the participants had undergone standard systematic medical examinations, on the basis of which they were deemed to be in good health and without any conditions that could significantly impact the test results. Each subject provided consent for participation, and the research was approved by the management of FC Sloboda Tuzla (No. 01/1-sl./11). For the purposes of this research, the participants were divided into two groups.

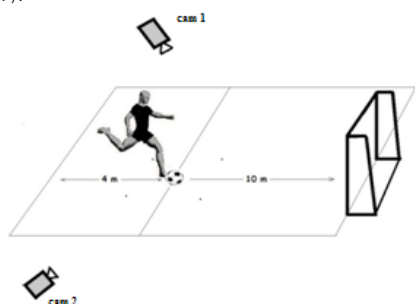
Variables

Twelve variables were chosen for the evaluation of kinematic parameters. The following were considered as independent and/or predictive variables: HCG1 (height of the body focus in the last step before positioning the standing leg on the ball (cm)); HCG2 (height of the body focus in the moment while positioning the standing leg on the ball (cm)); HCG12 (the difference in the height of the body focus between the last step and moment of positioning the standing leg on the ball - derived variable (cm)); Foot1 (distance between the foot joint kicking leg and the base at the initial phase of the impact (cm)); Aknee1 (angle in the knee joint kicking leg in the initial phase of the impact (degrees)); Aknee2 (angle in the knee joint standing leg while positioning it to the ball (degrees)); Aknee3 (angle in the hip joint swing foot while positioning it to the ball (degrees)); Aknee4 (angle in the hip joint of the swing foot while contacting the ball (degrees)); Aknee5 (differences between values of the angle in the hip joint swing foot in the moment of positioning and the moment of contacting the ball - derived variable (degrees)); Fspeed1 (the speed of the swing foot at the time of contact with the ball (m/s)); Fspeed2 (the speed of the knee joint swing foot at the time of contact with the ball (m/s)); Foot2 (Distance of the swing foot in the final phase of the impact - tracking (cm)).

Procedures

All of the testing was conducted at the Exercise Science Laboratory of the Faculty of Physical Education and Sport, Tuzla University, from 10 am to 12 noon. Tests were completed on a parquet surface and the participants wore outfits that complied with the conditions of testing. The participants performed a 15 minutes warm-up, which consisted of three phases. The first phase was a 5 minutes run (jogging, jumping, and dynamic stretching). The second phase involved exercises with the ball in pairs. During this phase, participants passed the ball at different distances by changing the passing techniques. All exercises were performed in motion. In the final

phase, participants performed the instep kick from different distances and positions, hitting a target set at the goal. For the purposes of this research, only the participants who kick with the right leg were taken. Five strokes were performed by each participant. The participants rested for one minute between strokes, in order to prepare for the next one. Each stroke ended with a three-step run that started within 4 m from the ball and was at an angle less than 45° to the goal. The stroke was performed at a distance of 10 m from the goal. Each stroke was recorded by two synchronized cameras (Casio Ex-F1) (Picture 1).



Picture 1: A scheme of the testing protocol

The testing space was calibrated within a frame of 1 m x 1 m x 2 m (Picture 2). The cameras had a 300 Hz frequency and a 720 x 576 pixels resolution. Data processing was completed by using the APAS motion analysis system (ASriel Dynamics Inc., San Diego, CA).



Picture 2: Space calibration

Thirty boys, who represented the sample of respondents, performed a total of 150 attempts at kicking. All 150 attempts were divided into two groups. In the first group .94 kicks were classified as those that were unsuccessful. Under the unsuccessful kicks, we defined all those in which the ball hit a part of the target that is marked with the number 1, or the ball did not hit the target at all. In the second group, 56 kicks were classified as successful, considering that the ball hit a part of the target marked with the numbers 2 and 3.



Picture 3: Target

Statistical analysis

To determine the differences the T – test for independent samples was used; it is calculated by the following formula (1 and 2):

$$S_{\bar{X}_1 - \bar{X}_2} = \sqrt{\frac{S_1^2}{N_1} + \frac{S_2^2}{N_2}} \quad (1)$$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{S_{\bar{X}_1 - \bar{X}_2}} \quad (2)$$

One of the most common cases in experimenting and statistical data processing is the comparison of two arithmetic means and testing the differences between them. The term “statistically significant difference” has a determined and defined meaning in statistics. If we state that a difference was statistically significant, then we actually determined the difference which was found (regardless of the size of the differences) is not random, accidentally the differences exists among populations. The most important reason for calculating the standard error

of the arithmetic means lies in the following: through this error we can calculate significant differences between two arithmetic means, or the difference did not arise by chance. From the formulas, it is apparent that t represents a certain z value. Both z as well as t are as one deviation, expressed in terms of standard deviation; as 1 z means that a certain result is exactly one standard deviation above the average, so the $t=1$ means that some difference found between arithmetic means of the one standard deviation, scattering of all random variations that can happen even if there is no difference between arithmetic means among population.

RESULTS

According to the results of the T-test (Table1.), it is visible that significant statistical differences in three applied variables between the "successful" and "unsuccessful" group were established. The significant statistical difference between successful and unsuccessful kicks in variable HCGL was established. According to the mean value, in this variable the significant statistical difference was

established in favour of the „successful" group. The average value of the height of the body focus in the last step before positioning the standing leg within the unsuccessful kicks is 65.67 ± 5.263 , while within the successful kicks this number is 67.46 ± 6.125 . The significant statistical difference within the successful and unsuccessful kicks is shown in variable Aknee1. According to the results of the average values the statistical difference goes in favour of the successful kicks (successful 93.63 ± 8.157 ; unsuccessful 91.12 ± 8.934). This data shows that the average values of angles within the successful group in numerical description are bigger, but ultimately, it means a smaller swing phase with the impact foot. Also, within the variable Aknee4 the significant statistical difference was established between the successful and unsuccessful group. The established significant difference was in favour of the unsuccessful group which is shown by the average value. This shows us that the participants who performed successful kicks had a bigger inclination of the torso forward in comparison to those participants who performed unsuccessful kicks (successful 139.43 ± 9.910 ; unsuccessful 142.18 ± 9.613).

Group Statistics						Independent Samples Test			
	GROUP	N	Mean	Std. Deviation	Std. Error Mean	F	Sig.	t	Sig. (2-tailed)
Hcg1	unsuccessful	94	65.67	5.263	.543	2.251	.136	-2.199	.039
	successful	56	67.46	6.125	.819				
Hcg2	unsuccessful	94	59.2547	5.35344	.55217	.991	.321	-1.438	.153
	successful	56	60.6087	5.93748	.79343				
Hcg12	unsuccessful	94	6.2915	1.81385	.18708	.424	.516	-1.551	.123
	successful	56	6.7925	2.07281	.27699				
Dfoot1	unsuccessful	94	55.3510	10.36158	1.06871	2.141	.146	.815	.417
	successful	56	52.1702	9.29103	1.24157				
Aknee1	unsuccessful	94	91.12	8.934	.922	.570	.452	-2.017	.048
	successful	56	93.63	8.157	1.090				
Aknee2	unsuccessful	94	154.03	8.413	.868	.029	.866	.980	.329
	successful	56	152.52	10.280	1.374				
Aknee3	unsuccessful	94	132.82	7.016	.724	.306	.581	1.280	.203
	successful	56	131.29	7.233	.967				
Aknee4	unsuccessful	94	142.18	9.613	.893	.783	.876	2.128	.044
	successful	56	139.43	9.910	1.043				
Aknee5	unsuccessful	94	10.79	7.080	.730	.797	.373	1.317	.190
	successful	56	9.21	7.068	.944				
Fspeed1	unsuccessful	94	1.2471	.16656	.01718	3.613	.059	-.408	.684
	successful	56	1.2577	.12738	.01702				
Fspeed2	unsuccessful	94	.3729	.07737	.00798	4.539	.035	.389	.698
	successful	56	.3673	.09528	.01273				
Dfoot2	unsuccessful	94	23.5819	9.13645	.94235	.167	.684	.814	.417
	successful	56	22.3407	8.85847	1.18376				

DISCUSSION

Based on the obtained results, it is visible that the average height of the body focus is bigger within successful than within the unsuccessful kicking. Given that each participant performed five kicks, it is clear they all had successful and unsuccessful ones. This leads us to the fact that same participants changed their height of the body focus during the kicking technique performance and eventually the body posture (Barfield et al., 2002). Smith et al., (1997) proved in their research that due the kicking technique, the hips show the greatest adaptation in relation to the angle of the run-up. As the run-up is performed at an angle of 45° it is assumed that the examinees in the last step, before setting the standing leg, adjusted their body posture, with the aim of more precise kicking. The ball trajectory is very important for a successful kick and it depends on the position of the standing leg. In their research, Cooper and Glassow (1982) state that the trajectory and speed of the ball depend on the positioning of the standing leg closer or further from the ball. According to them, if we want a lower trajectory of the ball, the standing leg should be as close to the ball as possible, and if we want a higher trajectory the standing leg must be positioned from 10.16 to 15.24 cm in front of the perpendicular line. We can state that the position of the body posture before positioning the standing leg is important for a precise kicking. Numerous studies that have dealt with this issue consider the body posture as a fact that contributes to the higher speed and precision kicking (Barfield et al., 2002; Dorge et al., 2002; Meamarbashi and Hossaini, 2010; Stanković et al., 2004). The results of our study suggest the different values of the height of the body focus in the last step before positioning the standing leg to the ball in relation to a different position in hitting the target. Also, the values of the height of the body focus in the moment of positioning the standing leg to the ball do not indicate any significant differences. Statistically significant differences are visible in the angle values of the knee joint kicking leg (Aknee1), and the established difference goes in favour of the successful kicks. As we have a higher average value of the angle in the knee joint with successful kicks, it actually indicates a lower phase of run-up. But, in their research, Goktepe et al., (2008) claimed quite similar values for angles in the knee joint while kicking to different locations of the goal. In their research, Gheidi and Sadeghi (2010) have established the average higher values of angles in the knee joint as unsuccessful rather than successful kicks (successful 129.36 ± 8.300 ; unsuccessful 137.17 ± 9.100). There is also a significant difference between successful and unsuccessful kicks in the variable, Aknee4 which estimates the angle of the hip joint of the standing leg in the moment of contacting with the ball. The stated difference goes in favour of the unsuccessful group. According to the results,

it is shown that the participants, while performing a successful kick, had a higher inclination of the torso forward. In their research, Gheidi and Sadeghi (2010) did not determine statically significant differences in the angle values between successful and unsuccessful kicks. The average values of the angles, in this study, show different values within successful kicks in comparison to unsuccessful ones. With females, those values are more significant than with males (successful kick 165.35 ± 10.20 (female), 146.86 ± 11.400 (male); unsuccessful kick 165.06 ± 11.60 (female), 146.96 ± 9.500 (male)). Also, in his research, Barfield (1998) proved that the values of angles in the hip and knee joints, as well as the values of the plantar flexion, were higher within unsuccessful kicks in comparison to successful ones. All the mentioned research, as well as the results obtained in this study lead to a determination of similar factors that affect the accuracy of the kicking. Scurr and Hall (2009) found different values in the hip joint, the knee joint swing leg, as well as the knee joint standing leg in comparison to a different angle of the run-up, while performing the penalty kick (knee 30° - 162.2 ± 8.8 , 45° - 160.5 ± 9.7 , 60° - 163.7 ± 9.8 , hip 30° - 148.5 ± 3.3 , 45° - 149.9 ± 5.4 , 60° - 153.1 ± 5.2 , supporting leg knee 30° - 141.4 ± 10.9 , 45° - 136.7 ± 7.8 , 60° - 140.6 ± 7.5) in their study. We must emphasize that the accuracy of the kicking at a target largely depends upon the place of the contact between the swing leg and the ball (Asai et al., 2002). Based on all the above, it is obvious that the player, while performing a kicking technique, needs to adjust his or her body posture for a more accurate kicking.

CONCLUSION

In order to improve the teaching process of this technical element, it is important to know the significance of enforcing certain elements within the game. Also, the knowledge of some of the technical elements' structural analysis that contribute to the knowledge of technical elements' kinematic profile is very important. Therefore, our study is focused on obtaining relevant information that will contribute to the understanding of the mechanical characteristics of movement and, thus, to the more efficient teaching process.

The results of our study clearly indicate that there are three factors important for a better accuracy. Those are: the height the body focus in the last step before placing the standing leg, the angle in which the knee joint swing leg is positioned in the initial phase of the stroke, and the angle of the hip joint standing leg while contacting the ball. The height the body focus is slightly higher within successful strokes, as well as the inclination of the torso forward. At the end we can say that these factors contribute to the body posture in order to perform more precise kicking. Also, the lower run-up phase with successful strokes does not contribute to a higher speed of the ball, but to more accurate determination of the swing leg contact with the ball, that also contributes to a more precise kicking.

Summarizing the results, we can say that, for a successful kicking performance, the adaptation of the position of the hips is essential, as well as a higher angle in the knee joint in the initial phase of impact which implies a lower run-up phase. Together, all the mentioned factors, considering the distance of the target, may not lead to distortion of the balance. It is important to emphasize that, if young athletes want to be successful in carrying out the technical elements, they have to focus on the elements that are presented in this study. Future research of the similar type should be directed in order to determine

the difference in the kinematic parameters between the different ranges of competition (quality – less quality). The measures of dynamometric lower extremities and the measure of the individual body segments' speed should be a part of future studies. In terms of obtaining complete information on this technical element, longitudinal studies should be carried out. Also, in order to compare them, the above mentioned parameters should be measured in a variety of conditions by changing the distance from which the stroke is performed in relation to the target.

REFERENCES

1. Asai T., Carre M.J., Akatsuka T., and Haake S.J. The curve kick of a football I: impact with the foot. *Sports Engineering*, 2002, 5, 183-192.
2. Barfield W.R., The biomechanics of kicking in soccer. *Clin. Sports Med.*, 1998, 17, 711-728.
3. Barfield W.R., Kirkendall T.D., and Yu B. Kinematic instep kicking differences between elite female and male soccer players. *J Sports Sci. Med.*, 2002, 1, 72-79.
4. Cooper J.M., Adrian M., and Glassow R.B. *Kinesiology*. St. Louis: Mosby Co, 1982
5. Dichiera A., Webster K.E., Kuilboer L., Moris M.E., Bach T.M., and Feller J.A. Kinematic patterns associated with accuracy of the drop punt kick in Australian football. *J. Sci. Med. Sport*, 2006, 9, 292-298.
6. Dorge H.C., Anderson T.B., Sorensen H., and Simonsen E.B. Biomechanical differences in soccer kicking with preferred and non-preferred leg. *J. Sports Sci.*, 2002, 20, 293-299.
7. Finnoff J.T., Newcomer K., and Laskowski E.R. A valid and reliable method for measuring the kicking accuracy of soccer players. *Journal of Science and Medicine in Sport*, 2002, 5(4), 348-353.
8. Gheidi N., and Sadeghi H. Kinematic comparison of successful and unsuccessful instep kick in indoor soccer. *American Journal of Applied Sciences*, 2010, 7(10), 1334-1240.
9. Goktepe A., Karabork H., Ak E., Cicek S., and Korkusuz F. Kinematic analysis of penalty kick in soccer. *J Fac Eng Arch*, 2008, 23, 45-49.
10. Ismail A.R., Mansor M.R.A., Ali M.F.M., Jaafar S., and Johar M.S.N.M. Biomechanics analysis for right leg instep kick. *Journal of Applied Sciences*, 2010, 10(13), 1286-1292.
11. Katis A., and Kellis E. Three-dimensional kinematics and ground reaction forces during the instep and outstep soccer kicks in pubertal players. *Journal of Sport Sciences*, 2010, 28(11), 1233-1241.
12. Kapiđić A., Huremović T., and Biberović A. Kinematic analysis of the instep kick in youth soccer players. *Journal of Human Kinetics*, 2014, 42, 81-90.
13. Kellis E., and Katis A. Biomechanics and determinants of instep soccer. *J. Sports Sci. Med.*, 2007, 6, 154-165.
14. Meamarbashi A., and Hossaini S.R.A. Application of Novel Inertial Technique to Compare the Kinematics and Kinetics of the Legs in the Soccer Instep Kick. *J Hum Kinet*, 2010, 23, 3-12.
15. Petrone N., Marcolin G., and Robazza C. Correlation between support foot placement and goal accuracy for instep kicks in the soccer fields, 2006. Available at: <https://ojs.ub.uni-konstanz.de/cpa/article/view/220/180>
16. Scurr J., and Hall B. The effects of approach angle on penalty kicking accuracy and kick kinematics with recreational soccer players. *J. Sports Sci. Med.*, 2009, 8, 230-234.
17. Shinkai H., Nunome H., Isokawa M., and Ikegami, Y. Ball impact dynamics of instep soccer kicking. *Med Sci. Sports Exerc*, 2009, 41(4), 889-897.
18. Smith N.A., Dyson R.J., and Hale T. Lower extremity muscular adaptations to curvilinear motion in soccer. *Journal of Human Movement Studies*, 1997, 33, 139-153.
19. Stanković R., Bubanj R., and Joksimović S. Characteristics of the speed of segments of swing foot at the technique of kicking the ball in football. *Int J Phys Educ.*, 2004, 12, 171-182.
20. Wesson J. *The Science of Soccer*. London: Institute of Physics, 15-29, 2002.

RAZLIKE U KINEMATIČKIM PARAMETRIMA IZMEĐU PRECIZNOG I NEPRECIZNOG ŠUTIRANJA PUNIM U NOGOMETU

U ovoj studiji željeli smo utvrditi koje od primjenjenih kinematičkih varijabli značajno razlikuju uspješne od neuspješnih udaraca (Instep Kick). Za potrebe ovog istraživanja konstruisan je uzorak ispitanika od 30 dječaka prosječnih godina starosti $11 \pm 0,8$, prosječne tjelesne visine $146,17 \pm 7,23$ i prosječne tjelesne težine $38,53 \pm 6,18$, from the FC Sloboda school of soccer. Svaki ispitanik je izvodio po pet šuteva a video zapisi su napravljeni sa dvije sinhronizovane kamere (Casio Ex – F1) pozicionirane 12 m od mjesta šutiranja lopte. Podaci su prikupljeni analizom video zapisa za svaki šut. Podaci sa načinjenih video zapisa su prikupljeni i nalizirani pomoću APAS sistema za analizu kretanja (ASriel Dynamics Inc., San Diego, CA). Razlika između grupe „unsuccessful“ i grupe „successful“ utvrđena je u sljedećima varijablama: Hcg1-visina težišta tijela u zadnjem koraku prije postavljanja stajne noge do lopte ($p=.05$), Aknee1-ugao u koljernom zglobov udarne noge u početnoj fazi udarca ($p=.05$) i Aknee4-ugao u zglobov kuka stajne noge u momentu kontakta sa loptom ($p=.05$). Rezultati naše studije ukazuju da za uspješnije izvođenje ovog tehničkog elementa, sportisti i treneri moraju obratiti pažnju na tri važna elementa. Prvo, na visinu centra težišta tijela u zadnjem koraku prije postavljanja stajne noge do lopte. Drugo, na manju fazu zamaha koja ne doprinosi većoj brzini lopte nego preciznijem određivanju mjesta kontakta udarne noge i lopte i treće veći nagib trupa prema naprijed kod uspješnih udaraca.

Received: November 04, 2016 / Accepted: December 01, 2016

Correspondence to: Alen Kapiđić, Faculty of Physical Education and Sports, University of Tuzla, Bosnia and Herzegovina

E-mail: alen.kapidzic@untz.ba

EFFECTS OF THE MOTOR ABILITY LEVELS ON RESULT EFFICIENCY IN 60 METERS SPRINT WITH ADOLESCENTS AGED 17-19

Jasmin Hrnjić

Faculty of Education, University of Travnik, Bosnia and Herzegovina

This transversal character research was realized in order to determine the effect of the motor ability levels on the results of running across a distance of 60 meters with adolescents aged 17-19. The research was conducted on a sample of 86 respondents, a Travnik high school fourth grade male students, aged 18 (± 0.6 yr.), with a body height of 181.5cm (± 5.5 cm) and weight of 79.50kg (± 8.5 kg). The system was created conducting twelve motor tests. The criteria variable used in this research was a 60 meters sprint.

A regression analysis showed that the multiple correlation predictor system (basic motor skills) with the criteria (60 meters sprint) is ($R = 0.66$), with a total common variance explained ($R^2 = 0.50$), on a statistically significant level ($P = 0.001$). This shows that the entire system of predictor variables is significant for predicting the outcome in relation to the 60 meters sprint.

By analysing the impact of individual variable contributions in the area of basic motor skills, it can be concluded that variables, forward bend with a ribbon, figure eight with bending, standing high jump, 20m sprint (full standing start) and weighted semi squats, have a statistically significant partial contribution to the prediction of the 60 meters sprint results.

Keywords: athletics, sprint, adolescents, regression analysis.

INTRODUCTION

Milanović (2009), defined motor skills as the ability that allows the realization of all types of movement. They are also defined as having the ability to participate in solving motor tasks, and based on the successful movement, regardless of whether they are acquired by training or not (Malacko, J., Wolf, B., 2004). The basis of this ability is the efficiency of organic systems, in particular neuro-muscular, responsible for the intensity, duration and control of movement. They are an ability to provide a strong, fast, long, accurate or coordinated implementation of various motor tasks.

Running is a cyclic motor activity, consisting of recurrent racing steps, and it belongs to elementary forms of movement. Sprint represents a quick run over a short distance and is one of the most important elements in many sports such as tennis, soccer, handball, where sprint exercising can greatly improve game performance (Burcar, 2014). Athletics disciplines, through the ongoing process of training and development, have a direct impact on the development of motor skills, but also there is a reversible process of motor skills activity level in the disciplines, notably sprint (Pavlović, 2010). Many authors have investigated the influence of motor abilities on the results of the sprint as a running discipline (Pavlović, 2005, 2006, 2008; Stojiljković S., Pržulj D., Branković N., and Pavlović R. 2006; Veličković, 2009. Babić and Čoh, 2010; Šolaja M., Golik-Perić D., Kovačević R., Petrović M., 2010). A different number of studies deal with the problem of the connection between certain anthropological characteristics and their impact on the realization of motor achievements (Katić et al., 2002; Metikoš et al., 1982; Momirović et al., 1984; Otte, 1999). The results of the previous studies show that with the technical disciplines there is a direct impact on the result of motor skills, and the motor achievement

(Cunha et al., 2007; Maleš et al., 2004).

Motor skills are compound and very complex, genetically determined, with inherent high coefficients (speed, coordination, balance, precision), and must be familiar in order to be able to work and to increase (Malacko, J., Wolf, B., 2004). Several studies have treated the issue of possible connections and the influence of motor skills, first of all the different forms of power and sprint. (Young, 1995; Wisløff, 1998; Baker and Nance, 1999; Hennessy and Kilty, 2001; Sleivert and Taingahue, 2005; Cronin and Hansen, 2005; Marques and González-Badillo, 2006; Harris, 2008a; Requena, 2009; Habibi, 2010).

Athletics disciplines, through the ongoing process of training and development, have a direct impact on the development of motor skills, but also there is a reversible process of motor skills activity level in the disciplines, notably sprint (Pavlović, 2010).

Sprint is the fastest form of natural human movement and, due to its comprehensive character, studied in various ways. This biotic movement analysed complex and group biomechanical and physiological procedures established by precise legality of optimal movement and energy demands of individual racing disciplines. Of course, there are larger, so-called kinesiological classic studies that have, for its object, the analysis of the impact of certain sizes of anthropological status of the implementation of the running (Markota et al., 2009; Smirniotou, A., et al., 2008).

It is believed that the functional and motor skills are the most responsible ones for the success of the short running (Homenkov 1977, Milanović, 2007, Mihajlović & Tončev, 2008).

The performance of the athletes and the results depend on the sprint explosive strength and this type of power Milanović (1993) is defined as the ability of the body for maximum acceleration.

It turned out that the ability to run is in conjunction with power factors (Maleš et al., 2001, 2002, Sha et al., 2014) and explosive power sprint, i.e. anaerobic capacity, and repetitive forces with persistent running, in other words, aerobic endurance. The running speed priority, with the necessary level of other anthropological characteristics, depends on the length and frequency of steps (Debaere et al., 2014; Maleš et al., 2003), but it can be established that the increase of knowledge in the art of running increases and the ability to run, because there is an important causal relationship between knowledge and skills.

PROBLEM AND AIM

The research was conducted to investigate the problem of sprint's anthropological characteristics integration and the extent to which basic motor skills affect the result efficiency of 60 meters sprint in adolescents.

The main objective of this study was to determine the effect of motor readiness on 60 meters sprint results in adolescents aged 17-19 years.

METHODS

The sample

A sample of 86 subjects consists of Travnik Gymnasium fourth grade male students, aged 18 ($\pm$ 0.6 yr.), with a body height of 181.5cm ($\pm$ 5.5 cm) and weight of 79.50kg ($\pm$ 8.5kg). All respondents were clinically healthy, with no distinct morphological abnormalities and damage to the musculoskeletal system. They regularly attended classes of physical and health education, led by one teacher. The conditions for testing, protocol testing and order tests, were the same for all subjects.

The sample of variables

When selecting variables to assess motor skills, we paid attention that the tests meet the required metric characteristics, and the best way to define the structure of the study motor space.

The sample of variables in the predictor space was formed by twelve (12) variables to estimate the motor space: coordination, flexibility, explosive and repetitive strength, while a 60 meters sprint - SPR60M was used as a criterion variable in this study. Assessment of motor space is realized by the following tests:

The predictor variables	
MKOONT	agility on the ground
MKOOSS	figure eight with bending
MKOKUS	steps aside
MFLBOS	side rope
MFLPRT	deep forward bend with a ribbon
MFLPRK	forward bend on the bench
MESSVM	standing high jump
MESSDM	standing long jump
MES20V	20 m run (Sprint)
MRSPTL	lying torso raise
MRSZTL	lying torso twist
MRSPTL	weighted squats
criterion variable	
SPR60M	sprint to 60 meters

RESULTS

The basic central and dispersion parameters of applied variables

The analysis of central and dispersion parameters in Table 1, based on the value of the range of results and standard deviations, shows that the results of the applied variables move in a normal range.

A review of discriminatory values (column Skewness) shows a lot of deviation from the normal value and the positive note, with variables to assess the explosive strength, MES20V - running 20 meters (sprint). These values with a positive sign tell us that the distribution of the results is epikurtic indicating the results of location variables applied in the zones of smaller value than the arithmetic mean.

After examining the coefficients of elongation (Kurtosis), we can also see a lot of deviation from normal values with the same variables. The odds are also a positive sign indicating a leptokurtic distribution of results in applied variables, which tells us that the results achieved in these variables are clustered around the mean.

	Valid N	Min	Max	Mean	Std.Dev.	Skewness	Kurtosis
MK00NT	86	11,3	28	17,07	3,45	1,06	1,8
MK00SS	86	14	25	18,02	1,85	0,82	1,95
MK0KUS	86	7,7	11,5	9,74	0,82	0,06	-0,7
MFLBOS	86	155	218	177,1	14,05	0,35	0,14
MFLPRT	86	16	41	28,88	5,62	-0,32	-0,65
MFLPRK	86	5	41	27,98	7,19	-0,55	0,75
MFLISK	86	35	101	83,3	13,77	-1,13	1,4
MESSVM	86	43	79	51,42	6	1,2	2,98
MESSDM	86	181	276	231,7	18,7	-0,14	0,08
MES20V	86	4	5,8	3,56	0,38	2,27	10,52
MRSPTL	86	4	32	14,48	5,68	0,42	-0,32
MRSZTL	86	8	54	26,64	11,06	0,3	-0,68
MRSPCT	86	4	51	19,10	11,07	1,26	1,42
SPR60M	86	7,8	9,5	8,6	0,36	-0,25	-0,28

Table 1: Basic Central and depression parameter variables

Regression analysis criterion variables SPR60M - 60 meters sprint in the manifest space of basic motor skills

In this study, regression analysis determined the amount of general statistical significance of the predictor variables' of the system impact as independent variables, and the criterion variable as the dependent variable. The relative size of the certain predictor variables' impact on the criterion variable was also determined.

The results in Tables 2 and 3 show that a multiple correlation predictor system (basic motor skills) with a criterion (SPR60M - running at 60 meters) is ($R = 0.66$), with the total common variance explained ($R^2 = 0.50$), a statistically significant level ($p = 0.001$).

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0,663(a)	0,498	0,369	0,2974

A) Predictors: (Constant) MK0KUS, MRSPCT, MESSVM, MFLPRT, MRSZTL, MES20V, MFLBOS, MRSPTL, MK00NT, MFLPRK, MESSDM, MK00SS

Table 2: Model Summary

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5,79	24	0,241	2,728	0,001(a)
	Residual	3,919	44	0,089		
	Total	9,749	68			

a Predictors: (Constant) MKOKUS, MRSPCT, MESSVM, MFLPRT, MRSZTL, MES20V, MFLBOS, MRSPTL, MKOONT, MFLPRK, MESSDM, MKOOSS

b Dependent Variable: SPR60M

Table 3: ANOVA (b)

From the analysis of the influence of individual variables (Table 4) in the area of basic motor skills we can conclude that the following variables have a statistically significant impact on the criterion variable SPR60M - 60 meters sprint: MFLPRT – deep forward bend with a ribbon MKOOSS - figure eight with bending, MESSVM – standing high jump, MES20V - 20 meters sprint (full standing start), MRSPCT – weighted squats.

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7,722	1,576		4,900	0,000
	MKOONT	-0,003	0,017	-0,030	-0,198	0,834
	MKOOSS	0,075	0,035	0,363	2,124	0,038
	MKOKUS	-0,022	0,063	-0,047	-0,346	0,741
	MFLBOS	0,004	0,004	0,142	1,016	0,325
	MFLPRT	-0,022	0,010	-0,330	-2,222	0,033
	MFLPRK	0,004	0,008	0,076	0,508	0,624
	MESSVM	-0,014	0,007	-0,250	-1,880	0,048
	MESSDM	-0,002	0,003	-0,101	-0,646	0,531
	MES20V	0,310	0,143	0,290	2,169	0,036
	MRSPTL	0,000	0,010	-0,001	-0,007	0,984
	MRSZTL	-0,003	0,004	-0,093	-0,764	0,445
	MRSPCT	-0,012	0,005	-0,348	-2,594	0,014

a Dependent Variable: SPR60M

Table 4: Coefficients (a)

DISCUSSION

Based on the results of multiple correlation predictor system with SPR60M criterion which is $R = 0.66$ and the explained overall common variability ($R^2 = 0.50$), we can conclude that the whole system is a significant predictor of variables for the results prediction in a 60 meters sprint test.

The results from the analysis of the influence of individual variables explain that explosive power is a very important factor for better results in the short sprints, as well as the flexibility and coordination, without which it is impossible to perform any movement structures, and the repetitive force that is very important with repetitive movements.

These results are logical and expected since similar results were obtained in a series of similar research. In his research, Burcar & Burcar (2014) concluded that explosive power has a significant impact on 60 meters sprint results. On the basis of the results in

this study, Pavlović (2010) concludes that the main predictor of success in the sprint explosive power, as well as other motor skills have a significant tendency to predict success in the results of the sprint.

Stoiljković et al (2016) establishes the importance of the lower extremities power and the upper and lower extremities segment speed for the success of the sprint test, while the results of the study Babić & Čoh (2010) show that the prediction of sprint success statistically significant effect has explosive strength type jump, and variable running 20 meters from a flying start.

CONCLUSION

All sprint disciplines belong to the group of mono cyclical movement athletic disciplines and contain four typical stages of movement: the starting position, starting acceleration, maximum speed and finish (Morin et al. 2012). The speed running short trail is almost completely the layout and type of great importance for achieving good results in individual and team sports (Mikić, 1981, Mikić et al. 2011). Most of the authors in their research papers for speed claim that the inherent coefficient is .95, which means that the variability of these abilities can possibly improve only about 5% (Wilmore and Costill, 1994; Čoh, 2003). The results of this research lead to the conclusion that the prediction of success in some disciplines, such as running over short distances, can be carried out on the basis of motor abilities (explosive power, flexibility, and coordination without which it is impossible to perform any movement structures and repetitive force that is very important for repetitive movements).

As in most previous studies, the present study confirmed the fact that the speed of a running technique consists of various movements, compounds which are derived from specific body parts or the whole body. The variety of exercises and different structure of certain movements, require a harmonious morphological structure and motor readiness from certain competitors.

Since each completed research work, as a rule, poses new problems and aspects, this one, though completed, does not, in any case, pretend to claim that everything is said. On the contrary, the results of this research allow the creation of a base which provides an opportunity for even more extensive evaluation and comparison of these and other characteristics and abilities of the population of adolescents aged 17-19.

REFERENCES

1. Babić V. and Čoh M. (2010). Karakteristike razvoja brzine i sprinterskog trčanja. [Characteristics of speed and sprinting development. In Croatian.]. In: Zbornik međunarodne konferencije 8. godišnja međunarodna konferencija "Kondicijska priprema sportaša 2010." (pp. 83-98). Zagreb: Kineziološki fakultet Sveučilišta u Zagrebu.
2. Baker D., Nance S. (1999). The relationship between running speed and measures of strength and power in professional rugby league players. *J Strength Cond Res*, 1999; 13: 230-235.
3. Burcar Ž., Burcar L. (2014). The impact of some morphological characteristics and motor abilities to 60m sprint results of 13 year's old female pupils. *Acta Kinesiologica* 9 (2015) 2: 12-17
4. Cronin JB, Hansen KT. (2005). Strength and power predictors of sport speed. *J Strength Cond Res*, 2005; 19: 349-357.
5. Cunha L., Ribeiro J., Fernandes O., Valamatos M. J., Pinto R., Santos P. (2007). The relationships between sprint run and strength parameters in young athletes and non-athletes. XXV ISBS Symposium 2007, Ouro Preto – Brazil.
6. Čoh M. (2003). Biomechanical analysis of Colin Jackson's hurdle clearance technique. *Biomechanics*, 18(1), 37-45.
7. Debaere S., Jonkers I., Delecluse C. (2014). The Contribution of Step Characteristics to Sprint Running Performance in High-Level Male and Female Athletes. *Journal of Strength & Conditioning Research*: January 2013 - Volume 27 - Issue 1 - p 116-124 doi: 10.1519/JSC.0b013e31825183ef
8. Findak V. (2009). Kinesiological paradigm of the curriculum in the field of physical and health education for the 21 century. *Metodika: časopis za teoriju i praksu metodika u predškolskom odgoju, školskoj i visokoškolskoj izobrazbi*, Vol.10 No. 19 decembar 2009.
9. Habibi W., Shabani M., Rahimi E., Fatemi R., Najafi A., Analoei H., Hosseini M. (2010). Relationship between Jump Test Results and Acceleration Phase of Sprint Performance in National and Regional 100 m Sprinters. *J Human Kinetics*, 2010; 23: 29-35.
10. Harris N.K., Cronin J.B., Hopkins W.G., Hansen K.T. (2008) Squat jump training at maximal power loads vs. heavy loads: effect on sprint ability. *J Strength Cond Res*, 2008b; 22: 1742-1749.
11. Henessy L., Kilty J. Relationship of the stretch-shortening cycle to sprint performance in trained female athletes. *J Strength Cond Res*, 2001; 15: 326-331.
12. Katić R., Maleš B., Miletić D. (2002). Effect of 6-Month Athletic Training on Motor Abilities in Seven-Year-Old Schoolgirls. *Collegium Antropologicum* 2(2), 533-538.
13. Malacko J., Rađo I. (2004). Tehnologija sporta i sportskog treninga [The technology of sports and sports training]. Univerzitet u Sarajevu, Fakultet sporta i tjelesnog odgoja. Sarajevo. ISBN 9958-606-25-9.
14. Maleš B., Hofman E., Antekolović Lj. (2004). Kanoničke relacije između znanja i sposobnosti kojima se vrednuje nastava atletike [Canonical relations between the knowledge and skills which are valued teaching athletics In Croatian.]. U V. Findak (ur.) Zbornik radova 13. ljetne škole kineziologa Republike Hrvatske "Vrednovanje u području edukacije, sporta i sportske rekreacije" Rovinj 2004, (16-20). Zagreb: Hrvatski kineziološki savez.
15. Maleš B., Hofman E., Žuvela F. (2002). Funkcionalna integracija motoričkih sposobnosti vojnika. [Functional integration of motor skills of soldiers In Croatian.]. U V. Findak (ur.) Zbornik radova 11. ljetne škole kineziologa Republike Hrvatske "Programiranje rada u području edukacije, sporta, sportske rekreacije i kineziterapije" Rovinj 2002, (150-152). Zagreb: Hrvatski kineziološki savez.
16. Maleš B., Katić R., Hofman E. (2001). Utjecaj vojnog tretmana na povezanost manifestacija snage i trčanja različitih dionica [The impact of treatment on military connections manifestation of power and running different stocks, In Croatian.]. U V. Findak (ur.) Zbornik radova 10. ljetne škole pedagoga fizičke kulture Republike Hrvatske, Rovinj 2001, (59-61). Zagreb: Hrvatski kineziološki savez.
17. Maleš B., Sekulić D., Rausavljević N. (2003). Kronološka dob mladih atletičara ne definira rezultat u trčanju na 20 metara [Chronological age of young athletes do not define the result of the run on 20 meters, In Croatian.]. U V. Findak (ur.) Zbornik radova 12. ljetne škole kineziologa Republike Hrvatske "Metode rada u područjima edukacije, sporta i sportske rekreacije" Rovinj 2003, (70-72). Zagreb: Hrvatski kineziološki savez.

18. Marques M.C., González-Badillo J.J. (2006) In-season Resistance Training and Detraining in Professional Team Handball Players. *J Strength Cond Res*, 2006; 20: 563-571.
19. Markota M., Čuljak Z., Čorluka M. (2009). Utjecaj specifičnih atletskih motoričkih znanja na rezultate trčanja jedne srednjoprugaške discipline kod studenata kineziologije [The impact of specific athletic motor skills on the results of running one middle distance discipline in students of kinesiology, In Croatian.]. U B. Neljak (ur.) Zbornik radova 18. ljetne škole kineziologa Republike Hrvatske "Metodičko organizacijski oblici rada u područjima edukacije, sporta, sportske rekreacije i kineziterapije" Poreč 2009, (183-187). Zagreb: Hrvatski kineziološki savez..
20. Metikoš D., Prot F., Horvat V., Kuleš B., Hofman E. (1982). Bazične motoričke sposobnosti ispitanika natprosječnog motoričkog statusa [Basic motor skills of respondents above average motor status, In Croatian.]. *Kineziologija*, 14 (5), 21-62.
21. Mikić B. (1981). Analiza brzinskih sposobnosti učenika I razreda srednjeg usmjerenog obrazovanja putem mjerenja rezultata trčanja na 60 metara. [Analysis of the special abilities of students and grade of vocational education by measuring the results of running the 60 meters, In Bosnian] Tuzla „Putokazi“ br. 3-4
22. Mikić B., Biberović A., Avdibašić-Vukadinović N., Čolakhodžić E. (2011). Kinematičko i strukturalno modeliranje brzine trčanja na 100 metara. [Kinematic and structural modeling of running speed at 100 meters, In Bosnian] IV Međunarodni simpozij „Sport i zdravlje“, (Zbornik radova). Tuzla.
23. Milanović D. (2009). Teorija i metodika treninga. [Theory and methods of training] Kineziološki fakultet Sveučilišta u Zagrebu. Zagreb. ISBN 978-953-6378
24. Momirović K., Hošek A., Metikoš D., Hofman E. (1984). Taksonomska analiza motoričkih sposobnosti. [The taxonomic analysis of motor skills, In Croatian.] *Kineziologija* 16, 115-132.
25. Morin J-B., Bourdin M., Edouard P., Peyrot N., Samozino P., Lacour J-R. (2012). Mechanical determinants of 100-m sprint running performance. *European Journal of Applied Physiology*. November 2012, Volume 112, Issue 11, pp 3921-3930
26. Otte B. (1999). Fitt's and Posner's three-stage model of motor skill acquisition as applied to high jump coaching. *Track coach*, 147, 4703-4704.
27. Pavlović R. (2005). Povezanost varijabli brzine i koordinacije sa rezultatom trčanja 400m. U Živković D. (Ed.). [The relationship between variables speed and coordination with the result of 400m running. In Živkovic D. (Ed.). In Serbian.]. In: Zbornik XI Međunarodni naučni skup Fis komunikacije (pp 38-43). Niš: Fakultet fizičke kulture.
28. Pavlović R., Stojiljković S., & Branković N. (2006). Uticaj morfoloških dimenzija na rezultat trčanja dugog sprinta u atletici. [The influence of morphological dimensions onto long sprint running result in athletics. In Serbian.]. *Fizička kultura (Skopje)*, 34(2), 130-132.
29. Pavlović R. (2008). Relacije varijabli brzine sa rezultatom trčanja 100m. [Relationships variable speeds with the result of running 100m, In Serbian] *SPORT MONT* (15, 16, 17/VI): 522-527.
30. Pavlović R. (2010). Motoričke sposobnosti kao faktori uspjeha u atletici [Motor skills as factors of success in athletics. In Serbian.]. *Sport i zdravlje*, (pp. 96-103). Pale: Fakultet fizičkog vaspitanja i sporta.
31. Requena B., González-Badillo J.J., Saez de Villarreal E.S., Erelina J., García I., Gapeyeva H., Pääsuke M. (2009). Functional performance, maximal strength, and power characteristics in isometric and dynamic actions of lower extremities in soccer players. *J Strength Cond Res*, 2009; 23: 1391-1401.
32. Sha Z., Bailey C.A., McInnis T.C., Sato K., Stone M.H. (2014) Using kinetic isometric mid-thigh pull variables to predict D-I male sprinters' 60m performance. 32 International Conference of Biomechanics in Sports (2014). ISSN 1999-4168
33. Sleivert G., Taingahue M. The relationship between maximal kump-squat power and sprint acceleration in athletes. *Eur J Appl Physiol*, 2005; 91: 46-53.
34. Smirniotou A., Katsikas C., Paradisis G., Argeitaki P., Zacharogiannis E., et al. (2008) *Journal of Sports Medicine and Physical Fitness*. 48.4 Dec. 2008: 447-54.
35. Stojiljković S., Pržulj D., Branković N. and Pavlović R. (2006). Relacije motoričkih sposobnosti sa rezultatima trčanja na 100 metara. [Relations between motor skills and the results of 100 meters running. In Serbian.]. *Fizička kultura (Skopje)*, 34(2), 130-132.
36. Stojiljković D., Živković M., Piršl D. (2016). The predictive value of basic-motor abilities on sprinting results in the case of school students. *Facta Universitatis Series: Physical Education and Sport Vol. 14, No 1, 2016*, pp. 115 - 119
37. Šolaja M., Golik-Perić D., Kovačević R., and Petrović M. (2010). Prikaz modela treninga za razvoj brzine u godišnjem ciklusu treninga u sprintera. [Display of training model for speed development in the sprinter training annual cycle. In Croatian.]. In: Zbornik 8. godišnje međunarodne konferencije "Kondicijska priprema sportaša 2010." (pp 405-409). Zagreb: Kineziološki fakultet Sveučilišta u Zagrebu.
38. Veličković V. (2009). Relacije morfoloških karakteristika i motoričkih sposobnosti sa brzinom trčanja kratkih staza kod učenika srednjih škola [Relations between morphological characteristics and motor abilities with the speed of running the short track with high school students. Master Thesis. In Serbian.]. Istočno Sarajevo: Fakultet fizičkog vaspitanja i sporta.
39. Wilmore J.H., and Costill D.L. (1994). Physiology of sport and exercise. Champaign, IL, Human Kinetics.
40. Wisloff U., Helgerud J., Hoff J. (1998). Strength and endurance of elite soccer players. *Med Sci Sports Exerc*, 1998; 30: 462-467.
41. Young W., McLean M., Ardagna J. Relationship between strength qualities and sprinting performance. *JSports Med Phys Fitness*, 1995; 35, 13-19.

UTICAJ NIVOVA MOTORIČKIH SPOSOBNOSTI NA REZULTATSKU EFIKASNOST SPRINTA NA 60 METARA KOD ADOLESCENATA UZRASTA 17-19 GODINA

Ovo istraživanje transferalnog karaktera realizirano je s ciljem da se utvrdi uticaj nivoa motoričkih sposobnosti na rezultate pretrčavanja distance od 60 metara kod adolescenata uzrasta 17-19 godina. Istraživanje je izvršeno na uzorku od 86 ispitanika, učenika četvrtog razreda Gimnazije iz Travnika, muškog spola, starih 18 godina ($\pm 0,6$ god.), tjelesne visine 181,5cm ($\pm 5,5$ cm) i tjelesne težine 79,50kg ($\pm 8,5$ kg). Od dvanaest motoričkih testova kreiran je sistem prediktorskih varijabli. Kriterijska varijabla koja je korištena u ovom istraživanju je sprint na 60 metara. Regresionom analizom je utvrđeno da multipla korelacija prediktorskog sistema (bazično motoričke sposobnosti) sa kriterijem (sprint na 60 metara) iznosi ($R=0.66$) sa objašnjenim ukupnim zajedničkim varijabilitetom ($R^2=0.50$), na statistički značajnom nivou ($P=0.001$). To pokazuje da je čitav sistem prediktorskih varijabli značajan za predikciju rezultata u odnosu na sprint na 60 metara. Analizom uticaja pojedinačnih doprinosa varijabli iz prostora bazične motorike može se zaključiti da varijable pretklon s trakom, osmica sa sagibanjem, skok u vis sunožno iz mjesta, sprint na 20m (visoki start) i polučučnjevi s teretom imaju statistički značajan parcijalni doprinos predikciji rezultata sprinta na 60 metara. Ključne riječi: atletika, sprint, adolescenti, regresiona analiza.

Received: November 04, 2016 / Accepted: December 01, 2016

Correspondence to: Jasmin Hrnjić, Faculty of education, University of Travnik, Bosnia and Herzegovina

E-mail: jasminhrnjić@gmail.com

THE INFLUENCE OF THE VESTIBULAR ANALYZER FUNCTIONAL CONDITION ON THE PHYSICAL FITNESS OF SCHOOL-AGE CHILDREN

Maslyak I.P., Shesterova L.Ye, Kuzmenko I.A., Bala T.M., Mameshina M.A., Krivoruchko N.V., Zhuk V.O.

Kharkov state academy of physical culture, Ukraine

Purpose: to define the extent to which the pupils' (aged 7-15) level of physical fitness changes under the influence of the special exercises on the vestibular analyser. Material: a number of researches were conducted on the basis of Kharkov comprehensive educational institutions. More than 800 pupils, out of whom 6 experimental and 6 control groups were made, took part in them. Results: the functional condition of the vestibular analyser and the pupils' level of physical fitness were investigated; distinctions of the studied indicators in age and gender aspects were considered; the interrelation between the vestibular sensory system resistance and rotational loadings, as well as the development level of the pupils' physical qualities was defined; the extent to which specially oriented exercises influence the vestibular analyser functional condition and physical fitness of examinees was revealed. Conclusions: 1. As a result of the initial researches, the insufficient level of vestibular analyser resistance in rotational loadings was established. 2. The correlation analysis showed the existence of a rather narrow interrelation between the vestibular analyser functional condition and the development level of physical qualities. 3. Application of specially selected exercises positively affected the functional condition of the vestibular analyser and had an indirect effect on the examinees' physical fitness.

Keywords: physical education, school age children, vestibular analyser, physical qualities.

INTRODUCTION

The modern requirements, imposed by the society on the children's health state and physical fitness, cause a need for a high-quality improvement of the physical education process in comprehensive educational institutions since it is an effective incentive for positive functional and morphological changes in the formed organism, and actively influences the development of motor abilities (Kryvoruchko, Masliak, Zhuravlyova, 2013; Maslyak, Mameshina, Zhuk, 2014; Bala, 2015; Aghyppo, Tkachov, Orlenko, 2016).

The most important question of the physical culture modern theory and practice is the improvement of the technique of pupils' physical education (Shesterova, 2003; Maslyak, 2006; Bala, 2015). It is caused by the fact that, between 7 to 15 years of age, first, the rapid development and formation of all the functions and systems of an organism occur, the major basic skills are formed, the base of a child's motor activity is created; secondly, school age children are very susceptible to various pedagogical, educational and training influences; thirdly, the foundation of practically all indicators of the adult physical fitness is laid at this stage of age development (Andreassi, 2000; Solodkov, Sologub, 2001; Smirnov, Dubrovskii, 2002).

According to many experts, the efficiency of the motor sphere formation process is, in many respects, defined by a functional condition of sensory systems: visual, acoustical, vestibular, tactile (Riemann, Lephart, 2002; Heekeren, Marrett, Bandettini, Ungerleider, 2004; Gold, Shadlen, 2007; Aghyppo, Kuzmenko, 2015).

One of the most important places in the course of training in movements and development of physical qualities is allocated to the vestibular analyser (Bundy, Lane, Murray, 2002; Geppert, Mailloux, Smith-Roley, 2004; Bear, Connors, Paradiso, 2007;

Rynkiewicz, Żurek, Rynkiewicz, Starosta, Nowak, Kitowska, Kos, 2010). As the vestibular sensory system is designed to analyse the provisions and the movements of the head and the body in space, it has an important role in managing motor activity. The vestibular mechanism preserves a person's body balance, it supports their posture, improves coordination of movements during rest and in the course of motor activities. The excessive irritation of the vestibular mechanism or heightened reactivity of the children's organism under high vestibular loadings can be one of the main barriers, which interferes in an all-round physical development (N. Sofiadis, E. Douda, O. Mertzanidu, N. Tsingilis, 1995; Horlings, Kung, Bloem, Honegger, Van Alfen, Van Engelen & Allum, 2008; Angelaki, & Cullen, 2008; Gaerlan, 2010).

Many authors dealt with issues of the separate analysers' influence on the pupils' motive sphere (Katukov, 2000; Rovnii, 2001; Smirnov, 2002; Maslyak, Shesterova, Terenteva, 2004; Kuzmenko, 2014). A number of researches is devoted to studying the extent of the influence special physical exercises have on sensory systems' separate functions and the development level of physical qualities at various contingents: Moiseenko, 2013 – at children of preschool age, Maslyak, 2015 – at children of younger school age; Shesterova, 1998; Ivanova, 2001; Kuzmenko, 2014 – at children of middle school age; Pomeschikova, 2010 – at children with violations of musculoskeletal system; Magomedova, Shesterova, 2013 – at visually impaired children. At the same time, the question of vestibular analyser functions influence on the level of school age children's physical fitness remains insufficiently studied.

The purpose, work tasks, material and methods of the research

The purpose of this work – is to define the extent to which the pupils' (aged 7-15) level of physical fitness changes under the influence of the special exercises on the vestibular analyser.

Research methods: analysis of scientifically-methodical literature, pedagogical testing, methods of defining indicators of the vestibular sensory system separate functions, pedagogical experiments, methods of mathematical statistics.

