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TABLE OF CONTENTS

Bojan Masanovic, Fitim Arifi and Jovan Gardasevic (Original Scientific Paper) Standing Height and its Estimation Utilizing Sitting Height Measurements in Adolescents from the Western Region in Kosovo	3-7
Aleksander Yurevich Osipov, Roman Sergeevich Nagovitsyn, Fanavi Haybrahmanovich Zekrin, Fendel' Tatyana Vladimirovna, Dmitry Alexandrovich Zubkov and Tatyana Vladimirovna Zhavner (Original Scientific Paper) CrossFit Training Impact on the Level of Special Physical Fitness of Young Athletes Practicing Judo.....	9-12
Monalisa Debnath, Subhra Chatterjee, Amit Bandyopadhyay, Gouriprosad Datta and Swapan Kumar Dey (Original Scientific Paper) Prediction of Athletic Performance through Nutrition Knowledge and Practice: A Cross-Sectional Study among Young Team Athletes.....	13-20
Vesna Babic, Gordana Bjelic and Ksenija Bosnar (Original Scientific Paper) Life Well-Being and Reasons for the Termination of Sport Careers among Croatian Elite Athletes	21-25
Jovan Gardasevic, Dusko Bjelica, Ivan Vasiljevic, Fitim Arifi and Sami Sermaxhaj (Original Scientific Paper) Body Composition of Elite Soccer Players from Montenegro and Kosovo.....	27-31
Dasa Prus, Miran Kondric, Vedran Hadzic and Petra Zaletel (Original Scientific Paper) Knowledge and use of Nutritional Supplements among Hip-Hop Dancers.....	33-39
Kostiantyn Prontenko, Grygoriy Griban, Nadya Dovgan, Orest Loiko, Volodymyr Andreychuk, Pavlo Tkachenko, Dmytro Dzenzeliuk and Ihor Bloshchynskyi (Original Scientific Paper) Students' Health and its Interrelation with Physical Fitness Level.....	41-46
Davor Sentija, Vesna Babic and Lucija Kolic (Original Scientific Paper) Gait Transition Speed and the Aerobic Thresholds for Walking and Running in Women.....	47-51
Ignatio R. Haryono, David Maurice and Nawanto A. Prastowo (Original Scientific Paper) Incidence Rate and Patterns of Sport Injury among College Students.....	53-57
Alexander Bolotin and Vladislav Bakayev (Original Scientific Paper) Model for Stamina Development in Biathletes Based on the Combined Application of Respiratory Exercises.....	59-65

Pavel Smela, Petra Pacesova, Branislav Antala, Iveta Cekanova and Hynek Fucik (Original Scientific Paper) Achievement Motivation of Physical Education Teachers.....	67-71
Lefkothea Tsevaridou and Ourania Matsouka (Original Scientific Paper) The Impact of Leadership Styles on Employees' Psychological Empowerment, in Greek Sport Departments	73-78
Volodymyr Klymovych, Artur Oderov, Serhiy Romanchuk, Orest Lesko and Mukola Korchagin (Original Scientific Paper) Motivation of Forming Students' Healthcare Culture on Principles of Interdisciplinary Integration	79-83
Dijana Medenica Mitrovic, Olivera Simovic and Milica Raicevic (Original Scientific Paper) The Relationship between Leadership Styles and Organizational Culture in Sport Organizations.....	85-89
Marija M. Jankovic (Original Scientific Paper) Holistic Marketing Approach in Media Communications of Sports Organizations	91-95
Sumaryanti, Tomoliyus and Japhet Ndayisenga (Original Scientific Paper) Circuit Training Intervention for Adaptive Physical Activity to Improve Cardiorespiratory Fitness, Leg Muscle Strength Static and Balance of Intellectually Disabled Children	97-100
Stefan Seman, Marija Macura, Branka Markovic and Otto Barak (Short Report) Injury Incidence in Female Serbian Elite Volleyball Players	101-104
Ciro Alminni, Tiziana D'Isanto, Francesca D'Elia and Gaetano Altavilla (Short Report) Test of the Jump Service Spin in Volleyball	105-108
Flavio Ceglie (Short Report) Dispositional Factors and Sportsmanship in Italian Athletes.....	109-112
Sanja Pekovic, Aleksandra Djekic, Vasilije Markovic, Milica Bojbasa and Djurdjica Perovic (Short Report) The Influence of Animation Programmes on Tourists' Satisfaction: The Role of Animators	113-115
Guidelines for the Authors.....	116-126

ORIGINAL SCIENTIFIC PAPER

Standing Height and its Estimation Utilizing Sitting Height Measurements in Adolescents from the Western Region in Kosovo

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Abstract

The purpose of this research is to examine standing height in both Kosovan genders in the western region of as well as its association with sitting height, as an alternative to estimating standing height. A total of 664 individuals (338 male and 326 female) participated in this research. The anthropometric measurements were taken according to the ISAK protocol. The relationships between standing height and sitting height were determined using simple correlation coefficients. A comparison of means of standing height and sitting height between genders was performed using a t-test, while linear regression analyses were carried out to examine the extent to which sitting height can reliably predict standing height. The results reveal that Western Kosovan males are 179.71 ± 6.00 cm tall and have a sitting height of 94.79 ± 3.60 cm, while Western Kosovan females are 166.26 ± 5.23 cm tall and have a sitting height of 90.28 ± 3.25 cm. The results have shown that both genders made Western-Kosovans tall and somewhat taller than the general Kosovan population. Moreover, the sitting height reliably predicts standing height in both genders but not arm span sufficiently reliably. This study also confirms the necessity of developing separate height models for each region in Kosovo as the results from Western-Kosovans do not correspond to the national values.

Key words: prediction, measurement, stature, sitting height, Kosovan

Introduction

According to Arifi et al. (2017), Kosovo is a democratic, secular and multi-ethnic republic, which is administratively divided into seven districts (Ferizaj, Gjakova, Gjilan, Mitrovica, Peja, Pristina, and Prizren) and five regions (Eastern, Western, Northern, Southern and Central). This study analyses the relationship between standing height and sitting height measurements in adolescents in the western region of Kosovo. Within this region are two districts (Peja and Djakova) and seven municipalities (Deçan, Gjakova, Junik, Rahovec, Pejë, Istok and Klina). The territory of western Kosovo (Figure 1) covers 2,494 square kilometres, and its population consists of 368,907 inhabitants (Gardasevic, Masanovic, & Arifi, 2018). Kosovo does not have a large territory, but its terrain is highly varied. Most of Kosovo's border areas are

dominated by mountains and high grounds (Masanovic, Gardasevic, & Arifi, 2018). One of the most noticeable topographical features is the Bjeshkët e Nemuna, also known as the Albanian Alps. They are a geological continuation of the Dinaric Alps that run laterally through the west along the border with Albania and Montenegro (Arifi, Gardasevic, & Masanovic, 2018). It is widely known that body height and body proportions are specific for populations living on the Dinarides (Grasgruber et al., 2019). People from this area were recognized as tall people by European anthropologists more than 100 years ago (Masanovic, 2018; Popovic, 2019). Based on that, one possible conclusion is that this fact might influence the main objective of this study, because of the soil type, as well as other socio social, economic and geographical characteristics as a potential influencing factor (Gardasevic, 2019).



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Figure 1. Geographical Location of Western Region in Kosovo

The measurement of standing height is a vitally important variable when evaluating nutritional status (Masanovic, Bavcevic, & Prskalo, 2019). Furthermore, there are many scientifically based findings that confirm that the measurement of standing height is an important variable when assessing the growth and development of children, the demands of energy, muscle strength, metabolic rate, lung volumes, and glomerular filtration, as well as adjusting the measures of physical abilities and predicting the appropriate dosage of medicine (M. Golshan, Crapo, Amra, Jensen, & R. Golshan, 2007; Saari et al., 2011; Bjelica et al., 2012; Popovic, 2018). Exact standing height sometimes cannot be measured in the usual way (Frederiks et al., 2005); because of some acute and chronic conditions, such as paralysis, fractures, amputation, scoliosis and pain, an estimate of standing height has to be differently estimated, from other reliable anthropometric indicators. For the most reliable anthropometric indicators, we consider sitting height, hand and foot lengths, knee height, length of the forearm, of the sternum, length of scapula, arm span, and others (Masanovic, Gardasevic, & Arifi, 2019; A. Ozaslan Iscan, I. Ozaslan, Tugcu, & Koc, 2003; Fatmah, 2010; Masanovic, Gardasevic, & Arifi, 2018a). In the older subjects, these anthropometric indicators can give us a better estimate of real growth due to the loss of standing height associated with ageing. In accordance with this, they are even more important when we want to diagnose individuals with abnormalities in growth or standing height loss during surgical procedures on the spine (Mohanty, Babu, & Nair, 2001), as well as to anticipate standing height in people who are too old to stand properly, thus making it very difficult to measure precisely, and sometimes impossible because of problems with movement and kyphosis (Bjure, Grimby, & Nachemson, 1968; Chumlea, Roche, & Steinbearagh, 1985; Popovic, Gardasevic, Masanovic, Arifi, & Bjelica, 2017). Finally, this information is of vital importance in sport, since the standing height represents a significant factor that influences the success in almost all sports disciplines (Popovic, 2014; Gusic, Popovic, Molnar, Masanovic, & Radakovic, 2017; Masanovic, 2019; Arifi, Bjelica, Masanovic, 2019).

The benefit of using various body parameters in predicting standing height has been verified several times (Yun et al., 1995; Hickson & Frost, 2003), and arm span, foot length and sitting height reported to be among of the most reliable ones (Mohanty, Babu, & Nair, 2001; Ozden, Balci, Demirüstü, Turgut, & Ertugrul, 2005; Dangour, Schilg, Hulse, & Cole, 2002). The complicating

circumstance is that the relationship of long bones and standing height has revealed to vary in different ethnic and racial groups (Steele, & Chenier, 1990; Quanjer et al., 2014) as well as various regions (Norgan, 1994; Bjelica et al., 2012). For example, the average sitting height/standing height ratio of populations from Europe is 0.52, while the population from Africa in general, have slightly longer legs and ratios around 0.51. Populations from Asia have slightly shorter legs with a ratio of 0.53–0.54, and finally, at the bottom of the range for sitting height/standing height ratio are Australian Aborigines with ratios of 0.45–0.49 (Abou-Hussein, Abela, & Savona-Ventura, 2011; Ukwuma, 2009). Consequently, a specific formula for calculating standing height from the long bones for each ethnic group is required. The mentioned variations might also be relevant for sitting height predictions, mostly because the population from the Dinaric Alps has specific body proportions from the perspectives of both the nation and the region (Popovic, 2017). Even though several studies about this issue are available on the global population, only narrow data is available on European subjects (Frederiks et al., 2005; Ariba-Munoz et al., 2013), while there were no regional analyses thus far in the Dinaric Alps population. Regarding the rather scant scientific material, the purpose of this research was to examine standing height in both Western-Kosovan genders and determine its association with sitting height.

Method

This study included a sample of 664 fourth-year secondary school students (338 male and 326 female) from the Western Region of Kosovo. This group of respondents was selected for two reasons: the first is connected to the fact that the growth process of an individual ceases by this age, while the second is related to the fact that there does is not age-related loss in standing height at this age. The average age of the male subjects was 18.24 ± 0.43 years, while the average age of the female subjects was 18.25 ± 0.45 years. It should be noted that excluded from the data analysis were the individuals with physical deformities, as well as those without informed consent. Another exclusion criterion was being non-Western Kosovan.

The anthropometric measurements that were needed for this research (standing height and sitting height) were taken according to the protocol of the International Society for the Advancement of Kinanthropometry (Marfell-Jones, Olds, Stew, & Carter, 2006).

Selected anthropometric indicators were measured by trained measurers, while the quality of their performance was estimated by the prescribed "ISAK Manual". The age of each subject was rated directly from their birthdays.

The analysis was conducted by using the Statistical Package for Social Sciences (SPSS) version 20.0. For both anthropometric variables, means and standard deviations (SD) were obtained. A comparison of means of standing height and sitting height between genders was performed using a t-test. The relationships between standing height and sitting height were determined using simple correlation coefficients (95% confidence interval). To examine the extent to which the sitting height can reliably predict

standing height, a linear regression analysis was carried out. Statistical significance was set at $p < 0.05$.

Results

In Table 1, a summary of the anthropometric measurements of both genders is shown. The mean of the standing height for males was 179.71 ± 6.00 centimetres, and sitting height was 94.79 ± 3.60 centimetres, while for females the standing height was 166.26 ± 5.23 centimetres, and sitting height was 90.28 ± 3.25 centimetres. The gender difference between standing height and sitting height measurements was statistically significant (standing height: $t = 30.759$; $p < 0.000$, and sitting height: $t = 16.936$; $p < 0.000$).

Table 1. Anthropometric Measurements of the Study Subjects

Subjects	Standing Height Range	Sitting Height Range
	(Mean \pm SD)	(Mean \pm SD)
Male	163.5-196.4 (179.71 \pm 6.00)	83.3-105.0 (94.79 \pm 3.60)
Female	153.3-181.8 (166.26 \pm 5.23)	80.0-98.7 (90.28 \pm 3.25)

The simple correlation coefficients and their 95% confidence interval analysis between the anthropometric measurements are displayed in Table 2. The associations between standing height

and sitting height were significant ($p < 0.000$) and high in this sample, for both genders (male: 0.661; female: 0.614).

Table 2. Correlation between Standing Height and Sitting Height of the Study Subjects

Subjects	Correlation	95% confidence	Significance
	Coefficient	interval	p-value
Male	0.661	0.581-0.742	<0.000
Female	0.614	0.527-0.700	<0.000

In Table 3, the results of the linear regression analysis are shown. First, all models were extracted by including age as a covariate. However, it was found that the contribution of age was insignificant and, therefore, the age was dropped, and estimations were derived as univariate analysis. The high values of the

regression coefficient (male: 0.661; female: 0.614) signify that sitting height notably predicts standing height in both Western Kosovan genders (male: $t = 16.157$, $p < 0.000$; female: $t = 13.998$, $p < 0.000$), which confirms the R-square (%) for the male (43.7) as well as for the female (37.7).

Table 3. Results of Linear Regression Analysis in which Sitting Height Predicts Standing Height

Subjects	Regression Coefficient	Standard Error (SE)	R-square (%)	t-value	p-value
Male	0.661	4.507	43.7	16.157	0.000
Female	0.614	4.137	37.7	13.988	0.000

The associations between sitting height measurements and standing height among the above models are presented as a

scatter diagram (Figure 2).

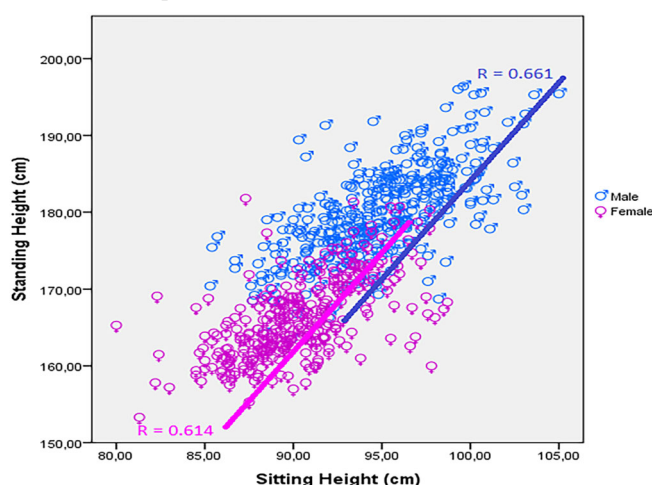


Figure 2. Scatter Diagram and Relationship between Sitting Height Measurements and Standing Height among Both Genders

Discussion

In previous centuries, many researchers attempted to assess standing height using various anthropometric measures. They concluded that the arm span is the most reliable body indicator for predicting the standing height of an individual (Datta Banik et al., 2011; Gardasevic, Rasidagic, Krivokapic, Corluka, & Bjelica, 2017), while sitting height was very close (Arriba Munoz et al., 2013). The study conducted by authors Frederiks et al. (2005) and Arriba Munoz et al. (2013) confirmed a very high linear correlation between standing height and sitting height in both genders of the Spanish population, while the research study conducted by Fatmah et al. (2010) shows a significant correlation between standing height and sitting height in both genders of the Indonesian population. The highest correlation coefficient in this population was found for sitting height in males ($r=0.661$) as well as in females ($r=0.614$).

However, researchers also found that the individual and ethnic variations exist with regard to standing height and its association with sitting height, i.e., that the relationship between standing height and some other anthropometric measures are different from ethnic group to ethnic group as well as race to race. Therefore, we conclude that racial and ethnic differences reduce the possibility of generalizing (Bjelica et al., 2012; Quanjer et al., 2014), i.e., that there are a need and necessity for developing separate standing height models for each population on account of ethnic differences.

Previous studies that have analysed the entire population confirm that there is a specific correlation coefficient in males ($r=0.691$) and females ($r=0.629$) from Kosovo (Popovic 2019). However, some recent studies have also confirmed that the regional differences between the same ethnic groups also exist (Popovic, 2017; Masanovic, 2019), which caused the need for additional caution. Therefore, the main goal of this research was to investigate the above-mentioned facts, and test their validity for Western-Kosovans, that is, for one of the five Kosovan regions. Specifically, in the present research, it was remarked that the sitting height/standing height ratio in Western-Kosovan male is quite smaller (male: 43.7%; female: 37.7%) in comparison to the entire Kosovan population (male: 47.7%; female: 39.6%) and other available populations that estimate over 70% each and more in the male population, while the female population is much more in parallel to previously measured populations. The sitting height measure seems to be a reliable indirect anthropometric indicator for estimating standing height in both genders of the Western-Kosovan population; consequently, the correlation between sitting height and standing height was significant in both Western-Kosovan genders. Despite similar relations, the estimation equations that are obtained in the Western-Kosovans differ considerably from the entire population of Kosovo and other available populations.

The results of the previous studies confirm the necessity for developing separate standing height models for both Kosovan genders, but it also recommended that subsequent studies should consider the division criteria of the population of this country to regional subsamples. Analyses should be done separately, to ensure that there are no geographical differences (such as type of soil) influencing the average standing height in both genders from Kosovo, as well as its association with sitting height. The reason for concern was based on the fact that the whole territory of Kosovo does not fall into Dinaric Alps racial classification. This study confirms the assumption that it is necessary to develop separate standing height models for each part of Kosovo on account of regional variations.

Another limitation of this research might also be the composition of the measured sample that consisted of high school students. There are some studies that assumed that the growth of an individual was not completed at this age (S. Popovic, personal communication, 2019). This assumption might be supported by the fact that in several previous studies we can find that university-educated individuals are taller than the high school individuals in Hungary, Poland, and Bosnia and Herzegovina (Szollosi, 1998; Wronka & Pawlinska-Chmara, 2009; Gardasevic et al., 2017). However, the results show that this was not so in Montenegro, where the situation is reversed (Popovic, 2017). Comparing the average standing height measures of this study with the results of the average standing height measures of a study that examines university students might provide much more precise conclusions.

A further limitation of this study is also the fact that both Kosovan genders had not yet reached their full genetic potential, since various environmental factors controlled their development. Further continuous monitoring is necessary, mostly because it is expected that the secular changes influencing standing height will ascend in the following two or three decades.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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ORIGINAL SCIENTIFIC PAPER

CrossFit Training Impact on the Level of Special Physical Fitness of Young Athletes Practicing Judo

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Abstract

The high level of individual physical fitness of athletes is one of the main factors in achieving sports success in martial arts. This study aimed to assess CrossFit training's impact on the level of physical fitness of young (16-17 years old) athletes practising judo. The athletes' competitive activity data was also assessed. The young athletes (n=33) demonstrated athletic performance at a level approaching that of elite athletes. They were randomly divided into approximately two equal groups. During the training of one of the groups (n=16), CrossFit sessions were used. The obtained data were evaluated using SJFT, the level of lactate concentration in blood and a comparative analysis of the judoists' competitive coefficients (CC). Statistical analysis was performed using the Mann-Whitney U-test. A significant ($p<0.05$) athletic superiority has been revealed among those who used CrossFit training in the coefficient of active combat time (CC-3) in competitive matches. SJFT indicators of both athlete groups show a positive trend. Increased dynamics of blood lactate concentrations after exercises were detected among both groups. Moreover, among the athletes who used CrossFit training, blood lactate level data were significantly ($p<0.05$) higher, averaging 14.54 ± 0.51 mmol/l. The duels percentage won by athletes who used CrossFit training was considerably higher than those athletes who did not use CrossFit training (59% vs 54%).

Key words: martial arts, judo, young athletes, CrossFit training, competitive activity

Introduction

Experts indicate that one of the main factors for achieving significant success is athletes' physical (Podrigalo et al., 2019) and the functional fitness level in martial arts (Volodchenko, Podrigalo, Aghyppo, Romanenko, & Rovnaya, 2017). It is known that athletes' level of physical and functional fitness should be at their best when practising judo since judo is characterised by periodic high-intensity strength exercises (Mohammed & Choi, 2017). Moreover, experts also state that athletes need to develop muscle strength, strength and endurance to achieve significant competitive results (Franchini, Brito, Fukuda, & Artioli, 2014). Unfortunately, scientists have revealed a lack of physical fitness level among some elite Russian judoists (Adolf et al., 2018). Also, experts point out

the lack of relevant data related to the possibility of a significant increase of judo athletes' physical and functional status (Ceylan, Gurses, Akgul, Baydil, & Franchini, 2018).

It should be noted that it is customary to use hypoxic interval training to increase athletes' functional status in the practice of training elite fighters (Rovniy, Pasko, & Galimskiy, 2017). Russian experts point to the need to use exercises that affect the physical fitness of judo, thereby increasing athletes' level of endurance when practising judo. Surkov (2015) recommends using the following exercises: leap over partner while he is bent over and crawl under his legs after his partner stands up. Pashintsev and Surkov (2015) recommend the use of exercises with weights (30 seconds - exercise, 30 seconds - rest) for 5 minutes, followed by 5 minutes of rest.



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Recently CrossFit training has been used to increase the level of athletes' preparedness in the practice of sports. It should be noted that CrossFit training is actively used in the training of police officers and special services in the Russian Federation (Galimova et al., 2018). Some experts recommend CrossFit training for a significant increase in the level of athletes' physical fitness for various types of martial arts (Osipov et al., 2017). Furthermore, there is evidence of using CrossFit trainings effectively in the process of competitive training of elite Russian athletes who practice martial arts: judo, sambo, and combat sambo (Osipov, Kudryavtsev, Koptev, Iermakov, & Bliznevskaya, 2018). However, there is a lack of accurate information about the required number and content of CrossFit training in the training process of elite and sub-elite athletes practising martial arts in the literature. There is a lack of reliable data on the impact of CrossFit training on the level of competitive results of young athletes practising judo.

The purpose of the research: dynamic analysis of competitive activity and competitive results of young (16-17 years old) judoists' using CrossFit trainings during pre-competitive and competitive training periods. Athletes' physical fitness level during the use of CrossFit training was also assessed.

Methods

Research participants: young (16-17 years old) male athletes who have been practising judo for at least 4-5 years. The weight category of judoists is 73 kg. Sports qualifications – athletes who are close to the elite level: candidates for master of sports in judo ($n=33$). All athletes underwent a medical examination and had no contraindications to judo. Moreover, all athletes gave informed consent to participate in the research. The athletes were randomly divided into two approximately equal groups: Group 1 ($n=17$) and Group 2 ($n=16$).

The studies were approved by the ethics committee of the Institute of Physical Culture, Sports and Tourism, Siberian Federal University. The research duration was 10 months (August-May 2018) during which all athletes, in addition to their training, took part in seven judo competitions. During the study period, the training of athletes for competitions was somewhat different. Group 1 ($n=17$) was prepared according to the standard training program operating in many judo schools of the Russian Federation and CIS countries (Koptev et al., 2019). This program has a specific ratio of the volume of training load: physical training (100-120 hours), tactical and technical training (380-400 hours), and Randori (50-55 hours). For the development of endurance, the following were used: Randori and circular training (serial execution of strength and gymnastic exercises in a specific sequence with the same rest intervals between the series). These training sessions were part of athletes' physical training of Group 1 and took about 30-40% of the total time.

The programme of athletes' pre-competition and competitive training of Group 2 ($n=16$) included physical training (120-130 hours); tactical and technical training (380 hours); Randori (50 hours). For the development of endurance, the following were used: Randori and CrossFit training. The latter took about 50% of the total amount of time spent on the physical training of athletes in this group. The training sessions consisted of a serial performance of the following exercises: fast run (60 m); work with weights (16 kg); squats with a barbell (weight 50-60% of the athlete's weight); jumping on pedestals (height - 60-80 cm); carrying the load (40-50% of the athlete's weight) for speed, etc. The duration of each series was 4 minutes (the time of a com-

petitive match in judo). The rest between the series was 4-5 minutes. The duration of each CrossFit workout was 45 minutes.

Special tests were used for qualitative monitoring of athletes' functional status while practising martial arts. Furthermore, lactate data concentration in judoists' blood was used for a qualitative assessment of athletes' condition after intensive training (circular and CrossFit sessions). A glucose and lactate analyser BIOSEN 5030 (Germany) was used for data collection. All athletes' blood was sampled on a monthly basis during training sessions. The level of physical fitness of athletes was assessed using SJFT. Data of Osipov et al. (2018) were used for a qualitative comparison of the obtained data with the results of young and elite judoists.

The level of competitive activity of the studied athletes was assessed using special criteria: competitive coefficients (CC). These coefficients are the average arithmetic indicators values of athletes' actions in competitive duels (Koptev, 2018). In our studies, we used athletes' CC activity: the number of Nage-waza technical actions (CC-1) and Ne-waza (CC-2) as well as the ratio of active combat time and total match time (CC-3). Furthermore, CC was calculated using the structural analysis of athletes' competitive duels. All the matches of both athletes' groups were taken for the analysis of the research period: 422 athletes' competitive duels of Group 1 and 431 athletes' competitive matches of Group 2. Experts were involved ($n=10$): coaches and judges of high qualification for the qualitative determination of CC in judo. Furthermore, the opinion of three experts was taken into account in the analysis of each match. The data of Osipov et al. (2018) were used for comparison of the CC of the studied athletes with the CC indicators of elite athletes from Russia and Kyrgyzstan.

Statistical analysis of the results was performed using SPSS20. Furthermore, a Mann-Whitney U-test is used determining the confidence level of the obtained data.

Results

The improvement dynamics of index assessment of athletes' physical fitness from average classification (13.04-13.94) to good (11.74-13.03) has been revealed in SJFT terms. An insignificant superiority of SJFT data was recorded among athletes of Group 2.

The lactate concentration of studied athletes' blood increased significantly over the study period. Also, an increase of lactate concentration was detected in both groups; however, athletes who used CrossFit during training had significantly ($p<0.05$) higher blood lactate content (14.54 ± 0.51 mmol/l) than athletes who did not use CrossFit (13.79 ± 0.38 mmol/l).

At the beginning of the study, data about athletes' CC had not been collected; determination of athletes' CC values was carried out in the research course. Comparative analysis of the values of CC-1 and CC-2 have not revealed significant differences in the coefficients of competitive activity among the judoists of both groups. Somewhat higher values of these coefficients were found among athletes of Group 2, but the differences between the results of groups are not significant. On average, athletes performed 6.22 ± 0.17 receptions of Nage-waza and 2.47 ± 0.19 receptions of Ne-waza per match. It should be noted that the smaller the value of this coefficient, the higher the level of activity in the match was when evaluating CC-3. A significant difference ($p<0.05$) of the values of this coefficient was found in favour of athletes from Group 2. These studies are presented in Table 1.

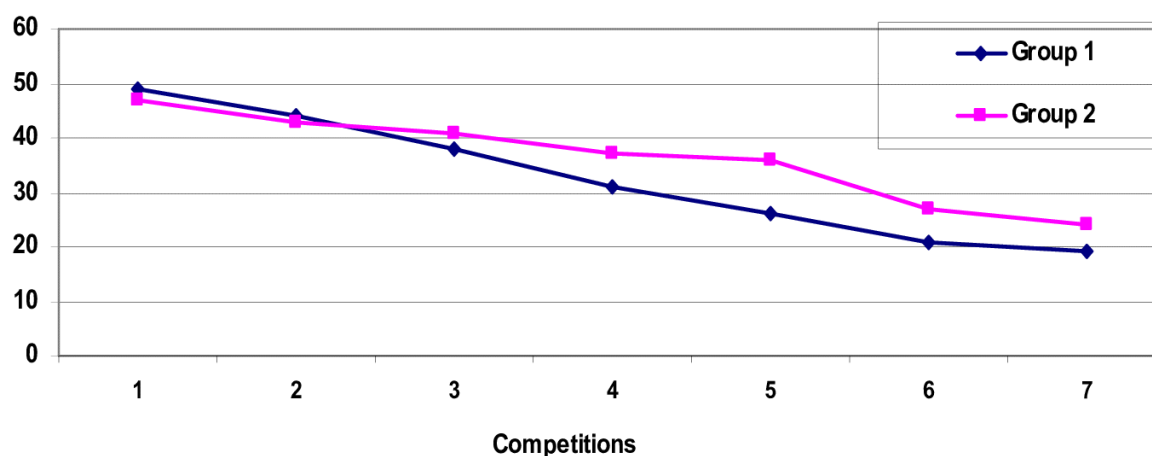
Table 1. Test results and CC values of studied athletes

Criteria	Group 1 (n=17)		Group 2 (n=16)	
	August	May	August	May
SJFT	13.26±0.19	12.94±0.37	13.31±0.14	12.77±0.32
Lactate	13.09±0.44	13.79±0.38	13.21±0.46	14.54±0.51*
CC-1	-	6.18±0.14	-	6.26±0.21
CC-2	-	2.39±0.22	-	2.55±0.16
CC-3	-	3.28±0.09	-	2.89±0.04*

Legend: * (reliability of results differences) – $p < 0.05$.

At the end of the research, some athletic advantage from Group 2 was revealed in the total number of competitive matches for the entire study period (August-May 2018). Athletes of Group 1 held 422 competitive matches and athletes of Group 2 – 431 matches. Competitive activity results of the

studied judoists were also evaluated by the number of duels won at seven competitions. Athletes of Group 1 won 54% of matches, while athletes of Group 2 won 59% of competitive matches. Statistics of won competitive matches of both groups are presented in Figure 1.

**Figure 1.** Ratio of duels won by the studied athletes

Discussion

First, a certain lack of significant scientific research of the use of CrossFit training in practice of pre-competition and competitive training of judoists at various levels should be noted. This is a matter of some concern, since athletes need a high level of endurance to achieve success in judo (Kuvačić, Krstulović, & Đapić Caput, 2017). However, the scientific literature presents data on the benefits of interval training for the development of athletes' endurance when practising martial arts (Rovniy et al., 2017). The effect of high-intensity interval training on the performance indicators of judokas has also been proven by experts (Franchini, Cormack, & Takito, 2019). In judo, interval workouts lasting for 20–60 minutes are used for certain cycles, from 4 to 8 weeks (Magnani Branco et al., 2017; Pashintsev & Surkov, 2015). However, scientists emphasize that the effect of short-term interval training for elite judo wrestlers will be minimal (Magnani Branco et al., 2017). For a significant increase in the level of athletes' physical fitness, regular and sufficiently long training effects of a certain power are necessary. In our studies, CrossFit sessions were used during the entire period of pre-competitive and competitive training of judoists at least two times a week. This made it possible to increase the indices of athletes' physical fitness.

According to expert data, the average lactate concentration in the blood of young athletes after intensive interval training is approximately 12.91±0.47 mmol/l (Pashintsev & Surkov, 2015). There is evidence of increased lactate levels among young judoists after a strenuous load of up to 15 mmol/l and

above (Campos et al., 2018). In our studies, increased dynamics in blood lactate concentrations of both athletes' groups was revealed. Athletes using CrossFit during the training showed an average of 14.54±0.51 mmol/l at the end of the study period. This dynamic shows a higher efficiency of CrossFit workouts compared to circuit training.

It is known that many specialists use Randori on a large scale to increase the fitness levels of judo wrestlers (Franchini, Del Vecchio, Ferreira Julio, Matheus, & Candau, 2015). However, the literature presents data on the insufficient effectiveness of Randori in the development of the physical fitness of judo wrestlers. Moreover, experts point out that the physiological requirements for meeting Randori differ from the requirements for intense competitive effects (Franchini et al., 2014). In our present study, an increase in fitness level was found in both athletes' groups who used Randori in the amount of 50–55 hours for 10 months. We consider a further increase of Randori volume for athletes of this age and qualification to be ineffective.

However, the dynamics of SJFT index changes in both athletes' groups show a significant improvement of indices of judo athletes' special physical fitness regardless of the training program. Scientists point out that the effectiveness of SJFT performance is directly related to the effectiveness of competitive matches (Kons, Ache Dias, & Detanico, 2017). Furthermore, athletes of Group 2 showed better results, which in our opinion indicates a high potential of CrossFit trainings in improving athletes' fitness. It was revealed that the results of studied athletes are somewhat inferior to the SJFT indicators

of junior foreign athletes (Agostinho, Olivio Junior, Stankovic, Escobar-Molina, & Franchini, 2018), but the differences are insignificant. Interestingly, the SJFT index indicators of young (16–17 years old) athletes compared with SJFT data of Russian older athletes (19–23 years old) (Osipov, Kudryavtsev, Iermakov, & Jagiello, 2018) turned out to be higher. In our opinion, a balanced program of CrossFit training (optimal choice of exercises and time interval of load) contributed to a higher result.

Comparison of CC data of the studied athletes with CC indicators of elite judoists from Russia and Kyrgyzstan of this weight category (up to 73 kg) have revealed a significant lag of young athletes of CC–1 (the number of Nage-waza techniques) from elite judoists. If young athletes perform 6.22 ± 0.17 technical actions of Nage-waza on average then elite athletes of this weight category perform 9.25 ± 0.41 judo techniques per duel. However, in terms of CC–2 (Ne-waza technique), young athletes of both groups significantly exceed the elite judo wrestlers. On average per match, the studied athletes perform 2.47 ± 0.19 receptions of Ne-waza, and the elite judo athletes perform only 1.41 ± 0.09 receptions. However, this advantage of young athletes cannot be explained only by CrossFit workouts. A significant advantage of CC–2 data over elite judoists was also found among athletes of Group 1 who have not used CrossFit in their pre-competitive and competitive training. It is possible that these results are explained by the tactical features of preparing athletes for dominance in the stalls.

It should be emphasized that the use of regular cross-trainings in the practice of young judoists seeking to join the competitive elite can significantly increase the combat activity of judo athletes in competitive matches (CC–3). A higher percentage of won matches (an average was more than 5%) was also found among athletes who have used CrossFit during the pre-competition and competitive training periods.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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ORIGINAL SCIENTIFIC PAPER

Prediction of Athletic Performance through Nutrition Knowledge and Practice: A Cross-Sectional Study among Young Team Athletes

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Abstract

The present study was conducted to assess the nutrition knowledge, practice, and status and to identify the nutritional and body composition factors predicting athletes' performance. Young team athletes including 40 footballers and 50 hockey players were recruited in this study (age 16.48 ± 1.5) to assess the nutrition knowledge (NK), nutrition practice (NP), and 24-hour dietary recall using a semi-structured questionnaire. Physical characteristics, including height, weight and body mass index (BMI), along with static strength- handgrip and relative back strength, were recorded. Fat mass (FM), fat-free mass (FFM), muscle mass (MM), basal metabolic rate (BMR) and glycogen store was determined using a bioelectrical impedance analyser. Aerobic capacity (VO_{2max}) was measured with a beep test. The majority of the athletes with good NK scores were found to have good NP scores as well and vice versa ($\chi^2=23.861$, $p=0.000$). Their mean recorded scores for NK and NP were found to be 11.13 ± 3.6 and 7.30 ± 2.0 out of a total of 20 and 12, respectively. Daily consumption of protein ($\beta=0.336$; p value=0.004), sodium ($\beta=0.273$; p value=0.006) and dietary fibre ($\beta=0.220$; p value=0.002) were found to be the best predictors for nutritional practice. Nutrition knowledge and practice had significant positive correlation with BMR (0.314^{***} ; 0.419^{***}), calcium intake (0.248^* ; 0.482^{***}), iron intake (0.303^{***} ; 0.221^*) and VO_{2max} (0.331^{***} ; 0.428^{***}), respectively. Daily calorie consumption ($\beta=0.144$, $p=0.029$), BMR ($\beta=0.304$, $p<0.001^{***}$), MM ($\beta=0.213$, $p=0.020$), calcium ($\beta=0.275$, $p=0.001$) and iron intake ($\beta=0.240$, $p=.001$) were the significant predictors of athletic performance. Therefore, good nutrition knowledge may improve the nutritional habits and dietary pattern of athletes. Body composition and nutrient intake can predict athletic performance. Intervention studies should emphasize nutrition education aiming for improved athletic performance.

Key words: basal metabolic rate, bioelectrical impedance analysis, body composition, dietary pattern, aerobic capacity

Introduction

Optimal fuelling is an essential requisite for athletes to excel to their best ability (Maughan & Burke, 2011; Kerkick et al., 2008). Apart from nutrition playing an influential role in enhancing on-field performance; it also promotes muscle growth, prevents injury, accelerates recovery, and supports re-

habilitation (Mahan & Stump, 1998). Undoubtedly, athletes' daily diet and fluid intake affect their health, body composition, and substrate availability during exercise as well as recovery time (American Dietetic Association, 2009). Adequate nutrition, which can be reached through sufficient nutrition knowledge (NK), is an integral part of a training programme



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as it helps in optimizing intake of both macronutrients and micronutrients; and modulating the body composition of athletes (Rosenbloom, Jonnalagadda, & Skinner, 2002)

However, it must be noted that many athletes are still not able to interpret the knowledge of adequate nutrition into suitable dietary alternatives (Sakamaki, Toyama, Amamoto, Liu, & Shinfuku, 2005; Cupisti, Alessandro, Castrogiovanni, Barale, & Morell, 2002). As reported by Sakamaki et al. (2005), only a few athletes reflect the concept of satisfactory dietary choices when selecting from a food menu. They remain poorly educated about healthy nutritional practice (NP) and are inexperienced in making apt daily nutritional preferences (Hornstrom, Friesen, Ellery, & Pike, 2011). A weak positive correlation between nutrition knowledge and dietary intake of athletes was reported in a systematic review (Sakamaki et al., 2005; Cupisti et al., 2002; Hornstrom et al., 2011; Heaney, O'Connor, Michael, Gifford, & Naughton, 2011). Furthermore, another study confirmed an insignificant correlation between nutrition knowledge and practice (Supriya, 2013). In contrast, increased nutrition knowledge with considerable increases in total energy, carbohydrates, and protein intakes was reported in other studies (Heaney et al., 2011; Supriya, 2013).

Appropriate nutrient consumption corresponds to peak athletic performance, whereas nutrient paucity may lead to decreased performance (Hornstrom et al., 2011; Valliant, Emplainscourt, & Wenzel, 2012). While working at the highest intensities that can be supported by oxidative phosphorylation, carbohydrate has an advantage over fat as a substrate thereby improving gross exercise efficiency (Cole, Coleman, Hopker, & Wiles, 2014). There exists an evidential interaction of dietary protein with exercise, which further provides both a trigger and a substrate for the synthesis of contractile and metabolic proteins (Phillips & Van Loon, 2011; Phillips, 2012). Physical activity and training are vital for maintaining appropriate body weight and fat mass, which are further dependent on the nutritional status of sportspersons (Rodriguez, Di Marco, & Langley, 2009; Burd, West, & Moore, 2011). Positive energy balance alone has an essential anabolic effect (Forbes, Brown, Welle, & Lipinski, 1986), whereas restriction of energy intake and loss of muscle and fat mass negatively affects athletes' performance (American Dietetic Association, 2009).

Research investigating the direct relationship between NK and performance has been sparse to date. Team athletes are always looking to expand their competitive edge over their opponents. Nevertheless, it has been frequently reported that athletes have poor NK (Heaney et al., 2011). So, if a relationship is proven to exist between NK and performance, nutritional education intervention could accordingly be designed to enhance athletic performance. The present study was conducted to assess the NK, NP and athletic performance; and to identify the nutritional and physiological factors predicting athletes' performance.

Methods

Subjects

The present cross-sectional study involved 90 randomly selected male athletes from the Sports Authority of India (age 16.48 ± 1.5) exclusively participating in team sports: football ($n=40$) and hockey ($n=50$). The inclusion criteria required the athletes to be at least state-level performers with a

minimum of 3-4 years of formal training history. The study protocol was executed in accordance with the ethical guidelines of the Declaration of Helsinki, 1975. Prior to the initial testing, a complete explanation of the procedures, potential risks and benefits of the tests were explained to all the subjects and informed consents were obtained from them.

Physical Characteristics & Body Composition Measurements

Physical characteristics of the subjects, including height and weight, were measured using anthropometric rod and digital scale following standard procedure, and the body mass index (BMI) was calculated (Sodhi, 1991; WHO, 1995). Body composition including fat mass (FM), fat-free mass (FFM), muscle mass (MM), basal metabolic rate (BMR) and glycogen content were assessed using Bioelectrical Impedance Analysis (BIA) (Maltron Bioscan 920- 2, UK). Measurements were taken following the standard testing manual of Maltron International (Sarkar, Debnath, Chatterjee, & Dey, 2018).

Assessment of Static Strength and Aerobic Capacity

Handgrip strength and Relative Back strength (RBS) was measured using digital handgrip dynamometer and back dynamometer (SENOH, Japan), respectively, following standard procedures (Sarkar et al., 2018). Maximal Oxygen Consumption or aerobic capacity (VO_{2max}) was gauged through an indirect method of a multistage physical fitness test (Beep test) from which VO_{2max} was predicted (Leger & Lambert, 1982).

Assessment for NK and Daily Dietary Intake

Information regarding participants' 24-hour diet recall was recorded by means of a self-administered, semi-structured questionnaire. The cooked food items were converted to raw amounts, and the nutrients were calculated accordingly. Food models were used to assist the team athletes in approximating portion sizes. All measurements were performed twice, and the average values were recorded. Three consecutive dietary recalls were repeated to reduce the imprecision in nutrient intakes. The nutrients were calculated using Dietsoft software (version 1.1.6) developed by the Department of Dietetics, All India Institute of Medical Sciences (AIIMS), New Delhi. The nutrients in the software are based on the values published in the "Nutritive value of Indian Foods" by ICMR, 2017 (Singh, Gupta, Ghosh, Lock, & Suparna, 2015). Questionnaire constituting of 20 and 12 questions were structured using previous studies and those referenced by Supriya (2013) and Zawila, Steib, and Hoo-genboom, (2003), respectively.

Data Analysis

The Statistical Package for the Social Sciences (SPSS, IL version 20.0) was used to execute all the statistical analyses. Mean NK and NP scores calculated based on the responses of the participants were found to be 1.13 ± 3.6 and 7.30 ± 2.0 respectively. The participants scored "1" for every correct answer and "zero" for every wrong answer as well as for those who chose the "not sure" option; their scores were summed up accordingly. Those who scored less than the mean score were classified as having poor NK and NP while those who scored more than the mean score were classified as having good NK and NP. The categorical variables NK and NP scores were compared using the chi-square test. Inferential statistical test was done using Pearson correlation product-moment and simple linear regression analysis.

Results

Table 1 represents the mean and SD of the anthropometric, nutritional, and physiological profile of the team athletes. Their mean height, weight, and BMI were 168.83±6.6 cm, 56.04±6.3kg, and 19.80±1.4 kg/m², respectively. Their fat mass and fat-free mass were 11.04±4.8% and 88.96±4.8%,

respectively, along with a mean glycogen store of 451.99±80.8 gm. Mean values for muscle mass and BMR were found to be 24.02±3.2 gm and 1756.91±125.9 Kcal, respectively. Their reported values for static strength and aerobic capacity parameters are displayed in Table 1.

Table 1. Anthropometric, Nutritional and Physiological Profile of the Team Athletes

Variables	Mean(SD)	Minimum	Maximum
Age (yrs)	16.5±1.5	14.3	19.8
Height (cm)	168.8±6.6	157.4	186.5
Weight (kg)	56.0±6.3	46.4	73.7
BMI (kg/m ²)	19.8±1.4	16.2	22.9
Fat mass (%)	11.0±4.8	4.8	25.3
Fat free mass (%)	88.9±4.8	74.7	95.1
Muscle mass (kg)	24.0±3.2	19.6	33.0
BMR (Kcal)	1756.9±125.9	1492.0	1997.0
Glycogen (gm)	451.9±80.8	193.0	621.0
RBS (kg/Kg body wt.)	1.8±0.2	1.4	2.4
Right-hand grip strength(kg)	37.9±6.2	26.0	52.0
Left-hand grip strength(kg)	36.9±6.4	24.0	56.0
VO ₂ max (ml/min/kg)	54.5±4.8	43.9	65.2

Legend: BMI: Body Mass Index; BMR: Basal Metabolic Rate; RBS: Relative Back Strength

Table 2 depicts the responses of the team athletes to the NK and NP questionnaire. Forty-two athletes scored above the mean NK score and therefore had good NK, whereas the rest scored poorly (Table 3). The majority of athletes answered the following questions correctly: increasing protein in the diet is necessary in order to increase muscle mass of the body (63%); consuming fruits and vegetables every day is important in order to get necessary vitamins and minerals (61%); during exercise, mass ingestion of large amounts of fluid is preferred over frequent ingestion of small amounts (65%); a sound NP for athletes is to eat a wide variety of different food types from day to day (77%); skipping meals is justifiable if you need to lose weight quickly (83%); a high-fat meal, which is slowly digested, should be avoided before athletic events (68%) and the pre-event meal should be eaten about 3-4 hours before competition (60%).

