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Temperature Changes on the Foot during Pregnancy Affected by Wearing Biomechanical Shoes

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ABSTRACT

Introduction: Everyone needs to walk; however, many people have problems with walking caused by non-standard condition or function of their feet, which in some cases can be easily recognized by thermography methods. The question is which internal actors can influence plantar temperature. 20 pregnant women from Czech and Slovak Republic in early stage of pregnancy, aged from 24 to 38 years old were included in the research. In this research, we followed the course of temperature-rested feet and feet returned to its original state after giving birth to clarify the temperature of the feet on any details of the thermal imager in increasing pregnancy will result in a significant increase in the temperature changes during the pregnancy. This fact enables us to explore how plantar pressure changes with increasing body weight for interacting pregnancy changes, as well as weight loss after childbirth, which also offers the opportunity to compare the original and final state and the question of whether the study of temperature has widespread applications across science and industry. Thermal image is able to give us real time two-dimensional temperature measurement (Ring & Ammer, 2011). With a new technology, a single image contains several thousands of temperature points, captured in one second. Average speed rates were 1 to 16 frames per second, temperature resolution was 0.5°C and spatial resolution was about 5 mm at a target size of 50 cm2 (Ring, 1984). Thermal imaging has been used mainly for research over the last 50 years. It has been used to study a number of diseases where skin temperature can reflect the presence of inflammation in underlying tissues, or where blood flow is increased or decreased due to a clinical abnormality (Ring & Ammer, 2011).

Thermography gives us very useful information if the process of change in the pressure load of legs in pregnant women is reversible.

Results of other studies suggest that pregnancy actually causes change in the formula of plantar pressure distribution. It is also necessary to consider whether these changes can somehow alleviate and prevent overloading areas for which such a burden is not usual. In this sense, it offers use of orthopedic aids or special orthopedic shoes, the effect of which should be experimentally tested. One factor related with the degree of blood perfusion of the foot is also temperature as one of the very important indicators.

Pregnancy is usually 38-42 weeks long period in which the woman - expectant mother - is preparing for childbirth and motherhood. This period is characterized by plenty of not only

Key words: Orthopaedic insoles, biomechanical shoes, pregnancy, thermography

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Body changes (see Fig. 1) but also mental changes (Behinová & Kaiser, 2012). In this chapter, we describe briefly the most important physical changes associated with pregnancy, which directly or indirectly affect gait parameters. These changes include changes in body weight, change in the position of the center of gravity and musculoskeletal changes.

Figure 1. Physical changes during pregnancy

Body weight

Although pregnancy is generally associated with weight gain, in early pregnancy some women may paradoxically experience weight loss. The reason is generally pregnancy-induced nausea caused by high concentration of the hormone hCG. The growth of the uterus, placenta and fetus, enlargement of breast volume, blood and extravascular extracellular fluid sooner or later results in a distinct increase in body weight (Hops, 2004). To a lesser extent, the increase in body weight also contributes to increased volume of intracellular water, fat and protein (lekari.porodnice.cz, 2013).

Concerning the size of the ideal weight gain during pregnancy, the experts are not unanimous. Usually a distinction is made for different BMI in early pregnancy and moves in various sources in the interval from 5 kg for high BMI to 18 kg for low BMI. In women expecting twins the ideal weight gain is 16 - 20.5 kg. (Brázdová, 1999) For illustration, we calculated expected weight gain composition of the woman who gives birth to a child weighing 3300 g:

- placenta weight by approximately 500 g
- uterine weight increases by approximately 1000 g
- amniotic fluid weight 1000 g
- fetal weight 3300 g
- mass volume increased blood of pregnant women 500 g
- weight multiplied fluid in body tissues 2000 g
- breast mass is increased by about 500 g

Methods

Characteristics intervention factors: "Biomechanical shoes" and "biomechanical insert"

The most specific feature of the shoe is a depression below the first metatarsal head, which should lighten this area while supporting the longitudinal and transverse arch of the foot, which is exactly what is particularly needed in pregnancy (Fig. 2 and Fig. 3).

Figure 2. Tested orthopaedic insoles

Figure 3. Tested biomechanical shoes

The characteristics of the reference file

In the research were included 20 pregnant women from the Czech Republic and Slovakia in late stage of pregnancy at age 24-38 years. None of participants wore any special health shoes to correct arch before the research. All women were monitored without serious health problems of musculoskeletal system.

In our case, we conducted single arm, two-factor, time-phased research. The study group of pregnant women was repeatedly measured in the laboratory of the Department of Sports Kinanthropology at the Faculty of Sports Studies in Brno.

Research situation

After their arrival, each participant was asked to lie down on a recliner without shoes and socks, and thus remained 5
minutes in the supine position or on their side, without contact with the foot pad. Then we took three pictures of rested feet with a thermal camera. There were 40 second intervals between each photo. Figure 4. Then the volunteer put on socks and shoes and walked on a treadmill for five minutes at a constant speed of 3km/h. Subsequently, they returned to lie down on the recliner and identical photographing with a thermo camera took place, with the same number of photographs in 40 second gaps. Immediately, the volunteers stood on prepared platform made of 2cm thick play plasticine. They remained on this platform for 30 seconds. The last photographing was done on thermal imprint left by the volunteer on the platform with the number of 1 photograph. Figure 5. We repeated the same process in the collection of data at the beginning of each trimester of pregnancy. Every tested pregnant woman was wearing our special insole and biomechanical shoes while walking on treadmill to keep standard conditions for each observed person.

**Results**

First we compared the temperature of the right and left foot on each image and in each trimester. Using a paired t-test we did not find statistically significant differences in temperature between the right and left foot in one frame. Therefore, the project further used the average of the right and left foot for evaluation. We evaluated the significance of differences in mean values of individual measurements in the second and third trimesters. We found statistically significant changes between measurements within one quarter.