Pedagogical testing assumed the use of motor skill tests to determine the development level of the main physical qualities. So, the extent of speed development was determined by results of a 30 m run for pupils 7-9 years old, 60 m – for pupils 10-15 years old (s); dexterity – by the results of a shuttle run 4×9 m (s); flexibility – trunk bending forward from a sitting position (sm); force – bending and extension of hands in lying support (a number of times), trunk lift exercises in a sitting position from a back-lying position (a number of times); endurance – by results of a 500 m run for pupils 7-9 years old, 1000 m – for pupils 10-15 years old (min., s).

The vestibular analyser resistance to rotational loadings was determined by deviation indicators, walking in a straight line on a 5 m piece (sm) while being blindfolded. The vestibular mechanism of examinees irritated with quintuple rotation to the right on the Barany chair with the head bent down and eyes closed. Rotation speed – 5 turns for 10 s. The results were determined, both before, and right after the vestibular irritation.

The researches were conducted on the basis of Kharkov comprehensive educational institutions. More than 800 pupils, out of whom 6 experimental and 6 control groups were made, took part in them: The first age group – 7 year old pupils, the second age group – 8 years old; the third – 9 years old (elementary school pupils); the fourth – 10-11 years old; the fifth – 12-13 years old; the sixth – 14-15 years old (middle school pupils).

All the children, participating in the research, were treated by the main and preparatory medical groups, and were observed by the school doctor.

Within the school year, the pupils of the control groups were engaged according to the standard state program for comprehensive educational institutions, and their physical education classes were supplemented with the specially selected physical exercises and outdoor games, which were oriented to activate the functions of the vestibular analyser: jumps with turns on 90 °, 180 ° and 360 ° with various starting positions of the head; running and walking with sudden stops; rotation around their own axis; fast bending of the head and trunks; performance of the listed exercises in the absence of visual control.

The special exercises were: performed in introductory, main and final parts of lesson; sports minutes were given at the lessons of general education subjects; implemented in the system of organized changes and offered in the form of homework. Besides, the main and final parts of lesson were supplemented with the modified outdoor games, and their content joined the listed exercises above.

The research results

The data acquired by the initial researches of the vestibular sensory system functional condition separate parameters allowed to establish the lack of reliable distinctions in indicators of pupils belonging to experimental and control groups ($p > 0.05$). Considering the initial results in deviation when walking before and after vestibular loading took

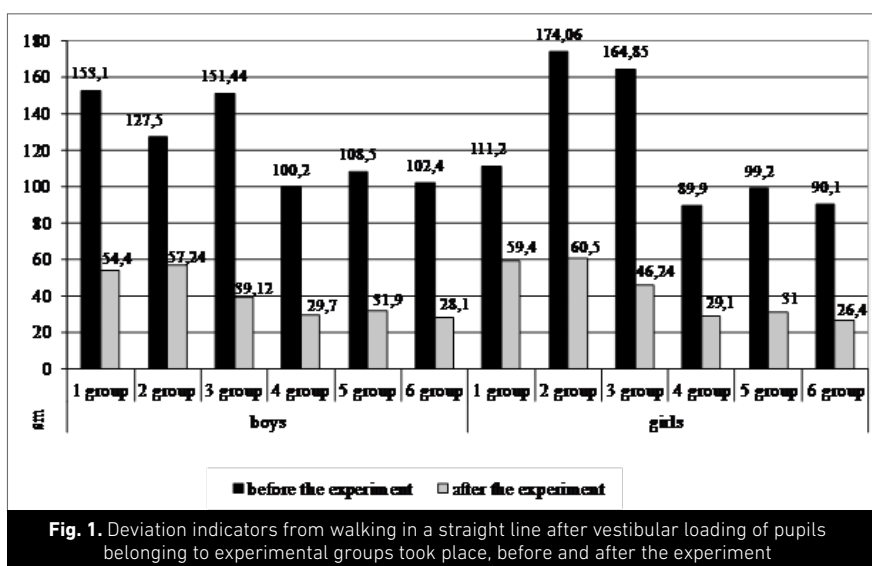
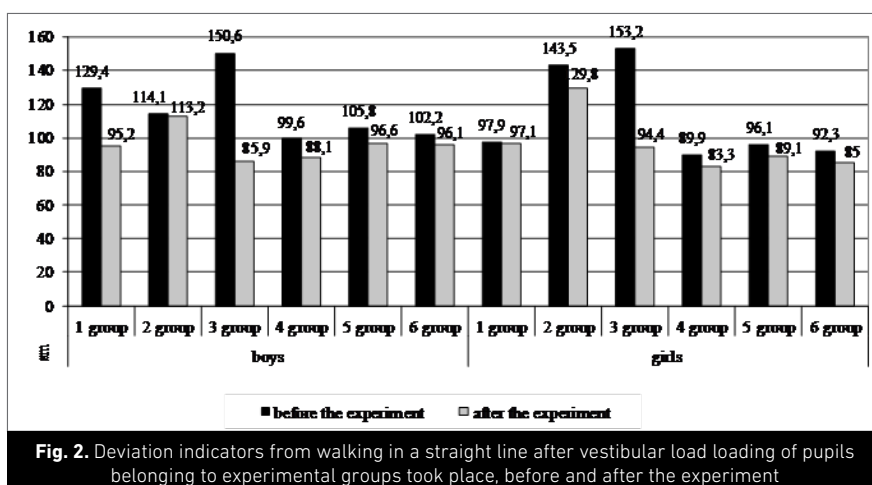
part, it is established that the results of pupils, belonging all age groups, authentically worsened after the irritation of vestibular mechanism took place ($p < 0.05-0.001$).

The variable changes were observed in age aspect. Generally, the prevalence of the girls' over indicators of the boys' results was noted on a gender basis. The results of pupils belonging to the second and the third age groups made an exception, where the opposite tendency was observed.

The analysis of the results received after the experiment showed a considerable improvement in the stability of the vestibular analyser in pupils belonging to experimental groups. So, after the experiment, by comparing indicators before and after vestibular loading took place, it was revealed that after rotation, as well as before the experiment, the results of pupils belonging all age groups worsened. However, these changes are less essential (fig. 1). Comparing the results received before and after the experiment, after vestibular loading took place, it

was revealed that indicators of vestibular stability in pupils belonging to all age groups significantly improved after the application of special exercises, and these distinctions, generally, have a reliable character ($p < 0.01-0.001$). It demonstrates the positive influence the experimental program had on practicing the school physical education. So, the obtained results on deviation indicators from walking in a straight line after vestibular loading took place are: boys from the first group had – 64.4%; the second group – 55.1%; the third – 74.1%; the fourth – 70.3%; the fifth – 70.6%; sixth – 72.6; and girls had 46.5%; 65.2%; 71.9%; 67.7%; 68.8%; 70.7% respectively. Thus, the most essential changes of indicators can be seen both in boys, and girls who are 9 and 14-15 years old.

The analysis of the studied control groups' vestibular stability indicators received after the experiment demonstrates that they also underwent some changes. However, these changes are neither essential nor reliable ($p > 0.05$) (fig. 2).



Essential changes, in comparison with the initial research on pupils from experimental, and control groups, were not revealed in age and sexual aspects. Thus, the introduction of a special exercises system in the physical education classes, which are oriented to increase vestibular stability, positively affected the functional condition of the vestibular analyser both in boys, and girls belonging to all age groups. The indicators of pupils 9 and 14-15 years old improved most significantly. The use of the offered system of exercises positively affected not only the sensory systems functional condition, but also the examinees' physical fitness. So, the gained indicators of the speed development level in boys of the first group were 9.3%; the second group – 10.4%; the third – 13.6%; the fourth – 7.9%; the fifth – 7.8%; the sixth – 5.8%; and the girls had 7.9%; 12.3%; 12.8%; 7.3%; 7.8%; 4.8% respectively; the gained indicators of the of dexterity development level in boys of the first group were 6.9%; the second – 7.7%; the third – 8.3%; the fourth – 9.4%; the fifth – 8.0%; the sixth – 5.5%; and the girls had 6.2%; 6.4%; 7.0%; 8.6%; 6.7%; 6.1% respectively; the gained indicators of the flexibility development level in boys of the first group were 22.6%; the second group – 13.5%; the third – 11.2%; the fourth – 14.9%; the fifth – 34.2%; the sixth – 29.8%; and girls had 6.3%; 5.9%; 6.6%; 53.4%; 28.9%; 21.7% respectively; the gained indicators of the hands muscular strength development level in boys of the first group were 5.8%; the second – 4.0%; the third – 3.8%; the fourth – 25.7%; the fifth – 14.9%; the sixth – 6.3%; and the girls had 12.7%; 10.6%; 8.2%; 22.6%; 14.8%; 19.9% respectively; indicators of the prelum abdominale muscular strength development level in boys of the first age group improved by 8%; the second – by 2.7%; the third – 5.7%; the fourth – 6.8%; the fifth – 10.7%; the sixth – 7.9%; and in girls – by 7.3%; 4.9%; 3.6%; 17.6%; 7.6%, 11.8% respectively. Indicators of the elementary school pupils' endurance development level didn't practically change, and the gain in the fourth group was 7.1% in middle school boys the gain in the fifth group was 4.1%; in the sixth – 5.2%; girls had 6.3%; 4.9%; 3.8% respectively.

Changes in the indicators of physical fitness level are less essential and had, as a rule, a natural character in examinees from control groups.

By analysing the change of indicators in age aspect, it is established that the most essential changes are recorded in speed indicators for 7 year old boys, for girls of the similar age – in prelum abdominale muscular strength indicators; the most considerable changes happened in flexibility indicators for 8 year old boys, for girls – in manifestations of speed and muscular strength of the prelum abdominale; the most essential changes are recorded in indicators of speed, dexterity, muscular strength of hands and prelum abdominale for 9 year old boys, for girls – in flexibility indicators; the most significant changes in indicators of high-speed abilities, endurance, dexterity and muscular strength of hands were observed in 11 year old boys, indicators of endurance, dexterity,

flexibility, muscular strength of hands and prelum abdominale improved most significantly for girls of this age. The substantial increase in indicators of prelum abdominale muscular strength, and flexibility was observed in boys at the age of 12-13, high-speed abilities were observed in girls. The less significant rates of the gain in motor skills preparedness indicators were noted both in boys and girls at the age of 14-15.

THE COMPARISON OF RESULTS OBTAINED FOR BOYS AND GIRLS ALLOWS US TO SAY THAT THE DEVELOPMENT OF MOTOR ABILITIES IN BOYS, AND GIRLS FROM ALL AGE GROUPS IS MORE SUSCEPTIBLE TO THE IMPACT OF THE SPECIALLY ORIENTED EXERCISES AT HIGHER ABSOLUTE MEASURES.

The correlation analysis was carried out for the purpose of defining the extent of the influence of the vestibular analyser functional condition on the level of 7-15 years old pupils' physical fitness.

The obtained data confirm the existence of interrelation between vestibular sensory system parameters and the development level of the pupils' motor abilities, which is reflected, generally, in "average" interrelation degree, on size (the coefficient of correlation varied ranging from 0.21 to 0.57 at $p < 0.05-0.01$). So, the coefficient of correlation varied ranging from 0.33 to 0.55, at $p < 0.05-0.01$; dexterity – from 0.33 to 0.57, at $p < 0.01$; endurance – from 0.21 to 0.39, at $p < 0.05$; forces – from 0.20-0.54, at $p < 0.05$; flexibility from 0.20 to 0.48, at $p < 0.05-0.01$ between the indicators of the vestibular analyser and the speed development level.

The tendency of interrelation remained also at the repeated research, and even the increase in degree of dependence to "strong" on size was in some cases noted. The essential increase in interrelation was noted between the vestibular sensory system parameters, the speed development level and dexterity ($r=0.75$; $r=0.81$ respectively). It is revealed that interference of the studied parameters depends on age and, in some cases, on sex.

Thus, the correlation analysis of the data obtained in the end of the experiment demonstrates that the extent of interference of the vestibular analyser functional condition indicators and the separate physical qualities development level considerably improved after the application of the specially oriented exercises. It should be noted that the interrelation degree of the studied parameters increased with age.

DISCUSSION

According to experts, the optimum level of an organism's functional condition is provided with a perfect vestibular sensory system function. It plays an important role in a person's spatial orientation, receives, transfers and analyses information on the accelerations or delays, arising in the course of performance of the movement and also in the change of the head position in space (N. Sofiadis, E. Douda, O. Mertzani, N. Tsingilis, 1995; Horlings, Kung, Bloem, Honegger, Van Alfen, Van Engelen & Allum, 2008; Angelaki, & Cullen, 2008; Gaerlan, 2010).

Considering the indicators of the vestibular analyser functional condition, it should be noted that they improved authentically in pupils of all experimental groups after the application of special exercises ($p < 0.01-0.001$). It confirms the data of a number of researchers on positive impact of the specially oriented exercises on improvement of the vestibular analyser functional condition (Kiryalanis, Laparidis, Sofiadis, 2002; Senicya, 2004; Nazarenko, Chehalin, 2004). In our opinion, it is connected with the fact that proprioceptive impulses, interacting with vestibular, subordinate them to the influence and slow down manifestation of vestibular reflexes, providing thereby the best solution of the motor task.

The most considerable gain of results was observed in pupils 9 and 14-15 years old. Results of the research confirm the opinion of Solodkov, Sologub, 2001, who consider that the vestibular sensory system ripens by the age of 14. The analysis of vestibular irritations is improved with a child's age, and excitability of vestibular sensory system decreases that reduces manifestations of collateral motor and vegetative reactions.

By analysing indicators of vestibular analyser stability before and after rotary loadings, it should be noted the deterioration in results in bipedalism, both in boys, and in girls, that will be coordinated with the researches' data of such authors as Maslyak, Shesterova, Terenteva, 2004; Kuzmenko, 2015, etc. Asymmetry during walking is explained by the fact that information which arrives from receptors of the motor skills' apparatus of the lower extremities especially from ankle joints of the right and left legs, is insufficiently accurately perceived and analysed, and does not give in to the careful comparison. Only with age (especially in conditions of sports activities) when special attention is paid to the correct placement of a leg on soil, the necessary degree of comparison of feet turning signals is reached.

The analysis of the repeated researches' results,

which were received after the application of the special exercises, which positively affected the vestibular touch system functional condition, has allowed revealing some changes which have happened in indicators of the physical qualities development level.

SO, THE SPEED DEVELOPMENT LEVEL OF PUPILS BELONGING TO EXPERIMENTAL GROUPS OF ALL AGE INCREASED CONSIDERABLY AND AUTHENTICALLY ($p < 0.001$). IN OUR OPINION, IT IS EXPLAINED BY THE EXISTENCE OF A RATHER CLOSE INTERRELATION BETWEEN THE MANIFESTATION OF SPEED AND THE VESTIBULAR ANALYSER FUNCTIONAL CONDITION (SAPIN, M.R. & SIVOGLAZOV, 2002).

By analysing the repeated indicators of the dexterity development level, it is revealed that they improved considerably and authentically for pupils belonging to experimental groups, both boys, and girls ($p < 0.05-0.001$). In our opinion, their gain is explained by a rather high degree of dependence of dexterity manifestation on functionality of the studied sensory system (Krucevich, 2012). Flexibility indicators for pupils belonging to experimental groups of all age improved authentically owing to the experiment ($p < 0.05-0.001$). In our opinion, the gain of indicators of this quality is explained by the existence of certain correlation interrelation between separate parameters of vestibular sensory system and the indicators of flexibility. By analysing the change of the force development level owing to the application of the specially oriented exercises, which are positively influencing the indicators of the studied analyser functional condition, it is revealed that they improved authentically for pupils belonging to experimental groups ($p < 0.05-0.001$). Their gain, in our opinion, is explained by the correlation dependence between the vestibular analyser parameters and force indicators, and also the existence of a rather close interrelation between the manifestation of power, coordination and high-speed abilities (Volkov, 2002; Nazarenko, 2003; Krucevich, 2012) That is, the gain of indicators of dexterity and speed development

causes an increase in the force development level and vice versa. Considering the repeated indicators of the endurance development level, it is defined that they improved for pupils belonging to experimental groups of all age. However, the recorded changes have a reliable character only in indicators of middle school pupils ($p < 0.001$). The endurance development

has a natural character in elementary school pupils. It confirms the opinion of a number of authors (Shiyan, Papusha, 2000; Volkov, 2002) who note that the manifestation of endurance is caused by the functional condition of cardiovascular and respiratory systems, which are insufficiently developed at a younger school age.

CONCLUSIONS

1. The Data collected by the initial researches confirm the insufficient stability level of the vestibular analyser that was confirmed by the considerable and reliable deterioration in indicators after rotary loading took place in all age groups.

2. The application of the specially oriented exercises in the course of physical education positively affected the vestibular sensory system functional condition of pupils belonging to experimental groups ($p < 0.05 - 0.001$). The most susceptible periods for vestibular analyser training of elementary school pupils is the age 9; of middle school pupils is the age of 14-15. The control groups' pupils' results did not change significantly and authentically.

3. The researches of the physical fitness level after the use of a specially oriented exercises system demonstrate a reliable improvement in pupils belonging to experimental groups of the physical qualities development level ($p < 0.05 - 0.01$). An exception is made by indicators of 7-9 years old pupils' endurance which practically didn't change. The data on pupils belonging to control groups didn't undergo essential changes.

4. The correlation analysis of the vestibular analyser functional condition and the physical qualities development level indicators confirms the existence of a rather close interrelation between them that gives the grounds to speak about a rather high extent of interference of these parameters ($r = 0.33 - 0.81$).

Further researches in this direction can be conducted by defining the extent of the influence of the separate sensory functions activity level on motor skills preparedness of the senior classes' pupils.

Thanks

The research was carried out according to the Kharkov state academy of physical culture research work thematic plan for 2013-2015 on the subject 3.5.29. "The theoretical and applied bases of the creation of monitoring various groups' of the population physical development, physical fitness and physical condition" and for 2016-2020 on the subject "Improvement of the physical education process in educational institutions of various profiles" (No. of the state registration is 0115U006754)

Conflict of interests

The authors declare that there is no conflict of interests.

REFERENCES

1. Aghyppo, Alexandr, Tkachov, Sergij, Orlenko, Olena (2016). Role of physical education on the formation of a healthy lifestyle outside of school hours. *Journal of Physical Education and Sport*, 16(2), 335-339.
2. Aghyppo, O.Yu., Kuzmenko, I.O. (2015). Faktorna struktura funkcionalnogo stanu sensornih sistem uchniv 6 klasiv [Factorial structure of functional condition of sensory systems of pupils of the 6th classes]. *Sportivna nauka Ukraini*, 1(55), 7-11.
3. Andreassi, J.L. (2000). *Psychophysiology. Human Behavior and physiological response*. 4 th edition. London: Lawrence Erlbaum Associates Publishers.
4. Angelaki, D. & Cullen, K. (2008). Vestibular system: The many facets of a multimodal sense. *Annual Review Neuroscience*, 31, 125-150 doi:10.1146/annurev.neuro.31.060407.125555
5. Bala, T.M. (2015). Change in the level of strength and endurance development of 5-6 grades pupils under cheerleading exercises influence. *Slobozhanskyi herald of science and sport*, 3(47), 14-18. dx.doi.org/10.15391/sns.v.2015-3.003.

6. Bala, T.M. (2015). Cheerleading exercises influence on 5–9th forms the schoolchildren's coordination abilities. *Slobozhanskyi herald of science and sport*, 5(49), 19–22. [dx.doi.org/10.15391/sns.v.2015-3.003](https://doi.org/10.15391/sns.v.2015-3.003).
7. Bear, Mark F., Connors, Barry W., Paradiso, Michael A. (2007). *Neuroscience* Lippincott Williams & Wilkins.
8. Bundy, A.C., Lane, S.J., Murray, E.A. (2002). *Sensory integration: Theory and practice*. Philadelphia: F. A. Davis.
9. Gaerlan, Mary Grace (2010). The role of visual, vestibular, and somatosensory systems in postural balance. UNLV Theses, Dissertations, Professional Papers, and Capstones.
10. Gold, J.I., Shadlen, M.N. (2007). The neural basis of decision making. *Annu Rev Neurosci*, 30, 535–574.
11. Geppert, Coleman G., Mailloux, Z., Smith-Roley, S. (2004). *Sensory Integration. Answers for Parents*. Torrance: Paediatric Therapy Network.
12. Heekeren, H.R., Marrett, S., Bandettini, P.A., Ungerleider, L.G. (2004). A general mechanism for perceptual decision-making in the human brain. *Nature*, 431, 859–862.
13. Horlings, C.G., Kung, U.M., Bloem, B.R., Honegger, F., Van Alfen, N., Van Engelen, B.G., & Allum, J.H. (2008). Identifying deficits in balance control following vestibular or proprioceptive loss using posturographic analysis of stance tasks. *Clinical Neurophysiology*, 119, 2338–2346. [doi: 10.1016/j.clinph.2008.07.221](https://doi.org/10.1016/j.clinph.2008.07.221)
14. Ivanova, A. (2001). Vliyanie fizicheskikh uprajnenii na funkcii zritel'nogo analizatora u detei [Influence of physical exercises on functions of the visual analyzer at children]. *Olympic sport and sport for all*, 411.
15. Katukov, N.V. (2000). Trenirovka sensornih sistem kak dopolnitel'nyy faktor v povyshenii tehnikeskogo masterstva gandbolistok [Training of sensory systems as additional factor in increase in technical skill of handball players]. *Theory and practice of physical culture*, 4, 37–38.
16. Kiryalanis, P., Laparidis, K., Sofiadis, N. (2002). Reakciya serdechno-sosudistoi sistemi na razdrazhenie vestibulyarnogo apparata u predstavitelei sportivnoi gimnastiki [Reaction of cardiovascular system to irritation of vestibular mechanism at representatives of artistic gymnastics]. *Theory and practice of physical culture*, 6, 20–24.
17. Kryvoruchko, N.V., Maslyak, I.P., Zhuravlyova, I.N. (2013). Impact on the display of power cheerleading ability of university students I-II levels of accreditation. *Pedagogics, psychology, medical- biological problems of physical training and sports*, 9, 38–42.
18. Kuzmenko, I.A. (2014). Funktsionalnoe sostoyanie zritel'nogo analizatora shkolnikov 10–15 let [Functional condition of the visual analyzer of pupils of 10–15 years old]. *Problems of quality of athletic-health-improvement and zdorov'esberegayushchey activity of educational establishments*, 2, 147–151.
19. Kuzmenko, I.O. (2015). Pidvischennya funktsionalnogo stanu vestibulyarnogo analizatora v procesi fizichnogo vihovannya shkolnyariv serednih klasiv [Increase in the functional condition of vestibular analyzer in the course of physical education of pupils of middle classes]. *Tourism and study of a particular region*, 67–70.
20. Magomedova, L.O., Shestereva, L.E. (2013). Rol sensornih sistem u rozvitku koordinatsiynih zdibnostei ditei shkil'nogo viku z vadami zoru [Role of sensory systems in the development of coordination abilities of children of school age with defects of sight]. *Slobozhanskyi herald of science and sport*, 2, 5–8.
21. Maslyak, I.P. (2006). Optimizatsiya procesu fizichnogo vihovannya shkolnyariv molodshih klasiv [Optimization of process of physical education of pupils of elementary grades]. *Theory and method of physical education*, 3, 5–8.
22. Maslyak, I.P. (2015). Influence of specially oriented exercises on separate functions of sensory systems of younger pupils. *Slobozhanskyi herald of science and sport*, 5(49), 63–67. [dx.doi.org/10.15391/sns.v.2015-5.010](https://doi.org/10.15391/sns.v.2015-5.010)
23. Maslyak, I.P., Shestereva, L.E., Terenteva, N.N. (2004). Vzaimosvyaz ustoychivosti vestibulyarnogo analizatora i urovnya razvitiya lovkosti shkolnikov [Interrelation of stability of the vestibular analyzer and the level of development of dexterity of pupils]. *Slobozhanskyi herald of science and sport*, 7, 14–16.
24. Maslyak, I.P., Mameshina, M.A., Zhuk, V.O. (2014). The state of application of innovation approaches in physical education of regional education establishments. *Slobozhanskyi herald of science and sport*, 6 (44), 72–76. [dx.doi.org/10.15391/sns.v.2014-6.013](https://doi.org/10.15391/sns.v.2014-6.013).
25. Moiseenko, E.K. (2013). Opredelenie funktsionalnogo sostoyaniya vestibulyarnogo analizatora detei 5-6 let [Definition of functional condition of the vestibular analyzer of children of 5–6 years old]. *Physical education of students*, 2, 133–135.
26. Nazarenko, L.D. (2003). *Ozdorovitel'nye osnovy fizicheskikh uprajnenii* [Health-improving bases of physical exercises]. Moscow: Vlados.
27. Nazarenko, L.D., Chehalin, I.V. (2004). Effektivnost vraschatel'nykh nagruzok pri sovershenstvovanii ravnovesiya v sportivnykh edinoborstvakh [Efficiency of rotary loadings at improvement of balance in combat sports]. *Theory and practice of physical culture*, 7, 52–55.
28. Pomeschikova, I.P. (2010). Dinamika pokazatelei vestibulosomaticheskikh reaktsii uchashchih'sya s narusheniyami oporno-dvigatel'nogo apparata pod vliyaniem spetsialno подобрannikh uprajnenii i igr s myachom [Dynamics of indicators of vestibular-somatic reactions of pupils with violations of musculoskeletal apparatus under the influence of specially selected exercises and ball games]. *Slobozhanskyi herald of science and sport*, 4, 13–16.

29. Riemann, Bryan L., Lephart, Scott M. (2002). The Sensorimotor System, Part II: The Role of Proprioception in Motor Control and Functional Joint Stability. *Journal of Athletic Training*, 37(1), 80–84.
30. Rynkiewicz, T., Żurek, P., Rynkiewicz, M., Starosta, W., Nowak, M., Kitowska, M., Kos, H. (2010). The characteristics of the ability to maintain static balance depending on the engagement of visual receptors among the elite sumo wrestlers. *Archive of Budo*, 6 (3), 159–164.
31. Sapin, M.R. & Sivoglazov, V.I. (2002). *Anatomiya i fiziologiya cheloveka (s vozrastnymi osobennostyami detskogo organizma)* [Anatomy and human physiology (with age features of children's organism)]. Moscow: Akademy.
32. Senicya, M. (2004). Rozvitok ta udoskonalennya vestibulyarnoi stiičnosti v sporti [Development and improvement of vestibular firmness in sport]. *Young sporting science of Ukraine*, 8 (1), 360–363.
33. Smirnov, V.M., Dubrovskii, V.I. (2002). *Fiziologiya fizicheskogo vospitaniya i sporta* [Physiology of physical education and sport]. Moscow : VLADOS-PRESS.
34. Sofiadis N., Douda, E., Mertzani, O., Tsingilis, N. (1995). The reaction of the cardiovascular system of young female gymnasts and basketball athletes after the irritation of their vestibular system. *Proceedings of the 3-rd International Congress of Physical Education & Sport*, 148.
35. Solodkov, A.S., Sologub, E. B. (2001). *Fiziologiya cheloveka. Obschaya. Sportivnaya. Vozrastnaya* [Human physiology. General. Sports. Age-specific]. Moscow : Terra-sport, Olimpiya Press.
36. Shesterova, L.E. (1998). Vpliv funkcionalnogo stanu analizatoriv na ruhovu pidgotovlenist shkolnyariv serezhnikh klasiv [Influence of the functional state of analyzers on motive preparedness of pupils of middle classes]. *Slobozhanskyi herald of science and sport*, 1, 5–7.
37. Shesterova, L.E. (2003). Shlyahi vdoskonalennya zmistu urokiv fizichnoyi kulturi v zagalnoosvitniy shkoli. *Theory and method of physical education*, 2, 18–20.
38. Shiyan, B.M., Papusha, V.G. (2000). *Teoriya fizichnogo vihovannya* [Theory of physical education]. Ternopil': ZBRUCH.
39. *Teoriya i metodika fizichnogo vihovannya. Tom 1* [pid red. Krukevich, T.Yu.] (2012) [Theory and technique of physical education]. Kiev: Olympic literature.
40. Volkov, L.V. (2002). *Teoriya i metodika detskogo i yunosheskogo sporta* [Theory and technique of child's and youth sport]. Kiev: Olympic literature.

UTJECAJ FUNKCIONALNOG STANJA VESTIBULARNOG APARATA NA FIZIČKE SPOSODNOSTI ŠKOLKE DJECE

Svrha: definirati opseg promjena razine fizičke spremnosti učenika 7-15 godina pod utjecajem posebnih vježbi, utjecajem na vestibularni aparat. Materijal: istraživanja su provedena na bazi obrazovnih institucija Kharkov-a. Ispitano je više od 800 učenika, od kojih su izrađene 6 eksperimentalnih i 6 kontrolnih skupina. Rezultati: ispitivani su funkcionalno stanje vestibularnog aparata i razine fizičke spremnosti učenika; uzete su u obzir razlike istraživanih pokazatelja u dobnim i spolnim aspektima; Povezanost otpornosti vestibularnog senzornog sustava na rotacijska opterećenja i definirane su razine razvoja fizičkih osobina učenika; utvrđen je opseg utjecaja posebno orijentiranih vježbi na funkcionalno stanje vestibularnog aparata i fizičke sposobnosti ispitanika. Zaključci: 1. Kao posljedica početnih istraživanja je ustanovljena nedovoljna razina otpora vestibularnog aparata u rotacijskim opterećenjima. 2. Analiza korelacija pokazala je postojanje prilično uske međusobne povezanosti funkcionalnog stanja vestibularnog aparata i stupnja razvoja fizičkih osobina. 3. Primjena posebno odabranih vježbi pozitivno je utjecala na funkcionalno stanje vestibularnog aparata i posredno na fizičke sposobnosti ispitanika. Ključne riječi: tjelesni odgoj, djeca školske dobi, vestibularni aparat, fizičke sposobnosti.

Received: November 06, 2016 / Accepted: December 01, 2016

Correspondence to: Masliak Irina Pavlivna, Kharkiv State Academy of Physical Culture, Ukraine.

E-mail: irina.maslyak@ukr.net

PERFECTIONIST TENDENCIES IN ATHLETES

Nermin Mulaosmanović, Irmela Mujkić, Jasmin Hrnjić, Zehrina Selimović

Faculty of Education, University of Travnik, Bosnia and Herzegovina

Perfectionist tendencies in sports are nowadays considered as an important prerequisite for achieving significant sports results. Perfectionism takes both positive and negative forms. Consequently, the objective of the study was to explore the presence of perfectionist tendencies in athletes focusing on positive and negative perfectionism. The reason why this study is conducted lies in the fact that negative or maladaptive perfectionism is one of the athletes' dark sides, and it represents the risk of failure and disappointment in sports. The study sample was made up of young people involved in sports activities. The participants filled out the perfectionism questionnaire which included three perfectionism aspects (standards, order and organization, discrepancy). The athletes have shown that they strive for setting higher standards, strive for order and organization and they have not shown negative perfectionism, i.e. they scored below-average on the discrepancy subscale, while it turned out that athletes strive for perfection in general.

Keywords: Positive perfectionism, negative perfectionism, sports.

INTRODUCTION

Studies on perfectionism in all areas of life have become extremely numerous and popular over the last 20 years. Striving to set high performance standards is the path to personal self-actualization of the individual. In this way, many are faced with the "dark" side of perfectionism which increases the likelihood of sports failure. Imposing victory as imperative is one of the fundamental characteristics of competitive sports; sports environment is very suitable for the development of perfectionist tendencies and consequently for exploring the origin and function of different forms of perfectionism. In top sports perfectionism is considered as a precondition for achieving significant results. High performance standards may motivate athletes, but if nothing but the perfect performance is considered well enough, those potentially positive tendencies may result in a number of undesirable effects. The athletes who participate in competitive sports are growing up in a specific highly competitive environment marked by the imperative of victory, which makes young athletes susceptible to developing maladaptive perfectionist tendencies.

THEORETICAL BACKGROUND

There is still no consensus on a single definition of perfectionism although this is a trait that significantly affects various aspects of mental health and psychosocial adjustment of the individual. According to one of the simplest definitions by Flett and Hewitt (2002), perfectionism is striving for flawlessness and extreme perfectionists are people who want to be perfect in all aspects of their lives. Burns (1983) defined the perfectionism as a "network of cognitions that includes expectations and evaluations of events, self-evaluations and evaluations of others characterized by a series of unrealistic, rigid and inflexible standards. Perfectionism equalizes self-

evaluation with success". Perfectionism is mostly studied as a permanent personal characteristic; its main feature is the "high performance standards" (Sindik, 2011). Contemporary literature usually defines perfectionism as a multidimensional construct comprising of two basic dimensions: positive perfectionism characterized by the tendency to achieve high but realistic and achievable goals and results, and negative perfectionism characterized by the tendency to set extremely high standards out of fear of failure and concern over the significant others' disappointment. Despite of the theorists' inability of reaching an agreement on the dimensions of perfectionism and their content, the studies conducted by Erceg-Jugović, and Lauri-Korajlija (2012), suggest that not all dimensions of perfectionism are associated with negative outcomes. Instead there are two higher order factors of perfectionism: positive (adaptive) and negative (maladaptive).

Many personality theorists believe that some aspects of perfectionism are essential and healthy for human growth and development; the recent studies show that perfectionism is a multidimensional construct that can also manifest in the form of adaptive striving for personal growth and development.

In line with the above theory Slaney, Ashby and Trippi (1995; according to Flett, Hewitt, 2002) note that one should not focus on the negative aspects of this construct only, instead when studying perfectionism positive aspects should be reflected. According to Adler perfectionism is healthy if it involves the maximum of one's potential. This notion of perfectionism is similar to Maslow's concept of self-actualization, i.e. fully using one's capabilities and talents.

Concerns over mistakes as Kurtović (2011) indicated include negative reactions to mistakes making the person believe that they will lose the others' respect if they fail, personal standards include the tendency to set very high performance standards and attribute excessive importance to these standards in the self-evaluation; parental expectations which include the belief that parents set very high standards and goals for the individual, parental nagging that describe the belief of a person that their parents are too critical, doubts about the quality of the actions, which describe the extent to which the person doubts their ability to fulfil the task in an appropriate manner, and organization that reflects the affinity as well as the importance that perfectionists attach to order and organization. Terry-Short et al. (1995) considers that negative perfectionism is also characterized by unrealistic individual criteria, an unpleasant response of the organism to failure, and the inner urge to avoid

failure. Papadomarkaki and Portinou (2012) believe that perfection discomfort is caused by mistakes, fear of failure and negative response to mistakes. "The most common driving force of chronic perfectionism can be a profound feeling of inferiority and self-rejection" (Stojaković, 2011, p. 387). Such people are never satisfied with their achievements and themselves, in their own eyes they are only losers.

Many authors of the 21st century note that perfectionism is an important element for explaining the sport anxiety in adolescence. According to the dual process model, perfectionism is a complex phenomenon that can manifest in the adaptive and maladaptive form. Although adaptive and maladaptive perfectionism can be very similar on the manifestation level, latent motivation and the accompanying emotional states and cognitive processes are significantly different depending on whether a certain behaviour is triggered by a desire for achieving success (adaptive perfectionism) or tendency to avoid failure and possible disappointments of significant others (maladaptive perfectionism). Overt behaviour may have considerably different effects depending on whether it occurs as a result of positive or negative perfectionism. Different dimensions of perfectionism are differently associated with a wide range of psychological, emotional and behavioural correlates. Understanding the cognitive, affective and behavioural correlates of perfectionism is particularly important in areas where we expect the impact on behaviours that imply achievement, and one of such areas is competitive sports. Perfectionist tendencies may occur in different areas of life, but their role is most evident in the achievement-oriented activities (Flett and Hewitt, 2002). Generally speaking, perfectionism is considered normal when a person feels satisfaction in the pursuit of perfection, but recognizes and accepts one's own limitations. Perfectionism becomes a problem when people have unrealistic expectations and are never satisfied with the performance (Hamachek, 1978, according to Sindik 2011). Accordingly, the pursuit of perfection in the first case reflects the need for maximum use of individual potential and as such is considered to be an adaptive and desirable trait, while in the second case, perfectionism is a factor of vulnerability for different problems of adjustment, even some more serious mental disorders (Greblo, Bosnar, Sporiš, 2007).

Some authors suggest that the relationship between perfectionism and success in sports is not simple, and the authors increasingly warn of the existence of the so-called perfectionism paradox (Flett and Hewitt, 2005) according to which if the tendency for perfectionism increases, the likelihood of sports

failure will also increase. Therefore, in order to protect the personal well-being of athletes, one should be careful when promoting perfectionism in top sports. In working with athletes who score high on maladaptive perfectionism, special attention should be paid to the latent motivational processes, emotional states, and irrational beliefs underlying their maladaptive perfectionist tendencies (Greblo, 2013). After identifying the risk factors, it is necessary to work on changing personal and environmental factors that may be associated with the development of maladaptive perfectionism. In their study, Hewitt and Flett (1991) prove the multidimensional nature of perfectionism, and distinguish three basic components of perfectionist behaviour:

1. Self-oriented perfectionism in which the person sets high standards and goals for themselves and is motivated to achieve perfection,
2. Others-oriented perfectionism where people have very high expectations from other people and are very strict in evaluating their performance,
3. Socially prescribed perfectionism where a person feels that other people set unrealistically high standards.

The main difference among these three components is their origin and direction of behaviour. Based on these components, Hewitt and Flett (1991) constructed a perfectionism scale (Multidimensional Perfectionism Scale, MPS-H) consisting of 45-item measure arranged in three subscales (each subscale includes 15 items) that describe the three dimensions of perfectionism.

Slaney et al. (2001) approached the concept of perfectionism in a somewhat different way, emphasizing the importance of both negative and positive aspects of perfectionism. Guided by the findings of a qualitative study showing that apart from setting high standards, the perfectionists find their implementation equally important, they included items in their perfectionism scale (APS-R) reflecting the observed discrepancy between the set and achieved goals. The scale was supposed to separate the perfectionism from its causes and consequences, and to separate the negative and positive aspects of perfectionism, as well as enable the evaluation of the treatment of perfectionism. The studies that were carried out for the purpose of forming and validation of the scale showed that the scale included three factors. Namely, "high standards", "order" and "discrepancy". The "high standards" dimension is the tendency of people to set high standards and strive for perfection. This aspect of perfectionism has a positive aspect because it is positively associated with high self-esteem, high

academic performance and low concern. However, the "discrepancy" dimension refers to the feeling and perception that the set standards are not attained due to the association with low self-esteem, depression, anxiety and continuous poor academic performance and represents the negative aspect. The third dimension of perfectionism "order" is a tendency to neatness and organization, and is considered as a moderately positive dimension. However, due to a lack of connection with the above variables the increasing number of studies (Slaney et al., 2001; Suddarth and Slaney, 1998) exclude the "order" dimension from the analysis and the "high standards" and "discrepancy" dimensions are treated as key dimensions of positive or negative perfectionism.

The key difference between positive and negative perfectionism is behaviour aimed at achieving high goals. In order to achieve the positive consequences, behaviour is driven by positive reinforcement, while in avoiding negative consequences, behaviour is driven by negative reinforcement.

PREVIOUS STUDIES

Studies about perfectionism are usually focused either on its consequences or its features and dimensions. It is pointed out that perfectionism is associated with many areas of human behaviour. Studies show that perfectionism is more present in athletes than in general population, and it is associated with negative consequences such as competitive anxiety as a state and personality trait, but it is also associated with the reduced competitive success and satisfaction with the accomplished results. According to Čerenšek (2012), the results showed that athletes have a more pronounced dimension of adaptive perfectionism than non-athletes. The athletes who are maladaptive perfectionists have higher levels of competitive anxiety as a state, including reduced self-confidence as a measure of competitive anxiety as a state. The dimension of maladaptive perfectionism was positively associated with competitive anxiety as a state and as a personality trait; the adaptive dimension of perfectionism is associated with confidence, and competitive anxiety as a personality trait is negatively associated with satisfaction with the success in sports.

In his paper, Gucciardi (2012) underlines the fact that athletes with intensified perfectionism, especially maladaptive perfectionism, have intensified sports anxiety as a dominant state during the competition. As expected, adaptive perfectionism is positively

associated with the sensitivity of BAS (behavioural activation system), and the perception of positive behaviour of parents and coaches, while maladaptive perfectionism is positively associated with the sensitivity of the BIS (behavioural inhibition), and with the perception of negative behaviour of parents and coaches (Greblo, 2011)

The studies that were conducted by Owens and Slade, Stoeber and Stoeber, then Stoeber, and Hanchon (Owens and Slade, 2008; Stoeber & Stoeber 2012; Stoeber 2014; Hanchon, 2010) emphasize that the athletes' tendency for perfection is statistically significant, because success in sports is in correlation with perfectionism. (Ivanović et al, 2015). In the recent years, this phenomenon has attracted the attention of many researchers, since it has a major impact on achieving results in sports.

The empirical results of the study by Braet and Goossens, followed by Stoeber (Braet, and Goossens, 2010; Stoeber, 2012) indicate the existence of both components of perfectionism tendencies in a sample consisting of athletes in comparison to people with symptoms of depression and eating disorders, as well as a control group representing the general population, especially in the dimension of the adaptive perfectionism. According to the studies, Sindik (2009) found a correlation between the two dimensions of perfectionism with standard and derived parameters of situational performance in basketball. This study suggests the possibility of dividing unidimensional perfectionism in two dimensions.

Research by Ivanović et al. (2015) shows that adaptive perfectionism in active athletes (football players and karate fighters) is more obvious in non-athletes of the same age, while the difference in the presence of maladaptive perfectionism among clusters of athletes and non-athletes proved to be statistically insignificant. This points to the fact that young athletes have a greater tendency for performing perfectionist movements, perfectionism in fulfilling their tasks and setting strict criteria, which is similar to the results of research conducted by (Stoeber, then Hil et al., Cumming and Duda (Stoeber, 2012; Hill et al., 2011; Cumming & Duda, 2012). Furthermore, the results showed that there are significant differences between the adaptive and maladaptive perfectionism in athletes and non-athletes in relation to variables of anxiety (as a state) and anxiety (as personality trait). These results are consistent with the research conducted by Dehghani et al. (2013).

The studies conducted by Ivanović et al. (2015) showed that the subsample of active athletes (junior) scored considerably higher in moderate adaptive perfectionism in comparison to the non-athletes in the same category, while there were no statistically significant differences in the maladaptive

perfectionism variable. Furthermore, it was noted that both subsamples of respondents had relatively high average values in the adaptive perfectionism dimension, while significantly lower values were scored in both groups of respondents in the maladaptive perfectionism dimension. According to the studies by Erceg (2007), these results are the standard among adolescents who are more commonly adaptive perfectionists and usually positively success-oriented.

METHODOLOGICAL BACKGROUND

Sample

The sample was formed by arbitrary selection due to the specificities of the population. The population in the study consisted of young people who are involved in a sports activity. The study sample was N = 124.

Statistical methods

Descriptive statistical methods and the t-test were used in this study.

Problem, objective, tasks and hypotheses

The main problem of the study was to examine the presence of positive and negative perfectionism in athletes and striving for perfectionism in general. Apart from testing perfectionist tendencies in athletes, the aim was to determine whether athletes display negative perfectionism in order to draw attention to the importance of its identification, and eliminate the causing factors.

Tasks

1. Test the level of tendency for setting high standards and striving for order in athletes (positive perfectionism);
2. Explore the presence of negative perfectionism;
3. Examine the overall presence of perfectionism in athletes.

Hypotheses

1. Athletes have above-average level of positive perfectionism.
2. Higher level of negative perfectionism is present in athletes.
3. Athletes have strong perfectionist tendencies.

RESULTS

Testing positive or adaptive perfectionism in athletes

The first task was to study the positive perfectionism, as shown in Table 1 below.

	N	Mean	Std. Deviation	Std. Error Mean
Tendency for setting high standards	124	36.1533	5.40630	.36272

Table 1. The descriptive parameters in the perfectionism subscale - Standards in students

Theoretical mean of the "standards" scale is 28. The calculated arithmetic mean (M) shows that the respondents achieved the average score of $M = 36.15$, which departs from the score 28 and suggests that athletes strive for high standards. The significance was checked by a t-test.

Test Value = 28					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference
					Lower Upper
Tendency for setting high standards	23.433	123	.000	8.15231	7.4365 8.8104

Table 2. Test of significance in relation to the value $M = 36.15$

Determining the significance by a t-test, ($t = 23.433$, $df = 123$, $p < 0.01$), results showed a statistically significant difference between 36.15 and theoretical mean 28, which means that students have a tendency to set high standards. Positive perfectionism included the "order" dimension, as shown in Table 3.

	N	Mean	Std. Deviation	Std. Error Mean
Tendency to achieve organization and order	124	22.0968	3.13124	.212823

Table 3. The descriptive parameters in the perfectionism subscale – order in students

The "order" subscale scores range from 4 to 28, theoretical mean in the scale is 16. All results over 16 indicate that the respondents strive for high organization and order.

The calculated arithmetic mean (M) shows that respondents achieved the average score of $M = 22.096$, which deviates from score 16 and shows that athletes strive for organization and order.

Test Value = 16					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference
					Lower Upper
Striving for organization and order	32.548	123	.000	6.09371	5.8725 6.7143

Table 4. Testing significance in relation to the value $M = 22.096$

By determining the significance using a t-test demonstrated a statistically significant deviation between 22.096 and theoretical mean 16. The obtained results ($t = 32.54$, $df = 123$, $p < 0.01$), indicate that students strive for organization and order.

Presence of negative perfectionism in athletes

The "discrepancies" dimension indicate the negative perfectionism. Results are shown in the following table.

	N	Mean	Std. Deviation	Std. Error Mean
Discrepancy	124	44.5230	11.80351	.83010

Table 5. The descriptive parameters in the perfectionism subscale – Discrepancy in students

The calculated arithmetic mean (M) shows that the respondents achieved the average score of $M = 44.52$, which is slightly lower than the theoretical mean of the scale, which is 48, therefore, the results showed that the discrepancy in athletes is reduced. The following table provides data on the significance.

Test Value = 48					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference
					Lower Upper
Discrepancy	-2.671	123	.006	-2.20000	-3.0842 -.6036

Table 6. Test of significance in relation to the value $M = 44.52$

Determining the significance by t-test it has been proved that although deviation of the theoretical mean from the arithmetic mean is low, there is still statistically significant difference between score 44.52 and theoretical mean 48.

The presence of perfectionism (positive and negative) in athletes

Under this task the presence of perfectionism in the overall scale has been examined, that is, negative and positive perfectionism.

	N	Mean	Std. Deviation	Std. Error Mean
Perfectionism – total score	124	104.7502	14.63717	1.03024

Table 7. Descriptive parameters of the overall perfectionist scale APS-R in students

The arithmetic mean (M) shows that the participants achieved the average score of $M = 104.75$, which is more than 92 (theoretical mean), indicating that athletes strive for perfectionism.

Test Value = 92						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Perfectionism – total score	12.305	123	.000	12.75212	10.7024	14.6306

Table 8. Test of significance in relation to the value $M = 104.75$

DISCUSSION AND CONCLUSION

The results of the previous studies show that the relationship between perfectionism and success in sports is not simple, and authors increasingly warn of the existence of the so-called perfectionist paradox, (Flett and Hewitt, 2005) according to which if the perfectionist tendency increases, the likelihood of sports failure will also increase. Our results showed that athletes have a higher level of positive perfectionism, which is consistent with many studies that are listed in this paper. According to the scores, negative perfectionism is not present in athletes and athletes have strong perfectionist tendencies in sports. In order to protect the well-being of athletes, the conclusion is drawn that one should be careful when promoting perfectionism in sports. It is necessary to pay attention to maladaptive perfectionism in athletes that can be very harmful. Working with athletes who achieve a high value of maladaptive perfectionism, a special emphasis should be given to latent motivational processes, emotional states, and irrational beliefs underlying maladaptive perfectionist tendencies. Upon the identification of risk factors, it is necessary to embark on changing personality and environmental factors that may be associated with the development of maladaptive perfectionism. Furthermore, the attitudes and behaviours encouraging the development of a healthy tendency for achieving excellence are required, which can result in a positive impact on performance in sports.

REFERENCES

- Čerenšek, I. (2012). Perfekcionizam, natjecateljska anksioznost, uspjeh i zadovoljstvo uspjehom kod adolescenata sportaša završni rad – diplomski / integralni studij. Zagreb: Filozofski fakultet
- Erceg Jugović, I., Lauri Korajlija, A. (2012). Povezanost ispitne anksioznosti s perfekcionizmom. Psihologijske teme. Vol. 21 (2), str. 299-316.
- Flett, G. L., Hewitt, P. L. (2002.). Perfectionism. Theory, Research and Treatment. Washington DC: APA.
- Kurtović, A., (2011). Odnos perfekcionizma i socijalne podrške s anksioznošću i depresivnošću kod studenata. Med Jad. Vol 43 (4), str. 189-200.
- Greblo, Z., Keresteš, G. (2012). Uloga roditelja u promicanju adaptivnih i neadaptivnih perfekcionističkih težnji kod darovitih sportaša. Zagreb: Hrvatsko psihološko društvo, str. 169-169
- Greblo, Z., (2013). Perfekcionizam: preduvjet ili prepreka za ostvarenje sportskog uspjeha? Sportski uspjeh: kako psihologija može pomoći? Zbornik radova. Zagreb: Kineziološki fakultet, 38-42
- Greblo, Z (2011). Perfekcionizam u darovitih sportaša: uloga osobinskih i okolinskih činitelja. Doktorska disertacija. Zagreb: Filozofski fakultet
- Greblo, Z., Bosnar, K., Sporiš, G. (2007) Perfekcionizam u sportskom okruženju. Prevencija (re)habilitacija psihoedukacija kroz interdisciplinarnost. Dubrovnik: Hrvatsko psihološko društvo.
- Ivanović, M. et al. (2015) Perfectionism, anxiety in sport, and sport achievement in adolescence. Sport Science 8, str. 35-42
- Sindik, J., (2009). Croatian Sports Medicine Journal / Hrvatski sportsko medicinski vjesnik. Vol. 24 Issue 2, p 98-112.
- Sindik, J., (2011). Razlike košarkaša uspješnih i manje uspješnih vrhunskih seniorskih momčadi u konativnim karakteristikama. Hrvat. Športsko med. Vjesn. 26: 106-117
- Stoeber, J., Uphill, M. A., Hotham, S. (2009). Predicting race performance in triathlon: The role of perfectionism, achievement goals, and personal goal setting. Journal of Sport & Exercise Psychology, 2, 211-245.
- Stojaković, P., (2011). Psihologija za nastavnike. Banja Luka: Grafid.

PERFEKIONISTIČKE TEŽNJE KOD SPORTISTA

Danas se u sportu perfekcionističke težnje ističu kao važan preduslov postizanja značajnih sportskih rezultata. Sam perfekcionizam se manifestira u pozitivnom i negativnom obliku. Negativni ili neadaptivni perfekcionizam jedna je od mračnih strana sportiste kao i mogući faktor neuspjeha i razočarenja u sportu. Stoga je cilj istraživanja je bio ispitati izraženost perfekcionističkih težnji kod sportista sa akcentom na pozitivni i negativni perfekcionizam. Populaciju u istraživanju su činili studenti koji su uključeni u sporte aktivnosti. Sudionici su ispunjavali upitnik perfekcionizma koji se sasio od tri aspekta perfekcionizma (Standardi, red i organizacija, diskrepanca). Sportisti su pokazali da teže postavljanju većih standarda, teže redu i organizaciji kao i to da nije pronađena izraženost negativnog perfekcionizma, odnosno ispitanici su postigli ispod prosječne rezultate na subskali diskrepanca. Ključne riječi: Pozitivni perfekcionizam, negativni perfekcionizam, sport.