The least correctly answered questions were the following: carbohydrates are not as easily and rapidly digested as protein and fat (42%); vitamin supplementation is recommended for all physically active persons (48%); vitamins are a good source of energy (42%); fibre in the diet may help to decrease constipation, decrease blood cholesterol levels, and prevent cancers (48%); and lack of iron in the diet can result in fatigue, injury, and illness (37%).

Thirty-two athletes were found to have good NP scores. The majority of the athletes believed that nutritious diet would help them improve their athletic performance (80%) and having a nutritionist would be helpful to them as an athlete (88%). Seventy-eight per cent of them had breakfast daily, and majorities were also found to have daily intake of milk and milk products (72%). Only 43% of athletes were aware of the number of calories they should consume every day in accordance with their sports discipline.

Table 2. Responses of Team Athletes (Percent) to the Nutrition Knowledge and Nutrition Practice Questionnaire

Nutrition Knowledge			
S/N	Questions	Correct n (%)	Incorrect n (%)
01	Carbohydrates are not as easily and rapidly digested as protein and fat	38 (42)	52 (58)
02	Eggs and legumes are examples of protein sources other than meats	38 (42)	52 (58)
03	Protein is the primary source of muscular energy for the athletes	51 (57)	39 (43)
04	Increasing protein in the diet is necessary in order to increase muscle mass of the body	57 (63)	33 (37)
05	Consuming fruits and vegetables every day is important in order to get necessary vitamins and minerals.	55 (61)	35(39)
06	Vitamin supplementation is recommended for all physically active persons	43 (48)	47 (52)
07	Vitamins are a good source of energy	38 (42)	52 (58)
08	Fibre in the diet may help to decrease constipation, decrease blood cholesterol levels, and prevent cancers	43 (48)	47 (52)
09	Dehydration can impair physical performance	54 (60)	36 (40)

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Nutrition Knowledge			
S/N	Questions	Correct n (%)	Incorrect n (%)
10	During exercise, mass ingestion of large amounts of fluid is preferred over frequent ingestion of small amounts	59 (65)	31 (35)
11	A 200-pound person uses about twice as many calories to run a mile as a 100-pound person	44 (49)	46 (51)
12	A person with a higher percentage of body fat may weigh less than a person of the same size with a greater muscle mass	45 (50)	45 (50)
13	A sound nutritional practice for athletes is to eat a wide variety of different food types from day to day	69 (77)	21 (33)
14	Skipping meals is justifiable if you need to lose weight quickly	75 (83)	15 (17)
15	When trying to lose weight, acidic foods such as grapefruit are of special value because they burn fat	31 (34)	59 (66)
16	If trying to lose weight, carbohydrates should come from fruits and vegetables rather than from breads and pastas	52 (58)	34 (38)
17	Nutrition is more important during the competitive season than during the off-season for the athlete	41 (46)	49 (54)
18	A high-fat meal, which is slowly digested, should be avoided before athletic events	61 (68)	29 (32)
19	The pre-event meal should be eaten about 3-4 hours before competition	54 (60)	36 (40)
20	A lack of iron in the diet can result in fatigue, injury, and illness	33 (37)	57 (63)

Nutrition Practice			
S/N	Questions	Yes n (%)	No n (%)
01	Do you have access to nutrition counselling?	35 (39)	55 (61)
02	Do you actively seek out or read nutrition information?	26 (29)	64 (71)
03	Do you read the nutrition facts label when selecting a food item to eat?	51 (57)	29 (43)
04	Having a nutritious diet will improve my athletic performance.	72 (80)	18 (20)
05	I change my pattern of eating at the time of a competition	48 (53)	42 (47)
06	Having a Sports Nutritionist would be helpful to me as an athlete.	79 (88)	11 (22)
07	I am aware of how many calories I need to consume every day to promote my best athletic performance.	39 (43)	51 (57)
08	I always eat at least one hour before training/competition	51 (57)	39 (43)
09	I consume lots of water during and after training/competition	59 (66)	31 (34)
10	I always take my breakfast daily	70 (78)	20 (32)
11	Do you use supplements like multivitamin as an athlete?	42 (47)	48 (53)
12	I consume milk and milk products daily	65 (72)	25 (27)

Table 3 demonstrates the status and relationship of NK of team athletes with their NP. Majority of the athletes with good NK scores were found to have good NP scores and vice

versa ($\chi^2=23.861$, $p=0.000$). Their mean recorded scores for NK and NP were found to be 11.13 ± 3.6 and 7.30 ± 2.0 out of a total of 20 and 12 respectively.

Table 3. Status and Relationship of Nutrition Knowledge with Nutrition Practice of Team Athletes

Nutrition Knowledge Scores (11.13±3.6)					
Nutrition Practice Scores (7.30±2.0)	Status	Poor	Good	χ^2	P
	Poor	42	16	23.8	<0.001
	Good	6	26		
	Total	48	42		

Legend: χ^2 - Chi-square test

Table 4 shows that team athletes had much lower daily calorie consumption (2756.90 ± 622.0 kcal) as their carbohydrate (465.58 ± 129.6 gm), protein (110.03 ± 26.0 gm) and fat (74.19 ± 12.9 gm) intakes were found to be lower than the RDA. Protein ($\beta=-.336$; $p=0.004$), sodium ($\beta=0.273$; $p=0.006$) and die-

tary fibre ($\beta=0.220$; $p=0.002$) intake were found to be the significant predictors for nutritional practice. Although inversely proportional, carbohydrate was also found to be significantly predictive ($\beta=-0.227$; $p=0.035$) NP. About 66% of the variance in the NP can be explained by the model represented in Table 4.

Table 4. Daily Nutrient Consumption of Team Athletes and Its Prediction on their Nutritional Practice

Nutrients	RDA	Daily consumption	β	t	Sig.
Energy (Kcal)	4500	2756.9±622.0	.006	.091	.93
Carbohydrate (gm)	675	465.6±129.6	-.227	-2.145	.04*
Protein (gm)	164	110.0±26.0	.336	2.949	.004**
Fat (gm)	125	74.2±12.9	.145	1.626	.12
Calcium (mg)	1200	1081.7±326.6	.130	1.730	.08
Phosphorus (mg)	2400	2280.9±619.6	.201	1.869	.07
Iron (mg)	28	22.9±8.7	.009	.122	.90
Sodium (mg)	<2300	1277.5±126.1	.273	2.818	.006**
Potassium (mg)	4700	2893.3±580.4	.087	.819	.42
Dietary fibre (gm)	28	21.6±5.3	.220	3.145	.002**

Legend: RDA- ;*-p<0.05; **-p<0.01; Predictors: (Constant) Energy, carbohydrate, protein, fat, calcium, hosphorus, iron, sodium, potassium, dietary fibre

Dependent variable: nutrition practice; Adjusted R2=0.665, Std. Error=1.190, F=18.66, p=.000

Table 5 depicts the Pearson correlation coefficient of the nutritional and physiological status of team athletes. NK and NP have significantly positive correlation (0.407***). Furthermore, both the parameters showed significantly positive

correlation with BMR (0.314***; 0.419***), calcium intake, (0.248*; 0.482***), iron intake (0.303***; 0.221*), and aerobic capacity (0.331***; 0.428***), respectively. NP also showed significantly positive correlation with calorie intake (0.282**).

Table 5. Pearson Correlation Coefficient of Nutritional Parameters and Physiological Status of Team Athletes

	GLY	VO ₂	HGS	Call	Cal	Fel	NK	NP
HT	.286**	.374***	.553***	.079	.275**	.391***	.042	.117
WT	.324***	.208*	.499***	-.141	-.034	.115	.011	.100
BMI	.424***	.157	.354***	-.021	.008	.238**	.146	.129
MM	.616***	.476***	.399***	.212*	.191*	.277**	.190	.197*
GLY		.320***	.286**	.186	.148	.026	.015	.171
BMR		.718***	.007	.363***	.578***	.375***	.314***	.419***
VO2			.149	.442**	.642***	.541***	.331***	.428***
HGS				-.046	-.015	.195*	-.016	.067
Call					.221*	.175	.054	.282**
Cal						.298**	.248*	.482***
Fel							.303***	.211*
NK								.407***

Legend: ***-p<0.001; HT-height, WT-weight; BMI-body mass index; FM-percentage body fat; FFM-percentage of fat free mass; MM-muscle mass; BMR-basal metabolic rate; GLY-glycogen store; HGR-right hand grip strength; HGL-left hand grip strength; VO₂m-ax-aerobic capacity; Call-calorie intake, Cal-Calcium intake, Fel-Iron intake, NK-nutrition knowledge; NP-nutrition practice

Muscle mass showed positive correlation with glycogen store (0.616***), handgrip strength (0.399**), and VO₂max (0.476***). Glycogen store was found to have a positive Pearson correlation value with VO₂max (0.320***) and handgrip strength (0.286**).

Total calorie (0.442**), calcium (0.642***), and iron (0.541***), intake were found to have significantly positive correlation with VO₂max. Also, VO₂max showed significant positive correlation with height (0.374***), and weight (0.208*).

Table 6. Prediction of Aerobic Capacity of Team Athletes with Reference to their Nutrition Score, Anthropometric Status and Body Composition Profile

Variable	β	T	Sig
Height	.013	.144	.88
Weight	-.102	-1.184	.24
BMI	.009	.093	.93
Fat mass	.060	.830	.41
Muscle mass	.213	2.373	.02*
Glycogen	.092	1.109	.27
BMR	.304	3.862	<0.001***
Call	.144	2.225	.03*
Cal	.275	3.617	<0.001***
Fel	.240	3.299	.001**
NK score	.025	.372	.71
NP score	.003	.043	.96

Legend: Dependent Variable - VO2max; Adjusted R2=0.716, Std. Error=2.537, F=19.71, p=.000

Table 6 shows the prediction of aerobic capacity of team athletes with reference to their nutrition scores, anthropometric status, and body composition profile. The highly significant predictor of aerobic capacity or VO_2max was BMR ($\beta=0.304$, $p<0.001^{***}$). Muscle mass ($\beta=0.213$, $p=0.020$), daily calorie consumption ($\beta=0.144$, $p=0.029$); calcium ($\beta=0.275$, $p=0.001$) and iron intake ($\beta=0.240$, $p=0.001$) were also found to significantly predict VO_2max . About 72% of the variance in maximal oxygen consumption (VO_2max) can be explained by this model.

Discussion

It is said that athletes who comprehend the vital function of an optimal diet and reflect the knowledge in their dietary behaviour tend to flourish more in their sports life (Ozdogan & Ozcelik, 2011; Frederick & Hawkins, 1992). The present study revealed significant correlation between NK and NP scores of team athletes, which are in agreement with the previous findings (Hornstrom et al., 2011; Oluyemisi, Abiola, & Rasaki, 2015) although Supriya (2013) reported contradicting results stating no significant correlation between knowledge and practice. The NK and NP scores recorded in this study ranged from a low of 15% and 16% to a high of 85% and 91% respectively. The mean scores were equivalent to answering only 55% of NK (11.13 ± 3.6) and 67% of NP (7.30 ± 2.0) questions correctly. Hornstrom et al. (2011) also reported similar mean NK scores attempted by the athletes. In contrast, Abood, Black, and Birnbaum (2004) reported comparatively higher NK scores and also demonstrated the ability to increase both NK and positive dietary changes during an eight-week intervention programme. Other studies showed even lower NK scores among athletes. Barr (1986) reported an average nutrition score of 34%, whereas Batson, Sease, Stanek, and Leski (2004) found 99% of athletes surveyed to have poor NK. It was observed in the present study that 62% of the study population who had good NK score, also scored well for NP.

Furthermore, in agreement with Heaney et al. (2011), a positive correlation between NP score and energy consumption was observed. Team games (i.e., football and hockey) categorized under Group-IV demand an average daily calorie consumption of 4500 Kcal with an energy bifurcation of 60%, 15% and 25% to be obtained from carbohydrate, protein and fat respectively (Panandiker, Satyanarayana, Ramana, & Sinha, 2007). On an average, only 61% of the total daily calorie requirement was met by the subjects; and carbohydrate, protein and fat intake was met up to 69%, 67%, and 56% of the daily recommendation respectively (Table 4). Team athletes were recorded with lower consumption of grains (76%) and milk & dairy products (51%), which are among the primary sources of carbohydrate and protein, respectively, which may be a cause for their macronutrient deficits, as also discussed by Hoogenboom et al. (2009).

In contrast, Saris, van Er-Baart, Brouns, Westererp, and ten Hoor (1989) reported intake of a hefty amount of carbohydrate-rich fluids and supplements by athletes and also affirmed the intake of CHO-rich liquids to be suitable for maintaining energy and fluid balance. A large number of respondents of this study did not meet the RDA for micronutrients including calcium, iron, sodium and potassium, as also observed in other studies (Cupisti et al., 2002; Heaney et al., 2011; Nazni & Vimala, 2010). Low energy availability and low dietary calcium aggravates the risk of low bone-mineral

density and stress fractures, whereas iron deficiency, with or without the prevalence of anaemia may impair muscle function and also limit work capacity (Nickols-Richardson, Beisiegel, & Gwazdauskas, 2006; Nattiv, Loucks, & Manore, 2007; Haymes, Driskell, & Wolinsky, 2006).

Food groups that were maximally consumed by the team athletes of the present study in accordance to the standard food composition pattern were meat, poultry, fish, pulses and fruits, whereas vegetable intake was much lesser than their standard RDA. Oladunmi and Sanusi (2013) reported similar results, which also found athletes to consume milk and legumes less frequently.

The present study illustrated that although team athletes had noteworthy nutritional deficits, daily intake of protein, sodium and dietary fibre were the best predictors of NP. Team athletes consumed an average of 2gm/kg body weight/day of protein, although they are recommended to have 2.4gm/kg body weight/day. In such intermittent games, long distances are covered by the players that eventually results in substantial sweat loss and electrolyte imbalance than observed in non-athletes (Bangsbo, Mohr, & Krstrup, 2006). However, sweat rates influencing sodium loss can differ broadly among individuals. Hence, considering each athlete's unique physiological needs, guidelines for sodium intake should be established (Abbey, Wright, Christina, & Kirkpatrick, 2017). A research finding suggested that dietary fibre enhances athletic performance, reduces physical stress, and augments the normal diurnal changes in cortisol levels (Sugiyama, Yamaguchi, Hu, A. Kobayashi, & H. Kobayashi, 2017). Micronutrient intake is considerably lowered by poor energy consumption, which may further impair athletic performance (Hornstrom et al., 2011). The inadequacy in players' energy intake may have occurred due to their unhealthy eating habit and suboptimal intake pattern of various food groups. Although 88% of the study population believed that having a sports nutritionist would be helpful only 39% had access to nutrition counselling, which might have resulted in negligence leading to infrequent consumption of common healthy staples and inadequate energy intake in majority of the athletes (Panandiker et al., 2007; Torres-McGehee et al., 2012).

Furthermore, NK and NP both showed significant correlation with aerobic capacity and hence may have translated to athlete's performance. The present study corroborated the findings produced by Ozdogan and Ozcelik (2011), who reported suboptimal athletic performance to be associated with poor knowledge of nutrition and athletes' lack of awareness about additional nutrient needs. This study revealed strong positive correlation between calorie intake and VO_2max , thus validating the necessity for sufficient energy intake for optimal athletic performance (American Dietetic Association and American College of Sports Medicine, 2000; American Dietetic Association, 2009). Athletes' performance expressed as VO_2max was best predicted by BMR, an essential factor of the energy requisite that elucidates the indirect role played by NK and practice. BMR is also positively correlated with energy and calcium intake, which also emerged as one of the best predictors of VO_2max . Another predictor of athletic performance was muscle mass (American Dietetic Association and American College of Sports Medicine, 2000; American Dietetic Association, 2009). It has strong positive correlation with glycogen store, resting metabolism, calorie, iron and calcium intake. Hence, combining an energy-rich diet that includes

adequate carbohydrate consumption with strategically timed protein intake with a well-designed strength and resistance training programme may prove beneficial for athletes (American Dietetic Association, 2009; Tipton and Wolfe, 2004).

Although NK and NP were not strong predictors for athletes' performance, present baseline data confirmed directly proportional relationship of NK and NP with VO_2max . Basal metabolic rate and iron intake were affirmed as the strongest predictors of VO_2max . However, muscle mass, daily calorie consumption and iron intake also notably predicted VO_2max . Therefore, NP and dietary habits, if channeled to meet optimal energy requirements ascertaining favourable muscle mass and body weight, may improve athletic performance. Athletes need to have a strong fuelling regimen so as to maintain their on-field excellence. Therefore, they should be self-sufficient with the basic knowledge of sports nutrition, avoid skipping meals and follow healthy diet pattern in accordance to their nutritional and metabolic demands.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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ORIGINAL SCIENTIFIC PAPER

Life Well-Being and Reasons for the Termination of Sport Careers among Croatian Elite Athletes

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Abstract

Ending a sports' career can be a traumatic event in elite athletes' lives. The success of the adjustment to a new way of life can greatly depend on the reasons for ending the career. This research paper aimed to establish a relationship between life well-being and reasons for the ending of sport careers. This research study was conducted on a sample of 170 elite Croatian male and female athletes who terminated their active sport career. Three scales measuring life well-being were employed: Scale of Life Quality, Scale of Life Well-being, and Extended Satisfaction with Life Scale. The eight most common reasons for ending a sport career were offered; the answers were given in binary mode with the possibility to give more reasons for career termination. The relationship between life well-being and reasons for ending one's sport career was determined via canonical and quasi-canonical correlation analysis. Prior to analysis, binary variables were normalized. A canonical correlation analysis showed one significant correlation with a magnitude of 0.362, significant at $p=0.036$, while a quasi-canonical analysis showed only one significant correlation with a magnitude of 0.23, significant at $p=0.003$. The analyses show two different relationships between the current life well-being of retired athletes and the reasons for their career ending; they could be explained by sport identity and deliberate or involuntary sport retirement.

Key words: *life well-being, elite athletes, reasons for sport career termination*

Introduction

A sport career is, according to European Federation of Sport Psychology (FEPSAC, 2000), defined as a perennial engagement in sport activities directed at a high level of achievement of an individual and on his improvement in sport. It lasts from their entry until their exit from sport, and during their sport careers, athletes go through several developmental phases: initial phase, mastery phase, and exit phase, or postcareer (Wylleman, Alfermann, & Lavallee, 2004).

The termination of a sport career can be a difficult and destructive process. Early and long-term identification with the role of an athlete at an exit from a sport can lead to confusion and can be a significant stressor. Problems with alcohol and drug abuse arise, as well as acute depression, eating disorders, identity disorders, confusion, a decline in self-con-

fidence, and even suicide attempts (Wylleman et al., 2004). Results of early papers show that 70-80% of athletes are faced with various difficulties and traumas after retiring (Hallden, 1965; Mihovilović, 1968; Haerle, 1975, according to Wylleman, Lavallee, & Alfermann, 1999; Wylleman et al., 2004). However, afterwards, it was established that this happens to a small number (13-19%) of athletes (Wylleman et al., 2004). Ceci Erpič, Wylleman, and Zupančič (2004) have ascertained that quality of retirement depends on the voluntariness of career termination, the subjective evaluation of sport achievement, the intensity of sport identity, educational status and apparition of negative non-sports related transitions. Athletes' experiences at the elite level of sport are of crucial importance (Tshube & Feltz, 2015). The importance of social support and interpersonal relationships for adjustment



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to the termination of a sport career has been confirmed as it is for adjustment to post-sport life (Cecić Erpić & Wylleman, 2005). In addition, a significant determinant of adjustment is undoubtedly a change in sport identity (Lavalley, Gordon, & Grove, 1997). Quality can be affected by sport factors (voluntariness and gradualness of sports retirement, subjective sense of achievement, planning of life after sports career termination, sports identity) and non-sports factors (age, education degree), as well as various sport career difficulties (Marthinus, 2007). Park, Tod, and Lavalley (2012) emphasize the importance of making a decision about retiring, including cognitive and behavioural changes, as well as internal and external influences. Torregrosa, Boixadós, Valiente, and Cruz (2004) indicate that athletes, while still in a competitive period of their sports career, gradually build a picture of their retirement to make it less problematic. The most significant influences on the difficulty of a transition are the result of involuntary retirement (injury or deselection), strong, exclusively sport-centred identity as well as lack of planning and using pre-retirement support services (Smith & McManus, 2008). Athletes can also voluntarily retire, which can be linked to personal reasons (financial problems), social (improvement of interpersonal and family relationships), psychological (decline in life satisfaction) or combinations of those reasons (Wylleman et al., 2004).

Every athlete wishes to stay healthy and to compete free from any injury during his/her career.

Reasons for sport retirement can be various (Leung, Carre, & Fu, 2005), but the cause is primarily a combination of factors as opposed to a single factor (Stambulova, 1994). The most frequent reasons for career termination are injuries, chronological age, deselection and personal choice. Athletes find involuntary and unexpected retirement hard to accept. The most unfortunate involuntary reason for retirement is injuries. Significant causes for retiring include increase in age, not managing to advance to the next level of elite competition, and being excluded from the team (Wylleman et al., 2004). For a large number of athletes, retiring from elite sport is not within their control (Wylleman et al., 1999; 2004).

According to Diener (2005), subjective well-being is a term that is superordinate to different evaluations of our own life, life events, and the conditions in which we live. It encompasses cognitive evaluations, such as life satisfaction, interests, engagement and affective (emotional) reactions to life events constituted of positive affects, such as joy, pride, and happiness, and negative affects, such as fear, anger, and depression.

Life satisfaction is a report of a person's evaluation of his/her life in its entirety. It can pertain to a person's satisfaction with the past, but also with the future. It is primarily a cognitive evaluation of a person's quality of experience during his or her life (DeNeve & Cooper, 1998). In everyday life, as in scientific literature, happiness has multiple meanings. It can denote a general good mood, a global evaluation of life satisfaction, living a good life, or it can relate to causes of happiness. Quality of life can be defined as a measure of desirable characteristics in life. In addition to the quality of living conditions, it also includes a person's subjective perception: their thoughts, feelings, and reactions to those conditions.

Life satisfaction, subjective well-being, happiness, and (subjective) quality of life are terms that are often equated in scientific research. Veerhoeven considers those terms to be synonyms while other authors (e.g., Lucas, Diener, & Suh, 1996; Andrews & Withey, 1976) are opposed to such a ge-

neralization because they think that those terms do not have the same meaning and that they do not necessarily pertain to same concepts (according to Mišura, 2011). However, when reading a greater number of articles from that domain, one can observe the overlapping and interweaving of the aforementioned terms.

In recent articles, there is an increase in usage of terms such as evaluative well-being (EWB) and affective well-being (AWB). Evaluative well-being is defined as a global, deliberate, and long-term evaluation of the state of well-being, which reflects a sense quality of life. It pertains to the course of life, not just one moment. Affective well-being is concerned with present well-being. It is measured with positive and negative affects (influences), which are experiences of a specific moment or of everyday life (Eger & Maridal, 2015). Croatian psychologists most commonly use the term "quality of life", because it implies a combination of objective and subjective factors (Vuletić & Misajon, 2011). Satisfaction with life, quality of the transition, and career satisfaction can be described as a subjective experience of life satisfaction and well-being.

This research paper aimed to establish relationship between life well-being and reasons for ending a sport career.

Methods

According to the criteria of Croatian Olympic Committee, elite athletes are those who won medals at the Olympic Games, Mediterranean Games, World Championships and World Cups, and European Championships and Cups. In the period from 1992 to 2012, from the Olympic Games in Barcelona to the Olympic Games in London, 1016 athletes won medals for Croatia at those prominent international sport events. From 2014 to 2017, an attempt was made to find as many athletes as possible. Finally, 638 athletes were contacted and asked to participate in research; almost all of them agreed, but only 304 of them completed the forms. The questionnaires were offered by mail, electronic mail, the Lime Survey internet application and direct contact with the researcher. In the sample of 304 elite Croatian athletes, 171 had terminated their active sport careers. One of them does not have complete results, and statistical analyses were done on the sample of 170 elite athletes; 74 of them are male and 96 are female athletes.

The subjects were given three scales measuring life well-being. These were: Scale of Life Quality (SLQ; Krizmanić & Kolesarić, 1992), Scale of Life Well-being (SLW; Penezić, 1999) and Extended Satisfaction with Life Scale (ESWL; Sindik & Rendulić, 2012, according to SWL-Scale of Life Well-being, Pavot & Diener, 1993). The SLQ consists of two subscales and produces two results; the first subscale has 15 questions with the intention of measuring the global level of well-being, including different aspects of life; the second subscale, containing six questions, measures the global level of well-being in the life-span perspective. The SLW consists of 20 items and is composed of items from the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985), the General Life Satisfaction Scale (Bezinović, 1988), the Positive Attitudes Toward Life (Grob, 1995) and the Joy in the Life Scale (Grob, 1995). Although the scale includes items from different authors, it is a unifactor instrument and has high reliability. The ESWL consists of five items from the SWL Scale of Life Well-being (Pavot & Diener, 1993) extended by the twelve new questions. The five items in ESWL are the same as those in SLW and were excluded from the version of the scale used in this research.

All items in all three questionnaires were measured on the five-point scale. Metric properties of scales were evaluated on the full sample of athletes. The reliability of the results was estimated by Cronbach's alpha coefficient of internal consistency; for SLW it is 0.091, for ESWL is 0.84, SLQ1 (first part) is 0.81 and SLQ2 (second part) is 0.71. The values are satisfactory, even for SLQ2, considering that it has only six items.

The eight most common reasons, according to literature, for ending a sport career were offered: age, deselection, injury, family matters, burnout, finances, unsatisfactory relations with persons in sport, and entering further education or employment (Schlossberg, 1981; Petitpas, Champagne, Chartrand, Danish, & Murphy, 1997; Wylleman et al., 1999; Wylleman & Lavallee, 2003). The answers were given in binary mode with

“yes” and “no” with the possibility for former athletes to give more reasons for career termination.

The relationship between life well-being and reasons for sports career ending was determined via canonical (Hotelling, 1936) and quasi-canonical correlation analysis (Momirović, Dobrić, & Karaman, 1983). The algorithm used (QCCR) is described in Momirović et al. (1984) and is written in the MATRIX language of SPSS. Prior to analysis, binary variables were normalized.

Results

The correlations of the scales measuring life well-being are in Table 1 showing high values from 0.51 to 0.77; without question, all four measures belong to the same set.

Table 1. Intercorrelations of the Scales Measuring Life Well-being

	SLQ1	SLQ2	SLW	ESWL
SLQ1	1.000	0.639	0.636	0.657
SLQ2	0.639	1.000	0.702	0.511
SLW	0.636	0.702	1.000	0.765
ESWL	0.657	0.511	0.765	1.000

The correlations of the reasons for termination the sports career are in Table 2, being small or near to zero.

Table 2. Product-Moment Correlations of the Normalized Values of the Reasons for Sport Career Termination

	age	deselection	injury	family	burnout	finances	relations	education
age	1.000	-0.110	-0.187	-0.020	-0.048	-0.107	0.034	-0.225
deselection	-0.110	1.000	-0.072	-0.058	0.066	-0.034	0.140	-0.063
injury	-0.187	-0.072	1.000	-0.195	-0.046	0.019	-0.062	-0.173
family	-0.020	-0.058	-0.195	1.000	0.069	-0.064	0.050	-0.038
burnout	-0.048	0.066	-0.046	0.069	1.000	-0.078	0.074	-0.100
finances	-0.107	-0.034	0.019	-0.064	-0.078	1.000	0.163	0.110
relations	0.034	0.140	-0.062	0.050	0.074	0.163	1.000	-0.064
education	-0.225	-0.063	-0.173	-0.038	-0.100	0.110	-0.064	1.000

The highest correlation is negative -0.23 between age and leaving sport because of education or employment. The cross-correlations of the variables of two sets are in Table 3; the

values are small or near to zero. The highest correlation is 0.196 between SLW and leaving sport because of education or employment.

Table 3. Cross-Correlations of the Scales Measuring Life Well-being and Normalized Values of the Reasons for Sport Career Termination

	age	deselection	injury	family	burnout	finances	relations	education
SLQ1	0.060	-0.093	-0.122	-0.032	0.025	-0.083	-0.157	0.117
SLQ2	-0.016	0.022	-0.082	0.108	0.048	-0.019	-0.134	0.001
SLW	-0.114	-0.66	-0.002	0.083	0.002	0.015	-0.094	0.196
ESWL	0.003	-0.081	-0.063	-0.031	0.055	-0.056	-0.107	0.172

Canonical correlation analysis showed one significant correlation with the magnitude of 0.362, significant at

$p=0.036$ (with degrees of freedom). This correlation is dominantly defined by SLW in the first set of variables (Table 4).

Table 4. The Results of Canonical and Quasicanonical Analyses: Coefficients and Factors of the Measures of Life Well-being

	CC1	CF1	QC1	QF1
SLQ1	-0.664	-0.384	-0.589	-0.869
SLQ2	-0.452	-0.086	-0.283	-0.775
SLW	1.677	0.357	-0.511	-0.899
ESWL	-0.758	-0.142	-0.559	-0.881

Legend: CC1 - unstandardized canonical coefficients, CF1 - canonical factor, QC1 - quasi-canonical coefficients; QF1 - quasicanonical factor

Regarding the high correlations of life well-being measures, SLW can be understood as the representative of four scales. In the second set, canonical correlation is mainly defined

by the sport career ending due to injury, family, and education with positive sign and sports career ending due to age with a negative sign (Table 5).

Table 5. The Results of Canonical and Quasicanonical Analyses: Coefficients and Factors of the Reasons for Sport Career Termination

	CC2	CF2	QC2	QF2
age	-0.438	-0.628	0.061	0.112
deselection	0.034	0.010	0.308	0.361
injury	0.524	0.450	0.316	0.358
family	0.524	0.374	-0.088	-0.128
burnout	-0.211	-0.209	-0.144	-0.052
finances	0.246	0.363	0.187	0.201
relations	0.259	0.245	0.573	0.611
education	0.315	0.333	-0.640	-0.677

The quasi-canonical analysis showed also only one significant correlation with the magnitude of 0.23, significant at $p=0.003$. All variables of life well-being are active in the formation of the quasi-canonical factors, all having a negative symbol (Table 4); they are positively related to ending one's sport career due to education or employment opportunity (with negative symbol), while their negative relation is due to bad relationships with individuals from sport, injury, and the deselection process (with positive sign). The other reasons for sport career termination (age, family, burnout and finances) have small or near to zero values (Table 5).

Discussion

The analyses show two different forms of the relationship between current life well-being of retired athletes and reasons for their career ending. The results of canonical correlation analysis show the positive relation of general life well-being and termination of a sport career due to different reasons but not age. To grow older is an unavoidable process, and it is expected that athletes be prepared to accept it; the reason for subjective less well-being when ending career because of being too old to continue can be due to the high intensity of sports identity. The athletes who have lengthy careers often develop strong sports identities, and sometimes it is their sole identity; the stronger the sports identity is, the stronger the crisis is after ending the sport career (Alfermann, Stambulova, & Zemaityte, 2004; Stambulova, Alfermann, Statler, & Côté, 2009), and the longer the adaptation to a new situation is; it is also accompanied by more life problems (Fraser, Fogarty, & Albion, 2009). Several researchers have recognized sports identity as a crucial negative factor in the quality of sport career termination (Cecić Erpić et al., 2004; Lavalley et al., 1997; Marthinus, 2007; Smith & McManus, 2008); the possible relation of low well-being, termination of sports career because of age and intensity of sports identity could be the subject of further research.

In the quasi-canonical correlation analysis, all the variables of life well-being are included in forming quasi-canonical variables; as in the canonical correlation analysis, it can be recognised as general life well-being. The second quasi-canonical variable is defined by the sport career ending due to education or employment at the negative side and bad relationships with individuals from sport, injury and deselection process at the positive side. The positive relation of general life well-being and sport career ending because of education or employment and the negative relation with ending due to bad relationships with individuals from sport, injury, and deselection can be explained by deliberate or involuntary sport retirement. The least distressing way to finish sport career is

to plan the termination and to plan life after the sport career (Marthinus, 2007); the most difficult way is involuntary ending, for example, because of injury or deselection (Smith & McManus, 2008).

The results of this research show that relationship of life well-being and the reasons of elite sport career termination are not simple and that different ways of association can exist; here, sports identity and deliberate or involuntary sports career termination are recognized as factors defining the relationship.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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ORIGINAL SCIENTIFIC PAPER

Body Composition of Elite Soccer Players from Montenegro and Kosovo

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Abstract

This research aimed to determine the differences among the top soccer players of a club in Montenegro, FC Buducnost, and the top soccer players of a club in Kosovo, FC Trepca '89, the champions in their countries, in the anthropometric characteristics and body composition. A sample of 45 subjects was divided into two sub-samples. The first sub-sample of the subjects consisted of 30 soccer players of FC Buducnost of the average age 22.73 ± 4.33 , the winners of the Montenegro Championship in the 2016/17 season, while the other sub-sample consisted of 15 soccer players of FC Trepca '89 of the average age 21.80 ± 3.57 , the winners of the Kosovo Championship in the 2016/17 season. Soccer players were tested immediately after the end of the 2016/17 competition season. Anthropometric characteristics were evaluated using a battery of seven variables: body height, body weight, waist circumference, triceps skinfold, biceps skinfold, skinfold of the back, abdominal skinfold. The body composition was evaluated using a battery of three variables: body mass index, fat percentage and muscle mass. The standard central and dispersion parameters of all variables were calculated. The significance of the differences between the players of the top two soccer clubs in the anthropometric characteristics and variables for assessing body composition was determined using a t-test for independent samples. It was found that the soccer players of the two mentioned clubs do not have statistically significant differences according to the variables.

Key words: football, morphological characteristics, football players, fat percentage, muscle mass

Introduction

A soccer game is said to be the most important “secondary thing” in the world; it gathers huge masses at stadiums and in front of TVs (Gardasevic, Bjelica, & Vasiljevic, 2019). It is a highly dynamic and fast team game that, with its richness of movement, falls under the category of polystructural sports games (Gardasevic, Bjelica, & Corluka, 2018; Bjelica, Popovic, Gardasevic, & Krivokapic, 2016). Soccer is a sport that is characterized by numerous and various complex and dynamic kinesiological activities, which are then characterized by either cyclical (Sermakhaj, Popovic, Bjelica, Gardasevic, & Arifi, 2017; Gusic, Popovic, Molnar, Masanovic, & Radakovic, 2017; Gardasevic, Bjelica, & Vasiljevic, 2017) or acyclical movement (Masanovic, 2019; Masanovic,

T. Bavcevic, & I. Bavcevic, 2019; Gardasevic, Bjelica i Vasiljevic, 2016; Gardasevic, Bjelica, Milasinovic i Vasiljevic, 2016; Gardasevic, Popovic, & Bjelica, 2016). In sport, top scores can be achieved only under conditions of well-programmed training process (Gardasevic, Akpinar, Popovic, & Bjelica, 2019; Gardasevic & Bjelica, 2019; Bjelica, Popovic, Tanase, & Gardasevic, 2017; Bojanic, Petkovic, Gardasevic, Muratovic, & Vasiljevic, 2015). High quality management of the training process depends on knowing the structure of specific anthropological capabilities and players' characteristics, as well as their development (Arifi, Bjelica, & Masanovic, 2019; Masanovic, 2018; Bjelica & Gardasevic, 2018; Bjelica, Popovic, & Gardasevic, 2016a; Bjelica, Popovic, & Gardasevic, 2016b). Various research studies have been conducted to



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establish certain principles and norms for the transformational processes of the anthropological characteristics important for soccer; with anthropometric characteristics and body composition among them as expected. Findings regarding anthropometric characteristics and body composition are of crucial importance for complex sports such as soccer. Body composition also depends on proper nutrition (Vasiljevic, Bjelica, & Gardasevic, 2018; Corluka, Bjelica, & Gardasevic, 2018; Vasiljevic, Bjelica, Popovic, & Gardasevic, 2015; Gardasevic, Vasiljevic, Bjelica, & Popovic, 2015). The anthropometric space is defined by the longitudinal dimension of the skeleton, the transversal dimensionality of the skeleton, and the mass and volume of the body. The purpose of knowing anthropometric characteristics is to improve skills in many sports. The anthropometric status of top-level athletes is relatively homogeneous, depending on the sport, and it can be defined as a model of athletic achievement. Research on anthropometric characteristics and body composition among athletes of different sports indicates that the athletes have specific characteristics. Muscle mass improves performance in activities that require muscular strength and endurance, but also in those that require significant aerobic ability (Green, 1992).

Today, soccer is undoubtedly the most popular sport in the world (Gardasevic, Georgiev & Bjelica, 2012), and the same applies to Montenegro and Kosovo (Bjelica, Gardasevic, Vasiljevic, Arifi, & Sermakhaj, 2019). In the 2016/17 competitive season, the club at the top of the First Montenegrin Telecom League, FC Buducnost, and at the top of the Super League of Kosovo, FC Trepca '89, both achieved a staggering success. Based on the two championship trophies that they won at the end of the competition season, both clubs have acquired the right to play on the international soccer scene within the framework of UEFA's Champions League qualification. It became interesting for researchers to determine the models of anthropometric characteristics and body composition of the players who play for these clubs to assess the differences among them.

This research aimed to determine the anthropometric characteristics and body composition of elite soccer players, players of FC Buducnost, who compete in the First Montenegrin Telecom League and soccer players of FC Trepca '89, who compete in the Super League of Kosovo. After which, a comparison of the variables between these soccer players and a determination of the possible differences between them were made.

Method

The data obtained in the study of anthropometric characteristics and body composition are checked and prepared for processing according to the set goal. Databases are arranged according to the features and prepared for planned statistical processing. The results obtained by statistical analysis are presented in the tables and analysed according to the corresponding logical units. In general, the results of the research, through gradualness in the explanation of individual relationships, allow determining differences in the observed anthropometric measures and body composition in accordance with the aim of the databases; specifically, they contribute to a more precise application of the obtained results in practice.

In terms of time constraint, the research is of transversal character and consists of a one-off measurement of the corresponding anthropometric characteristics and body composition of top-level senior soccer players.

Sample of subjects

A sample of the subjects consists of a total of 45 top-level senior soccer players who performed in the First Montenegrin Telecom League and the Super League of Kosovo, divided into two sub-samples. The first one consists of 30 soccer players of FC Buducnost, the average age of 22.73 ± 4.33 , the champions of the Montenegro Championship in the season 2016/17, and the second one that consists of 15 soccer players of FC Trepca '89 of the average age 21.80 ± 3.57 , the champions of the Kosovo Championship in the 2016/17 season. The soccer players were tested immediately after the 2016/17 season ended.

Sample of measures

Anthropometric research has been carried out concerning the basic rules and principles related to the selection of measuring instruments and measurement techniques standardized in accordance with the International Biological Program guidelines. For the purpose of this study, seven anthropometric measures have been taken: body height, body weight, waist circumference, triceps skinfold, biceps skinfold, skinfold of the back and abdominal skinfold; accompanied by three body composition assessment variables: body mass index, fat percentage, and muscle mass. An anthropometer, calliper, and measuring tape were used for anthropometric measurements. To evaluate the body composition, a Tanita body fat scale (model BC-418MA) was used. The principle of this scale is based on the indirect measurement of the body composition; a safe electrical signal is transmitted through the body via electrodes located in the standalone unit. The Tanita Scale, with its athletics mode, enables athletes to closely monitor their body weight, health condition, and form with all relevant parameters.

Method of data processing

The data obtained through the research are processed by descriptive and comparative statistical procedures. For each variable, central and dispersion parameters, as well as asymmetry and flattening measures are processed. Differences in anthropometric characteristics and the composition of the body of the soccer players of these two clubs were determined by using a discriminatory parametric procedure with a t-test for small independent samples, with statistical significance of $p < 0.05$.

Results

In Tables 1 and 2, basic descriptive statistical parameters of anthropometric variables and body composition of the soccer players of the two clubs, where the values of central measurements and dispersion tendencies are calculated, are shown: Arithmetic mean (Mean), Standard deviation (S.D.), Variance (Variance), Minimal (Min) and Maximal (Max) values, coefficient of Curvature (Skewness) and Elongation (Kurtosis). First, the central and dispersion parameters of the variables were analysed to evaluate the anthropometric characteristics and body composition of the soccer players of FC Buducnost (Table 1).

Table 1. Central and dispersion parameters of variables for assessment of anthropometric characteristics and body composition of soccer players of FC Buducnost (N=30)

Variables	Min	Max	Mean±S.D.	Variance	Skewness	Kurtosis
body height	171.1	196.0	181.96±5.89	34.748	.339	-.260
body weight	64.7	96.9	78.03±8.52	72.627	.730	-.308
waist circumference	74.0	95.0	83.43±5.23	27.357	.454	-.260
triceps skinfold	4.0	13.6	7.79±2.45	6.008	.481	-.274
biceps skinfold	3.2	8.2	5.28±1.29	1.687	.540	-.556
skinfold of the back	3.6	18.6	9.81±2.89	8.395	.827	2.138
abdominal skinfold	6.4	18.2	10.22±2.90	8.431	1.040	.941
body mass index	21.1	27.1	23.49±1.45	2.113	.872	.762
fat percentage	5.2	16.0	9.98±2.76	7.632	.160	-.470
muscle mass	34.7	46.9	39.54±3.69	13.632	.412	-1.133

Based on the central and dispersion parameters, the values of the skewness and the kurtosis, it can be noted that all the variables are placed within the normal distribution boundaries. It can be stated that the soccer players of FC Buducnost are younger on average, and that their body height is similar to the average adult body height in Montenegro (Milasinovic, Gardasevic, & Bjelica, 2017; Gardasevic, Rasidagic, Krivokapic, Corluka, & Bjelica, 2017). Generally, according to all statistical parameters, it can be concluded that there is

a normal distribution in all variables among these top soccer players and that the results that prevail are superior to the arithmetic mean, which is not statistically significant because it is to be expected that regarding soccer players of a professional soccer club. Furthermore, there is no overly large a span between the results of analysed variables. Table 2 shows the central and dispersion parameters of the variables analysed to evaluate the anthropometric characteristics and body composition of the soccer players of FC Trepca '89.

Table 2. Central and dispersion parameters of variables for the assessment of anthropometric characteristics and body composition of soccer players of FC Trepca '89 (N=15)

Variables	Min	Max	Mean±S.D.	Variance	Skewness	Kurtosis
body height	174.3	188.0	181.95±4.41	19.424	-.502	-.941
body weight	66.3	86.1	76.61±6.75	45.576	-.066	-1.565
waist circumference	79.0	91.0	84.20±3.76	14.171	.182	-.619
triceps skinfold	3.6	10.5	7.11±1.86	3.454	-.114	.094
biceps skinfold	2.6	8.2	4.57±1.49	2.209	1.015	.957
skinfold of the back	6.8	13.4	9.04±2.07	4.303	1.192	.333
abdominal skinfold	4.6	16.8	8.33±3.84	14.746	1.391	.702
body mass index	20.0	25.5	23.00±1.65	2.729	-.252	-.762
fat percentage	3.8	14.4	9.81±2.96	8.752	-.426	-.121
muscle mass	34.9	43.0	39.02±2.53	6.389	-.276	-1.124

Based on the central and dispersion parameters, the values of skewness and kurtosis of the soccer players of FC Trepca '89, it can be stated that all the variables are within the normal distribution boundaries and that the values are very similar to those of the soccer players of FC Buducnost. It can also be stated that the soccer players of FC Trepca '89 are younger on average and that their body height is similar to the average adult body height in Kosovo (Gardasevic, 2019; Masanovic, Bavcevic, & Prskalo, 2019; Gardasevic, 2018; Gardasevic, Masanovic, & Arifi, 2018; Masanovic, Gardasevic, & Arifi, 2018a; Masanovic, Gardasevic, & Arifi, 2018b; Arifi, Sermaxhaj, Gardasevic, Alaj, & Metaj, 2018; Arifi, Gardasevic, & Masanovic,

2018; Arifi et al., 2017). It can also be concluded that almost all variables of quantitative value are better with soccer players of FC Trepca '89. However, a comparative statistical procedure, a t-test (Table 3), will show whether it is statistically significant. By the value of the skewness, it can be observed that in the variables of the biceps skinfold, skinfold of the back, and abdominal skinfold, there was a slight inclination on the side of the lower results, which is good because subcutaneous fat is a disrupting factor for professional athletes. To determine whether there are statistically significant differences in the analysed variables in the top soccer players of these two clubs, the statistical procedure t-test (Table 3) was applied.

Table 3. T-test values between the arithmetic mean of variables for the evaluation of anthropometric characteristics and body composition of soccer players of FC Buducnost (N=30) and FC Trepca '89 (N=15)

Variables	Club	Mean±S.D.	Mean Difference	t-test	Sig.
body height	FC Buducnost	181.96±5.89	0.006	.004	.997
	FC Trepca '89	181.95±4.41			
body weight	FC Buducnost	78.03±8.52	1.4200	.562	.577
	FC Trepca '89	76.61±6.75			

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Variables	Club	Mean±S.D.	Mean Difference	t-test	Sig.
waist circumference	FC Buducnost	83.43±5.23	-0.7666	-.505	.616
	FC Trepca '89	84.20±3.76			
triceps skinfold	FC Buducnost	7.79±2.45	0.67333	.936	.355
	FC Trepca '89	7.11±1.86			
biceps skinfold	FC Buducnost	5.28±1.29	0.7066	1.640	.108
	FC Trepca '89	4.57±1.49			
skinfold of the back	FC Buducnost	9.81±2.89	0.7666	.912	.367
	FC Trepca '89	9.04±2.07			
abdominal skinfold	FC Buducnost	10.22±2.90	1.8933	1.849	.071
	FC Trepca '89	8.33±3.84			
body mass index	FC Buducnost	23.49±1.45	0.4800	.998	.324
	FC Trepca '89	23.00±1.65			
fat percentage	FC Buducnost	9.98±2.76	0.1766	.198	.844
	FC Trepca '89	9.81±2.96			
muscle mass	FC Buducnost	39.54±3.69	0.5233	.493	.625
	FC Trepca '89	39.02±2.53			

Based on the obtained values of t-test results, it was found that the soccer players of the two clubs do not have statistically significant differences according to the variables. In all variables, the differences are negligible and not statistically significant.