In the second trimester women had an average temperature of 28.26 (± 1.79) °C and after the load was increased to 29.54 (± 1.97) °C (p ≤ 0.01) and 29.17 (± 2.68) °C to 30.03 (± 2.32) °C (p ≤ 0.01) in the third trimester. When the women were pushing the plasticine, the temperature of the feet changed back to the original temperature of 26.12 (±1.69) °C and 26.13 (1.96) °C in the third trimester. Between trimesters we have recorded significant differences.

Figure 6 shows that the temperature of the foot on a treadmill increased from the second to the third trimester. This temperature rise is natural, due to increasing demands on the body in response to the load. With the increasing weight of the body is directly connected proportional increase of pressure applied to the sole of the mother, resulting in an increase in perfusion. A greater amount of perfusion in the foot increases the friction and thus the temperature of the foot. However, we did not show statistically significant increases.

Throughout the study, we observed various temperatures in each trimester. Every pregnancy is unique and female body can react to changes caused by pregnancy differently. Other factors that may affect the course of pregnancy, the mother and research results related to the measurement of the temperature of the foot of the reference file may be psychological mood of the mother, work, other physical activity, physical condition, age, and birth order.

**Discussion**

Results of work indicate that the temperature of the foot during pregnancy is changing. The temperature increases with progressing pregnancy. Analysis of variance did not confirm a statistically significant increase in the temperature of the feet on the camera images in all trimesters. This might be caused by the fact that the organism of each pregnant woman responds differently to the changes during gravidity. In our case, we might also face the situation where special
insoles and special construction of the shoes used in this research were influencing perfusion and of course feet temperature differs during scanned trimesters. It was observed that the temperature of the foot increased from 28.26 (± 1.79) °C to 29.54 (± 1.97) °C (p ≤ 0.01) in the second trimester and from 29.17 (± 2.68) °C to 30.03 (± 2.32) °C (p ≤ 0.01) in the third trimester. In the future we plan to compare our tested group of pregnant women with another group of pregnant women in order to capture differences caused by special insoles and shoes used in research more easily.

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Conflicts of Interest

The authors declare that they have no conflict of interest.

Ethical approval:

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Ultra Short-Term Heart Rate Recovery After Maximal Exercise in Two Different Body Positions in Elite Male Judokas Compared to Students of the Sport Faculty

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ABSTRACT

Heart Rate Recovery response to exercise has been recognized as a marker of physical fitness. Therefore, the aim of this study was to determine the effects of two different recovery protocols (supine and standing position) on heart rate during the first minute of recovery with a group of elite male judokas and group of students, after maximal progressive treadmill test.

Twenty-four male participants took part in this study, twelve (n=12) judokas (Serbian national team) and twelve (n=12) students as a control group. They were exposed to maximal progressive exercise treadmill test in order to record HR (bpm) during the test and during the first minute of recovery. One-way analysis of variance with repeated measures is used to test the differences between subjects’ responses over time. Statistical significance was assessed using ANCOVA and Student’s t-test for dependent samples.

HR\text{max} was similar in both trials for investigated groups. The results of Student’s t test showed significant differences between applied protocols in all HR levels for both groups. In addition, the within subjects effects for supine protocol showed significant differences between groups (F=14.172, P=0.0001), where the group of judokas revealed lower HR than students for 10s and 20s of recovery period (F=18.801 and F=19.668, p<0.01, respectively).

Obtained data could suggest better adaptation to exercise for trained judokas in exerting better potentials with faster recovery HR immediately after the exercise in supine position, consequently revealing better adaptation to training load.

Key words: Ultra short-term recovery, heart rate, judo, elite athletes

Introduction

Dynamic exercise is characterized by increase in heart rate and systolic blood pressure. The body’s main goal after intensive activity is to return to its previous state in shortest time - that is to recover. HR recovery is defined as the rate at which heart rate decreases to a resting rate after cessation of moderate to heavy exercise (Buchheit et al., 2007). It is usually measured during the first minute after exercise, and is highly correlated with vagal reactivation, especially during the first 30 seconds (Imai et al., 1994). Furthermore, HR recovery values are often taken as one of few indicators commonly used in noninvasive assessment procedures for the determination of cardiovascular parasympathetic function (Cole et al., 1999; Buchheit & Gindre, 2006; Kannankeril et al., 2004; Dewland et al., 2007).

In many competitive sports, performance is based on maintaining high-level physical outputs during repeated bouts (McAinch et al., 2004; Siegler et al., 2006; Spierrer et al., 2004). Judo represents a dynamic, high-intensity intermittent sport that requires complex skills for success (Degout et al., 2003). In order to be effective, judo techniques should be applied with accuracy, strength, velocity and power. These short bursts of energy are supplied mainly by anaerobic metabolism. Marcon et al. (2010) in their study reported an average of eleven action sequences per match, with four of them being on the ground. Even though anaerobic power is predominant in judo (for quick and brief power outbursts during match), aerobic capacity is responsible for judokas ability to sustain maximal efforts throughout match as well as to recover during low intensity parts of the match and between matches (Franchini, 2011; Bala & Drid, 2010; Drid et al., 2015). Level of aerobic fitness and different training load changes are some of the variables that can influence on HR response to exercise (Buchheit & Gindre, 2006). However, even though HR is sensitive to change as a response to training load, still there are no clear data, for HRR to be used as an index representing the body’s capacity to training respond in different sports (Ostojic et al., 2011). The faster dynamics of the recovery HR is important in judo sport, where athletes have several maximal activities in bout and competition with a brief time for recovery in-between. Up to date, there have been reported different values of HR for elite judo athletes after the maximal treadmill test: 191.1±3.7 (Trivic et al., 2009) opposed to 198.2±0.7 (Degoutte et al., 2003) after a simulated 5 - minute judo match. In addition, a different study reported a first minute HR recovery values to be from 130±10 to 162±10 after a SJFT (Special Judo Fitness Test), (Franchini et al.,...
To our knowledge, no investigation in short terms of HRR was conducted on judo athletes yet.