Received: November 04, 2016 / Accepted: December 01, 2016

Correspondence to: Irmela Mujkić, Faculty of Education, University of Travnik, Bosnia and Herzegovina

E-mail: irmela_mujkic@hotmail.com

THE EFFECTS OF AN ADDITIONAL 10-WEEKS STRENGTH TRAINING ON ISOKINETIC KNEE JOINT POTENTIAL OF YOUNG ATHLETES

Rađo Izet¹, Bajramović Izet¹, Likić Slavenko¹, Alić Haris¹, Jelešković Eldin¹, Habul Ćamil², Mekić Amel¹

¹ Faculty of sport and Physical Education, University of Sarajevo, Bosnia and Herzegovina

² Teachers Learning Faculty, University "Džemal Bijedić" Mostar, Bosnia and Herzegovina

The aim of the study is to determine the efficiency of an additional 10-weeks strength training (DTS) on isokinetic knee joint potential of young athletes. The study included 10 young male athletes, aged 15-17. Biodex System was used to estimate the isokinetic potential of the left and right legs knee joint. The selected variables were: Peak torque Extension 60°/s, Total work Extension 60°/s, Peak torque Flexion 60°/s, and Total work Flexion 60°/s. Univariate t-test (Paired Samples Test) pointed out the significant differences between the mean values of the initial and final test ($p < .05$) in the case of variables Peak torque Flexion 60°/s -left leg (PTILFL60) and Total work Flexion 60°/s -left leg (TVILFL60). The results of the study show that the realized DTS had an effective action on the power increase of the knee joint in young athletes. With proper selection of exercises, methods and training load it is possible to improve the explosive power and dynamic ability of the knee joints. An important precondition for the implementation of strength training is that young athletes should first learn biomechanical structure of the given exercises with external resistance and thereby build a proper coordination of movement. Young athletes should perform strength training under the control of a specialist coach. The authors recommend that strength training for young athletes should be properly dosed and adjusted according to age. DTS can be carried out before the main part of the training, after the warm-up phase, and continuously during the athletes' training preparation process. This study has indicated the positive effects of DTS to increase the isokinetic potential of knee joints, but the effects in relation to the result of running a sprint distance have not been determined, which can be a weakness of the presented study.

Keywords: Training preparation of athletes, external resistance, and explosive power.

INTRODUCTION

Strength is crucial in expressing athlete's speed qualities, which are reflected through fast, explosive and coordinated movements. The speed of an athlete is determined with effective neuro-muscular coordination (Winfried, 1997). This quick dynamic movements require a development of a large force over a short time duration, which indicates the importance of inter-muscular coordination. During quick dynamic movements, there is a need for fast, coordinated and relaxed inter-muscular work of agonists and antagonists. The development of an athlete's speed is largely determined by the neuro-muscular and energetic factors. Also, speed depends on the efficiency of anaerobic processes, and fast mobilization of energy. According to Lenz and Hardyk (2005), during the first eight to ten running steps, the highest progression of speed is reached, while about 75% of speed is reached during the first nine meters. The potential of maximum and explosive strength allows strong muscle contraction during these first few steps, and thus secure the preconditions for the next progression of speed potential. Čoh et al. (2010) states that speed is expressed in the form of a three-segment model (speed-strength-coordination). According to this model, it can be concluded that an athlete's training should act to quicken the generation of force in a variety of general and specific movements. Additional training of maximum power can contribute to improved inter-muscular qualities, and also indirectly affect the running economy (Karsten et al., 2015; Stkren et al., 2008). Young athletes, who are in the early stage of specialization, should use exercises that are more and more adapted to the specific requirements of a particular sport. Also, this period is more suitable for training at higher loads due to mature biological age of athletes. No matter that young athletes have reached the possibility for larger training loads, the principle of gradualism should always be respected.

METHODS

Sample subjects

The study included 10 young male athletic sprinters, aged 15-17, and members of Athletics Club Sarajevo from Bosnia and Herzegovina. All athletes tested in this study were clinically healthy.

Measurement procedure

Biodex System was used to estimate the isokinetic potential of the left and right legs knee joint (speed 60°/s). Measurements were conducted at the Sports institute of the Faculty of Sport and Physical Education in Sarajevo.

1. Peak torque Extension 60°/s	
Right leg	PTUREX60
Left leg	PTILEX60
2. Total work Extension 60°/s	
Right leg	TVUREX60
Left leg	TVILEX60
3. Peak torque Flexion 60°/s	
Right leg	PTURFL60
Left leg	PTILFL60
4. Total work Flexion 60°/s	
Right leg	TVURFL60
Left leg	TVILFL60

Table 1. Overview of isokinetic variables

Characteristics of additional strength training (DTS)

During the preparation period, athletes performed a total of 20 DTS within 10 weeks (2 sessions a week). All DTS trainings lasted for 75 minutes (15 minutes - preparation part; 45 minutes - main part; and 15 minutes - final part). Trainings were implemented separately in relation to other regular athletic training (4 times a week). The pause between two DTS trainings was 3 to 4 days. The performed strength exercises included more joints and muscles in movement. These exercises included: squats, Romanian lifts, steps forward, and the bench press exercises. Squats and Romanian lifts were realized with loads of 3-6RM, and steps forward and bench press exercises were performed with moderate loads of 7-12RM. Four exercises with 3-4 repetitions were realized during each additional strength trainings (DTS). The rest period between exercises lasted for 3-6 minutes.

Statistical analysis

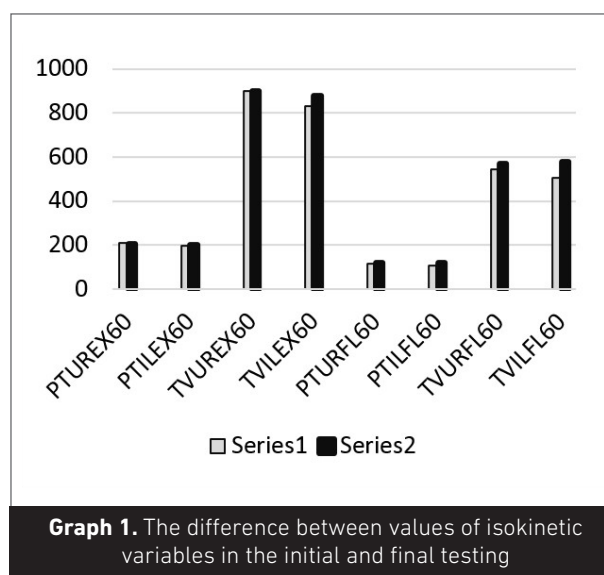
Descriptive Statistic was used for assessment of central and disperses parameters. Paired Samples Test (t-test) was used for determination of differences between initial and final measurement.

RESULTS AND DISCUSSION

Research results (Table 3) have revealed a statistically significant difference between the initial and final measurement in the case of two variables (PTILFL60 and TVILFL60; $p < 0.05$).

	N	Mean	Std. Dev.
PTUREX60I	10	211.34	49.21
PTUREX60F	10	206.48	45.27
PTILEX60I	10	199.62	48.82
PTILEX60F	10	200.06	49.46
TVUREX60I	10	902.00	202.48
TVUREX60F	10	900.14	208.91
TVILEX60I	10	830.40	215.99
TVILEX60F	10	880.78	245.79
PTURFL60I	10	114.88	23.37
PTURFL60F	10	120.20	21.72
PTILFL60I	10	107.96	24.00
PTILFL60F	10	119.91	28.89
TVURFL60I	10	545.83	144.19
TVURFL60F	10	571.24	141.33
TVILFL60I	10	506.10	158.90
TVILFL60F	10	579.57	181.56

Table 2. Values of isokinetic initial and final testing of athletes



Graph 1. The difference between values of isokinetic variables in the initial and final testing

	Variable	t	df	Sig.
Pair 1	PTREX60I - PTUREX60F	1.233	9	.249
Pair 2	PTLEX60I - PTILEX60F	-.084	9	.935
Pair 3	TVREX60I - TVUREX60F	.085	9	.934
Pair 4	TVLEX60I - TVILEX60F	-1.591	9	.146
Pair 5	PTRFL60I - PTURFL60F	-1.647	9	.134
Pair 6	PTLFL60I - PTILFL60F	-2.672	9	.026
Pair 7	TVRFL60I - TVURFL60F	-1.393	9	.197
Pair 8	TVLFL60I - TVILFL60F	-2.260	9	.050

Table 3. The difference between values of isokinetic variables in the initial and final testing Paired Samples Test

Peak torque is an indication of the maximum muscle strength and equivalent to the maximum isotonic 1RM test. Total work is the largest total value of torque, which a subject can achieve during a series of five repetitions. In order to have sufficient values, a muscle must have the ability to maintain a relatively constant force over a longer time period. If the peak torque is lower, or if the peak torque has an appropriate value but the range of motion is reduced, it will produce a smaller total mechanical work (Kovač et al, 2013). 10-weeks DTS has produced an increase in the maximum muscle force of young athletes, and a total force manifested throughout the series. The research results (Table 3) determined significant differences ($p < 0.05$) in the case of the two applied isokinetic variables, between the initial and final measurement. These two variables were Peak torque Flexion $60^\circ/\text{s}$ - left leg (PTILFL60) and Total work Flexion $60^\circ/\text{s}$ - left leg (TVILFL60). These significant changes were observed only in the knee flexion of the left leg.

Combined functional strength training performed through bilateral and unilateral exercises and different level of loading contributes to an increase of the young athletes' dynamic strength potential. Functional strength training should include targeted exercises through which a level of strength qualities and results successfulness, as well as the prevention of injuries could be increased (Thomme, 2008). The performed bilateral and unilateral exercises could achieve the effect on an athlete's strength potential only if the subject previously adopted its proper biomechanical movements. Dynamic stretching exercises during the warm up phase and static stretching exercises during the warm down training phase provides for the flexibility of muscles. Also, a greater range of motion during the exercises with external resistance provide additional mobility in specific movement conditions. The combined strength training should reduce stiffness and considerably contribute in the increase of motor mobility. The exercises applied through the fundamental movement patterns should be a part of any strength training. These basic strength exercises provide postural stability by strengthening the central core of the body. While performing the

strength exercises, it is necessary to provide a natural balance and coordination of movement. Also there should be a good ability to apply the effective load during the eccentric and concentric phase of the exercise movement. It is well known that the nervous system gradually adapts to higher loads in training. A gradually larger external resistance contributes to strength increase, based on the adjustment of the nervous system (Fry, 2004). A balanced combination of exercises and loads provides the necessary muscle balance, by which an athlete needs to achieve a higher strength output.

Inter-muscular coordination is determined by the amount, activation frequency and synchronization of motor units involved in the movement. Inter-muscular coordination ensures joint work of the synergist and antagonist muscles that assist and control agonist muscles. The result of increasing power and speed of young athletes, is the most common consequence of improving their neuromuscular mechanisms. Improved coordination of the involved muscle groups is probably one of the main determinants of the young athletes' increasing strength (Ramsay, 1990). This fact supports the results obtained in this study. The higher load during strength training can cause an increase in isokinetic muscle strength, which consequently ensures the stability of the knee joint during fast work of extended duration (Aagaard et al., 1996). Authors report that strength training should be integrated with other types of training, which should include specific movements in order to increase efficiency within the complex movement patterns.

Duration of contact with the ground is relatively long during the initial phase of the sprint. In this phase an athlete performs movements with powerful concentric muscle contractions. The developed strength potential may reduce the duration of contact time with the ground, allowing higher frequency and stride length, and thus the faster realization of movement. Also, the ability to maintain strength endurance ensures longer duration of work at maximum intensity. A strong athlete is able to quickly and efficiently develop power at different motor movements. In addition to the neuro-muscular mechanism and muscle mass, muscle strength is determined by the locomotors system levers, activation degree of various muscle groups, and muscle inhibition tendency due to a great fatigue (Bompa, 1999, Sharkey and Gaskill, 2008).

One of the goals of DTS is to ensure an optimal balance of the agonists and antagonists muscles, besides their strength potential. Although hamstrings muscles have an important role in the extension expressed hip flexion and lower leg, it is well known that this group of muscles is often neglected in training. Even though hamstrings muscles have important role in the hip extension or flexion of the lower leg, it is known that this group of muscles are often neglected in training. The applied DTS exercises and loads probably acted on improving the hamstrings. In training practice it is important to gradually modify general exercises into specific exercises, and to ensure a positive transformation into required strength qualities.

An imbalance of agonists and antagonists muscles,

or strength weakness of certain muscle groups in relation to another is very common in elite athletes. Some of the reasons for this is inadequate strength training, poor training methods, and wrong dosing loads in strength training. This can all contribute to a slower potential strength, poor performance, or injury risk. It is therefore important that athlete's regular training plan includes a training of functional strength. Brown and Miller (2005) suggest that speed training should be designed to be used together with strength training. The effects of such training should reflect in increasing maximal and explosive strength level, and strength endurance.

CONCLUSION

An additional 10-weeks strength training (DTS) with free weights can improve the young athletes' isokinetic potential. DTS is effective on power increase of the knee joint in young athletes. Good strength and coordination qualities are the basis of speed development. Strong athletes are able to develop power at various motor movements very quickly and efficiently. The developed quality of strength endurance ensures longer work at maximum intensity. The applied DTS aimed to

additionally act on the young athletes' strength potential. Such an integrated approach to training can be effective in developing the athletes' speed. With a proper selection of exercises, methods and training load it is possible to improve the explosive power and dynamic ability of the knee joints.

An important precondition for the implementation of strength training is that young athletes should first learn biomechanical structure of the given exercises with external resistance and thereby build a proper coordination of movement. The authors recommend that strength training for young athletes should be properly dosed and adjusted according to age. DTS can be carried out before the main part of the training, after the warm-up phase, and continuously during the athletes' training preparation process.

This study has indicated the positive effects of DTS to increase the isokinetic potential of knee joints, but the effects in relation to the result of running a sprint distance have not been determined, which can be a weakness of the presented study. This procedure can also be useful in order to achieve rehabilitation progress after athletes' injuries. Young athletes should perform strength training under the control of a specialist coach.

REFERENCES

- Aagaard, P., Simonsen, E.B., Trolle, M., Bangsbo, J., Klausen, K. (1996). Specificity of training velocity and training load on gains in isokinetic knee joint strength. *Acta Physiol Scand*, 156(2):123-9.
- Bompa, T. (1999). *Periodisation – Theory and methodology of training*. Champaign, IL: Human Kinetics.
- Brown, L.E., Miller, J. (2005). Sa fungerar trningen. In L.E. Brown, V.A. Ferrigno (Ed.). *Snabbhets trning*, Stockholm: SISU Idrottsbocker.
- Čoh, M., Bračić, M., Smajlović N. (2010). Methodical aspects of maximum speed development. *Sport Sci*. 3(2), 11-14.
- Fry, A.C. (2004). The role of resistance exercise intensity on muscle fiber adaptation. *Sports Med*. 34, 663-679.
- Karsten, B., Stevens, L., Colpus, M., Larumbe-Zabala, E., Naclerio, F. (2015). May the effects of sports specific maximal strength and conditioning training on critical velocity, anaerobic running distance and 5-km race performance. *J. Sports Physiol. Perform.*
- Kovač, S., Kovačević, E., Abazović, E., Alić, H. (2013). Izokinetičko testiranje i trening. Sarajevo: Fakultet sporta i tjelesnog odgoja.
- Lenz, D., Hardyk, A. (2005). Trning av accelerations och maximalsnabbhet. In L.E. Brown, V.A. Ferrigno (Ed.). *Snabbhets trning*, Stockholm: SISU Idrottsbocker.
- Ramsay, J.A., Blimkie, C.J., Smith, K., Garner, S., MacDougall, J.D., Sale, D.G. (1990). Strength training effects in prepubescent boys. *Med. Sci. Sports Exercise*, 22(5):605-14.
- Stkren, K., Helgerud, J., Stka, E.M., Hoff, J. (2008). Maximal strength training improves running economy in distance runners. *Med. Sci. Sports Exercise*, 40(6), 1089-1094.
- Sharkey, B.J., Gaskill, S.E. (2008). *Vježbanje I zdravlje - 6. Izdanje*. Beograd: Data status.
- Thomme, R., Augustsson, J., Wernbom, M., Augustsson, S., Karlsson, J. (2008). *Styrketrning for idrott, motion och rehabilitering*. Stockholm: SISU Idrottsbocker.
- Winfried, J. (1997). *Sprint*. Zagreb: Gopal.

EFEKTI 10-SEDMIČNOG DODATNOG TRENINGA SNAGE NA IZOKINETIČKI POTENCIJAL ZGLOBA KOLJENA MLADIH SPORTISTA

Cilj studije je utvrđivanje efikasnosti dodatnog 10-sedmičnog treninga snage (DTS) na izokinetički potencijal zgloba koljena mladih sportista. Ispitano je 10 mladih sportista, starosti 15-17 godina, muškog spola. Za procjenu izokinetičkog potencijala zgloba koljena lijeve i desne noge, korišten je Biodex System. Izabrane varijable su: Peak torque Extension 60°/s, Total work Extension 60°/s, Peak torque Flexion 60°/s, and Total work Flexion 60°/s. Univarijantni t-test (Paired Samples Test) ukazuje na statistički značajne razlike između srednjih vrijednosti inicijalnog i finalnog testiranja ($p < .05$) u slučaju varijabli Peak torque Flexion 60°/s-lijeva noga (PTILFL60) and Total work Flexion 60°/s-lijeva noga (TVILFL60). Rezultati studije su ukazali da realizirani DTS efikasno djeluje na povećanje snage zgloba koljena mladih sportista. Važan uslov za realizaciju treninga snage je da mladi sportisti prethodno dobro savladaju biomehaničku strukturu vježbi sa vanjskim otporom i izgrade adekvatnu koordinaciju pokreta. Mladi sportisti trebaju izvoditi trening snage pod kontrolom trenera specijalista. Autori preporučuju da trening snage za mlade sportiste treba biti korektno doziran i prilagođen uzrastu. DTS se može provoditi prije glavnog dijela treninga, nakon faze zagrijavanja, i kontinuirano tokom procesa sportske pripreme. Ova studija ukazuje na efekte DTS u povećanju izokinetičkog potencijala koljena, ali nije poznat efekat u odnosu na rezultat istrčavanja sprinterskih dionica, što može predstavljati slabost prezentirane studije. Ključne riječi: sportska priprema, vanjski otpor, maksimalna snaga.

Received: November 04, 2016 / Accepted: December 01, 2016

Correspondence to: Izet Bajramović, Faculty of sport and Physical Education University of Sarajevo Bosnia and Herzegovina

E-mail: bajramovic.izet@gmail.com

THE EFFECTS OF SPECIALLY PROGRAMMED CLASSES IN PHYSICAL EDUCATION ON SOME SECONDARY SCHOOL SECOND GRADE SCHOOLGIRLS' FITNESS SKILLS

Seryozha Gontarev, Lence A. Velickovska, Ruzdija Kalach, Ivan Anastasovski

Faculty of Physical Education, Sport, and Health, Ss. Cyril and Methodius University, Skopje, Macedonia

Purpose: The research was realized on a group sample of 90 respondents, female adolescents at the age of 16 (± 6 months). The sample was divided into three subsamples (groups), based on a different experimental model. The main aim of this research was to determine the effects of the physical education specially programmed three classes per week with teaching materials in step-aerobics and basketball on the secondary school second grade schoolgirls' fitness abilities. 9 fitness tests from the EUROFIT test battery were applied for the realization of the research aims. The obtained data were processed with the basic descriptive statistical parameters, and the multivariate and univariate analysis of covariance (MANCOVA) was applied to determine the differences between the control and experimental groups. Results: On the basis of the obtained results it can be concluded that the three-month experimental group gave the expected results and lead to an improvement of some fitness abilities. The first and second experimental group, in the final measurement, achieved better results than the control group in the assessment of dynamometry strength, agility and aerobic endurance tests. The second experimental group, in the final measurement, achieved better results than the control and the first experimental groups in the frequency and movement assessment test. Conclusions: The research results showed the correctness of the new concept in the physical education course realization in the context of its reform.

Keywords: step-aerobics, basketball, programmed classes in physical education, covariance, EUROFIT.

INTRODUCTION

The expansion of the scientific and technological discoveries, accelerated globalization and the process of informatization demand rooted changes and a permanent transformation of the education system. That is why the dynamic and complex reality (truth) requires schools to be able to adapt easily and quickly to all situations in life. Therefore, a modern society requires quality schools, or rather those where students go voluntarily, where they can optimally develop their qualities and abilities, gain useful knowledge, improve their achievements and gain knowledge about general human values. It is irrelevant, on the contrary, if we agree that the time young people spend at school is an ideal opportunity to prepare them for life (Hardman, 2008).

The modern way of life dictates new trends in education. Experts are making great efforts to determine what has changed in the students' consciousness and erudition under the influence of informal education, all the available information, technical and technological innovations, which allow them to simultaneously be at the other end of the world and be participants in various social games and social networks from their room or bed. In such conditions, young people spend less time in motion. Over the past years, there were more researches that aimed to determine to what extent the physical education leads to a positive impact on students. The results of some researches (Arunović 1978, Matić 1985, Krsmanović 1985, 1987, 1989, 1995) indicate that physical education classes are not adequate and satisfactory, tailored to the age of the students and their individual abilities, needs and interests. The main reasons for ineffective teaching

is a poor conception of modelling the programmed classes and the small number of classes per week (Krsmanović, 1995).

The curriculum is modelled so the students expect to overcome numerous motor tasks from a number of sports (athletics, gymnastics, sports games, dances, etc.). The disadvantages of such a curriculum are that they are only superficially adopted to the basic motivating element of the students, provided by the program. The curriculum practice is basically geared towards the development of sports-technical elements, and less in the development of the students' motor and functional abilities. The effectiveness of the physical education classes can be enhanced by real, professional and economic planning and monitoring of the curriculum effects, as well as by increasing the weekly number of classes. According to the new conceptual solutions for the physical education classes in secondary vocational schools in the Republic of Macedonia, the program is realized with 3(2+1) hours of classes per week, out of which 2 hours are implemented according to the regular schedule and 1 hour during the week realized outside the regular schedule, which may include students from several classes of the same year, designed for a specific sporting activity or sport in which a system of competitions will be held starting from the lowest level.

Since a compulsory third hour of physical education is introduced in the vocational schools, it is necessary to make great efforts to properly plan and design it. Namely, constant monitoring and investigation of the progress and the skills development among the students is needed. The type of means used in the curriculum should be explored, i.e., which sports, what type of activities will mostly contribute to the improvement of the students' abilities, increasing them, as well as those regarding fitness and their needs and interests for engaging in a particular sport of physical activity outside the educational system. It should be mentioned that the program of elective subjects gives the students a choice to decide which sport (football, basketball, handball, volleyball) they will attend throughout the year. The truth is, students must not always be offered only sports games, and it depends on the conditions at the school and the interest of the students.

The research started from the assumption that the results will demonstrate the correctness of the new concept in the physical education curriculum realization in the context of its reform. Furthermore, this research should show the effects of the physical education specially programmed three hours per week curriculum with teaching materials from step-aerobics and basketball on second grade schoolgirls' fitness abilities.

METHODS

The research is longitudinal, has an experimental character, realized in the form of a pedagogical experiment with parallel groups where the primary method used is the experimental, and the statistical methods are used as auxiliary ones. At the beginning of the school year, the school board responded positively to the authors' request to realize this research project in their school.

Sample of participants

The research was realized on a group sample of 90 respondents, female adolescents at the age of 16 (± 6 months). The sample was divided into three sub-samples (groups) on the basis of different experimental models. There were 30 respondents in each group. The sample was drawn from a population of high school "Gotse Delchev" from Kumanovo second year full-time schoolgirls. Only healthy capable students, who pleaded not to be the members of any club or section, but regularly attended the physical education classes entered the sample. Students who were absent more than 10% of the total number of hours from the subject did not enter the final data processing.

Description of the experimental treatment

The experimental treatment was realized in conditions that physical education regular curriculum is realized in the secondary schools. The experiment lasted 18 weeks, one semester. The three groups practiced in the same conditions, in which they tried, as much as possible, to reduce the influence of parasitic factors that may affect the results of the experiment. All the variables in the three sub-samples were measured in two time transits as follows: before the beginning of the experimental program (at the beginning of the first semester) and the end of the first semester (final measurement). The final measurement was realized in approximately equal conditions.

The groups were named as: first experimental group (E1), second experimental group (E2) and the control group (C1).

The first experimental group realized a three hours per week curriculum. The first two hours were realized in a classic way (as the control group) and, within the third hour, step-aerobics took place. The structure of the third hour of step-aerobics was

implemented in four stages according the scheme shown in Table 1.

In the introductory part of the lesson, motion structures that serve for introducing the step bench and its characteristics and dimensions, stability and strength, and the height and length of the step platform were elected. In this part of the lesson, low intensity steps that were performed in place on the pad and step platform, with gradual inclusion of the hands were selected.

In the first main "A" part of the lesson, the basic steps (basic step, V-step, L-step, A-step, K-step, knee up and similar), which had a lower level of the informational component, and dominated the energy component more, were applied. Basically these steps were combined with simple steps on the pad of a low-impact class in simple rhythmic units, thus enabling the intensity of the burden to slightly vary in the training area of optimal aerobic training, which was 60% to 80% (122 to 163 BMP) of the maximum students' heart frequency, measured by palpation of the artery radial or carotid artery every 5 minutes. The second B part of the lesson applied exercises performed by using the step bench or pad for improving the strength of the local large muscle groups. In the final part of the lesson, exercises for stretching and relaxing, whereby it is possible to primarily affect the tone of all large muscle groups, then the small muscle groups during the workout, were applied. A specially trained instructor, controlled by the subject teacher, implemented the lesson of step-aerobics in the physical education gym at school.

The frontal teaching method was used in the lesson, but unlike the frontal method used in the classic physical education lesson, here, each student individually performed the workout depending on their abilities. The respondents increased or decreased the intensity by performing a movement of greater or lesser amplitude, including or excluding the arms, and so on.

The second experimental group realized the three hours per week curriculum. The first two were held in the classical way (as a control group) and, within the third hour, basketball was played. The structure of the lesson was implemented in four stages with a standardized content. The subject teacher implemented the lesson in the physical education gym at school. The main focus of the main part of the lesson was on perfecting the basic elements of a basketball game and their application in the game with one or two baskets.

For the control group, the physical education

lessons were realized in the classic way with a fund of two hours per week. The classic way implies a common way of work in overcoming and practicing the lessons in parts of the secondary education second year curriculum and program approved by the Ministry of Education and the Bureau for Development of Education. The lesson had four parts (the introductory, the preparatory, the main and the final phase) with a standardized content. The subject teacher implemented the lesson in the physical education gym at school. The duration of the introductory part of the lesson took 10% of total time and in the same dominated the cyclical movement as: leisurely running, left and right side jumps, child jumps etc. During the preparatory part of the lesson simple standardized sets of exercises for shaping, without the use of exercise equipment, consisted of ten exercises and 20% of the total time was necessary for their implementation. After completing the introductory and preparatory part, which were identical for all the lessons, the final part took place. The planned curriculum provided by the educational plan and program was realized in it. In the final part of the lesson different program contents were realized. The curriculum, in the final part of the lesson, was chosen depending on the type of load in the main part of the lesson.

Evaluation of Physical Fitness

Physical fitness was assessed using the European physical fitness test battery, i.e. the EUROFIT test battery (Conseil de l'Europe, Comité pour le développement du sport. Eurofit, tests européens d'aptitude physique. Strasbourg: 1995) containing 8 tests that measure different components of fitness: Flamingo balance (general balance), plate tapping (coordination and speed of limb movement), sit and reach (flexibility), standing-broad jump (explosive strength), hand grip strength (static strength), sit-ups (trunk strength and endurance), bent arm hang test, 10x5m shuttle run (speed and agility), and 20m endurance shuttle run (cardiorespiratory endurance). This test battery is a reliable and valid instrument to measure physical fitness in children and is a commonly used test battery in Europe (Adam, et al. 1988).

Statistical analysis

The basic descriptive statistical parameters, and the multivariate and univariate analysis of covariance (MANCOVA) were used to assess the fitness tests applied in the research

The univariate differences in the analysed fitness tests in each group, between the initial and the final measurement, were tested by appropriate T-tests for small dependent samples. The normality of the test results distribution has been audited by the Kolmogorov and Smirnov method.

RESULTS

The data from the application of the Kolmogorov and Smirnov method pointed out that all the applied fitness tests, both in the initial and the final measurement in the three sub-samples, were normally distributed, and it was possible and methodologically correct to perform further data processing.

In order to define the differences in the measured fitness tests between the initial and final measurement, especially in the three sub-samples, the t-tests were applied for small dependent samples. The test results are shown in Tables 2 to 4.

From the results of the t-tests (Table 2) we can see that, in the first experimental group (E1), there are statistically significant differences between the initial and final measurement in the fitness tests: flamingo balance, plate tapping, standing-board jump, palm dynamometry, raising the trunk for 30 seconds, pull-ups endurance, shuttle running 10x5 meters, and 20 meters shuttle running. On the basis of the numeric values of the arithmetic means we can see that, in the final measurement, it led to improved results in all the fitness tests. Statistically significant differences between initial and final measurements are determined only in the sit and reach test.

From Table 3 we can see that, between the initial and final measurement, statistically significant differences were determined in the second experimental group (E2) in all fitness tests. After 18 weeks of experimental treatment for the second experimental group the numeric values of the arithmetic means in all tests are higher than the initial measurement.

From the results of the t-tests (Table 4) we can see that, in the control group (C1), there are statistically significant differences between the initial and final measurement in the fitness tests: flamingo balance, plate tapping, standing-board jumping, palm dynamometry, raising the trunk for 30 seconds, pull-ups endurance, shuttle running 10x5 meters, and 20 meter shuttle running. On the basis of the numeric values of the arithmetic means we can see that, in the final measurement and in the control group, it led to an improvement of the results for all fitness tests. Statistically significant differences between initial and final measurements are determined only in the sit and reach test. In order to define the differences in the measured fitness tests in the final measurement between the three sub-samples that were covered by different experimental programs, the multivariate and univariate analysis of covariance is applied. The results of the multivariate and univariate analysis of the covariance are presented in the Table 5.

From the analysis results we can clearly see that, in the entire system of treated fitness tests, there are statistically significant differences in the multivariate level ($Q=.00$). Due to this fact it was possible to

analyse the individual contribution of each test in determining these differences. Thus, from the review of the corrected arithmetic means and the corresponding values of the level of statistical significance we can see that there are statistically significant differences in the fitness tests: plate tapping ($F=13.12$; $p=.000$), handgrip strength ($F=6.59$; $p=.002$), shuttle running 10 x 5 meters ($F=6.23$; $p=.003$) and 20m Shuttle run ($F=5.70$; $p=.005$). In the other fitness tests, statistically significant differences in the final measurement between the three groups of respondents have not been determined.

IN ORDER TO PRECISELY DETERMINE WHICH GROUP ACHIEVED THE BEST RESULTS IN THE FINAL MEASUREMENT OF THE TESTS, POST-HOC TESTS WERE APPLIED WHERE STATISTICALLY SIGNIFICANT DIFFERENCES WERE DETERMINED.

The results from LSD Post-hoc tests are shown in Table 5. On the basis of the values of the results we can notice that, in the fitness tests plate tapping, there are statistically significant differences between the first (E1), second (E2) and third (C1) group. From the corrected values of the arithmetic means we can see that the participants in the second experimental group (E2) achieved better results in the final measurement in the test plate tapping compared to those of the first (E1) and third (C1) group. In fitness tests palm dynamometry, shuttle running 10x5 meters and 20 meters shuttle running, statistically significant differences between the first (E1) and the third (C1) group were not determined, and the second (E2) and third (K1) group regarding the respondents from the first (E1) and second (E2) experimental group achieved better results in the final measurement in these fitness tests compared to the control group (C1). Between the first (E1) and second experimental group (E2) statistically significant differences in the above mentioned tests were not determined.

DISCUSSION

The obtained results indicate that both experimental models of planning and realizing the physical education curriculum enabled improved results in the motor skills compared to the control group. Namely, the first experimental group in the final measurement achieved better results compared to the control group in the tests for assessing the dynamometric strength, agility, speed and aerobic endurance. This improvement is expected, taking into account the structure of the third hour of the first experimental group which worked in step-aerobics. The poly-structured cyclic activities, i.e. manifestly different structure movement without interruption dominated the lesson. It is successively prolonged, indicating a greater or lesser number of times and repeated cyclically. The main aim of the third hour per week was to primarily improve aerobic and strength abilities and satisfy some of the aesthetic criteria.

Similar results has come in several previous researches for respondents who attended aerobics classes, compared to respondents who attended regular physical education classes (Sekulić, 1999; Zagorc, M., Bergoč, Š., 2000; Sekulić, D., Rausavljević, N. & Zenić, N., 2003; Mandarić, 2004; Mandarić, S., Sibinović, A. & Stojiljković, S., 2011; Mandarić, S., Kocić, S. & Milinković, D. 2010; Sibinović, A., 2011; Gontarev et al, 2015).

The second experimental group in the final measurement achieved better results than the control group in tests for assessing the frequency of the movement of upper extremities, dynamometric strength, agility, speed and aerobic endurance. The changes in these fitness abilities are expected given the fact that, in basketball, coordination, i.e. agility (speed with changing the direction), frequency of the movements, strength and endurance dominate. It can be concluded that the additional engaging with basketball led to a number of positive effects, as in previous researches (Arunović 1978, Obradović, 1984; Srđenović, 1991; Popović, 2010; Ljubojević, 2011; Ljubojević, M., Višnjić, D., & Ilić, J. 2012; Ljubojević, 2014; Vukotić, 2010; Šekeljić, 2007; Kljajević, V. 2009; Gontarev, S., Kalac, R., & Naumovski, M. 2015).

However, based on the above mentioned and on the basis of the conclusions that came from authors in these research, it can be concluded that most of the previous research, the experimental programs, have a greater influence in terms of control, and that the experimental groups were superior to the control

in most tests. Therefore, several authors suggest that there are changes in physical education classes towards emphasizing the individual sports games or group fitness programs (aerobic, step-aerobics, Pilates, Tae Bo, dances, etc.), which are especially popular for the female population.

It seems that the displayed research, and other trends in the development of education influenced the change in the physical education classes, and above all, they have acquired the awareness that is necessary (even if it were chosen by the students) to be given the opportunity for the students to have more than two hours per week in physical education classes.

The results of this research may not go entirely in favour of physical education teachers because the additional third lesson of step-aerobics and basketball did not produce a statistically significant improvement in all fitness abilities such as balance, strength explosiveness of the lower extremities, flexibility in the hip joint, the abdominal strength of the abdominal muscles and static strength of the arms and shoulder girdle. However, we should have in mind that the experimental procedure lasted only one semester and was realized on a relatively small number of respondents. If the experimental treatment lasted until the end of the school year, changes in the other fitness abilities would probably be present. In addition to this assumption are the favourable values of the arithmetic means for most of the fitness tests in favour of the experimental compared to the control group.

However, the real fighters for the profession that we deal with and for the students who certainly lack physical activity in modern lifestyles, this research can be only one initial step, only one footprint on the road that we must search for. Now when we analysed some things and we found the mistakes, we will know to look for new courses of action.

The additional physical education lesson is a major advance for the place of physical education in the overall process of education. The survey results showed the correctness of the new concept in the realization of the physical education lesson in the context of reformation. Certainly the successful realization of the third hour will greatly depend on the skills and organizational abilities of the teacher. The research can serve as an insight into the current real picture of the situation and to give encouragement to the future researchers to show, in some new study, that, with the extra hour, we can primarily reach a much greater effect in the development the motor and functional abilities of students.

CONCLUSIONS

Generally it can be concluded that the three-month experimental programs have yielded the expected results and lead to improvement of some fitness abilities. The first and the second experimental group, in the final measurement, achieved better results than the control group in the assessing tests: dynamometric strength, agility and aerobic endurance. The second experimental group, in the final measurement, achieved better results than the control and the first experimental groups in the frequency and movement assessment test.

The obtained results showed the feasibility of introducing the compulsory third physical education lesson in the secondary vocational schools. Also, they commit themselves to continue the research in this direction, in order to determine how much the other contents from this area (other sport games, folk and modern dances, other group fitness programs) can contribute to improving the capabilities of the students who live in modern living conditions and have the need to be more physically active.

PARTS OF THE LESSON	DURATION	BMP
Introductory – preparatory part of the lesson (heating)	7 min	120-125
Main "A" part of the lesson (cardio-aerobic)	20 min	125-148
Main "B" part of the lesson (training of the muscle composition)	10 min	100-126
Final part of the lesson (stretching and calming)	8 min	100 and less

Table 1. The structure of the third hour of step-aerobics

Variables	Initial		Final		%	T-test	p
	Mean	SD	Mean	SD			
Flamingo balance	15,17	5,31	11,22	4,58	26,07	6,81	0,00
Plate tapping	12,72	1,62	11,65	0,80	8,39	3,80	0,00
Sit and reach	28,61	9,12	28,96	9,61	1,22	-1,12	0,28
Standing-broad jump	129,57	18,46	138,04	17,88	6,54	-4,74	0,00
Handgrip strength	46,09	11,18	54,00	11,94	17,17	-7,93	0,00
Sit-ups	15,70	3,31	21,13	3,20	34,63	-11,47	0,00
Bent arm hang test	10,35	10,61	16,48	14,38	59,24	-4,06	0,00
10x5m shuttle run	25,45	1,47	21,93	1,49	13,86	13,44	0,00
20m shuttle run	4,57	1,57	5,21	1,48	13,99	-4,84	0,00

Table 2. The significance of the differences of the arithmetic means in the initial and final measurement for respondents from the second experimental group (step-aerobics)

Variables	Initial		Final		%	T-test	p
	Mean	SD	Mean	SD			
Flamingo balance	11,20	4,02	8,10	3,06	27,68	6,05	0,00
Plate tapping	13,13	2,41	10,83	1,13	17,52	6,43	0,00
Sit and reach	25,65	8,90	27,10	8,67	5,65	-2,76	0,01
Standing-broad jump	125,60	30,77	143,50	15,57	14,25	-2,83	0,01
Handgrip strength	48,00	11,74	55,00	10,26	14,58	-6,66	0,00
Sit-ups	15,00	1,69	20,55	2,63	37,00	-10,77	0,00
Bent arm hang test	7,55	8,05	12,85	11,71	70,20	-4,19	0,00
10x5m shuttle run	24,30	1,89	20,97	1,78	13,72	11,21	0,00
20m shuttle run	4,75	1,03	5,44	1,09	14,42	-8,30	0,00

Table 3. The significance of the differences of the arithmetic means in the initial and final measurement for respondents from the second experimental group (basketball)

Variables	Initial		Final		%	T-test	p
	Mean	SD	Mean	SD			
Flamingo balance	11,00	5,20	8,49	3,89	22,86	4,41	0,00
Plate tapping	12,49	1,74	11,50	1,38	7,89	6,40	0,00
Sit and reach	24,74	9,00	25,16	9,11	1,67	-1,21	0,24
Standing-broad jump	138,71	19,19	146,14	17,45	5,36	-4,96	0,00
Handgrip strength	48,14	8,23	51,14	7,87	6,23	-5,11	0,00
Sit-ups	14,40	2,49	19,54	2,95	35,71	-14,98	0,00
Bent arm hang test	7,74	7,09	13,11	12,33	69,37	-4,24	0,00
10x5m shuttle run	24,65	1,65	22,30	1,67	9,55	10,60	0,00
20m shuttle run	4,46	1,14	4,79	1,04	7,50	-3,11	0,00

Table 4. The significance of the differences of the arithmetic means in the initial and final measurement for respondents from control group (physical education)

Wilks' Lambda	Rao's R		df 1		df 2		p-level	
0,43	3,37		18,00		116,00		0,000	

Variables	Aerobics		Basketball		Control		F	p	Post hoc pairwise comparisons
	Mean	SD	Mean	SD	Mean	SD			
Flamingo balance	9,57	0,55	8,54	0,54	9,32	0,41	0,98	0,382	ns
Plate tapping	11,61	0,17	10,64	0,16	11,64	0,13	13,12	0,000	1 & 2; 2 & 3
Sit and reach	26,38	0,49	27,65	0,49	26,54	0,37	2,08	0,133	ns
Standing-broad jump	140,31	2,63	145,20	2,60	143,68	1,98	0,83	0,440	ns
Handgrip strength	54,89	0,98	54,41	0,97	50,90	0,74	6,59	0,002	1 & 3; 2 & 3
Sit-ups	20,80	0,50	20,36	0,50	19,87	0,38	1,03	0,364	ns
Bent arm hang test	15,34	1,56	13,33	1,54	13,59	1,17	0,46	0,632	ns
10x5m shuttle run	21,60	0,27	21,23	0,27	22,36	0,20	6,23	0,003	1 & 3; 2 & 3
20m shuttle run	5,35	0,13	5,22	0,13	4,83	0,10	5,70	0,005	1 & 3; 2 & 3

Table 5. Multivariate and univariate differences in test for assessing the fitness skills between the three groups of respondents

REFERENCES

- Adam, C., Klissouras, V., Ravazzolo, M., Renson, R., & Tuxworth, W. (1988). Eurofit: European test of physical fitness. Rome: Council of Europe, Committee for the development of sport, 10-70.
- Arunović, D. (1978) Uticaj posebno programirane nastave fizičkog vaspitanja (sa akcentom na košarku) na neke motoričke sposobnosti učenika uzrasta 15-16 godina. Beograd: Fakultet fizičke kulture, FFK, Magistarska teza.
- Gontarev, S., Kalac, R., & Naumovski, M. (2015). The Effects of Special Programmed Classes in Physical Education With Third Lesson Basketball on Some Motor Skills for Female Students of II Year of High School Education. Research in Physical Education, Sport & Health, 4(2), 29-33.
- Gontarev, S., Živković, V., Kalac, R., Anastasovski, I., & Markovski, N. (2015). The Effects From Special Educational Program of Physical Education With Third Step-Aerobics Hour Over Motor Abilities For Female Students From II High School Year. Research in Physical Education, Sport & Health, 4(1), 15-19.
- Hardman, K. (2008). Physical education in schools: a global perspective. Kinesiology, 40(1), 5-28.
- Kljajević, V. (2009) Uticaj programa košarke na transformaciju antropološkog statusa srednjoškola. Podgorica: Crnogorska sportska Akademija.
- Krsmanović, B. (1985). Efikasnost nastave fizičkog vaspitanja u zavisnosti od modela nastavnih programa. Nepublikovana doktorska disertacija. Novi Sad: Fakultet fizičke kulture.
- Krsmanović, B. (1987). Opterećenja učenika na času fizičkog vežbanja. Zbornik radova, Fakultet fizičke kulture, Novi Sad.
- Krsmanović, B. (1989). Aktivnost i angažovanje učenika na času fizičkog vaspitanja, Zbornik radova. Fakultet fizičke kulture, Novi Sad.
- Krsmanović, B. (1995). Teškoće u realizaciji zadataka fizičkog vaspitanja u osnovnoj školi. Fakultet fizičke kulture. Zbornik radova, sv.7a, (21-25),

- Novi Sad.
11. Ljubojević, M. (2011). Efekti nastavnog predmeta – Sport za sportiste (košarka) na morfološke karakteristike i motoričke sposobnosti učenika osmog razreda osnovne škole. (Magistarska teza). Fakultet sporta i fizičkog vaspitanja, Beograd.
 12. Ljubojević, M. M. (2014). Obrazovni efekti izbornih sportova u nastavi fizičkog vaspitanja. (Doktorska disertacija). Fakultet sporta i fizičkog vaspitanja, Beograd.
 13. Ljubojević, M., Višnjić, D., & Ilić, J. (2012). Praćenje efekata programa košarke kao izabrane sportske aktivnosti u nastavi fizičkog vaspitanja na antropomorfološki status učenika. Inovacije u nastavi - časopis za savremenu nastavu, 25(3), 48-55.
 14. Mandarić, S. (2004). Efekti vežbanja po programu 'high-low' aerobika kod učenika osnovne škole. Godišnjak Fakulteta sporta i fizičkog vaspitanja, (12), 62-71.
 15. Mandarić, S., Kocić, S., Milinković, D. (2010). Komparativna analiza strukture treninga različitih fitnes programa. Zbornik radova, (190-194). Beograd: Fakultet sporta i fizičkog vaspitanja
 16. Mandarić, S., Sibinović, A., & Stojiljković, S. (2011). Efekti programa high-low aerobika na morfološke karakteristike, funkcionalne i motoričke sposobnosti učenika osmih razreda osnovne škole. Facta universitatis - series: Physical Education and Sport, 9(3), 307-319
 17. Matić, M. (1985). Reperi za prepoznavanje dobra u stručnom delovanju pedagoga fizičke kulture. Fizička kultura, 5, 305-312
 18. Obradović, S. (1984). Uspešnost različitih režima jednogodišnje obuke i igre fudbala i košarke u rešavanju zadataka fizičkog vaspitanja učenika osmog razreda osnovne škole (Doktorska disertacija). Fakultet za fizičko vaspitanje, Beograd
 19. Oja, P., & Tuxworth, B. (Eds.). (1995). Eurofit pour adultes: évaluation de l'aptitude physique en relation avec la santé. Council of Europe.
 20. Popović, N. (2010). Uticaj eksperimentalnog programa košarke na morfološke karakteristike i motoričke sposobnosti učenika osmog razreda osnovne škole. (Magistarski rad). Beograd: FSFV
 21. Šekelj, G. (2007). Efekti primene osnovnih elemenata košarke kao nastavnog sadržaja časova fizičkog vaspitanja kod učenika četvrtog razreda osnovne škole (Doktorska disertacija). Fakultet sporta i fizičkog vaspitanja, Beograd.
 22. Sekulić, D. (1999). Utjecaj različitih oblika aerobike na promjene nekih antropoloških obilježja vježbačica i vježbača. Magistarski rad, Zagreb: Fakultet za fizičku kulturu sveučilište u Zagrebu
 23. Sekulić, D.; Rausavljević, N.; Zenić, N. (2003). Changes in motor and morphological measures of young women induced by the HI-LO and Step aerobic dance programs. Kineziologija, 35 (1), 48-58.
 24. Sibinović, A. (2011). Efekti programa 'high-low' aerobika na morfološke karakteristike, funkcionalne i motoričke sposobnosti učenika osmih razreda osnovne škole - izvod iz magistarskog rada. Godišnjak Fakulteta sporta i fizičkog vaspitanja, (17), 23-37
 25. Srdrenović, B. (1991). Efikasnost primjene različitih modela programa nastave fizičkog vaspitanja na obilježja psihosomatskog statusa učenika osnovne škole (Doktorska disertacija), Fakultet fizičke kulture, Novi Sad.
 26. Vukotić, M. (2010). Nivo morfoloških karakteristika, motoričkih i funkcionalnih sposobnosti sportista različitog sportskog usmjerenja. (Magistarski rad). Fakultet za sport i fizičko vaspitanje, Nikšić.
 27. Zagorc, M., Bergoč, Š. (2000): Metode poučavanja u aerobici. Fakultet za sport, Ljubljana

EFEKTI POSEBNO PROGRAMIRANE NASTAVE FIZIČKOG VASPITANJA U NEKIM FITNES VJEŠTINANA UČENICA II. RAZREDA SREDNJE ŠKOLE

Svrha: Istraživanje je realizovano na grupnom uzorku od 90 ispitanika, ženskih adolescenata u dobi od 16 godina (± 6 mjeseci). Uzorak je podijeljen na tri poduzorka (grupe), na osnovu različitog eksperimentalnog modela. Glavni cilj ovog istraživanja bio je utvrditi efekte posebno programirane nastave fizičkog vaspitanja sa nastavnim materijalima u aerobiku i košarki u okviru tri časa sedmično u fitnes vještinama učenika II. razreda srednje škole. Za realizaciju ciljeva istraživanja je primijenjeno 9 fitnes testova koji čine EUROFIT baterije. Dobijeni podaci su obrađeni sa osnovnim deskriptivnim statističkim parametrima, a za određivanje razlike između kontrolne i eksperimentalne grupe primijenjena je multivarijantna i univarijantna analiza kovarijanse (MANKOVA). Rezultati: Na osnovu dobijenih rezultata može se zaključiti da je tromjesečna eksperimentalna grupa dala očekivane rezultate i dovela do poboljšanja nekih fitnes sposobnosti. Prva i druga eksperimentalna grupa je u finalnom mjerenju ostvarila bolje rezultate od kontrolne grupe u procjeni testova dinamometrije snage, agilnosti i aerobne izdržljivosti. Druga eksperimentalna grupa u finalnom mjerenju je postigla bolje rezultate od kontrolne grupe i prve eksperimentalne grupe na testu za frekvenciju i procjenu pokreta. Zaključci: Rezultati istraživanja pokazali su ispravnost novog koncepta u realizaciji nastave fizičkog vaspitanja u kontekstu njene reforme. Ključne riječi: aerobik, košarka, programirana nastava fizičkog vaspitanja, kovarijanse, EUROFIT.

Received: November 04, 2016 / Accepted: December 01, 2016

Correspondence to: Lence A. Velickovska, Faculty of Physical Education, Sport, and Health, Ss. Cyril and Methodius University, Skopje, Macedonia

E-mail: lencealex@yahoo.com

EFFECTS OF EXPERIMENTAL TRAINING PROGRAM ON VALUE OF SPECIAL JUDO FITNESS TEST IN YOUNG JUDOKAS

Amel Mekic, Haris Alic, Izet Bajramovic, Izet Radjo

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

The aim of the study is to determine the effects of the experimental judo program EJP based on the progressive increase of the throwing technique nage-komi-a (NK) number of repetitions on the value of the special judo fitness test (SJFT). We tested 26 young judokas ($n = 26$), aged 15-17, who were engaged in the training and competition process for at least 5 years. EJP lasted for 4 weeks, wherein we had 20 training units and 2 tests of the initial and final states. The implemented four weeks long EJP was based on gradually increasing the intensity and scope of work in each subsequent week, which is expressed in the increased speed and the total number of throws. The variables used in this research are: 1. the number of throws in the first 15 seconds; 2. the number of throws in the first 30 seconds; 3. the number of throws in the second 30 seconds; 4. the participants' heart rate immediately after the work - HR; 5. the participants' heart rate 1 min after the work - and HR1min and SJFT Index. The sample training program was implemented by training in pairs (13 pairs), of approximately the same body weight and height. Given that athletes encounter the SJFT for the first time, the same is presented in detail and demonstrated by the examiner. Descriptive value results are calculated using descriptive statistics, and the differences between the initial and final measurements were calculated by the student's t-test for paired samples. The analysis of the results shows a growth in the variables indicating the number of throws in the first 15 seconds, the heart rate after testing and SJFT Index ($p < .0005$). It can be concluded that the EJP has caused corresponding changes which confirms the hypothesis about the positive effects between the two points of measurement. The authors stress the need for a table which classifies the SJFT results for young judokas.