Discussion

This study aimed to determine the difference in the anthropometric characteristics and body composition of the top soccer players of the club in Montenegro FC Buducnost and the top soccer players of the club in Kosovo FC Trepca '89, the champions in their respective countries in the 2016/17 season. A sample of 45 respondents was divided into two sub-samples. The first sub-sample consisted of the 30 soccer players of FC Buducnost of 22.73±4.33 age on average, who were older than the 15 soccer players of FC Trepca '89, who comprised the second sub-sample of 21.80±3.57 age on average. The results were obtained by using a battery of seven tests in the area of anthropometric characteristics and three tests in the area of body composition. By examining the basic descriptive statistical parameters, it can be concluded that we have indeed examined professional athletes. It can be observed that the soccer players of both clubs are of the approximately similar mean values of the variables analysed, which is not surprising because these are the top two soccer clubs in Montenegro and Kosovo, states in which there are significant concentrations of good soccer players. The t-test results showed that the soccer players of the two mentioned clubs have no statistically significant differences according to the variables. Very similar anthropometric characteristics of soccer players were obtained, which shows that soccer players have similar the characteristics and body composition throughout the region (Gardasevic, Bjelica, Popovic, Vasiljevic, & Milosevic, 2018; Corluca & Vasiljevic, 2018).

For other variables, some values are better for soccer players of FC Buducnost and some for soccer players of FC Trepca '89, although these are statistically insignificant, which indicates that these soccer players have very similar anthropometric parameters and body composition, which is again, not surprising, considering that these two soccer clubs were the best in their countries in the 2016/17 competitive

season. The values obtained in this research can be useful for coaches of these soccer clubs for making a comparison of their soccer players with others and for formulating their work in a way that enables reduction of those parameters that are not good and raises those that are good to a higher level. That will surely make their soccer players even better and more successful. Also, both clubs should turn to other research studies and check the functional-motoric status, psychological preparation as well as tactical training of their soccer players and analyse whether there is room for their improvement. The results obtained in this research can serve as model parameters for the estimated variables for soccer players of all other soccer clubs in Montenegro and Kosovo, because the soccer players that have been analysed were among the best and the most successful soccer players in those two countries at the end of the 2016/17 competitive season.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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ORIGINAL SCIENTIFIC PAPER

Knowledge and use of Nutritional Supplements among Hip-Hop Dancers

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Abstract

Hip-hop is a cultural movement that captures different dance styles. The complexity of choreography is increasing, and the requirements for the physical condition are simultaneously higher. To reduce the risk of muscle and joint injuries, it is essential that dancers understand the importance of proper nutrition. The purpose of our study was to analyse the use and knowledge about food supplements in the daily diet of hip-hop dancers. We also wanted to highlight the problem in the lack of nutritional knowledge and to determine if this affects their body composition. The sample consisted of 114 hip-hop dancers, average age 17.2 ± 2.2 years, participating in adult categories, all members of the Dance Sport Federation of Slovenia and the International Dance Organization. For basic information, an anonymous questionnaire was used, followed by questions about food supplements, and doping. Body composition was analysed with an InBody 720 bioelectrical impedance device (Biospace Co., Ltd). The data were statistically processed using SPSS statistical software. We established that 42.1% of the surveyed dancers consume nutritional supplements, of which only 10.5% do so regularly. The use of food supplements and better nutrition knowledge is prevalent among more successful dancers. There is still a high percentage of those who do not consume dietary supplements, probably due to ignorance and insufficient information (48%). Better body composition in more successful dancers does not influence the knowledge and/or use of dietary supplements. Some intervention programmes about substance use and misuse might be useful in educating dancers and choreographers.

Key words: nutrition, food supplements, body composition, dance, hip-hop

Introduction

A dance style with a relatively short history, hip-hop has become an international phenomenon (Ojofeitimi, Bronner, & Woo, 2010). As a cultural movement, it has evolved to such an extent that it is impossible to define it as a single dance category, as it captures a number of styles that developed within hip-hop or were taken from other dance genres.

Great emphasis is placed on the quality, execution, and vocabulary of dance movement (Koutedakis et al., 2007). Hip-hop, as a form of competitive discipline, like other dance styles, entails great physical and psychological demands (Elpidoforou, 2016). Watson et al. (2017) emphasize that not

only muscle strength in the lower extremities and aerobic fitness are required in dance performance, but also significant core stabilization to achieve technically proficient movement. Hip-hop choreography is combined with a wide range of dance styles, different rhythms, postures, jumps, and pirouettes (Bronner, Ojofeitimi, & Woo, 2015), each with its own requirements.

Due to their high level of technical skills, which results in great economy of movement, dance activities have a low impact on dancers' cardiorespiratory system (Koutedakis & Jamurtas, 2004) and do not pose significant physiological stress on them. As running and strength training are often



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avoided because of their effect on aesthetics (body-shape), dancers, in general, have been shown to have worse aerobic fitness in comparison to other athletes (Allen & Wyon, 2008). The latter is often confirmed with various tissue and joint injuries, caused by overwork and poor physical conditioning (Laws, 2005). Fatigue and inadequate energy intake were cited as one of the leading cause of injuries (Bronner et al., 2015).

The complexity of choreography is increasing (Koutedakis, 2000) and, at the same time, the requirements for the physical condition are higher, which leads to a greater amount and greater intensity of training. To achieve optimal dance form, besides adequate energy, an appropriate selection of nutrients must be taken into consideration. While ballet and modern dancers have problems with inadequate energy intake, due to restricted body image, urban dancers struggle with unsuitable nutrients (fast food, cold meals, etc.). Regardless of the cause, a common issue of both is the inadequate intake of micronutrients in the dancer's body, which are essential for its normal function (Maughan et al., 2018). To perform at their best, dancers need to be adequately fuelled for the activities in which they regularly participate: classes, rehearsals, and performances/competitions (Challis, Stevens, & Wilson, 2016).

Appropriate body composition, which can be achieved with a properly constructed training plan supplemented with nutrition, has been shown to play an essential part in performance criteria (Liiv et al., 2014). To reduce the risk of muscle and joint injuries, at the expense of exhaustion and fatigue, it is essential that dancers understand the importance of diet and dietary supplements.

The purpose of our study was to analyse the use and knowledge about food supplements in the daily diet of hip-hop dancers. We also wanted to highlight the problem in lack of nutritional knowledge and to determine if this affects the body composition of dancers.

Methods

The sample consisted of 100 female (87.7%) and 14 male (12.3%) dancers from seven leading Slovenian dance schools, average age 17.2 ± 2.2 years, participating in adult categories, all members of the Dance Sport Federation of Slovenia and the International Dance Organization.

An anonymous questionnaire was used, containing basic information about the dancer, followed by questions on food supplements, general nutrition and doping (Sekulić, Perić, & Rodek, 2010; Kondrič, Sekulić, Uljević, Gabrilo, & Žvan, 2013). Body composition was analysed with an InBody 720

bioelectrical impedance (Biospace Co., Ltd); body height was measured with an anthropometer.

The collected data were analysed using the SPSS statistical software, 23.0.0 for Mac OS X; some graphical presentations were presented with Microsoft Excel 2017. The basic statistical parameters were calculated for all variables. The level of significance was set at $p \leq 0.05$.

Numeric data were verified for normality of distribution using Shapiro-Wilk's test, and the homogeneity of variances with Levene's test. Kruskal-Wallis ANOVA and Two-way ANOVA and Fisher's Exact Test were used to determine the differences between groups. The differences between individual groups of variables were verified with the PostHoc test. To determine the relationship between body variables, Pearson's coefficient of correlation was used.

The study was approved in advance by the Faculty of Sport Ethics Committee. All the participants agreed to contribute as volunteers and signed informed consent prior to testing.

Results

The sample for the presented study was composed of 114 hip-hop dancers (14 male and 100 female), sorted into three groups. The division was based on their competition successes/results in the previous two years and the subjective assessments of a panel of experts (trainers and judges) on the individual's talent, progress, and engagement in training and in preparations for competitions.

Trainers were assisted by the following division, which was used in the previous study (Pruš, 2015):

Rank 1: Finals at the European and World Championships.

Rank 2: Ranking in the semi-finals at the European and World Championships.

Rank 3: Ranking in the finals of the national championship.

Rank 4: Ranking in the semi-final at the national championship.

The general characteristics of the respondents are presented in Table 1. The average age of dancers and number of years dancing is 17.23 ± 2.21 years (min=15.8, max=28.0) and 8.24 ± 3.53 years, respectively. The most successful dancers were the oldest (18.10 ± 2.95 years) and most experienced (9.40 ± 4.24 years of training). From the table below, it can be seen that significant differences in body composition (height $p=0.03$, weight $p=0.03$, WHR $p=0.05$) only appear among female dancers of different ranks, while measurement data for male dancers are not significantly different. Among male participants, career length is the only factor that statistically ($p=0.02$) influences the success of dancers.

Table 1. General characteristics of hip-hop dancers

	Rank	Age M \pm SD	Years active M \pm SD	Height M \pm SD	Weight M \pm SD	BMI M \pm SD	%BF M \pm SD	WHR M \pm SD
	Total	N=114	17.2 ± 2.21	8.24 ± 3.53	166.8 ± 5.98	59.93 ± 7.01	21.75 ± 2.10	22.09 ± 6.02
Female	1 N=39	17.73 ± 2.68	9.00 ± 4.03	164.13 ± 5.28	58.95 ± 6.58	21.88 ± 2.13	23.55 ± 4.66	0.85 ± 0.04
	2 N=30	16.71 ± 1.42	8.10 ± 3.10	165.67 ± 4.24	57.40 ± 6.58	20.94 ± 2.15	22.69 ± 4.75	0.84 ± 0.03
	3 N=31	16.37 ± 1.06	7.39 ± 2.23	167.21 ± 4.36	61.95 ± 7.33	22.01 ± 2.44	23.84 ± 5.92	0.86 ± 0.04
	F	4.73	2.12	3.71	3.56	2.16	0.42	2.99
	p	0.01*	0.13	0.03*	0.03*	0.12	0.66	0.05*

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	Rank	Age M±SD	Years active M±SD	Height M±SD	Weight M±SD	BMI M±SD	%BF M±SD	WHR M±SD
Male	1 N=6	20.48±3.76	12.00±5.06	174.42±6.16	63.60±6.65	20.90±1.83	12.60±5.41	0.81±0.02
	2 N=6	17.53±1.48	6.17±2.56	176.33±3.63	60.75±4.47	19.55±1.53	9.57±2.59	0.78±0.02
	3 N=2	17.65±0.50	3.50±0.71	181.25±0.35	72.10±2.12	21.95±0.74	10.75±0.28	0.79±0.02
	F	1.97	5.30	1.51	3.26	2.01	0.85	2.53
	p	0.19	0.02*	0.26	0.08	0.18	0.45	0.12
Total	1 N=45	18.10±2.95	9.40±4.24	165.50±6.30	59.57±6.71	21.75±2.11	22.09±6.02	0.84±0.04
	2 N=36	16.85±1.44	7.78±3.07	167.44±5.75	57.96±6.3	20.71±2.10	20.51±6.65	0.83±0.04
	3 N=33	16.45±1.08	7.15±2.36	168.06±5.43	62.56±7.52	22.02±2.37	23.05±6.56	0.86±0.04
	F	6.68	4.56	2.04	4.02	3.61	1.41	4.25
	p	0.00*	0.14	0.02*	0.02*	0.03*	0.25	0.02*

Legend: BMI - body mass index, %BF - percentage of body fat (%), WHR - abdominal obesity degree

Prevalence and frequency of nutritional supplement use

Despite the fact that supplements have been a part of sports science for some time, we were interested in the extent to which they appear on the dance scene. We found that 42.1% of the surveyed dancers consume nutritional supplements, of

which only 10.5% did so regularly. There is still a high percentage of those who do not consume dietary supplements at all (57.9%). The results displayed in Table 2 show that there are no significant differences ($p>0.05$) between usage of supplements between male and female dancers.

Table 2. Data regarding the frequency of nutritional supplement use based on gender

		Females		Males		Total		Fisher's Exact Test	P
		N	%	N	%	N	%		
Consumption of nutritional supplements	Yes	9	9.0	3	21.4	12	10.5	2.13	0.37
	Occasionally	32	32.0	4	28.9	36	31.6		
	No	59	59.0	7	50.0	66	57.9		

The use of nutritional supplements is prevalent among more successful dancers, seen in Table 3. There are no significant differences between different ranks of dancers based on the use of individual supplements, but we can see that energy tabs, vitamins, and drinks for regeneration are most

common. Almost 50% of the most successful dancers from Rank 1 occasionally use energy bars, and 40% also vitamin and mineral supplements. Dancers from Rank 2 use these food supplements more rarely; nevertheless, the percentage of people who never take food supplements is still quite large.

Table 3. Comparison of supplement use between different ranks of dancers.

		Rank	vitamins	carbohydrates	proteins	isotonic	iron	drinks for regeneration	energy tabs
every day	1	N	7	4	4	0	1	0	0
		%	15.6	8.9	8.9	0.0	2.2	0.0	0.0
	2	N	3	2	2	0	0	0	1
		%	8.3	5.6	5.6	0.0	0.0	0.0	2.8
	3	N	4	1	0	1	1	0	1
		%	12.1	3.0	0.0	3.0	3.0	0.0	3.0
occasionally	1	N	18	3	9	9	4	10	22
		%	40.0	6.7	20.0	20.0	8.9	22.2	48.9
	2	N	11	3	1	4	3	3	8
		%	30.6	8.3	2.8	11.1	8.3	8.3	22.2
	3	N	8	4	5	6	4	5	12
		%	24.2	12.1	15.2	18.2	12.1	15.2	36.4

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	Rank		vitamins	carbohydrates	proteins	isotonic	iron	drinks for regeneration	energy tabs
rarely	1	N	4	3	5	9	9	5	5
		%	8.9	6.7	11.1	20.0	20.0	11.1	11.1
	2	N	3	3	7	10	8	7	10
		%	8.3	8.3	19.4	27.8	22.2	19.4	27.8
	3	N	4	2	5	2	4	1	3
		%	12.1	6.1	15.2	6.1	12.1	3.0	9.1
never	1	N	16	35	27	27	31	30	18
		%	35.6	77.8	60.0	60.0	68.9	66.7	40.0
	2	N	19	28	26	22	25	26	17
		%	52.8	77.8	72.2	61.1	69.4	72.2	47.2
	3	N	17	26	23	24	24	27	17
		%	51.5	78.8	69.7	72.7	72.7	81.8	51.5
		F	0.82	0.03	0.12	1.56	0.25	1.32	0.64
		p	0.44	0.97	0.89	0.26	0.78	0.29	0.51

The most common reason that dancers do not use dietary supplements is the lack of knowledge and insufficient information

(48%). From Figure 1, it is evident that the price limits 6% of respondents, and 14% think that food supplements are not healthy.

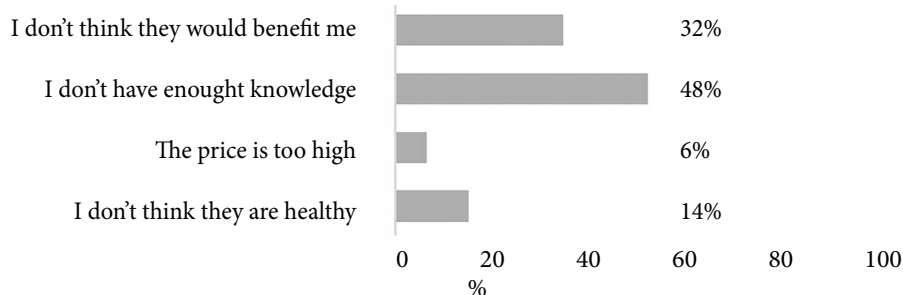


Figure 1. Restrictive factors of supplement use of hip-hop dancers

Knowledge of nutrition and supplement use

The dancers think that their knowledge of nutrition and nutritional supplements is quite good, which is contrary to our findings, which are presented below. We compared dancers' knowledge according to the ranking, years of training, and their interactions.

Overall, dancers' knowledge of nutrition is 3.49 ± 1.98 on a

scale from 1-10. The statistically significant difference between various ranks shows that dancers of Rank 1 have better nutritional knowledge (4.33 ± 1.85) than the remaining two ranks (3.33 ± 1.99 or 2.52 ± 1.70). A statistically significant difference is evident between Ranks 1 and 2 ($p=0.04$) as well as between 1 and 3 ($p=0.00$), while there were no statistically significant differences between Ranks 2 and 3 (Table 4).

Table 4. Interaction of rank of successfulness and age of the dancers on their knowledge of nutritional supplements

	Rank of successfulness			Age		Total N=114	Difference					
	Rank 1 N=45	Rank 2 N=36	Rank 3 N=33	U17 N=67	O17 N=47		rank		age		interaction	
N.K.	M±SD 4.33±1.85	M±SD 3.33±1.99	M±SD 2.52±1.70	M±SD 3.07±1.81	M±SD 4.09±2.08	M±SD 3.49±1.98	F	p	F	p	F	p
							8.9	0.00*	5.0	0.03*	0.68	0.51

Legend: N.K. - Nutritional knowledge; U17 – Under 17; O17 – Over 17

From the conclusion that a formal and non-formal education contributes to better knowledge, which should improve with age, we divided the dancers into two age groups. It turned out that older dancers who, as a result, also have higher education, have better knowledge of nutrition than their younger companions ($p=0.03$). The interaction of the ranking and age did not show statistically significant differences in diet knowledge ($p=0.51$).

Body composition in relation to knowledge of nutrition and supplement use

Six variables were selected for the analysis of body composition,

which best represents body image and which are, in addition to genetics and training, associated with proper nutrition. Dancers' knowledge about nutrition and supplements use, assessed for 1-10, was classified into five ranks (1 - no knowledge, 2 - poor knowledge, 3 - fair knowledge, 4 - good knowledge, 5 - excellent knowledge).

Better knowledge and/or use of dietary supplements do not influence body composition in more successful dancers, as shown in Table 5.

Table 5. Comparison of body composition based on use and knowledge of nutrition and nutrition supplements

Body composition	no knowledge			poor knowledge			fair knowledge			good knowledge			Differences:					
	tot	yes	no	tot	yes	no	tot	yes	no	tot	yes	no	use		knowledge		interaction	
	M	M	M	M	M	M	M	M	M	M	M	M	F	p	F	p	F	p
ATT	59.38	57.76	59.84	61.86	63.38	61.12	59.49	59.96	58.92	58.91	58.40	60.20	0.01	0.94	1.03	0.38	0.42	0.74
FFM	45.53	45.76	45.47	48.70	49.15	48.48	46.69	46.94	46.40	45.11	43.96	48.00	0.17	0.69	1.19	0.32	0.28	0.84
%BF	22.92	20.89	23.49	20.98	22.20	20.37	21.46	21.68	21.19	23.09	24.24	20.21	0.29	0.59	0.11	0.96	0.62	0.60
WHR	0.85	0.83	0.85	0.85	0.86	0.84	0.84	0.85	0.83	0.84	0.84	0.82	0.86	0.36	0.59	0.62	1.27	0.29
BMI	21.39	21.13	21.46	21.95	22.29	21.77	21.31	21.59	20.97	21.81	22.08	21.15	0.51	0.48	0.60	0.62	0.26	0.87
FS	75.38	77.71	74.72	78.25	77.13	78.81	77.26	77.36	77.13	77.14	76.20	79.50	0.11	0.74	0.51	0.68	1.11	0.35

Legend: M - mean, ATT - body weight (kg), FFM - fat-free mass (kg), %BF - percentage of body fat (%), WHR - abdominal obesity degree, BMI - body mass index, FS - fitness score

Discussion

Nutrition and dietary supplements represent an indispensable part of physical conditioning for people participating in sport competitions. Their contribution to the success of athletes is probably small, but nevertheless very valuable.

Many studies showed that the use of dietary supplements in sport is already widespread throughout the world (46-91%) (Diehl et al., 2011), while in dancing the percentage of regular use is somewhat lower (Burckhardt, Wynn, Krieg, Bagutti, & Faouzi, 2011). Use of supplements among hip-hop dancers, at 42%, is otherwise comparable with other athletes, but only 10% use supplements regularly. The percentage is lower than in the international survey by Brown and Wyon (2014), in which the share of dancers with the same opinion represented 29%, but still indicates the lack of education of dancers regarding this. Approximately 32% of dancers feel they are eating well and think using food supplements will not benefit their fitness.

The most common supplements used among hip-hop dancers are vitamins, energy bars, and regeneration drinks, which are also easily accessible for the consumer and, at the same time, do not require much knowledge. It is not surprising that vitamin supplements prevail in the diet of dancers, as it has also proved to be the main one used in other dance genres (Burckhardt et al., 2011; Laws, 2005). The dancers use vitamin supplements to maintain health, to strengthen their immune systems, to reduce and delay the onset of fatigue and, consequently, to prevent injury (Brown & Wyon, 2014).

Considering that the training of hip-hop dancers, for most of the season, takes place three times a week for 90 minutes, we think that this enables sufficient regeneration time during individual training without the use of dietary supplements. The nature of dance training does not match the physical demands of the final performance itself. Therefore, dancers in the last steps before the competition or performance, due to the increased amount of training, are subjected to greater physical efforts. We can conclude that dancers use supple-

ments just when the amount and duration of training are increased, and the time for regeneration is reduced. The latter is probably also the reason for the use of dietary supplements in competitions that last the entire day, National, European and World championships, even for several days together. Dancers do not have much time between performances, so they aim to replace as much energy as possible and to balance the electrolyte equilibrium with isotonic drinks.

In competitive dance training itself, there is no need for a constant substitution of energy supplies, but they can occur just before important competitions when training sessions are more frequent, and the intensity of them is much higher. The training sessions before major competitions or performances are more oriented at acquiring general endurance than the technical implementation of choreography itself. Dancers perform choreography as best as they can at intervals in which they improve only individual parts of the competition choreography or the whole performance, which, for example, lasts between 2.5-3 minutes in the hip-hop formation adult category (at a pace of 120 beats per minute). Knowing the meaning and proper use of nutritional supplements can considerably ease the training as well as accelerate regeneration during training.

The knowledge of nutritional supplements of hip-hop dancers, regardless of performance ranking, is still lower compared to that in other sports disciplines (Kondrič et al., 2013). Despite the fact that hip-hop is considered a social phenomenon, and dance is becoming increasingly popular in recreational sports, the knowledge of the population involved in the training process is still limited. The dancers join the adult categories upon entering high school. Because of their success, we often forget about age and related awareness of the maturity of an athlete, an essential part of which is nutrition.

That is why we compared the knowledge according to two age categories. The data analysis showed statistically significant differences between the categories in which dancers older than 17 years showed better knowledge. From that,

we can conclude that more successful hip-hop dancers have more knowledge about nutritional supplements, which is influenced by age and education. We anticipate that older dancers are more concerned with the aesthetic and body image of themselves on the stage or in front of the judges. They are aware that with better physical fitness, which is easier to achieve with the help of dietary supplements, they can be more effective in performing choreographies. The average values in other sports (synchronized swimming, swimming, table tennis) range between 5 and 7 (Furjan-Mandić, Perić, Krželj, Stanković, & Zenić, 2013; Kondrič et al., 2013; Šajber, Rodek, Escalante, Olujić, & Sekulić, 2013). The results obtained by the dancers are comparable with the results of the knowledge of Slovenian and Croatian badminton players whose average values (3.50 ± 0.80 or 2.58 ± 0.93) are also lower than the average (Šeme, 2016).

The dancers confessed that the main reason why they do not use the dietary supplements is lack of knowledge or they think that supplement will not be in any use to them. Brown and Wyon (2014) also highlight the importance of knowledge as the determining factor for the use of nutritional supplements. Dance still represents a hobby in Slovenia, only a few (coaches and dancers) get to develop their professional careers. Many coaches in street dance do not have formal education, or coaching represents a second profession for which they do not have enough time to develop. The problem is that choreographers and dancers devote more training (dance camps) to technical improvements and learning different dance styles than to physical conditioning and related dietary habits.

Examining the analysis of the body composition according to the rank of performance, we can see that the best results have dancers from Rank 2, which is in contrast to the previous survey (Pruš, 2015). Rank 2 is represented by several younger dancers who are still considered to be very successful, which means that they are quite comparable with dancers from Rank 1. Probably, according to their age, they have not yet had the opportunity to show themselves at major competitions as their colleagues from the first rank have had. However, the measurements of their body composition show their potential, which they will probably be able to develop through their dance style, greater participation in competitions and, above all, greater opportunities in the next two years.

We believe that those involved in the study of nutritional supplements do not consume supplements often enough so that the results can be reflected in their body composition. In addition, dancers reported more frequent use of vitamin and mineral supplements, isotonic and regeneration drinks and energy bars, which have no long-term effect on the body. The majority of participants was represented by female dancers; therefore, male dancers had a small impact on the research data. Nevertheless, the sample of participants in our study represents an authentic picture of dancers in the Dance Sport Federation of Slovenia.

To the best of our knowledge, this is the first research in the field of hip-hop dance, which can be the starting point for further analysis in the field of dance nutrition. We believe that proper nutrition must also find its place in the everyday life of a hip-hop dancer and in some way also be transferred to other dance genres, according to their training and

competition requirements. We can conclude that nutrition knowledge among Slovenian dancers is very poor, so it would be wise to implement intervention programmes for young dancers and place nutrition in training courses for dance coaches in Slovenia. The first step towards informing dancers and choreographer about nutrition could be through the Dance Sport Federation of Slovenia, which organizes representative meetings once a year for all registered dancers. The class or workshop could be performed by an expert on sports nutrition with practical advice for young dancers.

Finally, a retrospective study of 232 dancers by Ojofeimi, Bronner, and Woo (2010) reported an annual injury incidence of 237%, of which more than half (55%) were lower extremity injuries. Following the fact, it would be wise to explore also if there is any significant connection between injury incidence and knowledge and use of nutrition supplements.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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ORIGINAL SCIENTIFIC PAPER

Students' Health and its Interrelation with Physical Fitness Level

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Abstract

The level and dynamics of students' physical health during the 1st and the 2nd years of studying at a Ukrainian higher educational institution are investigated in this article, and the interrelation between the indicators of students' health and physical fitness is defined. Seventy-three students of Zhytomyr National Agroecological University (38 male and 35 female students) took part in the investigation. The level of the students' physical health was evaluated according to the methodology of Professor Apanasenko based on the anthropometry indicators (body weight and lengths, lung capacity, wrist power) and the state of the cardiovascular system (heart rate, blood pressure, heart rate recovery). It has been determined that the physical health level of both male and female students did not improve during the 1st and the 2nd years of studying; more than 80% of the students (both men and women) have below middle and low levels of health; the overall points are measured by 2.31–3.27 points. It indicates the lack of the efficiency of the current system of physical education at Ukrainian higher educational institutions and the necessity of the search for the means of its improvement. The correlation analysis defined an authentic interrelation ($p < 0.05$) between the students' physical fitness level and the indicators of their health. Most of the authentic correlation connections are defined due to the results in the endurance and power exercises.

Key words: *health, physical fitness, physical education, students*

Introduction

The system of modern higher education in Ukraine is aimed at the preparation of a highly qualified specialists who are capable of performing a reasonable amount of work not decreasing its quality and intensity under free-market conditions and who also should have highly developed psychomotor abilities that reflect the pattern of requirements for the physical and mental health, physical fitness, and working capacity of a student (Bolotin & Bakayev, 2015; Futorny, 2011). However, the analysis of researcher's results (Griban, 2009; Muntyan, 2010; Prysiachniuk et al., 2018; Mozolev, Halus, Bloshchyn-

skyi, & Kovalchuk, 2019) has proven an unsatisfactorily level of physical fitness of the majority of modern students and a continuous increase of the number of students who have reduced general condition of health at the beginning and during the studying at a higher educational institution. About 90% of students have different health problems; more than 50% have an unsatisfactory physical fitness level. Researchers (Maglyovanyi, 2010; O. Zavydivska, N. Zavydivska, & Khanikiants, 2016) consider this situation to be the consequence of the inefficient functioning of the current system of physical education of Ukrainian students.



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Summarizing the data of many research studies (Harso-da & Purohit, 2014; Mohammed, 2018; Warburton, Nicol, & Bredin, 2006), it can be defined that health is the most vital factor of an individual living programme implementation that significantly affects the realization of social tasks. According to the data of the World Health Organization (2015), health is determined to be a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity. In accordance with the definition in the study by Amosov (2002), a person who has harmonious physical and mental development and is well adapted to the surrounding physical and social environment can be considered healthy. As provided by the study by Maglyovanyi (2010), physical health is the state of an organism when integral indicators of the main physiological systems are within the physiological norms and are changed adequately while interacting with the environment. Reasoning from this fact, it can be stated that a healthy person is capable of a complete realization of his/her physical and mental abilities.

The study by Apanasenko (2007) states that there is a safe level of physical health (on the edge of the third and the fourth levels; according to the methodology, it equals 12 points), above which endogenous risk factors of chronic somatic illnesses, the diseases themselves, and deaths caused by them can hardly be found. The scientist mentions that the share of the population of Ukraine that is within the safe zone of health has decreased 1% in the last 20 years.

This work aims to investigate the students' level and dynamics of physical health during their studies and to define the interrelation between the indicators of their health and physical fitness.

Methods

The investigation was conducted in Zhytomyr National Agroecological University in 2015–2017 (during the 1st–4th semesters). Seventy-three students of the faculty of technology (38 male and 35 female students) took part in the research. The level of the students' physical health was investigated according to the methodology of Apanasenko (2007) based on the anthropometry indicators (body weight and lengths, lung capacity, wrist power) and the state of the cardiovascular system (heart rate, blood pressure, heart rate recovery). The methodology defines the amount of points for each of the following five indicators (calculated indices): body mass index, life index, Robinson's index, power index and heart rate recovery after 20 squats in 30 seconds. The body mass index characterizes the peculiarities of the students' constitution, and is defined as the ratio of the bodyweight to body height and is expressed in kg/m². The life index evaluates the reserves of the external respiration functions; it was determined by the ratio of lung capacity to body weight in ml/kg. The power index characterizes the state of the muscle system, and it was designated by the ratio of the wrist power to body weight as a percentage. Robinson's index describes the efficiency of the cardiovascular system functioning. The decrease in this indicator means the improvement of the system functioning. This index was defined in standard units by the product of the heart rate and systolic blood pressure, which was divided by 100. The evaluation of the heart rate recovery was held after 20 squats in 30 seconds. According to the methodology by Apanasenko (2007), a low health level equalled 3 points and less, below the middle 4–6 points, the middle 7–11 points, above the middle 12–15 points, a high 16–18 points (Table 1).

Table 1. The Physical Health Level Evaluation According to the Methodology by Apanasenko (2007)

The indicators investigated		The level of physical health				
		Low	Below the middle	Middle	Above the middle	High
Body mass index (kg/m ²)	men	≤18.9	19.0–20.0	20.1–25.0	25.1–28.0	≥28.1
	women	≤16.9	17.0–18.0	18.1–23.8	23.9–26.0	≥26.1
Numerical score		-2	-1	0		
Life index (ml/kg)	men	≤50	51–55	56–60	61–65	≥66
	women	≤40	41–45	46–50	51–55	≥56
Numerical score		-1	0	1	2	3
Power index (%)	men	≤60	61–65	66–70	71–80	≥81
	women	≤40	41–50	51–55	56–60	≥61
Numerical score		-1	0	1	2	3
Robinson's index (s.u.)	men	≥111	95–110	85–94	70–84	≤69
	women	≥111	95–110	85–94	70–84	≤69
Numerical score		-2	-1	0	3	5
Heart rate recovery (sec)	men	≥180	120–180	90–120	60–90	≤59
	women	≥180	120–180	90–120	60–90	≤59
Numerical score		-2	1	3	5	7
The amount of points		≤3	4–6	7–11	12–15	16–18

The level of physical fitness was estimated due to the following tests: for men – 100 m race, pull-ups, 3000 m race; for women – 100 m race, push-ups, 2000 m race.

During the examinations, the authenticity of the difference between the students' indicators at the beginning and was determined at the end of the experiment based on the student's t-test. To investigate the interrelation between the students' health indicators and physical fitness, the Pearson correlation coefficient

was applied. The significance for all statistical tests was set at $p < 0.05$. All statistical analyses were performed with the SPSS software, version 21, adapted to medical and biological research.

This study complies with the ethical standards of the Act of Ukraine on Higher Education No. 1556-VII dated 01.07.2014 and the Letter from the Ministry of Education and Science of Ukraine on Academic Plagiarism Prevention No. 1/11-8681 dated 15.08.2018.

Results

The analysis of the body mass index of the male students proves that the index did not change authentically during the 1st and the 2nd years of study ($p>0.05$): it was 23.2 kg/m^2 in the 1st semester and 23.4 kg/m^2 in the 4th semester, the difference equalled 0.2 kg/m^2 (Table 2). The body mass index of the female students increased for 0.8 kg/m^2 (from 21.8 to 22.6 kg/m^2) ($p>0.05$). It should be noted that both groups (men, women) have the uptrend of body mass index, which indicates the inefficiency of the current system of physical education and the necessity of its improvement to stabilize the body-weight indicators. According to Table 1, the body mass index of both male and female students corresponds to the physiological norm in all stages of the investigation ($18.50\text{--}24.99 \text{ kg/m}^2$) and equals 0 points; it is the middle level.

The investigation of the dynamics of the life index during studying shows that the indicators of both male and female students have the downtrend, but they are not changed significantly during the research ($p>0.05$) (Table 2). The difference in the indicators in the 1st and the 4th semesters is 0.4 ml/kg for

male students and 0.8 ml/kg for female students. The highest indicators of the life index of the male students are recorded in the 2nd semester (56.6 ml/kg), of the female students in the 1st semester (49.5 ml/kg). The level of functional abilities of the respiratory system according to the life index indicators of the students of both genders equals the middle level in all semesters of study. The conducted analysis of the life index shows the deterioration of the functional ability of the students' respiratory system during studying.

The analysis of the power index indicators shows that they are slightly increased for the students of both groups during studying, but they do not differ authentically at the beginning and at the end of research ($p>0.05$) (Table 2). The highest indicators of the power index of the male students are recorded in the 4th semester (55.5%), of the female students in the 3rd semester (39.1%). Additionally, the power index of both men and women are of a low level at all stages of this investigation; thus, the current system of physical education has the lack of efficient influence on the development and improvement of the students' power characteristics.

Table 2. The Dynamics of the Indicators of the Students' Physical Health during the 1st and the 2nd Years of Studying at an Agricultural Higher Educational Institution ($N=73$, Mean \pm SD)

The examined indicators	Semesters of studying				p - significance difference
	1 st	2 nd	3 rd	4 th	
Male students (N=38)					
Body mass index	23.2±0.23	23.1±0.21	23.2±0.20	23.4±0.21	p>0.05
Life index	56.5±1.21	56.6±1.16	56.4±1.14	56.1±1.17	p>0.05
Power index	54.1±1.17	54.5±1.14	55.3±1.12	55.5±1.09	p>0.05
Robinson's index	88.5±1.29	88.7±1.25	88.7±1.21	89.1±1.23	p>0.05
Heart rate recovery	131.8±2.93	130.3±2.86	128.5±2.89	129.6±2.91	p>0.05
Health level	2.31±0.54	2.48±0.59	2.61±0.60	2.73±0.62	p>0.05
Female students (N=35)					
Body mass index	21.8±0.29	22.2±0.26	22.6±0.27	22.6±0.25	p>0.05
Life index	49.5±1.44	49.1±1.40	48.8±1.38	48.7±1.35	p>0.05
Power index	37.9±1.23	38.7±1.20	39.1±1.18	38.2±1.22	p>0.05
Robinson's index	80.9±1.35	81.7±1.32	81.5±1.28	81.8±1.30	p>0.05
Heart rate recovery	137.2±4.06	135.6±3.98	138.3±3.88	139.4±3.95	p>0.05
Health level	3.08±0.62	3.14±0.60	3.22±0.58	3.27±0.55	p>0.05

The research of Robinson's index proves the decrease of the indicators of both male and female students; the lowest indicators are recorded in the 4th semester (Table 2). Robinson's index of the male students was 0.6 s.u. , decreased during studying ($p>0.05$), and it equalled 89.1 s.u. in the 4th semester. The difference of the female students' indicators is 0.9 s.u. , and it is not significant ($p>0.05$); Robinson's index of the female students equalled 81.8 s.u. in the 4th semester. The indicators of the functional abilities of the students' of both genders' cardiovascular system are of the middle level during all semesters of studying.

The investigation of the dynamics of the heart rate recovery after 20 squats in 30 seconds shows that the indicators of the students from both groups were not changed significantly ($p>0.05$) (Table 2). The heart rate recovery of the male students is within the range of 2 mins 10 sec and 2 mins 12 sec, of the female students in the range of 2 mins 15 sec and 2 mins 20 sec. The level of the cardiovascular system functional abilities of both male and female students that was evaluated according to the heart rate recovery after 20 squats is estimated as below the middle.

The analysis of the students' health level shows that the dynamics of the amount of points have a positive character during the 1st and the 2nd years of studying but the indicators of both male and female students in the 1st and the 4th semesters do not differ authentically ($p>0.05$) (Table 2). Therefore, the amount of points equalled 2.31 in the 1st semester and 2.73 points in the 4th semester; the difference is not significant ($p>0.05$). According to Table 1, the health level stays unchanged at all stages of the investigation, and it is evaluated as low. The analysis of the correspondence of the physical health levels shows that the majority of students (men and women) have low and below-the-middle levels of health at all stages of investigation (Table 3). Therefore, 81.6% of male students have a low and below-the-middle health level in the 1st semester (47.4% and 34.2% respectively), and 79% in the 4th semester (39.5% and 39.5%). The number of students who have a middle health level was increased from 13.2% in the 1st semester to 18.4% in the 4th semester. Additionally, the number of male students who have above-the-middle health level was decreased by half (from 5.2% in the 1st semester to 2.6% in the 4th semester).

The dynamics of the health level of the female students have a similar character. In the 1st semester, 54.3% of female students have a low health level, 31.4% below-the-middle health level, 11.4% a middle health level, and just 2.9% have above-the-middle health level. In the 4th semester, the number of female students who have a low health level decreased to 42.9%, and those who have below-the-middle health level increased to 40%. The

number of female students who have a middle health level increased by 5.5% (to 17.1%), and no students were determined to have a high health level in the 4th semester. This emphasizes the lack of the efficient influence of the traditional physical education classes on the physical health level of both male and female students. It also should be mentioned that no male or female students have a high health level during the investigation.

Table 3. Correspondence of the Students with Different Physical Health Levels during the 1st and the 2nd Years of Studying at an Agricultural Higher Educational Institution

Physical health levels	Semesters of studying				The difference in the 1 st and 4 th semesters
	1 st	2 nd	3 rd	4 th	
Male students (N=38)					
Low	47.4%	42.1%	39.5%	39.5%	−7.9%
<i>Below the middle</i>	34.2%	36.9%	42.1%	39.5%	+5.3%
Middle	13.2%	15.8%	15.8%	18.4%	+5.2%
Above the middle	5.2%	5.2%	2.6%	2.6%	−2.6%
High	0%	0%	0%	0%	0%
Female students (N=35)					
Low	54.3%	45.7%	42.9%	42.9%	−11.4%
Below the middle	31.4%	34.3%	34.2%	40.0%	+8.6%
Middle	11.4%	14.3%	17.1%	17.1%	+5.6%
Above the middle	2.9%	5.7%	5.7%	0%	-2.9%
High	0%	0%	0%	0%	0%

Therefore, the conducted investigations showed that the current system of physical education at an agricultural higher educational institution does not have an efficient influence on the students' physical health level. The majority of the students (more than 80%) have a low and below the middle levels of physical health and more than 95% of students are not within the safe zone (12 points). The development of the system of physical education to improve their health and working capacity during the studying activity is required.

The correlation analysis of the students' (both men and women) results in physical exercises (characterizing speed, power and endurance) and their indicators of physical health

was conducted to examine the influence of physical education classes on students' health. The analysis of the correlation coefficients of the examined indicators of the male students and their results in the 100 m race shows the lack of authentic connection of the results in speed development with the indicators of physical health of students ($p > 0.05$); the correlation coefficients are within the range from 0.127 s.u. to 0.215 s.u., and they are lower than an extreme mean ($r = 0.219$ s.u.) (Table 4). This means that the development and improvement of the speed characteristics of students during physical education classes will not promote their physical development, functional state, and physical health.

Table 4. Interrelation of the Physical Fitness Indicators of Male Students of an Agricultural Higher Educational Institution (N=38) and the Indicators of Their Health (Correlation Coefficients, s.u.)

Physical health indicators	Physical fitness indicators		
	100 m race	Pull-ups	3000 m race
Body mass index	0.183	-0.218	0.581
Life index	-0.211	0.223	-0.425
Power index	-0.127	0.625	-0.293
Robinson's index	0.204	-0.271	0.532
Heart rate recovery	0.201	-0.174	0.614
Health level	-0.215	0.314	-0.578

Legend: the critical value of the correlation coefficient is 0.219 s.u. ($p < 0.05$)

The analysis of the interrelation of the students' health indicators and their results in pull-ups showed a strong authentic ($p < 0.05$) connection of the results in power exercise and the indicators of the power index ($r = 0.625$ s.u.) (Table 4). Furthermore, the interrelation of the results in pull-ups of the male students and their life index ($r = 0.223$ s.u.), Robinson's index ($r = -0.271$ s.u.) and health level ($r = 0.314$ s.u.) is determined ($p < 0.05$). A weak correlation connection of the students' power characteristics with the indicators of body mass index ($r = -0.218$ s.u.) and heart rate recovery ($r = -0.174$ s.u.) is de-

termined ($p > 0.05$). Correlation analysis of the male students' results in the 3000 m race defined a strong authentic connection of the results in exercise and the physical health indicators ($p < 0.05$) (Table 4). Thus, the results in the 3000 m race is significantly ($p < 0.05$) interrelated with the body mass index ($r = 0.581$ s.u.), Robinson's index ($r = 0.532$ s.u.), heart rate recovery ($r = 0.614$ s.u.), health level ($r = -0.578$ s.u.). The significant influence of an endurance-developing exercise on the indicators of the life index ($r = -0.425$ s.u.) and power index ($r = -0.293$ s.u.) of the male students ($p < 0.05$) is also determined. The conducted

analysis proved the necessity of the endurance and power characteristics improvement during studying to improve the physical health and functional abilities of the main systems of an organism of students.

The correlation analysis of the results in 100 m race of the female students and their physical health indicators showed a similar trend: the lack of significant connection ($p > 0.05$) of speed characteristics and health indicators of the female students ($r = -0.083$ – -0.223 s.u.) (Table 5). The structure of the

interrelation of the female students' results in push-ups with their health indicators is complicated. Thus, the result in power exercise has as authentic ($p < 0.05$) connection with the indicators of the power index ($r = 0.517$ s.u.), body mass index ($r = -0.274$ s.u.) and health level ($r = 0.281$ s.u.). The interrelation with the indicators of life index ($r = 0.165$ s.u.), Robinson's index ($r = -0.230$ s.u.) and heart rate recovery ($r = -0.233$ s.u.) is determined, but it is not authentic ($p > 0.05$).

Table 5. Interrelation of the Physical Fitness Indicators of Female Students of an Agricultural Higher Educational Institution (N=35) and the Indicators of Their Health (Correlation Coefficients, s.u.)

Physical health indicators	Physical fitness indicators		
	100 m race	Push-ups	2000 m race
Body mass index	0.127	-0.274	0.648
Life index	-0.223	0.165	-0.513
Power index	-0.083	0.517	-0.222
Robinson's index	0.216	-0.230	0.579
Heart rate recovery	0.198	-0.233	0.650
Health level	-0.196	0.281	-0.552

Legend: the critical value of the correlation coefficient is 0.234 s.u. ($p < 0.05$)

The analysis of the interrelation of the female students' results in the 2000 m race with their physical health indicators proved an authentic ($p < 0.05$) connection with the majority of the indicators examined. Thus, the result in the 2000 m race is connected with the body mass index ($r = 0.648$ s.u.), life index ($r = -0.513$ s.u.), Robinson's index ($r = 0.579$ s.u.), heart rate recovery ($r = 0.650$ s.u.), health level ($r = -0.552$ s.u.) significantly. It proves our conclusions on the necessity of the development of endurance to improve the female students' health while studying at an agricultural higher educational institution.

In general, exercise developing endurance allowed determining the most correlation connections in contrast to the other physical exercises, which have a positive influence on the health indicators of students (both men and women). This proves the conclusions of many scientists (Altavilla, D'Elia, & Raiola, 2018; Montesano & Mazzeo, 2019; Wilmore & Costiill, 2004) on the importance of the endurance development and improvement to improve the students' working capacity, health, and efficiency of studying activity.

Discussion

Health protection organizations are commonly considered to be the only ones responsible for health. However, medical science studies the diagnostics of diseases, treatment process and prevention methods. Many other sciences, including physical education, solve the problems of the improvement of health, physical and mental development, and disease prevention, and study the issues aimed at the extension of the morphological and functional abilities of the students' organisms (Altavilla et al., 2018; Amosov, 2002; Bolotin & Bakayev, 2015; Tinazci, Ealrefai, & Musa, 2019).