A proper post-exercise cool-down period is an essential part of any workout in order to avoid hypotension (i.e. post-exercise hypotension is common after moderate-intensity dynamic exercise). Different authors suggest the use of both active and a passive recovery, seeing as both help facilitate venous blood flow back towards the heart (Crisafulli et al., 2003). The active and passive recoveries take different approaches to providing the nutrient rich blood that enhances energy regeneration and removal of lactate or H⁺ ions (Larson et al., 2013). Due to a structure movement in sport, athletes should select the most adequate position that ensures the most effective recovery. In a standing position, gravity significantly affects the distribution of the blood volume in the body (Takahashi et al., 2000). On the other hand, in a supine position, a balanced distribution of blood causes weaker peripheral resistance. Parasympathetic activity and weaker resistance cause the heart to have a lower heart rate and higher stroke volume (Takahashi et al., 2000).

Since competitive judo has actions in standing position and some of them being on the ground, the aim of this study was to determine and compare the effects of two different recovery protocols (supine and standing position) on heart rate during the first minute of recovery with elite male judokas and group of students.

**Methods**

**Study sample**

Measurements took place at the time of competitive preparation period for judokas. Twenty-four (N=24) healthy, young, male athletes participated in this study. Athletes were divided into two groups. First group consisted of Serbian university judokas national team (n = 12; age: 20.33±3.70 years; height: 176.95±7.43 cm; weight: 78.62±15.65 kg; BMI: 24.93±3.33 kg/m²). Second group consisted of students (n = 12; age: 20.58±0.79 years; height: 182.92±6.20 cm; weight: 81.32±11.15 kg; BMI: 24.28±2.92 kg/m²) of the Faculty of Sport and Physical Education (FSPE) as a control group.

All the subjects underwent a maximal progressive test on treadmill for measuring maximal oxygen uptake. Judo athletes had a mean value of absolute oxygen uptake (VO₂max): 3.90±0.59 ml min⁻¹, relative oxygen uptake (VO₂max/kg): 51.13±3.34 ml kg⁻¹min⁻¹, whereas students had VO₂max values 3.47±0.60 ml min⁻¹ and VO₂max/kg values 42.4±4.85 ml kg⁻¹min⁻¹. At the time of the study,
none of the university students was a professional athlete. The level of their physical fitness reflected in the regular program’s curriculum of third year activity on FSPE in summary of 180 minutes activity per week: including swimming (2x45 min/week) and judo (1x90 min/week). The intensity workload for group of students was low to moderate, and involved basic training for swimming and judo (i.e. learning techniques). Elite judokas had 12 training sessions per week (4 - physical preparation and 8 - judo combined training) in duration of 90 min per session in a competitive preparation period.

**Study protocol**

The experimental protocol consisted of two sessions performed on separate days. Twenty-four hours prior to both testing, subjects were instructed to perform no strenuous exercise, not to consume alcohol nor caffeine beverages, and to have a solid night’s rest between 8 and 10 hours. One week prior to testing subjects performed Spiro-ergometry test to familiarize with the testing procedure. Afterward, each participant took two maximal graded exercise tests on a treadmill - TSR protocol – that included 0.5 km/h speed increments every 30 seconds, until exhaustion, on treadmill T-170 (COSMED, Italy) with a breath-by-breath gas analyzer (CPET, Italy), and five days between two measurements.

The University Ethic Committee approved the protocols. Basic measurements were undertaken in a quiet room, air temperature ranging from 22-25ºC between 9 a.m. and 13 p.m. Before the experimental session, body mass and height were obtained for each participant.

For gathering data on heart rate, following variables was recorded: Maximal heart rate (HRmax; bpm), and HR recovery period for 60s in 10s intervals (HRR 10, 20, 30, 40, 50, 60 s) in standing and supine position at the end of test. HR was recorded using a HR monitor at beat-to-beat interval (wireless Cosmed HR monitor, Italy). For data on oxygen consumption, we recorded maximal oxygen uptake (VO2max; ml/min) and HR recovery period (Graph 2). However, no differences between two groups were found at later stages of the analyzed HRR for supine position. In contrast, no differences between recovery HR for judokas and students were found in standing position (Graph 2). Supine protocol proved as superior compared to standing protocol for both groups.

**Discussion**

To our knowledge, this is the first study that directly reveals the influence of two different body positions on the ultra short-term post exercise HR in judokas. It is recognized that HR recovery after exercise represents the reactivation of parasympathetic activity and a reduction in sympathetic activity that typically occurs during the 30 sec after exercise (Carreira et al., 2013). The general finding of present study is that body position influences the speed of recovery in heart rate during recovery after exercise, especially in first 30 seconds. Comparing two protocols, slower HRR results are shown for both groups in the standing recovery compared to recovery in supine position for the first minute of recovery for all tested subjects. This is not surprising, given the fact that in supine position, blood is being redistributed towards the heart-increasing preload, where the increased central blood volume imposes a greater vagal activation and reduces heart rate and cardiac output, leading to a faster decrease of HR values (Takahashi et al., 2000).

Present study showed significant differences between groups for supine recovery protocol, where judokas revealed significantly lower (p < 0.01) HR values in 10s and 20s of the observed recovery. Up to date, only few recent researches dealt with athletes in ultra short-terms for heart rate recovery (UST-HRR) for supine recovery position only (Ostojic et al., 2010, 2011) with elite and non-elite athletes. Findings of present study are partially in line with previous ones obtained (Barak et al., 2011; Buchheit, 2006; Olguin et al., 2013; Ostojic et al., 2011) who reported faster HRR after exercise test in supine recovery, particularly over the first 10 and 20s. Similar to our study, Buchheit et al. (2009) reported that lying supine during recovery, might be an effective way of transiently restoring HR and vagal modulation after the exercise. The results obtained for supine recovery applied in this study gave better recovery for both groups, and thus might have its practical use, especially in sport such as judo for having parts of bouts in ground floor.

Finally, the limitations of the present study should be taken into consideration. Firstly, a relatively small number of tested subjects could lead to overestimation of describing the differences between judokas and group of students in post-exercise HRR. The passive recovery protocol applied in this study has been used frequently in the past (Ostojic et al., 2011; Shetler et al., 2002; Javorka et al., 2001) but it does not reflect the real situation during judo competition. Secondly, the use of different tests, more specific to judo demands (i.e. SJFT or arm Wingate test, Franchini et al., 2009) could be more appropriate in obtaining results that more clearly could describe mechanisms that occurs during judo matches (Drid et al., 2009; Stojanovic et al., 2009; Drid et al., 2012) Finally, the present study is only descriptive and does not address any of the possible physiological mechanism of the observed phenomenon. Further investigation should include tests that are more specific to judo sport, including athletes of different gender and weight categories.