Keywords: young judokas, nage-komi, classification.

INTRODUCTION

Judo belongs to polystructural acyclic sports dominated by acyclic movements (Kajmović H., 2009 to the Crnogorac B., 2012) which means that it can be described as an activity of special complexity. Of course, the complexity of the structure is difficult to simply compare to other and different activities. (Rado I., 2003 under Crnogorac B., 2012). Judo is a sport in which we have an opponent, and the goal is to bring the opponent to the symbolic destruction. The fight lasts five minutes. However, during the time allowed, there are many interruptions during the fight. The typical time structure is 30s of activity to 10s of inactivity. Such segments averaged twelve times during the match. During the elimination process, the breaks between the fights most often last about 30 minutes. Diverse techniques in judo make the structure of the match more complicated and demand a timely execution of techniques, as well as its individual phases with the use of the entire potential of the fighter, who is able to apply technical and tactical stereotypes adopted, and to reorganize them in terms of the offensive, defensive and counter-offensive action programs.

Competitive judo can be described as a combat sport of high intensity in which judokas try to throw the opponent on his back or to control him during the fight on the ground. Both activities are dependent on specific techniques and tactical skills with the support of good physical fitness. Between strength, speed and endurance there is a link of methodical importance. During the initial years of training, skills have to be developed to build a solid foundation for a specialized training. For elite athletes, the connection between the size of the maximum power, speed and endurance, as most determined biomotor skills that are difficult to develop, will depend on the characteristics of the sport and the athletes' need. (Franchini E. 2005,

Muramatsu S. 1994, according to Crnogorac B., 2012). In sports training, there is often more interest in improving the athletes, not only by movement adoption, but also through their physiological components known as motor abilities. Most of the movement includes elements of force, speed, time, complexity and movement radius until a certain limit. Furthermore, we can study individual motor aspects such as strength, speed, endurance and coordination. (Crnogorac B., Mekić A., 2012).

The physiological requirements of such a form are the burden to both aerobic and anaerobic system. The anaerobic system provides short, quick and explosive bursts of maximum power during the match, while the aerobic system contributes to the judokas ability to withstand the strain during the fight and to recover during short periods of rest or reduced effort. The most significant correlation presented shows that athletes, in a heavier category, are stronger in absolute terms, similar to findings of Tomas et al. (According to Crnogorac B., 2012). However, there was a negative correlation between weight and performance in SJFT, showing that heavier athletes have a lower aerobic capacity in activities involving throwing opponents of the same category. Worse scores of the heavier athletes in the Cooper test can be found (explained) by the correlation between weight and estimated VO_2max . Thomas et al. also observed a negative correlation between the relative VO_2max and judokas weight. A large part of these relations can be explained by a high fat percentage and low fitness. The negative influence of body fat on the motor characteristics has been found in some studies. Nakajima et al. has found a negative influence of body fat on the isometric strength, flexibility, balance and aerobic capacity in judokas. Previous studies have also presented a negative correlation between the percentage of body fat and the number of throws in SJFT ($r = 0.70$) and between the percentage of body fat and the number of attacks in a fight simulation ($r = 0.76$) in high level judokas. (Franchini E., 2005 to Crnogorac B., 2012)

Based on the above it can be concluded that:

- Physical and morphological components make no difference in performance with the three best placed at the national level;
- The higher the percentage of body fat, the worse the performing activities that involve movement of the body (the Cooper and SJFT test);
- judo athletes who show a higher aerobic capacity also show better performance during high intensity activities with interruptions;
- judo athletes with larger body volumes show greater absolute maximum power, but this relationship was not significant when the power is displayed relative to body weight.

While this variable does not predict performance in a sport where technique and tactics are essential for success, they could give us some goals for the development of judokas. The data can provide judokas with information in which direction to focus training in order to enhance certain segments. (Crnogorac B., Mekić A., 2012)

Some types of physical fitness and anthropometric variable are considered necessary for a high performance in the judo competition. Recently, a table with the criteria for the classification performance in SJFT was proposed. Franchini E. et al (2006) conducted a study on 141 respondents in order to develop the table for classification results in SJFT. Based on the results they made a table that is a reliable tool to help with programming training sessions. The point is that the table itself is made on the basis of data taken during research on subjects which are 21.3 ± 4.5 years old, and this test is done on the sample of young judokas. So we will further elaborate and try to come to solutions that will facilitate the forthcoming research in this sphere.

METHODS

In this study, we applied a statistical, comparative and experimental methods. Based on the previously mentioned methods were collected numerical data and the same were compared in SPSS. The experimental method was used in the process of the training sessions' planning and programming in accordance with the age and needs of the participants, as well as in the case, the problem and the objectives of the research.

SAMPLE

For the purpose of this study, a sample was composed out of the "Una Bihać" judo club's cadet and junior teams. The number of judokas was 26, out of which there were 11 cadets and 15 juniors. The sample consisted of 6 subjects who trained two to three years, 12 respondents who trained five years or more, and 8 who trained eight years and more. The cadets sample group had 8-13 competitions a year, and the juniors had 10-15 competitions, including European cadet and junior cups and championships. All the measured participants were present at 90% of training during the specific training process.

DATA PROCESSING METHODS

A paired t-test is the most commonly used parametric test of significance for testing the null hypothesis. It is used for testing the significance of differences between the two arithmetic means. The requirements necessary for the application of the t-test are as follows: both variables that are tested should be numeric and if the sample size is less than 30 units, the shape should be normal or at least symmetrical.

Sample variables in this study are in the shape of quantitative values which are measured during the implementation of SJFT and in SPSS 18, using the variables paired t-test for the initial and final testing paired samples.

SAMPLE OF VARIABLES USED IN SFJT

In SJFT, for research purposes, the test results are determined by the 12 variables which serve as indicators in the two groups. The variables are as follows:

1. Variables at initial testing:

- 1.1. Number of throws in the first 15 seconds - Ia
- 1.2. Number of throws in the first 30 seconds - IIa
- 1.3. Number of throwing in another 30 seconds - IIIa
- 1.4. Heart rate immediately after work - HRA
- 1.5. Heart rate 1 min after work - HR1mina
- 1.6. Index SJFT a - index

2. Variables at final testing:

- 2.1. Number of throws in the first 15 seconds - Ib
- 2.2. Number of throws in the first 30 seconds - IIb
- 2.3. Number of throwing in another 30 seconds - IIIb
- 2.4. Heart rate immediately after work - HRB
- 2.5. Heart rate 1 min after work - HR1minb
- 2.6. Index SJFT's - indexb

THE MEASURING EQUIPMENT

Variables HRA and HRB are measured by Puma (PU910391001) Cardiac Plus Black Heart Rate Monitor.

SPECIFIC JUDO FITNESS TEST (SFJT)

This test is divided into three working periods (the first 15 seconds, the first 30 seconds, and the second 30 seconds) with 10 seconds of rest between the tests. During each working period of ten repetitions, the judoka (tori) throws his two partners who are about the same height and weight (uke A and B uke, standing at a distance of 6 m from each other) using the ippon-seoi-nage technique. The heart rate is measured upon completion of the last 30 seconds of the working period and 1 min after the first measurement. The obtained results are calculated and index is gained by the summation of heart rates divided by the total number of throws, throughout all three series. (Equation 1).

$$\text{Index} = \frac{\text{HR} + \text{HR1min}}{\text{Broj bacanja}}$$

Equation 1

PROGRAMME GUIDELINES

- In order to ensure a quality implementation of the created program, I included the "Una Bihać" judo club coaches to get a detailed knowledge of the participants and provide a creative, and effective formation of the program. Based on the conducted interviews with them, the initial results of SJFT and the judokas' feedback, the training plan and program for the next 22 training units was created. This means that the author respected the principle of individuation as much as possible, and adapted the program to the subjects.
- The training plan and program itself was created based on the author's personal experiences, which stem from a long-standing judo career, and experience with training camps and seminars.
- During the implementation process, the program was scheduled to take place during the summer season, in August. Trainings were held in the judo hall, which is equipped with the official tatami (battlefield). The high summer temperatures did not affect the training process, and the trainings were adjusted as tightly as possible to the working conditions, in the morning (09:00h).
- The program is, first and foremost, aimed at

influencing the improvement of aerobic and anaerobic capacity that affect the SFJT.

- The curriculum is formed on the basis of the order and progression principles, which gradually regulate the intensity by using the number of naked-coma-I, uchi-coma-I, strength trainings and a strictly regulated rest period.
- The whole process is adapted to the cadets' and juniors' age, assuming that all the subjects were dealing with competitive judo.
- The plan and program is based on an increase in physiological functions in a natural way.
- The optimal ratio of the intensity and scope; training in the middle of the week is always the most difficult in intensity.
- 5 training units were followed by two days of rest.
- In addition to all of these guidelines that determined the flow of the whole process, special attention was paid to the aspect of safety, protection from dehydration, reducing the effects of overtraining as much as possible and motivating respondents to work.

In addition to all of these guidelines that determined the flow of the whole process, special attention was paid to the aspect of safety, protection from dehydration, reduce the effects of overtraining as much as possible, to motivate respondents to work.

PROGRAM DESCRIPTION

The program is implemented through the 23 training units, out of which 2 are used for testing, divided into 4 training phases. In each phase, we had the progressive increase in intensity.

- The first phase is the first week of the training process. There is a noticeable process of the respondents' adaptation to the daily practice. The number of throws in a training session does not exceed 100, based on the increase in the speed of entry.
- In the second phase, the number of throws ranges from 90-114 per workout.
- In the third week, the number of throws ranges from 115-125 with other means of training. (Table 1.)
- In the last week, the number of throws in one training unit is 140.

Table 1 Example of training (in the third week)	23 rd August 2016 Bihac
Introduction:	Jogging and exercises in active movement 4 min. Warm up exercises in 6 min. Acrobatics and falls 5 min.
Preparation:	10x10 uchi-komi, 1 min (0), 10x4+1 uchi-komi+nage-komi 1 min, 3x3 ouchi-gari, kouchi-gari, osoto-gari, 2 min
Main part:	Nage-komi tabata 2x5 min (20 s nage-komi, 10 s rest) / 1 min (0), 3x3 nage-komi / 1 min (0), 5x5 uchi-komi with pronounced tsukuri
The final part:	Stretching exercises and cool down
Time: 09:00h	Location: judo hall
Duration of trainings: 80-90 min	Intensity: medium to submaximal
Notes:	There was no need to adjust the time of rest.

Table 1. An example of training (in the third week)

RESULTS

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	15 s	5.54	26	1.17	.23
	final 15s	5.96	26	1.31	.25
Pair 2	A30 s	9.35	26	1.54	.30
	final A30s	9.65	26	1.35	.26
Pair 3	B30 s	9.00	26	1.673	.328
	final B30s	9.35	26	1.672	.328
Pair 4	Hr	191.77	26	6.617	1.298
	final Hr	192.88	26	5.054	.991
Pair 5	Hr after 1min	160.42	26	10.908	2.139
	final Hr after 1min	159.19	26	9.896	1.941
Pair 6	Index SFJT	15.0781	26	2.92185	.57302
	final index SFJT	14.2746	26	2.65635	.52095

Table 2. Mean and standard deviation for each variable

Table 2 shows the average values for all the variables of the mean and standard and error deviation from the mean. In all statistical values, the paired variables have a noticeable difference when comparing results of the initial and final testing. What we are interested in this research is the correlation of pair 6 (Table 2), where the average SFJT index at the initial testing was 7.15 and at the final 14.27. There is a noticeable difference of 0.80 in the average values with a standard deviation of 1.38. The following table (Table 3) is represented by a paired t-test that was conducted to verify the significant differences

between the initial SJFT index and, after adjustments, performed on the training curriculum final testing. The results of the paired t-test were, $t(26) = 2.95$, $p < 0.0005$, and show that there was an increase in the SJFT index from the initial ($M = 07.15$, $SD = 2.92$, $N = 26$) to the final period ($M = 14.27$, $SD = 2.65$). The results of the observed increase in the average index $M = 0.80$ were with a 95% confidence and standard deviations 0.24 as the lowest and 1.36 as the highest value. The lower value of the index is considered as a better result.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Dif- ference				
					Lower	Upper			
Pair 1	15 s - final 15s	-.423	.902	.177	-.787	-.059	-2.391	25	.025
Pair 2	A30 s - final A30s	-.308	.970	.190	-.700	.084	-1.617	25	.118
Pair 3	B30 s - final B30s	-.346	1.056	.207	-.773	.080	-1.671	25	.107
Pair 4	Hr - final Hr	-1.115	2.613	.512	-2.171	-.060	-2.177	25	.039
Pair 5	Hr 1min - final Hr 1min	1.231	5.428	1.065	-.962	3.423	1.156	25	.259
Pair 6	Index SFJT - final index SFJT	.80346	1.38657	.27193	.24342	1.36351	2.955	25	.007

Table 3. Paired t-test

In table 3, we can isolated the variable of pairs 1 and 4, as they show an increase in the values thereof. The results of Pairs 1 and 4, significance = 0.025 (number of throws in the first 15 seconds) 0.039 (Pulse rate - final pulse rate), $p < 0.0005$, show values that indicate some significant differences in the statistical data. The mean in Pair 1, which indicates the number of throws in the first 15 seconds rose to 0.423, with a standard deviation $SD = 0.90$, which means that the average number of throws in the first 15 seconds rose to 0.42 ± 0.9 , while in the pair 4 mean the Hr after testing rose to 1.11 ± 2.61 . The other indicators show no significant statistical aberrations.

DISCUSSION

Judo is a sport of high intensity with intermittent operation, because there are a lot of disruptions

during the fight. Studies show that the time structure of a judo match takes 15 to 30 sec, with the average of 10 sec breaks. Today's studies show that the time needed for the activities is similar, but the working time is somewhat shorter. This can be explained by the change of the rules in the last 4-5 years. In reviewing this study, it should be considered that all subjects are young judokas, competitors in the cadet and junior age. The final test shows a higher number of throws $n = 24.96$, relative to the initial testing $n = 23.86$. What I would like to stress is the increase in the mean SJFT index in just a month of the programmed training process for $M = 0.80$, where the initial testing was 15.7 and the final 14.27. This would be, by the Franchini's classification table (Table 4), classified under poor / very poor.

Classification	Variables			
	Summ of throws	HR	HR1min	index
excellent	>29	<173	<143	<11.73
Good	27-28	174-184	144-161	11.74-13.03
Avarage	26	185-187	162-165	13.04-13.94
poor	25	188-195	166-174	13.95-14.84
Very poor	<24	>196	>175	>14.85

Table 4. Classification in SJFT(141 examiner), Franchini E.

Due to the mismatched research results in the classification table, their ranking as poor / very poor, there is an obvious need for a new classification table that will adequately rank young judokas' SJFT results.

CONCLUSION

For the purpose of this research we selected a sample of 26 respondents (cadets and juniors), the young judoka who compete in judo from 3 to 10 years and are well acquainted with the SJFT procedure and performance. The test was performed on all subjects in the same circumstances, and is considered to be valid, the procedure, and evaluation mode records, the performance is identical to the already performed SJFT. This final paper will show whether the training progressive increase in the number of throws had an impact on SJFT results, and to what extent, on the younger judoka. Using a t-test for dependent variables we obtained the results that show significant discrepancies in the statistics, which indicates the correctness of the main hypotheses (H).

Also it is considered that the first sub-hypotheses is correct. The need for SJFT classification tables for young judoka is not obvious, because the results of this study could not be compared with the average values of other studies completed on the seniors. The differences in the survey results, which do not have natural variations are in proportion to the differences in morphological and physiological systems.

As a conclusion of the final paper I would like to stress the results. It was found that the programmed activity had a positive effect on SJFT results, and that the index is significantly lower in the final than it was in the initial testing. Taking into consideration the results, calculated using SPSS 18, a t-test for dependent variables, the index value in young judoka and the seniors show noticeable differences. While the results can be classified in the appropriate categories, the young judoka's results can be classified, in minority, under the poor and the rest under very poor. Some results might not even be ranked, therefore I conclude that it is necessary to make a table to classify the young judoka's results.

REFERENCES

1. Crnogorac, B., Mekić, A. (2012). Judo. Izdavač. Sarajevo.
2. Drid P., Casals C., Mekić A., Rado I., Stojanović M., Ostojić SM.(2015); Fitness and anthropometric profiles of international vs. National judo medalists in half-heavyweight category; Faculty of sport and physical education, University of Novi Sad, Novi Sad, Srbija. Faculty of Sport and Physical Education, University of Sarajevo, Bosnia and Herzegovina.
3. Franchini E., Boscolo F. Del V., Sterkowicz S.(2009); A special judo fitness test classificatory table; Cracow Academy of Physical Education, Crakow, Poland.
4. Franchini E., JR Huertas, Sterkowicz S., Carratala V., Garcia-G. C., Molina E.(2011); Antropometrical profile of elite Spanish Judoka: Comparative analysis among ages; University of San Paulo, Brazil; University of Granada, Valencia, Leon, Spain; University of Crakow, Poljska.
5. Franchini E., Takito M., Moraes B. R. C.(2005); Morphological, physiological and tehnical variables in high-level college judoists; University of San Paulo, Brazil.
6. Jayasudha K., Shivaprasad S. G.(2012); Antropometric profile and special judo fitness levels od Indian judo players; Department of Psysical, Belgaum, India.
7. Kapo S., Kajmović H., Rado I., Smajlović N., Nedim Č., Alen Č.(2015); Can special judo fitness test be used to detect asymmetries in movement patterns; Fakultet sporta i tjelesnog odgoja, Univerzitet u Sarajevu, Sarajevo.
8. Katarzyna B., Dariusz B., Krzysztof B.(2010); Special Judo Fitness Test and biomechanics mesurements as a way to control of physical fitness in yount judoists; Department for Antropology, Josef Pilsudski, University of Physical Education, Warsaw, Poland.
9. Mekić A.; Efekti specifičnogprogramiranog treninga na morfološke karakteristike, funkcionalne i motoričke sposobnosti džudista; Univerzitet u Sarajevu; Fakultet sporta i tjelesnog odgoja; Sarajevo.

EFEKTI EKSPERIMENTALNOG TRENAŽNOG PROGRAMA NA VRIJEDNOSTI SPECIFIČNOG DŽUDO TESTA MLADIH DŽUDISTA

Cilj studije je utvrditi efekte eksperimentalnog džudo programa EJP na bazi progresivnog povećavanja broja ponavljanja bacačkom tehnikom nage-komi-a (NK) na vrijednost specifičnog džudo fitnes testa (SJFT). Testirano je 26 mladih džudista (n=26), starosti 15-17 godina, a koji su minimalno 5 godina u trenažnom i takmičarskom procesu. EJP je trajao 4 sedmice, pri čemu je realizovano 20 trenažnih jedinica i 2 testiranja inicijalnog i finalnog stanja. Realizovani 4-sedmični EJP je bio baziran na postepenom povećavanju intenziteta i obima rada u svakoj narednoj sedmici, što je iskazanom u povećanju brzine i ukupnom broju bacanja. Varijable korištene za ovo istraživanje su: 1. broj bacanja u prvih 15 sekundi; 2. broj bacanja u prvih 30 sekundi; 3. broj bacanja u drugih 30 sekundi; 4. broj otkucaja srca odmah nakon rada – HR; 5. broj otkucaja srca 1 min nakon rada – HR1min i Index SJFT-a. Ispitanici su program realizovali radeći treninge u parovima (13 parova), koji su približno iste tjelesne mase i visine tijela. Obzirom da se ispitanici prvi put susreću sa testom SJFT, isti je detaljno prezentiran i demosntriran od strane ispitivača. Deskriptivne vrijednosti rezultata su izračunate deskriptivnom statistikom, a razlike između inicijalnog i finalnog mjerenja su izračunate studentovim t-testom za zavisne uzorke. Analizom dobivenih rezultata primjetan je prirast u varijablama broja bacanja u prvih 15 sekundi, srčanog pulsa nakon testiranja i indexa SJFT-a ($p<.0005$). Može se zaključiti da je EJP prouzrokovao odgovarajuće promjene što potvrđuje postavljenu hipotezu o pozitivnim efektima između dvije tačke mjerenja. Autori naglašavaju potrebu za tablicom koja klasificira rezultata SJFT-a za mlade džudiste. Ključne riječi: mladi džudisti, nage-komi, klasifikacija.

Received: November 04, 2016 / Accepted: December 01, 2016

Correspondence to: Amel Mekić, Faculty of Sport and Physical Education, University of Sarajevo, Bosnia and Herzegovina

E-mail: amekic@fasto.unsa.ba

THE EFFECTS OF A PROGRAMMED KINESIOLOGY TREATMENT

ON THE PRIMARY SCHOOL FOURTH TO SIXTH GRADE PUPILS' POSTURAL STATUS AND TRANSFORMATION OF SOME MOTOR SKILLS

Branimir Mikić¹, Vesna Bratovčić², Žarko Kostovski³, Nedeljko Petrović⁴,
Nedeljko Stankvić⁵, Jovana Bozoljac⁴

1 Faculty of Education, University of Travnik

2 Education and Rehabilitation Sciences, University of Tuzla

3 Faculty of Physical Education, University of Skopje

4 Independent researcher

5 Faculty of Health Sciences European University Brcko District

This research was conducted in order to determine the effects of the applied Kinesiology treatment programmed to transform fourth to sixth grade (second triad of a nine-year long elementary education) students' motor skills and postural status of the feet. The study was conducted on a sample of 290 respondents, students from the primary school fourth to sixth grades. In this study, fourteen (14) variables for the assessment of motor skills and four (4) for the evaluation of the postural status of feet were applied. The study had a longitudinal character. Based on the goal, set tasks and hypotheses, the selection was made of appropriate methods for data processing. After examining the studied motor variables arithmetic means results in the initial and final measurements for the selected sample of respondents, and based on the significance of the change (difference) of the T-test for dependent samples, it is clear that the applied, programmed kinesiology treatment produced a statistically significant partial quantitative effects (changes) within the investigated area of motor skills. The applied contingent tables show the frequency and the corresponding percentages of the feet deformity occurrence. By applying the chi-square test, the prevalence and statistical significance of the feet deformity difference between the two groups was determined. The study results showed a statistically significant deformity of longitudinal and transverse arch of the foot percentage. The changes occurring in the arches of the foot are mainly in the first degree of deformation, which enabled a significant improvement with the use of programmed Kinesiology treatments. So, in a global quality assessment and the justified school year long programmed Kinesiology treatments application, we can say that it contributed to an improvement of motor skills and the condition of feet deformities in the selected sample of students.

Keywords: students, transformation process, motor skills, postural status, variables.

INTRODUCTION

Modern life, with all the dangers of a morbid tripartite lifestyle children lead (too little exercise, wrong diet and stress), in developing enhanced even prolonged sitting in school and at home, and excessive demands in the area of intellectual load, requires additional intervention in the sense of prevention or a never too late reaction, and the curative effects of the aforementioned factors. It is a known fact that the administration of sports activities can be a strong counterweight to the intellectual overload of students. It appears that today children display such frequent physical deformities and expansive deviant behaviour in and out of school. The only question is whether we use this segment of activity enough?

The specificity of physical and health education stems not only from its objectives and tasks, work contents, methods, methodical-organizational forms of work, but also from the fact that this teaching is basically a polyvalent process. Therefore, the teaching of physical and health education on the one hand is expected to influence the transformation of anthropological characteristics of students, and on the other hand to contribute to their education. Teaching physical education in schools in our country has a long tradition. However, the maturity of the process is not sufficient proof of its effectiveness and validity. The level of research, which was conducted to determine the efficacy of various physical activities within the school, showed that its content and intensity are not such as to significantly affect the development of the students' motor skills (Mikić et al. 2001: Džibrić, 2010). The main aim of this study is to determine the effects of the applied kinesiology treatment on the

fourth to sixth grade (second triad of a nine-year long elementary education) students' motor skills transformation and the postural status of feet - pes planus.

METHODS

The sample

The sample consisted of 290 respondents, out of which, 91 students attended the fourth, 98 students the fifth and 101 students the sixth grade of elementary school.

The sample of variables

The variables for the assessment of motor abilities. The study used a battery of 14 variables to estimate the selected sample of students' area of motor skills (according to the instructions designated by Mikić, 1999).

1. MFESDM - standing long jump
2. MFESVM - Sargent test
3. MFEBML - throwing a medicine ball from a lying position
4. MFE20V - 20 m running from a standing position
5. MAGTUP - envelope test
6. MAGKUS - side steps
7. MAGOSSO - figure eight with bending
8. MBFTAP - hand tapping
9. MBFTAN - foot tapping
10. MFLISK - turning the stick over one's head
11. MFLPRK - forward bend on the bench
12. MRCSKL - push-ups
13. MRCDTL - lying torso raise
14. RCZTL - lying backward bend

The variables to assess the postural status of feet - pes planus

1. PESNOR - normal status feet
2. PESPLA1 - lowered foot (first degree of deformity)
3. PESPLA2 - lowered foot (second degree of deformity)
4. PESPLA3 - lowered foot (third degree of deformity)

Methods of data processing

By applying a univariate T-test for paired samples, differences in applied variables before and after the applied kinesiology treatment (partial quantitative effects of changes) are tested. The applied contingent tables show the frequency and the corresponding percentages of the feet deformity pes-planus occurrence. With the Crosstabs analysis of physical deformity we compared the initial and final state. By using the Chi-square test, the statistical significance of the difference in the students' feet deformity pes - planus was determined at the initial and final measurement.

RESULTS AND DISCUSSION

Analysis of quantitative changes of the pupils' motor abilities (T-test).

After examining the studied motor variables arithmetic means results in the initial and final measurements for the selected sample of respondents, i.e. students (Table 1), and based on the significance of the application (difference) of the T-test for paired samples, it is clear that the applied program produced a statistically significant partial quantitative effects (changes) within the investigated area of motor skills.

Variables	Initial - final measurement				
	Mean	Std.dev.	t	Df	Sig.(2-tailed)
MBFTAPI - MBFTAPF	-2,3941	4,2875	4,5763	289	,000
MBFTANI - MBFTANF	-,6300	2,1732	-3,8256	289	,002
MFESDMI - MFESDMF	-5,8800	12,4172	6,4657	289	,000
MFESVMI - MFESVMF	-,7399	2,3196	-4,1652	289	,000
MFEBMLI - MFEBMLF	-2,4627	3,7835	-6,7895	289	,000
MFE20VI - MFE20VF	,0235	,1458	1,4744	289	,119
MFLPRKI - MFLPRKF	-1,1321	2,2160	-4,0321	289	,000
MFLISKI - MFLISKF	2,2235	4,3467	-4,4456	289	,000
MRCSKLI - MRCSKLF	-4,6260	12,1265	6,7456	289	,000
MRCDTLI - MRCDTLF	-5,2098	11,0501	5,8634	289	,000
MRCZTLI - MRCZTLF	-3,8765	9,3511	-5,7241	289	,000
MAGTUPI - MAGTUPF	1,0642	3,7135	3,9786	289	,002
MAGKUSI - MAGKUSF	,3431	1,5483	2,1453	289	,009
MAGOSSI - MAGOSSF	1,0432	2,9763	-4,0317	289	,000

Table 1. The difference between the initial and final measurements of the students' motor abilities T-test

According to the results of the T-test investigated motor variables (Table 1), no statistically significant difference between the initial and final measurements was recorded in all the investigated variables, I variables to assess running speed, having a coefficient of .119, .009 and variable agility, which have no statistical significance of the initial relative to the final testing of the studied samples. Basically, we can conclude that the applied kinesiology activities program with regular physical education program classes produced statistically significant partial quantitative effects within the studied area of motor skills.

The results from this study in the motor variables are in line, or slightly above the results obtained in (Stanković, 2002; Rašović, et al. 2004; Krsmanović, et al. 2006; Janković, et al. 2007; Obradović et al., 2008; Sertić, et al. 2008; Mikić, et al. 2009; Džibrić et al. 2010; Tanović, et al. 2011) studies.

The postural status of feet (PES PLANUS) deformity analysis - initial measurement

Table 2 and Figure 1 show the results of the postural status of feet - pes planus deformity analysis in the initial measurement. The analysis is subjected to 290 students divided into three subsamples consisting of students attending the fourth, fifth and sixth grades of elementary school. In (Table 2), which shows the frequency corresponding percentages of the postural deformity of the feet, we can see that out of the entire students test sample, 178 students or 61% of the sample have normal feet. In terms of the studied sample deformities representation percentage, we can conclude that 86 students or 30% of the sample have the first degree, 23 or 8% of the students have the second degree and 3 or 1% of them have the third degree of deformity.

IORDOSIS		The sample - PUPILS			
		CLASS			TOTAL
		IV	V	VI	
PESNOR	F	56	60	62	178
	%	62	61	61	61
PESPLA1	F	26	28	32	86
	%	29	29	32	30
PESPLA2	F	7	9	7	23
	%	8	9	7	8
PESPLA 3	F	2	1	0	3
	%	1	1	0	1
TOTAL	F	91	98	101	290
	%	100	100	100	100

Table 2. Contingency table of the subsamples'- students' postural status of feet frequency distribution in the initial measurement

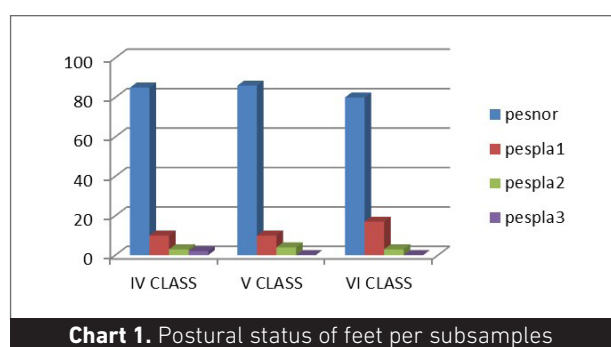


Chart 1. Postural status of feet per subsamples

This research revealed that there is a statistically significant percentage of the fourth to sixth grade students' feet deformity, which is in line with (Kosinac, et. al. 1995 and 1988; Magpie, 2003; Bižić, 1999, to: Restović et al., 2008; Stević and Pelemis, 2008; Mikić et al., 2010; Protić-Gava et al. 2010; Koničanin, et al. 2011) research.

It is evident that the percentage of feet deformity

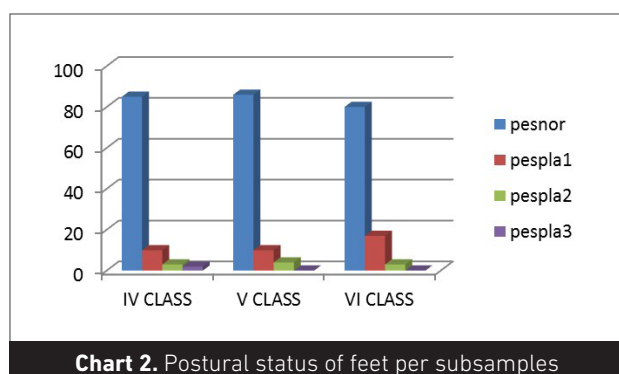
increases with the children's age, it is certainly associated with different loads (the length of sitting, standing, obesity, improper footwear). What is encouraging is that the majority of deformities are at the level of the first degree which provides the possibility of a successful correction.

Feet (Pes planus) deformity analysis - final measurement

Table 3 and Figure 2 show the results of the postural status of feet - pes planus deformity analysis in the final measurement. The analysis is subjected to 290 students divided into three subsamples consisting of students attending the fourth, fifth and sixth grades of elementary school. In (Table 3) which shows the frequency corresponding percentages of the postural deformity of the feet, it is evident that out of the entire students test sample, 242 students or 83% of the sample have normal feet. In terms of the studied sample deformities representation percentage, we can conclude that 36 students or 13% of the sample have the first degree, 10 or 3% of the students have the second degree and 2 or 1% of them have the third degree of deformity.

FOOT		The sample - PUPILS			
		CLASS			
		IV	V	VI	TOTAL
PESNOR	F	77	84	81	242
	%	85	86	80	83
PESPLA1	F	9	10	17	36
	%	10	10	17	13
PESPLA2	F	3	4	3	10
	%	3	4	3	3
PESPLA 3	F	2	0	0	2
	%	2	0	0	1
TOTAL	F	91	98	101	290
	%	100	100	100	100

Table 3. Contingency table of the postural status of feet frequency distribution per subsample in the final measurement



It is evident in the results that the state of feet deformities - pes planus, after the Kinesiology treatment, is significantly better and that the implemented kinesiology treatment significantly contributed to the improvement of the postural status of feet, especially in the first and second degree of the students' deformity.

The students' postural deformity of the feet - pes planus Descriptive Statistics, Crosstabs analysis and Chi-Square test

Tables 4 and 5 show that in the analysed data obtained on descriptive statistical indicators, based on the Crosstabs analysis and the application of a Chi-square test, there is statistically significant difference in the prevalence of deformities among students between the initial and final measurements. The integral value of statistical significance was expressed at the 0.01 level.

			PES-PLANUS		Total
			0	1	
SEX	men initially	f	178	112	290
		%	61,0%	39,0%	100,0%
	men's final	f	242	48	290
		%	83,0%	17,0%	100,0%
Total		f	420	160	580
		%	72,4%	27,5%	100,0%

Table 4. Crosstab analysis deformity "pes-planus"

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6,423a	1	,011

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 11,27.

Table 5. Chi-Square Tests

Table 4 shows the results of the studied sample postural deformity of the foot-pes-planus, distribution crosstabs analysis in the initial and final measurements. In the initial measurement of the processed 290 students, 112 students or 39.0% registered a pes-planus deformity of the first and second degree. In the final measurement of the processed 290 students, 48 students, or 17.0% of the total sample had a pes-planus deformity of the first, second and third degree.

The average postural deformity representation of the first, second and third degree with respect to the total number of respondents was 27. 5%, respectively in 160 students. Table 5 shows the Chi-Square test, and inspection of the chi-square size (Pearson Chi-Square), and 6.423 Asymp. Sig. (2-sided) .011 tells us that there is a statistically significant difference in the prevalence of deformities among students, between the initial and final states.

After examining the results of the analysis, and the presence of postural deformity of the feet diagnosis, after completing the Kinesiology treatments, we can conclude that there was a significant improvement in the students' postural status of the feet - pes planus, because the treated deformity was significantly reduced in comparison with the initial state.

CONCLUSION

After examining the studied motor variables arithmetic means results in the initial and final measurements for the selected sample of respondents aged 9 to 11, and based on the significance of the change (difference) of the T-test for dependent samples, it is clear that the applied, programmed kinesiology treatment produced a statistically significant partial quantitative effects (changes) within the investigated area of motor skills between the initial and final measurements. The applied contingent tables and crosstabs analysis show the frequency and the corresponding percentages of the students' SOPA - pes planus deformities occurrence. The study results showed a statistically significant deformity of longitudinal and

transverse arch of the foot - pes planus percentage. The changes occurring in the arches of the foot are mostly in the first and second degree of deformation, allowing the correction of the situation by applying programmed Kinesiology treatments in working with children of this age.

BY USING THE CHI-SQUARE TEST, THE PREVALENCE AND STATISTICAL SIGNIFICANCE OF THE FEET DEFORMITY -PES PLANUS DIFFERENCE, BETWEEN THE TWO GROUPS OF STUDENTS IN THE INITIAL AND FINAL MEASUREMENTS, WAS DETERMINED.

After examining the results of the presence of postural deformity detection, after completing the applied, programmed Kinesiology treatments, we can conclude that there was a significant improvement in the respondents' postural status of the feet, because the treated deformities were significantly reduced in comparison with the initial assessment of the postural state of feet-pes planus.

REFERENCES

1. Džibrić, Dž. (2010). Transformacioni efekti određenih antropoloških dimenzija učenika trećih razreda osnovne škole pod uticajem programskih sadržaja nastave tjelesnog i zdravstvenog odgoja. Tuzla. Doktorska disertacija. Fakultet za tjelesni odgoj i sport Univerziteta u Tuzli.
2. Hodžić, Z., Bijeković, G., Mikić, B., Bratovčić, V. (2008). Early Verticalisation and Obesity as Risk Factors for Development of Flat Feet in Children. *Acta Kinesiologica International Scientific Journal on Kinesiology*, 2008; 2(1).
3. Janković, I., Stojiljković, S. (2007). Motoričke sposobnosti dječaka mlađeg školskog uzrasta. U D. Bjelica. Zbornik radova sa III kongresa i IV Međunarodne naučne konferencije Crnogorske sportske akademije „SPORT MONT“ 2007, (12,13,14), 551-557. Podgorica :Montenegrosport.
4. Koničanin, A., Eminović, F., Bogdanović, Z. (2011). Analiza svoda stopala učenika srednje škole prosječne starosti od 15 do 18 godina. Podgorica. Crnogorska sportska akademija "Sport Mont", br.31,32,33.
5. Kosinac, Z. (1995). Spušteno stopalo (Pes planovalgus). Split. Sveučilište u Splitu.
6. Kosinac, Z., Kukalac, P. (1988). Transferzalna analiza stopala kod učenika starih 6-10 godina u Splitu. Beograd. Fizička kultura br.3.
7. Krsmanović, B., Bigović, M., Krsmanović, T., Dolga, M. (2006). Antropometrijske karakteristike i motoričke sposobnosti učenika. *Glasnik antropološkog društva Jugoslavije*. Vol. 41, str. 265-274.
8. Mikić, B. (1999) Testiranje i mjerenje u sportu. Tuzla. Filozofski fakultet Univerziteta u Tuzli.
9. Mikić, B., Biberović, A., Mačković, S. (2001). Univerzalna škola sporta. Tuzla. Filozofski fakultet Univerziteta u Tuzli.
10. Mikić, B., Bijeković, G. (2004) Biomehanika sportske lokomocije. Istočno Sarajevo, fakultet Fizičke kulture.
11. Mikić, B., Tanović, I., Korjenić, A., Malović, Z., (2009). Povezanost antropometrijskih karakteristika i motoričkih sposobnosti sa situaciono-motoričkim sposobnostima mladih rukometaša. Beograd. Zbornik radova V međunarodne konferencije „Menadžment u sportu“ (452-458).
12. Mikić, B., Hodžić, Z., Gerdijan, N., Bratovčić, V. (2010). Analiza statusa stopala učenika uzrasta 8-10 godina. Mostar, Sportski logos.
13. Milošević, Z., Obradović, B. (2008). Posturalni status djece Novosadskih predškolskih ustanova uzrasta 7 godina. *Glasnik, ADS*, 43(1).
14. Protić-Gava, B., Krneta, Ž. (2010). Posturalni status djece mlađeg školskog uzrasta 4 okruza Vojvodine. Novi Sad.
15. Rašović, D., Raičković, N. (2004). Razlike u motoričkim sposobnostima između učenika i tenisera uzrasta od 10 do 12 godina. Podgorica. Crnogorska sportska akademija "Sport Mont", br.2-3.
16. Sertić, H., Segedi, I., Baić, M. (2008). Praćenje promjena motoričkih i funkcionalnih sposobnosti te antropometrijskih karakteristika učenika tijekom dvogodišnje nastave tjelesne i zdravstvene kulture. U B. Neljak. Zbornik radova 17 ljetne škole kineziologa Republike Hrvatske, 192-198. Poreč: Hrvatski kineziološki savez.
17. Skender, N., Kendić, S. (2002). Tjelesni i zdravstveni odgoj u funkciji korekcije deformiteta lokomotornog sistema. Bihać. Pedagoški fakultet Univerziteta u Bihaću.
18. Stanković, A. (2002). Efekti programirane nastave tjelesnog i zdravstvenog odgoja na neke antropometrijske karakteristike i motoričke sposobnosti učenika i učenika V razreda. Magistrski rad, Sarajevo: Fakultet za fizičku kulturu.
19. Stević, D., Pelešić, M., Kovačević, B., Tešić, Z. (2008) Stepen prisustva i vrste deformiteta stopala učenika osnovnih škola u Bijeljini. Tuzla, I Međunarodni Simpozij "Sport i zdravlje" Zbornik radova.
20. Svrača, N. i sar. (2003). Učestalost deformiteta ravnog stopala kod učenika III, V i VII razreda osnovne škole „Veselin Masleša“ u Foči. Mostar. sportski logos, god. II, br.4.
21. Tanović, I., Gerdijan, N., Bratovčić, V., Pireva, F. (2011). Efekti vannastavnih tjelesnih aktivnosti na kvalitativne promjene motoričkog statusa učenika osnovnoškolskog uzrasta. Podgorica. Crnogorska sportska akademija "Sport Mont", br.31,32,33.

EFEKTI PROGRAMIRANOG KINEZIOLŠKOG TRETMANA NA TRANSFORMACIJU MOTORIČKIH SPOSOBNOSTI I POSTURALNOG STATUSA STOPALA UČENIKA IV – VI RAZREDA OSNOVNE ŠKOLE

Ovo istraživanje je provedeno sa ciljem utvrđivanja efekata primjenjenog programiranog kineziološkog tretmana na transformaciju motoričkih sposobnosti i posturalnog statusa stopala učenika IV do VI razreda (druge trijade devetogodišnjeg osnovnog obrazovanja). Istraživanje je provedeno na uzorku od 290 ispitanika, od IV do VI razreda osnovne škole. U ovom istraživanju primjenjeno je četnarnaest (14) varijabli za procjenu motoričkih sposobnosti i četiri (4) varijable za procjenu posturalnog statusa stopala. Istraživanje je imalo je longitudinalni karakter. Na osnovu cilja, postavljenih zadataka i hipoteza izvršen je odabir adekvatnih metoda za obradu podataka. Uvidom u rezultate aritmetičkih sredina istraživanih motoričkih varijabli na inicijalnom i finalnom mjerenju za odabrani uzorak ispitanika, te na osnovu značajnosti promjena (razlika) testiranih T-testom za zavisne uzorke, jasno je vidljivo da je primjenjeni programirani kineziološki tretman proizveo statistički značajne parcijalne kvantitativne efekte (promjene) unutar istraživanih motoričkog prostora. Primjenom kontingencijskih tablica prikazane su frekvencije i pripadajući postotci pojave deformiteta stopala. Primjenom Hi-kvadrat testa utvrđena je zastupljenost i statistička značajnost razlika deformiteta stopala između ispitivanih grupa. Dobijeni rezultati istraživanja ukazuju na statistički značajan procenat deformiteta uzdužnog i poprečnog svoda stopala. Promjene na svodovima stopala su uglavnom u prvom stepenu deformacije, što je i omogućilo značajno popravljjanje stanja uz primjenu programiranog kineziološkog tretmana. Dakle u globalnoj procjeni kvaliteta i opravdanosti primjene programiranog kineziološkog tretmana u trajanju od jedne školske godine, možemo konstatovati da je isti doprinio poboljšanju motoričkih sposobnosti i stanja deformiteta stopala istraživanih uzorka učenika. Ključne riječi: učenici, transformacioni procesi, motorika, posturalni status, varijable.

Received: November 04, 2016 / Accepted: December 01, 2016

Correspondence to: Branimir Mikić, Faculty of Education, University of Travnik, Bosnia and Herzegovina

E-mail: branotuzla@gmail.com

SOCIO-DEMOGRAPHIC STRUCTURE AND THE MANAGERS' LEVEL OF PERFECTIONISM IN THE CITY OF MOSTAR SPORTS CLUBS

Nedžad Vuk¹, Ekrem Čolakhodžić²

1 The Department for education, youth and sport, City of Mostar, Bosnia and Herzegovina

2 Teaching Faculty, University Džemal Bijedić Mostar, Bosnia and Herzegovina

The aim of the research was to determine the socio-demographic structure and the presence of stress in the City of Mostar sports clubs three management levels. The examination was conducted in 49 sports clubs, members of the Sports Association of the City of Mostar. The research involved a total of 248 managers who, by the gender structure, consist of 218 men and 30 women, out of which 111 examinees represent the Top management, 55 respondents represent the Functional management, and 82 respondents represent the Operational management. To calculate the difference of the perfectionism scale presence for managers in relation to the type of sport results that were obtained, a survey method and a multivariate analysis (MANOVA) were used. The analysis shows that the socio-demographic picture of managers engaged in clubs is diverse, and that, among the respondents, higher levels of perfectionism are found. A slightly higher level of perfectionism is found within the team sports clubs management compared to individual sports clubs, which can be attributed to a simpler system of competition, a lesser number of teams, smaller financial needs of the club, the easier achievement of individual results and such. The difference in the presence of stress with team sports clubs management compared to individual sports clubs is not statistically significant. Taking into account the fact that only 10.8% of managers are professionally engaged in clubs, and that 69.3% of clubs are lacking professional managers who have jobs tied to the sports activity, tells us that the organization and the functioning of clubs are on an amateur level with few professionals among the staff. Therefore, it is somewhat logical that this kind of management staff, which does not have continuity and the necessary routines in their line of work, has high levels of perfectionism and all the negative characteristics that it brings.

Key words: Sport management, perfectionism, City of Mostar.

INTRODUCTION

The success of sport clubs, as well as any organization, depends on the development level of social infrastructure, environment, demographics, and lifestyle, social, cultural and ethical values in the society. The activities and competitiveness of the organization may be affected by technological change, new scientific knowledge, the development of new technology and their implementation in the business and training process. Legislation, general economic conditions and trends are important external factors that organizations cannot influence, but only adjust to. The sports management ensures the functioning of the entire system of the sports organization, by establishing a system for selecting talents, organizing sports competitions, providing material and financial resources and creating the general conditions necessary for high achieving athletes. Sports management is the process of forecasting, planning, organizing and human, material, financial and other organizational resources management of the sports organizations, to achieve the stated objectives.

Managers are people engaged in management activities responsible for directing efforts towards achieving the objectives of the organization. Sports managers today face a changing environment. People are the most valuable resource for the successful management of sports organizations. The influence of people from different cultures, changing technology and the globalization of markets together create the need for managers to adapt to a changing environment. The several factors driving change in the environment

increase the risks in the business organization. The management's ability to make the right decisions to ensure the survival of the sports organization and achieve high profits and top results are therefore crucial. Other activities of managers in the modern organization are: connecting the organization's goals with the human, material and financial resources; establishing the organizational atmosphere, which will help achieve the stated objectives; effectiveness when choosing objectives, planning and collecting various information, organizing, leading and controlling; establishing communication with the external environment and responding to the needs of the wider inner environment, as well as enforcing activities in the field of development. Managers must possess professional knowledge, abilities and skills, related to working with people, using different methods, procedures and techniques in certain areas of the organization in a changing world.

Perfectionism is one of few human traits that causes divided reactions. Many consider perfectionism to be a positive quality, mainly because they consider that perfectionism involves expertise, diligence, ambition and quality. Individuals prone to perfectionism are chronically burdened by their achievements, behaviour, appearance and the like. They strive for perfection, forcing themselves to be the best and as flawless as possible at what they do. No matter how much a person prone to perfectionism has achieved, how much praise and recognition they get from others, a perfectionist is never satisfied. Perfectionists believe that their achievements not only can be better, but also must be better. From the standpoint of modern management, which requires daily, continuous and hard work in a dynamic environment, as well as continuously interacting and communicating with other people and expecting a certain level of results, insisting on perfectionism becomes too great a burden for both the people - perfectionists, and for their environment. In this context, and especially in relation to co-workers, perfectionism can be perceived as aggressive, and can lead to a bad work atmosphere.

RESEARCH GOALS

The aim and goal of this research is to determine the level of perfectionism in the city of Mostar sports clubs management, and determine their sociodemographic structure and propensity to perfectionism in the performance of the established objectives.

METHODS AND RESEARCH

In the research process the following methods were used:

- Survey methods
- Theoretical analysis

The interviews were performed in 49 sports clubs, members of the Mostar Sports Association, who encompass all the registered sports clubs operating in the city of Mostar.

A total of 248 subjects were interviewed, including 218 men and 30 women of whom 111 represent the top, 55 the functional, and 82 the operational management. The final work only includes the results of the interviews where the subjects performed in accordance with the official criteria.

In order to collect the research data we used the following:

- Questionnaire for „Managers“ (Bajraktarevic, F. 2008, modification 2010.) which covers the following:
 1. Social status and characteristics
 2. Perfectionism

Data gathering was performed through a multiple choice questionnaire. The subjects answered a number of prepared questions anonymously, meaning they were not required to show any identification or state their identity. The questionnaire contained a total of sixteen questions intended to define a sociodemographic status and thirty-five statements dealing with perfectionism. By answering the questions on a scale from one to five the subjects emphasised to what degree they agreed with the questions dealing with perfectionism. The scale used was the following;

1. True
2. Mostly true
3. Neither
4. Mostly false
5. False

Social status features
1.1. Gender M W
1.2. Age
1.3. Place of birth
1.4. Residence
1.5. Type of sport
1.6. Sports internship (vol)
1.7. Club
1.8. Qualifications
1.9 Involved in the club:
a) professionally b) part-time c) voluntary
1.10 I come from a family (social status):
a) farmers b) workers or artisans
c) employees d) private entrepreneurs
e) higher social status
1.11 Childhood and adolescence was spent in:
a) in the countryside b) small town c) town
1.12 The material circumstances in which I live are:
a) very good
b) good
c) both good and bad
d) poor
e) very bad
1.13 Currently employed
1.14. Job position
1.15 Position in club
1.16 Professional development

Claim
1. My parents had high expectations for me
2. Being organized is important for me
3. As a child I was punished when something was not done perfectly
4. If I did not set high standards for myself I would probably
5. My parents never showed understanding for my mistakes
6. It is important for me that I am fully competent in all I do
7. I am a neat person
8. I try to be well organized
9. If I fail in my job/studies, I fail as a person in general
10. I am terribly upset when I fail
11. My parent have always wanted me to be the best in every-thing I do
12. I set higher goals than most people
13. When someone achieves greater success in work or studies than I do, I feel like a loser
14. If I only partially succeed in something, that is as bad as failing
15. In my family only the greatest achievements are good enough
16. I am good at focusing my skills towards achieving a goal
17. I often have a feeling that I did not do something properly, even though I tried hard
18. I hate when I'm not the best at something
19. I set to myself extremely high goals.
20. My parents always expected maximum commitment in everything I did
21. Other people would probably have a lesser opinion of me if they noticed I made mistakes
22. I never felt I could satisfy my parents expectations
23. If I am not as successful as others, that means I am less valuable as a person
24. It seems other people accept lower criteria for themselves than I do for myself
25. If I was not always successful, people would have less respect for me
26. My parents always expected more for me than I did
27. I try to be a tidy person
28. I'm often ambiguous, even in doing ordinary everyday things
29. Neatness is very important for me
30. I expect myself to have greater commitment in everyday tasks than most people do
31. I am a well organized person
32. I am often late with work because I often repeat several times to ensure that work is properly done
33. I need a lot of time to do something right
34. The less mistakes I make, the more people will like me
35. I never felt that I met the demands of my parents

METHODS AND PROCESSING OF DATA

The results were calculated in the Windows program SPSS 18.0 used for the processing of mathematical and statistical information.