The works of many researchers (Futorny, 2011; Griban, 2009; Zavydivska et al., 2016) state that the students' of Ukrainian higher educational institutions health is unsatisfactory and characterized by downward trends and the number of students who belong to the physical education group with reduced exercise load and the special medical group is changing from 35% to 50% at Ukrainian higher educational institutions. More than 45% of

students do not meet the requirements of the physical education programme. Additionally, more than 30% do not reach established standards in the endurance and power exercises, and 15% do not do so in the exercises of the other types. Researchers (Muntan, 2010; Prontenko et al., 2018; Prysiazniuk et al., 2018) believe that a low health and physical fitness level of students is conditioned by a low level of physical development and health of school graduates, the lack of the students' interest and motives of traditional physical education classes; insufficient health-promoting and training orientation of the means of physical education; studying conditions in the modern higher educational institutions that are characterized by increased studying requirements, and low levels of students' activity and their lifestyle.

The conducted research proves the conclusions of many researchers (Apanasenko, 2007; Bolotin & Bakayev, 2015; Maglyovanyi, 2010) on the insufficient level of the students' physical fitness and health. The majority of the students of both genders (more than 80%) have below-the-middle and low levels of health; more than 95% of students are not within the safe zone. This proves the lack of efficiency of the current system of physical education at a Ukrainian higher educational institution and requires new ways for its improvement. Most of the authentic correlation connections are defined due to the results in the endurance and power exercises. It shows that the main physical characteristics that have a positive influence on the students' health level and the ones that should be focused on during physical education classes are power characteristics and endurance.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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ORIGINAL SCIENTIFIC PAPER

Gait Transition Speed and the Aerobic Thresholds for Walking and Running in Women

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Abstract

Recently, it has been shown that the preferred transition speed between walking and running (PTS) in men does not differ from the aerobic thresholds (AT) for both walking (ATw) and running (ATr). The PTS in men was also found to be related to ATr, but not for ATw (Sentija & Markovic, 2009). No study has, to the best of our knowledge, examined these relationships in female subjects. Men and women show no significant gender differences in the gait transition speed, although women have a lower aerobic capacity (VO_2max) than men do. Therefore, the present study aimed to explore the relationship between ATw, ATr, and the PTS in young, healthy women. Eleven female PE students (19.5 ± 0.5 y, 169.4 ± 5.7 cm) performed five treadmill tests: 1) to determine the individual PTS, 2-3) two fast ramp treadmill tests, running in one (VO_2max test) and walking in the other, 4-5) two incremental tests with 4-min stages, walking in one and running in the other, in order to determine steady-state VO_2 at speeds below and above PTS (5-9 km/h). The AT in ramp tests were determined from gas exchange data (V-slope method). The ATr was similar (7.34 ± 0.52 km/h) to PTS (7.21 ± 0.27 km/h, $p > .05$), while ATw was significantly lower (6.64 ± 0.47 km/h, $p < .001$). The PTS was significantly correlated with both ATr ($r = 0.77$) and ATw ($r = 0.72$). A high correlation was also present between ATr and ATw ($r = 0.80$). Several findings in our study suggest significant gender differences in the PTS/AT relationship: 1) the ATw in female subjects was found to be significantly lower than both the ATr and PTS, suggesting that the speed at the aerobic threshold in women depends on the modality of gait, and 2) the ATw was significantly correlated to both, PTS and ATr suggesting that the ATw could also be a significant predictor of the PTS in young women. Our results indicate that the PTS and the AT in young women are similar to the values reported for young men. In young women, the PTS is highly related to ATr and, to a lesser degree, with the aerobic threshold for walking. Gender differences should be taken into consideration for the proper interpretation of the factors that determine the gait transition speed between walking and running.

Key words: gait transition speed, walking, running, ventilatory threshold

Introduction

The energy cost to walk a given distance increases with pace, while the energy requirement to run a given distance is constant regardless of running speed, if the activity is predominantly aerobic (Margaria, Cerretelli, Aghemo, & Sassi, 1963; Di Prampero, 1986; Saibene, & Minetti, 2003; Bramble & Lieberman, 2004). At lower speeds of locomotion, walking costs less, while running is more efficient at

higher speeds. When increasing or decreasing the speed of locomotion, a spontaneous transition occurs (walk-to-run, or run-to-walk) at approximately the same speed for both genders (2 m/s), and this intensity is commonly referred to as the preferred transition speed (PTS) (Hreljac, 1993b). Several metabolic, mechanical, and perceptual factors have been postulated to trigger the walk-run transition (Hreljac, 1993a, 1993b; Hreljac, 1995a, 1995b; Mercier et al., 1994;



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Kram, Domingo, & Ferris, 1997; Minetti, Ardigo, & Saibene, 1994; Turvey, Holt, LaFiandra, & Fonseca, 1999; Neptune & Sasaki, 2005; Prilutsky & Gregor, 2001; Raynor, Yi, Abernethy, & Jong, 2002; Segers, Lenoir, Aerts, & De Clercq, 2007; Sasaki & Neptune, 2006; Malcolm, Segers, Van Caekenberghe, & De Clercq, 2009; Kung, Fink, Legg, Ali, & Shultz, 2018). Although women demonstrate a significantly lower aerobic capacity than men do, there are no gender differences in the PTS. Recently, it has been shown that the preferred transition speed between walking and running in men: 1) does not differ from the aerobic ("lactate", or "first ventilatory") thresholds for both, walking (ATw) and running (ATr) gaits, 2) is related to the aerobic threshold for running, but not for walking (Sentija & Markovic, 2009). No study has, to the best of our knowledge, examined those relationships in female subjects.

Therefore, the study aimed to investigate the energy expenditure, the aerobic threshold for walking, the aerobic threshold for running, and the preferred transition speed in women, and to establish gender differences, by comparing the observed parameters with published data on male subjects.

Methods

Eleven female (19.4 ± 0.5 y, 169 ± 6 cm) physical education students participated in the study. All subjects were familiarized with treadmill walking and running prior to data collection (Schieb, 1986). Five tests were performed on a motorized, calibrated treadmill with a speed resolution of $0.1 \text{ km}\cdot\text{h}^{-1}$ (Run Race Technogym, Gambettola, Italy), and preceded by a short warm-up and stretching procedure. Gas exchange data were measured breath-by-breath using a Quark b2 metabolic measurement cart (Cosmed, Italy). Before each test, the gas analysers were calibrated using gasses of known concentration, and the flow-meter was calibrated using a 3-L syringe. Heart rate was recorded during the tests using an HR monitor (Polar Electro, Kempele, Finland).

Incremental running ($\text{VO}_{2\text{max}}$) and walking treadmill tests

A treadmill test to volitional exhaustion was performed for the determination of $\text{VO}_{2\text{max}}$. The starting speed of $3 \text{ km}\cdot\text{h}^{-1}$ was maintained for 3 min, after which the speed was increased by $1 \text{ km}\cdot\text{h}^{-1}$ every 60 s. The subjects walked the first two stages (up to $4 \text{ km}\cdot\text{h}^{-1}$), and continued running from $5 \text{ km}\cdot\text{h}^{-1}$ until volitional exhaustion. The last half or full stage the subject could sustain (for either 30 or 60 s) was defined as the subject's maximal speed. During recovery, the subjects walked at $5 \text{ km}\cdot\text{h}^{-1}$ for 5 min.

All subjects performed the other ramp treadmill test with a similar procedure as in the $\text{VO}_{2\text{max}}$ test, except subjects walked through all the stages. As the peak VO_2 for walking is generally 5–15% lower compared to running (Hagberg & Coyle, 1983), the maximal speed was limited to $10 \text{ km}\cdot\text{h}^{-1}$ for all subjects, regardless of whether exhaustion was achieved (at this or lower speed) or not, to minimize musculoskeletal stress and prevent injury to the lower leg muscles.

Gas exchange data (Quark b2, Cosmed) were averaged at 30 s intervals and analysed (simplified V-slope method) to determine the first ventilatory (aerobic) threshold for

each gait modality (Schneider, 1993; Sentija & Markovic, 2009). The highest oxygen uptake for any 30-second period recorded in the incremental running test was defined as $\text{VO}_{2\text{max}}$.

Determination of metabolic cost for walking and running

All subjects performed two incremental treadmill tests with 4-min stages, walking in one and running in the other, in order to determine steady-state VO_2 at speeds below and above PTS ($5\text{--}9 \text{ km}\cdot\text{h}^{-1}$). One test was performed by walking at all speeds and started at $5 \text{ km}\cdot\text{h}^{-1}$, after which the speed was increased by $1 \text{ km}\cdot\text{h}^{-1}$ every 4 min up to $8 \text{ km}\cdot\text{h}^{-1}$. The other test was performed by running at all speeds and started at $6 \text{ km}\cdot\text{h}^{-1}$ with a speed increase of $1 \text{ km}\cdot\text{h}^{-1}$ every 4 min up to $9 \text{ km}\cdot\text{h}^{-1}$. The tests were separated by a 30-min rest and were performed in randomized order. The average VO_2 achieved in the 4th minute of every stage was used as a measure of steady-state VO_2 at that particular speed. The curves of energy expenditure (VO_2/kg) in relation to gait speed were fit to the four data points for both walking and running, using a least squares regression method. A third-order polynomial model was used to fit walking data and a linear model to fit running data. The steady-state VO_2 at the PTS was interpolated from the respective curves for walking and for running.

PTS test

A fifth treadmill test was also performed with all subjects to determine their individual PTS, according to the procedure described previously by Sentija and Markovic (2009).

In all walking tests, subjects had to fulfil the criteria used in race walking, i.e., the stance leg has to be extended in the mid-stance phase (inverted pendulum model), while in the running tests the stance leg had to be flexed in the midstance (spring-mass model). All testing sessions were separated by 1–3 days and performed in randomized order.

Statistical analysis

The results are presented as means \pm SD for all subjects. The normality of appropriate data sets was confirmed with the Kolmogorov-Smirnov test. Paired t-tests were used to make comparisons between the PTS and velocities at the gas exchange thresholds and between data in this study and the findings for male subjects in a similar study by Sentija and Markovic (2009). Relationships between the PTS and velocities at the gas exchange thresholds were determined using Pearson product-moment correlations. A value of $p < 0.05$ was established a priori to determine statistical significance.

Results

The preferred gait transition speed in the female subjects occurred at $7.21 \pm 0.3 \text{ km}\cdot\text{h}^{-1}$, in close agreement with values for the PTS reported in previous studies (Hreljac, 1993a, 1993b; Raynor, 2002). The corresponding energy expenditures at PTS for walking and for running (Figure 1) were 26.6 ± 3.7 and $31.3 \pm 2.9 \text{ ml O}_2/\text{min}/\text{kg}$, respectively, and also did not differ from values reported for male subjects in the study of Sentija and Markovic (2009) (24.3 ± 3.6 and $29.5 \pm 2.6 \text{ ml O}_2/\text{min}/\text{kg}$, $\text{PTS} = 7.15 \pm 0.4 \text{ km}\cdot\text{h}^{-1}$, all $p > 0.05$).

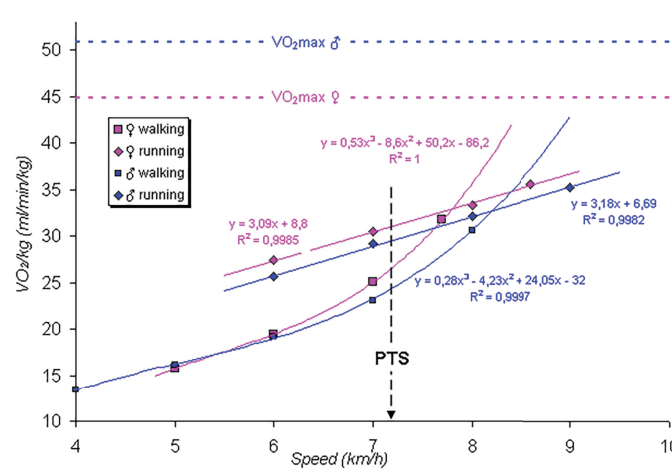


Figure 1. Preferred transition speed (PTS), average energy expenditures for walking and running and VO₂max values (data for males are added from the study of Sentija and Markovic, 2009).

The ATr had a similar average value (7.34 ± 0.5 km/h) as all female subjects (6.64 ± 0.5 km/h, $p < .001$). PTS ($p > .05$), while ATw was lower than the PTS and ATr in

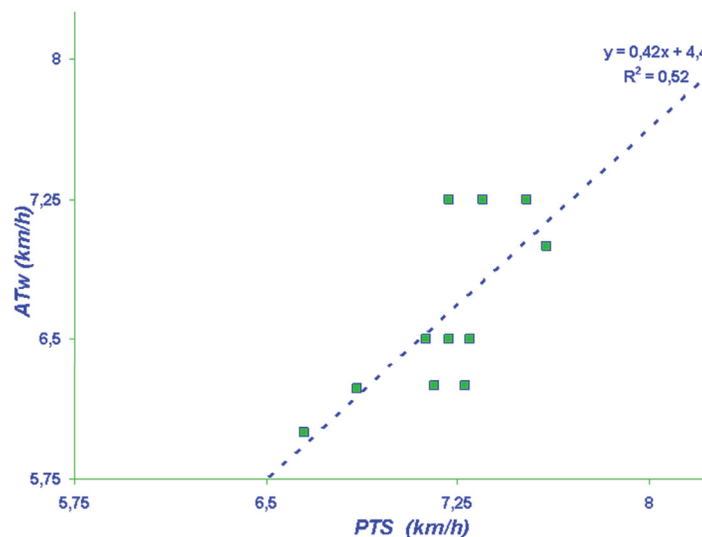


Figure 2. Relationship between PTS and ATw

The PTS was significantly correlated with both ATr and ATw were also highly correlated ($r = 0.80$, Figure 4). (Figure 2) and ATr ($r = 0.77$, Figure 3).

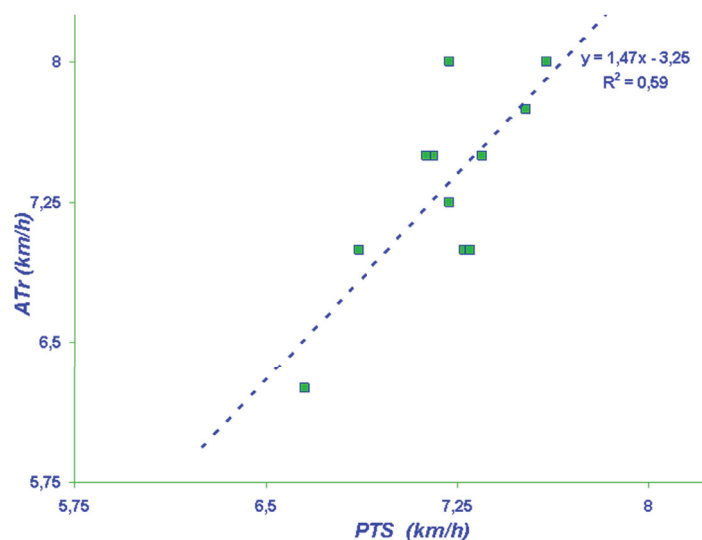


Figure 3. Relationship between PTS and ATr

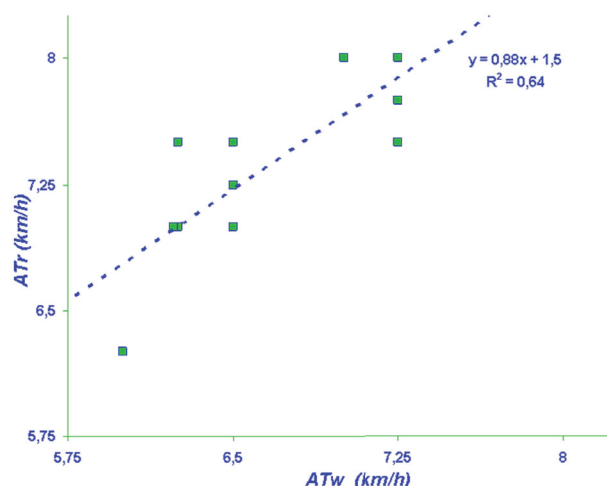


Figure 4. Relationship between ATw and ATr

The PTS in males was reported to be similar and highly correlated to ATr ($r=0.82$) but not to ATw ($r=0.06$). Furthermore, the aerobic thresholds for walking and running in men were not correlated ($r=0.26$, $p>0.05$). As expected, the VO_2max in the present study was significantly lower (44.9 ± 4.0 vs 50.8 ± 4.7 ml O_2 /min/kg, $p<0.01$) than previously found in males (Sentija, & Markovic, 2009). However, the relative energy expenditures at the PTS, expressed as percentages of VO_2max , were significantly higher in women than the values reported for males, both for walking ($59\pm6\%$ vs. $48\pm6\%$, $p<0.01$) and for running ($70\pm6\%$ vs $58\pm6\%$, $p<0.01$).

Discussion

In comparison to the results reported for males (Sentija & Markovic, 2009), several findings in our study suggest significant gender differences in the PTS/AT relationship:

- 1) the ATw in our sample of female subjects was found to be significantly lower than both the ATr and PTS, suggesting that the speed at the aerobic threshold in women depends on the modality of gait,
- 2) the ATw was significantly correlated to both, PTS and ATr suggesting that the ATw could also be an important predictor of the PTS in young, untrained women,
- 3) in comparison to men, women change gait at a similar absolute intensity (speed of locomotion), but significantly higher relative intensity due to lower aerobic fitness.

There is no experimental evidence explaining why women change gait at the same speed as men. The lack of difference between the PTS of male and female subjects probably reflects the pressure of natural selection that has shaped the development of a similar gait transition speed and aerobic thresholds in men and women despite significant gender differences in stature, mass and aerobic capacity. Sentija, Rakovac, and Babic (2012) investigated the relationship between anthropometric variables and the PTS in both genders. They found moderate but significant gender-specific correlations between PTS, and several body-size and body-shape variables. Female foot length is consistently smaller than male foot length, independent of absolute stature (Fessler, Haley, & Lal, 2005), which may also contribute to higher walking efficiency in women in comparison to men, due to lower inertia with increasing walking speed. Smith, Lelas, and Kerrigan (2002), and Chumanov,

Wall-Scheffler, and Heiderscheit (2008) found significant gender differences in the centre-of-mass and non-sagittal motion at the hip and pelvis, as well as greater gluteus maximus activity in females than in males.

In summary, our results indicate that the gait transition speed corresponds to, and is highly related with the aerobic threshold for running and, to a lesser degree, with the aerobic threshold for walking in young women. The observed aerobic capacity (VO_2max) in young women is significantly lower, while the metabolic thresholds and the preferred transition speed are similar to the values previously reported for male subjects. Therefore young women, in comparison with men, have a wider relative range of energy expenditure for walking. The sexual dimorphisms in body size, body shape, and locomotion kinematics established in previous studies probably reflect the intersexual selection to overcome a lower aerobic capacity in women, favouring the preservation of similar walking capacity and endurance in men and women. Gender differences should be taken into consideration for proper interpretation of the parameters that supposedly determine the preferred transition speed between walking and running.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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ORIGINAL SCIENTIFIC PAPER

Incidence Rate and Patterns of Sport Injury among College Students

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Abstract

The participation of college students in sport is quite large, which causes them to be at higher risk of injury. However, data on sport injury in college students are not always available at college or universities. Injury reports can be used to develop an injury reduction program in college. This study aims to determine the injury rate and patterns of injury among college students. This is a cross-sectional study followed by one hundred students of the faculty of medicine, Universitas Katolik Indonesia Atma Jaya, Jakarta. A self-administered questionnaire and physical examination were performed. Data were analysed using appropriate statistical tests in the Statistical Package for Social Science (SPSS) version 17. Significance was set at $p < 0.05$. There were 107 injuries from seventy six students (76%) from four sport. The total injury rate was 99 per 1000 student-exposure. Males had higher injury rate and prevalence than females. Injured students were older and taller (20.03 vs 19.50, $p = 0.02$; 168.83 vs 164.75, $p = 0.05$, respectively). Ankle and sprain were the most common site and type of injury (34.6% and 56%, respectively). Logistic regression indicated that gender, age, BMI, and type of sport were not determinant factors for injury (odds ratio [OR] 2.07, $p = 0.13$; [OR] 2.60, $p = 0.11$; [OR] 0.63, $p = 0.38$; [OR] 1.66, $p = 0.31$, respectively). Many college students of Atma Jaya participating in sport suffered from injury. The most common injury was ankle sprain. Injury reduction programmes should emphasize ankle sprain.

Key words: Injury rates, sport injury, injury patterns, students college

Introduction

Students' involvement in sport exposes them to two contradicting situations. On the one hand, their health benefits due to a physically active lifestyle; on the other, involvement in sport is likely to bring about some health challenges, particularly sport-related injury (Merkel, 2013). Sport injury rates will continue to increase as the involvement of students in sport increases (Tolbert, Mc Ilvain, Giangarra, & Binkley, 2011; Sheu, Chen, & Hedegaard, 2016). A prior study (Rosa et al., 2014) reported that the prevalence of injury among college students in Brazil was almost 50%. A higher prevalence of collegiate injury was found in India (73.4%) as reported by Kumar, Singh, Yadav, Mangal, and Raut (2014). The difference of incidences of injury between genders is inconclusive as it depends on injury characteristics and injury surveillance reporting methods.

Reducing the sport injury rate of students is necessary to prevent school-time loss and to prevent catastrophic injury. Sport injuries can be largely prevented. Warming up and stretching, and using protective equipment are some injury prevention methods that have become well known (Schiff, Caine, & O'Halloran, 2010). Students may take these preventive measures. However, a more effective and comprehensive strategy should be developed and introduced to minimize sport injury among college students to the lowest level. This injury prevention program can best be accomplished by conducting injury surveillance to obtain information on injury prevalence or rate and characteristics of injury. However, any prevention program being developed should never discourage or hinder the students from taking part in physical activities.



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Indonesia is a large country with a large population. The number of college students was estimated to be about seven million, of which about 16.6% of them engage in physical activity (Data and Information Center for Science, Technology, and Higher Education, 2015; National Central Bureau of Statistics. Indonesian youth statistics, 2015). Some of them engage in sport organized by the university, while others belong to a sport club. Thus, there are more than a million college students exposed to injury. To the best of our knowledge, there has not been a study on injury among college students in Indonesia.

This study aimed to determine the injury rate and to provide detailed information about the injuries obtained by collegiate students of the Faculty of Medicine, Universitas Katolik Indonesia Atma Jaya. The results of this study will be used as preliminary data to conduct further injury surveillance in a larger sample.

Methods

Study design and subjects

This cross-sectional study was conducted at the Faculty of Medicine, Universitas Katolik Indonesia Atma Jaya, Jakarta, between May 2018 and July 2018. Subjects were students engaged in four types of sport organized by the campus: badminton, basketball, futsal, and volleyball. The inclusion criteria include being members of college sport teams and following practice and games regularly. Exclusion criteria were one of the following criteria: declined to participate in the study and did not submit the completed questionnaires during the study period. Informed consent was obtained from participants prior to the study by signing. Ethical clearance was approved by the Faculty Ethics Committee.

Study tool and measurements

Data were obtained via a questionnaire distributed to participants through the sport team coordinator. The questionnaire included age, type of sport engaged in, training program, competition schedule, and characteristics of injury sustained in the last 12 months, from August 2017 to July 2018. Clarification was performed by participants or researcher if the questions or answers in the questionnaire were unclear.

Weight and height were measured according to standard procedure. Body mass index (BMI) was obtained by dividing

weight (kg) with the square of height (m). Body mass index was classified as normal if $BMI < 23 \text{ kg/m}^2$, and overweight if $BMI \geq 23 \text{ kg/m}^2$ (Hsu, Araneta, Kanaya, Chiang, & Fujimoto, 2015; WHO Expert Consultation, 2004). Musculoskeletal physical examinations were performed to confirm sites and type of injury sustained.

Injury report

Injury incidence was reported in terms of percentage among all participants and as injury rate. The injury rate was reported as 1000 students' exposure (S-E). Students' exposure was defined as one student engaging in one practice or competition in which he or she is exposed to the possibility of obtaining an athletic injury (Phillips, 2000; Dick, Agel, & Marshall, 2007). Data regarding exposures were obtained from the weekly attendance list for practice and the list of team members for competition. The competitions followed by college students were regional competition, inter-faculty competition, and inter-level competition. The injury rate was reported according to sport and gender.

Statistical analysis

Data were presented as mean \pm standard deviation (SD) for numeric and frequency (percentage) for categorical data. The independent t-test was applied to compare the mean between two groups. Chi-square was used to analyse the association between variables. Determinant factors for sport injury were computed using a binary logistic regression. Significance was set at $p \leq 0.05$. Statistical analysis was computed using the Statistical Package for Social Sciences (SPSS) version 17.

Results

The distribution of the participants according to the sociodemographic, BMI, and injury are presented in Table 1. One hundred college students (64 male, 36 female) of the Faculty of Medicine, Universitas Katolik Indonesia Atma Jaya were eligible to engage in this study. Most of the students were twenty years old or younger (70%) and had normal BMI (53%). Students engaging in futsal had the highest number, whereas students engaging in basketball had the lowest. Most of the students suffered from injuries (76%), with a total number of injuries being 107.

Table 1. Distribution of sociodemographic, BMI, and injury of the participants

Variables		Number	Percentage
Gender	Male	64	64%
	Female	36	36%
Age (years)	≤ 20	70	70%
	> 20	30	30%
BMI (kg/m^2)	Normal	53	53%
	Overweight	47	47%
Sport event	Badminton	26	26%
	Basketball	21	21%
	Futsal	30	30%
	Volleyball	23	23%
Students injured (n)		76	76%
Number of injury		107	107%

Legend: BMI - body mass index

Comparison of the characteristics and number of students were presented according to the injury status of the students (Table 2). Mean age and height of the students with

injury were higher than students with no injury (20.0 vs 19.5, $p=0.02$; 168.8 vs 164.7, $p=0.05$). There was no association between sport event and injury frequency ($p=0.07$).

Table 2. Comparison of characteristics and number of students according to injury status

	Students with injury (n=76)	Students with no injury (n=24)	p
Age (years)	20.03±0.94	19.50±0.98	0.02
Height (cm)	168.83±7.98	164.75±10.68	0.05
Weight (kg)	66.42±13.75	64.96±14.21	0.65
BMI (kg/m ²)	23.15±3.66	23.83±4.32	0.45
<i>Badminton</i>	15	11	0.07
<i>Basketball</i>	16	5	
<i>Futsal</i>	26	4	
<i>Volleyball</i>	19	4	

Nine injury sites and five types of injury were identified. Table 3 shows the distribution of body parts and the types of injury in all sports. Injury to the ankle accounted for almost 35% of all injuries, and it is the most frequent injury in three sport events,

except in volleyball. Injury to the hand and wrist is the most frequent type of injury in volleyball. The most common type of the injury sprain (56%). The buttocks and dislocation were the least affected site and type of injury, respectively (both 1.9%)

Table 3. Distribution of body part and types of injury among the various sports

Site of injury	Badminton	Basketball	Futsal	Volleyball	Overall
Ankle	7	10	13	7	37 (34.6%)
Hand & wrist	2	3	1	10	16 (14.9%)
Leg	3	3	5	3	14 (13.1%)
Knee	3	3	6	2	14 (13.1%)
Trunk	2	4	2	2	10 (9.3%)
Shoulder	3	1	1	2	7 (6.6%)
Foot	1	1	2	-	4 (3.7%)
Arm	2	-	-	1	3 (2.8%)
Buttock	-	2	-	-	2 (1.9%)
<i>Types of injury</i>					
Sprain	11	16	19	14	60 (56.0%)
Strain	6	5	6	5	22 (20.6%)
Contusion	4	3	4	7	18 (16.8%)
Muscle cramps	2	2	1	-	5 (4.7%)
Dislocation	-	1	-	1	2 (1.9%)
Total	23	27	30	27	107 (100%)

Legend: "Hands & wrist" includes fingers; "Foot" includes toes.

The overall injury rate was 9.9 (per 1000 students-exposure). Male students had higher injury rates than females did (11.0 vs 8.1 per 1000 students-exposure). The injury rate in badminton was the highest (13.8), whereas futsal had the

lowest (7.8). According to gender in each sport, the highest injury rate in males was recorded in badminton (18.2) and in females was basketball (18.2%) (Table 4).

Table 4. Injury rate according to the sport and gender

	Number of students	Number of injury	Exposures	Injury rate (per 1000 student-exposure)
<i>Badminton</i>	26	23	1,664	13.8
Female	8	2	512	3.9
Male	18	21	1,152	18.2
<i>Basketball</i>	21	27	2,016	13.4
Female	4	7	384	18.2
Male	17	20	1,632	12.3

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	Number of students	Number of injury	Exposures	Injury rate (per 1000 student-exposure)
<i>Futsal</i>	30	30	3,840	7.8
Female	10	7	1,280	5.5
Male	20	23	2,560	9.0
<i>Volleyball</i>	23	27	3,312	8.2
Female	14	18	2,016	8.9
Male	9	9	1,296	6.9
<i>Overall</i>	100	107	10,832	9.9
Female	36	34	4,192	8.1
Male	64	73	6,640	11.0

Possible determinant factors for injury were identified. Gender, age, BMI, and type of sport were included as possible determinant variables for injury rate. Binary logistic regression was applied to examine the association between injury incidence and the determinant factors. For statistical purpose, the determinant factors were set into two groups.

Reference value (1.00) was determined for each group; female for gender, age ≤ 20 years, BMI < 23 kg/m², and non-contact sports for the type of sport. Logistic regression indicates that gender, age, BMI, and type of sport had no association with incidence of injury (all $p > 0.05$) (Table 5).

Table 5. Logistic regression analysis for determinant variables

	Determinant variables	Sport injury (%)		Adjusted OR (95% CI)	p
		Yes	No		
Gender	Female	24	12	1.00	0.13
	Male	52	12	2.07 (0.80 - 5.34)	
Age (years)	≤ 20	50	20	1.00	0.11
	> 20	26	4	2.60 (0.80 - 8.41)	
BMI (kg/m ²)	< 23	42	11	1.00	0.38
	≥ 23	34	13	0.63 (0.23 - 1.75)	
Type of sport	Non-contact	34	15	1.00	0.31
	Contact	42	9	1.66 (0.62 - 4.44)	

Discussion

The epidemiology of injury has been widely studied. The present study might be the first on the injury rate among college students in Indonesia. Seventy-six students (76%) from four sports suffered from injury with a total injury rate of 9.9 per 1000 students-exposure. Male students had higher injury rates than female students did, with the most dominant injury being ankle sprain. In our study, the injury rate was not affected by age, gender, BMI, or type of sport.

The frequency of injury in this study is high. Several previous studies also reported high injury prevalence among college students. A similar result was reported by Kumar et al. (2014), which found a 73.4% frequency of injury among Indian college students. A higher frequency (80%) of injury was reported by Ayanniyi, Oluwasegun, and Adekanla (2015) among Nigerian college students. Rosa et al. (2014) found a lower frequency (49.9%) of injury among college students in Brazil. Variation in injury prevalence between studies is caused by several factors. Contact or non-contact sport, the level of competition and definition of sport injury are possible factors that could affect the results of injury surveillance.

The present study also reported injury by calculating exposure, according to time or appearances. This type of report can be used to predict the occurrence of injury. The present study reported an injury rate of 9.9 per 1000 S-E. The

highest injury rate was in badminton, which recorded 13.8 per 1000 S-E. Asperti, Fernandes, Pedrinelli, and Hernandez (2017) reported that injury rates among amateur athletes at a Brazilian university to be 13 per 1000 athlete-exposure (A-E). A report from 16 years of the National Collegiate Athletic Association (NCAA) injury surveillance found an injury rate of 13.8 per 1000 athlete-exposure, with football having the highest risk (Hootman, Dick, & Agel, 2007). Factors influencing differences in the prevalence of injuries may also affect the variation in injury rate.

Sprained ankle is the most common injury in this study, accounting for almost 35% of all injuries. This result was similar to those of several previous studies conducted which also found sprained ankle to be the most common injury in some sports, including football, basketball (Drakos, Domb, Starkey, Callahan, & Allen, 2010), futsal (Varkiani, Alizadeh, & Pourkazemi, 2010; Angoorani, Haratian, Mazaherinezhad, & Younespour, 2014; Serrano, Shahidian, Voser, & Leite, 2013) and volleyball (Sattler, 2011; Massada, Aido, Magalhaes, & Puga, 2011; Pimenta, Junior, Neto, & Lope, 2017). In contrast to previous studies, hand and wrist injury, not sprained ankle, was the most frequent injury in volleyball in a recent study. A possible explanation is that most volleyball players in our study were female. They were not high-level athletes, and they play the games in a different way than elite athletes do. They

tend to use their hands more often to hit the ball than the legs to jump. Injury incidence patterns in badminton were also different in a study by Shariff, George, and Ramlan (2009), which found knee injury to be the most frequent. Differences in the level of competition may also be associated with different injury patterns.

Some variables in this study were suspected as determinant factors for sport injury. However, none of the variables were proved to determine the injury occurrence. We observed that sport types with lower-level exposure tend to have higher injury rates. Low exposure level could mean that time for practice or game was low. Low time for practice can reduce muscle performance and, therefore, increase the possibility of injury.

This study also has some limitations. First, the sample size was too small for an injury study. Many students were unable to attend the study because of various reasons. Second, bias in injury rate was present due to retrospective exposure data collection. The students' attendance list was not completely reported. Third, bias in diagnosis due to the absence of additional examination such as ultrasound or x-ray was also present.

Injury surveillance is essential to any institution, body, groups or individuals dealing with sport or exercise activity to develop an injury reduction programme. This study showed that injury frequency and rate among college students were high, with ankle sprain being the most common injury. In this study, gender, age, BMI, and sport type did not contribute to the incidence of injury. The injury reduction strategy should emphasize on the need to increase practice sessions (include strength and conditioning) and reducing ankle sprain. A further study with large sample size in many more colleges is needed to confirm the results and to obtain a complete and comprehensive sport injury report.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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ORIGINAL SCIENTIFIC PAPER

Model for Stamina Development in Biathletes Based on the Combined Application of Respiratory Exercises

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Abstract

Studies have shown that the adaptation of biathletes' bodies to different loads takes place gradually from stage to stage due to the development of stamina in the framework of the combined use of respiratory exercises. The process of adaptation and change in functional parameters characterizing physical performance and functioning of external respiration occurs mainly due to the expansion of the range of application of the means that expand the capabilities of the cardiorespiratory system of the biathlete's body. The use of respiratory exercises with and without exercise machines in combination with aerobic exercises of moderate, medium, and maximum intensity allows expanding the reserve and functional capabilities of the biathlete's body. This allows achieving more significant positive changes in general and specific physical fitness, physical performance, functional fitness, breathing capacity and biathlete reserves, as well as the rates of response to different loads during training sessions.

Key words: training model, biathletes, stamina development, respiratory exercises

Introduction

Competitive activity makes high demands on the levels of the physical and functional fitness of athletes (Bolotin, & Bakayev, 2017a; Dempsey, Amann, Harms, & Wetter, 2012). This fully applies to the preparation of biathletes. The content of biathletes' training requires improvement and searching for new effective training tools and methods. The biathletes' preparation for competitions is aimed at solving multiple tasks. Moreover, among the variety of tasks, the primary focus should be placed on the task of preparing and expanding the functional capabilities as well as the adaptive reserves of their bodies. The solution to this task is due, first of all, to the specific features of the competitive activity of biathletes, which is characterized by high mental and physical tension.

It is known that stamina reflects the level of physical preparedness of biathletes for competitive activity. The study of scientific works and practical experience shows that respiratory exercises, which are nonspecific means for developing stamina

and have a wide range of action on the bodies of athletes, have great potential (Bakayev, Bolotin, & Vasil'eva, 2015; Bakayev, Bolotin, & Aganov, 2016). They enhance the effect of training exercises performed and increase the level of physical performance (Batzel, Kappel, Schneditz, & Tran, 2007; Bohuslavskaya, Furman, Pityn, Galan, & Nakonechnyi, 2017; Bolotin, Bakayev, & You, 2018; Bolotin, & Bakayev, 2016; Przybyła et al., 2016; Vogiatzis et al., 2007; Bolotin, & Bakayev, 2017b; Bakayev et al., 2018).

The purpose of the study is to create optimal conditions with the help of experimental methods for increasing the indicators of reserve capacity and the body's resistance to oxygen deficiency in biathletes.

Methods

To solve the tasks, the following methods were used: analysis of scientific and methodological literature, testing (including functional tests), pedagogical experiments, and mathematical statistics methods.



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Analysis of the scientific and methodological literature included the study and summary of the works of domestic and foreign experts on the problem of the development of stamina in biathletes based on the use of respiratory exercises in various compositions. In the course of this analysis, the types of breathing, respiratory exercises, development of physical qualities, and the role of the respiratory system in the manifestations of stamina and physical performance of biathletes were studied.

Pedagogical testing was conducted to assess the overall physical fitness of biathletes. The following tests were used as indicators of general preparedness: standing long jump (cm); pull-ups (quantity); hip pull-over (quantity); shuttle run 10 × 10 (s); running 100 m (s); running over rough terrain for 5 km (s); 1 km and 3 km runs in a stadium.

The Spirolab III device was used to study and analyse the indicators of the respiratory system of biathletes. This device allows determining the forced vital capacity of the lungs, inspiratory capacity, expiratory capacity, maximum ventilation of the lungs, setting breathing pattern, and measuring oxygen saturation in the blood and pulse. The following indicators were studied: the vital capacity of the lungs (VC), forced vital capacity of the lungs (FVC), maximum voluntary ventilation (MVV), vital expiratory capacity (EVC), forced inspiratory volume in the first second (FIV 1).

To assess the performance of the respiratory system, timed expiratory capacity was used. In a sitting position, after resting, the biathletes took several deep breaths and held their breath as they exhaled (not to the maximum). The timed expiratory capacity was assessed according to the following indicators: "Excellent" - breath holding for more than 40 s; "Good" - from 30 to 40 s; "Satisfactory" - from 25 to 30 s; "Bad" - less than 25 s.

To assess the state of the respiratory system during inhalation breath holding, Stange's test was used. In a sitting position, after a five-minute rest, the biathletes took 2-3 deep breaths in and out, and then, after a deep inhalation, held their breath. Stange's test was assessed according to the indicators: "Excellent" - more than 60 s; "Good" - 40 to 60 s; "Average" - from 30 to 40 s.

To assess the state of the respiratory system, Serkin's test was also used. The test run consisted of three phases: 1st phase - holding breath when inhaling (sitting), 2nd phase - holding breath when exhaling immediately after 20 squats for 30 seconds, 3rd phase - holding breath when inhaling after 1 minute of rest.

Testing of biathletes' body reserves was carried out using the "Sources of Health" (Istoki Zdorov'ya) hardware-software apparatus, with which the level of functional and adaptive reserves of their bodies was assessed.

For the athletes psycho-diagnostics, the following tests were used: traffic lights, snake, tremor and tapping test.

The "Traffic Light" test (determines complex visual-motor reaction of biathletes in ms). At the command "Go!", red lights start blinking erratically, and the subject must quickly respond to the switching off of the left light by pushing the left button with the left hand, to the switching off of the right light - with the right hand and to the switching off of the middle light - simultaneously with both hands, with the hand on the button at all times. The subjects were given three attempts for each hand; the best and worst attempts were discarded, and the intermediate result was recorded.

The "Snake" test (determines dynamic tremor, which is associated with the attention properties, visual acuity of biathletes, etc.). At the "Go!" command, the subject put a stylus at the beginning of the "snake" maze and, at the first touch, began to mo-

ve along the snake with the timer being activated. In the course of the test, a touch record was performed. When performing the test, the subject had to try to outline all the figures over the entire length of the maze with a length of 60 cm and a width of 3 mm, and touch the edges as little as possible. The scoreboard showed the time in seconds and the number of edge touches. When performing this test, the needle of the stylus should not go beyond the edges of the maze.

The "Tremor" test (determines static tremor). At the "Go!" command, the subject inserted a stylus needle into a 3 mm hole, and the timer was activated when the edge of the hole was first touched. This test was performed for 30 seconds. At the end of time, the number of touches was displayed on the board. When performing this test, the needle of the stylus should not come out of the hole.

The "Tapping" test (determines lability, mobility, nature of arousal state, as well as the speed of the neuromuscular system). At the command "Go!", the subject began to beat a 2.5 by 2.5 cm square with a stylus in the form of a needle-pen for 30 seconds at a maximum rate.

The pedagogical experiment was carried out to assess the effectiveness of the developed model for stamina development in biathletes based on the use of respiratory exercises. Development of stamina in biathletes in the experimental group was carried out based on the integrated use of respiratory exercises. This approach to training biathletes enabled describing this process step by step and schematically present a model of stamina development based on the integrated use of respiratory exercises.

The model included the tasks, principles, structure and content of the biathlete training method, assessment of the methodology implementation, organizational and methodological features, and the planned result.

The main objectives for the implementation of the biathlete training model

1. Mastering respiratory exercises and using them during physical training.
2. Optimization of the process of biathletes physical training.
3. Increase in the level of functional preparedness of biathletes.
4. Control over adaptation to physical loads.

Experimental model effectiveness was assessed according to the results of the indicators of preparedness, possibilities of external respiration, physical performance and adaptive reserves of the biathletes' bodies.

In this study, for the quantitative analysis of the experimental data of the study, a system for statistical processing of the results was used. Mathematical-statistical processing of the results was carried out using Microsoft Excel 7.0 software.

Results

Biathlete training effectiveness is largely determined by the functional capabilities of their body. Practice has shown that the low level of physical performance and functional capabilities of the respiratory system of the body reserve capacity creates negative prerequisites for the development of physical qualities and motor abilities of biathletes.

The following indicators were identified as indicators characterizing the physical performance and functionality of biathlete breathing: 1- PWC 170 (kg / m / min); 2- MOC (ml); 3- MEI (cu); 4- expiratory reserve volume (ERV) (l); 5- ventilation per minute (VE) (l); 6- respiratory volume (TB) (l); 7- inhalation capacity (IC); 8- forced inspiratory volume (FIVC) (l).

The following indicators were identified as indicators characterizing the reserve capacity and the biathlete body's resistance to oxygen deficiency: 1- Stange's test (s); 2- timed expiratory capacity (s); 3- Serkin's test No.1 (s); 4- Serkin's test No.2 (s); 5- Serkin's test No. 3 (s); 6- General reserves (cu); 7- Physical reserves (cu); 8- Mental reserves (cu); 9 - Adaptation reserves (cu).

Determination of physical performance and functional capabilities of biathletes' breathing at the beginning of the experiment indicates the absence of significant differences between the mean values of the experimental and reference groups ($P > 0.05$). The obtained data on the functional capabilities of biathletes' breathing during the experiment are shown in Table 1.

Table 1. Indicators of Physical Performance and Functional Capabilities of Respiration in Biathletes of the Experimental and Reference Groups

No.	Parameters	Periods	Gr.	Stage 1	Stage 2	Stage 3	Stage 4
1	PWC 170 (kg/m /min)	Start	CG	1146.70±35.46	1193.85±67.67	1246.05±41.77	1297.70±59.42
			EG	1139.35±119.88	1184.10±68.10	1238.70±38.90	1284.85±56.63
			p	0.794	0.652	0.568	0.488
		End	CG	1164.40±38.02	1216.85±67.76	1263.70±45.42	1321.70±62.33
			EG	1208.70±25.09	1293.35±76.23	1390.85±52.12	1463.75±62.13
			p	0.000	0.002	0.000	0.000
2	MOC (ml)	Start	CG	2906.40±60.60	2992.25±63.75	3288.35±209.7	3517.55±198.01
			EG	2939.70±78.62	2969.45±50.88	3232.50±115.50	3487.90±58.52
			p	0.142	0.219	0.304	0.525
		End	CG	2920.90±19.48	3014.00±63.21	3309.60±209.11	3540.80±196.48
			EG	3013.10±118.74	3129.00±65.34	3486.85±148.55	3666.65±61.53
			p	0.001	0.000	0.004	0.009
3	MEI (c.u.)	Start	CG	408.30±11.54	411.40±5.56	432.30±15.79	432.10±8.60
			EG	404.35±9.38	412.80±4.53	434.45±8.98	434.65±5.96
			p	0.242	0.388	0.6	0.283
		End	CG	413.00±5.88	419.25±5.62	439.60±15.48	435.70±9.52
			EG	425.00±12.39	447.95±11.60	468.40±18.52	474.00±8.05
			p	0.000	0.000	0.000	0.000
4	Expiratory reserve volume (ERV) (l)	Start	CG	0.33±0.36	0.45±0.46	0.85±0.74	0.60±0.82
			EG	0.31±0.33	0.47±0.46	0.85±0.93	0.64±0.77
			p	0.879	0.879	0.996	0.866
		End	CG	0.37±0.36	0.45±0.46	0.87±0.67	0.70±0.92
			EG	0.71±0.27	0.82±0.54	1.29±0.80	0.93±0.60
			p	0.002	0.025	0.148	0.400
5	Vent/min (VE)	Start	CG	9.75±5.29	23.00±7.79	23.14±9.43	12.55±7.83
			EG	9.92±4.87	22.95±7.55	23.05±8.77	12.28±8.71
			p	0.917	0.986	0.974	0.919
		End	CG	10.24±5.16	23.00±7.08	23.19±9.78	12.59±8.01
			EG	13.85±5.48	25.79±6.04	27.74±6.29	13.84±7.77
			p	0.039	0.188	0.088	0.6
6	Respiratory volume (TB) (l)	Start	CG	0.28±0.23	0.94±0.30	0.74± 0.32	0.64±0.34
			EG	0.31±0.26	0.90±0.25	0.71±0.39	0.66±0.40
			p	0.763	0.634	0.774	0.862
		End	CG	0.30±0.22	0.97±0.30	0.75±0.18	0.69±0.35
			EG	0.44±0.26	1.17±0.23	0.95±0.26	0.91±0.31
			p	0.09	0.021	0.009	0.000
7	Inhalation Capacity (IC) (l)	Start	CG	4.23±0.71	3.83±0.63	3.71±1.00	4.04±1.08
			EG	4.24±1.04	3.79±0.49	3.75±1.05	4.03±1.04
			p	0.983	0.817	0.895	0.978
		End	CG	4.31±0.83	3.84±0.67	3.78±1.03	4.08±0.69
			EG	4.67±0.89	4.57±1.05	4.33±0.70	5.33±1.39
			p	0.2	0.012	0.056	0.001
8	PWC 170 (kg/m /min)	Start	CG	4.25±0.08	2.91±1.25	3.48±0.94	3.84±0.99
			EG	4.23±0.08	2.95±0.81	3.47±0.93	3.83±0.88
			p	0.35	0.894	0.975	0.976
		End	CG	4.30±0.10	2.93±1.19	3.51±0.87	3.85±0.99
			EG	4.53±0.31	3.35±0.41	4.25±0.55	5.33±1.33
			p	0.002	0.147	0.003	0.000

Legend: PWC 170–test physical working capacity; MOC-max oxygen consumption; MEI-maximum endurance index; VE-ventilation per minute

Determination of physical performance and functional capabilities of biathletes' breathing at the end of the experiment indicates the presence of significant differences between the mean values of the experimental and reference groups by several indicators ($P < 0.05$).