Judokas had faster HRR decrease in supine position immediately after the exercise test, particularly over the first 10 and 20 seconds. These findings might suggest that trained judokas could be better adapted to exercise exerting better potentials with faster recovery HR immediately after the exercise in supine position.
revealing better adaptation to training load. Even though recovery in supine position is associated with accelerated HRR, faster lactate elimination is associated with recovery in standing position, which is more relevant in development of judokas individual tactical performance. The choice of adequate athlete’s recovery should be left to coaches, as long as they rely on scientific achievements in this field, regarding individual characteristics of the athletes as well as a structure demand of sport activity.

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Six-Week Preparation Period and its Effects on Transformation Movement Speed with Football Players Under 16

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ABSTRACT

The main aim of the research was to identify a level of quantitative changes of the movement speed with fifteen years old football players under the influence of the programmed football training of a six weeks preparation period. The training programme covered forty-four training units. The research was made on a sample of 120 cadet level football players. To estimate the movement speed three tests have been used: foot tapping on the wall, sprint to 20m high start and sprint to 60m high start. In the area of comparative statistics, we used discriminant parametric procedure t-test for big paired samples. Can be concluded that there are statistically significant differences in all three variables to estimate the movement speed. This confirmed the hypothesis that the expected significant positive quantitative changes of basic-motor abilities influenced by the proposed model of training in preparation period with fifteen years old football players. The authors were guided by the fact that this kind of training program in preparation period, where dominates the situational model training is very effective in terms of raising the movement speed level with fifteen years old. The obtained results can be directed towards innovation plans and programs in the preparation period, and the adaptation of the same needs of the respective population.

Key words: Football, effects preparation period, movement speed

Uvod

Fudbal je sport koga odlikuju mnogobrojne i raznovrsne složene dinamičke kineziološke aktivnosti koje se odlikuju velikim brojem cikličnih i acikličnih kretanja (Gardašević & Bjelica, 2013). Evidentno je da sva četiri momenta igre, i posjed lopte protivnika, i transformacija po osvojenoj lopti zavisi od mogućnosti igrača da izvede određeno kretanje različitog intenziteta, u različitim pravcima i različitim dionicama igrališta (Gardašević & Bjelica, 2014). Oni moraju imati razvijene i bazične i specifične motoričke sposobnosti. Jedna od bazičnih motoričkih sposobnosti koja treba biti na visokom nivou je brzina pokreta.


Osnovni cilj ovog istraživanja je bio da se utvrdi nivo kvantitativnih promjena brzine pokreta kod fudbalera kadetskog uzrasta, pod utjecajem programiranog fudbalskog treninga koji je obuhvatio jedan pripremni period u trajanju od četrdeset dva dana.

Metode

Ovo je bilo longitudinalno istraživanje sa ciljem da se u vremenski različite dvije tačke utvrdi kvantitativne promjene brzine pokreta kod fudbalera kadetskog uzrasta (15–godišnjaka ± 6 mjeseci) pod utjecajem programiranog treninog rada, koji je obuhvatio ljetnji pripremni period za takmičarsku sezonu u jedinstvenoj kadetskoj ligi Crne Gore i kadetskoj ligi srednje regije Crne Gore. Trenažni program je trajao 42 dana i sproveden je na pomoćnom terenu FK Sutjeska u Nikšiću. Trenažni program je obuhvatio 44 trenažne jedinice, u sklopu kojih je odigrano i 8 prijateljskih utakmica.

Za obradu podataka su uzeti samo rezultati onih ispitanika koji su prošli kompletan program rada i koji su pristupili inicijalnom i finalnom mjerenju. U ovom istraživanju je obuhvaćen uzorak od 120 mladih fudbalera kadetskog uzrasta, članova 4 kluba, svih iz Nikšića. Svi ispitanici su prije programiranog rada udradno prošli sistematske pregledne da bi sa sigurnošću mogli pristupiti trenažnom procesu. Prilikom izbora mjernih instrumenata (testova) vodilo se računa da oni zadovoljavaju osnovne metrijske karakteristike, da su prikladni uzrastu i objektivnim

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materijalnim i prostornim uslovima. Za procjenu brzine pokreta upotrijebljeni su slijedeći testovi:
1. Taping nogom o zid (MBFTAZI)
2. Sprint na 20m visoki start (MB20MV)
3. Sprint na 60m visoki start (MB60MV)

Autori ovog rada su odlučili da najveći dio trenučnog programa čini situacioni trening. Po Michelsu (2001), situacioni trening zasnovan je na modernoj viziji fudbalskog treninga mladih uzrasta koju propagira UEFA, odnosno usvajanja elemenata fudbalske igre kroz igru. Vremenska struktura treninga je iznosila od 60 do 120 minuta, zavisno od cilja i zadataka trenučne jedinice i podijeljena je u 3 faze:
- Uvodno-pripremni dio (od 25–30% trajanja treninga)
- Osnovni dio (od 60–65% trajanja treninga)
- Završni dio (do 10% trajanja treninga)

U uvodno-pripremnom dijelu treninga akcent je bio na podizanju radne temperature kod djece. Kao sredstvo korišćene su razne elementarne igre sa loptom koje su omogućile rad na elementarnoj tehnici i osnovama taktike, zatim korišćeni su i razni poligoni sa vježbama koordinacije. Razne igre i vježbe za razliku od normalnog rasporeda, što nam govore rezultati Kolmogorov i Smirnov testa (K-S test).