The multivariate analysis (MANOVA) sought to calculate the managers' level of perfectionism in relations to their field of sport

The variable "Level of perfectionism" calculated the following:

- Mean
- Standard Deviation
- Minimum
- Maximum

The average distribution was controlled for:

- Skewness
- Kurtosis

RESULTS AND DISCUSSION

The part of the questionnaire dealing with sociodemographic characteristics yielded the following results:

- A total of 248 managers participated in the study of whom 218 were men and 30 were women. Out of these, 111 represent the top, 55 the functional, and 82 the operational management;
- A total of 20 clubs have women in their management structure. Furthermore, 115 managers have an intermediate level of training, 34 have a higher level of training and 99 have a high level of training;
- Out of the total number of managers, 27 are hired on a full time basis in 15 clubs, another 36 are hired part time in a further 15 clubs, while 5 clubs do not have any volunteers;
- The managers' background shows that 24 clubs have managers who spent their adolescence in a rural area, 26 clubs have managers who spent their adolescence in a small town, while 7 clubs do not have managers who spent their adolescence in the city of Mostar;
- The majority of the managers are families of workers and public servants;
- Out of the total number of respondents, 79 characterize their material status as "poor", while 169 respondents define their material status as good;
- Out of the total number of managers who participated in this study, 28 are professionally engaged in sports, while 34 clubs do not have a single manager who is professionally engaged in sports;
- The mean age of the subjects ranges from 24.7 years to 73 years in Flight Club Mostar because the data was based on a single respondent;
- The mean value of the respondents' sports

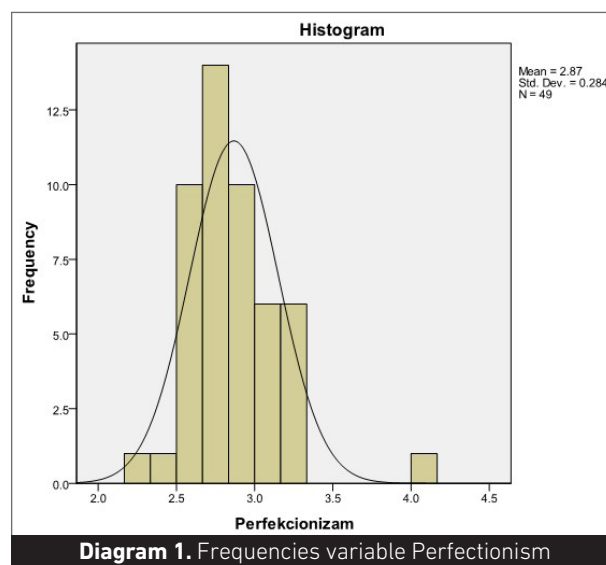
experience in clubs ranges from 5 years up to 73 years;

- The study takes into account 23 team sports clubs and 26 individual sports clubs.

After analysing the scale according to the levels of perfectionism, we found the following results:

N	Valid	49
	Missing	0
Mean		2.867
Std. Deviation		.2841
Skewness		1.482
Std. Error of Skewness		.340
Kurtosis		5.168
Std. Error of Kurtosis		.668
Minimum		2.3
Maximum		4.1
Percentiles	25	2.670
	50	2.806
	75	3.007

Table 1. The descriptive parameters variables Perfectionism



The average value on a scale of perfectionism is 2.867 and it can therefore be concluded that on average the respondents are perfectionists in performing the tasks and reaching the set goals.

The clubs were divided into clubs dealing with team sports and those dealing with individual sports, and we did the comparison using the arithmetic means of the results with respect to the levels of perfectionism.

	SPORT	Mean	Std. Deviation	N
Perfectionism	Team sports	2.922	.3097	23
	Individual sports	2.819	.2558	26
	Total	2.867	.2841	49

Table 2. The difference preferences perfectionism in relation to the type of sport

The results shown in table 2 show that the managers of clubs engaged in individual sports gravitate less to perfectionism in their work than clubs engaged in team sports. This can be attributed to a more simple system of competition, a smaller number of clubs, lower financial needs as well as a simpler way of reaching ones goals.

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
SPORT	Perfectionism	.129	1	.129	1.624	.209

Table 3. Statistical significance of the scale of perfectionism in relation to the type of sport

Table 3 shows that there is no statistically significant difference (at the level of significance .005) between clubs belonging to team sports and clubs belonging to individual sports on the scale of preferences towards perfectionism. This characteristic of management that is most prone to perfectionism in performing and achieving the set goals, is very dangerous, and essentially negative. The lower level of perfectionism can help to achieve significant successes, while a high level of perfectionism is a sure path to failure. The results of the sports clubs are very modest, and the reasons for the managers' attitudes must be looked at from the sociodemographic data and ways of organizing the clubs. The fact that 69.3% of clubs do not have managers who are professionally engaged in sports, only 10.8% of managers are hired full time and 14.5% are part time, shows that the organization and functioning of the clubs is at an amateur level with a very small number of staff with a background in the field of sports. Therefore, it is somewhat logical that such a managerial staff that does not have the necessary continuity and daily routine at work has a high level of perfectionism, as well as all the negative characteristics that it entails.

CONCLUSION

The results of this study show that the sociodemographic situation of the club managers is varied. Out of the total number of managers who participated in this study only 28 or 11.2% of them are professionally engaged the field of sports, while 34 clubs or 69.3% do not have a single manager who is professionally engaged in sports. The average value on a scale of perfectionism is 2.867, and it can be said that the respondents, on average, tend to be prone to perfectionism in performing the tasks and reaching the set goals. This characteristic of management that is most prone to perfectionism in performing and achieving the set goals, is very dangerous, and essentially negative. A slightly lower level of perfectionism is found in the individual sports clubs management in relation to the team sports clubs, but this difference was not statistically significant. The fact that a large percentage of 69.3% clubs do not have managers who are professionally engaged in sports, while only 10.8% of managers are professionally engaged in the clubs, shows that the organization and operation of the clubs is at an amateur level with a little trained staff. Therefore, it is somewhat logical that such a managerial staff that does not have the necessary continuity and daily routine at work has a high level of perfectionism as well as all the negative characteristics that it entails. Also, it is necessary to rejuvenate the clubs managerial staff, engage professional managers who are able to cope with the tasks set before them and, what is very important, look for success in their work, which will be indicated by the results of the sports club.

REFERENCES

1. Bajraktarević, F. (2009): Uloga menadžmenta u sportu i problem organizacije sportske prakse u BiH, Časopis „Sportekspert“ Vol. 2 (2009) No.1, Sarajevo: Udruženje profesora i stručnih lica u oblasti fizičke kulture i sporta kantona Sarajevo.
2. Bajraktarević, J. (2008): Psihološka priprema sportista, Sarajevo: Univerzitetski udžbenik „Arka“, treće izmenjeno i dopunjeno izdanje ISBN 978-9958-588-22-8.
3. Bartoluci, M., Škorić, S. (2009). Karakteristike menadžera u upravljanju sportskim organizacijama. // Metodčki organizacijski oblici rada u područjima edukacije, sporta, sportske rekreacije i kineziterapije / Neljak, Boris (ur.). - Zagreb : Hrvatski kineziološki savez , 2009. 358-363.
4. Krstić, D. (1996): Psihološki riječnik, Beograd: Savremena administracija.
5. Malacko, J., Rađo, I. (2006): Menadžment ljudskih resursa u sportu, Sarajevo: Fakultet sporta i tjelesnog odgoja.
6. Tomić, M. (2007): Sportski menadžment, Beograd: Data status.
7. www.plark.net/literatura/mng010.php
8. www.portal.ludbreg.hr

SOCIODEMOGRAFSKA STRUKTURA I NIVO PERFEKCIONIZMA KOD MENADŽERA U SPORTSKIM KLUBOVIMA GRADA MOSTARA

Cilj istraživanja je bio da se utvrdi sociodemografska struktura i nivo perfekcionizma kod sva tri nivoa menadžmenta u sportskim klubovima na području Grada Mostara. Ispitivanje je sprovedeno u 49 sportskih kolektiva koji su članovi Sportskog saveza Grada Mostara. U ispitivanju je ukupno učestvovalo 248 menadžera koji po spolnoj strukturi čini 218 muškaraca i 30 žena, od čega Top menadžment zastupa 111 ispitanik, Funkcionalni menadžment zastupa 55 ispitanika, Operativni menadžment 82 ispitanika. U istraživanju je korišten servej istraživački metod, te multivarijantna analiza varijance (MANOVA) za izračunavanje razlika skale nivoa perfekcionizma kod menadžera u odnosu na vrstu sporta. Rezultati do kojih se došlo pokazuju da je sociodemografska slika menadžera angažovanih u klubovima raznolika, te da je kod ispitanika većinom prisutan visok nivo perfekcionizma. Nešto veći nivo perfekcionizma je kod menadžmenta klubova ekipnih sportova u odnosu na klubove u individualnim sportovima, što možemo pripisati jednostavnijem sistemu takmičenja, manjoj brojnosti ekipe, manjim finansijskim potrebama kluba, lakšem individualnom postizanje rezultata i slično. Razlika nivoa perfekcionizma kod menadžmenta klubova ekipnih sportova u odnosu na klubove individualnih sportova nije statistički značajna. Obzirom da je samo 10,8% menadžera profesionalni angažman u klubovima, te da 69,3% klubova nema menadžere čiji je profesionalni posao vezan za sportsku djelatnost, govori da su organizacija i funkcionisanje klubova na amaterskom nivou, sa jako malo stručnog kadra iz oblasti sporta. Zato je donekle i logično da takav menadžerski kadar koji nema svakodnevni kontinuitet i potrebnu rutinu u radu ima visok nivo perfekcionizma i sve negativne karakteristike koje isti sa sobom nosi. Ključne riječi: Sportski menadžment, perfekcionizam, Grad Mostar.

Received: November 04, 2016 / Accepted: December 01, 2016

Correspondence to: Nedžad Vuk, The Department for education, youth and sport, City of Mostar, Bosnia and Herzegovina

E-mail: neckovuk1@gmail.com

STRESS AND SPORTS ACTIVITIES

Nermin Mulaosmanović, Hazim Selimović

Faculty of Education, University of Travnik, Bosnia and Herzegovina

The modern pace of training and competitions in sports often brings symptoms of anxiety and stress that no athlete is immune to. Many authors point out a significant link between sports and excitement, anxiety and stress. A large number of athletes' emotional experiences is provoked by the agents which represent stressors or factors contained in the exercise load changes and conditions in which the specific sports activity is being generated. Introducing athletes with stressors that may occur in the competition, and training how to deal with such agents, are the activities that should be incorporated into the overall sports training program. The aim of this paper is to contribute to understanding the factors that elicit excitement, anxiety and stress, their influence, and how we can learn to regulate excitement and control anxiety and stress in order to improve the success in sport. The differences in stress and anxiety, factors that influence the stress occurrence in sports activities and ways to control stress and anxiety in athletes are analysed in the paper.

Keywords: stress, anxiety, excitement, sports activities, control.

INTRODUCTION

There are numerous situations and activities in sports that encourage the athletes' emotional excitement and determine their emotional states. Often, the obligations imposed on the athletes are those exceeding their abilities, inducing the fear of failure, or struggle with their own success probability estimation assessment, the confrontation with the tactical pressure from opponents, crowd favour etc. Therefore, it is necessary to distinguish fear or, as it is popularly called, the normally conditioned physiological body preparation stage fright.

Anxiety and the fear of hardly achievable expectations, and awareness of the insufficient and incomplete technical or physical conditioning preparation for the competition, motivate reverberation of the forced thoughts, which can be determined in a permanent state of negative emotional excitement and develop into a neurosis. An increased emotional excitement, caused by the conflict between the athletes' desires and opportunities to achieve sports tasks, manifests itself through instability or a sudden unexpected mood swing and the way of reacting to equivalent stimuli. When speaking of anxiety, stress is often used in this context, although stress is a much broader and more comprehensive concept. Stress is defined as a "physical response of an individual to different environmental conditions, incorrect adjustment of the organism to these conditions, the imbalance between the demands of the environment and the individual (Bungić, Baric, 2009). Stress is a process whereby an individual perceives a threat and responds with a series of psychological and physiological changes, including an excitement increase and anxiety experience. Sports psychologists believe that there are differences between the excitement, stress and anxiety. Excitement is a general physiological and psychological activation of the body which varies continuously from a deep sleep to intense excitement. Highly excited people are mentally active and experience increased heart rate, breathing and sweating. Weinberg and Gould (1995) define anxiety as a negative emotional state with a sense of nervousness, concern and fidgeting associated with activation or excitement in the body.

SPORTS ACTIVITY AND STRESS

Stress, in its classic meaning, is a non-specific body response to any task set. Stress means the actual gap between the task and ability to respond, provided that there are significant consequences if the task is not executed.

A physiological response to that kind of stress is neutral. According to Mc Grath stress consists of four phases: environment task, task experience, stress response and behaviour consequences. A stressor may take the form of a physical exercise, joyful excitement or a body threat. All stress examples result in the same reactions (Cox, 2005). According to Hans Selye there are four basic stress variants that are dichotomised in the anxiety and excitement, as well as the hyperstress and hypostress. Too much stress (hyperstress) is a condition that occurs as a result of an exceeding stress quantity and the stress level which our body cannot adapt (Bunjić, Baric, 2009). In contrast, hypostress (small stress) is characterized by a physical immobility and boredom, and occurs when there is a lack of sensory stimulation. Then, anxiety is defined as "bad stress" whose manifestations are well known, in the form of concern, restlessness and tension. According to the intensity, sports stress can be calibrated in three stages, typical of different sport phases. The first stage is characterized by fear (a feeling of restlessness, tension, and anxiety), the second stage, resistance, and the third, exhaustion. Fear itself does not have to have a negative impact on the process of the activity implementation (Drenovac, 2007). It can be present at the beginning or in general, just before the athletes' advent, to favour a better mobilization of its energy resources. Resistance corresponds to the adjustment function by raising the general level of activity but also with the actualization of defence mechanisms aimed at preserving the intactness (inviolability), the attention establishment and caution to the possible sources of injuries, disrupting the performance of competitive activities. Exhaustion is reflected in an abrupt change of resistance, the defence forces degradation and the loss of ability to adapt.

The other useful way of understanding stress in the form of a process refers to the process associated with the manifestation of anxiety conditions (suffering). The stress process as described by Martens (1982), and McGrath (1970) refers to the process associated with the manifestation of anxiety conditions. This process is explained in terms of the objective needs, the perceived fear and anxiety state. Bunjić, Baric (2009) points out that anxious athletes are often concerned about the errors, often thinking negatively before the competition, having difficulties to concentrate. According to the Spielberg concept, anxiety may occur as a state and a feature.

ANXIETY AS A STATE IS TRANSIENT AND OCCURS DURING THE PERCEPTION OF REAL OR IMAGINED STIMULI THAT RELATE TO THIS SITUATION AND RESPONDING TO THEM WITH CERTAIN EMOTIONS AND BEHAVIOUR (GRGIN, 1997).

Whilst anxiety as a feature represents a relatively stable feature of personality. Competitive anxiety is also worth mentioning in the sports domain. It is defined as the persistent tendency of experiencing the competitive situation as threatening, and competition entry is accompanied by all the symptoms of anxiety. (Bosnar, Balent, 2009). Specific anxiety related to certain situations is a reaction to stimuli that surrounded us and proved to be menacing, but this situation is called a state of anxiety. This condition is defined as a current emotional state, characterized primarily by a high physiological excitement, then fear, concern and tension. On the other hand, apart from the anxiety as a feature, which is defined as a predisposition of personality in terms of the multidimensional nature of anxiety, the cognitive and somatic anxiety state should be noted. Cognitive anxiety state is the mental component of anxiety which derives the situations such as fear of negative social evaluation, fear of failure and loss of self-respect, while somatic anxiety state is a physical component of anxiety and its manifestations are formed in terms of a physiological response of the sympathetic type as a rapid heartbeat, rapid breathing and muscle tension (Bunjić, Baric, 2009).

It is said that the relationship between the cognitive anxiety state and performance in physical activity is linear and negative, which indicates that the increase in cognitive state anxiety leads to a decrease in physical activity or sports achievement. Contrary to these obtained findings, the relationship between the somatic condition and anxiety is something different, it is square shaped and takes the form of an inverted "U", from which it can be concluded that up to one optimal level of somatic anxiety condition, performance in physical exercise is improved, but then with a further increase in somatic state of anxiety, success in physical exercise and sports achievements decreases.

Confronting athletes with the inevitable sources of stress in individual sports is already happening in the first attempts to implement the basic elements that represent the sport event and the encounter with real-terms in which they are exercised. A certain stimulating situation, which contains stress elements in certain persons, does not cause any emotional reaction, while others cause an increase in blood pressure, an allergic reaction, the occurrence of ulcers, and a risk of organic disorders. All this points to the need to distinguish situational and individual factors that influence the stress and anxiety in sports activities pathological from normally specialized emotional reactions. In athletes, stressors include concerns about the incapacity of performance and the completion of assigned tasks, ensuring the existence and the time needed to train, a doubt in your own talent, and traumatic experiences outside sports activities.

Some of the factors listed are: low self-esteem, low expectations of sports results, a common concern over the failure, less satisfaction with their sports performance, defeat, the importance of the event, etc. The personal resources include high character concern and low self-esteem. A person with a greater character concern experiences competition with more dangers and concerns. An athlete with less self-esteem has less confidence and experience (Bajraktarević, 2008). An important means to reduce anxiety are strategies to increase self-esteem. It is said that there are two main sources of stress states that fall into the situational sources. The importance given to an event or contest and the uncertainty surrounding the outcome of the event. Some people are more prone to anxiety and stress than others, regardless of the situation. A number of authors use genetics as an explanation (according to Eysenck), and social learning theorists explain that they learned from adults during childhood. A psychodynamic view emphasizes the importance of early family relationships and the fact that they had experienced early trauma or a family disruption. Some individuals are likely to see competition as particularly stressful (Jarvis, 1999).

The main sources of long-term emotional stress or emotional strain in sport are contained in the organization and sports training modes, in intense physical and psychological burdens arising from the frequency, dynamics duration and intensity of the athletes' engagement in sports training, as well as the pressures associated with tasks that the athletes must achieve in the forthcoming competitions. From

the discrepancy between the obligations imposed and the real impact of training on the willingness of athletes to compete, a sense of discomfort is developed as well as a conjecture about a possible unfavourable outcome on the competition and an unrealized goal which is set by a club, the public, and the media.

A source of stress is associated with experiencing pain caused by a great physical exertion (weight lifting, marathon, etc.) or various forms of shocks from falls, performance activities, inflicting and receiving blows in a fight. This applies to all sports and disciplines with the extreme emotional charge in which minimal achievement progress depends on the maximum or prolonged physical exertion. Often, during competition preparation, a source of stress is the multi-shift training, which limits sports privacy (personal planning needs and obligations outside sport).

ADDITIONAL SOURCES OF STRESS ARE CONTAINED IN THE INSTITUTION OF COMPETITION, IN THEIR SPECIFIC REGIMES, AND IN ITS DYNAMICS, DURATION AND SOMETIMES UNPREDICTABLE FRAGMENTATION.

The absence of the competition age distribution categories in some sports is a great source of stress. A great source of stress in the sport is, in fact, due to a constant value change and the personal sports achievements evaluation criteria. Even success is the source of stress, especially when it comes to excellent achievements because success should be confirmed, and the records sometimes last very shortly, but it is not uncommon that the records are broken multiple times in the same competition. It seems that the biggest source of stress lies in the professionalization of sport, because each event directly affects the athletes rating and his financial status. A specific emotional charge, particularly just before the competitive activities unfold, especially stands out.

It is emphasized that there are five factors when it comes to anxiety and any combination of these five factors may result in an altered state, and the factors include: a) a threat to the person's ego, b) a threat to cause injury, c) the ambiguity, d) disarranging a routine e) negative social evaluation threats. (Baric, 2009). The emotional stress that athletes experience in the function

of its sports development goes through specific phases which, according to the intensity load, can be graded in terms of freshness, speed loss, fatigue and the efficiency decline in the execution of the training tasks, and the so-called phenomena of episodic psychosomatic disorders such as headaches etc.

Increased emotional excitement caused by the conflict between the athletes' desires and achieving sports tasks manifests itself through instability or a sudden unexpected mood swing and a way of reacting to equivalent stimuli. A latent form of mood instability refers to qualifications variability effect of their own result, achievement satisfaction and enthusiasm on the one hand, and disappointment or switching to a more permanent discontent on the other. In the first phase, reactions of increased emotional stress at the beginning of practicing a sports activity are expressed by defensive reactions to avoid physical exertion and inadequate execution of complex procedures training elements when exercising activities. In the phase which is famous for being emphatic, increased intensity and frequency of training naturally result in fatigue, and a more frequent emotional instability, irritability, unrestrained reactions and sometimes anticipation of inconvenience and forecast an unfavourable outcome of the upcoming competition. The excitability increases under the influence of fatigue, reducing the ability of self-control, rage and violent reactions emerge.

When it comes to emotionally unstable athletes, the intensity of emotional load as a training function and preparation for higher level of competition, an asthenic stage dominated by depressed mood gradually appears. Depression involves the emergence of doubt in their own possibilities, uncertainty, fear, hypersensitivity and extreme emotional vulnerability. Uncontrolled development of such a situation leads to a fear of failure, overestimating opponent quality in the upcoming competition, sometimes to the point that the opponent is seen as an insurmountable obstacle to the realization of the personal sports tasks and achieving the planned goal. It is believed that the most intense stress is experienced immediately before the start of competition in many sports disciplines at the starting point. This moment is characterized by start – of – competition syndrome (preparation for intensive load) which, in the physiological sense, is reflected in elevated level of activity through turbulent physiological responses referred to the mobilization of the body for maximum involvement, but psychologically, in an increased psychological tension (due to expectations of a critical signal to start). Because such preparations are characterized by the so – called pre – start tachycardia, many uninformed athletes equate this change with signals of fear or anxiety, which deepens

the experience of stress. One of the major obstacles to the acceptance of increased exposure is fear and anxiety that encourage forced thoughts reverberation and negative qualification tendency of doing further sports. A distorted view of events appears in rational individuals under the strong emotional load, incorrect value assessment of the assignment and unrealistic expectations of declaring success.

CONTROL AND STRESS MANAGEMENT

An anticipation that refers to the competitive task difficulty, opponents strength and the competition outcome, affects the intensity and quality of the entire task and emotional investment in the training and preparation for competition. Preparing for the competition is therefore a phase in which the athlete has a few hours before going to the sports arena. At this stage, the trained self-motivation techniques can help, raising and maintaining confidence in their own capabilities, emotional excitement control and the elimination of forced thinking or attention concentration. Adjusting excitation and interventions are used to designate different strategies for changing the current level of anxiety and excitement. To denote the same thing, some authors have chosen the terms of dealing with stress. The classic approach uses different types of stimulating conversation and activation technique. However the process of intervention is best applied on an individual basis.

Usually the case is that the initial increased level of excitation leads to the decrease of achievement, and this decline results in a higher anxiety leading to spiral anxiety / stress. There is only one way to get rid of this spiral and this is to reverse the process so as to reduce anxiety and tension. Coping strategies are defined by Lazarus and Folkman (1984) as the constantly changing cognitive and behavioural efforts to deal with special extreme or internal requirements which are estimated to reach or go beyond one's strength. Thus, coping strategies are dynamic conscious efforts of the individual to eliminate or manage stress (Cox, 2005). Negative stress occurs when an individual perceives an imbalance between the demands and opportunities. Coping strategies can be divided into two basic types: focused on the problem and focused on emotions.

Problem focused coping strategies are cognitive behavioural efforts so that a problem causing stress is resolved. The confrontation strategies that target the emotions seek to regulate the feelings that have been caused by stress using the techniques of excitement control. In one study, the wrestlers listed 39 different ways of coping, and their number was reduced to four broad dimensions. Those are thought control strategies (monologue, positive thinking, and thought control), the strategy of directing the focus of attention (concentration control, tunnel guidance), feelings control strategies (excitement control, relaxation, and visualization), and behavioural strategies (establishing routines, rest, and environment control). In the problem focused coping strategy, an individual is directly facing a stressful situation. Block (1981) found that human presentation, using visualization to imagine a situation, is one of the most important topics in cognitive science. There were two theories, the first one points out that when we imagine the scene, we are examining the actual notion that has somehow formed in our brain. This position is represented by the artists. Another view is descriptive. They feel that there is no such thing as a mental image. Our thoughts appear to actually create the image so clear that we think we see it. It is necessary for the athletes to train the self - control application methods, managing emotions and use of self-help mechanisms in the emotionally intense and conflicted situations, and the conditions of the high physical and mental load. In the prestart period, many factors encourage athletes to develop emotional excitement. When it comes to coping training developed by Smith (1980), it consists of three phases.

In the first introduction phase, an athlete learns to understand the general nature of stress, especially to understand the source of his stress. He learns the causes and how to deal with them. He learns that there are already a number of stress coping strategies. In the second skills acquiring phase an athlete learns and practices integrated coping responses. Coping reactions are based on relaxation, presentation, deep breathing and other cognitive-behavioural skills. By using cognitive self - reports an athlete learns to activate these coping skills. In the third phase of testing skills, the induced affect is used to produce high levels of emotional excitement which an individual reduces using the coping reactions learned through the skills acquisition. Interpersonal factors including social support, coach-

athlete relationship, and the effect of the audience, team spirit and cohesiveness are very important. The role of evaluation in the stress process has a central place in the context of determination. Specific responses of cognitive anxiety are thoughts, experience in stressful situations, such as care, negative expectations, and fear (Britton, Brewer 2009). However, somatic reactions are perceptions of their physiological excitement in a stressful environment. Symptoms include muscle tension, rapid heartbeat, and sweating.

A large number of coaches have a problem to predict the athletes' level of stress and anxiety. One of the best but rarely applicable ways of understanding what people feel, is to ask them. Unleash the athletes to freely talk about their feelings. People with high self-esteem believe in their abilities, and experience a lower sense of anxiety. The two strategies are making an encouraging situational climate and the introduction of a positive orientation towards the defeat. One of the main sources of stress is uncertainty. A productive approach to facilitate confidence is to create a positive environment in training. It is necessary to frequently give sincere support. It is very important to adopt a positive productive orientation towards mistakes and defeat. It is useful to teach people to overcome their mistakes in productive terms. It is only a part of success to remain calm, learn from your mistakes and build roads to success. Controlling the emotional tension and eliminating anxiety and fear can be learned through a special training: calling attention to the content, changing the direction of thought, and relaxation.

THE PROCESS OF THE CONTENTS ALTERATION AND DIRECTION OF THOUGHT IS DIRECTED PRIMARILY AT DISCOURAGING DISTURBING PREMONITION.

Each appearance in the competition causes more or less anxiety in athletes, feelings of discomfort, which activates the mechanisms of internal struggle against such a situation. There are two aspects of this technique application. Firstly, the expert guidance is acting to change the content and direction of thought and secondly, the athlete himself, by a voluntary self-regulation, manages these changes. The essence of the techniques application changes the contents and direction of thought so that the athletes have fun with the material for mental engagement. In the immediate preparation, an ideomotor recap of upcoming activities, performance

simulation or visualization is much more effective. This enables you to move the focus thoughts from the possible outcomes of activities content analysis on the performance of the activities, thus creating the conditions for a normal neuropsychological status and balance of activation functions, and the vast psychic energy, otherwise focused on the compensation of emotional excitement, is released. Due to a high exposure to strong pressure from the environment, many athletes develop an anxiety-state tension and anticipation of unpleasant consequences.

Indications are: increased excitation of the vegetative system (increased heartbeat rhythm, elevated blood pressure, rapid breathing, increased muscle tension, increased body metabolism, nausea, heat waves, etc.). Short-term memory disorder perceptions, temporal and spatial orientation and complex cognitive functions are caused by an excessive preoccupation.

A behavioural disorder that manifests itself with avoidance events, stereotypes and less movement coordination. The athletes' self-esteem and self-efficacy are very important in order to manage stress and control anxiety. Self-esteem is related to how we feel. Self-efficacy refers to beliefs in our abilities. So, self-esteem belongs to the emotional context in nature, and self-efficacy is cognitive. Both, self-esteem and self-efficacy are related to our ability to deal with stress, low self-esteem and low self-efficacy are associated with high levels of anxiety when the athlete is under pressure (Jarvis, 1999). The authors cite a number of psychological techniques for regulating excitement and anxiety that can be applied in sports psychology. Relaxation techniques are designed to reduce the athletes' excitement. Relaxation means to reduce the level of physical excitement. There are several ways in which we can learn to relax better. These are: progressive relaxation, autogenous training, meditation, and biofeedback. Two important ways of achieving relaxation are: biofeedback and progressive muscle relaxation.

It is very important to mention the cognitive-behavioural interventions in sports that increase or have a positive effect on achievement and learning sports skills. Cognitive-behavioural techniques are designed to improve the athletes' trust and cognitive anxiety. These techniques lead to a mental relaxation and cognitive restructuring. Cognitive restructuring is something more than the use of cognitive-mental skills for restructuring or changing the way we look at certain situations. A very simple example of cognitive restructuring techniques is a monologue that athletes often use to achieve quality attention focus and excitement during competition. In fact, it is an autogenous training at work, designed not only to control the level of excitement, but also to control

thoughts. Negative self-talk is associated with the loss and poor achievement, and positive self-talk is associated with winning and improving achievement. Other cognitive factors that influence how an athlete reacts to a particular situation, including coping skills, are presentation and goal setting. When they speak about the training of psychological skills, some authors include cognitive and relaxation skills. In order to increase trust and reduce excitement and anxiety mental images can be used. Mental exercise means that an individual exercises a physical task in a disguised way, although the actual image of the task may or may not be present. In contrast it is possible that athletes visualize or present a particular scene without actually exercising anything. Some authors have attempted to clarify the difference between these two terms marking the presentation of the mental process and mental exercise as a specific technique. Elements that are used as the presenting equivalent are: symbolic rehearsal, visualization, secret exercise, cognitive and mental rehearsal (Cox, 2005). The combination of mental and real practice results in the highest level of learning and memory.

There are two types of presentation, internal and external. It is believed that the internal presentation, in its nature, is primarily kinaesthetic as opposed to visual. It is kinaesthetic in the sense that one actually imagines themselves performing a motor task from the inside of their body. It is considered that the external presentation, in its nature, is primarily visual. Imagining the outside of your body, you look at yourself from a distance. Internal presentation is generally considered superior, it is often used by professional athletes, and internal presentation results in measurable sublimated electrical muscle activity. Some applications of the cognitive-behavioural interventions, which use presentation and relaxation, worth mentioning are: visual - motor behavioural training (VMBT), vaccination against stress (VAS) and stress coping training (SCT). Excessive tension that undermines the perfect performance is mainly caused by exaggerating the importance of the outcome of an event. If you constantly worry about your own performance and the possibility of being bad, you are probably overly focused on your bad situation and what others think about you. Concerns have a devastating effect on people from the start of the performance.

During the last decade a goal-setting theory has become popular in sports. The goal-setting theory is a cognitive theory of motivation that is effective in giving power to the individual to become more productive. The objectives are generally defined as a purpose or an object that we're trying to achieve (Locke and Latham, 1985). Perhaps the most important component of goals is whether an athlete accepts them or not, or whether these goals are set by others or themselves. Another important factor is the orientation of the target. Outcome orientation is the aim of those who set the goals related to the outcome of the competition. They think in terms of winning and not about the quality of the game. Individuals who have orientation on performance tend to think in terms of quality performance and not necessarily in terms of the outcome of the competition. Thus, the goal-setting theory is a theory of motivation and stress management. Some guidelines for setting goals effectively are: specific objectives are better than general goals, they should be measurable, hard goals are better than easy ones, short-term goals can be useful in achieving long-term goals, objective-oriented performance is better than the underlying goals, objectives should be written and carefully monitored, and they should be accepted by the athlete. Alternative techniques to reduce cognitive anxiety include the use of mind control techniques such as stopping thoughts or positive thought control. Traditionally, a stop in thinking implies that the athlete keeps a log of concern and the use of the word "stop" or "no" to block the negative thoughts. The use of a self-talk is also recommended.

CONCLUSION

This paper looks at the problem of stress in sport activities where it is possible to draw a number of conclusions. Every athlete should acquire skills to cope with the agents of the physical and emotional stress. Coaches should take into account the predicted levels of stress, and the athletes' anxiety. It is important to identify the origin of stress in sports, and the distinction of mental and physical responses to stressors which athletes have been faced with. Mastering the psychological techniques for regulating excitement and anxiety has a special task to improve their success. The mere combination of mental and real practice results in the highest level of success. An important aspect of managing anxiety and stress management for athletes are the orientation aims on the task. The restructuring and rationalization of the way certain situations are observed in sports activities, are basically cognitive abilities that can be applied.

REFERENCES

1. Bajraktarević, J. (2008). Psihologija sporta – teorija i empirija. Univerzitetski udžbenik Arka“, Sarajevo, treće izmenjeno i dopunjeno izdanje ISBN 978-9958-588-23-5.
2. Bajraktarević, J. (2008). Psihološka priprema sportista. Univerzitetski udžbenik „Arka“, Sarajevo, treće izmenjeno i dopunjeno izdanje ISBN 978-9958-588-22-8.
3. Bosnar, K., Balent, B. (2009). Uvod u psihologiju sporta. Kineziološki fakultet Sveučilišta u Zagrebu.
4. Bungić, M., Barić, R. (2009). Tjelesno vježbanje i neki aspekti psihološkog zdravlja. Kineziološki fakultet, Sveučilište u Zagrebu, Hrvat. Športskomed. Vjesn. 24: 65-75
5. Cox, R.H. (2005). Sportska psihologija: Koncepti i primjene. Jasterbarsko: Naklada Slap
6. Drenovac, M. (2007). Sportska psihologija. Osijek: Filozofski fakultet.
7. Franceško, M., V. Mihić i G. Bala (2002a): Struktura motiva postignuća merena skalom MOP 2002; u M. Franceško i B. Čukić (ur.): Ličnost u višekulturnom društvu 4 (134 – 143). Novi Sad: Filozofski fakultet.
8. Havelka, N. i Lj. Lazarević (1981): Sport i ličnost. Beograd: Sportska knjiga.
9. Hrnjica, S. (2005). Opšta psihologija sa psihologijom ličnosti. Beograd: Naučna knjiga nova
10. Lazarević, D., Trebješanin, B. (2007). Motiv postignuća budućih nastavnika fizičkog vaspitanja. Zbornik instituta za pedagoška istraživanja, br 2, str. 271-288.
11. Lepir, D. (2002). Motiv sportskog postignuća i anksioznost kao dispozicije ličnosti sportista. Fizička kultura. Beograd, br. 56, str. 133-141.
12. Mladenović M. (2011). Karakteristike ličnosti i motivacije za postignućem kod fudbalera i košarkaša kadetskog uzrasta. SPORT – Nauka i Praksa, Vol. 2, No3, 2011, str. 5-16
13. Rot, N. (1994): Osnovi socijalne psihologije, Beograd, Zavod za udžbenike i nastavna sredstva.
14. Rot, N. (1990). Opšta psihologija, Beograd. Zavod za udžbenike i nastavna sredstva.
15. Tišma, M. (2008). Razlike u afektivno –motivacionim dispozicijama s obzirom na vrstu sporta i nivo uspjehnosti sportista. PRIMJENJENA PSIHOLOGIJA, Vol. 2 (1), str. 93-109.

STRES I SPORTSKE AKTIVNOSTI

Savremeni tempo treniranja i takmičenja u sportu često donosi simptome anksioznosti i stresa na koje niti jedan sportista nije imun. Na postojanje važne veze između sporta i uzbuđenja, anksioznosti, stresa ukazuju mnogi autori. Velik broj emocionalnih doživljaja sportiste provociran je agensima koji predstavljaju stresore ili faktore koji su sadržani u promjenama opterećenja i uslova u kojima se ostvaruje određena sportska aktivnost. Upoznavanje sportista sa stresorima koji se mogu pojaviti na takmičenju, te uvijekbavanje načina suočavanja s takvim agensima, sadržaj je koji treba biti ukomponiran u ukupni program sportskog treninga. Cilj ovog rada je doprinjeti razumijevanju koji to faktori izazvaju uzbuđenje, anksioznost i stres, kako utiču i kako možemo naučiti regulirati uzbuđenje, kontrolirati anksioznost i stres u cilju poboljšanja uspjeha u sportu. U radu su analizirane razlike između stresa i anksioznosti, faktori koji utiču na pojavu stresa u sportskim aktivnostima, te načini kontrole stresa i anksioznosti kod sportista. Ključne riječi: stres, anksioznost, uzbuđenje, sportske aktivnosti, kontrola

Received: November 04, 2016 / Accepted: December 01, 2016

Correspondence to: Nermin Mulaosmanović, Faculty of Education, University of Travnik, Bosnia and Herzegovina

E-mail: nerminmulaosmanovic81@gmail.com

DIFFERENCES IN PHYSICAL DEVELOPMENT OF FEMALE STUDENTS TESTED IN 1995 AND 2010

Petar Karadžić¹, Dragan Doder², Biljana Savić², Branko Đukić², Lana R. Doder³

¹ Faculty of Sport Management, University Donja Gorica, Podgorica, Montenegro

² Regional Institute of Sport and Sports Medicine, Novi Sad

³ Faculty of Technical Sciences, University of Novi Sad, Novi Sad, Serbia

The testing was carried out in the "Prva vojvodanska brigada" primary school, by applying the relevant "Eurofit" test battery, with the purpose of comparing the general information on the primary school age girls' physical development with those tested in 1995. On this occasion, 320 girls from 1st to 8th grade were tested. Based on the measured anthropometric parameters, it can be concluded that the physical development of the present generation (body height and mass) of the female students aged from 7 to 14, has a positive acceleration trend. This trend is not positive when it comes to the body mass index (BMI), since there is tendency to obesity in girls, especially at the age of 13. In regard to the physical development, the values indicate a statistically significant difference in body composition of today's generation of primary school age children, who are taller, heavier and have a higher body mass index (BMI) in comparison to the children tested in 1995. On average, the body height of the female students aged from 7 to 14 increased by 2.86% (4.15 cm), the body mass increased by 10.28% (4.15 kg), whereas BMI increased by 5.02% (0.90 kg/m²).

Keywords: female students, body mass, body height, differences.

INTRODUCTION

Based on numerous previous studies on the structure of morphological space, a certain number of factors has been identified, which gave the initial information on their structure, as well as on a certain hierarchical relationships in that structure (Kurelić et al., 1975 Momirović, 1969).

So far, the most commonly identified four main factors that determine human morphology are: longitudinal skeleton dimensionality, responsible for the longitudinal growth of bones, transverse skeleton dimensionality, responsible for latitudinal growth of bones, body mass, body volume and subcutaneous tissue, responsible for the total amount of fat in the body. Information on the structure of morphological characteristics is very important in terms of their transformation (change and development). As it is known, the morphological characteristics are largely influenced by genetic factors (endogenous) and environmental factors (exogenous), where it should be pointed out that the influence of genetic factors is not the same for all morphological characteristics (Doder et al., 2009, Stanković et al., 2009). The heritability coefficient for skeleton dimensionality is about .98, body volume .90 and adipose tissue .50. Thus, the greatest transformation under the influence of exogenous factors (sports training) is possible with adipose tissue, then the body volume, and is almost negligible with the dimensionality of the skeleton (Malacko, Doder, 1998). This study, through applying "Eurofit" test battery, is aimed at determining the condition and differences in the physical development and physical abilities between the primary school age children from Vojvodina and their peers from Serbia, as well as those from certain European countries.

MATERIALS AND METHODS

Sample of examinees

The sample of the examinees in this study consisted of 320 female students from 1st to 8th grade of the "Prva vojvodanska brigada" primary school from Novi Sad.

Sample of variables

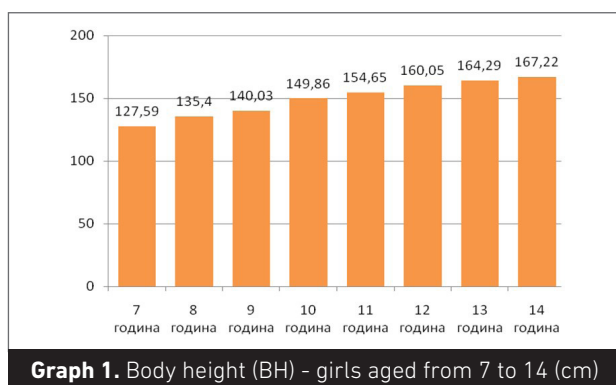
All students were tested using the "EUROFIT" battery prescribed by the Committee for the Development of Sport, the Council of Europe (Council of Europe, 1987, Eurofit, 1983, 1998). For the purpose of assessing the physical development in this study the following was measured:

- Body height (BH) and
- Body weight (BW).

Data processing

For each applied variable, the following central and dispersion parameters were calculated: arithmetic mean (AM), standard deviation (SD), standard error of the mean (SEM), minimum value (Min), maximum value (Max), range (R) skewness (SK) and kurtosis (KU). Testing the significance of differences is determined by means of a t-test. The data were processed by using the statistical software packages Statistica (6.0) and SPSS (11.5).

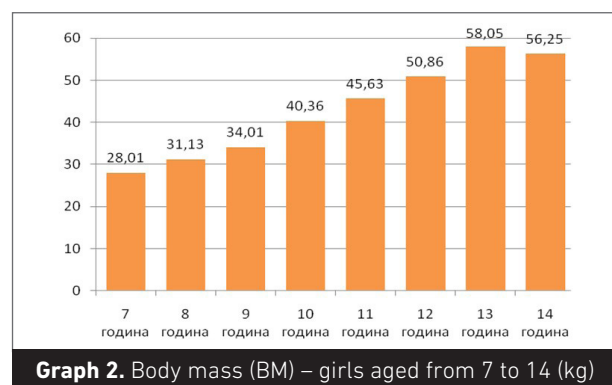
RESULTS AND DISCUSSION



AGE	AM	SD	SEM	R	MIN	MAX	SK	KU
7	127.59	6.18	0.97	16	116.5	142	.36	-.74
8	135.4	6.48	0.95	32.5	118.5	151	-.14	.85
9	140.03	6.43	0.97	26	126.5	152.5	-.01	-.67
10	149.86	7.44	1.13	36	137.5	173.5	.91	1.04
11	154.65	7.95	1.45	31	137.5	168.5	-.31	-.37
12	160.04	7.72	1.16	31	144.5	175.5	.23	-.35
13	164.28	7.13	1.21	31.5	150	181.5	.12	.19
14	167.22	5.15	8.58	20	154	174	-.67	-.03

Table 1. Body height (BH) female students (cm)

The body height of the female students aged from 7 to 14 shows a linear biphasic increase with the age. The first phase, with a steeper curve, is from 7 to 10 years of age, and the second phase is from 11 to 13 years of age. The biggest annual increase in the body height for the female students is between the age of 7 and 8 (7.81 cm) and 9 and 10 (9.83 cm). The results are distributed so that they do not deviate significantly from the normal distribution. The sharpness of the curve's peak (SK) has a positive asymmetry; the negative asymmetry is noticed in the female students at the age of 8, 9, 11 and 14. The shape of the distribution curve (KU) is platykurtic, which means that there is a wide range of results, especially at the age when the highest increase in the body height was noticed (from 10 to 13 years of age), which is shown by the values of the standard deviation and range in Table 3.2.1. It is worth mentioning, in this study, as it has already been pointed out in many earlier studies, that the biggest increase in the body height of the female students occurs 3 to 4 years earlier in comparison to the male students. Therefore, this confirms the proven fact that girls mature biologically earlier than boys. The biggest standard deviation for the female students is at the age of 11 and 12, and for the male students at the age of 13 and 14. Taking into consideration the range of scores for each year, a difference in the female students' biological and chronological age has been identified.

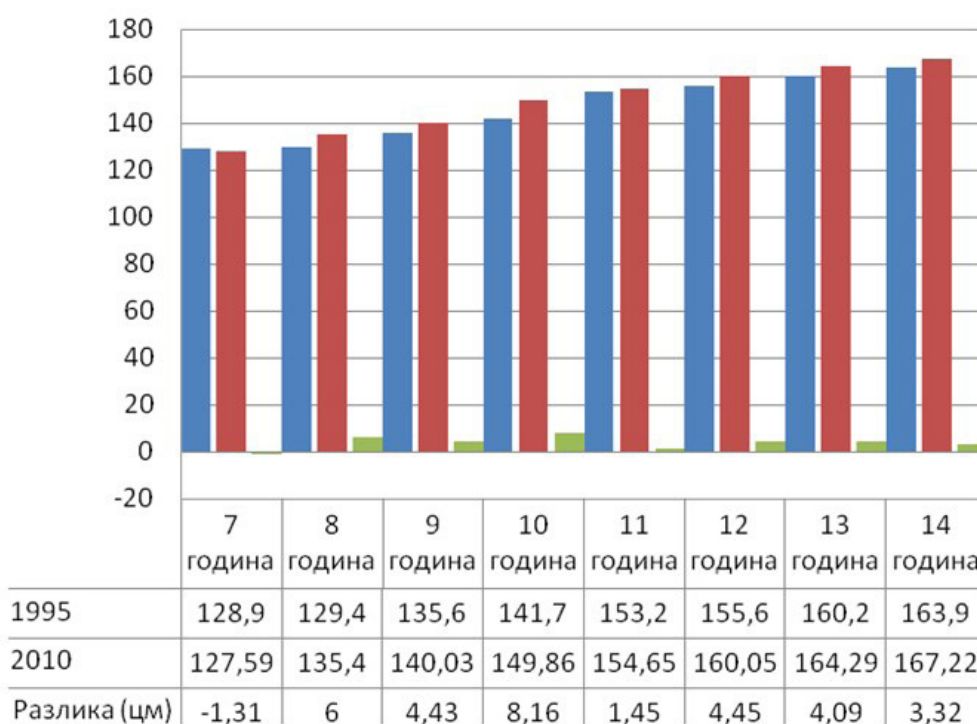


AGE	AM	SD	SEM	R	MIN	MAX	SK	KU
7	28.01	7.22	1.13	37.8	19.20	57	1.82	5.36
8	31.12	4.85	0.71	23.4	21.3	44.7	.53	.88
9	34.01	5.79	0.87	24.6	23.5	48.1	.29	-.21
10	40.36	10.21	1.56	48.3	28.2	76.5	1.67	3.18
11	45.64	10.69	1.95	46	26.1	72.1	.33	.12
12	50.86	9.88	1.49	41.9	32.9	74.8	.03	-.71
13	58.05	12.67	2.14	47.7	35.1	82.8	.24	-.64
14	56.25	7.67	1.28	41.4	41.4	82.8	.84	2.83

Table 2. Body mass – female students (kg)

The body mass of the female students aged from 7 to 13 has a linear trend of increasing with age (a specific sharp rise from 9 to 13 years of age, which is clearly shown in the histograms in Table 3.2.2), but after the age of 13 this trend stagnates. The biggest annual increase in the body mass is between 9 and 10 (6.35 kg) and 12 and 13 years of age (7.19 kg). The results do not significantly deviate from the normal distribution. The sharpness of the curve's peak (SK) at all ages tends to be positive. The only major deviation has been identified in regard to the female students aged 7 and 10, which indicates that a larger number of the female students has a lower body mass index. The shape of the distribution curve (KU) is platykurtic, as confirmed by the value of the standard deviation and range. The first large increase in the female students' body mass occurs much earlier (4 - 5 years) in comparison to the male students and when examining the curve of the body mass increase from 7 to 14 years of age for both sexes, it shows a far greater rise when it comes to

the female students. Also, if the curves representing the increase in the body height and body mass of the female students are compared, it can be seen that the curve representing the body mass rises more sharply. In regard to the male students, the curve representing the body height rises more sharply, while the curve representing the female students' body weight rises more than the curve representing their body height and the male students' body weight. These results prove that the female students gain more weight than the male students, especially from 8 to 13 years of age. The girls' body weight is stagnant after 13th year of age, while the boys' body weight shows a growing tendency. Certainly, the hormonal activity is the cause (testosterone in boys, leading to the increase in muscle mass, and thus in the total body mass). The values of the students' motor variables from 7 to 14 years of age. Differences in the physical development and physical abilities of students tested in 1995 and 2010.



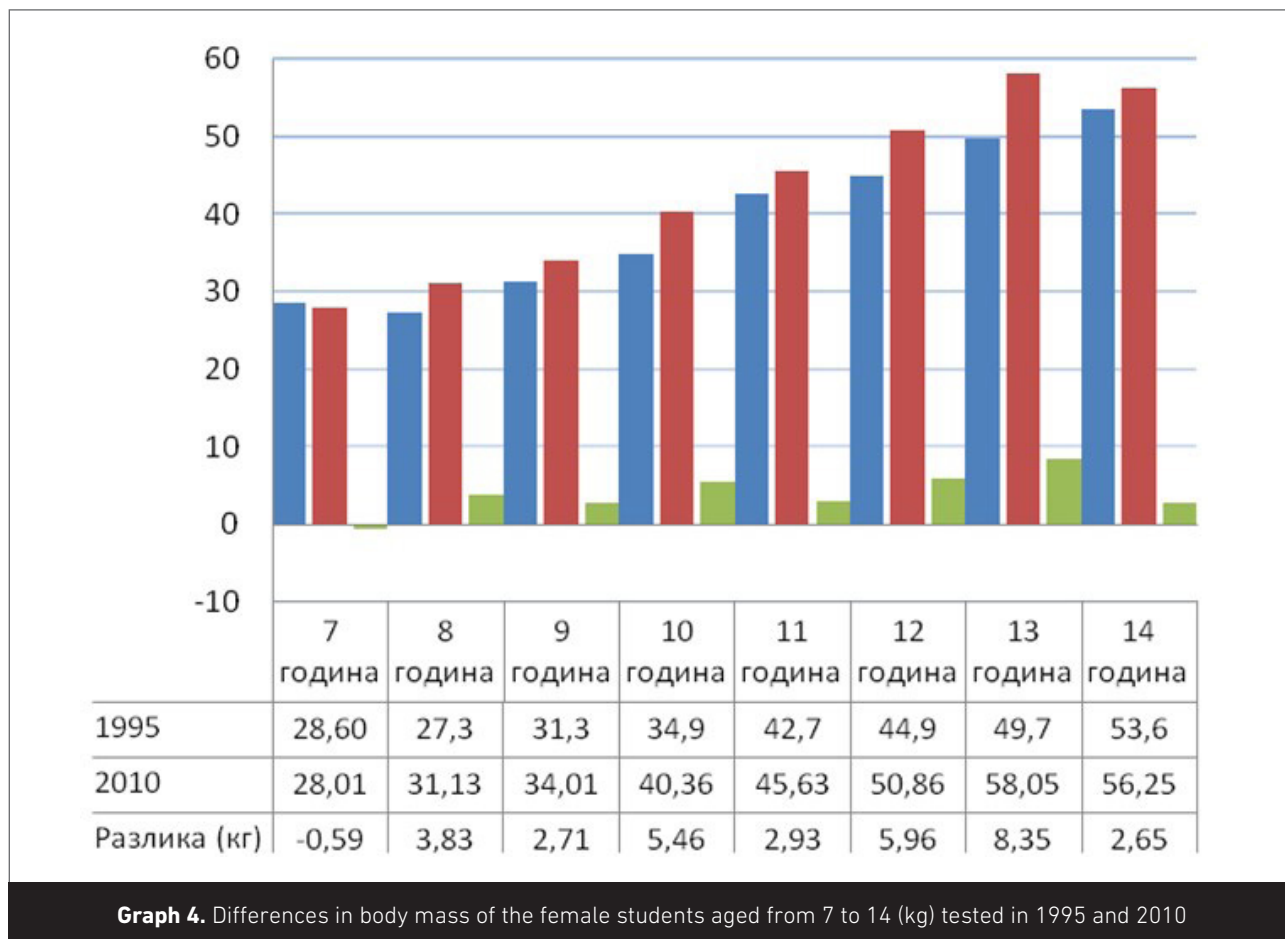
Graph 3. Differences in physical development and physical abilities of the female students tested in 1995 and 2010

The statistical significance level ($p=.007$) has been determined for all age groups except for the age of 7 on the basis of testing the significance of differences between the arithmetic means of the female students' body height tested in 1995 and 2010. The differences in the female students' body height tested in 1995 compared to their peers tested in 2010 are as follows:

7 years of age: $-1,31$ cm ($\approx -1,02\%$);
 8 years of age: $+6,0$ cm ($\approx +4,64\%$);
 9 years of age: $+4,43$ cm ($\approx +3,27\%$);
 10 years of age: $+8,16$ cm ($\approx +5,76\%$);
 11 years of age: $+1,45$ cm ($\approx +0,95\%$);
 12 years of age: $+4,45$ cm ($\approx +2,86\%$);
 13 years of age: $+4,09$ cm ($\approx +2,55\%$);
 14 years of age: $+3,32$ cm ($\approx +2,03\%$).