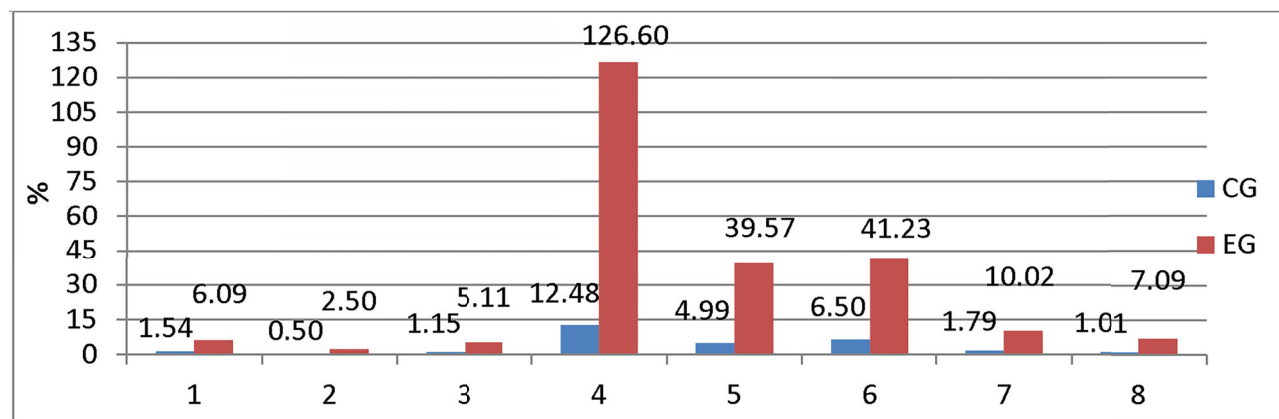
The results of the biathletes from the experimental groups were significantly higher than the results demonstrated by the biathletes from the control groups.

In the test results, no significant differences were observed in expiratory reserve volume (ERV) at stages 3 and 4, ventilation per minute (VE) at stages 2, 3 and 4, respiratory volume (TB) and inspiratory capacity (IC) at stage 1, forced inspiratory volume (FIVC) at stage 2; however, the average values of the indicators for biathletes of the experimental groups are higher than those for the control groups

biathletes.

When analysing the obtained data on the state of physical performance and functional capabilities of respiration in the studied groups of biathletes, it should be noted that over the period of the experiment, the growth rates of the indicators in the experimental groups were significantly higher than those in the control groups (Figures 1-4).

The biathletes of the reference and experimental groups at the first stage of the experiment had the following increase results: PWC 170 - 1.54% and 6.09%; MOC - 0.50% and 2.50%; MEI - 1.15% and 5.11%; Expiratory reserve volume (ERV) - 12.48% and 126.60%; Ventilation per minute - 4.99% and 39.57%; Respiratory volume (TB) - 6.50% and 41.23%; Respiratory volume (TB) - 1.79% and 10.02%; Forced inspiration volume (FIVC) - 1.01% and 7.09% (Figure 1).



Legend: 1-PWC 170 (kg/m/min); 2-MOC (ml); 3-MEI (cu); 4-expiratory reserve volume (ERV); 5-Vent/min. (VE); 6-Respiratory volume (TB); 7-Inhalation capacity (IC); 8-Forced inspiratory volume (FIVC)

Figure 1. Increase in the indicators of physical performance and functional capabilities of biathletes' breathing for the first period of the experiment

The biathletes of the reference and experimental groups at the second stage of the experiment had the following increase results: PWC 170 - 1.93% and 9.23%; MOC - 0.73% and 5.37%; MEI - 1.91% and 8.52%; Expiratory reserve volume

(ERV) - 0.22% and 74.52%; Ventilation per minute - 0.03% and 12.38%; Respiratory volume (TB) - 2.87% and 29.91%; Respiratory volume (TB) - 0.17% and 20.66%; Forced inspiration volume (FIVC) - 0.91% and 13.47% (Figure 2).

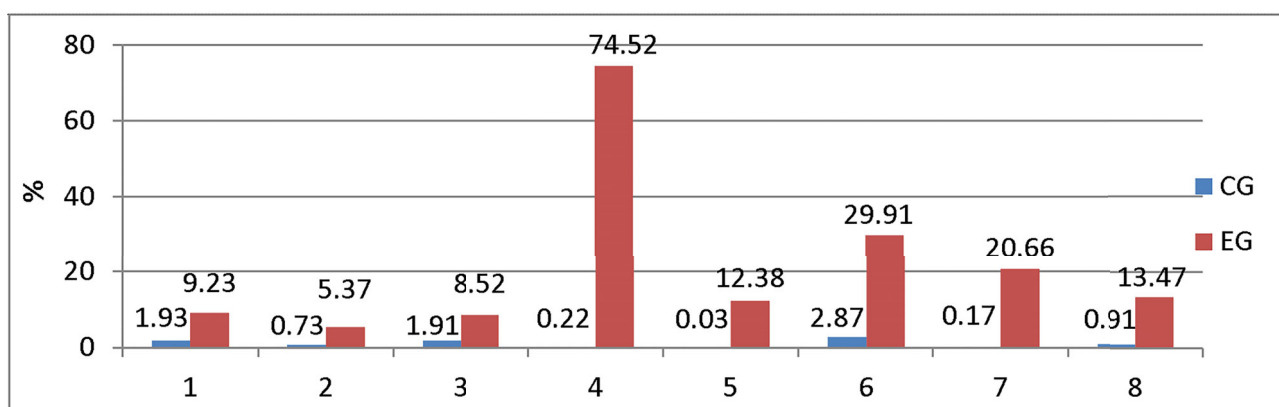


Figure 2. Increase in the indicators of physical performance and functional capabilities of biathletes' breathing for the second period of the experiment

The biathletes of the reference and experimental groups at the third stage of the experiment had the following increase results: PWC 170 - 1.42% and 12.28%; MOC - 0.65% and 7.87%; MEI - 1.69% and 7.81%; Expiratory reserve volume

(ERV) - 2.90% and 51.83%; Ventilation per minute - 0.22% and 20.36%; Respiratory volume (TB) - 1.28% and 33.38%; Respiratory volume (TB) - 1.81% and 15.26%; Forced inspiration volume (FIVC) - 0.83% and 22.23% (Figure 3).

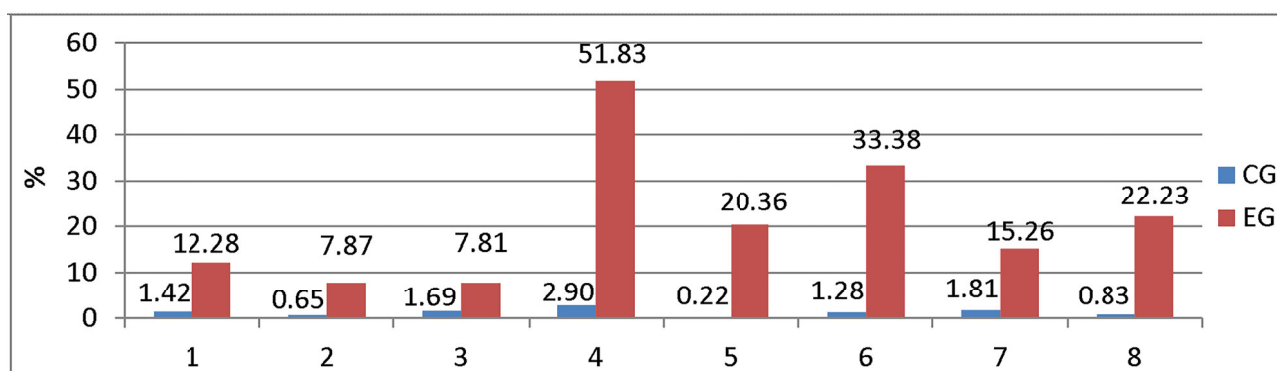


Figure 3. Increase in the indicators of physical performance and functional capabilities of biathletes' breathing for the third period of the experiment

The biathletes of the reference and experimental groups at the fourth stage of the experiment had the following increase results: PWC 170 - 1.85% and 13.92%; MOC - 0.66% and 5.12%; MEI - 0.83% and 9.05%; Expiratory reserve volume (ERV) -

16.76% and 44.78%; Ventilation per minute - 0.28% and 12.66%; Respiratory volume (TB) - 6.54% and 36.87%; Respiratory volume (TB) - 0.95% and 32.37%; Forced inspiration volume (FIVC) - 0.12% and 39.11% (Figure 4).

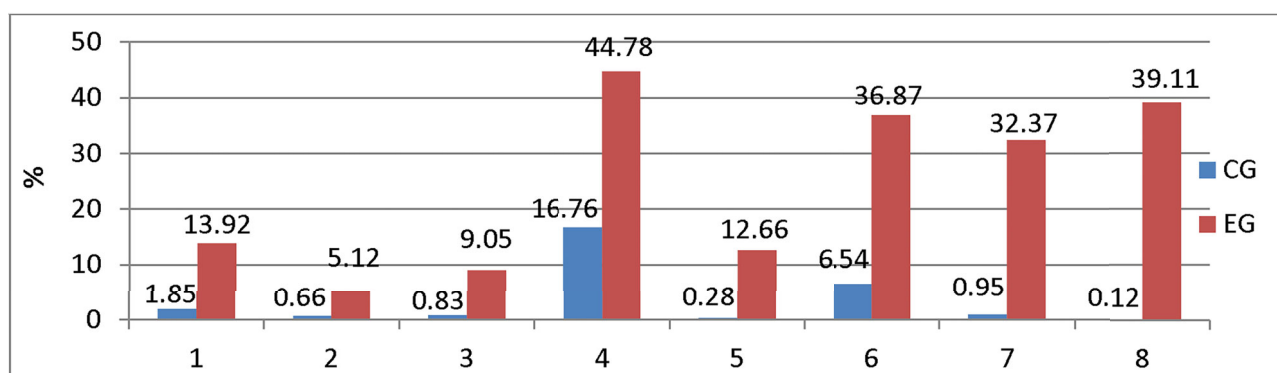


Figure 4. Increase in the indicators of physical performance and functional capabilities of biathletes' breathing for the fourth period of the experiment

Discussion

Analysing the data of growth rates, we can conclude that, during the experiment period, there is an improvement in the performance of the reference and experimental group biathletes at all stages of training. However, the increase in performance in the experimental groups is significantly higher than that in the reference groups.

Summarizing the results of the study, we can conclude that the use of the method of developing stamina based on the integrated use of respiratory exercises has created optimal conditions for improving the indicators of physical performance and the functional capabilities of breathing in the experimental group biathletes.

The obtained indicators of reserve capacity and body resistance to oxygen deficiency in the biathletes are presented in Table 2.

Table 2. Indicators of Reserve Capacity and Resistance of the Biathletes' Body to Oxygen Deficiency in the Experimental and Reference Groups during the Experiment

No.	Parameters	Periods	Gr.	Stage 1	Stage 2	Stage 3	Stage 4
1	Stange's test (s)	Start	CG	87.00±18.87	94.75±18.55	84.40±12.39	61.40±11.54
			EG	88.30±5.00	94.30±19.69	83.45±12.60	61.10±12.03
			p	0.767	0.941	0.811	0.936
		End	CG	89.00±5.74	96.70±18.77	85.95±8.64	63.05±12.07
			EG	97.80±5.59	103.45±18.57	92.30±11.13	66.95±13.03
			p	0.000	0.26	0.065	0.065
2	Timed expiratory capacity (s)	Start	CG	75.20±10.68	83.10±17.32	73.35±8.26	51.80±10.50
			EG	75.00±3.60	83.70±18.01	72.85±8.32	50.80±14.43
			p	0.937	0.915	0.85	0.803
		End	CG	77.40±5.34	85.50±17.32	73.70±8.58	53.35±10.06
			EG	85.60±4.12	92.40±18.06	81.90±8.43	56.85±14.30
			p	0.000	0.225	0.012	0.012

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No.	Parameters	Periods	Gr.	Stage 1	Stage 2	Stage 3	Stage 4
3	Serkin's test No. 1 (s)	Start	CG	57.50±5.45	59.80±4.64	61.10±5.22	58.60±7.16
			EG	57.30±2.27	59.90±5.12	60.50±6.56	57.05±4.39
			p	0.88	0.949	0.751	0.415
		End	CG	59.60±5.15	61.40±5.11	62.50±4.99	60.00±7.15
			EG	64.70±2.62	65.90±7.18	68.20±7.67	61.90±5.43
			p	0.000	0.028	0.008	0.008
4	Serkin's test No. 2 (s)	Start	CG	17.75±2.81	24.70±2.99	27.05±4.49	28.30±4.50
			EG	17.90±1.86	24.30±3.53	28.25±5.04	28.95±5.23
			p	0.843	0.701	0.431	0.676
		End	CG	19.25±3.58	26.90±3.45	29.80±5.06	29.85±4.33
			EG	24.80±2.65	30.85±3.05	34.85±5.26	35.00±4.87
			p	0.000	0.000	0.004	0.004
5	Serkin's test No. 3 (s)	Start	CG	35.80±3.37	43.95±4.25	59.10±5.93	59.75±4.54
			EG	35.70±2.90	43.30±5.02	60.35±6.82	59.10±7.38
			p	0.92	0.661	0.54	0.739
		End	CG	39.30±5.32	45.65±4.34	61.10±5.48	61.05±5.01
			EG	42.70±3.40	50.15±5.44	68.05±7.47	64.80±8.73
			p	0.021	0.006	0.002	0.002
6	Total reserves (c.u.)	Start	CG	41.45±3.76	40.40±4.02	39.85±6.54	38.10±6.75
			EG	41.95±3.20	41.00±3.60	40.85±5.19	38.55±5.62
			p	0.653	0.622	0.595	0.82
		End	CG	42.15±2.94	42.35±4.85	42.25±6.94	40.10±7.37
			EG	51.55±4.10	46.50±5.57	47.10±5.63	46.75±46.75
			p	0.000	0.016	0.02	0.02
7	Physical reserves (c.u.)	Start	CG	20.00±3.45	23.85±3.10	24.45±3.75	26.50±3.32
			EG	20.20±3.05	24.05±1.90	25.25±5.99	25.95±4.43
			p	0.847	0.807	0.616	0.659
		End	CG	21.50±3.44	26.30±3.45	26.85±3.76	28.45±3.75
			EG	29.50±4.20	30.20±3.52	31.75±5.85	35.60±7.71
			p	0.000	0.001	0.003	0.003
8	Mental reserves (c.u.)	Start	CG	57.50±4.97	59.70±3.77	59.35±6.53	58.45±6.85
			EG	57.85±5.46	62.85±3.60	59.75±5.78	59.50±5.86
			p	0.833	0.49	0.839	0.605
		End	CG	59.00±5.43	61.75±4.13	60.95±6.20	61.00±6.87
			EG	68.50±5.17	68.80±4.30	67.90±5.80	67.85±67.85
			p	0.000	0.000	0.007	0.007
9	Adaptation reserves (c.u.)	Start	CG	75.25±3.18	72.75±5.07	70.15±6.18	69.35±6.67
			EG	75.85±4.16	73.25±5.19	70.80±6.01	70.10±6.21
			p	0.611	0.76	0.738	0.738
		End	CG	76.85±4.73	75.00±4.95	72.25±6.23	71.75±6.81
			EG	84.30±4.37	79.00±6.30	77.10±6.54	79.00±8.28
			p	0.000	0.032	0.021	0.021

The determination of indicators of reserve capacity and resistance of the body to the lack of oxygen in biathletes at the end of the experiment indicates the presence of significant differences between the mean values of the experimental and reference groups according to several indicators ($P < 0.05$).

When analysing the obtained data on the state of reserve capacity and body resistance of biathletes to the oxygen deficiency in the studied groups, it should be noted that throughout the experiment, the growth rates of the indicators in the experimental groups were significantly higher than those in the control groups.

Summarizing the study results, we can conclude that the use of an experimental technique allowed us to create

optimal conditions for increasing the indices of reserve capacity and the body's resistance to oxygen deficiency in the experimental groups.

Thus, the obtained results confirm the feasibility of arranging and conducting training sessions using the developed tools for stamina development based on the integrated use of respiratory exercises.

Improvement in the process of arranging and expanding the content of physical training for biathletes using multidirectional means aimed at developing stamina and the integrated use of breathing exercises creates favourable conditions for the further development of the adaptive capabilities of the functional systems of their body. This contributed to the effectiveness of the competitive activity of biathletes.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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ORIGINAL SCIENTIFIC PAPER

Achievement Motivation of Physical Education Teachers

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Abstract

This paper identifies the differences in achievement motivation of the physical education teachers, divided by gender, and the results are compared with national standards. The research sample was comprised of 52 physical education teachers (male: $n=22$; 41.59 ± 9.95 years old, female: $n=30$; 39.33 ± 10.67 years old) from Slovakia. A standardized LMI questionnaire consisting of 170 items was used as the research tool. The Shapiro-Wilk test was used to assess the normality of the data. The Mann-Whitney test was used to evaluate the significance of the differences between individual independent samples. The degree of dependence between two groups was expressed by using the r coefficient. Male physical education teachers have significantly higher ($p=0.043$) achievement motivation compared to female physical education teachers. A comparison of dimensions of achievement motivation of male physical education teachers showed that they achieved significantly higher scores in the dimensions of persistence, fearlessness, and competitiveness. Comparing them with national standards, the achievement motivation of male teachers of physical education corresponds with the 58th percentile (stanine value 5) and of female teachers of physical education with 46th percentile (stanine value 5). The outcomes of this study characterize PE teachers as an elementary component in the teaching process from the aspect of achievement motivation and its dimensions and also indicate the status of PE teachers in society. This study is designated for PE teachers as well as for the general public striving to improve the quality of the teaching process in sports.

Key words: motivation profile, physical education teachers, sport, national standards

Introduction

People have always longed for success, but success is classified based on performance strength. Performance motive is the ratio of the desire for success and the fear of failure. The greater the fear of failure, the worse the performance, provided the same hope for success. Based on this, we distinguish between two types of people: those permanently striving for success and those attempting to avoid failure (Nakonecny, 1996). Motivation represents an inner strength that forces us in a certain direction, and we can anticipate it from indicators in our behaviour, knowledge, and emotional experiences (Goetz & Hall, 2013). Murphy, Nevill, Neville, Biddle and Hardman (2002) treat motivation as an inner strength that arises between people and their acts to propel them mutually.

Achieving performance takes place in several stages: 1) creating a certain need, 2) assessing how much we are able to achieve the given need, 3) assuming that we will achieve the need, and 4) becoming determined to carry out the

given activity. If an individual has a lack of motivation, his/her performance will also be low. In contrast, if motivation is sufficiently high, the performance will also become better. The motivation of employees is also determined by job satisfaction, which is influenced by factors such as salary, a fair remuneration system, social solidarity, work tasks, work environment and the expectations of employees (Armstrong, 2007). Job satisfaction is a critical component determining usefulness in a job.

Paulik studied 1,280 teachers of elementary and secondary schools and higher education institutions in his research (1999), in which he defined the positive and negative characteristics of teachers' job satisfaction. The positive characteristics were good relations among the staff, creativity, the upbringing of students and passing knowledge down to them, working with children and the feeling of a job well done. The negative characteristics included low salaries and lack of appreciation of society, lowered morals of students,

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lack of cooperation between the parents and the school, the psychological burden, and insufficient material and technical equipment.

Contemporary teachers face great pressure from students, parents, society as well as from the employer. Therefore, it is alarming that despite the fact that this job is difficult and very important for society, it is not adequately appreciated by our society (Ruckova & Vareckova, 2017). The place of a teacher is also related to his/her social status and role. This has an impact on the interest in becoming a teacher and on the people who do this job. Tomsik (2015) cites social status as the most discouraging factor in choosing to become a teacher – he claims that this factor discourages a high number of students from becoming teachers.

Achievement motivation is understood as a concept that helps to explain the differences in the individual behaviour and actions of people in various areas of life. Individuals with a high level of achievement motivation are energetic and focused, competitive, goal- and success-oriented, have managerial potential and are proactive (Ward, 1997). Schuler, Thornton, Frintrup and Prochaska (2011) describe an onion-like model of achievement motivation in their handbook, based on their analysis of the current knowledge about achievement motivation. This model consists of central features (e.g., expectation of success, self-discipline, endurance), peripheral features (e.g., independence and status-orientation), theoretically-related features (e.g., mode of attribution, beliefs of control, self-confidence), and background features (conscientiousness and neuroticism). Based on this model, performance motivation can be considered to be a complicated variable whose level is determined by a range of factors. One of these factors is sport activity.

Because the physical activities of PE teachers are more significant in comparison with other professions, we think that this is a factor that plays a role in the level of achievement motivation with PE teachers in comparison to other professions or with standards. The level of achievement motivation is positively affected by the frequency and level of sports activity (Smela, Pacesova, Kracek, Kukurova, & Halacova, 2018; Smela, Pacesova, Kracek, & Hajovsky, 2017). Gender is another factor that impacts achievement motivation (Schuler et al., 2011; Meece, Glienke, & Burg, 2006). This study aims to extend the knowledge about achievement motivation of PE teachers, to identify their strong and weak dimensions of achievement motivation, and to identify the differences in achievement motivation of PE teachers divided by gender and results compared with national standards.

Methods

The research sample was comprised of 52 physical education teachers (male: $n=22$; 41.59 ± 9.95 years old, female: $n=30$; 39.33 ± 10.67 years old) from Slovakia. A standardized LMI questionnaire (Schuler et al., 2011) was used as the research tool. The achievement motivation questionnaire contained 170 items, in which the respondents evaluated their level of consent to each statement on a Likert scale. The questionnaire consisted of seventeen dimensions: Persistence is characterized by stamina and the deployment of strengths that are necessary to manage tasks. Individuals with high scores can entirely focus their attention on the progress of work; characteristics such as persistence, tenacity, firmness, concentration and others are typical for this scale. Domi-

nance is the manifestation of power, influencing others and leading them; individuals accomplishing high levels in this scale are dominant, influential, initiative, and responsible. Engagement represents the willingness to give performance, the extent of effort and amount of work done; according to this scale, individuals are characterised by joy of working, eagerness, involvement, the need to always be doing something and are frequently marked as workaholics. Confidence in success is manifested by achieving set goals in the case of new or difficult tasks, self-confidence, optimism, certainty of victory. Flexibility is related to the manner of coping with new tasks and situations; individuals with high scores are open, willing to accept change, are approachable and can overcome obstacles. Flow deals with the issue of eliminating all disturbing impulses with high concentration; in the flow state, work is considered to be positive; this state is characterised by commitment, contemplativeness, and inertia. Fearlessness: according to this scale, individuals with high scores do not fear failure or negative evaluation. They are fearless, resolute, brave, steadfast, stable and resistant to frustration. They do not feel stress before important tasks; thus, the result of their activities does not have a negative impact. Internality: individuals with high scores explain the results of their behaviour based on internal causes. They are sure that their success depends on their own deployment of strength, they can see the cause in themselves, and they never blame fate. Compensatory efforts: this scale is described as constructively avoiding fear, zeal, fear of failure. Individuals in which this scale dominates have the tendency to invest great effort in avoiding failure. Pride in productivity: the source of motivation is the permanent need to experience positive feelings; it is an emotional state which is a consequence of one's own performance. Individuals with high scores have the need to compare themselves with others; they are addicted to success, on emotional reinforcement and are ambitious. Eagerness to learn: the basis is desire to learn, discover new knowledge, to expand knowledge. Individuals with high scores based on their own will dedicate time and effort to learn in their own field. Preference for difficult tasks: a demanding nature, looking for challenges, difficult tasks requiring a high degree of skill. Tasks are accompanied by an elevated possibility of failure and where obstacles make the work more encouraging are atypical. Independence is a tendency to autonomous behaviour, i.e., responsibility for one own's actions. Individuals with high scores love freedom, independence, self-indulgence. Self-control is the method of organizing and implementing tasks. The scale is described by concentration, discipline, prudence, precision, thoroughness. Individuals in this scale show discipline and concentration in work; they can deprive themselves in order to achieve long-term goals. Status orientation is characterised by the effort to achieve a significant role in a social environment. It is the effort to gain acknowledgment for accomplishments and to obtain a responsible position. Activities are carried out to achieve professional promotion and an important position. Competitiveness: individuals with high scores enjoy competing, comparing themselves with others, they want to be better, faster, they fight for first place. Success and victory empower them to accomplish better performance. Purposefulness/goal setting: the subject is one's relation to the future. There is a clear idea about how a task's solutions should look. Ambitiousness, purposefulness, thoroughness and diligence are crucial.

According to the standards defined in the test manual, the gross scores were converted to stanine values. These stanines comprise a scale containing nine values, the middle value of which is five. According to the manual, stanine values of seven, eight, and nine are considered above-average, while stanine values of one, two, and three are below-average.

The data were processed statistically. The Shapiro-Wilk test was used to assess the normality of the data. The Mann-Whitney test was used to test the significance of the differences between particular independent choices. The significance level was set at $\alpha \leq 0.05$, $\alpha \leq 0.01$. The rate of dependence (effect size) between the two groups of features was conveyed by means of the coefficient r ($r > 0.90$ - very large effect size; $r = 0.70$ – 0.90 - large effect size; $r = 0.50$ – 0.70 - medium large effect size; $r = 0.30$ – 0.50 - small effect size; $r < 0.29$ - very small effect size). This study was approved in advance by Ethics Committee of Faculty of Physical Education

and Sport, Comenius University. Each participant voluntarily provided written informed consent before participating.

Results

The results of achievement motivation in the different dimensions of the research sample broken down according to gender are presented in Table 1. The gross achievement motivation score among male PE teachers was 777.68 ± 75.64 of point and 735.03 ± 60.83 of point among female PE teachers. There is a significant difference between men and women in total score of achievement motivation ($U = 221.00$, $p = 0.043$, $r = 0.28$), in which effect size corresponds with low dependence. Men achieved a statistically significantly higher score of achievement motivation. We can find statistically significant differences even when looking at individual dimensions of achievement motivation among men and women.

Table 1. The mathematical-statistical characteristics of the research sample segmented according to gender and differences in particular dimensions of achievement motivation

Dimension of Achievement Motivation	male PE teachers	female PE teachers	Mann-Whitney U test		Effect size
	mean \pm SD	mean \pm SD	U	p	r
Persistence	46.27 \pm 8.36	41.13 \pm 5.35	208.50	0.024	0.31
Dominance	44.91 \pm 5.94	41.53 \pm 5.73	230.00	0.063	0.26
Engagement	42.36 \pm 6.29	40.43 \pm 8.21	298.00	0.553	0.08
Confidence in Success	49.86 \pm 6.66	45.63 \pm 8.04	230.00	0.063	0.25
Flexibility	45.41 \pm 8.30	42.77 \pm 6.51	265.50	0.231	0.16
Flow	46.23 \pm 8.26	44.27 \pm 7.25	278.00	0.345	0.13
Fearlessness	43.95 \pm 10.32	36.77 \pm 6.70	193.00	0.011	0.35
Internality	41.73 \pm 7.02	41.07 \pm 6.86	303.50	0.622	0.07
Compensatory efforts	45.32 \pm 6.36	45.93 \pm 7.79	309.00	0.697	0.05
Pride in productivity	50.91 \pm 6.96	50.33 \pm 6.54	328.50	0.978	0.01
Eagerness to learn	49.05 \pm 6.93	47.40 \pm 6.09	297.50	0.546	0.08
Preference for difficult tasks	45.00 \pm 7.03	41.43 \pm 6.96	252.50	0.150	0.20
Independence	43.77 \pm 6.08	42.40 \pm 6.33	278.00	0.335	0.13
Self-control	41.77 \pm 6.00	45.47 \pm 8.12	273.50	0.294	0.14
Status orientation	47.14 \pm 6.63	44.27 \pm 7.33	285.50	0.408	0.11
Competitiveness	45.68 \pm 5.63	39.07 \pm 7.68	165.50	0.002	0.42
Purpose fullness/Goal setting	48.32 \pm 7.47	45.13 \pm 5.44	257.50	0.177	0.19
Total score	777.68 \pm 75.64	735.03 \pm 60.83	221.00	0.043	0.28

Statistical significance ($\alpha \leq 0.05$) between male and female PE teachers was detected in the dimensions of purposefulness/goal setting ($U = 208.50$, $p = 0.024$, $r = 0.31$) and fearlessness ($U = 193.00$, $p = 0.011$, $r = 0.35$). In both cases, the effect size expressed by the coefficient r reaches the level of low dependence. Male PE teachers achieved a significantly higher score in purposefulness/goal setting and fearlessness dimensions. When assessing the differences in score between men and women in the competitiveness dimension, we observed statistical significance ($\alpha \leq 0.01$). Men achieved a significantly higher score in this dimension, and the size of effect expressed by coefficient r shows low dependence ($U = 165.50$, $p = 0.002$, $r = 0.42$).

By converting the results to percentiles, we can compare and evaluate PE teachers in view of national standards. However, we must take into consideration the fact that they overrate average and underrate differences at both ends of the research sample. The monitored sample of men in total score achievement motivation reached the 58th percentile, which means that 42% of male respondents reached a higher total score in achievement motivation in comparison to our group. The total score of our

monitored sample of female PE teachers corresponds to the 46th percentile, i.e., 54% of the female respondents reached a higher total score in achievement motivation in comparison to our group. We also compared the results of our research sample of men and women with the national standards based on stanine values. This method establishes more precisely the strengths and weaknesses of our research sample, and the percentage of respondents in view of our research sample reached the same, higher or lower score in achievement motivation and in individual dimensions. Total score achievement motivation by male PE teachers corresponded with indifferent stanine values number five. In six dimensions of achievement motivation, PE teachers achieved slightly above the average stanine values six, i.e., 40% of respondents in comparison to our group reached the same or higher results in selected dimensions of achievement motivation. It pertains to the following dimensions: persistence, engagement, fearlessness, eagerness to learn, preference for difficult tasks and purposefulness. PE teachers reached slightly under average values (stanine value 4) in the following dimensions: internality and pride in productivity. In terms of flexibility,

flow, competitiveness, confidence in success, compensatory efforts, dominance, independence, self-control, status orientation, male PE teachers reached average, indifferent stanine values (stanine value 5). The total score achievement motivation by female PE teachers also corresponds with indifferent stanine value number 5. Slightly above average values (stanine value 6) were achieved by female PE teachers in terms of eagerness to learn and self-control. Less distinctive (stanine value 4) dimensions of achievement motivation were flexibility, internality, pride in productivity, status orientation and competitiveness, which shows that 60% of the individuals in these dimensions reached higher scores in comparison with the female PE teachers. The female PE teachers achieved just average, indifferent values (stanine value 5) in dimensions such as persistence, dominance, engagement, confidence in success, fearlessness, compensatory efforts, preference for difficult tasks, independence and purposefulness (goal setting).

Discussion

With regard to the importance of achievement motivation, it is surprising that only a few studies have dealt with this subject. Studies conducted in the field of achievement motivation are mostly oriented on the field of occupational psychology; however, the results from this field of research can broaden the knowledge in the field of sports psychology and education (Smela et al., 2018, Smela et al., 2017).

Since a PE teacher is also a manager who plans, manages and evaluates the teaching process, a high level of managerial competence is required. A significant variable influencing the level of managerial competence is the level of achievement motivation (Georgie & Jones, 2002; Robbins & Decenzo, 2001). Ones, Viswesvaran, and Dilchert (2005) show that the level of achievement motivation is a significant predictor of reaching the required level of work performance. Studies (Green & DeBacker, 2004; Hyde & Kling, 2001) indicate the changing level of achievement motivation among men and women. While in the 1950s the level of achievement motivation was significantly lower with women, this significant difference is becoming smaller, due in part to the greater emancipation of women. Our results show the differences in achievement motivation between men and women resulting from stereotypical roles of genders, in which young men are encouraged to compete, and young women are encouraged to cooperate with the aim to avoid competitive situations (Sutter & Glatle-Rutzler, 2015). Men react more strongly to situations of comparison with others, while women tend to avoid competitive situations (Ruzic, Matesic & Stefanec, 2016; Dohmen & Falk, 2011; Croson & Gneezy, 2009). Our results are consistent with the results of the study by Ruzic et al. (2016), showing that men achieved higher results on facets dealing with competition, fearlessness and independence, while women achieved higher results regarding issues of self-control. In her research, Paskova (2007) found a significantly higher achievement motivation with men in comparison with women, specifically in the following dimensions: confidence in success, competitiveness, eagerness to learn, fearlessness, preference for difficult tasks, independence, engagement, dominance, goal setting, and self-control. Zitniakova-Gurgova (2007), who studied achievement motivation in a sample of 213 university students, also found significantly higher achievement motivation among men in comparison with women. The higher level of achievement motivation among men in

comparison to women was also manifested in the research by Adsul and Kamble (2008).

Based on the analysis of the aforementioned studies and according to Green and DeBacker (2004), men set fewer goals than women do, but their goals are higher. However, other research studies found no significant differences in achievement motivation according to gender (Pandey & Faiz Ahmad, 2007; Pratibha Sood, 2006; Kaushik & Rani, 2005).

When comparing our results of total score of achievement motivation to the results of the study (Martincova, Andrysova, & Trubelikova, 2016), where the research sample was comprised of bachelor's and master's level students of social pedagogy, based on stanine values, we can see achievement motivation scores that are two levels higher among PE teachers. If we compare our results with the results of the study (Sigmund, Kvintova, Hanus, Bartkova, & Hobza, 2014), whose research sample was comprised of employees of middle and top management of companies in the pharmaceutical sector, we can see that the achievement motivation score is markedly lower among PE teachers. While the total score of achievement motivation among business managers in this research reached values above 900 points, the PE teachers are not even close to 800 points. We believe that this situation is influenced by financial remuneration, the social status and position of teachers, and not only PE teachers, in society.

Achievement motivation is a current and much-needed area of research. The results and conclusions of studies concerned with this issue will find their place not only in vocational, social and sports psychology but also in the process of learning and success achievement. Achievement motivation is an essential and necessary characteristic for each individual and influences their level of success. It is socially appreciated and establishes the grounds for experiencing success-associated, pleasant and joyful feelings in terms of the achievement of a goal. According to Ward (1997) people with high achievement motivation are potentially energetic employees with intense concentration on work, are competitive, centre their thoughts on improving achievement, are focused on achievement goals, have significant managerial potential and are proactive.

The outcomes of this study characterize PE teachers as an elementary component in the teaching process in terms of achievement motivation and its dimensions and point out the status of PE teachers in society. The presented findings provide a specific motivation profile of the monitored group and may also be applicable in selecting PE teachers. This study is designated for PE teachers, as well as for the general public in striving to improve the quality of the teaching process in sports.

In compliance with the studies pointing out changes in levels of achievement motivation according to gender (Ruzic et al., 2016), age (Sutter & Glatle-Rutzler, 2015), education (Riepe, 2004), occupation (Schuler et al., 2011) and sports activity (Smela et al., 2018, Smela et al., 2017) it is necessary to continue in researching differences in the facets such as achievement motivation, including the relationship between achievement motivation and specific occupations.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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ORIGINAL SCIENTIFIC PAPER

The Impact of Leadership Styles on Employees' Psychological Empowerment, in Greek Sport Departments

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Abstract

Effective leadership is a matter of constant concern as a sequence of factors hampers employees' capabilities and their progress, team spirit, the establishment of collaboration, a common vision for the future, policymaking and finally, the configuration of a healthy workplace environment. The present research aimed to examine the effects/correlations of transformational, transactional, and laissez-faire leadership styles on employees psychological empowerment in the context of local Greek municipalities. The sample of the research constituted 29 managers and 247 employees of local Greek municipalities, of Eastern Macedonia and Thrace, of Western Macedonia and of Central Macedonia. To investigate the specific concern, the managers completed the multi-factor leadership questionnaire of Bass and Avolio (1997), and the employees completed the psychological empowerment instrument of Spreitzer (1995). For the statistical data analysis, SPSS 20 was used. More specifically, regression analysis was used for the variables that satisfied the affair of regularity, while for those variables that were not satisfactory, non-parametric Spearman's rank correlation coefficient was used. The non-parametric Spearman's rank correlation coefficient shows that self-determination, as a dimension of psychological empowerment, had a strong positive correlation with idealized influence attributes (IIA) ($r=0.492$; $p=0.007$), and strong negative correlation with idealized influence behaviour (IIB) ($r=-0.421$; $p=0.023$) of the transformational leadership style. In contrast, neither the transactional style nor the laissez-faire style had strong effects with any dimension of psychological empowerment. Implications and directions for future research are discussed.

Key words: *sport managers, fitness instructors leadership, empowerment*

Introduction

According to Bass and Avolio (1994), transformational leadership was defined as a procedure during which the leaders ought to evolve and develop to the ultimate extent the capabilities and potentials of their followers, including better value systems, morals, and motives. As soon as all the aforementioned prerequisites meet their standards, the followers are motivated and change their aims and morals, as incitements are a powerful motive for leaving their personal interests behind and acting solely in the interest of the

organization (Bass, 1994, 1999). Transformational leadership consists of four dimensions, which are sufficient for the leaders to inspire their followers to overcome any personal interests and, against all odds, be more effective: a) idealized influence, b) inspirational motivation, c) intellectual motivation, and d) individualized consideration.

Idealized influence (charisma) refers to those talented and gifted leaders who act as role models to their followers and as a result, they gain their respect, trust, and admiration. There are two sub-dimensions: a) attributes and b)



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behaviour. Inspirational motivation refers to those leaders who inspire and compel their followers to succeed in pursuing high-flying goals which have been difficult to materialize. Intellectual motivation refers to the awakening and directions of the followers, the awareness and the management of difficult situations they may face, with creative and free-wheeling thought, using their imagination and innovative methods. Individualized consideration refers to the leaders who provide socio-emotional support, tailored to their followers' needs as they simultaneously strengthen and evolve them.

Transactional leadership is based on the relationship between exchangeable duties and rewards between the staff members and managers in order for the former to achieve their organizational goals. Transactional leadership has three dimensions: a) the contingent reward, b) the active management by exception, and c) the passive management by exception. The first is a constructive transaction and reasonably effective since the procedure of prompting the members can result in making them succeed higher levels of growth and output (Antonakis, Avolio, & Sivasubramaniam, 2003; Bass, Avolio, Jung, & Berson, 2003). The second refers to the levels of control in which the leader actively controls both the inadvertences and behaviours of his members and then proceeds to the necessary reformative measures. In the third, passive management by exception, the leader amends or the members' actions and attitudes whenever a problem occurs (Judge & Piccolo, 2004). The laissez-faire style of leadership represents the absence of any form of leadership in which the leader avoids the decision-making process, hesitates to act, is not present whenever is needed, does not take any responsibility or make use of his authority. He is considered as being active since he does not shirk his work duties.

For Spreitzer (1995a), and Thomas and Velthouse (1990), psychological empowerment is a complicated and cognitive psychological dimension, which is mostly connected with the self-confidence and emotions of the subordinated rather than the specific managerial practices that related to the structures and policies which the workforce is enforced through them. It is also specified by four cognitive dimensions: a) meaning, b) competence, c) self-determination, and d) impact. Meaning refers to the matching of the work-role demands with the perceptions, views, values, attitudes, and standards of the employer (Spreitzer, 1995). Competence is related to the employer's self-confidence that he is sufficiently productive (Thomas & Velthouse, 1990). Self-determination refers to the variety of options regarding the tasks that an employer feels he/she has throughout his duties (Spector, 1986). Impact is defined as the belief of the employer that he/she holds sway over the functions and procedures of an organization as well as the tactical, administrative and operational results of it (Spreitzer, 1995b).

The role of leadership on the psychological empowerment

The dimensions of transformational leadership act through empowerment affecting the organizational results of a business association (Bass, 1999; Menon, 2001; Seibert, Wang, & Courthright, 2011). The leader's charisma affects his followers and improves their organizational commitment. At the same time, transformational leaders use the dimension of intellectual stimulation to evoke the imagination and creativity of their workforce. Intellectual stimulation can enforce the di-

mension of self-determination (Bass, 1999; Rafferty & Griffin, 2004). The idealized influence offers meaning in every work role, while through individualized consideration, the followers' choices are under guidance.

Moreover, their needs for accomplishments and growth are enforced as they undertake even more responsibilities and, in that way, helps them develop their capabilities to the maximum and prepares them for the cognitive conditions of empowerment (Avolio et al., 2004; Bass & Avolio, 2000). Yet, as T. Dai, Y. Dai, Wen and Chu (2013) state, those managers who apply the transactional type of leadership put forward the methods of reward in an aim of increasing their organizational efficiency and recompensing their subordinates with rewards whenever there is an improvement in the degree of effectiveness; when the results are not sufficient, penalties are applied. Many researchers agree that transactional style of leadership has a positive impact on each professional context and in that way, transactional style is improving. Nevertheless, there are also results showing quite the opposite.

The main objective of the current research was the examination of the effect/correlation of the transformational, transactional, and laissez-faire management style of the sports departments of Greek municipalities in the psychological empowerment of their employees (education instructors).

Methods

In the present study, 29 managers and their 247 employees took part; they were permanent and contract fitness instructors of sport departments of Greek municipalities of East Macedonia and Thrace, West Macedonia and Central Macedonia.

The main questionnaires that were used for the whole study were:

- a) the Multifactor Leadership Questionnaire (M.L.Q) of Bass and Avolio (1997), given to the sports managers, consisting of 45 questions, 5 scaled Likert, closed-questions of high validity and credibility for all the aforementioned dimensions (.91 to .94)
- b) the Psychological Empowerment Instrument scale (Spreitzer, 1995, 1995a) given to the employees, consisting of 12 questions, seven scaled Likert, closed-questions that the validity of the dimensions range approximately to .80

The collection of data for the specific project included two phases: a) the pilot research and b) the main research. The questionnaires that were used for the study were translated from English to Greek and back again. The pilot research is based on the answers that were given by 25 individuals with the purpose of testing the reliability and validity of the questionnaires. Afterwards, some slight necessary improvements took place.

The distribution of the questionnaire was a part of the main research, which was completed through e-mails, towards the persons in charge of the sports organizations. Those individuals with whom regular telephone contact was maintained, participated in the mass athletic programme in the districts of East Macedonia and Thrace, West Macedonia, and Central Macedonia.

The first part of the questionnaire referred to the demographic features of the respondents such as sex, age, location, family status, education, monthly income, experience, and years of employment at the organization. Completing the questionnaire for every dimension was the second part of the procedure.

Results

The analysis of data was carried out with the help of SPSS 20. Firstly, the factors of the questionnaires were calculated as the average of the responses to the corresponding questions in each factor. Then, the factors were checked regarding the test for Normality (Razali, Wah, & Sciences, 2011; Shapiro & Wilk, 1965). For the analysis of the results, $p=0.05$ was defined as the level of statistical significance.

For the investigation of the statistical hypothesis regarding the effect/correlation of the three leadership styles upon the dimensions of psychological empowerment, linear regression was applied for the dimensions that fulfilled the Test of Normality. The Spearman correlation was applied for the non-parametrical analysis of the dimensions that could

not fulfil the Test of Normality. More specifically, the results proved that, according to the effect/correlation of transformational leadership style upon the dimensions of psychological empowerment, only the self-determination of psychological empowerment had a major positive correlation with the idealized influence attributes (IIA) of the transformational style ($r=0.492$; $p=0.007$) and considerable negative correlation with the idealized influence behaviour (IIB) of the same style ($r=-0.421$; $p=0.023$; Table 1). More specifically, the more idealized influence attributes are increasing, the better self-determination is strengthened. In contrast, the more the idealized influence behaviour is being enhanced, the more considerable is the decrease noted towards self-determination (Figure 1, Figure 2).

Table 1. Results of the Correlation/Effect of Transformational Leadership towards the Subordinates' Psychological Empowerment

	IIA	IIB	IM	IS	IC	Total transfor.style
Meaning	$r=0.131$; $p=0.497$	$r=0.054$; $p=0.782$	$r=0.240$; $p=0.209$	$r=0.035$; $p=0.857$	$F(1,27)=0.079$; $p=0.781$; $R^2=0.3\%$	$F(1,27)=0.032$; $p=0.858$; $R^2=0.1\%$
Competence	$r=0.006$; $p=0.976$	$r=0.029$; $p=0.881$	$r=0.016$; $p=0.934$	$r=-0.119$; $p=0.537$	$r=0.229$; $p=0.233$	$r=0.067$; $p=0.728$
Determination	$r=0.492$; $p=0.007^*$	$r=-0.421$; $p=0.023^*$	$r=-0.085$; $p=0.660$	$r=-0.147$; $p=0.447$	$F(1,27)=2.376$; $p=0.135$; $R^2=8.1\%$	$F(1,27)=5.702$; $p=0.024^*$; $R^2=17.4\%$
Impact	$r=0.191$; $p=0.320$	$r=-0.055$; $p=0.776$	$r=0.065$; $p=0.738$	$r=0.093$; $p=0.632$	$F(1,27)=0.266$; $p=0.610$; $R^2=1.0\%$	$F(1,27)=0.149$; $p=0.702$; $R^2=0.5\%$
Psych. emp.	$r=0.302$; $p=0.112$	$r=-0.171$; $p=0.375$	$r=0.011$; $p=0.955$	$r=0.091$; $p=0.640$	$F(1,27)=0.043$; $p=0.837$; $R^2=0.2\%$	$F(1,27)=0.910$; $p=0.349$; $R^2=3.3\%$

In the figures below, the relation between the idealized influence of transformational leadership with subordinates'

self-determination are displayed (Figure 1, Figure 2).