Raspon (Range) rezultata čudno od normalnog rasporeda, što nam govore rezultati Kolmogorov i Smirnov testa (K-S test). Vremenska struktura treninga je iznosila od 60 do 120 minuta, zavisno od cilja i zadataka trenučne jedinice i podijeljena je u 3 faze:
- Uvodno-pripremni dio (od 25–30% trajanja treninga)
- Osnovni dio (od 60–65% trajanja treninga)
- Završni dio (do 10% trajanja treninga)

Podaci dobijeni istraživanjem obrađeni su postupcima deskriptivne i komparativne statistike. U segmentu deskriptivne statistike, za svaku varijablu i u inicijalnom i u finalnom stanju obrađeni su centralni i disperzionalni parametri kao i mjere asimetrije i sploštenosti. Hipoteza o normalnoj distribuciji rezultata testirana je na osnovu Kolmogorov i Smirnov testa. U segmentu komparativne statistike, za utvrđivanje razlika primijenjenih varijabli za procjenu brzine pokreta na početku (inicijalno stanje) i kraju (finalno stanje) trenučnog programa u pripremnom periodu, korišćena je diskriminativna metrika procedura Studentov t-test za velike zavisne uzorke.

### Tabela 1. Centralni i disperzionalni parametri varijabli za procjenu brzine pokreta u inicijalnom stanju

<table>
<thead>
<tr>
<th>R.br.</th>
<th>Varijabla</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Std. Error</th>
<th>CV%</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Range</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>K-S test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MBFTAZI</td>
<td>21,58</td>
<td>3,25</td>
<td>0,30</td>
<td>15,05</td>
<td>16</td>
<td>29</td>
<td>13</td>
<td>0,29</td>
<td>-0,51</td>
<td>0,41</td>
</tr>
<tr>
<td>2.</td>
<td>MB20MV</td>
<td>3,56</td>
<td>0,20</td>
<td>0,02</td>
<td>5,61</td>
<td>3,17</td>
<td>3,97</td>
<td>0,80</td>
<td>-0,07</td>
<td>-0,64</td>
<td>0,60</td>
</tr>
<tr>
<td>3.</td>
<td>MB60MV</td>
<td>8,99</td>
<td>0,27</td>
<td>0,02</td>
<td>3,20</td>
<td>7,99</td>
<td>9,40</td>
<td>1,41</td>
<td>0,41</td>
<td>0,33</td>
<td>0,84</td>
</tr>
</tbody>
</table>

Analizirajući centralne i disperzionalne parametre varijabli za procjenu brzine pokreta u inicijalnom stanju (taping nogom o zid (MBFTAZI)), brzinu na 20m iz visokog starta (MB20MV) i brzinu na 60m iz visokog starta (MB60MV), može se primijetiti da distribucija dobijenih rezultata ne odstupa statistički znacajno od normalne distribucije, što nam govore rezultati Kolmogorov i Smirnov testa (K-S test). Raspon (Range) rezultata je malo veći kod varijable tapping nogom o zid (MBFTAZI), što govori o raspršenosti rezultata, međutim kada se pogleda vrijednost koeficijenta varijacije (CV%) i ti rezultati pripadaju izrazito homogenom skupu, jer po Periču (2006), sve vrijednosti koeficijenta varijacije (CV%) od 0 do 25% označavaju izrazito homogen skup. Vrijednosti skewnessa i kurtozisa kreću se u opsegu od -1 do +1, što znači da nagnutost i izduženost rezultata ne odstupa statistički znacajno od normanog rasporeda.

Centralni i disperzionalni parametri varijabli za procjenu brzine pokreta u inicijalnom stanju pokazali su slijeđeći vrijednosti (Tabela 2.)

### Tabela 2. Centralni i disperzionalni parametri varijabli za procjenu brzine pokreta u finalnom stanju

<table>
<thead>
<tr>
<th>R.br.</th>
<th>Varijabla</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Std. Error</th>
<th>CV%</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Range</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>K-S test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MBFTAZF</td>
<td>25,55</td>
<td>3,05</td>
<td>0,28</td>
<td>11,92</td>
<td>20</td>
<td>32</td>
<td>12</td>
<td>0,30</td>
<td>-0,44</td>
<td>0,12</td>
</tr>
<tr>
<td>2.</td>
<td>MB20MVF</td>
<td>3,38</td>
<td>0,22</td>
<td>0,02</td>
<td>6,50</td>
<td>3</td>
<td>3,87</td>
<td>0,87</td>
<td>0,16</td>
<td>-0,90</td>
<td>0,57</td>
</tr>
<tr>
<td>3.</td>
<td>MB60MVF</td>
<td>8,38</td>
<td>0,28</td>
<td>0,03</td>
<td>3,31</td>
<td>7,77</td>
<td>9,40</td>
<td>1,63</td>
<td>0,54</td>
<td>1,55</td>
<td>0,26</td>
</tr>
</tbody>
</table>
Analizirajući centralne i disperzionalne parametre varijabli za procjenu brzine pokreta u finalnom stanju – može se primijetiti da vrijednosti aritmetičkih sredina u sve tri varijable, tapping nogom o zid (MBFTAZF), brzina na 20m iz visokog starta (MB20MVF) i brzina na 60m iz visokog starta (MB60MVF), pokazuju bolje vrijednosti nego u inicijalnom stanju, da su rezultati kod varijable tapping nogom o zid (MBFTAZF) homogenije raspoređeni nego kod inicijalnog stanja (koeficijent varijacije), a ostale dvije varijable imaju sličnu homogenost rezultata. Analizirajući vrijednosti skewnessa kod varijabli brzina trčanja na 20m iz visokog starta (MB20MVF) i brzina trčanja na 60m iz visokog starta (MB60MVF) vidi se nagnutost krive ka boljim rezultatima u odnosu na inicijalno stanje. Vrijednosti Kolmogorov i Smirnov testa govore o normalnoj distribuciji rezultata u sve tri analizirane varijable koje procjenjuju brzinu pokreta.

 Za utvrđivanje statističke značajnosti (signifikantnosti) razlika aritmetičkih sredina (parcijalne kvantitativne promjene) varijabli za procjenu brzine pokreta, primijenjen je t-test za velike zavisne uzorke. Vrijednosti t-testa su bile na nivou značajnosti ili signifikantnosti (Sig.) od 0.01 (p≤0.01) u svim varijablima za procjenu brzine pokreta. Razlike aritmetičkih sredina inicijalnog i finalnog mjerenja varijabli za procjenu brzine pokreta, prikazane su u tabeli 3.