It is obvious that today's female students aged from 7 to 14 (except for the age of 7) are taller than their peers tested in 1995. These differences are highly statistically significant and show the trend of acceleration, which is smaller than it was the case with the boys.

The biggest difference between the height of the female students 15 years ago and the present generation of the same age was at the age of 10. This finding may indicate that today's girls are biologically more mature than the girls 15 years ago (Ivanić, 1996).

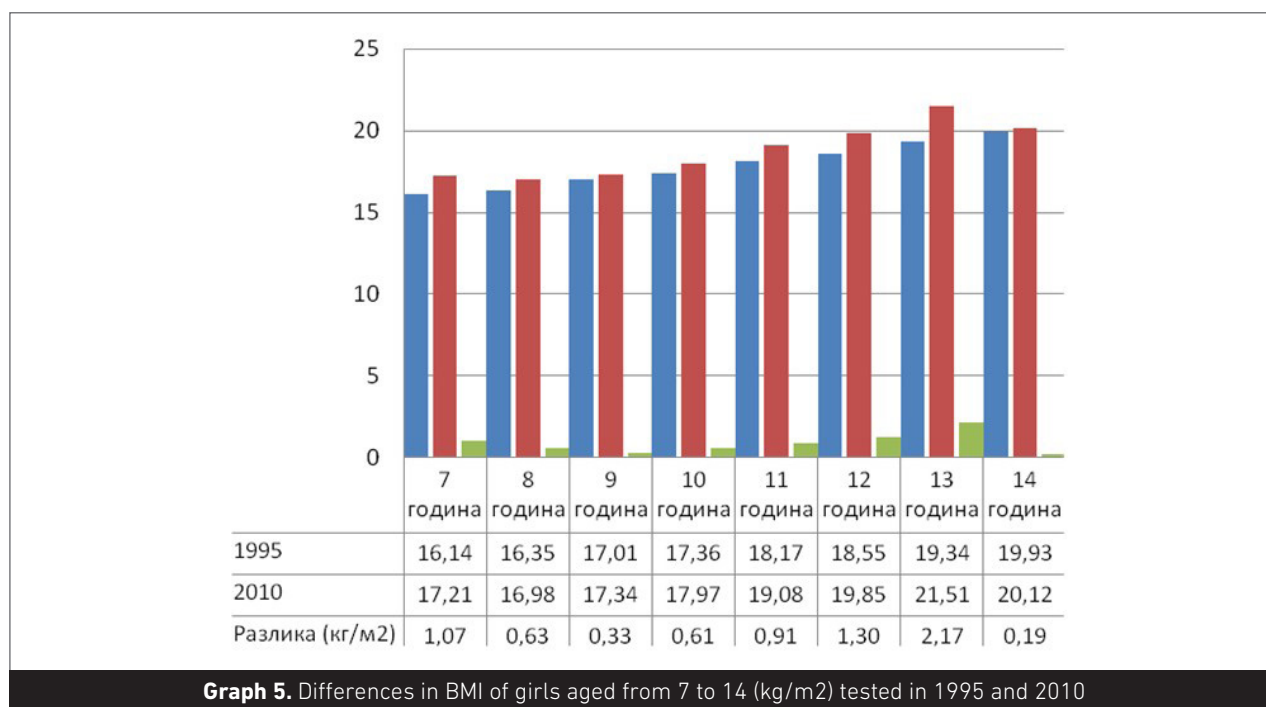


Graph 4. Differences in body mass of the female students aged from 7 to 14 (kg) tested in 1995 and 2010

The statistical significance level ($p = .004$) has been determined for all age groups except for the age of 7 on the basis of testing the significance of differences between the arithmetic means of the female students' body mass tested in 1995 and 2010. The differences in the female students' body mass tested in 1995 compared to their peers tested in 2010 are as follows:

7 years of age: $-0,59$ kg ($\approx -2,06\%$);
 8 years of age: $+3,83$ kg ($\approx +14,03\%$);
 9 years of age: $+2,71$ kg ($\approx +8,66\%$);
 10 years of age: $+5,46$ kg ($\approx +15,64\%$);
 11 years of age: $+2,93$ kg ($\approx +6,86\%$);
 12 years of age: $+5,96$ kg ($\approx +13,27\%$);
 13 years of age: $+8,35$ kg ($\approx +16,80\%$);
 14 years of age: $+2,65$ kg ($\approx +4,94\%$).

These values show that the increase in the body height is accompanied by the increase in the body mass in both female and male students. The biggest differences in the increase in the body mass are at the age of 13, 10 and 8, and the smallest differences are at the age of 7. This correlates with the differences in the body height. However, the results demonstrate that the percent of the differences in the body height is much smaller than the percent of the differences in the body mass only in regard to the female students at the age of 13. Consequently, it can be expected that the difference in the body mass index will be larger.



Graph 5. Differences in BMI of girls aged from 7 to 14 (kg/m²) tested in 1995 and 2010

The statistical significance level ($p=0.005$) has been determined for all age groups on the basis of testing the significance of differences between arithmetic means of the female students' body mass index tested in 1995 and 2010. The values of the body mass index (BMI) of the present generation are within average percentile values of 50-85.

The differences in the values of the female students' body mass index tested in 1995 compared to their peers tested in 2010 are as follows

7 years of age: + 1,07 kg/m² ($\approx + 6,63\%$);
 8 years of age: + 0,63 kg/m² ($\approx + 3,85\%$);
 9 years of age: + 0,33 kg/m² ($\approx + 1,94\%$);
 10 years of age: + 0,61 kg/m² ($\approx + 3,51\%$);
 11 years of age: + 0,91 kg/m² ($\approx + 5,01\%$);
 12 years of age: + 1,30 kg/m² ($\approx + 7,01\%$);
 13 years of age: + 2,17 kg/m² ($\approx + 11,22\%$);
 14 years of age: + 0,19 kg/m² ($\approx + 0,95\%$).

It is evident that today's girls of all ages are bigger than their peers from a decade and a half ago (this was not the case only in regard to the age of 7). Taking into consideration the results of the differences in the body mass index, the previous assumption has been fully confirmed - the biggest difference occurs at the age of 13, i.e. the female students of the present generation are somewhat bigger than their peers from Belgrade were 15 years ago. It should be noted that the mean values are within the average ones, but the trend of a non-linear increase in the body mass index has been clearly identified.

CONCLUSION

Based on the anthropometric measurements, it can be concluded that the physical development of the present generation (body height and mass) of the tested female students aged from 7 to 14 has a positive trend of growth and development accompanied by the biological growth and development (acceleration). This trend is not positive in case of the body mass index (BMI), since there is a tendency to obesity in girls, especially at the age of 13. The given development tendency of the physical development and physical abilities is similar to the findings of the Republic Institute for Sports, for female students from the territory of Belgrade, measured in 2009 (Gajević, 2009).

In the area of the physical development, the values indicate a statistically significant difference in the body composition of today's generation of primary school age children, who are taller, heavier and have a higher body mass index (BMI) in comparison to the children tested in 1995. These differences are as follows: the body height of the female students aged from 7 to 14 increased by 2.86% (4.15 cm), body mass increased by 10.28% (4.15 kg), and the body mass index (BMI) increased by 5.02% (0.90 kg/m²).

REFERENCES

1. Gajević, A. Fizička razvijenost i fizičke sposobnosti dece osnovnoškolskog uzrasta. Beograd: Republički zavod za sport, 2009.
2. Kurelić, N., Stojanović, M., Šturm, J., Radojević, Đ., Viskić-Štalec, N. Struktura i razvoj morfoloških i motoričkih dimenzija omladine. Beograd: Institut za naučna istraživanja FFK, 1975.
3. Momirović, K. Faktorska struktura antropometrijskih varijabli. Zagreb: Institut za kineziologiju, 1969.
4. Doder D., Malacko J., Stanković, V. & Doder, R. Impacts of morphological and motor skills variables and their predictor validity on mawashi geri. *Acta Kinesiologica*. 2009; 3: 104-109.
5. Stanković, V., Malacko J. & Doder, D. The differences in morphological characteristics among top handball players, basketball players and footballers. *Acta Kinesiologica*. 2009; 3: 90-94.
6. Malacko, J. i Doder, D. Tehnologija sportskog treninga i oporavka. Novi Sad: Pokrajinski zavod za sport. 2008.
7. Council of Europe. Recommendation No. R (87) 9 of the Committee of Ministers to Member states on the Eurofit Tests of Physical Fitness. 1987.
8. Eurofit. Handbook for the Eurofit Tests of Physical Fitness, ed. 2 Strasbourg. Council of Europe, (1988).
9. Eurofit. Handbook for the Eurofit Tests of Physical Fitness, ed. 2 Strasbourg. Council of Europe, 1983.

RAZLIKE U FIZIČKOM RAZVOJU DEVOJČICA TESTIRANIH 1995 I 2010. GODINE

Testiranje je sprovedeno u osnovnoj školi „Prva vojvođanska brigada“, odgovarajućom „Eurofit“ baterijom testova, sa ciljem dobijanja osnovnih informacija o stanju fizičkog razvoja devojčica osnovnoškolskog uzrasta u odnosu na 1995. godinu. Testirano je 320 učenica od 1. do 8. razreda. Na osnovu izmerenih antropometrijskih vrednosti, može se zaključiti da fizički razvoj sadašnje generacije (telesna visina i masa), testiranih učenica od 7 do 14 godina, ima pozitivan trend rasta i razvoja, koji prate biološke zakonitosti rasta i razvoja (akceleracija). Kod indeksa mase tela (BMI), ne bi se moglo govoriti o pozitivnom trendu, jer se javlja tendencija gojaznosti kod devojčica, posebno u 13. godini. U okviru prostora fizičke razvijenosti, vrednosti ukazuju na statistički značajnu razliku u telesnom sastavu današnje generacije dece osnovnoškolskog uzrasta, koja su viša, teža i sa višim vrednostima indeksa mase tela (BMI), od onih iz 1995. godine. Visina tela kod učenca je za uzrast od 7 do 14 godina u proseku veća za 2.86% (4.15 cm). Telesna masa učenica je povećana za 10.28% (4.15 kg). Vrednosti indeksa telesne mase (BMI) povećane su kod učenica 5.02% (0.90kg/m²). Ključne reči: učenice, telesna masa, telesna visina, razlike.

Received: November 13, 2016 / Accepted: December 01, 2016

Correspondence to: Petar Karadžić, Faculty of Sport Management, University Donja Gorica, Podgorica, Montenegro

E-mail: gariste@t-com.me

CONSTRUCTION AND VALIDATION OF SPECIFIC FLEXIBILITY TESTS IN RHYTHMIC GYMNASTICS

Lejla Šebić¹, Adriana Ljubojević²

¹University of Sarajevo - Faculty of Sport and Physical Education (B&H)

²University of Banja Luka - Faculty of Physical Education and Sport (B&H)

The success in rhythmic gymnastics significantly depends on the level of motor skills, in particular, flexibility. In general, young females that do rhythmic gymnastics competitively, possess an above average flexibility level in comparison with the rest of the population. This study pays special attention to innovation and construction of new specific flexibility tests for training and selection requirements in rhythmic gymnastics. In rhythmic gymnastics, flexibility assessment through standardized tests for the competitors, does not offer adequate scrutiny or progress monitoring of their skills; therefore, it is necessary to construct new tests, which will provide better accuracy in determining flexibility levels, differences between the competitors, and monitor the progress in their abilities during the training process. The sample for this study consisted of 74 female rhythmic gymnastics competitors from three Sarajevo based rhythmic gymnastics clubs. The variable sample was presented through 8 newly constructed flexibility tests. The results received from the examinees in all the applied variables were processed through standard descriptive procedures. In order to determine the metric characteristics of the constructed tests, factor analysis and Cronbach's alpha test were applied. After the validation of the metric characteristics of the newly constructed tests, it was indicated that the calculated coefficients point to a high reliability, therefore, it can be said that all the tests have factorial validity. Taking into consideration the satisfactory metric characteristics of the tests, this study demonstrates that they are applicable in practice for testing specific flexibility in rhythmic gymnastics.

Key words: rhythmic gymnastics, flexibility, construction, tests.

INTRODUCTION

Flexibility is defined as a human ability to perform movement with the highest possible amplitude. Maximum movement amplitude in various body parts is used as a measure. The term flexibility stems from Latin "flectere" or "flexibilis" or to bend, bending. Flexibility has various meanings for different fields of research. Numerous authors define flexibility differently. Holland (1968) referred to flexibility as the total range of motion of a joint or group of joints, and Pećina (1992) defined flexibility as mobility, freedom of movement or possible capacity of movement in an individual joint, joint cluster or the entire body. Milionis (1997) said it is the ability to perform high amplitude movements, where the most common measure is maximum amplitude of bodily movements in specific joint systems, while Clark (2001) defined flexibility as a normal extensibility of all soft tissues allowing complete free joint movement capacity. One of the basic features of flexibility is its uniqueness, i.e. movement capacity is different for each joint and flexibility, and depends upon the movement. Flexibility primarily depends on the structure of joints and ligaments involved in the movement. A series of factors influence the level of flexibility, such as temperature, fatigue, physical condition, and sex. Flexibility is specific for each joint; therefore, certain joints are more or less flexible. Considering that it is virtually impossible to influence the development of morphological joint structure at a later adult age, the ability development is exclusively influenced at a very early age (after 5 years of age), while the locomotor system is still developing. When we practice flexibility at a later age (after completing morphological development), the results are significantly weaker. After 12 years of age, it is improved until early maturity, but it can

never reach the childhood level. (Haimer, Matković, 1997.). An illustration of an extreme development of flexibility is depicted in rhythmic gymnastics, where the top results are achieved mostly in a very young age when the abilities are peaking. In scientific research, flexibility is mostly expressed in angle degrees and, in practice, in linear criteria. There is a wide spectre of various tests for determining the current flexibility state. Some of the flexibility evaluation tests are bench forward bend, straddling bend, front split, side split, abduction while lying on the side; straddling while lying down on the back, front raise leg while lying on the back; back raise leg while lying on the front, twist with the stick, and many other tests used for measuring. All the above-mentioned tests in rhythmic gymnastics, in working with female contestants of various age, do not show enough discrimination because the results are homogenous and of maximum value. Testing, as a group of procedures for measuring, evaluating and assessing the condition of athletes, represents an unavoidable activity in enhancing sports and sport results (Milanović, 2010), hence the necessity in preparing specific tests, with their application in rhythmic gymnastics training. The aim of this paper is to determine metric characteristics of the constituted flexibility tests and their internal and factorial validity.

PROBLEM AND AIM

The problem of this work relates to the method enhancement of relevant flexibility evaluation in rhythmic gymnastics through preparation of new tests. The aim is to determine the validity of the newly designed flexibility tests.

WORK METHOD

The sample for this study consisted of 74 female rhythmic gymnasts from three clubs of the Canton of Sarajevo. The requirement for the testing was being a participant in the competition program and training rhythmic gymnastics for at least 3 years, i.e. having attained a level of flexibility necessary for participation in competition. The variable sample is 8 (eight) new specific flexibility tests:

Test 1 "Leg raise bridge" - (MPDN) is measured in degrees. The test is performed three times, each result recorded separately. The subject stands sideways to the protractor on the wall. She makes a bridge and remains in the position until receiving a signal to begin the exercise (picture no. 1). Upon the signal, she slightly raises her better leg to maximum, holds it for couple of moments, and the result is shown on the protractor. The standing leg is on the marked line, immovable (picture 1a, 1 b).

Test 2 "Torso raise from lying on the front" - (PTLS). The subject is lying down on her stomach; hands extended in front of her, legs are together, extended and tight. The tailbone is on the designated zero point of the protractor. The subject lifts herself slowly; arms extended to maximum, legs are tight and fixed to the floor, not raised. The evaluation of the test is done in degrees, measured three times (picture 2a and 2b).

Test 3 "Forearm bridge" - (SMNP). The subject makes a bridge, hands are on the floor, waiting for a signal to perform the test. From the initial position, she descends to her forearms, waiting for the examiner to register the result. The test is repeated three times. The test is completed once the examiner has registered three correctly performed attempts and is measured in centimetres (picture 3a and 3b).

Test 4 "Front split with front leg raise" - (CSPN). The subject sits in a front split, hands are next to the body, waiting for a signal to perform the task. One of the examiners lifts the subject's front leg to its maximum. The subject remains in this position for a few seconds until the other examiner registers the result. After that, the subject drops her leg and waits for the next signal. The task is repeated three times. Between each attempt, the subject is given a pause long enough for screening and registering the results. The back leg is extended, not raised. The result is measured in degrees (picture 4a and 4b).

Test 5 "Front split with back leg raise" - (CSZN). The subject sits in a front split, hands are next to the body, waiting for a signal to perform the task. One of the examiners lifts the subject's back leg to its maximum. The subject remains in this position for a few seconds until the other examiner registers the result. After that, the subject drops her leg and waits for the next signal. The task is repeated three times. Between each attempt, the subject is given a pause long enough for screening and registering the results. The front leg is extended, not being lifted. The result is measured in degrees (picture 5a and 5b).

Test 6 "Side split with right leg raise" - (BSDN). One of the examiners lifts the subject's right leg to its maximum. The subject remains in this position for a few seconds until the other examiner registers the result. After that, the subject drops her leg and waits for next signal. The task is repeated three times. Between each attempt, the subject is given a pause long enough for screening and registering the results. The left leg is extended, not being lifted. The result is measured in degrees (picture 6a and 6b).

Test 7 "Side split with left leg raise" - (BSLN). One of the examiners lifts the subject's left leg to its maximum. The subject remains in this position for a few seconds until the other examiner registers the result. After that, the subject drops her leg and

waits for the next signal. The task is repeated three times. Between each attempt, the subject is given a pause long enough for screening and registering the results. The right leg is extended, not raised. The result is measured in degrees (picture 7a and 7b). Test 8 „Vertical split with forward bend“ – (VESP). The subject stands sideways to the protractor, arms next to the body, waiting for a signal to perform the task. On a given signal, she slowly raises her better leg the highest possible, without any support, holding it for a few seconds until the examiner has registered the result. Afterwards, she drops her leg and waits for the next signal. The task is performed three times. Between individual attempts, the subject is given a pause long enough for screening and registering the results. The standing leg is extended, on the marked line. The test result is registered in degrees (picture 8a and 8b).

The results in all the applied variables are processed through standard descriptive procedures. Factorial analysis and Cronbach alfa test were applied for determining metric characteristics of the designed tests.

RESULTS AND DISCUSSION

For the purposes of this paper, central and dispersive parameters were calculated: arithmetic mean (Mean), standard deviation (SD), minimum (MIN), maximum (MAX) kurtosis (KURT) and skewness of distribution (SKEW) (table 1). The best sensitivity was shown

in the SMNP test – “Forearm Bridge”, where the sensitivity measure is a standard deviation of a 1/3 of arithmetic mean in a good test. The factorial analysis of the newly established tests shows that the tests measure the exact dimension we had assumed they would measure. The tables show high correlation between the newly designed tests and the latent factor, which implies, without any doubt, that they measure the motor skills they had been designed for – flexibility. Considering the normal distribution of the test results in all parts (no significant differences between the achieved and normal distribution), as well as the skewness and kurtosis values ranging within acceptable limits (table 1.), we might say that all measuring instruments have optimal sensitivity, none of the tests are too difficult or too easy, and that they easily distinguish between the subjects according to the measuring subject. Bearing in mind that all the tests have high projections to their common factor, we can conclude that every test measures the same measurement subject, which is flexibility. Consequently, one can conclude that all eight newly designed tests have factorial validity. The presented tables show a relatively high value of the Cronbach alpha coefficient. All the tests are satisfactorily reliable. Through variance analysis, we have determined that none of the tests have any statistically pertinent difference, therefore we can conclude that the tests are homogenous. The variation coefficient, showing the average result variation of the subjects in specific elements, has satisfactory values in all the tests.

variables	Valid N	Mean	Minimum	Maximum	Std.Dev.	Skewness	Kurtosis
MPDN1	74	82.07	60	100	9.541	-0.585	-0.482
MPDN2	74	82.84	55	102	9.819	-0.541	-0.142
MPDN3	74	82.97	55	105	9.701	-0.499	0.082
PTLS 1	74	93.65	25	180	43.382	0.203	-0.911
PTLS2	74	94.66	25	180	43.753	0.156	-0.952
PTLS3	74	94.78	25	180	43.387	0.186	-0.898
SMNP1	74	29.19	1	45	9.929	-0.941	1.101
SMNP2	74	29.08	1	49	9.771	-0.957	1.501
SMNP3	74	29.19	1	58	10.176	-0.675	1.622
CSPN1	74	12.86	3	35	7.484	1.096	1.052
CSPN2	74	13.09	3	35	7.427	1.061	0.983
CSPN3	74	13.59	3	35	7.671	1.048	0.989
CSZN1	74	14.30	4	35	7.690	0.981	0.543
CSZN2	74	15.08	5	35	8.199	0.951	0.328
CSZN3	74	14.91	5	35	7.973	0.993	0.572
BSDN1	74	16.65	3	55	9.445	1.339	2.642
BSDN2	74	17.46	3	55	9.923	1.161	1.653
BSDN3	74	17.76	3	58	10.034	1.246	2.257
BSLN1	74	16.22	5	50	9.416	1.174	1.441
BSLN2	74	16.86	5	60	10.150	1.467	3.335
BSLN3	74	17.18	5	60	10.172	1.481	3.325
VESP1	74	87.15	65	110	9.679	-0.116	-0.259
VESP2	74	87.81	65	107	9.224	-0.090	-0.071
VESP3	74	87.80	65	110	9.449	-0.054	-0.110

Table 1. Elementary statistical parameters (Mean = average value, Min. = minimum result, Max. = maximum result, STD = standard deviation, SKEW = skewness, KURT = kurtosis)

FACTOR ANALYSIS – MAIN COMPONENT METHOD

Factor Loadings (Unrotated)									
Extraction: Principal components									
(Marked loadings are > ,700000)									
	Factor		Factor		Factor		Factor		Factor
	1		1		1		1		1
MPDN1	0.98	PTLS1	0.99	SMNP1	0.98	CSPN1	0.98	CSZN1	0.98
MPDN2	0.99	PTLS2	0.99	SMNP2	0.99	CSPN2	0.99	CSZN2	0.99
MPDN3	0.99	PTLS3	0.99	SMNP3	0.99	CSPN3	0.99	CSZN3	0.99
Expl.Var	2.942	Expl.Var	2.993	Expl.Var	2.948	Expl.Var	2.956	Expl.Var	2.958
Prp.Totl	0.980	Prp.Totl	0.997	Prp.Totl	0.982	Prp.Totl	0.985	Prp.Totl	0.986

	Factor		Factor		Factor
	1		1		1
BŠDN1	0.99	BŠLN1	0.98	VEŠP1	0.98
BŠDN2	0.99	BŠLN2	0.99	VEŠP2	0.99
BŠDN3	0.99	BŠLN3	0.99	VEŠP3	0.99
Expl.Var	2.97	Expl.Var	2.961	Expl.Var	2.958
Prp.Totl	0.992	Prp.Totl	0.987	Prp.Totl	0.986

CRONBACH ALPHA TEST

Summary for scale: Mean=247,878 Std.Dv.=28,7821 Valid N:74

Cronbach alpha: ,990210 Standardized alpha: ,990248

Average inter-item corr.: ,973477

	Mean if deleted	Var. if deleted	Stdv. if deleted	Itm-Totl Correl.	Squared Multp. R	Alpha if deleted
MPDN1	165.811	373.099	19.316	0.968	0.939	0.993
MPDN2	165.041	359.390	18.958	0.981	0.971	0.984
MPDN3	164.905	362.464	19.038	0.986	0.977	0.980

Summary for scale: Mean=283,095 Std.Dv.=130,386 Valid N:74

Cronbach alpha: ,998945 Standardized alpha: ,998952

Average inter-item corr.: ,997104

	Mean if deleted	Var. if deleted	Stdv. if deleted	Itm-Totl Correl.	Squared Multp. R	Alpha if deleted
PTLS1	189.446	7484.787	86.515	0.997	0.993	0.999
PTLS2	188.432	7411.381	86.089	0.998	0.997	0.998
PTLS3	188.311	7476.673	86.468	0.998	0.997	0.998

Summary for scale: Mean=87,4595 Std.Dv.=29,6205 Valid N:74

Cronbach alpha: ,991176 Standardized alpha: ,991325

Average inter-item corr.: ,975174

	Mean if deleted	Var. if deleted	Stdv. if deleted	Itm-Totl Correl.	Squared Multp. R	Alpha if deleted
SMNP1	58.270	389.062	19.724	0.974	0.950	0.990
SMNP2	58.378	392.397	19.809	0.985	0.972	0.983
SMNP3	58.270	377.656	19.433	0.981	0.967	0.986

Summary for scale: Mean=39,5541 Std.Dv.=22,4152 Valid N:74						
Cronbach alpha: ,992445 Standardized alpha: ,992553						
Average inter-item corr.: ,980696						
	Mean if deleted	Var. if deleted	Stdv. if deleted	Itm-Totl Correl.	Squared Multp. R	Alpha if deleted
CSPN1	26.689	223.808	14.960	0.973	0.957	0.995
CSPN2	26.459	222.653	14.921	0.992	0.988	0.982
CSPN3	25.959	216.903	14.727	0.983	0.981	0.988

Summary for scale: Mean=44,2838 Std.Dv.=23,6999 Valid N:74						
Cronbach alpha: ,992770 Standardized alpha: ,993030						
Average inter-item corr.: ,982017						
	Mean if deleted	Var. if deleted	Stdv. if deleted	Itm-Totl Correl.	Squared Multp. R	Alpha if deleted
CSZN1	29.986	256.932	16.029	0.975	0.955	0.995
CSZN2	29.202	238.269	15.435	0.992	0.987	0.983
CSZN3	29.378	246.262	15.692	0.986	0.983	0.987

Summary for scale: Mean=51,8649 Std.Dv.=29,2894 Valid N:74						
Cronbach alpha: ,995785 Standardized alpha: ,996095						
Average inter-item corr.: ,989147						
	Mean if deleted	Var. if deleted	Stdv. if deleted	Itm-Totl Correl.	Squared Multp. R	Alpha if deleted
BSDN1	35.216	391.656	19.790	0.987	0.975	0.996
BSDN2	34.405	371.349	19.270	0.994	0.990	0.991
BSDN3	34.108	367.745	19.176	0.992	0.987	0.993

Summary for scale: Mean=50,2568 Std.Dv.=29,5510 Valid N:74						
Cronbach alpha: ,993023 Standardized alpha: ,993548						
Average inter-item corr.: ,983540						
	Mean if deleted	Var. if deleted	Stdv. if deleted	Itm-Totl Correl.	Squared Multp. R	Alpha if deleted
BSLN1	34.040	405.957	20.148	0.976	0.953	0.996
BSLN2	33.391	373.697	19.331	0.990	0.987	0.985
BSLN3	33.081	372.966	19.312	0.990	0.986	0.985

Summary for scale: Mean=262,757 Std.Dv.=28,1560 Valid N:74						
Cronbach alpha: ,992791 Standardized alpha: ,993039						
Average inter-item corr.: ,982785						
	Mean if deleted	Var. if deleted	Stdv. if deleted	Itm-Totl Correl.	Squared Multp. R	Alpha if deleted
VESP1	175.608	342.832	18.515	0.974	0.949	0.996
VESP2	174.946	356.186	18.872	0.988	0.986	0.986
VESP3	174.959	347.471	18.640	0.990	0.987	0.984

CONCLUSION

Regardless of numerous measuring instruments (tests) which are standardized, and whose metric characteristics that had been verified several times in flexibility evaluation, we should still strive to construct new, better and more precise tests for assessing this ability in rhythmic gymnastics.

Therefore, a new test should not only be an improved copy of the existing tests, but also a contribution to a new, better and more precise check-up of motor skills. Considering the satisfactory metric characteristics, this research has shown the tests applicability in practice of testing specific flexibility. A new series of tests may have application in rhythmic gymnastics, as well as in other sports in which flexibility is of high importance.

REFERENCES

1. Clark, M.A. (2001). Integrated Training for the New Millenium. National Academy of Sports Medicine, Thousand Oaks, Ca
2. Holland, G. J. (1968). The physiology of flexibility: A review of the literature. Kinesiology Review, 49-62.
3. Haimer, S., Matković, B. (1997). Manual for Sports Instructors. Zagreb. Faculty of Physical Culture, University of Zagreb.
4. Pečina, M. (1992). Vježbe istezanja (Stretching). Globus, Zagreb
5. Milanović, D. (1997). Training Basics. U: Manual for Sports Instructors. (Ur:D. Milanovic). Faculty of Physical Culture. 483-599.
6. Milanović, D. (2010). Sports Diagnostics. U: D. Milanović (ur.), Theory and Methodology of Training (2nd edition.), pg. 117-134. Zagreb: Faculty of Kinesiology, University of Zagreb; Social Science Polytechnic, Zagreb, Department of Instructor Education.

KONSTRUKCIJA I VALIDACIJA SPECIFIČNIH TESTOVA FLEKSIBILNOSTI U RITMIČKOJ GIMNASTICI

Uspjeh u ritmičkoj gimnastici u velikoj mjeri zavisi od nivoa motoričkih sposobnosti, ali posebno fleksibilnosti. Generalno gledano djevojke koje se bave ritmičkom gimnastikom na takmičarskom nivou posjeduju nadprosječan nivo fleksibilnosti u odnosu na ostalu populaciju. U ovom radu posebna pažnja je posvećena inovaciji i konstrukciji novih specifičnih testova fleksibilnosti za potrebe treninga i selekcije u ritmičkoj gimnastici.

Procjena fleksibilnosti standardizovanim testovima u ritmičkoj gimnastici ne diskriminira dovoljno takmičarke niti adekvatno prati njihov napredak u ovoj sposobnosti, stoga je potrebna konstrukcija novih testova koji će još pouzdanije utvrditi nivo fleksibilnosti, razlike između takmičarki i napredak u ovoj sposobnosti tokom trenažnog procesa. Uzorak ispitanika za ovo istraživanje činile su 74 ritmičarke iz tri kluba ritmičke gimnastike iz Sarajeva. Uzorak varijabli je predstavljen kroz 8 osam novokonstruisanih testova fleksibilnosti. Rezultati ispitanika u svim primjenjenim varijablama obrađeni su standardnim deskriptivnim postupcima. Za utvrđivanje metrijskih karakteristika konstruisanih testova primjenjena je Faktorska analiza i Cronbachov alfa test. Nakon validacije metrijskih karakteristika novokonstruisanih testova pokazalo se da izračunati koeficijenti upućuju na visoku pouzdanost, tako da možemo reći da su svi testovi faktorski valjani. S obzirom na zadovoljavajuće metrijske karakteristike, ovo istraživanje je pokazalo su testovi primjenjivi u praksi za testiranje specifične fleksibilnosti u ritmičkoj gimnastici. Ključne riječi: ritmička gimnastika, fleksibilnost, konstrukcija, testovi.

Received: November 04, 2016 / Accepted: December 01, 2016

Correspondence to: Lejla Šebić, Faculty of Sport and Physical Education, University of Sarajevo, Bosnia and Herzegovina

E-mail: lejla@ln1.ba

A COMPARATIVE ANALYSIS OF THE STUDENTS' AWARENESS REGARDING UNIVERSITY SPORTS IN MONTENEGRO AND SERBIA

Nela Tatar¹, Mirza Mulešković²

1 University Donja Gorica, Podgorica, Montenegro

2 Center for development of sports, Podgorica, Montenegro

This paper covers a detailed analysis of the students' awareness regarding University sports in Montenegro and Serbia, as well as the state of students' sports in Montenegro, the main problems and ways to overcome the current situation. The main objective of the paper is to show the current state through the survey results, and to show the students' point of view, and their awareness regarding University sports, as well as their motives for practicing sports activities. Also, the paper provides a huge number of recommendations with the goal to improve students' sports in Montenegro and to better integrate the students in the process of organizing sports events. The methodology of the paper includes a desk survey, analysis of relevant strategies on a national level and, on the other side, the filled out survey among students and a comparative analysis of the answers, to the same questions, as the students from Montenegro and Serbia had. Generally, the survey showed that students' sports in Montenegro improved in past few years, but there is still a huge area for improvement, and there is a huge amount of problems which must be resolved with the joint force of all actors in a very short period of time.

Key words: Sport associations, sport and events, problems, relevant institutions, comparative analysis.

INTRODUCTION

In modern societies, sports are one of the main elements of an integrally developed person. In the current living and working conditions, sports are a very important field in which people can, above all, in a specific way, show their creative, motoric skills etc. Sports represent a very complex activity, and their structure is composed from 3 sports subsystems: competition sports, amateur sports, University sports, schools sports, sports for all, sports for people with disabilities, etc.

Having in mind the importance of sports, the Student sport Federation of Montenegro, in cooperation with the local and national institutions, try to create conditions for a better involvement of students in sports activities and also improve the overall sports in the country. The state, position and development of University sports in Montenegro is closely connected with the general state in the country in various areas: socio-economic, politics etc.

The activities of sports Universities in Montenegro are mostly done via the Students' sports Federation of Montenegro, which organizes various competitions for this population. One part of the activities is done via sports clubs on faculties, which allow their students to improve their personality, together with the educational part at the faculty, through socializing and sport. The main goal of the paper is to compare the students' level awareness regarding University sports in Montenegro and Serbia through a comparative data analysis.

THE METHODS AND RESULTS

The main tool used for collecting data for this paper is a filled out survey among students of same age structure, in Serbia and Montenegro. In order to obtain the data that can be compared, we used the same questions in both countries. For the purpose of data processing, in this paper we used SPSS software package, and we got the main results by comparing the percentages between the two countries. Apart from this, we have conducted a desk survey in Montenegro, to obtain the real picture of the University sports in Montenegro through official data.

The main goal of the paper is to create a comparative data analysis regarding the students' awareness of University sports in Montenegro and Serbia, and also provide recommendations for further creation of policies with the purpose of improving the current state and making University sports, in both countries, better. The sample consisted of 120 students, from 3 Universities in Montenegro, and 150 students from 3 Universities in Serbia. Having in mind the differences in the size of the countries and the number of students, a small difference in the sample is not important.

UNIVERSITY SPORTS IN MONTENEGRO

University sports in Montenegro have reached a growth in the past few years. It is clear that various stakeholders recognized the importance of the sports and, it is obvious that now there are a lot of efforts for improvement of this, very important, segment of society.

The Students sports federation, as a leader and implementer of various activities and an organizer of the biggest number of sports events for students in Montenegro, recognizes the importance of organizing national sports events for students in Montenegro, with the goal to improve the position of our sports players at the international sports events.

It is clear that the Students sports Federation of Montenegro has, as a very young organization, done huge efforts to improve its own capacities and the employees' organization skills in the period after recognizing Montenegro's independence, with the purpose of a better and more professional work with students, and people engaged in sports activities, who represent the future of Montenegrin sport. The fact that the number of students participating in the sports events is increasing year after year deserves praise. So, it can be concluded that the Students sports Federation of Montenegro accomplished its goal – a greater affirmation and

involvement of students and other relevant actors in sports activities that are the framework for the overall development of sports in any country. Also, what makes us happy is the data on the increased number of sports included in the contests, which to a significant extent increases the visibility of the contests making them much more attractive for all students in Montenegro.

The field of study conducted among students for the purpose of this paper, significantly confirmed the situation stated in official statistics. Still, according to the students, although it is clear that positive shifts are visible, there is room for additional improvement of University and student sports in Montenegro. The very conclusions students drew and the given recommendations should be the basis for implementing further policies in the area, whereby students themselves should, to a greater extent, act as the creators of these policies, since the organization of these events is intended primarily for the students, i.e. they are the end users of all the implemented activities in this field.

The main problems students recognized in the organization of sports events in Montenegro are :

THE LACK OF SPORTS INFRASTRUCTURE AND FINANCIAL RESOURCES.

These are the two main areas and key problems that influence a lower student participation in all sports events at the faculties. The problems cannot be fixed on the Federal, or faculty levels, but they must become national priorities. The conclusion is clear. Without further investments in sports infrastructure, and bigger investments in sports events, the development process of University sports in Montenegro can be very slow.

Apart from this, some of the following problems are recognized: problems in the Student Sport Federation, faculties, and other institutions in charge of organizing sports competitions work process. Some of the problems are a weak promotion and a very low participation of the visitors at the sports events. All of this influences the lower motivation of students to actively participate in sports events. Some groups, especially women see that the problem occurring at sports events is improper harmonization of the event and the participants' needs.

A comparative analysis of the students' awareness regarding University sports in Montenegro and Serbia

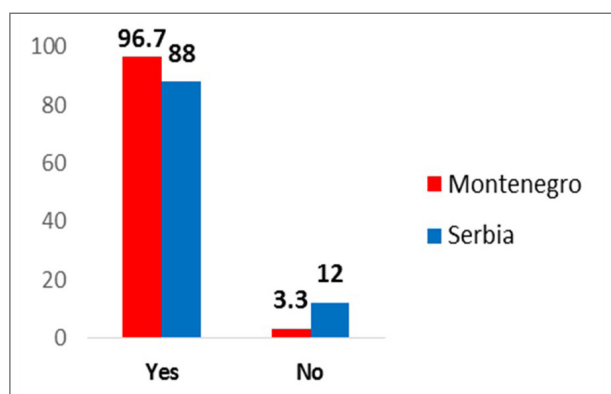
In order to conduct a thorough analysis of the students' awareness regarding University sports,

our methodology includes the use of the same questionnaire in both countries. The data from Serbia, collected and analysed by Ranko Marijanović, PhD, The Faculty of sports management – Belgrade, is used in this paper for the purpose of making a comparative analysis between the two countries.

	Serbia			Montenegro		
	No	Yes	N %	No	Yes	N %
Are you familiar with the existence of University Sports?	18	132	150	4	116	120
	12,0%	88,0%	100%	3.30%	96.70%	100%
Are you satisfied with the work of management that organizes sport activities at your University?	47	103	150	13	107	120
	31,3%	68,7%	100%	11.00%	89.00%	100%
Do you have all the information regarding sports activities at your University?	39	111	150	15	105	120
	26,0%	74,0%	100%	12.10%	87.90%	100%
Do you know when the first University game was held?	126	24	150	13	107	120
	84,0%	16,0%	100%	11.00%	89.00%	100%
Do you know that our country organized some previous University games?	21	129	150	96	24	120
	14,0%	86,0%	100%	80.2%	19.80%	100%
Do you know which international competition was last held in our country?	111	39	150	83	37	120
	74,0%	26,0%	100%	68.90%	31.10%	100%
Do you agree that physical education should be obligatory at the Universities?	28	122	150	26	94	120
	18,7%	81,3%	100%	22%	78%	100%

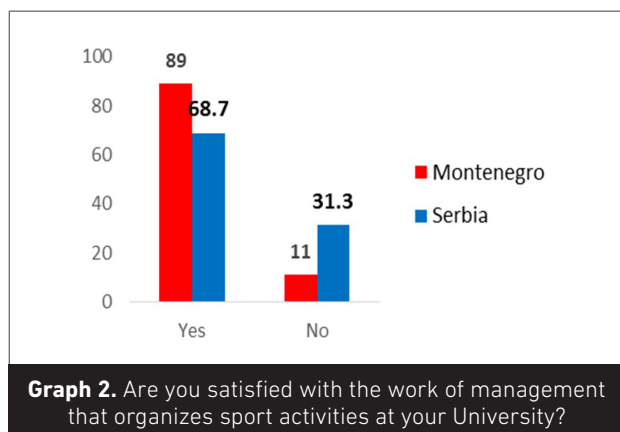
Table 1. Results of the survey interviews

The previous table shows the results of the first part of the questionnaire related to the information regarding University sports in Serbia and Montenegro.

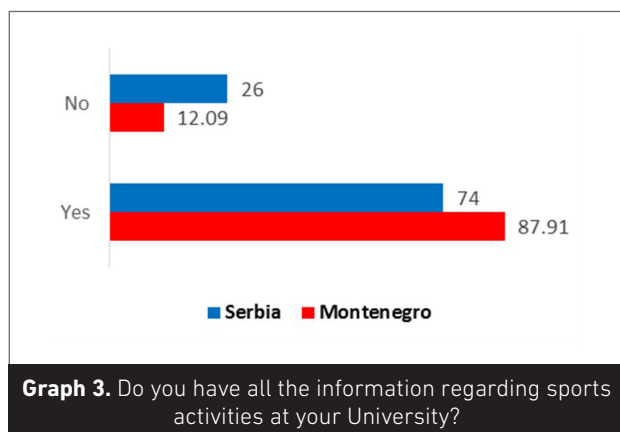


Graph 1. Are you familiar with the existing of Universities sports?

The majority of students had a positive answer when asked: "Are you familiar with the existence of University sports?" There is a slight difference between Montenegro and Serbia, where 96.7% of Montenegro students had a positive answer versus the 88% of positive answers in Serbia. Although this is not a big difference, it is clear that Montenegrin students have a better perception regarding University sports.

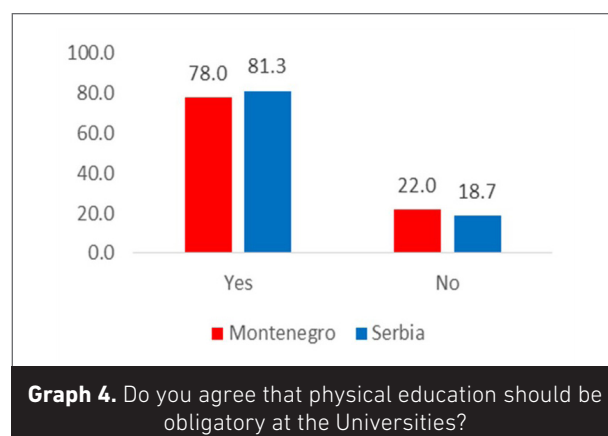


A very important part of the University sports is the organisation of sports activities at the Universities. Based on the received answers, Montenegrin students are much more satisfied with the management that organizes sport activities at the University, than their colleagues in Serbia. Based on that, 89% of Montenegrin students are satisfied with the management that organizes sports activities at the University, compared to only 68.7% in Serbia.



The data for Montenegro show that students are greatly informed about the sports activities at the Universities (87.91%) and this percentage in Serbia is bit lower (74%). Having in mind that, in Serbia, more that ¼ of the students are not informed about sports activities at the Universities, these results are very worrying, because they show that a large part of the student body does not have proper information regarding the sports activities. The University management of both countries should invest more effort in precisely this field. On the other side, the majority of the students, from both countries, provided negative answers to the question: "Do you know when the first University game was held?"

In Montenegro just 11% of respondents know when the first University game was held, and in Serbia this number is slightly higher (16%). The fact that 80.2% of Montenegrin students do not know if Montenegro was the host of some University games is very worrying. In Serbia, the situation is totally different and the data show that 86% of respondents know the answer to this question. Also, a big lack of knowledge regarding the international competitions that were organized in Montenegro is confirmed by the results obtained on the question: "Do you know which international competition was last held in our country?" In Montenegro, 68.9% do not know, and in Serbia, the situation is almost the same with 74% of respondents who do not know answer.

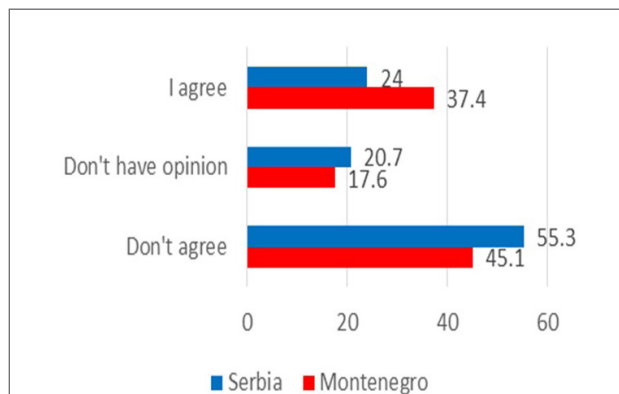


In both countries, the respondents have a positive attitude related to the involvement of physical education as obligatory at the Universities. In Serbia, 81.3% of respondents agreed with this statement and almost the same share of Montenegrin students answered identically (78%). The second part of the survey directly focuses on the students' physical activities in Serbia and Montenegro.

STATMENTS		I don't agree	I don't have opinion	I agree
During the day I often feel pressure	Serbia	83	31	36
		55,3%	20,7%	24,0%
	Montenegro	54	21	45
		45.10%	17.60%	37.40%
At the Faculty, I easily get annoyed	Serbia	96	20	34
		64,0%	13,3%	22,7%
	Montenegro	64	17	39
		53.30%	14.40%	32.20%
Exercises help me to concentrate and learn better	Serbia	11	16	123
		7,3%	10,7%	82,0%
	Montenegro	13	19	88
		11.00%	15.40%	73.60%
I try very hard during the exercise	Serbia	20	20	110
		13,3%	13,3%	73,4%
	Montenegro	21	28	71
		17.60%	23.10%	59.30%
I enjoy stretching exercises the most	Serbia	29	43	78
		19,3	28,7%	52,0%
	Montenegro	29	45	46
		24.20%	37.40%	38.60%
I feel relieved after practicing	Serbia	8	17	125
		5,3%	11,3%	83,3%
	Montenegro	8	21	91
		6.60%	17.60%	75.80%
Students are not so active in sports	Serbia	17	33	100
		11,3%	22,0%	66,7%
	Montenegro	29	25	66
		24.40%	20.90%	54.70%
Students are not so active in sports	Serbia	17	33	100
		11,3%	22,0%	66,7%
	Montenegro	29	25	66
		24.40%	20.90%	54.70%

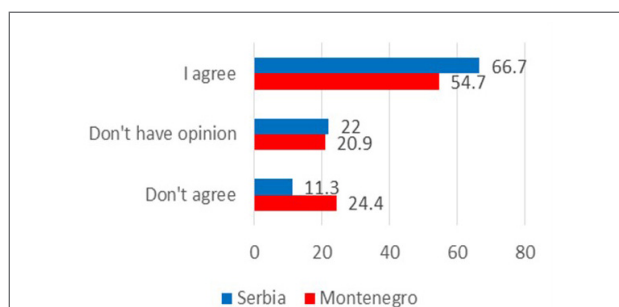
Table 2. The survey results – the second part

The previous table shows the results of the second part of the questionnaire related to physical activities and students' opinion regarding sports activities.



Graph 5. During the day I often feel pressure

Students in Montenegro state that during the day they often feel pressure (37.4%). This share in Serbia is just 24%. This indicates an important difference between the two countries and leaves additional space for the following studies to target this area of student's life in Montenegro and Serbia. Also, the situation is almost the same with the statement: "At the Faculty, I easily get annoyed", where 32.2% of students answered positively and, on the other side, in Serbia that share is just 22.7%. In Montenegro, 11% of students think that exercising does not help them to concentrate and learn better, and the same attitude is seen in 7.3% of respondents from Serbia. On the other side, 82% of Serbian representatives agreed with this statement. The majority of students in Serbia (73%), try very hard during the exercises, and on the other side, this share in Montenegro is on the level of 59.3%. Also, there is a big difference between the students regarding stretching exercises. In Serbia 60% enjoy in these exercises and in Montenegro the situation is completely different, where 38.5% of students enjoy them. From the total number of respondents in Montenegro $\frac{3}{4}$ are relieved after practicing and this share in Serbia is 81%. Also, it is very positive that students from Montenegro and Serbia choose to be active in sport more than: going to solariums, watching TV, series, etc.



Graph 6. Students are not so active in sports

The last question in the survey opens a large area for discussion in both countries. 66.7% of students in Serbia and 54.7% in Montenegro think that students are not so active in sports activities. This data not only leave a huge space for further development of University sports in both countries, but also leave a huge space for improvement of each aspect of sports activities in Serbia and Montenegro.

It is clear that the survey showed there is no proper involvement of students in sports activities at the Universities. The main goal of all the actors in a country should be to jointly make efforts in order to contribute to the improvement of the students' participation in sports activities at the Universities.

In the survey regarding the motives for recreational sports activities, students had a possibility to choose and mark the 7 motives based on their importance. The main goal of this part was to see if there are differences between the two countries and to create a list of motives that are a dominant reason for the students to be active in sport. The results were almost the same in both countries.

In Montenegro, the most dominant motives for doing the sports activities are:

1. Socializing;
2. Health;
3. Relaxation;
4. Fun;
5. Life style;
6. Beauty;
7. Being overweight.

In Serbia, the situation is almost the same, and the list of motives is as follows:

1. Health;
2. Socializing;
3. Fun;
4. Relaxation;
5. Life style;
6. Beauty;
7. Being overweight.

In the end, it is very positive that students from both countries recognized the right reasons for doing sports. So, based on the results, health and socializing are at the top of the priorities in both countries, while beauty and being overweight is at the end of the list.

CONCLUSION

As we previously stated, the paper had a goal to show the students awareness regarding University sports, and to show if there are some differences between their opinions in Montenegro and Serbia.

Some previous surveys showed that the students see a possibility for the development of University sports in Montenegro and Serbia.

The opinions of Montenegrin, and students from Serbia are almost the same with the very small variation from topic to topic. The joint conclusion is that, in general, the students from both countries have a good level of awareness regarding the University sports, but they still miss the proper information regarding the sports events organized at the national local, and faculty levels. Also, there are big differences between the students' feelings regarding pressure at the Faculty. The level of Montenegrin students who feel pressure is much higher than the level of students in Serbia.