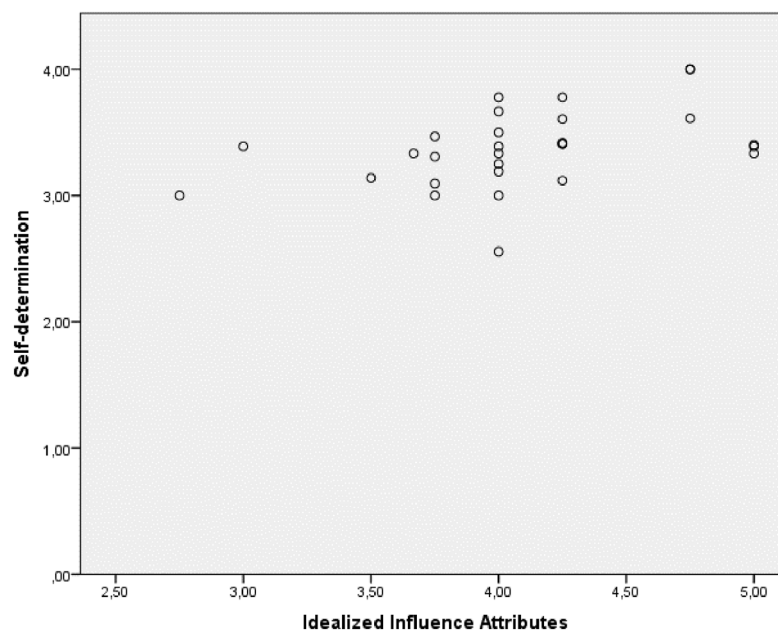


Figure 1. The factor idealized influence on attributes of the transformational leadership had a positive relation with subordinates' self-determination ($r=0.492$, $p=0.007$)

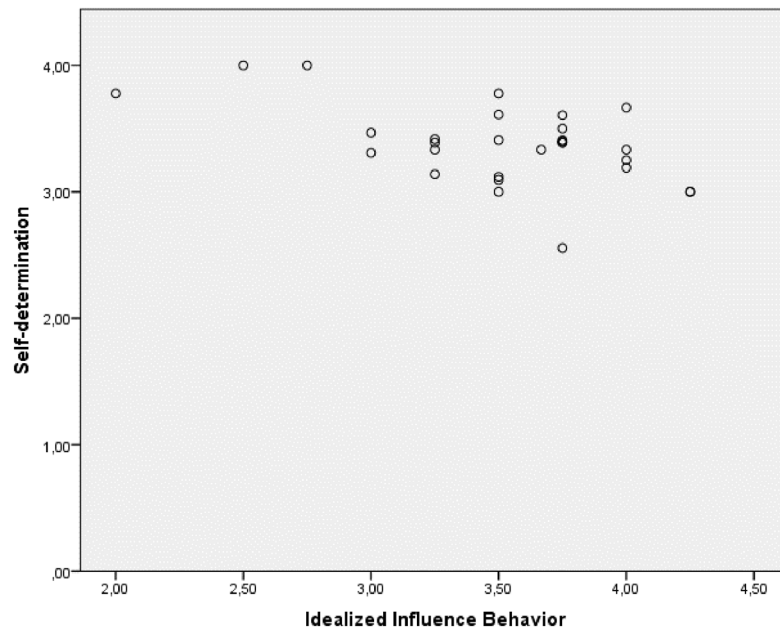


Figure 2. The factor-idealized influence on the behaviour of the same style had a quite negative relation with subordinates self-determination ($r=-0.421$, $p=0.023$)

Furthermore, on the whole, transformational leadership can significantly provide self-determination ($F(27,1)=5.702$; $p=0.024$; $R^2=0.174$), and transformational style justifies 17.4% of the subordinates' self-determination (Figure 3).

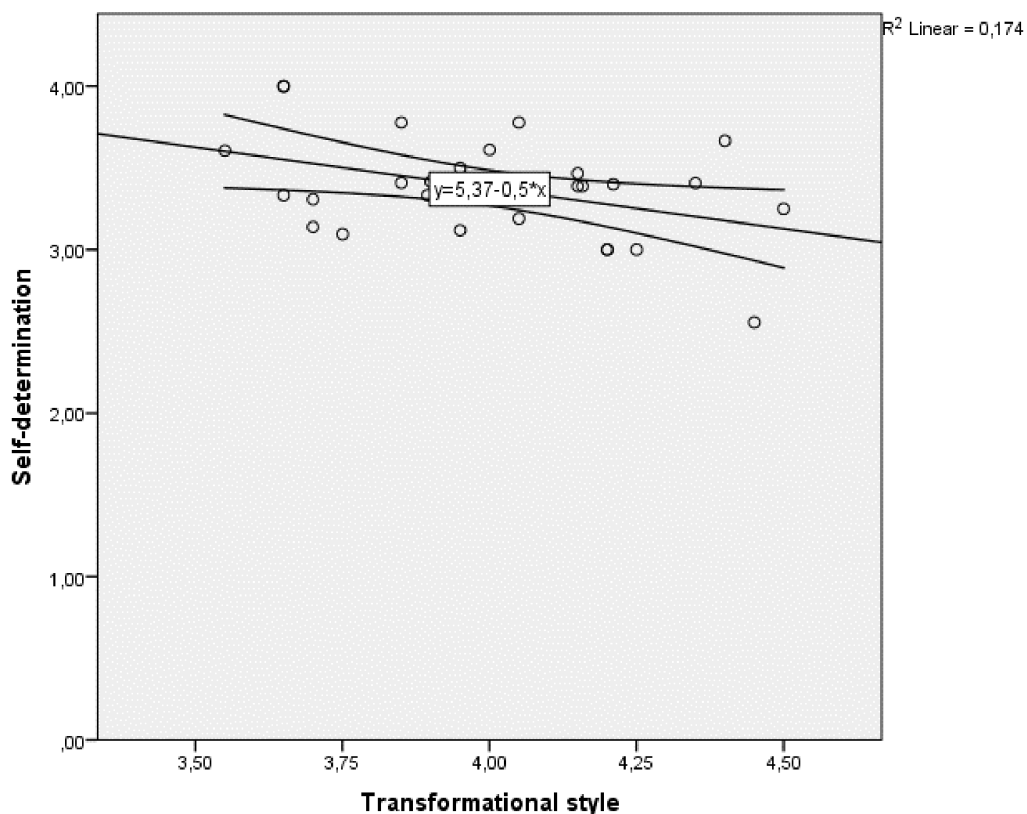


Figure 3. The transformational style seems to provide for self-determination

For the investigation of the second statistical hypothesis regarding the effect/correlation of the transactional style of leadership upon the dimensions of the psychological empowerment, the results showed that the dimensions of the

transactional style of leadership and the overall transactional style does not influence or relate to any of the four dimensions of subordinates' psychological empowerment ($p>0.05$) (Table 2).

Table 2. Results of the Correlation/Effect of the Transactional Style of Leadership towards the Subordinates' Psychological Empowerment

	Contingent Reward	Management by exception-	Management by exception- passive	Transactional Style
Meaning	$r=0.164$; $p=0.395$	$F(1,27)=0.439$; $p=0.513$;	$r=-0.056$; $p=0.774$ $R^2=1.6\%$	$F(1,27)=0.002$ $p=0.962$; $R^2=0.0\%$
Competence	$r=0.114$; $p=0.556$	$r=0.182$; $p=0.344$	$r=0.128$; $p=0.509$	$r=0.240$; $p=0.210$
Self determination	$r=-0.116$; $p=0.549$	$F(1,27)=1.403$ $p=0.246$;	$r=-0.163$; $p=0.398$ $R^2=4.9\%$	$F(1,27)=2.784$; $p=0.107$; $R^2=9.3\%$
Impact	$r=-0.070$; $p=0.720$	$F(1,27)=0.002$; $p=0.965$; $R^2=0.0\%$	$r=-0.128$; $p=0.509$	$F(1,27)=0.028$; $p=0.868$; $R^2=0.1\%$
Psychological empowerment	$r=-0.123$; $p=0.526$	$F(1,27)=0.256$; $p=0.617$; $R^2=0.9\%$	$r=-0.093$; $p=0.630$	$F(1,27)=0.341$; $p=0.564$; $R^2=1.2\%$

For the investigation of the third statistical hypothesis regarding the effect/correlation of the laissez-fair style of leadership on the dimensions of psychological empowerment, the results

proved that the laissez-fair style does not affect or relate to any of the four dimensions of subordinates' psychological empowerment ($p>0.05$) (Table 3).

Table 3. Results of the Correlation/Effect of the Laissez-Fair Style with the Subordinates' Psychological Empowerment

	Laissez-Faire leadership style
Meaning	$F(1,27)=0.032$; $p=0.859$; $R^2=0.1\%$
Competence	$r=-0.008$; $p=0.969$
Self determination	$F(1,27)=0.210$; $p=0.651$; $R^2=0.8\%$
Impact	$F(1,27)=0.030$; $p=0.864$; $R^2=0.1\%$
Total psychological empowerment	$F(1,27)=0.087$; $p=0.770$; $R^2=0.3\%$

Discussion

The purpose of the current study was the investigation of the effect/correlation of the leadership styles that are applied by the managers of the sport departments of the Greek municipalities to their employees, permanent or contract fitness instructors, for their psychological empowerment.

Therefore, it must be mentioned that the results of the survey came after collecting the necessary data taken from a specific number of sport organizations and not throughout the country as a whole. There was a major positive correlation of the idealized influence attitudes of the transformational leadership, with the self-determination of the psychological empowerment. However, a negative correlation of the idealized influence behaviour of the transformational leadership with the same dimension of self-determination emerged. Moreover, there was no effect/correlation in either transactional or laissez-faire leadership with the dimensions of psychological empowerment.

More specifically, transformational leaders, through their enthusiasm, high moral role models, rectitude and optimism, create a team spirit providing meaning and challenge to the work of their employees, enforcing their subordinates' level of self-effectiveness, trust, intention and self-determination. The main goal is the empowerment of their employees in order

to achieve their objectives (Avolio, 1999; Avolio, Zhu, Koh, & Bhatia, 2004; Bass & Avolio, 1994; Luthans & Avolio, 2003; Walumbwa, Avolio, Luthans, May, & Gardner, 2004).

Nevertheless, the negative correlation between idealized influence on behaviour, of the transformational leadership, with self-determination can be justified from the fact that transformational leaders, via narcissistic tendencies, are overly optimistic with regard to their capabilities of influencing or controlling others (Villiers, 2014). This can have adverse effects on the creativity of followers, especially when influence or control is high. Moreover, when transformational leaders give more emphasis to the future than the present, it weakens followers sense of safety and hinders their creativity. This can explain the significant negative cross-correlation of idealized influence behaviour with self-determination in the present research, when the followers do not have choices to implement their tasks.

Congruent with the present findings, various studies in teachers proved that when headmasters use a transformational leadership style, it contributes considerably to the psychological empowerment of their teachers (Kurnaz & Arslan, 2011). Moreover, participative decision making by employees and the mechanisms of the coordination of completion that managers apply increase the levels of psychological empowerment of their followers (Al-Zahrani et al., 2012).

Relevant results are also presented in the sport frame (Lee, Kim, & Joon-Ho, 2013); transformational leadership style has a statistically significant effect on the psychological empowerment of professional handball players in five different teams in Korea.

In conclusion, this study provides researchers investigating transformational leadership, transactional leadership, laissez-faire leadership, and psychological empowerment with a preliminary map of how these constructs are related, and highlights the critical challenges and responsibilities that are associated with multifactor leadership research and practice. As indicated by several researchers (e.g., Bass & Riggio, 2006; Sosik & Jung, 2010), psychological empowerment is a crucial process that defines transformational leadership and illustrates why it is effective in building follower's organizational identification and performance.

Given the evidence presented here, future research should address the relationships of transformational to transactional and laissez-faire leadership styles as well as study these in greater depth as well as their correlation with psychological empowerment.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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ORIGINAL SCIENTIFIC PAPER

Motivation of Forming Students' Healthcare Culture on Principles of Interdisciplinary Integration

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Abstract

This article demonstrates the effectiveness of the motivation of students to the formation of health preservation culture on the basis of interdisciplinary integration. As the object of the research, we have developed methods for motivating students to form a culture of healthcare on the basis of interdisciplinary integration. The study involved 208 students from two higher educational institutions of Ukraine (Ivan Franko Lviv National University, Yuriy Fedkovych Chernivtsi National University). Students were divided into control (n=86) and experimental groups (n=122). As the verification result, we have identified and compared the effectiveness of the motivation of students in the control and experimental groups to form healthcare culture on the basis of interdisciplinary integration. The digital indicators of the obtained results confirm the suitability of using the author technique in the process of studying the following disciplines: "Safety of life", "Philosophy", "History of Ukrainian culture", and "Physical education".

Key words: *interdisciplinary integration, healthcare, students, training, motivation*

Introduction

One of the strategic tasks of modernizing contemporary education is to direct it to the healthcare of the younger generation. This is stated in the National Programme "Health - 2020: Ukrainian Dimension" (Ishchenko, 2013). Contemporary researchers integrate the basic concepts of pedagogy and health in the curricula of environmental, valeological and inclusive education (Romanchuk, 2016). The issue of maintaining health for students acquires particular importance. It is associated with many health-destructive factors affecting their body. The stressful schedule of the high school educational process is accompanied by such negative influences as hypo-dynamics, stress, tension of the organs of vision, and lack of preparedness for health preservation. The problems of human health, physical culture, and healthy lifestyle are featured in the fundamental works of Ukrainian researchers. The culture of student healthcare is one of the components of the physical culture of future professionals. To form the culture of healthcare, it is essential to conduct compulsory physical education classes during stu-

dents' high school studies (Melnychuk, 2012; Palichuk, 2014).

Foreign scientists in healthcare programmes highlight the prospects for maintaining health in the economic field, determine the relationship between healthcare conservation and promotion of healthy lifestyles at workplaces, the impact of health-saving measures on the behavior of adolescents regarding their health (Pronk, 2013), determine the challenges and opportunities for healthcare in the context of the economic crisis in Europe (Korchagin, Kurbakova, & Olkhovyi, 2017); argue for the introduction of new methods for the study of health conservation and the promotion of a healthy lifestyle in small and medium-sized labor collectives (Putrov, 2014; McDaid et al., 2013).

The analysis of scientific works in the field of health care, pedagogy, medicine, sports and physical culture shows that scientists pay close attention to the study of the problems of the professional training of future specialists for health and conservation activities. Thus, the subject of modern research is the educational aspect of the issue of the development of a healthy



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lifestyle (Ashytok, 2013). Scientists have conducted a series of studies to form a culture of students' health. They used interdisciplinary integration, mobile and traditional games (Kyverialg, 1980), and other innovative approaches. Particular attention is paid to the formation of a value attitude toward a healthy lifestyle among students. Scientists focus research on improving the training of future specialists in various specialities for health-saving activities: economists, nurses, and doctors (Boiko, 2014). Researchers emphasize the need to improve the training of specialists in physical education for health-saving activities by developing models for future teachers of physical culture in order to use mobile and national games in professional activities and to organize a health-preserving educational environment through the use of innovative technologies for the organization of physical training (Makarenko, 1984; Jessor, Turbin, & Costa, 2017).

However, the problem of motivating students to form a culture of health preservation on the basis of interdisciplinary integration has not yet been sufficiently reflected in the psychological and pedagogical literature (Olkhovyi, 2015).

The purpose of this study is to test the effectiveness of students' motivation to form a culture of healthcare on the basis of interdisciplinary integration by using the author methodology for training future specialists in the following disciplines: "Safety of Life", "Philosophy", "History of Ukrainian Culture", and "Physical Education".

Methods

Participants: Students of two higher educational institutions and teachers who conduct classes on disciplines: "Safety of life", "Philosophy", "History of Ukrainian culture", and "Physical education".

Organization of the study: The study was conducted in two stages. The constitutive stage of the experimental study was that the control (CG - 86 students) and the experimental (EG - 122 students) groups were determined and diagnosed (by questionnaire) regarding students' motivation. The results are determined as the formation of the motivational-ideological component of health preservation culture. In the questionnaire, students are asked to choose the answer to a question that reflects their attitude to the problem of healthcare:

1. I am aware of the importance of the problem of healthcare as one of the most important in my life: a) yes; b) yes, but I do not have enough willpower to take care of my health every day; c) only when there is a health problem; d) no, these problems will concern me when I am old.

2. I believe that I have formed a value attitude to health: a) yes; b) yes, but health, as a value, is not my ideological benchmark; c) not exactly; d) no, but I have a sufficient "safety margin" of health.

3. I am interested in information related to healthcare issues (on healthy lifestyles, ecological situation in a city, country, the world; negative technogenic influences on health and contaminated water, air, chemicals, features of healthy nutrition, safety of life; active rest, physical perfection of my body, etc.): a) systematically; b) I am interested in that information in the field of healthcare that interests me; c) episodically; d) everything is known for a long time.

4. Do you realize your own responsibility for choosing your lifestyle and organizing your leisure time?: a) yes; b) yes, so I try to stick to the diet, exercise, but I do not always manage to do so; c) sometimes it depends on the situation; d) nothing

depends on me, because I often tend to agree with what others think.

5. Do you think that knowing the real ways of saving your health has a certain effect on your lifestyle choices?: a) yes, it allows me to improve my healthcare programme; b) sometimes, it can be interesting and makes some changes in my life; c) I do not think that it will somehow affect my lifestyle; g) no, I'm used to stability.

6. Your attitude to the analysis of various programmes of physical perfection: a) systematically get acquainted with new programmes, as this allows me to improve my healthcare programme; b) periodically take interest in this information, if there is an urgent need (to get rid of excess weight, etc.); c) sometimes it can be interesting; d) I do not care about it.

7. Do you plan, systematically analyse, and self-assess your own healthcare activity?: a) yes; b) episodically; c) sometimes it is interesting; d) I do not care about it.

Calculation of the results of the survey, which indicates a certain level of formation of the motivational-ideological component of the culture of health preservation of future specialists:

- a) 4 points (high level);
- b) 3 points (sufficient level);
- c) 2 points (satisfactory level);
- d) 1 point (low level).

The motivational-ideological component characterizes the hierarchy of personality values in a healthy way of life, the attitude of students to this phenomenon, its influence on life plans and professional orientation; satisfaction with activities aimed at preserving and strengthening health; awareness of students about the needs and aspirations for development in healthcare, motives for healthy lifestyle, etc. As the criterion for this component, we determine the motivation of students to maintain their own health and the expression of a health-saving outlook as the central value orientations of the future specialist and a guarantee of his professional development. The formation of the motivational-ideological component is determined by the following indicators:

a) stability of value orientation on healthy life, preservation of health, success in future professional activity as priority factors of personal growth;

b) the formation of the need to enhance knowledge of healthcare;

c) student interest and aspiration for activities in the field of healthcare.

Based on the defined criteria and indicators of the formation of the motivational-ideological component of the health culture of specialists-to-be, the following levels were identified: the conscious activity-oriented (high), executive-productive (sufficient), copying-reproductive (satisfactory), initial-shaping (low). The levels will now be examined in more detail.

Conscious activity-oriented (high) level of formation of healthcare culture is characterized by highly resistant attitudes to healthy life, health maintaining, success in future career as priority factors of personal growth; the formation of need to enhance knowledge in the field of one's own health preservation; the stability of students' interest, and the desire for healthcare activity. Practical healthy motivation of students with a high level of healthcare culture transforms into motivation for success to which future professionals attempt to move deliberately, outlining their health creating goals. Students recognize health as the highest value and strategic life goal.

The executive-productive (sufficient) level of the formation of healthcare culture is inherent in students who exhibit a certain indirect interest in the philosophical and historical aspects of healthcare, understanding the importance of leading a healthy lifestyle and maintaining their own health as a safe way of life, but do not think that success in future professional activity correlates with the state of health. Future specialists feel the need to maintain their own health, but it is not always supported by action, in particular, during physical education classes.

Copying-reproductive (satisfactory) level of formation of health preservation culture is characterized by the fact that students exhibit a weak level of cognitive interest (manifested episodically or absent at all) to deepen knowledge about the preservation of health; health care motives are not sustainable,

Table 1. The results of the constitutive stage of the research

Diagnostic direction	Group	High		Sufficient		Satisfactory		Low		AI
		QoS	%	QoS	%	QoS	%	QoS	%	
Motivation	CG	24	27.91	30	34.88	27	31.40	5	5.81	3.85
	EN	33	27.05	44	36.07	37	30.33	8	6.56	3.84

Legend: QoS - number of students, AI – average indicator

At the second stage, a shaping experiment was conducted. Students of the CG studied the disciplines “Philosophy”, “History of Ukrainian culture”, “Safety of life”, and “Physical education” via traditional methods according to common syllabi. Students training of the EG was carried out according to the author's experimental method.

Thus, students had opportunity to expand knowledge and understanding of the philosophy of health and the idea of healthcare, healthy lifestyle in different periods of human development, while forming an understanding of the history of the formation of a health conservation culture in Ukraine. Future specialists were able to draw a parallel between world philosophical ideas and the ways these thoughts influenced the development of ideas about health preserving in the historical territory of our country. This contributed to the awareness of philosophical views and the development of their own philosophy of health preservation. Extension of health-preserving knowledge took place in classes on the history of Ukrainian culture, philosophy, life safety and physical education, the content of which was enriched with practical aspects of health care. Pedagogical ways of motivation to form a health preservation culture of students in these disciplines formed an integral system of solving the problem based on the integration of the courses content, developmental and educational learning, which focused students on active self-development, self-improvement.

During “Physical Education” lessons. EG students received information on the importance of physical exercise for human health. The attention of students was focused on the fact that their professional activities will often be associated with a sedentary lifestyle that leads to the rapid deterioration of health. At the same time, the gradual destruction of the body and the exhaustion of physical and intellectual strength increases

because students do not distinguish health as the highest value. Healthcare activity does not cause interest; therefore, there is no desire to master the methods of healthcare. Future specialists are unaware of the meaning and importance of a healthy lifestyle, thinking that maintaining their health is the work of doctors.

Initial-shaping (low) level is characterized by a lack of students' interest in the problems of healthcare; motivation is at the level of spontaneous interest in health issues. Future specialists are not aware of the meaning and importance of a healthy lifestyle, are not aware of health preservation problems and the avoidance of professional risks, believing that they will always be healthy.

The results of the constitutive stage are reflected in Table 1.

with each passing day. On the basis of combining this information gained from “Physical Education” with materials from “Philosophy”, “History of Ukrainian Culture”, and “Life Safety”, students generalized that the problem of healthcare is a problem-in-common for everyone, and its solution should be based not only on the knowledge in the field of healthcare or the ability to perform appropriate physical exercises but on the awareness about the value of their own health as a core value orientation in the system of human life values.

The use of interdisciplinary integration as the basis for the formation of the healthcare culture of students on the basis of the study of the disciplines “Philosophy”, “History of Ukrainian Culture”, “Safety of Life”, and “Physical Education” enabled the formation of students' need to deepen their knowledge of healthcare; the raising of students' awareness of health preservation issues at various historical stages of societal development, motivating them to avoid professional risks and increase their level of knowledge of disease prevention, health-saving technologies, and health improvement measures; the formation of students' ability to critically evaluate their physical health and imperfections in their life activity; abilities associated with the support of physical activity, the ability to organize their own health protection activities (rational nutrition, compliance with the regime of the day, etc.).

Results

The effectiveness of the formation of the motivational-ideological component of the health preservation culture of future professionals is reflected in Table 2 (where IC is the initial control, reflecting the results of the stated experiment, and FC is the final control, which was carried out after studying the specified disciplines).

Table 2. Results of the formation stage of the research

Components	Groups and control stage	Levels								CI
		High		Sufficient		Satisfactory		Low		
		QoS	%	QoS	%	QoS	%	QoS	%	
Motivational- ideological	CG-IC	24	27.91	30	34.88	27	31.40	5	5.81	3.85
	CG-FC	26	30.23	32	37.21	26	30.23	2	2.33	3.95
	EG-IC	33	27.05	44	36.07	37	30.33	8	6.56	3.84
	EG-FC	71	58.20	12	9.83	39	31.97	0	0	4.26

The reliability of the results of the experimental study was verified by the methods of mathematical statistics that are used in professional pedagogy: comparison of dispersions for initial

and final control in CG and EG and determination of Fisher's criterion (Table 3).

Table 3. Calculations to determine the F-criterion

Group and QoS	Control stage and average indicator	Indicators for F-criterion determination										F_{crit}
		f				$(x_i - \bar{x})$				$\sum f(x_i - \bar{x})^2$	σ^2	
		High	Suf	Sat	Low	High	Suf	Sat	Low			
CG-86	IC - 3.85	24	30	27	5	1.15	0.15	-0.85	-1.85	69.04	0.80	1.14
	FC - 3.95	26	32	26	2	1.05	0.05	-0.95	-1.95	59.81	0.70	
EG-122	IC - 3.84	33	44	37	8	1.16	0.16	-0.84	-1.84	98.72	0.81	1.03
	FC - 4.26	71	12	39	0	0.74	-0.26	-1.26	-2.26	101.61	0.83	

The F-value table was taken as the basis to compare the numerical values of the empirical F-criterion (which was calculated using the digital data obtained during the experiment) and the theoretical F-criterion, shown in the standard Table 3. The Fcrit index was determined by the number of degrees of freedom. In the control groups, the number of degrees of freedom was $86-1=85$, and in the experimental ones it has a value of $122-1=121$. According to the standard F-criterion table (Fcrit) for the results of our study, when the number of degrees of freedom is within 60-120 and from 24 to infinity (which corresponds the digital indicators in CG), has a value from 1.7 to 1.3. In the EG, the number of degrees of freedom varies from 120 to infinity and from 24 to infinity and has a value from 1.6 to 1.0. In the course of the study, the Femp-CG index with a value of 1.14, which goes beyond the limits of probability, was obtained. It is concluded that a slight increase in the level of motivation of students of CG for the formation of healthcare culture is associated with the conditions of the traditional learning process. The F-criterion for the experimental groups (Femp-EG) had an index of 1.03, which is within the validity of the results. This means that the results of the study are plausible and confirm the validity of the experiment.

Discussion

The analysis of modern scientific research shows that the majority of foreign scientists pay more attention to the issues of promoting a healthy lifestyle in the workplace, in small and medium-sized labour collectives. In our opinion, the formation of the motivation of students to form a culture of healthcare should begin in the first year of study in high school. In this context, we agree with the opinion of the scientists that the educational aspect of the problem of forming healthy lifestyles is relevant at the present stage of education development. We support the view of the researchers that the promotion of healthy living can be done through interdisciplinary integration and the use of innovative technologies (Aliexsieiev, 2014). To form the value attitude of young people towards a healthy lifestyle, it is necessary to establish the motives and value orientations of future professionals to health-preserving activity (Ishchenko, 2013). It is essential to use the possibilities of different disciplines that are not tangential to health problems ("Philosophy", "History of Ukrainian culture," etc.), by health-saving content. However, modern researchers do not pay due attention to filling the lessons on these disciplines with factual and methodological material on motivation to preserve human health, using interdisciplinary integration. This issue can be debatable. However, the results of our study indicate the lack and feasibility of scientific research in this direction.

We plan to reveal the results of the approbation of such techniques in our following publications.

The results of our study indicate the need to organize and use new approaches to the formation of a healthcare culture of students. It is advisable to combine the material content of several disciplines on the basis of interdisciplinary integration in relation to the preservation of health. For example, the connection between philosophy, history of Ukrainian culture, life safety and physical education will make it possible to use the philosophical understanding of the essence of health with the historical trends of the culture of its preservation in Ukrainian society, with the safety of life at the present stage and testing of new forms and methods of health promotion at the physical education classes that will motivate students to maintain their health.

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Conflict of Interest

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ORIGINAL SCIENTIFIC PAPER

The Relationship between Leadership Styles and Organizational Culture in Sport Organizations

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Abstract

The relationship between leadership style and organizational culture is interdependent; while organizational culture affects the manager's choice of leadership style, with time, the manager himself shapes and changes the organizational culture. Much attention has been given to this matter in scientific literature since the leadership style in an organization is directly related to the structure, strategy, management and other relationships in the organization. This research aims to determine which leadership style can be found in sport organizations in Montenegro, and which organizational culture comes from it. The goal is to recognize and determine a satisfactory leadership style that will improve the quality of sports organizations in Montenegro. For the needs of this research, a questionnaire has been developed, adapted to the Leadership Network as well as to the Test for Diagnosing Organizational Culture. The data were collected using a questionnaire for 300 respondents that are active members of sport organizations. The contribution of this research is seen in providing insight into the dominant leadership style and the corresponding organizational culture, which influences both achieving results and the levels of motivation and loyalty of the sport organization's members.

Key words: leadership styles, organizational culture, sport organizations

Introduction

The cultural patterns that can be found in people's everyday behaviour and way of acting are transmitted to their ways of behaving and acting in organizations. The relationship between organizational culture and the leadership style represented in the organization is one of the most studied relationships in scientific literature, because the leadership style is connected with all other elements of an organization. According to Stogdill (1974), leadership itself represents a complex and multi-dimensional process. Northous (2007) stated that it is a process in which an individual affects a group to achieve the organization's goals. With the arrival of a new leader, or by changing leadership style in an organization, all of the elements of an organization (such as strategy, structure, and management) undergo some changes. These changes will affect the change of behaviour as well as values,

i.e., the change of the organization's organizational culture (Robbins, 2003).

According to Schein (1996), the relationship between leadership and organizational culture is an interactive process, according to which a leader, with his leadership style, creates an organization that, with its beliefs, behaviours, and values, creates a future organizational culture. Sarros, Gray, and Densten (2002) believe that leadership has a significantly greater impact on the culture than the culture of leadership does.

The correct choice of a leader and his/her leadership style accompanied by the organizational culture that they create are responsible for the organization's business success. Organizations like sport organizations are quite specific, therefore, their way of organizing, setting goals and tasks, even succeeding can be seen through their members' success,



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their motivation, and the relationship between members and the leader. Their success depends on the leader's knowledge and skills, as well as the relations he/she creates with his/her followers; in the end, these cause them to achieve better results and make the organization known for their members' success.

In the scientific literature, there are different types of classifications of leadership styles. These will help us make a connection between leadership styles and types of organizational cultures. Some of these classifications were made as a result of research done at universities in Iowa, Ohio, and Michigan, Likert's classification, as well as Blake's and Mountan's managerial network. The goal of this research was to find a leadership style that best fits every type of situation. There is no doubt that the research has made an enormous contribution to understanding the relationship between leadership style and organizational culture.

In the Iowa study, the simplest classification of leadership was made, according to which there are three basic styles (Lewin, 1977): autocratic, democratic, and liberal. Autocratic leadership style is characterised by the fact that the leader makes decisions without consulting with other team members. With a democratic leadership style, the leader allows the members to take part in making decisions. The liberal style is characterized by the absence of the leader in decision making.

In the study done at Ohio State University (Northouse, 2008), it was concluded that a leader has one of two basic types of behaviour (consideration or initiating structure); both of which are seen as different and independent.

Researchers from the University of Michigan gave particular attention to the influence that a leader's behaviour has on performance in small groups-

R. Likert and G. J. Likert (1976) constructed a model of leadership styles, in which four different styles can be found: exploitative authoritative, benevolent authoritative, consultative, and participative. In the exploitative authoritative type of management system, the responsibility lies with those in higher positions in the hierarchy, and the leader has no trust in his subordinates. In the benevolent authoritative type, the responsibility lies in higher positions in the hierarchy, but leaders do have some trust in their subordinates. In the consultative system, the leader has substantial but not complete trust in his subordinates. In the participative system, the leader has full confidence in his subordinates.

Blake and Moutoun created a concept of managerial networks with two basic dimensions: task-oriented leaders and people-oriented leaders. From the managerial network, there are five basic leadership styles: impoverished management, in which the managers exert minimum effort to get the work done; task management, in which subordinates are required to perform the task as directed by their superiors; middle of the road, in which the manager attempts to keep a balance between the organizational goals and subordinates' personal needs; country club management, in which leaders are cooperative; team management, in which the leader takes both people and production hand in hand.

The relationship between a leadership style and organizational culture is interactive, and it is the leader who – with his values, beliefs, and behaviour – creates a foundation for the making of organizational culture. There are many definitions of organizational culture; in one of them, culture is defined

as a complex system of values that organization's members follow when making decisions and simply behaving. Values, such as creativity and efficiency, work as a foundation for the organization's culture, which creates its identity and sets it apart from the competition (Erhardt, Carlos, & Heckscher, 2016). Also, according to Schein (1996), organizational culture is a series of assumptions that a person makes about the group in which they participate; these assumptions are grouped into three levels: artefacts, espoused beliefs and values, and basic underlying beliefs.

Classifications of organizational cultures have emerged as a result of generalizing the authors' experiences, as in the case of Handy's classification of organizational culture, or as a result of empirical research, as in the case of the Cameron and Quinn classification (Janicijevic, 2013).

Classification of types of organizational cultures was one result of Cameron and Queen's empirical research done in 1999, according to which there are four basic types of organization cultures: clan culture, adhocracy culture, hierarchy, and market culture.

The subject of the research is to determine which leadership style is used in sport organizations in Montenegro, in relation to their members and which organizational cultures comes from it. The initial hypothesis is: leadership style and the improvement of relations between sports management and organization's members affects the organizational culture and the organization's task performance, which affects the organization's members and the level of their motivation and loyalty.

The goal of this research is to recognize the leadership style that will improve the quality of sports organizations, and improve their task performances; as well as to define which type of approach will improve the quality of the relationship between the leader and his subordinates.

Methods

The research was conducted on 300 respondents from 16 sport clubs that are active members of sport organizations. The data was collected using the questionnaire method, with a specially designed questionnaire adapted to the Leadership Network and Test for Diagnosing Organisational Culture. The questioning was done in the period from June to November 2018, in Montenegro. It included sports clubs from the cities of Podgorica, Kotor, Budva, Bar, Tivat, Herceg Novi, Bijelo Polje, Berane, Niksic, and Kolasin.

The questionnaire had three parts:

The first was about basic information on the respondents, including: how old they are, how long they have been active in sport, how many sports clubs they have been part of thus far, how long they were the members of the sport club.

The second part was about the managerial network; it was made to measure the orientation of sport managers on tasks, or interpersonal relations, through 20 statements followed by a five-step Likert scale, which expresses the degree of agreement or disagreement with the given claim (where 1 means never to 5 that means always), on the basis of which the average grades for each claim are calculated, as well as the overall score on the basis of average grades, based on what a certain style of leadership is. The analysis of the collected data included the assertion of assertion analysis for the needs of the Leadership Network and the determination of the focus on tasks and relationships, which indicates the style of leadership.

The third part of the questionnaire concerned the establishment of the organizational culture of sport organizations. The Organizational Culture Assessment Tool (OCAI) was used, by which six key dimensions of the organizational culture are evaluated. Respondents divided points (100 points) for each individual denominator, according to the relevance of the offered answers and situations in their sport organizations. In all matters, a total of 100 points should be allocated to four offered responses in such a way that the highest number of points is assigned to a response that best describes the situation in the club for the given dimension. Based on the obtained results, a conclusion can be made regarding the type of organizational culture and the style of leadership that characterize the sport organizations.

Results

The results showed that more male respondents (61.33%) participated in the research than female respondents did (38.67%). The respondents were divided into six age groups: 76.67% of them younger than 20; 18% of them aged from 21-25; 4.66% of them aged from 26-30; and 0.67% of them aged from 36-40, there were no respondents aged from 31-35 or those ol-

der than 41 that participated in this research. Regarding the duration of the period they spent actively doing sports, the greatest percentage of them have been active for 1 to 3 years (34.67%) and for 3 to 6 years (30.33%); they are followed by respondents who have been active for less than a year (17%); 8% of them fall into the category of 9 to 12 years; 6.33% of them are in the category of 6 to 9 years, and 3.67% of them have been active for more than 12 years. It is interesting that 67.33% of the respondents have never changed the sport organization they are currently a member of. Regarding the time spent at the same club, the results showed that the longest time was from 1 to 3 years (32.33%), followed by the period of 3 to 6 years (24.33%) with nearly the same percentage for the period of one year (24%); 11% of the respondents had been active members of a club for over 9 years, while 8.33% of them had been members of the same club for 6 to 9 years.

In the part of the questionnaire referring to the managerial network, the obtained results show that Montenegrin sport managers scored high on task orientation (40.09); high average grades have been given to all of the criteria by which this result is measured (Table 1).

Table 1. Leader's Results Orientation

Leader's behaviour	Average grade
Leader tells the team members what they need to do	4.01
Leader sets the standards for the members' task performance	3.92
Leader gives suggestions on how to solve a problem	4.04
Leader clearly points out his attitudes to the club members	4.04
Leader comes up with the group's plan of activities	4.07
Leader sets the roles and responsibilities for every group member	4.04
Clarifies his own role in the group	3.90
Makes plan on how to do the job	4.08
Sets the criteria on what is expected from the group	4.01
Encourages group members to achieve best results	3.99
Total score	40.09

Orientation on relations is measured through a set of questions designed to reveal how the management treats the sport organization's members, to which extent it contributes to building trust, promoting individual values, providing good conditions and adequate rewards, promoting

healthy interpersonal relations, etc. The results show that managers of sport organizations in Montenegro have scored high on the relations orientation (39.23). High average grades have been given to all of the criteria by which this result is measured (Table 2).

Table 2. Leader's Orientation on Interpersonal Relations

Leader's behaviour	Average grade
Leader is friendly with other group members	3.88
Helps others feel comfortable in the group	3.91
Open for other member's suggestions	3.85
Behaves properly with other members	4.11
His behaviour is predictable	3.87
Actively communicated with group members	4.06
Shows that he cares for the well-being of club members	3.97
Shows flexibility in decision making	3.90
Shares his thoughts and shows his feelings to group members	3.68
Helps the group members agree	3.99
Total score	39.23

Combining these two sets of results, it can be concluded that the characteristic leadership style for managers of sport organizations in Montenegro is Team management. This leadership style promotes a high level of participation and teamwork, in which team members are included in decision making and setting priorities, and the manager is open to suggestions and enjoys his job. Team management as a leadership

style is characterized by results achieved by dedicated people, and the participation in achieving the organization's goals creates relationships of trust and respect (Northouse, 2008).

Based on results from the Test for Diagnosing Organizational Culture, a conclusion has been made regarding which organizational culture characterizes sports organizations in Montenegro (Table 3).

Table 3. Dimensions of organizational culture

Dimensions	Claim	Results
The dominant characteristic of the organization	Sports organization is a very personal place. People share a lot among themselves.	33.47
	In sport organization, people are willing to act decisively and take risks.	20.23
	Sport organization is oriented to the result. People are very competitive and oriented towards achievement.	22.22
	Sport organization is very structured and controlled. Formal procedures are very important and are respected in directing the activities of team members	24.08
Leadership in organization	Leaders in my organization provide an example of mentoring, support and assistance to members of a sports organization.	31.04
	Leaders in my sports organization give an example of entrepreneurship, innovation and risk taking.	24.53
	Leaders in my sports organization give an example of reason in decision-making and focus on the result.	19.62
	Leaders in my sports organization provide an example of coordination and harmonious functioning.	24.81
Leadership style	The leadership style in my sports organization is characterized by team work, consensus and participation.	33.01
	The leadership style in my sports organization is characterized by individual takeover of shares.	21.90
	The leadership style in my sports organization is characterized by strict competition, high expectations and achievements	21.05
	The leadership style in my sports organization is characterized by security and stability in relationships.	24.02
Unity of the organization	The "Glue" who holds my sports organization together is loyalty and mutual trust. Commitment to a sports organization is high.	34.18
	The "Glue" who holds my sports organization together is a commitment to development. The focus is on tracking the latest trends.	21.29
	The "Glue" who holds my sports organization together is an emphasis on achieving and achieving goals.	21.25
	The "Glue" who holds my sports organization together is formal rules and procedures.	23.07
Strategic focus	Sports organization focuses on people's development, openness, trust and participation.	31.67
	Sports organization focuses on getting new resources and creating new challenges. Trying new things and creating chances is highly appreciated.	22.04
	Sports organization puts emphasis on achieving results. To achieve high goals is highly appreciated.	22.25
	Sports organization puts emphasis on stability and durability. Efficiency and coherent functioning are highly appreciated.	24.11
Criteria of successes	Sports organization defines success based on the development of human resources, team work, people's dedication and care for people.	31.77
	Sports organization defines success based on innovation, change and achievement.	21.76
	Sports organization defines success on the basis of whether we are better than the competition.	20.16
	Sports organization defines success on the basis of achieving high results and a large number of good results.	26.34

For the dominant characteristics of organizational culture the most represented opinion is that the sport organization is seen as a personal place, where people share many things among themselves (average grade 33.47); while the least represented opinion is that people are willing to act and take risks when it comes to decision making (20.23). The dimension leadership in an organization is characterized by a leader who is a good mentor, supportive and there to help (31.04), while the least represented focus is the one on results (19.62). Managing people is characterized by teamwork, consensus, and participation (33.01). Individual risk taking is less represented, as are innovation, freedom of acting, stability and predictability, tough competition, high expectations and achievements (21.05-24.02). What gives a sense of unity of the organization is loyalty and mutual trust, with a high level of dedication to the sport organization (34.18). As less meaningful for the sense of unity, the respondents have marked achievements and accomplishing goals, innovations, following the latest trends, as well as formal rules and procedures (21.25-23.07). As for strategic focus, it is on the development of people, openness, trust and participation (31.67). Lower average grades were given for the remaining three offered answers, in relation to obtaining new resources and creating new challenges, competition action and achievements, as well as stability and sustainability (22.04-24.11). Sport organizations define their success through teamwork, dedication and caring for their members (31.77). Respondents have marked as less meaningful leadership in respect of results, innovations, efficiency and efficacy (20.16-26.34).

Based on total average grades, it can be concluded that the dominant culture in sport organizations in Montenegro is clan culture. The total average score of 32.53 includes the employees seeing the club as a very personal place in which leaders support and help to their members through te-

amwork, consensus, and participation. The club's focus is on the development of members, and the criteria for success is caring for the development of human resources, teamwork, dedication, and caring for the members.

Discussion

The contribution of this research is seen in acknowledging that team management is the dominant type of leadership and clan culture is the organizational culture of sport organizations in Montenegro, and that they influence each other, but need to be compatible for the sport organizations to achieve success and high results. The initial hypothesis has been proven correct: creating an organizational culture that will amplify the sports organization's members' level of satisfaction while performing tasks contributes member's loyalty and better performances in a sports organization. The results obtained from this research have given a good basis for further tracking and comparison of changes in leadership style and organizational culture, and their influence on task performance.

The change of organizational culture is a result of changes in the leadership style. In the beginning, it is the leader who adjusts his leadership style to the organizational culture, but over time, it is the leadership style that later changes the organizational culture. Different types of organizational culture work best with different leadership styles. A leader in a specific organizational culture chooses the leadership style that fits best that culture, because otherwise he will not be accepted as a leader in that organization. Based on this research, it is possible to conclude that sport managers are both people- and task-oriented, which makes the team management the dominant leadership style in sports organizations in Montenegro, and the following organizational culture of this leadership style is clan culture (Table 4).

Table 4. Leadership Network and Organizational Culture of Sports Organizations in Montenegro in 2018

LS/OC	2018
Task Oriented	40.09
People Oriented	39.23
Leadership Style	Team Management
Organizational Culture	Clan Culture

This research confirms the hypothesis that leadership style and improving relations between sports management and organization's members affect the organizational culture and the quality of achieving results, which then affects the organization's members and their motivation and loyalty within the sports organization to which they belong.

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Conflict of Interest

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ORIGINAL SCIENTIFIC PAPER

Holistic Marketing Approach in Media Communications of Sports Organizations

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Abstract

This paper will give theoretical and practical approaches to media communications in sport organizations. The first part of the paper presents theoretical aspects of media communications in sport organizations in history, by leading authors in the field of sport management. Modern sport communications range from traditional forms of experiences to an integrated, holistic approach, which includes information technology platforms, modern presentations of sport events, interactive discussion with audiences, by using social media. The second part of the paper will present theoretical aspects of sport journalism in the era of modern media communications. It is emphasised that all aspects of media communications have an impact on the leading of sport organizations and events. This paper emphasises that the new generation of sport audiences need integrated, modern approaches, based on both traditional and modern media communications, as well as a new approach to sport journalism.

Key words: *media communications, sports organizations, social media, integrated marketing communications, share of sports experiences*

Introduction

This paper will give a theoretical and practical approach to the challenges of media communications in sport organizations. Modern media communications have a great task to educate and inspire young generations. Media communications are changing and need to be present in both traditional and new social media. Today, media communications range from traditional forms of presenting sport organizations to integrated media communication, which includes modern approaches to presenting sport organizations, sport news and sport lifestyles through social media. Modern media communications include interactive discussions with audiences, the use of sport portals, mobile platforms, and new concepts of relationship with newer sport organizations, based on dialogue.