Tabela 3. Vrijednosti t-testa izmedju aritmetičkih sredina inicijalnog i finalnog mjerenja varijabli za procjenu brzine pokreta

<table>
<thead>
<tr>
<th>Varijable</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
<th>Correlation</th>
<th>T-test</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Par 1</td>
<td>MBFTAZI</td>
<td>21,58</td>
<td>3,25</td>
<td>0,30</td>
<td>0,88</td>
<td>-27,66</td>
</tr>
<tr>
<td></td>
<td>MBFTAZF</td>
<td>25,55</td>
<td>3,05</td>
<td>0,28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Par 2</td>
<td>MB20MVI</td>
<td>3,56</td>
<td>0,20</td>
<td>0,02</td>
<td>0,95</td>
<td>26,29</td>
</tr>
<tr>
<td></td>
<td>MB20MVF</td>
<td>3,38</td>
<td>0,22</td>
<td>0,02</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Par 3</td>
<td>MB60MV1</td>
<td>8,55</td>
<td>0,27</td>
<td>0,02</td>
<td>0,91</td>
<td>16,01</td>
</tr>
<tr>
<td></td>
<td>MB60MVF</td>
<td>8,38</td>
<td>0,28</td>
<td>0,03</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Na osnovu dobijenih rezultata može se primijetiti da postoje statistički značajne razlike kod svih varijabli za procjenu brzine pokreta, te se stoga može reći da je došlo do pozitivnih statistički značajnih parcijalnih efekata trenažnog programa u pripremnom periodu, a vrijednosti t-testa bile su značajne na nivou pouzdanosti p<0.01 kod svih varijabli za procjenu brzine pokreta.

Diskusija

Na osnovu uvida u dobijene parametre može se zaključiti da su statistički značajni parcijalni kvantitativni efekti (promjene) kod svih varijabli za procjenu brzine pokreta dobijeni kao rezultat primijenjenog trenažnog programa u pripremnom periodu. Iako je poznato da je sposobnost brzine pokreta genetski predijeljen, korišten je situacioni metod treninga, veoma efikasan na nivo potreban za takmičenje. Autori zaključuju da je trenažni program programiranog treninga lopte petnaestogodišnjih fudbalera kadeta. Autori zaključuju da je ovakav trenažni program rada u pripremnom periodu doveo do pozitivnih transformacija kod svih varijabli koje su procjenjivale, po strukturi hipotetski postavljenog modela, brzine pokreta. U ovom istraživačkom radu autori su se rukovodili činjenicom da je ovakav trenažni program rada u pripremnom periodu, gdje uglavnom dominira situacioni model treninga, veoma efikasan način rada u pogledu podizanja novoj brzine pokreta fudbalera kadeta. Autori zaključuju da je u ovom trenažnom programu rada, optimalan za podizanje brzinog pokreta na nivo potreban za takmičenje. Dobijeni rezultati se mogu usmjeriti u pravcu inoviranja programova i programa rada u pripremnom periodu, te prilagođavanju istih potrebama dotične populacije.

References


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Knowledge of Physical Education Students on Sports Nutrition

Ivan Vasiljević, Duško Bjelic, Miroslav Kezunović and Jovan Gardašević
University of Montenegro, Faculty for Sports and Physical Education, Niksic, Montenegro

A B S T R A C T

Sports nutrition has a direct impact on the present physical condition of the body or the physical preparation of the athletes depends on the nutritional status of athletes engaged. The sample was composed of 18 students of specialized postgraduate studies of Physical Culture Faculty of Sports and Physical Education from Niksic. When we consider the results as a whole, it can be concluded that the students' knowledge of sports nutrition at a very satisfactory level, especially when comparing results with previous research knowledge athletes and coaches on sports nutrition. From a total of 360 responses was achieved 310 correct answers, or 86.1%. No matter how talented athletes in the sport they practice or train, motivated and well trained, the line between defeat and victory is usually very thin, and as the most important link imposes a sports nutrition. Results of an athlete and that you can depend on quality, quantity and time entries diet.

Key words: students, sports nutrition, and health status

Uvod

Decenije istraživanja podržavaju teoriju da od kada postoje sportska takmičenja prisutno je pitanje šta jesti i piti da bi se po-
boljšao sportski rezultat. Optimalna ishrana može da smanji za-
mor muskulature i omogućava sportisti koji su duže pod trena-
žnim opterećenjem i takmiči se, da se brže oporavljavaju (Lin & Lee, 2005). Sportska ishrana može direktn uticaj na trenutno fizi-
cko stanje organizma, odnosno fizička priprema sportista zavisi i od
nutritivnog statusa angažovanog sportiste (Beals & Manore, 1998). Prema većim istraživanjima sprovedenim u svijetu sportisti najviše informacija dobijaju od svojih trenera kada je u pitanju
sportska ishrana, a pogotovo od trenera koji se bave kondicioni-
treningom (Burns, Schiller, Merrick & Wolf, 2004). Ne postoji
jedan plan ishrane koji će doprinijeti poboljšanju takmičar-
ske sposobnosti. U planiranju modela ishrane treba uzeti u obzir
energetske potrebe, makronutritivni sastav namirnica, unos mi-
kronutrijenata i balans tečnosti sportiste. Cilj ovog istraživanja je
utvrđivanje znanja studenata Fizičke kulture o sportskoj ishrani.