A desk survey showed that the relevant stakeholders have an obligation to make an additional effort, on the local and national levels, as a way of strengthening the students' sports in Serbia and Montenegro. It is necessary to provide additional financial resources and organize a larger number

of events which will create a better connection and a higher motivation of the students to participate in sports events. With all of this, we will improve competitiveness of the Montenegrin, and students from Serbia, and we will also improve their results at the international competitions.

The results of the survey showed that, apart from the fact that there is good knowledge regarding University sports, it is clear that students do not have all the necessary and accurate information regarding events and competitions organized in the country, on the national and local levels, so there is further space for improving the management of sports activities at the Universities, and also the students have a clear attitude towards making physical education obligatory at the Faculties in both countries.

In the end, it is clear that this is not a short process, and it should be improved year after year, but with the active participation of all the relevant stakeholders, this process could be empowered. As a small country, in the past, Montenegro showed that it has brilliant individuals in sports, and if we want to continue with this practice we all need to create a state which will be appropriate for a sustainable development of young people in sports.

REFERENCES

1. Nešić, M. and Kuburović, D. (2011). Attitudes of students regarding Universities sports. In Bunčić, V. (Ed.), 4. International interdisciplinary expert-scientific conference 'Educational and sporting horizons' (page.128-136). Subotica: Collection of works
2. Nićin, Đ., Lolić, V., Lolić, D. i Srdić, V. (2009). Sports activities of students - need, desire or necessity today. U Bjelica, D. (Ed.) Sport mont, Podgorica, 2009, VI (18,19,20), page. 64-69.
3. Marijanović, R. (2014). Informing students about university sport. Gazette of for social sciences, 2014 (6), 205-224.
4. Mitić, D. (1992). Comparative analysis of the motivation for engaging in sports and recreational activities among students and female students of Belgrade University, Annual paper FFK, Beograd, (4),157- 166.
5. Ostojić, S., Stojanović, M., Veljović, D., Stojanović, M. D., Međedović, B., Ahmetović, Z. (2009). Physical Activity and Health. TIMS Acta, Vol.3, 1-13.
6. Radoš, J., Nešić, M. (2010). Sport at the university as a realization of the idea of kalokagathia. Business economy, Sremska Kamenica, IV (1),149-159.
7. Tatar, N. (2013). Physical activity during leisure time of young people in Montenegro. Sport mont, 2013, br. 37, 38, 39, page. 241-246.

KOMPARATIVNA ANALIZA INFORMIRANOSTI STUDENATA SRBIJE I CRNE GORE O UNIVERZITETSKOM SPORTU

Ovaj rad obuhvata detaljnu analizu informisanosti studenata o Univerzitetkom sportu u Crnoj Gori i Srbiji kao i studentskog sporta u Crnoj Gori, glavnim problemima te načinima za poboljšanje. Cilj rada je da prikaže trenutno stanje, kroz rezultate istraživanja da prikaže stavove studenata, njihovu informisanost o samom Univerzitetkom sportu te razlozima za njihovo bavljenje. Takođe, rad nudi veliki broj preporuka u cilju daljeg unapređenja studentskog sporta u Crnoj Gori, te boljoj integraciji svih studenata u sam proces organizacije sportskih događaja. Metodološki pristup rada je uključio desk istraživanje, analizu relevantnih strategija na nacionalnom nivou, te anketiranje studenata upitnicima iz ove oblasti kao i komparativnu analizu dobijenih odgovora, na isti upitnik, studenata iz Crne Gore i Srbije. Generalno, istraživanje je pokazalo da se stvari u studentskom sportu u posljednjih nekoliko godina pomjeraju na bolje, ali da i dalje postoji veliki broj problema koji moraju zajedničkim snagama svih aktera u najkraćem periodu biti riješeni. Ključne riječi: Sportski savezi, motivisanost studenata, sport i takmičenja, nedostaci, nadležne institucije, komparativna analiza.

Received: November 20, 2016 / Accepted: December 01, 2016

Correspondence to: Nela Tatar, University Donja Gorica, Podgorica, Montenegro

E-mail: nela.tat@t-com.me

THE DIFFERENCES BETWEEN PARTICULAR ANTHROPOLOGICAL CHARACTERISTICS OF FOOTBALL PLAYERS FROM DIFFERENT COMPETITION LEVELS

Miroslav Smajić¹, Branko Đukić², Senida Saldum³

1 Faculty of Sport and Physical Education University of Novi Sad, Serbia

2 Regional Institute of Sport and Sports Medicine, Novi Sad, Serbia

3 Faculty of Education, University of Travnik, Bosnia and Herzegovina

Physical preparation of players is one of the key prerequisites of a successful engagement in football. In order to fulfil high demands of a contemporary football game, in terms of particular morphological characteristics, motor and functional skills, it is necessary to conduct a proper training process in the form of a successful development of prominent characteristics in football. The aim of this paper is to determine the differences between certain anthropological characteristics of football players at different competition levels. The research is performed with senior football players playing for the clubs engaged in the Super Football League of Serbia (top rank) and the Serbian league of Serbia (third rank). For the determination of differences between the maximum oxygen consumption and the variables that describe particular morphological characteristics of football players (body height and body mass), a t-test is applied for independent groups. The findings indicate that there are statistically significant differences in the maximum oxygen consumption between football players of the first and the third competition rank, that are expressed in absolute and relative values ($p=0.00$). However, these differences are expected due to the fact that skills and abilities of the Super League of Serbia football players are higher than those of the lower-ranked competition players. The differences between the measured morphological characteristics are not found.

Key words: aerobic capacity, maximum oxygen consumption, body height, body mass, football players.

INTRODUCTION

One of the key preconditions for successful football playing is the physical fitness of players. In order for certain morphological characteristics, motor and functional capabilities to provide an answer to large demands of modern football game, it is necessary to implement an adequate training process in the function of the dominant characteristics of successful development in football. Good understanding of anthropological characteristics of athletes who achieve superior results can be a landmark and a guide in which direction the selection and training process should be directed. Different sports disciplines determine the development of different anthropological characteristics, so the standards for each sport should be defined. Anthropological characteristics are subject to weather changes, which is why standards have time restrictions. Practice has shown, as well as many authors in their research, that the morphological characteristics of athletes may affect the performance in achieving sports results (Popović et al, 2009).

The basic prerequisite for the successful implementation of the sports training transformation process is the use of an initial diagnosis of the athletes' condition, i.e. the current state of the athletes at the beginning of the training preparation. Within the morphological diagnosis, anthropometric measures are used in the selection of athletes, and special attention is drawn to body height, which is heavily influenced by hereditary factors.

On the contrary, in the evaluation of the training process, special attention is drawn to those morphological characteristics that are influenced by external factors (diet and training), and can be adjusted to the optimal values. These are the skinfold thickness, weight, and scopes of limb segments and trunk (Malacko, Rado, 2004). Functional diagnostics in sports covers a wide area of general functional abilities, registration in routine laboratory sports and medical practice, through a deeper insight into specific physiological and biochemical processes to research and measure a sports field, in situational conditions (Sudarov, Fratrić, 2010, Malacko, Doder, 2008).

Based on the available studies dealing with diagnostics of power capacity, and aerobic and anaerobic capacity of athletes, we note that standardized test protocols are generally used. The tests that diagnose energy capacity can be divided into laboratory and field tests, specific and non-specific tests, tests with fixed and progressive load, continuous and discontinuous tests. Aerobic capacity is an essential component in most sports. It is necessary for football players who want to actively, i.e. professionally play football, and the coaches who train them. All the participants in the sport, the coach, the players, the sports physicians, and the fitness trainers should be equally interested in tracking the progress in terms of better motor skills, including the aerobic capacity that is essential for this sport. Aerobic capacity is the ability of an organism to, by aerobic metabolic processes (oxidative degradation of carbohydrates and free fatty acids), generate the energy needed for physical work. It depends on the functional capability of all organic and metabolic systems involved in the transport and energy transformation of oxygen: diffuse lung capacity, transport capacity of blood for oxygen, cardiac output, functional capacity of muscles for energy in the presence of oxygen and the size of the total muscle mass. The value of maximum oxygen consumption ($\text{VO}_{2\text{max}}$) determines the "maximum aerobic capacity," because it represents the quantity of oxygen consumed by the body for energy production during an operation of maximum intensity. (Živanić et al, 1999).

Maximum oxygen consumption is the maximum amount of oxygen a person can take from the inhaled air during dynamic physical activity that engages large muscle groups. The economy of running represents oxygen debt at a submaximal intensity exercise and can vary more than 20% in athletes with the approximate value of $\text{VO}_{2\text{max}}$ (Wagner, 1996).

Football is characterized by a continuous stream of activities with varying game intensity and a very low coefficient of performance, when viewed in terms of scored goals and the time spent in the field, as well as of individuals in possession of the ball. A football player covers about 10 km during a game (Mayhew, & Wenger, 1985; Reilly, Clarus, & Stibbe, 1993). Maximum oxygen consumption $\text{VO}_{2\text{max}}$ is represented in the highest percentage of the total motion actions, followed by walking and intensive running, and then sprint. By the nature of the game it corresponds to aerobic needs of about 80% of maximum oxygen consumption (Reilly, Clarus, & Stibbe, 1993; Helgerud, Engen, & Wisløff, 2001). The research results of the world's football players from different leagues indicate significant differences in maximum oxygen consumption. Thus, some researchers measured 53.8 ml/kg/min, questioning 248 players from the Mexican first league. They also stressed the need to improve these results, if they wanted to achieve better results at the international level (Diaz et al, 2003).

However, significantly higher values were recorded during other tests of the players' functional abilities. Some researchers, while questioning two teams of the Norwegian professional league, got the results of 60 ml/kg/min (Wisløff et al, 1998), some recorded 66.4 ml/kg/min in the Spanish first league players (Casajús, 2001), while some authors obtained the data of 64.3 ml/kg/min, also in the Norwegian professionals (Helgerud et al, 2001). Good aerobic capacity undoubtedly affects the performance of the explosive motion action during a football game, both in terms of quantity (number of sprints per game) and quality (without slowing down). Researches show that, especially in football, good aerobic capacity of the organism is one of the most important preconditions for achieving top results (Reilly, Clarus & Stibbe, 1993). Energy needs of the body in football vary, and to a large extent depend on the rank of the competition, the position in the team, game model, training cycle stage, age (Reilly, Bangsbo & Franks, 2000). Such requirements include excellent physical preparation of the players on the field, in all ages of life, which could be the reason for minor differences in aerobic capacity in relation to the position in the team. It is known that aerobic capacity depends on three important factors: $\text{VO}_{2\text{max}}$, anaerobic threshold and economy of operation, i.e. running economy (Pate & Kriska, 1984).

PROBLEM AND AIM OF THE STUDY

The problem of this study is the maximum oxygen consumption as the main indicator of aerobic capacity, as well as the players' body height and body mass at different levels of competition.

The aim of this study was to determine the differences in some anthropological characteristics of football players at different levels of competition.

METHODS

Testing and measuring of functional abilities and some morphological characteristics were conducted on the total sample of 60 senior age players, divided into two groups based on the level of competition.

The first group consisted of 32 players who play in the Serbia Super League (first level), and have an average age 20.91 ± 3.59 SD, and 28 players who play in the Serbian league of Serbia (third level), and have an average age 22.71 ± 4.49 SD.

Athletes were tested in a diagnostic centre of the Regional Institute for Sport and Sports Medicine in Novi Sad. The respondents' body height (cm) was measured by an anthropometer (SECA), with the accuracy of 0.1 cm, while their body weight (kg) was measured by digital scales (Omron HN-288, Netherlands) with the accuracy of 100 gr. Ventilation parameters were measured by a progressive exercise test on a treadmill with an increasing load at every minute through the "breath-by-breath" gas analyser (Quark PFT ErgoCPET, Cosmed, Italy).

The tests were performed under the same

environmental conditions (air temperature 18–22 °C, humidity <70%). The test protocol began with the reading of monitored values at rest for one minute, after which the tread was moved at the speed of 5km/h for the next 2 minutes to warmup the respondents. At the speed of 7 km/h, the respondents began running, while the tread progressively accelerated by 1 km/h every minute. The test ended with the athletes refraining from further running. The inclination of the tread throughout the test was at 2% because of the running economy and air resistance simulation.

Data analysis was conducted using descriptive statistics to calculate the basic descriptive statistics of functional and morphological variables. A t-test for independent samples was used to determine statistically significant differences between the measured variables of the respondents.

RESULTS

A descriptive statistics analysis (Table 1) of the observed anthropological variables, indicates the homogeneity of both groups of athletes. The tested players expressed homogeneity in both variables for the estimation of oxygen consumption, while the third level players showed a greater result variability in the absolute maximum oxygen consumption (VO2max) variable. The values of the asymmetry (Sk-skjunis) and the curvature coefficients (Kurt-kurtosis) indicate that the distribution of the analysed variables does not deviate significantly from the normal distribution. Shapiro-Wilk test values indicated the normality of all the analysed variables (SWp>0.05) distribution.

Variable	Competition level	N	MIN	MAX	AM	S	Sk	Kurt	CV(%)	SWp
Body height (BH)	first	32	164.0	194.6	181.19	7.69	-0.42	-0.19	4.24	0.61
	third	28	173.0	195.6	182.49	5.85	0.63	-0.19	3.21	0.16
Body weight (BW)	first	32	55.8	87.2	76.49	6.66	-0.99	1.95	8.71	0.09
	third	28	61.0	89.8	77.73	7.25	0.44	0.86	9.33	0.83
VO2 max (ml/kg/ min)	first	32	49.32	65.48	58.40	3.91	-0.21	-0.22	6.70	0.47
	third	28	37.63	58.39	47.86	6.20	0.27	-0.74	12.95	0.16
VO2max (l/min)	first	32	3.21	5.11	4.46	0.48	-0.53	0.05	10.76	0.16
	third	28	2.41	4.85	3.77	0.58	-0.03	-0.18	15.38	0.59

Legend: N-number of entities in the research, MIN-minimum values of the measurement results, MAX-maximum values, AM-arithmetic mean, S-standard deviation, Sk-asymmetry coefficient, Kurt-curvature coefficient, CV-variation coefficient, SWp-the level of statistical significance of the Shapiro Wilk coefficient

Table 1. Descriptive statistics of the football players' certain anthropological characteristics at different competition levels

Based on the results obtained by using a t-test for independent groups (Table 2), one can observe statistically significant differences in two of the four analysed variables: absolute maximum oxygen consumption and relative maximum oxygen

consumption in favour of the players who compete in the higher competition level, while statistically significant differences were observed in the variables of body height and body weight.

Variable	Competition level	Difference AM	t	p
Body height (BH)	first third	-1.30	0.88	0.38
Body weight (BW)	first third	-1.24	0.72	0.47
VO2 max (ml/kg/min)	first third	10.54	-7.75	0.00
VO2 max (l/min)	first third	0.69	-5.03	0.00

Legend: AM - arithmetic mean, t - t-test value, p - level of statistical significance of t-test

DISCUSSION

During football games, the total distance covered by players, depending on the position, is 9-14 km, with an average labour rate of about 75% of VO₂max, while players must have a well-developed ability to perform high-intensity activities (Bangsbo, 1992). Football players run across longer distances, since the field is bigger, they perform a rapid change of direction during manoeuvring (Ostojić, 2000 Sporiš et al, 2009). There is a large number of studies that dealt with the assessment of the football players' aerobic capacity. This study confirmed the results of previously carried out researches, which dealt with the comparison of parameters that describe the football players' aerobic capacity, and that the values of aerobic capacity are higher in players from more qualitative clubs. A better aerobic fitness of players points out that the players are physically ready to perform at a higher level. It is certain that the features and capabilities necessary in football are more developed in players who play at the highest level of competition in relation to players who play in the third level, for a simple reason that the game is faster, more dynamic, more demanding than football games in a lower league. Thus, the study of the Croatian players' positions in a team (Sporiš et al, 2009) concluded that the midfielders have the best values of maximum oxygen consumption, from 62.3 to 63.1 ml/kg/min and they are better compared to attackers and defenders, which is to be expected given that these players during the game run across the highest distances. The previous studies of functional abilities in team sports reported that, in elite players from Serbia, the

maximum oxygen consumption is 53.5±8.6 ml/kg/min, while these values range from 42.9±6.66 ml/kg/min in lower league players (Ostojić, 2000). The obtained values of VO₂max in the third level football players from Serbia (47.86±6.206 ml/kg/min) were much higher than the values of the lower league players from Serbia (42.9±6.66 ml/kg/min), but also markedly lower than the values of Serbian top (53.5±8.66 ml/kg/min) and Croatian players (range 50.3-65.36 ml/kg/min) at different positions (Ostojić, 2000; Sporiš et al, 2009). The obtained values of VO₂max in higher level football players (58.40±3.916 ml/kg/min) are a little higher than in Serbian and Croatian players, but they are considerably lower than the Norwegian first league players (60.6 ml/kg/min) and the Spanish players (64.36 ml/kg/min). Examining the differences in age, body composition, body height and body weight, it is noticed that the whole system of compared parameters contains a statistically significant difference among players at different levels of competition - representative, national and recreational level (Popović et al, 2010). Comparing two generations of players in relation to their morphological characteristics, it was found that they were in a statistical sense uniform (body height, weight, ideal body weight, muscular component of the players), while the fat component revealed, as a determinant of differentiating them in such a way, that the first group of players showed a significantly lower percentage of the fat component compared to other groups of players (Tomić et al, 2012). The conducted research reported that, among the

first and the third-tier competition players, there was no statistically significant difference in body height and body weight, i.e. the results showed that the third level players had a higher body height and weight (182.49cm, 77.73kg) than the first level players (181.19cm,76.49kg).

CONCLUSION

The results of this study indicate the existence of statistically significant differences in maximal oxygen consumption $\text{VO}_{2\text{max}}$, the basic parameters of aerobic capacity among the players of the first level ($58.40 \pm 3.916 \text{ ml/kg/min}$) and the third level players ($47.86 \pm 6.206 \text{ ml/kg/min}$). The results indicate that more qualitative players perform in clubs of a higher competition level. It can be concluded that the players of the first competition level underwent the training process, which in intensity and volume was bigger than the one for the third level players, in order to improve their functional ability and thus answer the demands placed before the

premiere league football players. In addition to the morphological characteristics, motor and functional abilities of football players for successful playing of football, technical and tactical preparedness of the players is also important. The exact insight into the load structure during a football match and the aerobic capacity of each individual is an essential prerequisite for the realization of the training process, i.e. the proper dosage and customization capabilities of players.

REFERENCES

1. Bangsbo, J., & Lindquist, F. (1992). Comparison of Various Exercise Tests with Endurance Performance during Soccer in Professional Players. *International Journal of Sports Medicine*, 13(02), 125-132.
2. Casajus, J.A. (2001). Seasonal variation in fitness variables in professional soccer players. *Journal of Sports Medicine and Physical Fitness*, 41(4), 463-469.
3. Díaz, F.J., Montaña, J.G., Melchor, M.T., García, M.R., Guerrero, J.H., Rivera, A.E., Tovar, J.A., Moreno, M.F. (2003). Changes of physical and functional characteristics in soccer players. *Revista de Investigacion Clinica*, 55(5), 528-534.
4. Helgerud, J., Engen, L.C. & Wisloff, U. (2001). Aerobic endurance training improves soccer performance. *Medicine and Science in Sports and Exercise*, 33, 1925-1931
5. Malacko, J., Rado, I. (2004). *Technology of sport and sports training (Tehnologija sporta i sportskog treninga)*. Sarajevo: Fakultet sporta i tjelesnog odgoja.
6. Mayhew, S.R. & Wenger, H.A. (1985). Time-Motion Analysis of Professional Soccer. *Journal of Human Movement Studies*, 11, 49-52.
7. Ostojić, S. M. (2000). Physical and physiological characteristics of elite Serbian soccer players. *Facta universitatis-series: Physical Education and Sport*, 1(7), 23-29.
8. Pate, R. R. & Kriska, A. (1984). Physiological basis of the sex difference in cardiorespiratory endurance. *Sports Medicine*, 1, 87-98.
9. Popović, S., Mašanović, B., Molnar, S., Smajić, M. (2009). Determination of body composition of top football players (Determinisanost kompozicije tela vrhunskih fudbalera), *Teme*, 4, 1535-1549.
10. Popović, S., Smajić, M., Joksimović, A., Mašanović, B. (2010). The differences in body composition between football players of different rank competitions (Razlike u telesnoj kompoziciji fudbalera različitog ranga takmičenja), *Sport Mont*, 23-24, 362-367.
11. Reilly, T., Clarus, J. & Stibbe, A. (1993). *Science and Football II*. New York: E & FN Spon.
12. Sporiš, G., Jukic, I., Ostojic, S. M., & Milanovic, D. (2009). Fitness profiling in soccer: physical and physiologic characteristics of elite players. *The Journal of Strength & Conditioning Research*, 23(7), 1947-1953.
13. Sudarov, N., Fratrić, F. (2010). *Diagnostics of athletes training level (Dijagnostika treniranosti sportista)*. Novi Sad: Pokrajinski zavod za sport.
14. Tomić, B., Smajić, M., Jakonić, D., Vasić, G. (2012). Comparative analysis of morphological characteristics of two generations of football players (Komparativna analiza morfoloških karakteristika dve generacije fudbalera). *Glasnik antropološkog društva Srbije*, 47, 119-123.
15. Wagner, P. D. (1996). Determinants of maximal oxygen transport and utilization. *Annual Review of Physiology*, 58, 21-50.
16. Živanić, S., Životić-Vanović, M., Mijić, R., Dragojević, R. (1999). Aerobic capacity and its assessment Astrand exercise test on a bicycle-ergometer (Aerobna sposobnost i njena procena Astrandovim testom opterećenja na bicikl-ergometru). Beograd: Udruženje za medicinu sporta Srbije.

RAZLIKE U NEKIM ANTROPOLOŠKIM KARAKTERISTIKAMA FUDBALERA RAZLIČITOG RANGA TAKMIČENJA

Jedan od ključnih preduslova za uspešno bavljenje fudbalom je fizička pripremljenost igrača. Da bi obredene morfološke karakteristike, motoričke i funkcionalne sposobnosti dale odgovor velikim zahtevima koje postavlja savremena fudbalska igra potrebno je sprovesti i adekvatan trenažni proces u funkciji uspešnog razvoja dominantnih svojstava u fudbalu. Cilj ovog istraživanja je bilo utvrđivanje razlika u nekim antropološkim karakteristikama fudbalera različitog ranga takmičenja. Istraživanje je sprovedeno na fudbalerima seniorskog uzrasta koji nastupaju u klubovima koji se takmiče u Super ligi Srbije (najviši rang) i Srpskoj ligi Srbije (treći rang). Za potrebe utvrđivanja razlika u maksimalnoj potrošnji kiseonika i varijablama koje opisuju pojedine morfološke karakteristike fudbalera (telesna visina i telesna masa), korišćen je t-test za nezavisne grupe. Rezultati istraživanja su ukazali na postojanje statistički značajnih razlika u maksimalnoj potrošnji kiseonika izraženim u relativnim i apsolutnim vrednostima ($p=0,00$) između fudalera prvog i trećeg ranga takmičenja, što je i za očekivati da su sposobnosti i umeća fudbalera u Super ligi Srbije u odnosu na sportiste u nižem rangu takmičenja na višem nivou. Razlike u izmerenim morfološkim karakteristikama nisu uočene. Ključne reči: aerobne sposobnosti, maksimalna potrošnja kiseonika, telesna visina, telesna masa, fudbaleri.

Received: November 04, 2016 / Accepted: December 01, 2016

Correspondence to: Miroslav Smajić, Faculty of Sport and Physical Education University of Novi Sad, Serbia

E-mail: miroslav.smajic@gmail.com

THE INITIAL DISCUSSION ON SOCIAL MEDIA AND SPORTS RELATIONSHIP NATURE

Marko Begović¹, Damir Ahmić², Ivana Parčina³

¹ German Sport University, Germany

² Faculty of Education, University of Travnik, Bosnia and Herzegovina

³ Faculty of Management in Sport, Alfa University, Belgrade, Serbia

To keep, maintain, and enhance relationships, sports stakeholders need to communicate and engage in dialogue with consumers (current and the potential ones). Social media, from the beginning, has grown exponentially. The purpose of this paper is to establish an adequate academic basis for in-depth research regarding the position and range of social media within the Sports Movement with a brief review of the Montenegrin Olympic Movement. Sports is seen as a vital part of Montenegrin identity and brand. In particular, the Montenegrin Olympic Committee is, by the Law on Sports and by the general population perception, considered the main sports actor in Montenegro, gathering as a "supra-federation" of all the National Sport Federations as constituents of the MOC. As derived from the Olympic Charter and the competent national legislation, the role of the NOC is to promote Olympic values and, through a four year long strategy, prepare teams/individuals to represent their country during competitions based on IOC program.

Key words: Social media, relationship, sport.

THE DEVELOPMENT OF SOCIAL MEDIA

As a kind of technological revolution, new media represents a way of transmitting information/culture as a computer based method of communication (Kotler & Armstrong, 2010, p. 528). The internet is the first media tool that meets consumer needs representing a combination of traditional media tools (TV and newspaper) (Zugic & Raicevic, 2013, p.388). Rakita divided the main characteristics of internet as a global, interactive, uncensored, multipurpose and dynamic media tool (Rakita, 2003, pp. 477-79). Social media is a group of internet applications founded on ideological and technological basis of Web 2.0 enabling a two-way user exchange (Kaplan & Haenlein, 2010, pp. 59-68). Web 2.0 technologies are based on application types into these five categories: blogs, social networks, content communities, forums and bulletin boards, and content aggregators (Constantinides & Fountain, 2008, pp. 231-244).

With these constellations, users utilize a whole range of various information, toolkits, in order to implement the process of educating recipients about their products, services, brands, individuals and challenges (Mangold & Faulds, 2009, pp. 357-365). In accordance with the above mentioned approach, consumer users likewise started to produce content (Solis, 2010). In less than 3 years, social media became the most popular activity on the web (Qualman, 2009). About 55% of the users' ages between 12 and 17 have created profiles on social network sites with increases up to 64% in

the age between 15 and 17 (Boyd, 2007, p.3). Social network sites allow individuals to construct a profile within a bounded system, to articulate a list of other users with whom they share a connection and view/traverse their list of connections and those made by others within the system (Boyd & Ellison, 2007, p.2). On the one hand, the root of the networking process is based on the global economic crisis, development of free oriented social movement and development of communication technologies (Castells, 2005). On the other hand, van Dijk defines the network society as a social formation with social and media networks infrastructure (Dijk, 2006).

LITERATURE REVIEW

Many types of businesses today are increasingly engaging in new media with the aim of delivering their products and services competitively, including sports organization (Askool & Nakata, 2011, pp. 205-220). New media gives opportunities for the creative viral marketing campaigns to build awareness about companies and brands (Terence, 2008). It seems that companies such as Coca-Cola, Apple or Google greatly understood the possibilities that the new media constantly offers. Social-networking sites represent a unique and engaging communication tool that can be used by companies to disseminate unfiltered messages to mass audiences and specific target markets (Pegoraro, 2010, pp. 501-514). To establish, maintain, and enhance relationships with its customers, any business needs to communicate and engage in a dialogue with them, including sport organizations (Grönroos, 2004, 99-113). Researchers defined social media as a web-based application that enables users to create and easily transmit content in different forms (words, pictures, videos, audios) (Safko & Brake, 2009). The concept of social media is to foster participation, collaboration and community engagement (Meraz, 2009, p.682). Social media enable sports organizations to foster closeness with fans through interactive marketing and promotional activities (Williams & Chinn, 2010, pp. 422-437). The orientation of this paper is to briefly review how Montenegrin Olympic Movement utilizes social media for enabling conditions for the sports to be an activity of public interest. Within the Law on Sports, sports is defined as an activity of public interest derived from constitutional ius cogens provision. Montenegrin Olympic Committee is recognized, as the key implementing organization for activities of public interest through sports. The promotion of Olympic values through OVEP, high performance development and the athlete's preparation for Olympic Games, sport for development, talent identification development, anti-doping, and good governance system, are considered as core activities of the Montenegrin Olympic Committee (London 2012 Strategy, Montenegrin

version).

The relation marketing theories provide a necessary insight on the possible role of social media within field of sports, from a structural/organizational point. Grönroos defines relationship marketing as a process of identifying and establishing, maintaining and enhancing, and when necessary, also terminating relationships with customers and other stakeholders, at a profit, so that the objectives of all parties are met; and this is done by a mutual exchange and fulfilment of promises (Grönroos, 2004, pp.99-113). An obstacle lies in the fact that there had not been many studies regarding relationship marketing in the sports sector (Stavros & Westberg, 2009, pp.307-320), but the existing ones have showed that sports organizations could benefit from relationship marketing (Lapio & Speter, 2000, pp. 85-95). Sports participants (organizations, athletes, companies, viewers) have relationships, with one another, that depend on their successful management (Bee & Kahle, 2006, pp. 102-110). Web 2.0 existing technologies for sports stakeholders provides more effective ways to implement strategies, where social media provide one way to meet relationship marketing goals (Williams & Chinn, 2010, pp. 422-437).

SOCIAL MEDIA MADE POSSIBLE FOR SPORTS STAKEHOLDERS TO GET AND STAY IN TOUCH WITH USERS

(read: customers) in a direct way and to engage in dialogue (Ioakimidis, 2010, pp. 271-282), forcing them to look/think outside the box (Hennig-Thurau et al., 2010, pp.311-330). Taking into account the whole range of benefits, the sports movement is seeking to profit from linking their goals with social media (Coyle, 2010). Non-sporting organizations are increasingly focusing their marketing efforts beyond creating a single exchange to building long-term relationships with their customers (Kotler, 2011). Integrated marketing communications go to total communications, then to international communications and develop to a globally integrated marketing communication through new social media and other concepts of communication (Zugic & Janicic, 2013, p.79). Many companies nowadays develop strategies for globally integrated marketing communications (Larry, 2008). Lastly, not many studies have addressed issues related to sports organizations from a relational perspective (Harvery, Lévesque & Donnelly, 2007, pp. 206-223). Traditionally, sports organizations have had difficulty maintaining contacts and interacting on an ongoing basis with their customers (Rein, Kotler & Shields, 2006).

MONTENEGRIN OLYMPIC MOVEMENT AND SOCIAL MEDIA

Before getting into a discussion on sports, we have to mention a study regarding the use of computers in Montenegro that shows 53.2% of the population between 16 and 74 years of age are active users. 49% of them use internet in general, while 76.6% use it on a regular (every-day) basis (The Statistical Institute 2011). Based on the research "The Media and new technologies", conducted by Ipsos Strategic Marketing, internet users are mostly oriented on using social media sites (59%), web search (54%), reading news (44%) and watching online TV (9%) (Ipsos Strategic Marketing, 2011). From a sporting perspective, the Olympic Games in China are considered as Web 2.0 Olympic Games (Hutchins & Mikosza, 2010, pp.279-297). Until the Games in London and the creation of the Olympic Hub, the use of social media among sports professionals and organizations experienced a boom. Among Montenegrins, only Milivoj Đukić (sailing) was active via the Olympic Hub. On the other hand, only several NSFs (football, handball, basketball and water polo) are active on Facebook, and none of the national umbrella sports organizations are active on Twitter.

Sports plays a very important role in the Montenegrin overall identity, especially in times where the economic crises tremendously increased the gap between classes with negative effects on socialization of the vulnerable populations. With these negative outcomes, sports organizations tended to follow organizational structure of other governmental organizations. In his work, Chifflet defines three different types of organizational cultures of the sports' governing bodies: the association culture of the elected volunteer executives, which is based on the federal values of amateurism and volunteering; the public service culture of public servants, who are formally placed at different levels within the federation (Montenegrin sports organizations tend to follow the public service organizational model because they are predominantly governed/financed from the central state authorities), and the managers' and experts' managerial culture, based on meritocracy, performance and profitability (Chifflet, 1993). The National Sports Federation is responsible for implementing competent sports rules adopted in accordance with the international documents and the Montenegrin Law on Sports (Gazette, 2013). Based on the mentioned law, articles 61 and 62 define the Montenegrin Olympic Committee as the federation of all national sports federations (non-Olympic sports as well). The strategy and action plans depend on the NOC of Montenegro General Assembly comprised by various representatives of the Sports Movement (national sports federation representatives) (www.cokcg.org, 2016). The main mission of the Montenegrin Olympic Committee is promotion of Olympic values

through OVEP, high performance development and the athlete's preparation for Olympic Games, sport for development, talent identification development, and anti-doping, and good governance principles in place. For implementing a sporting strategy, authors stressed the importance of content in new media as a mixture of entertainment, journalism and marketing (a very big portion of it) which promotes consumption ideology (Haverson & Halverson, 2008, pp.286-308). Nevertheless, the goal (read mission) of the IOC and TOP sponsors is to turn the world into a big spectator place, and thus to make a bigger profit (Billings, 2007). Sport and the media must surely be the most potent combination of forces amongst the key factors in the globalization game, having a unique synergy (Davies, 2002). At the national (Montenegrin) level, the majority of MOC and NSF marketing promotion activities is done primarily via TV and daily newspaper (where they have specific coverage of sporting events). Without going into the evaluation of the London 2012 Strategy overall strategic approach quality, for the object of this paper, the document did not adequately treat the approach to media as well as the use of social media as a powerful tool in promoting the strategic framework of the Montenegrin Olympic Committee. Bearing this in mind, it could be stated that the MOC relies primarily on the traditional approach with roots from the state oriented sport system and organizational culture well defined by Chifflet.

CONCLUDING REMARKS

The relationship management theory presupposes that managing "organizational public relationships" around similar interests will ultimately lead to a mutually beneficial interaction between the involved entities (Ledingham, 2003, pp.181-198). Within sports communication, establishing effective relationships between sports stakeholders and consumers is essential. It is necessary to continuously improve this two-way relation in order to prevent it from becoming ineffective. Researches argue that effective marketing and communications strategies are steering away from traditional approaches of promotion, and turning to social media as a dependable source (Mangold & Faulds, 2009, pp.357-365). Therefore, there is a significant increase in the usage of social media within the sports movement on the one hand, and a decline in the involvement of traditional media (TV or newspaper) on the other hand (Rothschild, 2011, pp.139-150). Clearly, with the use of social media, sport stakeholders are more in control over quality of press release, using their influence to promote their activities. Often, they act as a producer of the content for the public (Sanderson & Kassing, 2011, pp.114-127). The Montenegrin Olympic Movement showed a lack of social media involvement, especially in the process of implementing the MOC's strategy/mission. The sports system in Montenegro still remains the same, with a dominant use of traditional media in communication with the audience. Sports stakeholders must understand the consumers' needs for information, and a necessity to clearly frame their messages in order to meet the objectivities and be competitive with respect to the other existing content.

REFERENCES

1. Askool, S., & Nakata, K. (2011). A conceptual model for acceptance of social CRM systems based on a scoping study. *AI & Society*, 26(3). doi:10.1007/s00146-010-0311-5
2. Bee, C., & Kahle, R. (2006). Relationship marketing in sports: A functional approach. *Sport Marketing Quarterly*, 15(2).
3. Billings, A. (2007). *Olympic media: Inside the biggest show on television*. New York: Routledge.
4. Boyd, D. (2007). "Why youth (heart) social network sites: The role of Networked Publics in Teenage Social Life." *MacArthur Foundation Series on Digital Learning- Youth, Identity, and Digital Media Volume* (ed. David Buckingham). Cambridge, MA: MIT Press.
5. Boyd, D., Ellison, N. (2007). Social Network Sites: Definition, History, and Scholarship. *Journal of Computer-Mediated Communication*, 13 (1)..
6. Castells, M. (2005). "The Network Society: From Knowledge to Policy". Washington, DC: Johns Hopkins Center for Transatlantic Relations.
7. Chifflet, P. (1993). Associations de sportifs ou entreprises du sport. In A. Loret (Ed.), *Sport and Management*. Paris: Dunod.
8. Constantinides, E., & Fountain, S. (2008). Web 2.0: Conceptual foundations and marketing issues. *Journal of Direct Data and Digital Marketing Practice*, 9(3). doi:10.1057/palgrave.ddmp.4350098
9. Coyle, P. (2010). Teams active in social media build strategic advantage. *Street & Smith's SportsBusiness Journal*.
10. Dijk, J.V. (2006). "The Network Society", London: Sage Publications.
11. Grönroos, C. (2004). The relationship marketing process: Communication, interaction, dialogue, value. *Journal of Business and Industrial Marketing*, 19(2). doi:10.1108/08858620410523981
12. Grönroos, C. (2004). The relationship marketing process: Communication, interaction, dialogue, value. *Journal of Business and Industrial Marketing*, 19(2). doi:10.1108/08858620410523981
13. Halverson, E. R., Halverson, R. (2008). Fantasy baseball: The case for competitive fandom. *Games and Culture* 3, 3-4.
14. Harvery, J., Lévesque, M., & Donnelly, P. (2007). Sport Volunteerism and Social Capital.
15. Hennig-Thurau, T., Malthouse, E.C., Friege, C., Gensler, S., Lobschat, L., Rangaswamy, A., & Skiera, B. (2010). The impact of new media on customer relationships. *Journal of Service Research*, 13(3). doi:10.1177/1094670510375460
16. Hutchins, B and Mikosza, J. (2010). 'The Web 2.0 Olympics: Athlete Blogging, Social Networking and Policy Contradictions at the 2008 Beijing Games', *Convergence: The International Journal of Research into New Media Technologies* 16 (3).
17. Ioakimidis, M. (2010). Online marketing of professional sports clubs: Engaging fans on a new playing field. *International Journal of Sports Marketing & Sponsorship*, 11(4).
18. Kaplan, A., Haenlein, M. (2010). "Users of the world, unite! The challenges and opportunities of Social Media", *Business Horizons*, Vol. 53, Issue 1.
19. Kotler, P. (2011). In Peppers, D., & Rogers, M. (Eds.), *Managing customer relationships: A strategic framework*. Hoboken, NJ: Wiley.
20. Kotler, P., Armstrong, G. (2010). "Principles of Marketing", Pearson Prentice Hall.
21. Lapio, R., & Speter, K. (2000). NASCAR: A lesson in integrated and relationship marketing. *Sport Marketing Quarterly*, 9(2).
22. Larry, P. (2008). "Strategic Integrated Marketing Communication", Elsevier Inc., Canada.
23. Ledingham, J.A. (2003) "Explicating Relationship Management as a General Theory of Public Relations." *Journal of Public Relations Research*, Vol. 15, No. 2.
24. Mangold, G.W., Faulds, D.J. (2009). "Social media; The new hybrid element of the promotion mix", *Business Horizons*, Vol. 52, No. 4.
25. Meraz, S. (2009). Is there an elite hold? Traditional media to social media agenda setting influence in blogs networks. *Journal of Computer-Mediated Communication*, 14.
26. Pegoraro, A. (2010). Look who's talking—Athletes on Twitter: A case study. *International Journal of Sport Communication*, 3.
27. Qualman, E. (2009). *Socialnomics*. Hoboken, NJ: John Wiley&Sons.
28. Rakita, B. (2003). *Međunarodni marketing*, sedmo izdanje, Ekonomski fakultet, Beograd.
29. Rein, I.J., Kotler, P., & Shields, B. (2006). The elusive fan: Reinventing sports in a crowded marketplace. New York, NY: McGraw-Hill.
30. Rothschild, P.C. (2011). "Social media use in sports and entertainment venues." *International Journal of Event and Festival Management*, Vol. 2 No. 2.
31. Saffo, L., & Brake, D.K. (2009). *The social media Bible: Tactics, tools & strategies for business success*. Hoboken, NJ: John Wiley & Sons.
32. Sanderson, J., & Kassing, J. W. (2011). Tweets and blogs. In A. Billings (Ed.), *Sports Media* (pp. 114-127). New York: Routledge *Sociology of Sport Journal*, 24(2).
33. Stavros, C., & Westberg, K. (2009). Using triangulation and multiple case studies to advance relationship marketing theory. *Qualitative Market Research: An International Journal*, 12(3). doi:10.1108/13522750910963827
34. Terence, A.S., (2008), "Advertising Promotion and Other Aspects of Integrated Marketing Communications", Prentice Hall, New York.
35. Williams, J., & Chinn, S.J. (2010). Meeting relationship-marketing goals through social media: A conceptual model for sport marketers. *International Journal of Sport Communication*, 3(4).
36. Zugic, J., Janicic, R. (2013), "Media Globalization and Marketing Communications", *Medijski Dijalozi*, No. 17.
37. Zugic, J., Raicevic, M. (2013), Effect of Internet Marketing to the Crisis of Print and Electronic Media, *Medijski Dijalozi* No. 16.
38. Davies, R., (2002). Media power and responsibility in sport globalisation. Presentation made to the Third International Conference for Media Professionals in a Globalised Sport World, Copenhagen. www.iblf.org
39. <http://hub.olympic.org/home/athlete/4178?name=Milivoj+Dukic>
40. <http://www.cokcg.org/onama/statut/>
41. <https://twitter.com/>
42. <https://www.facebook.com/>
43. Solis, B. (2010). Defining Social Media: 2006- 2010. <http://www.brainsolis.com/2010/01/defining-social-media-the-saga-continues/>
44. Ipsos Strategic Marketing (2011), "Nove Tehnologije-Crna Gore", Podgorica.
45. Law on Sport, Off. Gazette, No. 36/2013. July, 2013.
46. London 2012 Strategy of the Montenegrin Olympic Committee.
47. Zavod za statistiku. (2011), "Informaciono komunikaciona tehnologija", Podgorica.

Početa razmatranja o prirodi odnosa društvenih medija i sporta

U cilju očuvanja i unapređivanja odnosa, neophodno je da predstavnici sportskog sektora komuniciraju i aktivnije učestvuju u dijalogu sa "potrošačima" (trenutnim i onih potencijalnim). Razvoj društvenih medija je u stalnom porastu. Cilj ovog rada je da postavi adekvatnu akademsku osnovu za dubinska istraživanja, tj. pozicija i dometi korišćenja društvenih medija u okviru sportskog pokreta sa kratkim osvrtom na primjer iz Crne Gore. Sljedstveno tome, sport je u Crnoj Gori vitalni je segment crnogorskog identiteta ali je i ustavna kategorija pretpostavlja poseban status sportskih aktera. Crnogorski olimpijski komitet, shodno Zakonu o sportu ali i percepcije opšte populacije, smatra se nosećim konstituentom razvoja sporta. Polazeći od odredaba Olimpijske povelje i nacionalnog zakonodavstva, misija NOK-a je promocija olimpijskih vrijednosti i preprema sportskih ekipa/takmičara koji će predstavljati zemlju na velikim sportskim manifestacijama koje su na programu Međunarodnog olimpijskog komiteta. Ključne riječi: društvene mreže, veza, sport.

Received: November 25, 2016 / Accepted: December 01, 2016

Correspondence to: Marko Begović, German Sport University, Germany

E-mail: marko.begovic@ms.gov.me

DIFFERENCES BETWEEN TRADITIONAL PROGRAMS AND TRAINING THROUGH GAME ON PERFORMANCE IN LEARNING ICE SKATING

Marijana Podrug Arapović¹, Lejla Šebić², Izet Rađo²

¹ KJP ZOI '84 Sarajevo, Bosnia and Herzegovina

² Faculty of Physical Education and Sport, University of Sarajevo

The goal of this work was to determine the efficiency of the learning through game model on the stylized moves on the ice acquisition and perfection. The sample consisted of 120 students from the first, second and third grades of elementary school. They were divided into two groups of 60 pupils each who underwent two separate programs – the traditional training model and the game and fun model of training. The skating techniques success evaluation variables were determined through five situational tests on the ice. The evaluation of the learned structures on the ice was carried out by a three member expert panel. The learned stylized structures on the ice were marked with 1-5 marks. The T-test results for dependent samples indicated the existence of a statistically important difference in the arithmetic mean between the initial and final measuring of all the variables at both skating programs. The T-test results for independent samples at a univariate level indicated that there are no statistically important differences between the final results of the two different learning programs. One can conclude that it is possible to successfully use either the traditional or the fun and game program with beginners who are learning to ice-skate. The selection of a program depends on the material-technical conditions and professional development of the available coaches.

Key words: transformation process, training methods, movement structures on the ice.

INTRODUCTION

By analysing the research conducted so far on the territory of Bosnia and Herzegovina, with insight into the skating practice, deficits in the sliders selection and systematic work to improve the anthropological status of sliders are highly noticeable. Although the results in some Ice Skating disciplines such as short track speed skating approximate region results, and observing the general situation of skating sports in BiH, it can certainly be claimed that skating sports in BiH lack quality work at the appropriate stages of the young skaters' sensibility and development.

Top athletes are experienced in motor abilities and are able to almost instinctively, or in other words without thinking, cope with the demands of sports. However, when it comes to beginners, it is known that during the training process there are differences in speed of the ice skating basic techniques adoption. The Speed of adopting new movement structures largely depends on adequate methodological approaches in training the elements on ice.

The term motor learning (training) refers to the process of forming the motor skills, that can be defined as a learned ability to achieve certain results and external goals with maximum safety, and performance harmony, as well as minimum energy and time consumption (Jarvis, 1999).

In order to achieve excellent results in ice skating, it is necessary to quickly and efficiently master the ice skating basic techniques on the ice first, which is the same for all disciplines: speed skating, ice hockey and figure skating. It is best to teach the basic elements of skating to children aged 6-8 years, because that is the period in which they adopt new movement structures in the fastest and easiest possible way. Relative harmonious development is typical for the period from the first to the fourth grade of elementary school. The period of early school age represents the most important and critical time in comparison to later sports activity and it is safe to say that this is the period in which kids have the most adaptable organism for adoption of new motion and motor patterns. (Mikić 2000) Considering the limited time in which the ice is available to children in Sarajevo and Bosnia and Herzegovina, it is very important to know how and in what way children can master the basic skating techniques in the fastest and the most efficient way.

The transformation of the motion structures for beginners in the process of training figure skating elements can be distinguished in three relatively independent stages: Stage I - initial training elements (mastering the basic techniques); Stage II - detailed training of the technique elements (technique fine-tuning); Stage III - mastering the technique elements. In this study, special attention was given to Stage I - the initial training of ice skating basic elements for primary school female students. The Ice Skating traditional training program certainly represents conventional and established practice of training the skating techniques and is by default applied in Skating schools, while the learning through games program is an experimental program that designed for this study.

In the conventional training model, the analytical method of learning is dominant. The analytical method involves a procedure in which the global structure is divided into several stages or elements that are taught separately, and after a certain time integrated into a whole. The main disadvantages of the analytical learning are reflected in the fact that the child learns the part of movements very well, but later finds it very difficult to link it in a qualitative whole and that this type of learning can be "boring" for a child, because the child cannot have the image of the whole, while mastering the previous parts. Therefore, during the analytical learning, the lack of will and reduced concentration is evident.

Learning movement structures by using the learning through the game model is called situational training. This form of learning technical structures happens on a problem level, which means that the elements of the techniques are best taught in situational conditions through the game or its parts (Bompa, 1994 Matveyev, 2002). Simply put, the child's approaches to motor learning as the process problem solving using the information, rules, observing the conditions and consequences of performance, however verbal, and other types of feedback are key parts of that process. The process of acquiring motor skills is a specific goal within the entire training process (Horga, 1993), and is an integral part of the transformational activity and a necessary precondition of specific sports and competitive efficiency. Generally in sports, it is necessary to constantly explore the problem of the individual methodological procedures relative value in learning technical and tactical knowledge.

PROBLEM AND OBJECTIVE

The problems occurring are the stylized movement structures on ice transformational processes under the influence of differently structured learning programs. The objective of this work is to determine the efficiency of the learning through game model on the stylized movement structures on the ice acquisition and perfection.

WORKING METHODS

The sample for this study is targeted and purposefully selected. The survey was conducted on a sample of 120 Sarajevo "Nafija Sarajlić" and "Musa Ćazim Ćatic" elementary schools female students of the first, second and third grades. The population from which the sample was selected for this study can be defined as a female student population of 6, 7 and 8 years of age. A relatively harmonious development is characteristic for the treated period from the first to the fourth grade. All traits and skills are demonstrated harmoniously, there are no outliers in development in general, not even in certain traits and abilities in particular (Findak, Metikoš, Mraković, 1996).

In regards to the purpose of this research, the basic criteria of the sample was that the students had never tried ice skating or a similar activity such as roller skating. The subjects were divided into two groups of 60 students who carried out the two different programs. To estimate the technical elements of ice skating in this study a battery of 5 situational tests selected to cover the basic principles of skating on ice was applied. The criteria variables are: KNAP – forward skating (pushing and sliding), KNAO – skating forward figure eight, KNAS – forward skating slalom, KNAJN- one leg forward skating, KNAV – forward stride skating.

The differences between the initial and final measurements in all the research areas were calculated on the T-test univariate level for dependent samples. The value of Eta squares showing the impact of the program on learning the

skating elements were also calculated.

The differences between the final results of the measurements between the two programs of learning skating structure were calculated with a T-test for independent samples at the univariate level.

RESULTS

With the T-test for dependent samples results, the effects of learning skating stylized movement structures were estimated at the applied programs (Table 1, 2). Significant differences in the treated variables of skating in both training programs were identified. According to the Eta square meters values, the largest positive impact is obtained in the carried out games and entertainment program, and the traditional program had a smaller impact.

	AS	SD	SD Gr	95% span		t	df	Sig.	Eta
				Lower	Upper				
KNAPI - KNAPF	-3.35	1.35	.17	-3.69	-3.00	-19.2	59	.000	0,39
KNAOI - KNAOF	-3.31	1.39	.18	-3.67	-2.95	-18.4	59	.000	0,38
KNASI - KNASF	-2.45	1.28	.16	-2.78	-2.11	-14.8	59	.000	0,33
KNAJNI-KNAJNF	-2.83	1.27	.16	-3.69	-3.00	-19.2	59	.000	0,39
KNAVI - KNAVF	-3.35	1.35	.17	-3.67	-2.95	-18.4	59	.000	0,38

Table 1. T-test for dependent samples: Traditional program

	AS	SD	SD Gr	95% span		t	df	Sig.	Eta
				Lower	Upper				
KNAPI - KNAPF	-3.66	1.00	.12	-3.92	-3.40	-28.3	59	.000	0,49
KNAOI - KNAOF	-3.50	1.09	.14	-3.78	-3.21	-24.7	59	.000	0,46
KNASI - KNASF	-2.81	1.14	.14	-3.11	-2.52	-19.1	59	.000	0,39
KNAJNI-KNAJNF	-2.93	1.14	.14	-3.22	-2.63	-19.7	59	.000	0,40
KNAVI - KNAVF	-2.45	1.22	.15	-2.76	-2.13	-15.4	59	.000	0,34

Table 2. T-test for dependent samples: Game program

	Group	N	AS	Std. Dev.	t	df	Sig.
KNAP	1	60	3.35	1.35	-1.458	118	.147
	2	60	3.66	1.00			
KNAO	1	60	3.31	1.39	-.800	118	.425
	2	60	3.50	1.09			
KNAS	1	60	2.45	1.28	-1.655	118	.101
	2	60	2.81	1.14			
KNAJN	1	60	2.83	1.27	-.451	118	.653
	2	60	2.93	1.14			
KNAV	1	60	2.46	1.24	.074	118	.941
	2	60	2.45	1.22			

Table 3. Comparison of the final score in skating between traditional (group 1) and game programs (group 2)

The final results of the skating elements acquisition between the two programs are: the traditional group "A" and game group "C" were compared with the T-test (Table 3). The results demonstrated that there are no statistically significant differences between the average values in comparing the learned skating motion structures results final success evaluation between the two carried out programs.