Furthermore, the modern media environment has changed and has impacted sport news, sport lifestyles, and the presentation of sport organizations. The changing media environment

bring to sport events new topics and new professions. Media fields now have new professions, such as sport portal journalist, YouTube influencers, Facebook, Twitter and Instagram pages of sport organizations and various events. It is emphasized that the new generation needs an integrated, modern approach to sport journalism, based on both traditional media communications and social media communications. New generations need traditional media information, but also dialogue with sports journalists, sports managers, sports influencers and athletes. New generations look for fast information on the internet, such as YouTube, Instagram, Facebook, Twitter, sports channels, such as Sports Club. New generations look for fast information on the internet, such as YouTube, Instagram, Facebook, Twitter and sports channels, such as BBC sport, CNN sport. In Serbia one of the favourite sports channel is Sport Club, where target audience looking for sports information, events and interviews. Young generations love to share sports experiences and have strong feeling



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for connection with others, to learn more, to travel, to have experiences. They are mobile and looking for knowledge, experiences, and non-traditional professions. They use social media for sharing sport information and experiences, and love to do this. Sports managers and journalists have to follow these media communications changes. The young generation's behaviour has changed modern media communications processes.

Sport managers and sport journalists have to follow their audiences' needs, desires, and new approaches to sport media communications.

Challenge of Sport Media Communications in the Modern Environment

The challenge of sport media communications in the modern environment is that it must be innovative and creative. A holistic marketing approach is one way to modernize media communications.

A holistic marketing approach has the challenge of improving the planning process of media communications. All parts of holistic marketing approaches are important: internal marketing, integrated marketing, relationship marketing, and socially responsible marketing. Internal marketing strategies improve media and sport organizational structures and communications with their audience and the sport public. Strategies of integrated marketing improve the consistency of media communications. A socially responsible approach is the basis of every form of media communication. The key message of media communications is informing, sharing, success, and social changes. Strategies of relationship marketing make platforms for clear and direct communications with target sport audiences. In all these ways, a holistic marke-

ting approach is the foundation for the realization of modern sport media communications and the presentation of sport organizations, news, and experiences. The elements of the holistic marketing approach are present in Figure 1 (Kotler & Keller, 2016). The implementation of the holistic marketing approach in media communications is challenging, because target audiences are sophisticated, the process of planning and organizing of sports events is demanding, as are those of social responsibility.

Strategies of relationship marketing and modern media give opportunities for direct communication with target audiences. It is essential to make good connections with the audiences of sport organizations and events, based on truth and the openness of journalists and management staff. The key strategies in media communications are those of innovations, adaptation, relationship marketing, social responsibility, and communications with target audiences (Kennet, 2008).

Media communications include journalists, sport managers, focus group discussion, and social media discussion and other forms of interactive communications with the sport public. Sport media communications have always had a socially responsible impact on social development, on raising awareness about social problems. Sport media communications have an impact on social movements, as well as improving awareness about social problems. Sport is part of the development of modern society.

Modern society needs interactive communications through modern media about sport. Sport organizations send messages to audiences but also listen to the needs and desires of target audiences. One specific opportunities of social media are that sport organizations can impact the awareness and attitude of public audiences about social problems.



Figure 1. Elements of holistic marketing approach

A holistic marketing approach has integrated marketing communication with target audiences, which present opportunities for the research needs and desires of the sport public, as well as social movements. It is imperative that integrated marketing communications of sport organizations have consistent storytelling with target audiences (Terence, 2008). Sport sends social impulses to the public and calls people to think about social problems, attitude, young people, the future, civilization, life, life stories, history, and sociology. In that way, sport drives

people to react, to have certain attitudes, to communicate with other people and to create a better world. Sport projects are creative and drive the public to think and feel in a certain way (Larry, 2008).

Creative sport ideas that motivate the public have original imaginative approaches. Creative ideas have to be clear, simple, and inspirational (G. Belch & M. Belch, 2012). Strategies of public relations are essential in sport media communications. These strategies improve communications and connections

between sport organizations and their target audiences (Pel-smacker, Geuens, & Bergh, 2007). Strategies of public relations develop and improve communications between sport organizations and their target audiences. Socially responsible approaches give platforms for sport projects, as well as purpose and messages to target audiences. Strategies of relationship marketing have specific impacts in leading sport projects. They give opportunities for interactive communications with the sport public, through traditional ways of communication and modern, social media. Two-way communications give opportunities for listening to the wants and needs of the public, which indicates needs for future development (Kotler & Keller, 2016). Media communications are part of sport projects. Media culture is also a culture of high technology, which gives opportunities for better communications and gives to sport's projects global dimension (Larry, 2008).

Social Media and Sports

Social media gives great opportunities for sport media communications. The sport public can be informed and inspired to learn about sport events, sport organizations, sport clubs, to follow their sport interests, through many social media channels. The public can follow their favourite sports on Instagram and be inspired. They can follow YouTube channels and learn about every interesting and inspiring sport topic, or they can share their sports experiences about sport events and experiences.

Young people are developing physically and mentally, and by being engaged with such healthy activity, they avoid unhealthy habits and addictions. Additionally, sport activities from the earliest days are the best way to recognize talents that later can professionally be engaged with a particular sport and become part of the national representation of a country (Maros, 2018).

Young people believe that it is important to practice sport, to share sport experiences, in order to inspire each other. Sport today is based on innovation, motivation, digital media, communications, and sharing of sports experiences (Janicic, 2018).

Insufficient physical activity in youth damages development and contributes to poor socialization and lack of recognition of sport talents (Maros, 2018).

In this new digital environment, it is important that sport managers and journalists accept technology as a modern approach to informing audiences. Furthermore, it is important that sport journalists and managers improve their communications skills to improve the understanding of the sport public.

The use of sport in modern business communication has influenced significant changes in the general attitude of consumers regarding advertising, and recognizing the attractiveness of sport has enabled business organizations to approach sport consumers. Regarding the general attitudes of the respondents towards advertising in sport in relation to observing sporting events during the day, Masanovic (2018) found differences in attitudes among respondents who have different habits of watching sporting events over course of the day. The general opinion is that advertising in sport is good.

Today, advertising activities are more than ever overwhelmed by ethical dilemmas; given the increasing competition of advertising on the market, it becomes harder to think about unique advertising messages that will not provoke the feeling of being cheated and manipulated. Accordingly, ethical problems are concerned with questions, situations, and opportunities that require individuals or organizations to choose between a few advertising actions which should be evaluated as good or bad (e.g., ethical or non-ethical), which will not allow consumers to feel cheated on manipulated, regardless the legitimacy of the advertising (Bjelica, Gardasevic, Vasiljevic, & Popovic, 2016).

There are so many ways to inform the public, to inspire them, and to motivate them. The present environment requires a media approach and new style of writing. Many sport organizations have portals on the internet, such as Sport Club. Many sport organizations have portals on the internet, such as Manchester United Football Club, which present good example of communication with target audience. In that way, the public can read news, see videos, but also can ask journalists for additional information. The landscape of social media is presented in Figure 2.



Figure 2. Landscape of social media (Janičić, 2018)

Sport has long been known to raise awareness about social problems. Sport journalists have to follow new technological trends, but also have to have objective attitudes with audiences in new environments. Journalists have to implement responsible media practices (Janicic, 2018).

A focus group was organized with six journalists from sport media. The conclusions of the group are that the sport public need all information's online, so that they can both read it online and in traditional ways (e.g., in a newspaper); the focus group was organized with Serbian and Montenegrin

sport journalist on meeting in Podgorica, Montenegro. They was asked to explain their opinion about information in sport media, about impact of social media on target audience, about strategies of communications on new social media, about opportunities to be interactive with target audience on social media, about behavior of sport audience whose looking for information about sport events. The journalist gave us answers about all questions and there was organized discussion about all of topics. The result of focus group present that the audience wants communications with athletes on sport portals, and they need inspiration and motivation from new inspiring sport persons, such as managers of sport's clubs. The conclusion of focus group is that journalists have to be more flexible in media communications, that they have to accept information te-

chnologies in media communications, the journalists emphasize that media communications has to be modern, innovative, and inspirational. The future work on this topic will include focus groups with sportists, sports managers and audience that follow sports informations and sevents.

Good Examples of Media Communications in Sport

One good example of holistic marketing approach in sports media communications is Sport Club, which has a great impact on sport information. Sport Club informs audience about all sports events in the traditional way on television, but also on its internet portal and social media platforms, which give opportunities for interactive communications with audience. The Sport Club portal is present in Figure 3.

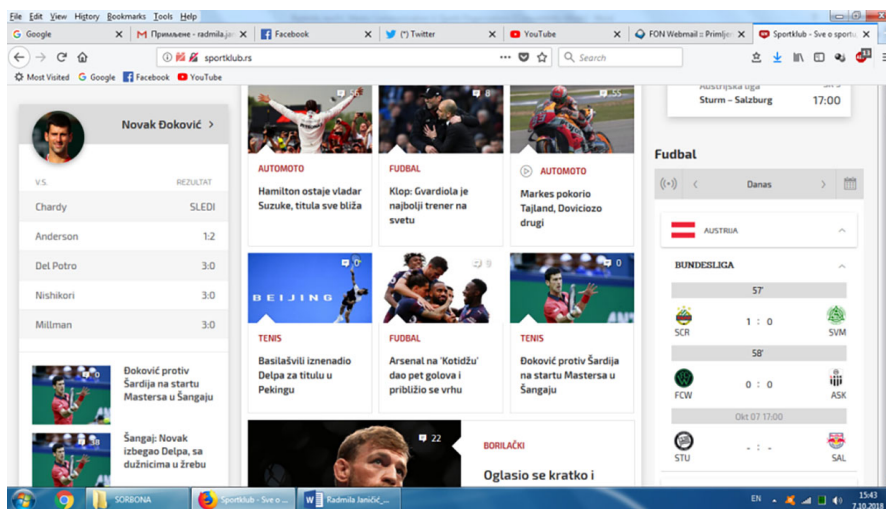


Figure 3. Sport Club Portal

The Sport Club Portal has all the information, in one place, about sports events, sports clubs, athletes, their trainers, their opinions about social problems, about life in sport, even about their personal stories that inspire the public. The most important feature for the public is that Sport Club gives 24-hour live streams of all sport events on their television channel and via online streams. The public have opportunities to write comments about events, team members, and results, and to share happiness about sport events. Sport Club is favourite offline and online channel for sports enthusiasts in the territory of the former Yugoslavia. In this medium, journalists give fast, factual, inspirational information. They are real sport lovers and committed professionals, led by qualified journalists and profes-

sional sport media managers. The atmosphere in Sport Club is enthusiastic, inspirational and can be described as "all sports in one place". The managers of Sport Club use strategies of holistic marketing approaches, including strategies of internal marketing to motivate their journalists, and to inspire journalists to provide accurately and timely inform public about sporting events. Managers use strategies of integrated marketing communications with an all-media approach. They also use strategies of relationship marketing with the public. Via the online portal the public have dialogue with journalists and, also, they can share their experiences about sport events. Sports Club is highly socially responsible media, which supports young athletes and raises awareness about sport.

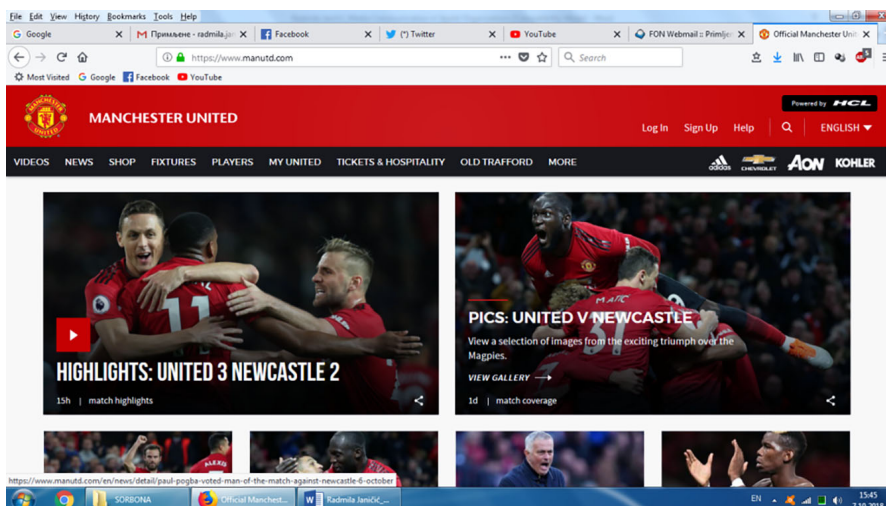


Figure 4. Manchester United Football Club

The Manchester United club uses a holistic marketing approach. The managers of this club use strategies of social responsibility to help solve social problems locally and globally. They use internal marketing strategies to motivate football players, to raise good atmosphere in team, to inspire players. They use integrated marketing strategies to send messages about sport atmosphere and good sport attitude. They use strategies of relationship marketing to be in communication with the public, to listen their comments and to build dialogue with them. Manchester United is good example of the implementation of the holistic marketing approach in sports media communications. Their internet portal is presented in Figure 4.

Conclusion

According to theoretical and empirical research, media communications in sport organizations have to be clear, fast, and inspirational. Furthermore, the results emphasize that sports messages have great impact in behaviour of sport public. In that way, the media communications of sport organizations have great social responsibility in their communications. From theoretical aspects, it is essential to be transparent and open in when communicating; they must be socially responsible and inspire the public. Journalists have the task of improving media communications with audience through social media. Empirical research emphasizes that future of media communication in sports lie in integrated media communications through social media. Theoretical analysis, comparative analysis, examples from practice, and focus groups with journalists about challenges of holistic marketing approach in sports media communications conclude that it is necessary to be innovative in sport media specifically through social media.

The conclusion is that holistic marketing approach has impact on sport media communications. Through strategies of internal marketing, integrated marketing, socially responsible marketing, social marketing, and relationship marketing improve sport media communications.

Journalists, as members of a focus group, emphasize that it is important that sports journalists improve their social media skills, so that audiences can be more informed. They emphasize that it is necessary to make connection between

athletes all over the world and sports public to improve sport awareness. Modern sport media communications include multimedia digital approaches, as well as holistic marketing approaches. Good traditional ways of media communications have to stay, but should be accompanied by with modern, multimedia, digital approaches. The conclusion of focus group is that sport managers and journalists have to be more flexible with digital media, that they have to accept information technologies in media communications, that they have to follow public needs, new information habits, as well as follow new information technology platforms for communications. They emphasize that sports media communications have to be modern, innovative, and inspirational.

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Conflict of Interest

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ORIGINAL SCIENTIFIC PAPER

Circuit Training Intervention for Adaptive Physical Activity to Improve Cardiorespiratory Fitness, Leg Muscle Strength Static and Balance of Intellectually Disabled Children

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Abstract

Physical activity intervention programmes have been found to effectively improve cardiorespiratory fitness, strength, and balance. However, few studies thus far have examined the effects of a circuit training physical activity adaptive programme to improve the cardiorespiratory fitness, leg muscle strength and balance of the static environment of children with intellectual disabilities. The purpose of this study was to examine the effects of the adaptive activity circuit training of six weeks performed three times per week on the cardiorespiratory fitness (VO₂ max), leg muscle strength, and balance of intellectually disabled children. The research method was experimental with group pretest-posttest design. The subject of this study was 15 male students with mild intellectual disabilities aged from 15 to 17 years who followed sport extracurricular activities taken by random sampling. The cardiorespiratory fitness (VO₂ max) measurement used the modified Queen's College Step Test; leg muscle strength was measured using a leg dynamometer; static balance was measured using a stork stand test. The data were analysed with a paired samples test using SPSS. The results showed significantly increased ($p < 0.05$) cardiorespiratory fitness, leg muscle strength, and static balance at the end of the intervention period of the circuit training physical activity adaptive programme. It has been concluded that the circuit training physical activity adaptive programme of six weeks, at a frequency of three times per week was effective for improving cardiorespiratory fitness (VO₂ max), leg muscle, strength and balance.

Key words: circuit training, cardiorespiratory, leg muscle strength, balance, intellectual disabilities

Introduction

Physical activity programmes (PA) are adapted as necessary for children with intellectual disabilities to improve their cardiorespiratory ability, endurance, strength and balance (Boswell, 1993; Fotiadou, Neofotistou, Sidiropoulou, Tsimaras, Mandroukas, & Angelopoulou, 2009; Giagazoglou, Arabatzis, Dipla, League,

& Kellis, 2012; Giagazoglou et al., 2013; Jankowicz, Mikolajczyk, & Wojtanowski, 2012; Tsimaras, Giamouridou, Kokaridas, Sidiropoulou, & Patsiaouras, 2012). Cardiorespiratory ability (VO₂ max) is the basic component of a person's fitness complex, because it involves the function of the heart, lungs, and the ability of blood vessels and capillaries to send oxygen to all parts of



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the body to create energy. The balance of fitness components is essential to maintain the head and body against gravity and the force from outside and maintain the body's centre of mass to the plane of the pivot. Physical activity programmes adapted to develop cardiorespiratory fitness and balance for children with intellectual disabilities are essential for the wellbeing of children.

Based on the results of a study, the general condition of cardiorespiratory fitness and muscular strength of children with intellectual disabilities (ID) is very low compared with those without intellectual disabilities (Temple, Frey, & Stanish, 2006; Pitetti, Yarmer, & Fernhall, 2001; Pitetti & Yarmer, 2002; Gillespie, 2003; Lotan, Isakov, Kessel, & Merrick, 2004; Dixon, Lee, & Dugala, 2013). The lower levels of cardiorespiratory fitness and muscular strength of children with intellectual disabilities than those without intellectual disabilities are a result of the fact that they do less physical activity and have less motivation to do physical activity (Pitetti, Beets, & Combs, 2009). Children with intellectual disabilities have inactive lifestyles or fewer opportunities for physical exercise, and they have high health risks (Ayvazoglu, Ratliffe, & Kozub, 2004).

In addition, children with mild intellectual disabilities (MID) often have limited motor skills (Westendorp, Houwen, Hartman, & Visscher, 2011). Delays and limitations of the development of motor skills are due to the condition of the brain, which affects its cognitive and motor function (Giagazoglou et al., 2012). The research of Guidetti, Franciosi, Gallotta, Emerenziani, and Baldari (2010) showed that children with intellectual disabilities faced difficulty in coordinating movement from childhood to adulthood. Such difficulties resulted in the lower performance on tests of balance (Hale, Bray, & Littmann, 2007; Minshew, Sung, Jones, & Furman, 2004).

The results of the above studies demonstrated that children with intellectual disabilities had limitations and difficulties of coordination and balance, and the level of physical fitness included cardiorespiratory ability, muscle strength, and muscle endurance were low compared to children without intellectual disabilities. How can exercise intervention be guided in order to improve the balance and physical fitness of children with intellectual disabilities? Few studies have been conducted on this topic. Specifically, most of the studies related to the use of design implementation effectiveness of a cross-sectional survey with a questionnaire to assess physical activity behaviour. This has limitations regarding exercise participation; in particular, changes cannot be observed, and only a simple relationship can be inferred. The lack of adaptive activity programmes that can be applied in school and on the training field is a limiting factor to develop the physical fitness of children with special needs.

Based on the statement above, the purpose of this study was to test the intervention programme of an adaptive circuit workout that can improve cardiorespiratory fitness, leg muscle strength and static balance among children with intellectual disabilities.

Methods

Participants

The participants of this study were 15 male students with mild intellectual disabilities aged 15 to 17 years who participated in extracurricular sports.

Research procedure

The research was carried out in two stages. The first stage was a literature review of previous research to develop an intervention programme of an adaptive circuit training for children

with intellectual disabilities. The content validity was reviewed and tested by three physical education specialists. The second stage of the experiment had a one-group pretest-posttest design. Participants were given training (treatment) exercise three times per week for six weeks. Before and after treatment, participants' cardiorespiratory endurance, coordination, and static balance were tested.

Intervention

The adaptive circuit programme was developed and designed based on the literature and the results of previous research. Once developed, it was validated by three experts to assess the Delphi technique. The results of the assessment data validation of three experts were calculated using the formula content validity ratio (CVR) to obtain an agreement. The more the data approach $CVR=1$ the better the data are. The circuit training programme composed by six stations with 5 meter spacing was used to evaluate the cardiorespiratory, strength and balance of children intellectual disabilities. The programme was composed by the following stations: Station 1: shuttle run 6 beams move a distance of 5 meters, Station 2 sit-ups 10 times, Station 3 corks jump 10 centimeters 8 times, Station 4 BAKS up 10 times, Station 5 push-ups 10 times, Station 6 runs above the beam (width of 12 centimeters and a length of 4 meters). Circuit training is carried out for six weeks with a frequency of three times per week. From first and second week the circuit training program has been done twice for each week. The resting time was 3 minutes between the repetitions, and on the third and fourth weeks there was an increasing of volume and intensity; the circuit training program has been done 3 times per week with the same time of resting 3 minutes after one circuit. On the two last weeks (the fifth and sixth), the circuit training program still occurred 3 times per week but only there was a restriction of resting time (now 2 minutes)

Measurements

The data were obtained first by pre-test of the following variables: (1) cardiorespiratory fitness (VO_{2max}), (2) leg muscle strength, and (3) static balance. The pre-test was done to establish the strengths and weaknesses of the athlete or someone else. After the training during 6 weeks, the post-test of the previous variables has been conducted because the fitness testing is a great way to monitor and assess athlete's ability as it relates to aerobic fitness, strength, and static balance. It can also help the athlete or someone else to understand how healthy they are and learn to set goals to improve their health-related fitness.

Cardiorespiratory fitness (VO_{2max})

Cardiorespiratory fitness can be determined by the value of the volume of maximum oxygen uptake (VO_{2max}) (Foster, 1983). Cardiorespiratory Fitness value (VO_{2max}) max The VO_{2max} has been tested by using the Queen's College Step Test is modified. The necessary tools are blocks (28 cm high), a stopwatch, and a metronome. Study participants do step movement up and down the block as high as 28 cm by 22 times up and down the stairs per minute (88 steps per minute) for 3 minutes without break. After 3 minutes, participants were asked to sit down, and their pulse rate was calculated using the radial artery for 1 minute. Counts were recorded as a heart rate of their recovery.

Leg muscle strength

Leg muscle strength in this study was measured using the

leg dynamometer (CYBEX division of Lumex). Implementation: the subject wears a waist fastener, then stood with his knees bent up to an angle of $\pm 45^\circ$, then the tool is attached to a waist fastener. After that, the subjects do their utmost with both legs. After the test, it has been seen that the legs were strengthened to the maximum, and then the needle of the device showed the number. The figure states the level of leg muscle strength. Rating: the best score of the three trials is recorded as the score in units kg, with a level of accuracy of 0.5 kg (Barry & Jack, 1979).

Static balance

Static balance is the ability to control the balance in the treatment of standing, sitting, and relative stillness. Static balance is measured using the Stork Stand Test. Participants using the pedestal stand with one leg that is considered stronger. One foot is positioned and bent beside the foot of the pedestal. Hand holding the waist, with eyes closed and the researchers com-

manded the movement by to counting: 1, 2, and 3 (one, two, and three). Participants must maintain the position. Scores are expressed in seconds.

Results

Test of normality of each variable

According to Table 1, the test normality using Kolmogorov-Smirnov obtained the significance value of each variable: the variable pretest had a significance value of 0.951; cardiorespiratory fitness and cardiorespiratory fitness posttest had a significance value of 0.961; strength pretest variables muscles had a significance value of 0.740, and posttest leg muscle strength has a significant value of 0.309; balance variable significant value 0.799 for the pretest. and posttest balance the significant value was 0.797. All of these variables were significantly greater than 0.05; therefore, it can be concluded that all the variables were normally distributed.

Table 1. Kolmogorov-Smirnov Test Results (N=15)

Test	Pre-test Cardio	Post-test Cardio	Pre-test Power	Post-test Power	Pre-test balance	Post-test balance
Normal Parameters ^{a, b}	35.036	37.9	81.333	94.6	6.00	7.7333
Sig. (2-tailed)	.951	.961	.740	.309	.799	.797

Different Test Results pretest and posttest Cardiorespiratory fitness.

Paired samples based on the analysis of different test cardiorespiratory fitness pretest and posttest results are as follows:

Table 2. Paired Samples Test (N=15)

	Pre-test Cardio	Post-test Cardio	Sig. (2-tailed)
Mean	35.0360	37.9253	-
Pretest-Posttest Cardiorespiratory	35 ml/kg/min	45 ml/kg/min	.000

Different Test Results pretest and posttest Leg Muscle Strength

Based on the analysis of different paired samples, pretest and posttest muscle leg strength result, as in Table 3, showed:

Table 3. Paired Samples Statistics of Strength (N=15)

Test	Pre-test Strength	Post-test Strength	Sig. (2-tailed)
Mean	81.3333	94.6667	.000

Based on Table 3, the results showed the value of significance (2-tailed) was 0.00 ($p < 0.05$). Nevertheless, with a statistical analysis of paired samples, the descriptive value of final test leg muscle strength average 94.6667 is higher than the average value of the initial test of 81.3333. Therefore, we concluded that the circuit exercise training programme increased leg muscle

strength in children with intellectual disabilities.

Different Test Results pretest and posttest Balance

The Table 4 below showed different test Paired Samples, pre-test and post-test balance of the subject tested.:

Table 4. Paired Samples Statistics of Balance (N=15)

Test	Pre-test Strength	Post-test Strength	Sig. (2-tailed)
Mean	6.0000	7.7333	.000

Table 4 showed the value of significance (2-tailed) was 0.00 ($p < 0.05$). Therefore, the results of initial test and final test had significant changes. In the same table, we saw that the statistical analysis of paired samples descriptive value of the final test of static balance was on average 7.733 higher than the average value of initial tests 6.000. Therefore, we concluded that the circuit exercise training programme improved the static balance child with intellectual disabilities.

Discussion

The results showed that participants with mild intellectual disabilities after training have significantly increased cardiorespiratory fitness (VO_2 max; $p < 0.05$). Furthermore, it was shown that the final descriptive test value of VO_2 max 37.925 millilitres/kilogram body weight/minute (ml/kg/minute) higher than the initial VO_2 max test average of 35.036 ml/kg/minute. The findings of this study are reinforced by several

research results (Alcaraz & Blazevich, 2008; Giannaki, Aphas, Tsouloupas, Ioannou, & Hadjicharalambous, 2016; S. Romero, Martinez, & Alcaraz, 2013; Mayorga-Vega, Vician, & Cocca, 2013) that stated that circuit programs with resistance and carried out repeatedly within six weeks to eight weeks could increase cardiorespiratory ability. In addition, the results of the studies of Mayorga et al. (2013), and Schmidt, Anderson, Graff, and Strutz (2016) state that physical activity programmes using circuit training can increase endurance cardiorespiratory strength.

This study also found that there was a significant increasing of leg muscle strength ($p < 0.05$) for children with intellectual disabilities after conducting the circuit training programme. It was also shown that there was an increasing of average yield of leg muscle strength pretest (mean 81.33) to the leg muscle strength in posttest with (mean 94.66). The findings of this study were similar to the results of several studies that stated that circuit training programs can increase muscle strength (Wirat, Pratoom, & Sootmongkol, 2017; Mayorga et al., 2013; Schmidt et al., 2016; Giannaki et al., 2016)

It was also shown that there was an increasing in the results of static balance pretest (mean 6.00) and posttest of static balance test (mean 7.70). The findings of this study were similar to those of Jankowicz et al. (2012) and Giagazoglou et al. (2013), which stated that circuit training improved static and dynamic balance.

Circuit training programmes can improve cardiorespiratory fitness, leg muscle strength, and the balance of children with intellectual disabilities, when the children were enthusiastic and motivated in carrying out the exercises. This was similar to the results of research by Jan Wilke (2018) stating that circuit training with low intensity can increase the motivation of practicing children.

Based on the research results and the above discussion, it can be concluded that the circuit adaptive activity programme can improve cardiorespiratory fitness, leg muscle strength, and static balance for the child mild intellectual disabilities. The programme can be used by physical education teachers in schools to improve cardiorespiratory fitness, leg muscle strength, and balance for children with intellectual disabilities.

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Conflict of Interest

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SHORT REPORT

Injury Incidence in Female Serbian Elite Volleyball Players

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Abstract

Sport injuries are unavoidable factors that influence the life of every elite athlete. They are most likely caused by increased frequency, intensity, and duration of training. Even the slightest injury could, from a functional point of view, influence athletic results. This research aims to analyse and provide data regarding injury typology of elite volleyball players of Serbia. Data were collected from 15 female volleyball players of the Serbian national volleyball team. The average age of the players was 25.53 years, with 14 years of volleyball experience. The results show that the most frequent injuries were injuries of the ankle (33%), followed by shoulder injuries (20%), and other injuries, and that the jumping phase had the highest occurrence of injury.

Key words: elite sport, female, injury

Introduction

Volleyball is characterized by fast and explosive movements, high jumps and ball play, as well as the need for short reaction time. Technology and knowledge have advanced in the previous two decades, and sport science has followed this development. Novel training modalities have been introduced; new diagnostics procedures, rehabilitation techniques, and supplements have emerged. With this, the intensity by which athletes exercise has become higher, recovery times shorter, and achievements greater. In volleyball, the rules have also changed, and the game itself has gone through significant changes. All this has led to more precise training planning in aspects of volume, intensity, type, recovery, to achieve the highest results possible. The game requires high levels of strength, technique, and adequate tissue adaptation for every aspect of it. If the players lack the needed skill in just a single aspect, be it technical or inadequate preparation, the results are more likely to be worsened.

The most frequent injuries in volleyball occur in the shoulders, knees, ankles, and fingers (Aagard, & Jorgensen, 1996). The most common acute ones are in the fingers and ankles, while chronic injuries are characteristic for the shoulders and knees (Aagard, & Jorgensen, 1996; Bere, Kruczynski,

Veintimilla, Hamu, & Bahr, 2015). Concerning injury risks, researchers conclude that senior players have a higher risk, and also have more reported injuries (Bere et al., 2015). With that in mind, the results of several studies (S.R. Augustsson, J. Augustsson, Thomee, & Svantesson, 2006; Pimeta, Hespanhol, Grangeiro, & Lopes, 2017) show that the prevalence of overuse injuries in volleyball is high, although lower than in other sports, such as soccer and handball (Augustsson et al., 2006; Bere et al., 2015; Junge et al., 2006; Soligard et al., 2018).

This research is focused on current trends in injury epidemiology of elite Serbian female players.

Methods

The data were gathered using a questionnaire given to female volleyball players on the Serbian national team for 2016. Fifteen players voluntarily filled out the questionnaire. The survey had 20 questions in three parts: a socio-demographic and descriptive part, a part related to training and preventive programmes, and a part related to and injuries. Variables taken into consideration were preventive methods and activities not related to training. Data were analysed with descriptive statistics using percentages and sums.



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Results

Risk factors that may influence injury incidence and should be taken into consideration are the number of hours spent in practice (Table 1) and the specific need for physical skills that

volleyball requires players to provide. This information could indicate the type of stress the body has to adapt to during practice and can also show in which ways training modalities have an impact on tissue adaptations, during strictly professional exercise.

Table 1. Descriptive Statistics of Volleyball Players (N=15)

	Mean±SD	Min	Max	Range
Age	25.53±2.72	20	30	10
Height (cm)	187.73±6.31	170	194	24
Weight (kg)	75.07±7.09	59	85	26
Volleyball Experience (years)	14.73±3.35	8	20	12
Training sessions per week	10±0	10	10	0
Hours in training per week	20±0	20	20	0
BMI	21.22±1.16	19.8	23.3	3.5

In Table 2, preventive measures that athletes are introduced to are shown; the relative drop in Strength Training is assumed to be the result of an increase in Technical Drills. Also,

none of the subjects were involved in sports activities other than volleyball, and all reported that they were monitored by the coach.

Table 2. Descriptive Statistics of Volleyball Players (N=15)

	Strength	Plyometric	Technical Drills.
Preseason	100%	40%	46.67%
Season	86.68%	40%	66.68%

Figure 1 and 2 show the data about situational incidence and positional assessment regarding injury percentages. It is seen (Figure 1) that the moment that poses the highest

risk of injury occurrence in volleyball is the jumping phase; this is supported by other authors (Bere et al., 2015; Schafle, Requa, Patton, & Garrick, 1990).

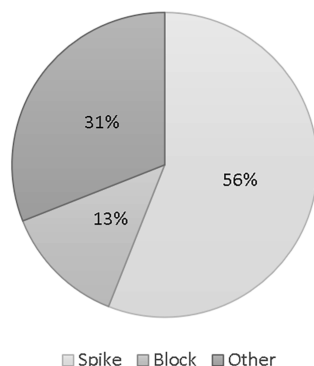


Figure 1. Situational Epidemiology

This is further strengthened by our results (Figure 2) that the positions of the setter and left/right front row have 53% of injuries altogether, while 40% is on the backline and 7% in the libero, which shows that the front row has more

injuries than the back does. Several studies (Bere et al., 2015; Miranda, Mas, Lopez, Perez, & Micheo, 2015; Schafle et al., 1990) concluded that the position closer to the net has more injuries.

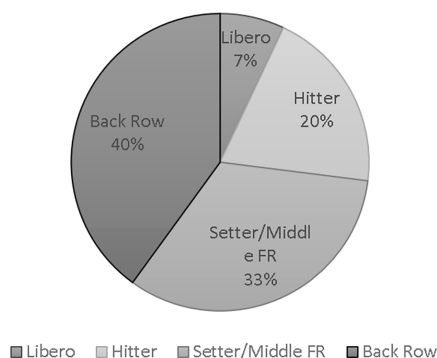


Figure 2. Positions

Concerning the locations of injuries, our results show that the ankles are most frequently injured but, with 20% of

injuries, the shoulder is mostly reported regarding overuse (Figure 3).

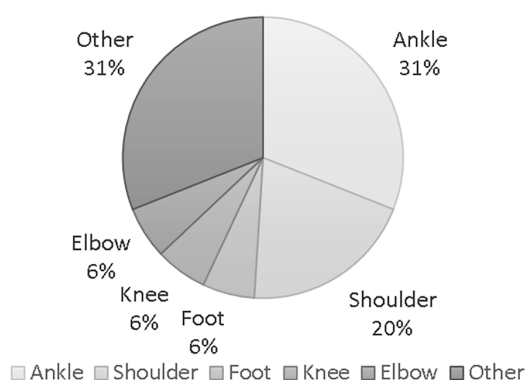


Figure 3. Epidemiology

This is also supported by previous results that show the shoulders and knees as locations at risk of overuse injury (Aido, Massada, Leita, Magalhaes, & Puga, 2011; Augustsson et al., 2006; Aagard & Jorgensen, 1996; Bere et al., 2015). It is also reported that the female population has more chronic overuse shoulder problems (Aagard & Jorgensen, 1996). Also, players reported that they could not finish the match 80% of the time,

and 40% of the time it resulted in absences of two to four weeks.

Interest should be focused on overuse injuries and injuries of the shoulders since they can be affected by changes in training methodology, monitoring, and planning. It should be noted (Figure 4) that almost half of the injuries occurred in contact with another player. Nesic, Ilic, Sikimic, and Dopsaj (2011) also provided similar data.

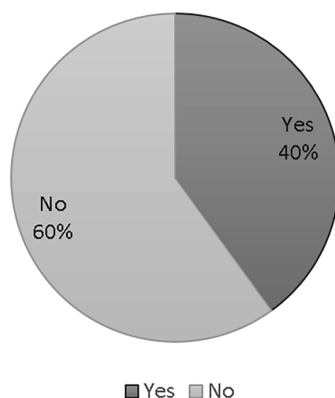


Figure 4. Contact

Discussion

Evidence suggests that little has changed regarding injury typology in the last two decades, and Serbian elite players do not differ from other athletes. From the data collected, it can be assumed that cumulative training and game hours in addition to volleyball sport specific requirements could pose an increased risk from overuse injuries. Even though ankle injuries were the most commonly reported ones, shoulder injuries were the most chronic, while the jumping phase and spiking had the highest risk.

This calls for further discussion of how preventive programs and methodologies can be improved to reduce the risk of occurrence. Taking all evidence into consideration, it should be proposed that future advanced training techniques and research should be aimed to improve monitoring in the developmental phase of players and younger categories. Many individual characteristics may express their effects in later stages, especially as overuse injuries. To improve the resting and recovery techniques and mechanisms should also be suggested for further research goals.

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Conflict of Interest

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SHORT REPORT

Test of the Jump Service Spin in Volleyball

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Abstract

This pilot study aimed to test a procedure to evaluate the improvement of the performance in the short term between incoming and outgoing periods of the volleyball fundamental of the spin jump service by measuring accuracy and differential in the jump. The procedure was performed on a sample of 11 male players (amateur team), aged between 15 and 20 years. Data were collected at the beginning and the end of a four-week intensive training period and included mean and standard deviation of anthropometric data, reach to a hand, Vertec testing, and estimation of the training effect with percentages of improvement. The statistical analysis of the data was conducted with a T-test to verify the difference between the pre and post-workout. The significant difference was set with $p < 0.05$. After four weeks of training, the jump increased by 3.45 cm. In the jump service with a choice of area, the training has produced a precision increase of 16%; while in the jump service in Zone 1, it produced an increase of 16%. Testing the spin service is useful because it enables monitoring performance, designing the training properly, and choosing the most effective training methodology. This test can be a fundamental tool for training and for identifying the best adaptations to be made to the training programme.

Key words: volleyball, jump test, intensive training, performance

Introduction

Several reasons exist for sport testing. The first enables quantifying the athlete's potential, as well as his athletic and technical qualities (Ferrara, Di Tore, & Gaetano, 2018); the second allows setting a correct training methodology (Raiola, 2017) and the third verifying and monitoring the effectiveness of the training and changes in physical condition (D'Isanto, Altavilla, & Raiola, 2017). For both coaches and athletes, it is imperative to periodically monitor the results of training programmes (D'Elia, Mazzeo, & Raiola, 2018). The tests constitute, especially for coaches, a fundamental and highly effective instrument of periodic control; due to the analysis of its results and the received feedback, it is possible to relate the performance with the adopted working strategies (Altavilla, D'Isanto, Di Tore, & Raiola, 2018a) and consequently identify the best adaptations to be made to the training programme being administered to the athletes. The aim of the present study is to analyse and evaluate the jumping ability and technical skills in the fundamental of the

spin jump service in a volleyball team, verifying the effects induced after a four-week training period. The service (Raiola, Altavilla, De Luca, & Di Tore, 2016) in the spin jump is carried out by throwing the ball forward-high inside the baseline so that the player can advance and jump to hit it on the fly with the body fully extended. The spin jump service requires good body control ability and muscle tone, which guarantees the executive safety of the jump; the jump phase and its subsequent landing require strong muscle-articular control capacity, as the impact of relapse has a traumatic value. If an athlete becomes very skilled in feet-to-ground service (Parisi & Raiola, 2014), he can switch to the jumping technique.

Methods

The statistical sample comprises one group of 11 players (under 20) participating in the provincial championship (Mean = 19.2 ± 0.7 years; height: 181.5 ± 5.52 ; weight: 76.0 ± 10.79 ; reach with one hand: 232.2 ± 7.08). These eleven young Italian players have been tested regarding anthropometric aspects,



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physical ability, and technical ability. The tests were carried out before and after the four-week training period, the players performed specific technical work and adequate warm-ups (Altavilla, Di Tore, & D'Isanto, 2018b) before each training or test. During the four weeks of training, the players performed general and specific strength work to improve their jumping ability and their general physical condition. As far as the technical aspect is concerned, the exercises were carried out to improve service techniques, specifically ball throwing technique, run-up, shot-in-flight management, and ball rotation technique (spin effect). In some phases of technical training, a video camera was used to record the images of the technical gesture to help each athlete notice any errors in the execution. Training hours between pre- and post-testing were comprised of physical training (5h 30m), technique (9h 30m), and phases of game-friendly matches (11h 30m) for a total of 26h 30m. The time dedicated to the training of the float serve (with jump service spin) was 5h 45m.

The following tests were used:

Anthropometric tests: Height (cm); Weight(kg); One-handed reach (cm)

Physical ability tests: Vertec jump test: the athlete makes a run-up and tries to reach as high as possible with the dominant

hand; each athlete makes three jumps, performed after proper recovery. In the end, the average value is calculated, which is taken as the reference value for the test performed. Furthermore, by subtracting the value of the reach to a single hand from the average three jumps, the value of the differential from the ground of the jump is obtained.

Technical ability test: Spin Jump Service: each player must perform 10 jump spin serves (5 to an area of the opponent's field of his choice, 5 to an area established by the coach or Zone 1).

Measures of central tendency and dispersion (average \pm standard deviation) of height, weight and flow rate with one hand were performed on a group of 11 subjects. A t-test was conducted to verify the differences between the pre-post (Vertec Jump and spin Jump service) and the percentages related to improvement. The analysis concerned the basic statistics and the percentages for the considered date.

Results

With the Vertec jump test (Table 1), a difference been detected between two series of jumps (in 11-September and 09-October) between pre and post (3.45 cm), representing an improvement of 16%.

Table 1. Vertec jump test

Player	11 - Sept		09 - Oct		Diff. Jump Test 2- Test 1
	Average	Difference Jump	Average	Difference Jump	
1	291.3	64.3	295.3	68.3	4.0
2	282.0	57.0	282.7	57.7	0.7
3	299.0	61.0	304.7	66.7	5.7
4	297.3	53.3	304.7	60.7	7.3
5	295.7	60.7	299.3	64.3	3.7
6	291.3	60.3	292.0	61.0	0.7
7	291.3	54.3	294.7	57.7	3.3
8	292.7	69.7	298.7	75.7	6.0
9	285.3	54.3	286.0	55.0	0.7
10	293.3	52.3	294.0	53.0	0.7
11	281.3	59.3	286.7	64.7	5.3
Mean	291.0	58.8	294.4	62.2	3.45
Stand. D.	5.57	5.00	6.93	6.26	2.36

A t-test (Table 2) was conducted to check the differences between the two series of jump with the Vertec jump test.

The result is a significant difference with $p=0.001$ between the two series of jumps.

Table 2. T-test (significant difference with $p=0.001$ between the two series of jump)

	Average	Std. Dev.	Average Std. error	t	Sign. (with two tails)
VAR01 - VAR02	-3.4818	2.4806	.74794	-4.655	.001

Each athlete performed two series of five spin jump services (11 September and 9 October) to an area of their choice in

the opponent's field (Table 3). Accuracy increased from 30.9% pre- to 47.24% post-test (an increase of approximately 16%).

Table 3. Spin jump Service, free choice area

Player	11 - Sept		09 - Oct	
	O	X	O	X
1	2	3	2	3
2	3	2	3	2
3	1	4	2	3
4	1	4	2	3

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Player	11 - Sept		09 - Oct	
	O	X	O	X
5	2	3	2	3
6	3	2	3	2
7	1	4	2	3
8	1	4	2	3
9	1	4	3	2
10	1	4	2	3
11	1	4	3	2
Total	17	38	26	29
Positiveness	30.9%		47.27%	

Legend: O-centred goal; X-error

A t-test was conducted to check the differences between the two sets of results at the free choice area. The result is a significant difference with $p=0.005$ between the two sets of results at the free choice area (Table 4).

Table 4. T-test (significant difference with $p=0.005$ between the two sets of results at free choice area)

	Average	Std. Dev.	Average Std. error	t	Sign. (with two tails)
VAR01 - VAR02	-.81818	.75076	.22636	-3.614	.005

Each athlete has two spin jump service series (11 September and 9 October) towards Zone 1 (Table 5) of the opposing field (area chosen by the coach). The accuracy has gone from 60% pre-test to 76.4% post-test (increase of approximately 16%).

Table 5. Spin jump service to Zone 1

Player	11 - Sept		09 - Oct	
	O	X	O	X
1	2	3	3	2
2	3	2	4	1
3	4	1	4	1
4	3	2	4	1
5	2	3	3	2
6	3	2	4	1
7	4	1	4	1
8	3	2	4	1
9	2	3	4	1
10	3	2	4	1
11	4	1	4	1
Total	33	22	42	13
Positiveness	60%		76.4%	

Legend: O-goal; X-error

A t-test was conducted to check the differences between the two sets of results with service to Zone 1 (Table 6). A significant difference with $p=0.001$ between the two sets of results with service to Zone 1.

Table 6. T-test (significant difference with $p=0.001$ between the two sets of results with service to Zone 1)

	Average	Std. Dev.	Average Std. error	t	Sign. (with two tails)
VAR01 - VAR02	-.81818	.60302	.18182	-4.500	.001

Discussion

Through the statistical processing (t-test with $p < 0.05$) of the data, it emerged that following the training sessions carried out in the four weeks between pre- and post-testing, there was an average increase of 3.45 cm in the jump differential at the Vertec jump test (Table 1). The result of the t-test between the two series of jumps in Table 2 ($p=0.001$) was also confirmed. In data processing of the statistics and parametric

cs (t-test with $p < 0.05$) on the spin jump service towards the area of the opposing field chosen by each individual player, the services that hit the target zone have gone from 17 to 55 to 26 out of 55 with an increase in the accuracy of this specific service by 16% (Table 3). The results of t-test between the two sets of results at free choice area in Table 4 ($p=0.005$) were also confirmed. The services directed towards the area of the opposing field chosen by the coach (Zone 1) went from 33

out of 55 to 42 out of 55 with an estimate of the effect of training on the precision of 16% (Table 5). From the result of the t-test, the two sets of results with service to zone 1 in table 6 ($p=0.001$) were also confirmed.