Metod

Uzorak ispitanika bio je sastavljen od 18 studenata specija-
lističkih postdiplomskih studija Fizičke kulture Fakulteta za
sport i fizičko vaspitanje iz Nikšića. Znanje studenata o sportskoj ishrani utvrđeno je putem odgovarajućeg standardizovanog
anketnog upitnika koji je preuzet i modificiran (Matković, Knjaz, & Ćigrovski, 2006). Upitnik je bio koncipiran tako da se
utvrđi znanje studenata o sportskoj ishrani, o sastojcima koji su
neophodni da bi se obezbeđivale dovoljna količina energije za
trening i takmičenja, o dodacima ishrani, obroćima prije takmičenja kao i dehidraciji i rehidraciji za vrijeme treninga i takmičenja. Anketa je bila anonimna. Dobijeni podaci su obra-
đeni statističkim postupcima, pomoću statističkog paketa STATI-
STICA kojim je dobijen uvid u kvantitativne i kvalitativne vrijednosti istraživanja.

Rezultati

U tabeli 1. prikazan je anketni upitnik sa pitanjima na koja su ispitanici dali svoje odgovore kao i odnos tačnih i netačnih
odgovora. Kada se sagledaju rezultati u cjelini, može se zaklju-
ci da je znanje studenata o sportskoj ishrani na veoma zadovoljnu
nivou, posebno kada se uporedi rezultati sa dosadašnjo
im istraživanjima znanja sportista i sportskih trenera o sport-
skoj ishrani. Od ukupno 360 odgovora, ostvareno je 310 tačnih
odgovora, odnosno 86,1%.

Diskusija

Analizirajući i upoređujući rezultate istraživanja (Matković, Knjaz & Ćigrovski, 2006) koji su na uzorku od 56 trenera ko-
šarke i skijanja, dobili 77,8% tačnih odgovora, istraživanja (Va-
siljević, Bojanić, Petković & Muratović, 2014) koji su od 30 licen-
ciranih trenera iz Crne Gore dobili 65,5% tačnih odgovora, zagrijaju da je znanje studenata o sportskoj ishrani na veoma zadovoljnu nivou u odnosu na dosadašnja istraživanja studenata Fizičke kulture ostvarili veći procenat tačnih odgovora u odnosu i na sportske trenere. Sagledujući pojedinačne odgovore dosadašnjih
istraživanja, zabrinjavajuće djeluje podatak da jedina trećina an-
ketiranih sportista i sportskih trenera ima izuzetno nizak nivo
znanja o proteinskoj ishrani i smatra da su proteini glavni izvor
energije, a još više to što gotovo 70 % ispitanika ne poznaje
metabolizam proteina. Što se tiče anketiranih studenata, isti su
pokazali da u velikoj mjeri poznaju i metabolizam proteina.

Ako se uzme u obzir činjenica da sportisti često koriste amino-
kisijelne kao dodatak ishrani, bilo bi za očekivati da osobe koje
I. Vasiljević et al.: Students’ knowledge about nutrition, Sport Mont 14 (2016) 1: 17-19

Tabela 1. Anketni upitnik sa tačnim odgovorima i odnosom tačnih i netačnih odgovora

<table>
<thead>
<tr>
<th>Pitanja koja su bila ponuđena ispitanicima u anketnom upitniku</th>
<th>Tačni odgovori</th>
<th>Odnos tačnih i netačnih odgovora</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Proteini su glavni izvor energije? T</td>
<td>N</td>
<td>18-0</td>
</tr>
<tr>
<td>2. Prekomjeran unos proteina hranom opterećuje rad hubrega i jetre? T</td>
<td>N</td>
<td>5-13</td>
</tr>
<tr>
<td>3. Sportistima je potrebno 3 puta više proteina od netreniranih osoba? N</td>
<td>T</td>
<td>18-0</td>
</tr>
<tr>
<td>4. Sportistima je potrebno više ugljenih hidrata od netreniranih osoba? N</td>
<td>T</td>
<td>18-0</td>
</tr>
<tr>
<td>5. Žeđ nije adekvatan pokazatelj potrebe za vodom tokom vježbanja? T</td>
<td>N</td>
<td>11-7</td>
</tr>
<tr>
<td>6. Tečnost se mora unositi prije, za vrijeme i poslije takmičenja? T</td>
<td>N</td>
<td>16-2</td>
</tr>
<tr>
<td>7. Preskakanje obroka je opravdano kada se želi postići vrh gubitak težine? N</td>
<td>T</td>
<td>15-3</td>
</tr>
<tr>
<td>8. Brzi gubitak tjelesne težine s jako restriktivnom dijetom može negativno uticati na sportsko izvođenje? T</td>
<td>N</td>
<td>18-0</td>
</tr>
<tr>
<td>9. Gubitak težine restriktivnim kratkotrajnim dijetama najvećim je dijelom posljedica gubitka tečnosti? T</td>
<td>T</td>
<td>12-6</td>
</tr>
<tr>
<td>10. Nedostatak kalcijuma može uzrokovati prelom kostiju (frakture) i osteoporozu? T</td>
<td>N</td>
<td>18-0</td>
</tr>
<tr>
<td>11. Unos mješavin različitih aminokiselin može izazvati nutritivni disbalans – višak jedne aminokiseline utiče na drugu? T</td>
<td>T</td>
<td>14-4</td>
</tr>
<tr>
<td>12. Citrusi (limun, narandža) su jedini izvor vitamina C u hrani? N</td>
<td>T</td>
<td>18-0</td>
</tr>
<tr>
<td>13. Obrok poslije takmičenja važan je samo ako je sportista gladan? N</td>
<td>N</td>
<td>18-0</td>
</tr>
<tr>
<td>14. Urvanotežena ishrana važna je samo prije takmičenja? N</td>
<td>N</td>
<td>18-0</td>
</tr>
<tr>
<td>15. Posljednji čvrsti obrok treba pojesti 3-4 sata prije takmičenja? T</td>
<td>T</td>
<td>16-2</td>
</tr>
<tr>
<td>16. Nadoknadu tečnosti i ugljenih hidrata treba započeti neposredno poslije takmičenja? T</td>
<td>T</td>
<td>17-1</td>
</tr>
<tr>
<td>17. Nemoguće je pobijediti bez suplemenata? N</td>
<td>N</td>
<td>16-2</td>
</tr>
<tr>
<td>18. Voće i povrće su dobar izvor vitamina i minerala? T</td>
<td>T</td>
<td>17-1</td>
</tr>
<tr>
<td>19. Velike doze vitamina i minerala mogu biti opasne po zdravlje? T</td>
<td>N</td>
<td>18-0</td>
</tr>
<tr>
<td>20. Vitaminu i minerali su izvor energije? N</td>
<td>N</td>
<td>15-3</td>
</tr>
</tbody>
</table>