DISCUSSION

The success in the skating sport depends on the efficiency of motor programs, or a level of their adoption and stability. A fully adopted motor program for the realization of aesthetic structures of movement (technique) generally allows a full utilization of the young skaters' biological potential. All the learning methods that have been applied in this work have the same regulatory process as a base. Information about the structure of the movement first comes in the nervous system, where it is treated and where, based on a set of data about the movement and the situation structure, creates and activates an appropriate program of action. It results in a corresponding level of efficiency or in an effect that can be objectively registered.

Hence, in the first part of motor learning, no matter which method of procedure is carried out, it is necessary to supply the assumption that a child creates a proper idea of how the movement looks like and what it should look like, in accordance with his or her abilities of reproducing the movement task that is being taught. In this part it is important to establish a real communication with a child who has a certain motoric problem. Cognitive activity prevails in the initial phase of learning, in which it is characteristic for a child to focus on the nature of the task, but at the same time higher mental processes are used in order to analyse and understand what to do and in which way that can be achieved.

The result of this phase is an established motor program that represents the basis of performance and rehearsal of movements necessary for mastering motor skills. At this stage models of learning through game have the biggest effects, because, simply put, a child approaches motor learning as a process of problem solving by using the information, and the rules, as well as observing the conditions, and consequences of the performance. While discovering an entirely new medium, ice, at first a child has a great fear.

They release their fears and difficulties naturally through the game, because it is a leisurely and spontaneous activity that arises from the child's inner needs. In addition, the movements, actions and operations that appear while playing have a special motivational source.

Throughout the game, the child gains self-confidence and thus solves the simplest and easiest conflicts, but that is, for the majority of children, above all, a fear that appears in the early stages of learning to skate. For this reason, a game and fun program is undoubtedly the best and most effective in the beginning. This program should be adjusted to the abilities, knowledge and age of the child in all segments. Therefore, it is very important that the child experiences the first moments of skating with pleasure and joy, rather than with torture and boredom.

Especially for young children, the game has a special meaning in encouraging the development of postural reflexes and ancillary support structures that are responsible for the upright posture and balance (Kolašinac, 2009). Improvement and stabilization of postural reflexes is most naturally achieved through games, and for that reason this method is recommended in the initial stages of training the stylized movement structures on ice. It is important for trainers to know that the feedback about the performance results strengthens the perceptual trace for children, which has an information value for trainees and improves the learning process (Glencross, 1993).

The traditional model of training in the learning process and performing technique creates the initial conditions which include all the information the child gets about the environment in which the learning movements are happening, as well as the information on the body position. Performance results occur as a consequence of understanding the first preparatory activities, necessary for an efficient motor performance.

THE TWO PROCESSES HAPPEN SEPARATELY DURING THE TRAINING. THE PERCEPTION PROCESS OCCURS FIRST, AND THEN COMES THE PROCESS OF ACTION.

Structural units, that lie behind the process of perceiving and processing are mental, motor and sensory nodes (and their subtypes) that interactively act and "communicate" during the learning process and motor performance.

For example, in ice skating, sensory nodes analyse the visual, auditory and proprioceptive content related to the performance, motoric nodes control the sequences of skating forward, back, wreath, turning, stopping etc., while mental nodes interpret complex motion sequences that are, along with the music, combined into a whole. Hence, the programs have their applicability in the sports practice.

None of the applied programs dominate the other. Which of the training program will be used depends on the material and technical conditions and how well the coaching staff are trained. It is recommended that the first days of training start with the method of games and entertainment content because of fear and for children to get

CONCLUSION

The research results are showing that the model of learning through the game is the most effective for training the girls of younger school age. This approach in training the younger age categories must have a dominant application.

The stabilization of the program of motor skills will be possible in cases if the motor information are repeatedly reproduced in consciousness. Learning through the game, which is closest to the children of junior school age, provides multiple reproduction of activities in consciousness, because such activity produces pleasure and joy. It is characteristic for children to easily and permanently remember only what they are interested in and attracted to.

Children hardly hold their attention and concentration for a longer period of time and are only focused on what they are interested in that moment (Ivankovic, 1978). Because of this, the game as a medium to attract attention is often necessary when working with children and makes it possible to focus children's attention on a specific task. As children grow and develop, so does the time to concentrate on a specific task extend, but we should not neglect the fact that six years old children are able to focus their attention for about twenty minutes (Hraski, 2002). The game represents a basic form of physical activity for children. The most interesting method of teaching children to skate is achieved using different games on the ice. The use of various games provides a

used to the ice, and then switch to a traditional method to maintain the necessary discipline for work. Besides, the contents described in the game and entertainment method should be used in the final part of the lesson. A combination of these two training programs would be a best option, taking into account their efficiency and applicability in practice.

wide range of welfare and benefits. Appropriate contents of various games ensure the conditions for a normal state of health of the organism and the development of his physical abilities (Trajkovski, Visic and Associates 2010) developing locomotion and acquiring different knowledge, skills and habits and have the impact on the psychological well-being of the child, such as self-confidence, joy, a sense of satisfaction.

The game affects the development of anthropological characteristics, adoption of motor knowledge, improvement of motor achievements, gaining of life and work habits.

IN THE GAME, CHILD HAS A SENSE OF FREEDOM AND IS PHYSICALLY AND EMOTIONALLY FULLY ENGAGED. THE GAME ALSO INCREASES THE WORK OF ALL ORGANS AND FUNCTIONS, SO ITS ROLE IN THE GROWTH AND DEVELOPMENT OF CHILDREN IS VERY IMPORTANT.

REFERENCES

1. Bompá, T. (1994). *Theory and Methodology of Training* (Third Edition). Kendall/Hunt Publishing Company. Dubuque, Iowa
2. Findak, Vladimir; Metikoš, Dušan; Mraković, Miloš; Neljak, Boris (1996):
3. *Applied Kinesiology in Education / Norms*. Zagreb: Croatian pedagogical and literary Assembly, Faculty of Physical Education, University of Zagreb.
4. Glencross, D. (1993). Human skills: ideas, concepts and models. U: Singer, R.N., Murphey, M., Tennant, L.K.: *Handbook of research in sport psychology*, 242-256. New York, Macmillian Publ. Company.
5. Horga, S. (1993). *Psychology of Sport*. Zagreb: Faculty of Physical Education.
6. Hraski, Ž. (2002). The influence of programmed physical activities on the growth and development of preschool children U: V. Findak (ur.), *Collected papers of 11th Summer School of Kinesiologists of Croatia, Rovinj, 2002.* (str. 242-244). Zagreb: Croatian Kinesiology alliance
7. Ivanković, A. (1978). *Physical education of pre-school children*. Zagreb: School book
8. Jarvis, M. (1999). *Sport psychology*. London & New York: Routledge.
9. Košinac, Z. (2009) Game in a function of stimulus upright posture and balance in children's developmental age. *Life and school: Journal of theory and application of education*, 55(22), 11-22.
10. Metvejev, L.P. (2000). *Basis of modern sports training system*. FIS, Moskva.
11. Mikić, B. (1999). *Testing and measuring in sports*. Faculty of Philosophy, Tuzla.
12. Šebić - Zuhrić, L. (2008). *Transformation processes of basic motor skills and stylized movement structures in Rhythmic Gymnastics under the influence of proprioceptive training.* (Doctoral dissertation), Faculty of Physical Education and Sport, University of Sarajevo.
13. Trajkovski Višić, B., Zebić, O., Hrvoj, Z. (2010). The influence of kinesiology program on improving the explosive strength and agility of a four years old child. Eighth annual international conference „Condition training of athletes” Zagreb: Faculty of Kinesiology (str 477-480).

RAZLIKE TRADICIONALNOG PROGRAMA I OBUČAVANJA KROZ IGROU NA USPJEŠNOST UČENJA KLIZANJA NA LEDU

Cilj rada je bio utvrditi efikasnosti modela učenja kroz igru na uspješnost savladavanja i usavršavanja stilizovanih kretnih struktura na ledu. Uzorak ispitanika je sačinjavalo 120 učenika prvog, drugog i trećeg razreda osnovne škole. Ispitanici su podijeljeni u dvije grupe od po 60 ispitanika koji su provodili dva različita programa tradicionalni model treninga i model igre i zabavnih sadržaja. Varijable za procjenu uspješnosti tehnike klizanja činilo je pet situacionih testovana ledu. Procjenu efikasnosti naučenih kretnih struktura na ledu izvršila je tročlana ekspertna sudijska komisija. Ocjenjivali su ocjenama od 1-5 efekte osmodnevnog učenja stiliziranih kretnih struktura na ledu. Rezultati T-testa za zavisne uzorke pokazali su postojanje statistički značajne razlike aritmetičkih sredina između inicijalnog i finalnog mjerenja svih varijabli kod oba sprovedena programa klizanja na ledu. Rezultati T-testa za nezavisne uzorke na univarijantnom nivou, su pokazali da nema statističkih značajnih razlika između finalnih rezultata ovadva programa učenja stilizovanih kretnih struktura klizanja na ledu. Može se konstatovati da je moguće jednako uspješno koristiti tradicionalni program ali i program igre u fazama obuke i učenja tehnika klizanja na ledu kod početnika. Koji od programa će biti korišten zavisi od materijalno-tehničkih uvjeta i stručne obučenosti trenerskog kadra. Ključne riječi: transformacioni proces, metode obučavanja, kretne strukture na ledu.

Received: November 04, 2016 / Accepted: December 01, 2016

Correspondence to: Marijana Podrug Arapovic, KJP ZOI '84 Sarajevo, Bosnia and Herzegovina

E-mail: mpodrugarapovic@gmail.com

PLANNING AND DESIGNING TOP SAMBO ATHLETES' TRAINING SESSIONS

Patrik Drid¹, Tatjana Trivic¹, Sergey Tabakov²

1 Faculty of Sport and Physical Education, University of Novi Sad, Serbia

2 Russian State University of Physical Education, Sport, Youth and Tourism Moscow, Russia

The uniqueness of sambo is primarily reflected by its specific throws, holds, and arm and leg locks. Points are awarded by throwing the opponent, by holding the opponent's back toward the mat, or by arm bar, leg lock, joint lock, and ankle lock. A successful sambo performance depends on a specific technique and tactical skills with the support of an optimal physical fitness. Thus, adequate technical, tactical, physical and physiological attributes seem to be the prerequisites for an elite competition.

Keywords: A training session, Microcycle, Strength Training, Muscle Fibres.

INTRODUCTION

Sports training inevitably leads to changes in the human body through an anatomical, physiological, biochemical and psychological adaptation. The effectiveness of training depends on its duration, volume in running distance and repetitions, intensity through load and speed, and finally on its performance frequency (density). Prior to competition, components that should be emphasized in order to achieve the objective are defined through training stages.

Sambo is a relatively modern international martial art founded back in 1930s. It is mainly characterized by specific throws, holds, and arm and leg locks, which, with a successful performance in sambo, seem to depend on specific technique and tactical

skills along with an optimal physical fitness [1]. At the present stage of this wrestling development the main task is to include sambo in the program of the Olympic Games. For this purpose, sports functionaries, coaches and sportsmen conduct a large scope of work on the popularization of sambo throughout the world [2]. Besides sports direction of sambo, it is a basic kind for sportsmen training in "mixed" martial arts and is a professional-applied kind of sports, the component of military and police officers training in many states [2].

The most complex problem in sambo is planning the training process, due to numerous objective factors that affect all types of preparation as well as sports performance. Thus, it is necessary to take into account sambo characteristics along with an individualization program in planning, training resources selection and work methods applied.

PLANNING THE SAMBO TRAINING

A training session is the most important form of work in sambo sport. It represents a form of work carried out with a constant group of athletes of certain age and gender, under directions given by a qualified person – the coach. Training sessions follow a strict curriculum that enables the gradual distribution of training loads and allows continuity. Through a training session, a precise organization is foreseen. The choice of training methods and resources are applied accordingly to the periodization and specific condition tasks.

Precisely, the developed previous working program is important for coaches to implement a successful training session. When planning a training session, attention must be paid to the work continuity in the context of the overall program, followed by tools that will be implemented through it. Furthermore, special attention should be paid to the way and means of warm-up loads, selection of general and specific exercises with their order of appearance. Determining the extent (volume) of exercises, a number of repetitions and character of exercises, the degree of exercise intensity, length and character of the pause between training loads, technical and tactical characteristics linking and their application in Randori should also be in the focus of a training session. Training length directly depends on the gender and the athletes' age in addition to the training period (preparative, competitive, etc.). Usually, a training session lasts for 45 minutes (in sambo school), 60-90 minutes (for cadets and juniors), up to 150 minutes for seniors and top level athletes. Training usually consists of three (or four) parts which are: introductory (warm-up), preparatory, basic and final part of the training session. However, the length of the training parts can vary and it should not be taken so strictly.

At the introductory part of every training session, coaches should summarize information about what will be done during the training, in order to prepare the athletes for intensity and training volume, and introduce them with periods of rest. Afterwards, a warm-up should be done through appropriate task games, running forms and movements in order to prepare the athletes for loads that follow. At the end of the warm-up period, certain exercises for joints, ligaments and muscles for higher loads should be applied. In the basic part of training session, exercises that make the essence of a particular training should be applied.

This might include the following tasks: raising the sambo athletes' general and specific physical fitness level; mastering the elements of technique and tactics, as well as the improvement of technical and tactical resources; and the development of psychological, volitional and moral qualities - in terms of preparing the body for increased efforts. The main part of the training can consist of two parts, logically continuing one after the other. First, the basic part should cover learning and the development of technical and tactical elements, whereas the second part refers to stabilization and improvement of the learned elements through randori practice.

The final part of a training session includes a gradual load reduction for the return of the body optimal functioning. This part of training creates conditions for faster body calming which allows sambo athlete inclusion in a normal after-training activity. At the very end of the training session, a quality analysis can be conducted with an active coach - athlete participation. Often in this part of training, stretching and deep breathing are used, walking in pleasant conversation, very moderate pace jogging, or the use of entertaining attention character exercises. This final part of the training session should last about 10 minutes.

**FOR A SKILFUL OVERALL TRAINING
LOAD DOSAGE, IN ORDER TO ALIGN
THE VOLUME, INTENSITY AND REST
PERIODS BETWEEN EACH EXERCISE,
A HIGH EXPERTISE OF COACHES IS
REQUIRED.**

	Morning workout	Afternoon workout
	Line-up. Setting training tasks. General preparatory work (walking, different versions of running, jumping and hopping, general development exercises, stretching). Specific preparatory exercises.	Line-up. Setting training tasks. General preparatory work (walking, different versions of running, jumping and hopping, general development exercises, stretching). Specific preparatory exercises.
Monday		
	New technique adoption (defence, combination) in ground level and standing position. Randori task with limitations and resistance.	Randori technique improvement.
	Stretching. Line-up. Conversation about the training session.	Stretching. Line-up. Conversation about the training session.

Table 1. An example of a training day

In the sambo athlete's preparation, a microcycle has to be structured on the individual ability, based on a functional portrait obtained through a detailed sophisticated testing analysis. The preparation criteria of a sambo athlete can be his maximal alactic strength as well as anaerobic threshold of upper limb muscles [3]. The microcycle represents a short-term training plan, which can last from three to ten days, but most commonly it overlaps with one-week period (7 days). It refers to the total and limiting load distribution, regulating effort to the rest period between training sessions and competitions, as well as intensity training level [4].

The aim of this chapter is to introduce readers to the concept and principles of sambo strength training, and how to fit strength training into various microcycles along with other important training components. Strength Training for sambo athletes is aimed at increasing mitochondria and muscle mass in all the relevant muscle groups. This kind of muscle force development can be divided into two groups: 1) the development of glycolytic muscle fibres and 2) the development of oxidative muscle fibres. Therefore, training at the anaerobic threshold level can be considered major for the mitochondria increase in glycolytic muscle fibres. In order to improve glycolytic muscle ability, it is necessary to implement a developmental 7 days training program at 60%, following 10-15 days at 90% and 30-90 days up to 100% of one repetition maximum (1RM) [3]. It is recommended a maximum of three-muscle group workouts per training session.

If the athletes spend more than 45 minutes in intensive training, a possibility that endocrine system starts to work intensively and to increase the amount of hormones in the blood may occur. Furthermore, if it is necessary to train other muscle groups as well, this should be done in different training sessions. One muscle group should be treated once or twice a week, with the exception of a second training to be conducted more like a warm-up (two to three sets per each muscle group), with the main aim of increasing the necessary hormones, and thus allowing protein synthesis.

In sambo, sport in which strength represents the essential success factor, it is important to increase or maintain the required muscle strength level for arms, legs and trunk flexors and extensors. Accordingly, the muscle groups can be divided into pairs, so that the development programs could be introduced three days per week. To complement these sessions, a toning training can be conducted. During the weekly microcycle, it is necessary for sambo athletes to include three training sessions aimed at developing glycolytic muscle abilities (e.g. Monday-Wednesday-Friday). During this microcycle, three toning sessions can be implemented to support the athletes' strength capabilities. It is common knowledge that strength training stimulates the endocrine system, which implements a greater amount of anabolic hormones into the bloodstream that consequently contributes to anabolic processes increase during the week (Table 2).

Day of the week	Morning workout	Afternoon workout
Monday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Warm-up, DGMF (pectoral muscles, 2x- shoulder muscles)
Tuesday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Swimming
Wednesday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Warm-up, DGMF (back muscles, 3x-shoulder muscles)
Thursday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Swimming
Friday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Warm-up, DGMF (leg muscles, deltoid muscles)
Saturday	Warm-up, IT, Stretching	Swimming
Sunday	Swimming	Sauna, massage

IT - interval training for improving the sambo athletes' aerobic capacity; TT (LI) - the technical and tactical training (learning and improving combat elements techniques at a moderate pace); DGMF- development of glycolytic muscle fibres

Table 2. An example of sambo microcycle (DGMF) [3].

Strength endurance training with a prolonged and moderate intensity improves aerobic capacity, mainly by increasing the myoglobin level in the blood (pigment binding oxygen carrier), mitochondrial enzymes (in number and size), glycogen stores and increasing the oxidative capacity. Significant adaptation to extended activity include a better respiratory capacity, increased oxygen transfer, increased cardiac output and structural changes in volume density of muscle mitochondria. Therefore, the increase in maximal oxygen uptake (VO₂max) occurs as an indicator of increased aerobic capacity for prolonged exercise and increased activity of the enzyme in the working muscles.

The main advantage of the increased enzyme levels is the fatty acid oxidation, which enhances the body's ability to use fat as an energy source. It is believed that the increase in muscle mitochondria and myoglobin contributes to approximately 50% of VO₂max increase. The better transfer of oxygen through the cardiovascular system contributes the further increase in VO₂max percentage.

Systematically practiced endurance training increases the total amount of blood in athletes, and thus, increases the number of red blood cells and haemoglobin too. This increase can go up to 20%, and consequently contributes to a greater amount of oxygen supplying the working muscles.

An increased capacity of the respiratory system and heart to send a larger amount of oxygen to the muscles will only make sense if there has been a peripheral adjustment that involves changes at the level of capillaries and muscle. These changes will lead to a better utilization of oxygen and delivered nutrients. Endurance training will contribute to a greater number and density of muscle capillaries. Furthermore, this type of training leads to an increase in the number and size of small organelles in muscles (mitochondria), which are important for energy production in the presence of oxygen. At the same time, the increase and concentration of oxidative enzymes (which accelerate the production of energy in the presence of oxygen) will occur.

The mechanism for increasing the oxidative capacity of muscle through endurance training was initially structurally unclear. It was concluded earlier that the mitochondria increase in size [5] is multiplied [6] as a result of training. However, these studies remained inconclusive because morphometric techniques applied in displaying mitochondrial structure changes were inadequate. Using the morphometric approach to individual muscle fibre type, Howald et al [7] showed that 6 weeks endurance training on the cycle-ergometer leads to an increase in mitochondria volume and density for all three types of muscle

fibres. This difference was slightly greater in type IIa than in type I and type IIb / x muscle fibres. It was an unexpected finding that the IIb / x type muscle fibres were recruited during low intensity cycling endurance training (about 20% of the maximum). The skeletal muscle consists of two muscle fibre types: Type I and Type II. These fibre types are classified according to their contracting and biochemical properties. Type I muscle fibre (slow contracting fibre) takes a long time (approximately 80 msec) to develop a maximal contraction from the moment of activation. Conversely, type II (fast contracting fibre) requires an average of 30 msec to develop a maximal contraction from the moment of activation.

Slow contracting properties of type I muscle fibres are mainly the result of low myosin ATPase activity in the myofibril. It catalyses the division of limiting high-ATP phosphates, lowers the value of the regulatory protein C++ - troponin activation and slows the rate of Ca++ consumption from sarcoplasmic reticulum. These qualities are crucial for an increased resistance of type I fibres to fatigue.

The biochemical differences between two main fibre types are essentially based on their capacity for oxidative and glycolytic activity. Type I fibres, particularly rich in myoglobin are known as red fibres, whereas type II fibres, that have significantly lower levels of myoglobin, are known as white fibres. Type I fibres have higher oxidative enzymes level along with a higher activity and glycolytic enzyme profile. Types II fibres are further classified into type IIa, IIb and type IIx. Type IIx is based on greater oxidative and glycolytic potential than IIa type and smaller potential than type IIx fibres. In terms of substrate storage, the concentration of muscle glycogen is similar for both fibre types (I and II), however, triglyceride levels are 2-3 times higher in slow the contracting fibre type I.

For oxidative training (slow contracting muscle fibres) development, training is conducted twice a week for each major muscle group:

- Wednesday, Thursday - arm flexors and extensors;
- Tuesday, Friday - trunk flexors and extensors; and
- Wednesday, Saturday - leg flexors and extensors.

Accordingly, it is necessary to have six training sessions in sambo microcycle focused on oxidative muscle fibres development (two sessions for each muscle group). This allows the implementation of the two related and similar in character microcycles followed by two toning microcycles. A development program variant, focused on mitochondria increase, has to provide a good blood supply and minimal acidification for both fast contracting fibre types.

Day of the week	Morning workout	Afternoon workout
Monday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Warm-up, IT DOMF - arms, Streching
Tuesday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Warm-up, IT DOMF - trunk, Streching
Wednesday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Warm-up, IT DOMF - legs, Streching
Thursday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Warm-up, IT DOMF - arms, Streching
Friday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Warm-up, IT DOMF - trunk, Streching
Saturday	Warm-up, IT, Stretching	Warm-up, IT DOMF - legs, Streching
Sunday	Games, cross running, Swimming	Sauna, massage

IT - interval training for improving the sambo athletes' aerobic capacity; TT (LI) - technical - tactical training (learning and improving technical and tactical combinations, technique elements in various forms: exercise on demand, orchestrated fight, etc.; high tempo, diverse training stimulus funds); DOMF- development of oxidative muscle fibres

Table 3. A microcycle example in sambo (DOMF) [3]

Coaches can choose from a variety of exercises as long as they respect the basic principles as follows:

- A low intensity workout (10–20% from maximal);
- An exercise should be mid to high tempo;
- An exercise should be done in full movement range;
- An exercise should be executed until local exhaustion;
- No periods of rest between exercises;
- Execute 5-10 exercises (until fatigue) - that represents one full circle;
- Breaks between circles last 10-15 minutes;
- During one training episode 1-5 circles should be done;
- Only 2-3 trainings of this kind should be done per week.

In a muscle-toning microcycle, an athlete's body is recovering from previous the microcycle. A higher volume in technical and tactical character training followed by training that is aimed at the achieved abilities level maintenance due to stabilization. Through mid-season or at the beginning of the preparatory period, the methodology of aimed increasing muscle mass training may be applied, if necessary. Sambo athletes must possess tactical excellence. Furthermore, they have to be able to perform a series of complex skills necessary for success. However, for a sambo athlete to move well and effectively, it is necessary for the required movement forms to be without postural disorders, wrong movements or muscle asymmetry [8].

Day of the week	Morning workout	Afternoon workout
Monday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Warm-up, IT DOMF - arms, Streching
Tuesday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Warm-up, IT DOMF - arms, Streching
Wednesday	Warm-up, Games, Streching	Warm-up, IT DOMF - legs, Streching
Thursday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Warm-up, IT DOMF - arms, Streching
Friday	Warm-up, IT, TT (LI), Sparing, IT, Stretching	Warm-up, IT DOMF - trunk, Streching
Saturday	Warm-up, IT, OMFF - legs, Streching	Sauna, massage
Sunday	AB	-

IT - interval training for improving the sambo athletes' aerobic capacity; TT (LI) - technical - tactical training (learning and improving technical and tactical combinations, technique elements in various forms: exercise on demand, orchestrated fight, etc.; high tempo, diverse training stimulus funds); OMFF- maintenance of oxidative muscle fibres force level training; AB - Active break

Table 4. A microcycle example in sambo (toning) [3]

CONCLUSION

Anyone who applies periodization in the training process planning will soon feel its benefits. Primarily, periodization brings a better and more efficient load distribution through yearly training, in which the training load varies from one phase to another. In addition, periodization puts a specific emphasis on the volume (quantity) and intensity (quality)

training in each phase of the annual cycle. With the training load volume and intensity variations, as well as focusing on physical, technical, tactical and psychological aspects during the preparatory phase of the competition, athletes can achieve better results and more stable levels of physical fitness during the competition period.

REFERENCES

1. Drid P, Kondratijeva A, Tabakov S, Stojanovic M, Trivic T, Casals C, Ostojic SM. Hormonal responses to sambo exercise in women. In: Kalina RM (ed.) Proceedings of the 1st World Congress on Health and Martial Arts in Interdisciplinary Approach, 17–19 September 2015, Czeszochowa, Poland. Warsaw: Archives of Budo; 2015: 201.
2. Zakorko IP. Use of swimming in involving and restoration microcycles in the training process of highly skilled heavy weight sambo wrestlers. Physical Education of Students, 2013; 1: 30–2.
3. Maksimov DV, Seluyanov VN, Tabakov SE. Physical training in combat sport (Физическая подготовка единоборцев). Moscow: TVT Division, 2011.
4. Bompa, T. (1999). Periodization, Theory and Methodology of Training. Champaign, IL: Human Kinetics.
5. Kiessling KH, Piehl K, Lundquist CG. Effect of physical training on ultrastructural features in human skeletal muscle. In: Muscle Metabolism during Exercise, B Pernow and B Saltin (Eds.), New York: Plenum Press, 1971; 97–101.
6. Gollnick PD, King DW. The immediate and chronic effect of exercise on the number and structure of skeletal muscle mitochondria. Biochemistry of Exercise, 1969; 3: 239–44.
7. Howald H, Hoppeler H, Claassen H, Mathieu O, Straub R. Influences of endurance training on the ultrastructural composition of the different muscle fiber types in humans. Pflügers Archiv, 1985; 403(4): 369–76.
8. Drid P, Drapsin M, Trivic T, Lukač D, Obadov S, Milosevic Z. Asymmetry of muscle strength in elite athletes. Biomedical Human Kinetics, 2009; 1(1): 3–5.

PLANIRANJE I PROGRAMIRANJE TRENINGA VRHUNSKIH SAMBISTA

Jedinstvenost sambo-a ogleda se prvenstveno u svojim specifičnim bacanjima, zahvatima, polugama na rukama i nogama. Bodovi se dodjeljuju za bacanja protivnika, držanja protivnikovih leđa na tlu, ili polugom na laktu, koljenu ili gležnju. Uspješan nastup u sambo-u zavisi od konkretne tehnike i taktičke vještine uz potporu optimalne fizičke kondicije. Stoga, adekvatne tehničke, taktičke, fizičke i fiziološke karakteristike čine osnovne pretpostavke za postizanje rezultata na takmičenju. Ključne riječi: Trening, mikrociklus, trening snage, mišićna vlakna

Received: November 29, 2016 / Accepted: December 01, 2016

Correspondence to: Patrik Drid, Faculty of Sport and Physical Education, University of Novi Sad, Serbia

E-mail: patrikdrid@gmail.com

WORLD ANTI-DOPING AGENCY BLOOD COLLECTION

GUIDELINES AS AN EFFECTIVE ATHLETES TESTING PROGRAMME SUPPORT

Amir Avdagić, Nihada Ahmetović

The Agency for Anti-Doping control of Bosnia and Herzegovina, Bosnia and Herzegovina

One of the basic objectives of prevention, education and doping control for athletes in the area of doping in sports is to protect the athlete's health. According to the World-Anti-Doping Code, one of the anti-doping rule violations is the presence of a prohibited substance or its metabolites or markers in an athlete's sample. The prohibited substances are defined by the World-Anti-Doping-Agency and each year it issues a Prohibited List which includes the in-competition and out-of-competition prohibited substances and methods in particular. During the doping control process, a blood or urine sample is collected from the athlete. The urine samples can give the matrix for the analysis which includes the majority of prohibited substances and methods. However, some substances and methods can only be detected from a blood sample. Blood is the only matrix in which it is possible to find the risks of homologous and autologous blood transfusions, in particular erythropoiesis receptor activators (CERA), growth hormone (GH), growth hormone releasing factors, and Haemoglobin - based oxygen carriers (HBOCs). In order to preserve the integrity of a blood sample, and to ensure the athlete's, as well as the Doping control officers' health safety, the process of blood sample collection should be conducted in compliance with the international health care standards, and especially in compliance with WADA Blood Sample Collection Guidelines which define the whole process from planning to preparation and transporting the sample for a laboratory analysis. The Guidelines are WADA International Standards for Testing and Investigation supplement, and they are regularly updated according to the latest scientific discoveries.

Key words: doping control, blood testing.

INTRODUCTION

The efforts taken in the fight against doping in sports by the authorities on the local, national and international levels resulted in a new World Anti-Doping Code (in effect since 2015), innovated international standards, guides and guidelines. The Code works in conjunction with five international standards: 1) Prohibited List, 2) International Standard for Testing and Investigations, 3) International Standard for Laboratories, 4) International Standard for Therapeutic Use Exemptions, 5) International Standard for Protection of Privacy and Personal Data. The Anti-Doping Agency of Bosnia and Herzegovina has been founded pursuant to the Act on Sports in Bosnia and Herzegovina (Official Gazette of Bosnia and Herzegovina, no. 27/08 and 102/09), which is, among other activities, responsible for the implementation of the World Anti-Doping Code and the aforementioned standards.

Blood Sample Collection Guidelines represent, in a way, the amendment of the International Standard for Testing and Investigation (ISTI), having an aim to direct, standardize, and define the roles and responsibilities, the preparations for the sample collection procedure, selection of athletes, sample storage and laboratory analysis, transport of samples and the ownership of samples. An additional importance of the Guidelines is that they offer some practical advice on biological passport testing integration into the existing testing system, and also include the explanation how to use the Anti-Doping Administration and Management System (ADAMS). In order to conduct the doping control and the blood sample collection process according to the stipulated standards and the Guidelines, it is necessary to perform those procedures according to the standardized

procedure with the final goals of blood sample integrity and the athlete and the doping control officer health protection. The Guidelines can be viewed as the amendment to the International Standard for Testing and Investigation and they are subject to amendments in order to define the best practice and solutions.

Since 2004, the World Anti-Doping Agency (WADA) has been publishing and updating the Prohibited List, and the amendments of the List are the reflection of pharmaceutical industry development, and the trends in doping. The inclusion of a substance or method into the List is concerned if WADA, with its own decision, establishes that the substance or method meet two of the following three criteria: medical or other scientific proof, pharmacological effect or the experience that the substance or method, individually, or in combination with other substances or methods, has the potential to improve or improve the sports performance; medical or other scientific proof, pharmacological effect or the experience that the use of the substance or method is risky or presents a potential risk for the athlete's health; a decision by WADA that the use of the substance or method violates the spirit of sports as it is described in the introduction of the World Anti-Doping Code. The substance or method will also be included in the List if WADA establishes that there is a medical or other scientific proof, pharmacological effect or the experience that the substance or method have the potential of hiding the use of other prohibited substances or methods. The list includes the prohibited substances and methods that are prohibited in-competition and/or out of competition, or in particular sports.

METHODS

The paper analyses the current WADA's technical documents and guidelines in the field of collecting blood samples as part of doping control.

RESULTS

The urine and/or blood sample are taken from an athlete in the doping control process. Urine samples can give the matrix for the analysis which includes a majority of prohibited substances and methods. However, some substances and methods can be found only through blood sample analysis. Blood is the only matrix for finding the risks of homologous and autologous blood transfusions, certain erythropoiesis receptors activators (CERA), growth hormone (GH), growth hormone releasing factors (GHRFs) and haemoglobin based oxygen carriers (HBOCs). Growth hormone (GH) or somatotropin is an anabolic hormone released in the anterior pituitary gland. It is a peptide of a very short half-life in blood

and low concentration in urine. Hypothalamus hormones, growth hormone releasing hormone (GHRF) and somatostatin, stimulate, or in other words inhibit the growth hormone secretion.

ANY ENERGY SPENDING PROCESS (PHYSICAL ACTIVITY, PSYCHICAL STRESS, RUNNING) WORKS AS A STIMULUS FOR SOMATOTROPIN SECRETION. THEIR USE AS PERFORMANCE IMPROVING DOPING AGENTS IS WIDESPREAD AMONG ATHLETES AND ADOLESCENTS DOING SPORTS.

It is used as a synthetic rGH (recombinant form of GH) which is included in the Prohibited List. Due to its anabolic, lipolytic and repairing effects on the musculoskeletal system, it is possible that some athletes take it. It shows ergogenic effects, acts as an anabolic hormone, increases the skeletal muscles mass and, therefore, increases the strength and endurance, helps the assimilation of nutrients for tissue growth, acts lipolytically, helps in sports injuries recovery, and causes weight loss. High risk sports where the GH use is frequent are the sports/ disciplines that require strength (bodybuilding) and endurance (cycling, triathlon, and athletics) or those requiring frequent and intensive activity during trainings and competitions (running, boxing, weight lifting).

The secretion is increased with hyperglycaemia, stress and a higher temperature. GH diet decreases obesity with lower carbohydrates administration and beta-adrenergic agonists. The detection is difficult due to the similarity of endogenous and recombinant form, and due to the pulsatile secretion, and therefore, due to the short detection window and short half-life in the circulation (about 20 minutes). It shows a very short share of urinary secretion, and its concentrations in urine are 100-1000 times lower than in blood. It shows better effects when combined with anabolic steroids and EPO. The research have shown that 25% of athletes using anabolic steroids take GH as well, because GH shows a lot better effects if used in combination with anabolic steroids and EPO. Exogenous hGH administration inhibits the production of GH in human body due to a negative feedback. Since the concentrations of growth hormone are lower in urine than in blood, the blood sample collection in order to detect the growth hormone is not an appropriate method. Blood sample collection has proved to be a more reliable method.

GHRFs stimulate the growth hormone secretion. It is used as a synthetic form stimulating the growth hormone endogenous production. It can be analysed in urine or a blood serum. The effects are similar to those in the growth hormone. It decreases the body fat, and increases the muscular mass, strength and endurance.

Oxygen transport to the muscles can improve the athletes' performance. One of the best ways to improve the oxygenation is blood manipulation known as "Blood doping". It is defined as the abuse of substances or particular techniques for the optimisation of oxygen transport to the muscles with the aim to increase the performance in sports activities, and it includes, among others, the blood transfusion or administration of erythropoietin-stimulating agents. Erythropoietin is naturally present as a kidney-produced hormone (brain and liver produced in smaller amounts), and it stimulates the production of erythrocytes. Its production in the human body depends on the concentration of oxygen in blood. Due to the increase of erythrocyte production and the increase of haemoglobin mass, the transport of oxygen to the muscles is increased as well. The endurance parameters, such as the maximum oxygen usage and endurance time, increase, too. It is used by the athletes to improve their performance in the sense of endurance.

THIS HORMONE IS ALSO SYNTHETICALLY PRODUCED AND ADMINISTERED SUBCUTANEOUSLY OR DIRECTLY INTO THE BLOOD STREAM.

The first and the second generation of erythropoietin-stimulating agents can be detected in urine. CERA (Continuous Erythropoiesis Receptor Activator) is a synthetic erythropoietin, and belongs to the third generation of EPO stimulating agents that can be detected in blood, while it partially appears in urine after a physical activity, but it is very difficult to detect it in urine. It has a longer half-life and better ability of erythropoietin receptors stimulation than other factors. It is used in endurance sports. The artificial oxygenic carriers (AOCs) can be abused in sports due to the aerobic capacity improvement. Those are chemical substances that stimulate the activity of human haemoglobin. It is administered for the purpose of blood ability improvement to transport oxygen to the muscles. Those are perfluorocarbons and haemoglobin-based oxygen carriers (HBOCs). HBOCs are the synthetic oxygen carriers that optimise the oxygen transport, and therefore they are abused in sport. They are detected in blood samples (serum or plasma). They have a short half-life in circulation.

Some HBOCs do not excrete in kidneys, and therefore the concentrations in urine are very low. That is why the methodology based on blood analysis is necessary.

In order to keep the integrity of blood samples, and to ensure the safety of the athlete's and doping control officer's health, the process of blood sample collection should be conducted in accordance with the relevant health care international standards, and especially in accordance with WADA Blood Sample Collection Guidelines which define the whole process from planning and preparation to the transport of samples to the laboratory for the analysis.

The procedure of blood sample collection is conducted according to the strictly stipulated procedure. The type of equipment used, and the procedure after the samples are collected differ depending on the analysis that is required. The complete equipment must be completely approved by WADA. BD vacutainers with test tubes containing EDTA as anticoagulant are used among others (for the analysis of prohibited substances and methods in whole blood or plasma), i.e. with the inert polymeric gel for serum separation and coagulation activation factor (for the analysis of prohibited substances and methods in serum). After the blood sample is taken, for the analysis of whole blood or plasma, the samples should be gently shaken at least three times in order to mix the blood and the anticoagulant contained in the test tube, in order to avoid the clot. The samples are then sealed and prepared for transport. For serum analysis, the samples should be gently shaken in order to initiate the coagulation and should remain at room temperature for 15 minutes before they are sealed and prepared for transport. Each sample collected must be stored in a way to protect its identity, integrity and safety before the transport from the blood sample collection facility. That includes the meeting of the criteria related to a detailed form filling and procedure documentation until the sample gets to the destination. Other factors are: the location where the samples are stored, how they are stored, who has the authority over the samples, who has the authorized access to the samples etc. The samples must be stored cold, in a refrigerator if possible or in a cool container. Their transport must ensure the integrity of the sample and minimize the possibility of sample degradation under the influence of factors such as being late or extreme temperature variations. It would be ideal if the sample could be delivered to the laboratory the same day it was taken.

If the blood sample is intended for GH isoform method analysis, the sample should arrive not later than 96 hours from the sample collection. If the sample is intended for GH biomarker method analysis, the sample can be analysed if it is delivered to the laboratory not later than 120 hours from the moment of the sample collection. If the sample is intended for ESAs analysis, HBOCs or blood transfusion analysis, it must be analysed not later than 72 hours from the moment of the sample collection. Specific transport requirements within the International Standard for Testing and Investigations (ISTI) are determined for the sample intended for the analysis within the athlete's biological passport. The blood samples must be delivered cold but never frozen.

When selecting the container for storage, it is necessary to consider the duration of storing and transport, the number of samples that should be stored together, and the weather conditions (low and high temperatures). In that case the containers that should be selected are refrigerators, isolated refrigerating containers, isothermal bag or similar. During the storage and transport, the temperature in the container is recorded with the temperature data logger. If possible, the blood samples should be transported in a vertical position.

At this moment, the current ISTI is in force until January 2017. The complementary guidelines reflecting the ISTI amendments are amended as well. The amendments of standards and guidelines are related to the Athlete's Biological Passport (ABP) functioning and blood samples collection. New transport procedures for ABP blood samples are defined as the response to the need for ABP blood samples collection in remote areas or at weekends. The WADA Expert panel developed and validated the so called Blood Stability Score (BSS), which takes into account the relation between the blood samples stability, the temperature and the duration of the transport. The sending of the blood samples to the laboratory demands that the samples arrive unchanged and as soon as possible according to the established criteria.

BSS also allows, under specific circumstances, the prolongation of the transport duration, from the moment of sample collection to the analysis (the so called Collection-to-Analysis Time, CAT) from the existing 48 hours to 78 hours. The prolongation primarily depends on enabling the appropriate temperature during the sample transport in the period between the sample collection and the analysis.

The new Guidelines that have been in force since September 2016, except from being updated in order to reflect the amendments in ABP process, secure clearer instructions related to the required equipment and transport conditions for the different types of blood analysis (serum, plasma or the whole blood). The amendments are related to the sample transport: the part related to the duration of sample transport to the laboratory within 36 hours under the temperature of 40°C as ideal with the allowed range 2-120°C is deleted, and the temperature during transport is not precisely defined in the new Guidelines, but it is pointed out that the samples should be transported in low temperatures, enabling the samples to remain cold during transport. The requests for the allowed GH analysis transport are included (isoform method and biomarker method), and for the ESA analyses, HBOCs or blood transfusions as well, from 96 to 120 hours, i.e. 72 hours.

CONCLUSION

Blood is the only matrix in which it is possible to find the risks of homologous and autologous blood transfusions, particular erythropoiesis receptor activators (CERA), growth hormone (GH), growth hormone releasing factors, and Haemoglobin-based oxygen carriers (HBOCs). In order to preserve the integrity of a blood sample, and ensure the athlete's, as well as the Doping control officers' health safety, the process of blood sample collection should be conducted in compliance with the international health care standards, and especially in compliance with WADA Blood Sample Collection Guidelines. The Blood Sample Collection Guidelines present an important tool for the intelligent and efficient testing programmes.

REFERENCES

1. World Anti-Doping Code. World Anti-Doping Agency, 2015.
2. International Standard for Testing and Investigations. World Anti-Doping Agency, 2015.
3. International Standard for Testing and Investigations. World Anti-Doping Agency, 2017.
4. Blood Sample Collection Guidelines. World Anti-Doping Agency, Version 4.0, 2016.
5. Blood Sample Collection Guidelines. World Anti-Doping Agency, Version 5.0, 2016.
6. Athlete Biological Passport Operating Guidelines & Compilation of Required Elements. World Anti-Doping Agency, Version 5.0, 2014.
7. Athlete Biological Passport Operating Guidelines. World Anti-Doping Agency, Version 6.0, 2017.

SMJERNICE SVJETSKE ANTIDOPING AGENCIJE ZA PRIKUPLJANJE UZORAKA KRVI KAO PODRŠKA EFEKTIVNIM PROGRAMIMA TESTIRANJA SPORTISTA

Jedan od temeljnih ciljeva prevencija, edukacije i doping kontrole sportista iz oblasti dopinga u sportu jeste zaštita zdravlja sportista. Prema Svjetskom antidoping kodeksu, jedno od kršenja antidoping pravila je prisustvo zabranjene supstance ili njenih metabolita ili markera u uzorku sportiste. Zabranjene supstance definiira Svjetska antidoping agencija i svake godine objavljuje Listu zabranjenih sredstava koja obuhvata zabranjene supstance i metode koje su zabranjene na takmičenju i/ili van takmičenja ili u pojedinim sportovima. Tokom doping kontrole od sportiste se uzima uzorak urina i/ili krvi. Uzorci urina mogu dati matricu za analizu koja uključuje veliku većinu zabranjenih supstanci i metoda. Međutim, određene supstance i metode mogu se otkriti samo putem krvi. Krv je jedina matrica kojom je moguće otkriti rizike homolognih i autolognih transfuzija krvi, određenih aktivatora receptora eritropoeze (CERA), hormon rasta (GH), oslobađajuće faktore hormona rasta (GHRFs) i nosače kisika na bazi hemoglobina (HBOCs). Kako bi se održao integritet uzorka krvi, te da bi se osigurala sigurnost zdravlja sportiste i doping kontrolora, proces prikupljanja uzoraka krvi treba da se odvija u skladu sa relevantnim međunarodnim standardima u oblasti zdravstvene zaštite, a posebno u skladu sa smjernicama WADA-e za proces prikupljanja uzoraka krvi koje definiraju cijeli proces od planiranja i pripreme do transporta uzorka u laboratorij na analizu. Smjernice su dopuna Međunarodnog standarda za testiranje i istrage WADA-e, i redovno se ažuriraju u skladu sa najnovijim naučnim spoznajama. Ključne riječi: doping kontrola, testiranje krvi.

Received: November 04, 2016 / Accepted: December 01, 2016

Correspondence to: Amir Avdagić, Agency for Anti-Doping control of Bosnia and Herzegovina, Bosnia and Herzegovina

E-mail: amir@ada.gov.ba

INSTRUCTIONS TO THE AUTHORS OF PAPERS

The aim and purpose of the journal

Sport science – an International scientific journal, which has, in the previous editions, been related to the area of Kinesiology, is, from this issue, open to the areas of education, development and new achievements, not exclusively related to the area of kinesiology. It is issued twice a year.

The Abstract

Each paper is evaluated, so that it corresponds to the intention of the journal, and then reviewed. The authors are responsible for the content and the ethics of everything written in the Paper. The authors can be requested to give a specific statement that the paper has not been published in another publication. Sport Science does not question the copyright the authors have on the published papers, but preserves the right of distribution in accordance with the legal provisions, and without further consultation with the authors, with which the authors agree when submitting the paper. Authors are not entitled to re-release / reprint the paper, apart from a copy of the printed journal. It is necessary to include the name of the corresponding author, his or her e-mail address and the institutional e-mail address.

Preparation of attachments

It is recommended that the authors keep the structure of the journal that includes: the Abstract, the Introduction, the Problem and the Aim, the Methods, the Results, the Discussion, the Conclusion and the Literature. This recommendation does not bind the authors but helps ease the publishing process, and understanding of the subject matter. The attachments are not limited in size, but should not exceed 7 pages in the journal. Each page that exceeds the recommended 7 pages is paid 50 €. The text font is Verdana 9 pt, the titles in the text are in size 9 bold, with a justified line spacing or 1 created in two columns. The titles are in the text font Verdana, size 10, the authors' names are in size 9 bold, the authors' institutions in size 9 italic (University, Faculty and the country of origin). The expected size of the paper is 12 000, exceptionally 14 000, characters without tables and images. All tables should be standardized (e.g. MS Excel) by the APA standard and adjusted to the column. The images, photographs and other illustrations should be in a vector format, or a high quality printing resolution (600 dpi). Before printing, the journal has the right to edit the illustration. In such instances, the author will be consulted or informed via e-mail.

References

The reference list, as well as other forms of text formatting, will be accepted if they are made in accordance with the APA standard (American Psychological Association), and translated into English with an indication of the original language in the brackets. The attachment is sent exclusively in electronic form (e-mail, CD, disc etc.)

Delivery address for the attachments

Sport Science – Association for Research, Education and Development "NIA"
Aleja konzula No. 5, Travnik, Bosnia and Herzegovina
E-mail: info@sportscience.ba

Language used in the attachments

Sport Science publishes the papers in English with abstracts in Bosnian. In the event that the attachment is sent in its original form, in another international language, the author of the attachment will be consulted.

Note

Attachments that do not meet the requirements, or need to be consulted upon, will be immediately returned to the author with a warning containing the actions that need to be undertaken.

Publication of the journal

The journal is published in printed and electronic form. The electronic version is available on the web addresses: www.sportscience.ba and www.nia.ba

UPUTE AUTORIMA RADOVA

Namjera i svrha časopisa

Sport Science – međunarodni znanstveni časopis koji je u predhodnim izdanjima bio vezan za područje kineziologije, a od ovog broja otvorena su područja edukacije, razvoja i novih dostignuća koja nisu vezana isključivo za područje kineziologije. Izdaje se dva puta godišnje.

Opće odredbe o prilogima

Svaki rad se vrednuje u odnosu na to odgovara li intenciji časopisa, a zatim se upućuje na recenzije. Autori snose odgovornost za sadržaj te etičnost svega što je radu. Od autora se može zatražiti posebna izjava da rad nije objavljen u nekoj drugoj publikaciji. Sport Science ne dovodi u pitanje autorska prava autora objavljenih radova, ali zadržava pravo distribucije u skladu sa pravnim odredbama i bez dodatne konsultacije sa autorima, a sa čime autori predajom rada postaju saglasni. Autori nemaju pravo na reizdanje/reprint, osim jednog primjerka štampanog časopisa. Potrebno je dostaviti naziv autora za korespondenciju, njegov mail i institucionalni mail.

Priprema priloga

Preporučuje se da se autori pridržavaju forme koja uključuje: Sažetak, Uvod, Problem i cilj, Metode, Rezultati, Rasprava i zaključak, Literatura, Abstract. Ova preporuka ne obavezuje autore priloga, ali olakšava put do publiciranja i kasnijeg lakšeg razumijevanja materije. Prilozi nisu ograničeni veličinom, ali ne bi trebali prelaziti 7 stranica u časopisu. Svaka stranica rada koji prelazi 7 stranica, plaća se 50 €. Font teksta je Verdana 9, naslovi u tekstu bold 9, prored 1, obostrano poravnanje teksta, kreirano u 2 kolone. Naslovi su font Verdana 10, autori 9 bold, institucije autora 9 italic (Univerzitet, Fakultet i Država iz koje dolaze). Očekivana veličina je 12.000 znakova bez tabela i slika (izuzetno 14.000). Sve tabele trebaju biti standardne (npr. MS Excel) po APA standardu i prolagođene koloni, a slike, fotografije i druge ilustracije u vektorskom formatu ili rezoluciji koja osigurava kvalitetnu štampu (600 dpi). Časopis ima pravo radi pripreme za štampu urediti ilustraciju, o čemu se konsultira ili informira autora putem e-maila.

Navodi referenci

Navodi literature, kao i drugi oblici formatiranja teksta, bit će prihvaćeni po APA standardu (American Psychological Association), prevedeni na engleski sa navodom originalnog jezika u zagradi. Prilog se šalje isključivo u elektronskom obliku (e-mail, CD, disk,...).

Adrese za dostavu priloga

Sport Science – Association for Research, Education and Development "NIA"
Aleja konzula br. 5, Travnik, Bosnia & Herzegovina
E-mail: info@sportscience.ba

Jezik priloga

Sport Science objavljuje radove na engleskom jeziku uz sažetke na bosanskom jeziku. U slučaju da je prilog poslan u izvornom obliku na nekom drugom međunarodnom jeziku, autor priloga će u vezi sa tim biti konsultiran.

Napomena

Prilozi koji ne ispunjavaju uslove ili je za njih potrebna dodatna konsultacija bit će istom vraćeni autoru s upozorenjem o radnji koju je potrebno poduzeti.

Objava časopisa

Časopis izlazi u printanom i elektronskom obliku. Elektronska verzija dostupna je na web adresama: www.sportscience.ba i www.nia.ba

www.sportscience.ba