The research conducted is a pilot study for a small sample size (11 players) and for the shortness of the route between the incoming and outgoing tests (4 weeks). The test is a tool that enables a very effective periodic check and, due to the analysis of its results and the feedback received, it is possible to correlate the performance with the work strategies adopted. Therefore, with this operational strategy, it is possible to identify the best adaptations to be made to the training programme that is given to the athletes. To optimize monitoring and programming, this study is repeated several times during the competitive season (preparation phase - core championship phase - end of the championship) to periodically verify whether there are improvements in physical and technical performance.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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SHORT REPORT

Dispositional Factors and Sportsmanship in Italian Athletes

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Abstract

The research focused on dispositional factors determining fair play is a matter of debate. In this vein, sportsmanship has been considered to be a multidimensional construct reflecting how athletes are inclined to play sport. Previous investigations found significant associations between motivational orientations and sportsmanship. To date, little attention has been paid to the construct of the trait of self-control in predicting sportsmanship and to the role of gender differences in this relationship. This study analysed not only the associations between task and ego orientation, trait self-control and sportsmanship in order to determine the best predictor of sportsmanship, but also to verify whether the linkages were confirmed in the gender subgroups. Competitive level athletes (N=674, 387 males and 287 female; M=27.23 years, SD=10.01) completed a questionnaire including the scales of goal orientation, self-control and sportsmanship. Descriptive statistics, bivariate correlations, and regression analyses were applied to the data. The results indicated positive associations between task orientation, self-control and sportsmanship, and between task orientation and self-control. No significant association emerged between ego orientation and self-control in the total sample and in the gender subgroups. Sportsmanship was influenced positively by task orientation and age in all groups and negatively by ego orientation in the total sample and in the male group. A weak but significant relationship between trait self-control and sportsmanship was found only in the total sample. These findings suggested further analyses of the mediating/moderating role played by self-control in the indirect relationships between goal orientations and sportsmanship in relation to gender differences.

Key words: sportsmanship, task orientation, ego orientation, trait self-control, gender differences

Introduction

In light of the various forms of unethical behaviour, which continually increase on and around playing fields, psychologists are carefully reflecting on the dispositional factors that could reduce or eliminate such behaviours and promote prosocial conduct generally defined as sportsmanship. The construct has been analysed from a threefold perspective, referring to Bandura's social cognitive approach, to the structural developmental model based on moral reasoning, and to the social-psychological approach (Vallerand, Brière, Blanchard, & Provencher, 1997). The last perspective, adopted in this research, focuses on how athletes are inclined to play sport (their prosocial and antisocial behaviour) and includes a multidimensional factor: "concern and respect for the rules and officials, social conventions, the opponent, as well as

one's full commitment to one's sport and the relative absence of a negative approach to sport participation" (Vallerand et al., 1997).

Among the dispositional factors, sportsmanship has been examined in relation to the goal perspective based on the Achievement Goal Theory (AGT; Nicholls, 1989). This conceptual framework posits that individuals achieve competence-based aims in evaluating settings including sport (Duda & Nicholls, 1992). Competence (i.e., the perception of ability) is the core variable comprising two orthogonal goal orientations: task and ego. Task-oriented athletes are motivated by personal mastery to achieve specific performance standards/goals of higher ability: success and failure depend on the self-referenced perceptions of their own performance. Ego-oriented athletes are motivated by normative competence, such as demonstrating higher ability or beating



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opponents: success and failure are evaluated by comparing their own performance with the performance of competitors.

Past research showed consistent associations between athletes' achievement goals and socio-moral functioning: ego-oriented goals were generally linked to unsporting behaviours, whereas task-oriented goals were related to pro-social attitudes and behaviours (Bortoli, Bertollo, Hanin, & Robazza, 2012; Monacis, de Palo, & Sinatra, 2015).

Dispositional self-control, defined as the capacity to alter one's responses to achieve a desired state that otherwise would not arise naturally (e.g., Bauer & Baumeister, 2011), is a further factor considered in literature in association with positive outcomes (Tangney, Baumeister, & Boone, 2004): when self-control is impaired, anti-social behaviours generally increase. In the specific sport context, recent empirical investigations have highlighted the main role of trait self-control in the regulation of maladaptive behaviours (Sofia & Cruz, 2016), as well as its mediating role in the relationships between motivational orientations and sportsmanship. Indeed, the construct was predicted positively by task orientation and negatively by ego orientation, and it indirectly influenced sportsmanship via aggressiveness (de Palo, Monacis, Carlucci, Tanucci, & Sinatra, 2019).

Consequently, the first aim of the current explorative research was to examine the associations between task and ego orientation, trait self-control and sportsmanship in order to determine the best predictor of sportsmanship in a sample of Italian athletes. The second aim was to verify whether the linkages were confirmed in the gender subgroups.

Methods

Participants

The sample consisted of 674 competitive level athletes (387 males and 287 females; $M=27.23\pm10.01$). They competed in soccer and martial arts. Participants voluntarily completed a questionnaire on site and before the beginning of their performances. Anonymity and confidentiality were clearly stressed through verbal and written instructions. Informed consent was obtained

before collecting information. The study procedures were carried out in accordance with the Declaration of Helsinki. The study design was approved by the Research Committee of the University of Bari.

Instruments

Multidimensional Sport Orientation Scale (MSOS). The Italian version of the Multidimensional Sport Orientation Scale (de Palo et al., 2019) was used to measure the sportsmanship orientations according to Vallerand's approach. The scale includes 20 items rated on a five-point Likert scale (from "does not correspond at all to me" to "corresponds exactly to me"). The level of internal consistency of the total score was high with $\alpha=0.88$. High scores indicate athletes' fair play.

The Italian version of the Task- and Ego-Orientation in Sport Questionnaire (TEOSQ; Bortoli & Robazza, 2005) assesses individuals' tendency to judge their own competence in goal achievement. Task-oriented individuals tend to be self-referenced, whereas ego-oriented individuals tend to compare themselves to others. The scale measures the two orthogonal orientations with seven task-orientated items and six ego-orientated items rated on a five-point Likert scale (1=Totally disagree, 5=Totally agree). In the present study, $\alpha=0.83$ for Task-orientation and $\alpha=0.77$ for Ego-orientation.

The Brief Self-Control Scale (BSCS; Tangney et al., 2004) consists of 13 items assessing dispositional self-regulatory behaviours. Each item is rated on a five-point Likert scale (1=Not like me at all, 5=Very much like me). In this study, $\alpha=0.85$ for the total score.

Data analysis

Data were analysed using descriptive statistics, bivariate correlations and regression analyses with SPSS20. P-values for statistical significance were set at <0.05 .

Results

Table 1 shows descriptive statistics for the total sample, males and females of the variables of interest.

Table 1. Descriptive statistics of the total sample (N=674) and of the male (N=387) and female groups (N=287)

	Total Sample		Males		Females	
	Min-Max	Mean \pm SD	Min-Max	Mean \pm SD	Min-Max	Mean \pm SD
Sportsmanship	41-100	80.114 \pm 11.232	41-100	80.768 \pm 11.4693	45-100	78.630 \pm 10.488
Task Orientation	7-35	30.35 \pm 4.110	7-35	30.42 \pm 4.032	13-35	30.42 \pm 4.032
Ego Orientation	6-30	12.39 \pm 4.069	6-30	12.55 \pm 4.065	6-27	12.03 \pm 4.062
Trait Self-control	15-65	45.62 \pm 8.554	15-65	45.61 \pm 8.638	19-62	45.62 \pm 8.736

Table 2 reports bivariate correlations coefficients among the variables in the total sample.

Table 2. Bivariate correlations among the variables of interest in the total sample

	Task Orientation	Ego Orientation	Trait Self-control
Sportsmanship	0.449**	-0.118**	0.177**
Task Orion	-	0.065	0.197**
Ego Orientation	0.065	-	-0.051
Trait Self-control	0.197**	-0.051	-

Legend: ** $p<0.01$

Table 3 and 4 shows associations in the males and females group.

Table 3. Bivariate correlations among the variables of interest among males

	Task Orientation	Ego Orientation	Trait Self-control
Sportsmanship	0.449**	-0.152**	0.162**
Task Orion	-	0.057	0.152**
Ego Orientation	0.057	-	-0.042
Trait Self-control	0.152**	-0.042	-

Legend: **p<0.01

The results indicated positive associations between sportsmanship, task orientation and self-control, and between task orientation and self-control in the total sample and in the gender subgroups. Negative associations between sportsmanship

and ego orientation emerged in the total sample and in the male group. No association between ego orientation and self-control was found in the three groups.

Table 4. Bivariate correlations among the variables of interest among females

	Task Orientation	Ego Orientation	Trait Self-control
Sportsmanship	0.450**	-0.054	0.220**
Task Orion	-	0.078	0.295**
Ego Orientation	0.078	-	-0.054
Trait Self-control	0.220**	-0.054	-

Legend: **p<0.01

Causal relationships were examined in each group by statistical regression analyses using sportsmanship as a dependent variable and the other constructs as independent variables. In the total sample, when sportsmanship was predicted, task orientation ($\beta=0.443$, $p<0.01$), age ($\beta=0.300$, $p<0.01$), ego orientation ($\beta=-0.111$, $p<0.01$), and self-control ($\beta=0.065$, $p<0.05$) were found to be significant predictors. The overall model fit was $R^2=0.318$ and accounted for 31% of the variance ($\text{Adj}R^2=0.315$). In the male group task orientation ($\beta=0.438$, $p<0.01$), age ($\beta=0.318$, $p<0.01$), and ego orientation ($\beta=-0.135$, $p<0.01$) emerged as significant predictors. The construct of self-control resulted in a non-significant predictor ($\beta=0.066$, $p=0.059$). The overall model fit was $R^2=0.341$ and accounted for 34% of variance ($\text{Adj}R^2=0.336$). In the female group task orientation ($\beta=0.451$, $p<0.01$) and age ($\beta=0.188$, $p<0.01$) were significant predictors. Two constructs were not significant, ego orientation ($\beta=-0.058$, $p=0.302$) and self-control ($\beta=0.073$, $p<0.215$). The overall model fit was $R^2=0.250$ and accounted for 24 % of variance ($\text{Adj}R^2=0.238$).

Discussion

The aims of this research were to examine the associations between task and ego orientation, trait self-control and sportsmanship in order to determine the best predictor of sportsmanship in a sample of Italian athletes and to verify whether these linkages were confirmed in the gender subgroups. Generally, findings supported the positive bivariate associations as well as the positive predictors of sportsmanship in the three groups. This means that task-oriented athletes with increasing age tend to play respecting rules, social conventions, opponents, and accepting defeat and victory. Conversely, ego-oriented athletes tend to evaluate their performance using other-referenced criteria and to display transgressive behaviours. These results are conceptually and empirically consistent with past investigations (Gonçalves, Silva, Cruz, Torregrosa, & Cumming, 2010; Lucidi, Zelli, Mallia, Nicolais, Lazuras, & Hagger, 2017; Monacis, de Palo, & Sinatra, 2014; Monacis et al., 2015). It is noteworthy that self-control seems to determine et-

hic sport behaviours, but only to a lesser extent. Consequently, future research should analyse more in-depth the mediating/moderating role of this trait in explaining the linkage between goal orientations and sportsmanship between genders.

Finally, the finding that sportsmanship was not predicted by ego orientation in females is consistent with previous studies reporting that more experienced athletes, particularly males, accept more aggressive and unsportsmanlike behaviours. This tendency has been explained by the observation that aggressive behaviours in sport are more socially acceptable for males than for females (Corrion et al., 2010). These findings may be ascribed to gender stereotypes that create different social expectations concerning males' and females' social behaviour: males are expected to be more aggressive than females who are more willing to value peer relationships, cooperate with others, and adhere to social rules and role expectations.

Despite the limitations of this study, at least three important implications can be derived. First, the findings provide further empirical evidence for predicting prosocial sport behaviours according to a dispositional perspective. Second, they show that the role of trait self-control should be better analysed in the indirect relationships between the two orientations and sportsmanship. Third, they provide some insights to implications for developing interventions and educational programmes to engender better moral functioning in male competitive athletes.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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SHORT REPORT

The Influence of Animation Programmes on Tourists' Satisfaction: The Role of Animators

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Abstract

Animation programmes represent a specific range of services and facilities that complement and improve the overall range of tourism service. Animation activities provide a wide range of services that are intended to provide more than expected for tourists. Therefore, to respond to tourists' various requests and needs, the role of animators in animation programmes is essential. In other words, tourists' satisfaction could be achieved via the tourist animators' competences, since they are intended to make the stay at the tourist destinations as pleasant as possible. However, it is necessary to note that there is a large gap in the literature concerning the importance of animation programmes and animators for tourism services. To overcome this deficit in the literature, this paper analyses the influence of different animator competences on the tourists' satisfaction to determine their importance for the tourist services. Using the Tobit model on a sample of 30 tourists, the results show that the relation between tourists' satisfaction and animator competences associated with patience, qualification, and organization, is positive and statistically significant. Based on the obtained results, we have suggested mechanisms for further development in this field, focusing on the constant improvement of the animator competences and animation programmes.

Key words: animation programmes, animator competences, tourists' satisfaction

Introduction

Tourism is considered to be a global socio-economic phenomenon that contributes significantly to the development of a destination. However, every tourist destination needs to diversify its range of services by relying on various tourist attractions (Pekovic, Perovic, Stanovic, & Vukcevic, 2018). Therefore, to expand the range, especially in terms of diversity, great potential is associated with animation and recreational activities.

Tourism-related actors are becoming increasingly aware of the need for animation and recreational activities in tourism services partly because of the competition on the market but also because these activities can play an important role in the improvement of tourist satisfaction. According to Mikulic and

Prebrazac (2011), animation/recreational programmes are a way to broaden the tourist services through many entertaining activities, thus making tourists' stay richer and more interesting and connecting them with the cultural and natural heritage of the destination.

In every field, including tourism, human capital has an essential and special role and significance (Grgona, 2013). In other words, to achieve tourists' satisfaction, employee professionalism is required since it affects the quality of the service directly. The animator's role in animation and recreational programmes is therefore crucial. The animator is supposed to satisfy the requests and needs of tourists through his skill and knowledge, which would be reflected in tourist experience at the destination (Ivanovski, 2014).



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Furthermore, Duricek and Cynarski (2017) argue that the professional attitude of tourist animator is essential since many well-organized festivities cannot attract visitors these days due to disinterested tourists. Therefore, it is the role of animators to make the programmes more appealing. In other words, the importance of the animator in tourism is in making tourists' experience complete during their stay at a destination.

In the same vein, the results of Wartecka-Wazynska (2014) show that communication skills are very important for animators, especially if the animation programmes target younger populations. Accordingly, in western European destinations, animation and recreation programmes now have a leading role and are not seen as a luxury but as a synonym for leisure time, while animators are considered to be a synonym for recreation (Rokicka-Hebel, Ziolkowska, & Patyna, 2016). Therefore, animators and their teams have the difficult task of organizing appropriate animation programmes that are suitable for various groups of tourists (Djordjevic, 2017). However, Mikulic and Prebezac (2011) point out the lack of literature and knowledge about importance of animation and recreational activities as well as of animators.

Therefore, the goal of this paper is to examine the relationship between animator competences and overall tourist satisfaction.

Methods

As indicated previously, in this research, we will examine

how animator competences affect tourists' satisfaction in Montenegro. We work on a sample of 30 tourists who visited Montenegro in February-April, 2019.

The relationship between animator competences and tourist satisfaction will be empirically analysed using cross-sectional data. The animator competences were measured using the following indicators: kindness, interaction, patient, qualification, communication, organization, and professionalism. Moreover, since our dependent variable is count one, we will employ the Tobit model.

Results

The results of the Tobit model are presented in Table 1. We can see that three competences (patience, organization, and qualification of animators) have a positive and significant impact on tourists' overall satisfaction. On the other side, the competences of kindness and communicativeness do not have significant impact on tourists' satisfaction. Surprisingly, the competences related to interaction and professionalism have a negative effect on tourists' satisfaction. Therefore, it should be noted that further investment is needed to improve those competences.

It is noteworthy that the coefficients are negative even though our control variables do not have a significant effect on tourists' satisfaction. We assume that this negative effect could be overcome by proposing diverse animation programmes in Montenegro.

Table 1. Results of the Tobit model

Variables	Coefficient
Constant	1.76***
Animators are kind	0.09
Animators encourage interaction	-0.35*
Animators are patient	0.45***
Animators are qualified	0.46***
Animators are communicative	0.10
Animators are well-organized	0.28**
Animators are professional	-0.38*
Frequency of holidays per year	-0.16
Not first time in Montenegro	-0.20
Days staying in Montenegro	-0.21
Frequency of participating in animation programmes during last two trips	-0.10
Time devoted to animation programmes	0.06
R2	0.51

Legend: (*), (**) and (***) - indicate parameter significance at the 10, 5 and 1 per cent levels, respectively

Discussion

Animation programmes are considered to have an essential role in broadening the range of tourism services (Nesic, 2010). Therefore, developed tourist destinations provide different animation programmes. For animation programmes to fulfil tourists' needs, the human role in animation and recreational programmes is significant. Tourist destinations and the hotel industry have recognized human work as an essential feature that affects tourist satisfaction (Kang, Gatling, & Kim, 2014). However, there is limited literature and a lack of knowledge concerning the importance of animation programmes and animators. Therefore, in this paper, we have analysed the importance of animators for tourist satisfaction: in other

words, whether and how competences of an animator affect tourist satisfaction.

Based on the results from the Tobit model, we may conclude that certain animator competences positively influence tourists' satisfaction. More precisely, the obtained findings indicate that competences associated with the patience, qualification, and organization of animators improve tourists' satisfaction. In contrast, kindness, encouraging interaction with guests, communicativeness, and professionalism do not enhance tourist satisfaction. Our results are in line with those of Perovic et al. (2018), who indicated the importance of intangible factors such as patience for the improvement of tourists' satisfaction.

Overall, it could be concluded that animator competences

are one of the main conditions for achieving economic benefit. Moreover, we can suggest that animations and recreational programmes, as well as animators, can allow hotels and tourist destinations to improve general expectations and tourists' satisfaction (Markus, Perovic, Pekovic, & Popovic, 2019).

Managerial implications of this paper are various. Hotel managers should pay attention to human resources management since it is related to the structure and the quality of the range of services available. Every hotel is facing a battle on the market to bring more guests not just for a few months but throughout the season. Including animation and recreational programmes in a hotel's range of services allows it to be broadened, has positive economic effects and makes their positions on the market more stable. Animation programs also represent an impulse for the implementation and improvement of new activities in accordance with tourists' needs and requests.

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Conflict of Interest

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Review papers should provide concise in-depth reviews of both established and new areas, based on a critical examination

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After the manuscript has been accepted, authors will receive a PDF version of the manuscripts for authorization, as it should look in printed version of SM. Authors should carefully check for omissions. Reporting errors after this point will not be possible and the Editorial Board will not be eligible for them.

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2. MANUSCRIPT STRUCTURE

2.1. Title Page

The first page of the manuscripts should be the title page, containing: title, type of publication, running head, authors, affiliations, corresponding author, and manuscript information. See example:

Talented High School Football Players' Perception of Talent Identification Criteria

Original Scientific Paper

Talent Identification Criteria

Vazjwar Matin¹ and Stig Arve Sæther¹

¹University of Science and Technology, Department of Sociology and Political Science, Trondheim, Norway

Corresponding author:

S. A. Sæther

Norwegian University of Science and Technology

Department of Sociology and Political Science

Dragvoll, 7491 Trondheim, Norway

E-mail: stigarve@ntnu.no

Word count: 2,946

Abstract word count: 236

Number of Tables: 3

Number of Figures: 0

2.1.1. Title

Title should be short and informative and the recommended length is no more than 20 words. The title should be in Title Case, written in uppercase and lowercase letters (initial uppercase for all words except articles, conjunctions, short prepositions no longer than four letters etc.) so that first letters of the words in the title are capitalized. Exceptions are words like: “and”, “or”, “between” etc. The word following a colon (:) or a hyphen (-) in the title is always capitalized.

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Authors should suggest the type of their submission.

2.1.3. Running head

Short running title should not exceed 50 characters including spaces.

2.1.4. Authors

The form of an author's name is first name, middle initial(s), and last name. In one line list all authors with full names separated by a comma (and space). Avoid any abbreviations of academic or professional titles. If authors belong to different institutions, following a family name of the author there should be a number in superscript designating affiliation.

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Affiliation consists of the name of an institution, department, city, country/territory (in this order) to which the author(s) belong and to which the presented / submitted work should be attributed. List all affiliations (each in a separate line) in the order corresponding to the list of authors. Affiliations must be written in English, so carefully check the official English translation of the names of institutions and departments.

Only if there is more than one affiliation, should a number be given to each affiliation in order of appearance. This number should be written in superscript at the beginning of the line, separated from corresponding affiliation with a space. This number should also be put after corresponding name of the author, in superscript with no space in between.

If an author belongs to more than one institution, all corresponding superscript digits, separated with a comma with no space in between, should be present behind the family name of this author.

In case all authors belong to the same institution affiliation numbering is not needed.

Whenever possible expand your authors' affiliations with departments, or some other, specific and lower levels of organization.

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Corresponding author's name with full postal address in English and e-mail address should appear, after the affiliations. It is preferred that submitted address is institutional and not private. Corresponding author's name should include only initials of the first and middle names separated by a full stop (and a space) and the last name. Postal address should be written in the following line in sentence case. Parts of the address should be separated by a comma instead of a line break. E-mail (if possible) should be placed in the line following the postal address. Author should clearly state whether or not the e-mail should be published.

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All authors are required to provide word count (excluding title page, abstract, tables/figures, figure legends, Acknowledgements, Conflict of Interest, and References), the Abstract word count, the number of Tables, and the number of Figures.

2.2. Abstract

The second page of the manuscripts should be the abstract and key words. It should be placed on second page of the manuscripts after the standard title written in upper and lower case letters, bold.

Since abstract is independent part of your paper, all abbreviations used in the abstract should also be explained in it. If an abbreviation is used, the term should always be first written in full with the abbreviation in parentheses immediately after it. Abstract should not have any special headings (e.g., Aim, Results...).

Authors should provide up to six key words that capture the main topics of the article. Terms from the Medical Subject Headings (MeSH) list of Index Medicus are recommended to be used.

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Abstract

Results of the analysis of

Key words: *spatial memory, blind, transfer of learning, feedback*

2.3. Main Chapters

Starting from the third page of the manuscripts, it should be the main chapters. Depending on the type of publication main manuscript chapters may vary. The general outline is: Introduction, Methods, Results, Discussion, Acknowledgements

(optional), Conflict of Interest (optional). However, this scheme may not be suitable for reviews or publications from some areas and authors should then adjust their chapters accordingly but use the general outline as much as possible.

2.3.1. Headings

Main chapter headings: written in bold and in Title Case. *See example:*

- ✓ **Methods**

Sub-headings: written in italic and in normal sentence case. Do not put a full stop or any other sign at the end of the title. Do not create more than one level of sub-heading. *See example:*

- ✓ *Table position of the research football team*

2.3.2 Ethics

When reporting experiments on human subjects, there must be a declaration of Ethics compliance. Inclusion of a statement such as follow in Methods section will be understood by the Editor as authors' affirmation of compliance: "This study was approved in advance by [name of committee and/or its institutional sponsor]. Each participant voluntarily provided written informed consent before participating." Authors that fail to submit an Ethics statement will be asked to resubmit the manuscripts, which may delay publication.

2.3.3 Statistics reporting

SM encourages authors to report precise p-values. When possible, quantify findings and present them with appropriate indicators of measurement error or uncertainty (such as confidence intervals). Use normal text (i.e., non-capitalized, non-italic) for statistical term "p".

2.3.4. 'Acknowledgements' and 'Conflict of Interest' (optional)

All contributors who do not meet the criteria for authorship should be listed in the 'Acknowledgements' section. If applicable, in 'Conflict of Interest' section, authors must clearly disclose any grants, financial or material supports, or any sort of technical assistances from an institution, organization, group or an individual that might be perceived as leading to a conflict of interest.

2.4. References

References should be placed on a new page after the standard title written in upper and lower case letters, bold.

All information needed for each type of must be present as specified in guidelines. Authors are solely responsible for accuracy of each reference. Use authoritative source for information such as Web of Science, Medline, or PubMed to check the validity of citations.

2.4.1. References style

SM adheres to the American Psychological Association 6th Edition reference style. Check "American Psychological Association. (2009). Concise rules of APA style. American Psychological Association." to ensure the manuscripts conform to this reference style. Authors using EndNote® to organize the references must convert the citations and bibliography to plain text before submission.

2.4.2. Examples for Reference citations

One work by one author

- ✓ In one study (Reilly, 1997), soccer players
- ✓ In the study by Reilly (1997), soccer players
- ✓ In 1997, Reilly's study of soccer players

Works by two authors

- ✓ Duffield and Marino (2007) studied
- ✓ In one study (Duffield & Marino, 2007), soccer players
- ✓ In 2007, Duffield and Marino's study of soccer players

Works by three to five authors: cite all the author names the first time the reference occurs and then subsequently include only the first author followed by et al.

- ✓ First citation: Bangsbo, Iaia, and Krstrup (2008) stated that
- ✓ Subsequent citation: Bangsbo et al. (2008) stated that

Works by six or more authors: cite only the name of the first author followed by et al. and the year

- ✓ Krstrup et al. (2003) studied
- ✓ In one study (Krstrup et al., 2003), soccer players

Two or more works in the same parenthetical citation: Citation of two or more works in the same parentheses should be listed in the order they appear in the reference list (i.e., alphabetically, then chronologically)

- ✓ Several studies (Bangsbo et al., 2008; Duffield & Marino, 2007; Reilly, 1997) suggest that

2.4.3. Examples for Reference list

Journal article (print):

- Nepocatych, S., Balilionis, G., & O'Neal, E. K. (2017). Analysis of dietary intake and body composition of female athletes over a competitive season. *Montenegrin Journal of Sports Science and Medicine*, 6(2), 57-65. doi: 10.26773/mjssm.2017.09.008
- Duffield, R., & Marino, F. E. (2007). Effects of pre-cooling procedures on intermittent-sprint exercise performance in warm conditions. *European Journal of Applied Physiology*, 100(6), 727-735. doi: 10.1007/s00421-007-0468-x
- Krstrup, P., Mohr, M., Amstrup, T., Rysgaard, T., Johansen, J., Steensberg, A., Bangsbo, J. (2003). The yo-yo intermittent recovery test: physiological response, reliability, and validity. *Medicine and Science in Sports and Exercise*, 35(4), 697-705. doi: 10.1249/01.MSS.0000058441.94520.32

Journal article (online; electronic version of print source):

- Williams, R. (2016). Krishna's Neglected Responsibilities: Religious devotion and social critique in eighteenth-century North India [Electronic version]. *Modern Asian Studies*, 50(5), 1403-1440. doi:10.1017/S0026749X14000444

Journal article (online; electronic only):

- Chantavanich, S. (2003, October). Recent research on human trafficking. *Kyoto Review of Southeast Asia*, 4. Retrieved November 15, 2005, from <http://kyotoreview.cseas.kyoto-u.ac.jp/issue/issue3/index.html>

Conference paper:

- Pasadilla, G. O., & Milo, M. (2005, June 27). *Effect of liberalization on banking competition*. Paper presented at the conference on Policies to Strengthen Productivity in the Philippines, Manila, Philippines. Retrieved August 23, 2006, from <http://siteresources.worldbank.org/INTPHILIPPINES/Resources/Pasadilla.pdf>

Encyclopedia entry (print, with author):

- Pittau, J. (1983). Meiji constitution. In *Kodansha encyclopedia of Japan* (Vol. 2, pp. 1-3). Tokyo: Kodansha.

Encyclopedia entry (online, no author):

- Ethnology. (2005, July). In *The Columbia encyclopedia* (6th ed.). New York: Columbia University Press. Retrieved November 21, 2005, from <http://www.bartleby.com/65/et/ethnolog.html>

Thesis and dissertation:

- Pyun, D. Y. (2006). *The proposed model of attitude toward advertising through sport*. Unpublished Doctoral Dissertation. Tallahassee, FL: The Florida State University.

Book:

- Borg, G. (1998). *Borg's perceived exertion and pain scales*: Human kinetics.

Chapter of a book:

- Kellmann, M. (2012). Chapter 31-Overtraining and recovery: Chapter taken from *Routledge Handbook of Applied Sport Psychology* ISBN: 978-0-203-85104-3 *Routledge Online Studies on the Olympic and Paralympic Games* (Vol. 1, pp. 292-302).

Reference to an internet source:

- Agency. (2007). Water for Health: Hydration Best Practice Toolkit for Hospitals and Healthcare. Retrieved 10/29, 2013, from www.rcn.org.uk/newsevents/hydration

2.5. Tables

All tables should be included in the main manuscript file, each on a separate page right after the Reference section.

Tables should be presented as standard MS Word tables.

Number (Arabic) tables consecutively in the order of their first citation in the text.

Tables and table headings should be completely intelligible without reference to the text. Give each column a short or abbreviated heading. Authors should place explanatory matter in footnotes, not in the heading. All abbreviations appearing in a table and not considered standard must be explained in a footnote of that table. Avoid any shading or coloring in your tables and be sure that each table is cited in the text.

If you use data from another published or unpublished source, it is the authors' responsibility to obtain permission and acknowledge them fully.

2.5.1. Table heading

Table heading should be written above the table, in Title Case, and without a full stop at the end of the heading. Do not use suffix letters (e.g., Table 1a, 1b, 1c); instead, combine the related tables. *See example:*

- ✓ **Table 1.** Repeated Sprint Time Following Ingestion of Carbohydrate-Electrolyte Beverage

2.5.2. Table sub-heading

All text appearing in tables should be written beginning only with first letter of the first word in all capitals, i.e., all words for variable names, column headings etc. in tables should start with the first letter in all capitals. Avoid any formatting (e.g., bold, italic, underline) in tables.

2.5.3. Table footnotes

Table footnotes should be written below the table.

General notes explain, qualify or provide information about the table as a whole. Put explanations of abbreviations, symbols, etc. here. General notes are designated by the word *Note* (italicized) followed by a period.

- ✓ *Note.* CI: confidence interval; Con: control group; CE: carbohydrate-electrolyte group.

Specific notes explain, qualify or provide information about a particular column, row, or individual entry. To indicate specific notes, use superscript lowercase letters (e.g. ^{a,b,c}), and order the superscripts from left to right, top to bottom. Each table's first footnote must be the superscript ^a.

- ✓ ^aOne participant was diagnosed with heat illness and n = 19.^bn = 20.

Probability notes provide the reader with the results of the tests for statistical significance. Probability notes must be indicated with consecutive use of the following symbols: * † ‡ § ¶ || etc.

- ✓ *P<0.05, †p<0.01.

2.5.4. Table citation

In the text, tables should be cited as full words. *See example:*

- ✓ Table 1 (first letter in all capitals and no full stop)
- ✓ ...as shown in Tables 1 and 3. (citing more tables at once)
- ✓ ...result has shown (Tables 1-3) that... (citing more tables at once)
- ✓in our results (Tables 1, 2 and 5)... (citing more tables at once)

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On the last separate page of the main manuscript file, authors should place the legends of all the figures submitted separately.

All graphic materials should be of sufficient quality for print with a minimum resolution of 600 dpi. SM prefers TIFF, EPS and PNG formats.

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The price of printing in color is 50 EUR per page as printed in an issue of SM.

2.6.1. Figure legends

Figures should not contain footnotes. All information, including explanations of abbreviations must be present in figure legends. Figure legends should be written below the figure, in sentence case. *See example:*

- ✓ **Figure 1.** Changes in accuracy of instep football kick measured before and after fatigued. SR – resting state, SF – state of fatigue, * $p > 0.01$, † $p > 0.05$.

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All graphic materials should be referred to as Figures in the text. Figures are cited in the text as full words. *See example:*

- ✓ Figure 1
 - × figure 1
 - × Figure 1.
 - ✓ ...exhibit greater variance than the year before (Figure 2). Therefore...
 - ✓ ...as shown in Figures 1 and 3. (citing more figures at once)
 - ✓ ...result has shown (Figures 1-3) that... (citing more figures at once)
 - ✓ ...in our results (Figures 1, 2 and 5)... (citing more figures at once)

2.6.3. Sub-figures

If there is a figure divided in several sub-figures, each sub-figure should be marked with a small letter, starting with a, b, c etc. The letter should be marked for each subfigure in a logical and consistent way. *See example:*

- ✓ Figure 1a
- ✓ ...in Figures 1a and b we can...
- ✓ ...data represent (Figures 1a-d)...

2.7. Scientific Terminology

All units of measures should conform to the International System of Units (SI).

Measurements of length, height, weight, and volume should be reported in metric units (meter, kilogram, or liter) or their decimal multiples.

Decimal places in English language are separated with a full stop and not with a comma. Thousands are separated with a comma.

Percentage	Degrees	All other units of measure	Ratios	Decimal numbers
✓ 10%	✓ 10°	✓ 10 kg	✓ 12:2	✓ 0.056
× 10 %	× 10 °	× 10kg	× 12 : 2	× .056
Signs should be placed immediately preceding the relevant number.				
✓ 45±3.4	✓ p<0.01	✓ males >30 years of age		
× 45 ± 3.4	× p < 0.01	× males > 30 years of age		

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✓ First time appearing: *musculus biceps brachii*

Abbreviated: *m. biceps brachii*



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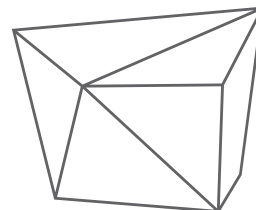
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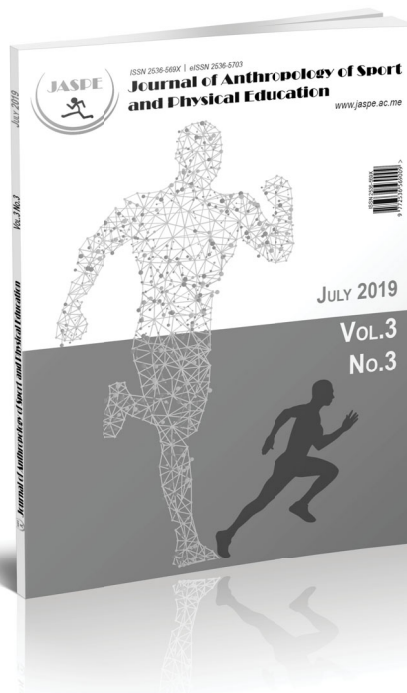
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Journal of Anthropology of Sport and Physical Education (JASPE) is a print (ISSN 2536-569X) and electronic scientific journal (eISSN 2536-5703) aims to present easy access to the scientific knowledge for sport-conscious individuals using contemporary methods. The purpose is to minimize the problems like the delays in publishing process of the articles or to acquire previous issues by drawing advantage from electronic medium. Hence, it provides:

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- Post-publication tools to indicate quality and impact;
- Community-based dialogue on articles;
- Worldwide media coverage.

JASPE is published four times a year, in January, April, July and October of each year. JASPE publishes original scientific papers, review papers, editorials, short reports, peer review - fair review, as well as invited papers and award papers in the fields of Anthropology of Sport and Physical Education, as well as it can function as an open discussion forum on significant issues of current interest.

JASPE covers all aspects of anthropology of sport and physical education from five major fields of anthropology: cultural, global, biological, linguistic and medical.

Prospective authors should submit manuscripts for consideration in Microsoft Word-compatible format. For more complete descriptions and submission instructions, please access the Guidelines for Authors pages at the JASPE website: <http://www.jaspe.ac.me/?sekcija=page&p=51>. Contributors are urged to read JASPE's guidelines for the authors carefully before submitting manuscripts. Manuscripts submissions should be sent in electronic format to jaspe@ucg.ac.me or contact JASPE's Editor:

Bojan MASANOVIC, *Editor-in Chief* – bojanma@ucg.ac.me

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Summer issue – July 2020



Univerzitet Crne Gore

UNIVERZITET CRNE GORE PRAVNI FAKULTET – PODGORICA

UNIVERZITET
CRNE GORE



PRAVNI
FAKULTET
PODGORICA



Faculty of Law was founded on October 27th, 1972 in Podgorica as a scientific and artistic educational institution, in which educational and research work was organized in the area of law and similar social studies. While making into law the establishment of this institution, Assembly of Socialist Republic of Montenegro highlighted that "The establishment of this institution of high education is necessary for meeting overall demands of the society of the Republic". Faculty of Law is one of the founding fathers of the University of Montenegro.

During the forty-five years of its existence Faculty of Law grew to a modern, contemporary, scientific and artistic educational institution. Forty-five generations studied at the faculty. About 17.000 students enrolled at the faculty and 4285 students graduated from the faculty. About 15 percent of the students studied abroad. Part of the best students continued postgraduate and doctoral studies at prominent university centers. Most of the former students stayed in Montenegro due to family ties. 88 professors and associates worked at the faculty, out of whom there were 26 guest professors. Today most of the professors and cadre at the faculty are former students.

Faculty organizes graduate and postgraduate studies. There

are teaching and cadre resources for organizing specialist and doctoral studies in all the areas of law.

As a university branch Faculty of Law realizes a big number of its planned aims and tasks and finds solutions for many important questions of cadre organization, technical and material problems. With the help of the University of Montenegro, faculty largely develops the international cooperation net.

Faculty follows world trends and achievements in the area of high education with the aim to coordinate its work with European and world demands. This year faculty made the first steps in realization of Bologna declaration. There is enough cadre for all the necessary teaching at the faculty.

The faculty was founded because of expression of need to reach the necessary standard for socio-economic, political, cultural and social development of Montenegro. During its overall existence faculty shared the fate with Montenegrin society. It will continue to do so by making steps towards implementing new practises and creating new relations, with the help of implementation of modern European trends.

The faculty is a complex organization and managing institution nowadays.

Faculty of Economics

University of Montenegro

The Faculty of Economics celebrated its 57th anniversary this year, and it is the oldest higher education institution in the country. Since its establishment, 8,630 students graduated at our Faculty.

Today, Faculty of Economics is a largely interdisciplinary institution, characterized by expressed dynamism in its work. Employees at the Faculty are dedicated to constant improvements and enhancements, all in accordance with the needs brought by the changes.

We provide our students with the best theoretical and practical knowledge, enabling them to develop critical spirit in approaching economic phenomena and solving concrete problems in daily work. From September 2017, at the Faculty, the new generation will start a 3 + 2 + 3 study, which will improve the quality of studying.



Development of Faculty of Economics in the coming period will follow the vision of development of the University of Montenegro, pursuing full achievement of its mission

Comprehensive literature, contemporary authors and works have always been imperative in creation of new academic directions at Faculty of Economics, which will form the basis of our future.

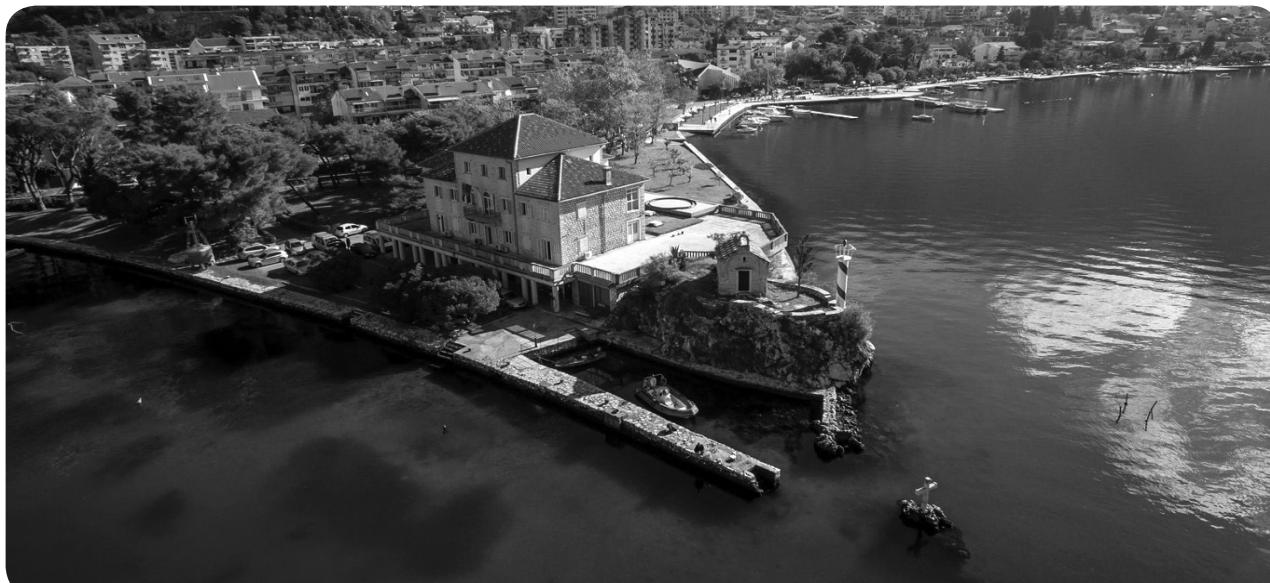
Faculty and its employees are dedicated to developing interest in strengthening the entrepreneurial initiative, creative and interdisciplinary approach among young people, using modern teaching and research methods. In this regard, the Faculty has modern textbooks and adequate IT technology, which supports the objectives set.





Univerzitet Crne Gore

UNIVERZITET CRNE GORE INSTITUT ZA BIOLOGIJU MORA



University of Montenegro – Institute for marine biology is located in Kotor, Montenegro. Since its establishment in 1961, the Institute performed comprehensive research of the marine and coastal area, which has its wide impact to the environmental protection, pollution-prevention and practical application. Core competencies of the Institute are focused on research in the fields of marine conservation, ichthyology and marine fisheries, marine chemistry, aquaculture, plankton research, neuro and eco-physiology. The main research area is investigating and protection of Adriatic sea with special interest of South Adriatic area. Institute for marine biology have a wide range of international cooperation with Marine research institutions and Universities all over Mediterranean area through a numerous EU funded scientific projects.

All over the year Institute is looking to hire a young students from the field of general biology, marine biology, marine chemistry, molecular biology or similar disciplines on voluntary basis to work with us. We need opportunity for international internship or MSc or PhD thesis that could be performed on Institute in our 5 different labs: Fisheries and ichthyology, Aquaculture, Marine chemistry, Plankton and sea water quality and Benthos and marine conservation.

Every year Institute organize several summer schools and workshop for interested students, MSc and PhD candidates. From 01-05 July 2019 we will organize Summer school "Blue Growth: emerging technologies, trends and opportunities" in frame of InnoBlueGrowth Project who is financed by Interreg Med programme. Through the specific theme courses, workshops and working labs offered – covering different areas of the blue economy – the Summer School aims at encouraging young people involvement in blue economy sectors by offering high-quality technical knowledge and fostering their entrepreneurial spirit. The Summer School will facilitate fruitful exchanges and a stronger understanding among a variety of actors coming from different Mediterranean countries with diverse profiles, including representatives from the academia, the public and private sectors, but also potential funders and investors. These activities will count on specific team building activities for participants as well to reinforce interpersonal skills and foster cohesion among blue academia and sectors.

If You are interested apply on the following link: <https://www.ucg.ac.me/objava/blog/1221/objava/45392-ljetnja-skola-plavi-rast-nove-tehnologije-trendovi-i-mogucnosti>

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UNIVERSITY OF MONTENEGRO FACULTY OF MECHANICAL ENGINEERING Podgorica



www.ucg.ac.me/mf

Mechanical engineering studies in Montenegro started during the school year 1970/71. On April 15th, within the Technical Faculty, the Department of Mechanical Engineering was formed. The Department of Mechanical Engineering of the Technical Faculty was transformed in 1978 into the Faculty of Mechanical Engineering, within the University "Veljko Vlahović". Since 1992 the Faculty of Mechanical Engineering is an autonomous University unit of the University of Montenegro. It is situated in Podgorica.

The University of Montenegro is the only state university in the country, and the Faculty of Mechanical Engineering is the only faculty in Montenegro from the field of mechanical engineering.

Activities of the Faculty of Mechanical Engineering can be divided into three fields: teaching, scientific-research work and professional work.

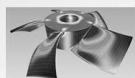
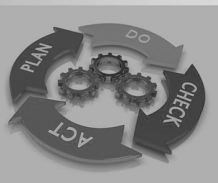
Two study programmes were accredited within the Faculty of Mechanical Engineering:

- Academic study programme MECHANICAL ENGINEERING
- Academic study programme ROAD TRAFFIC

The study programmes are realised according to the Bologna system of studies in accordance to the formula 3+2+3.

On the study program Mechanical Engineering it is possible to study next modules:

- Mechanical Engineering – Production
- Applied Mechanics and Construction
- Energetics
- Energy Efficiency
- Mechatronics
- Quality



At the Faculty of Mechanical Engineering, as organisational units, there are centres and laboratories through which scientific-re- search and professional work is done:

- Centre for Energetics
- Centre for Vehicles
- Centre for Quality
- Centre for Construction Mechanics
- Centre for Traffic and Mechanical Engineering Expertise
- Centre for transport machines and metal constructions
- 3D Centre
- Didactic Centre – Centre for Automation and Mechanomics training
- European Information and Innovation Centre
- Cooperation Training Centre
- Laboratory for Metal Testing
- Laboratory for Turbulent Flow Studies
- Laboratory for Vehicle Testing
- Laboratory for Attesting of Devices on the Technical Examination Line



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MONTENEGRIN OLYMPIC COMMITTEE**

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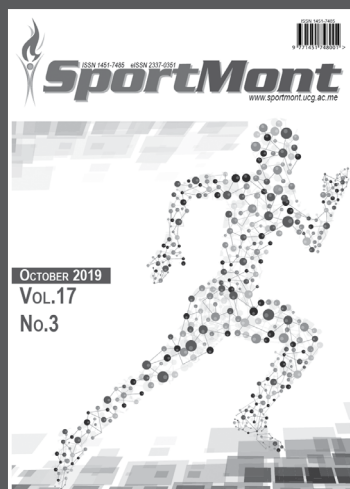
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We have expanded the quality of our journals considerably over the past years and can now claim to be the market leader in terms of breadth of coverage.

As we continue to increase the quality of our publications across the field, we hope that you will continue to regard MSA journals as authoritative and stimulating sources for your research. We would be delighted to receive your comments and suggestions, mostly due to the reason your proposals are always welcome.

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Sport Mont

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www.mjssm.me

MSA Conference 2020

17th Annual Scientific Conference of Montenegrin Sports Academy "Sport, Physical Activity and Health: Contemporary Perspectives"

<http://www.csakademija.me/conference/>



2th - 5th April 2020,
Dubrovnik - Croatia