savjetuju uzimanje takvih dodataka znaju i o problemima ili negativnim pojavama koje mogu uzrokozati zdravlje sportista. Studenici Fizičke kulture su što je i očekivano i uvidom u rezultate dokazano da znaju rasporediti obroke i tečnosti prije, u toku i poslije treninga i takmičenja, a kada je riječ o nutricionima i mineralima koji se vrlo često koriste kao dodatak u ishrani, anketirani studenti su pokazali veoma visok nivo informisanosti. Još jedan zabrinjavajući podatak, a odnosi se na dosadašnja istraživanja je da približno 70% anketiranih trenera i sportista misli da su vitamini i minerali izvor energije, a u odnosu na studente koji su na navedena pitanja ostvarili približno 85% tačnih odgovora. Vitamini i minerali sami po sebi nisu izvor energije i nemaju energetičku važnost na drugu? – višak jedne aminokiseline utiče na drugu aminokiselinu, a kada je riječ o sportskim istraživanjima znanja sportistova i sportskih trenera o sportskoj ishrani. Koliko god da su sportisti talentovani u sportu kojim se bave ili treniraju, motivisani i dobro utrenjani sportistima se postiže optimalni rezultati. Poznato je da su redovni treninzi i opti- malmalna ishrana dva neraskidiva faktora i samo njihovom kombinacijom mogu se postići optimalni rezultati.
LITERATURA


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The Effect of Regular Physical Education in the Transformation Motor Development of Children with Special Needs

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ABSTRACT

The aim of the research is to determine the level of quantitative changes of motor abilities of pupils with special needs under the influence of kinetic activity regular physical education teaching. The survey was conducted on students of the Centre for children and youth with special needs in Mostar, the city of Los Rosales in Mostar and day care facilities for children with special needs in Niksic. The sample was composed of boys of 46 subjects, who were involved in regular physical education for a period of one school year. The level of quantitative and qualitative changes in motor skills, written under the influence of kineziology operators within regular school physical education classes, was estimated by applying appropriate tests of motor skills, selected in accordance with the degree of mental ability and biological age. Manifest variables applied in this experiment were processed using standard descriptive methods in order to determine their distribution function and basic function parameters. Comparisons of results of measures of central dispersion parameters initial and final measurement, it is evident that the applied program of physical education and sport contribute to changing the distribution of central and dispersion parameters, and that the same distribution of the final measurement closer to the normal distribution of results.

Key words: teaching, physical education, transformation, motor skills, students

Uvod

Tokom ontogenetskog razvoja čovjek svoju tjelesnu aktivnost usavršava od grubih, nepreciznih, nesinhronizovanih, do vrlo složenih pokreta i kretanja (Mikić, 2000). Tokom rasta i razvoja deca se manje ili veće promjene cjelokupnog organizma djeteta (Levandovski i Teodorović, 1989). Kada se govori o fizičkom vježbanju, važno je da u njemu prevladaju prirodni oblici kretanja i da se ono može prilagoditi sposobnostima svakog djeteta, a zatim treba uticati na prirost njegovih sposobnosti (Daneš, 1994). Većina motoričkih sposobnosti i navika stiče se i razvija isključivo u periodu djetinjstva, na njih se može naročito uticati i efikasno razvijati u predškolskom ili mladem školskom uzrastu (Naylor, 2008). U tom periodu se izgrađuje struktura motoričkog prostora na osnovu endogenih i egzogenih faktora koji utiču na kasniji rast i razvoj djece (Bala i Kmet, 2006). Generalno gledano, može se reći da se motoričke sposobnosti postojano poboljšavaju tokom predškolskog i mladom školskog perioda, ali ne uvijek na linearan način (Mikić, Tanović i Bjeković, 2008). Populacija učenika sa posebnim potrebama predstavlja jednu od karikata u lancu kompleksnog edukacijskog i sistematskog društvenog utjecaja u tjelesnom i zdravstvenom odgoju kojemu su podvrgnuti novi naraštaji (Mikić, 2000). Američki stručnjaci Francis i Rarick (1960), su istraživali motoričke sposobnosti djece sa posebnim potrebama i došli do zaključka da zaostajanje u motoričkom ponašanju djece s laksim psihičkim smetnjama iznosi od dvije do četiri godine u odnosu na djecu iz normalne populacije istog hronološkog uzrasta. Danas se i u drugim dijelovima svijeta ovisi o razvoju i novim mogućnostima odgoja i obrazovanja u specijalnim školama za djecu sa posebnim potrebama. Memić (2006) je istraživao transformacione procese na bazi motoričkih sposobnosti kod djece sa posebnim potrebama, pod uticajem redovnog programa nastave fizičkog vaspitanja na cijeloj dostupnoj populaciji, uzimajući u obzir tri subkategorije: uzast, pol i stepen retardacije u odnosu na dio populacije koja je bila obuhvaćena eksperimentalnim programom tokom jedne školske godine.

Metode

Istraživanje je sprovedeno na učenicima Centra za djecu i omladinu sa posebnim potrebama u Mostaru, Centar Los Rosales Mostar i Ustanove za dnevni boravak djece s posebnim potrebama u Nikšiću. Uzorak su sačinjavali dječaci ukupno 46 ispitanika, a koji su bili uključeni u redovnu nastavu fizičkog vaspitanja u trajanju od jedne školske godine. Nivo kvantitativnih promjena motoričkih sposobnosti, uticalih pod uticajem kinezioloških operatora u okviru redovne nastave fizičkog vaspitanja, procijenjen je primjenom odgovarajućih testova motoričkih sposobnosti, odabranih u skladu sa stepenom mentalnih sposobnosti i biološkim uzrastom.

Rezultati

U ovom istraživanju primjenjeno je 15 varijabli za procjenu motoričkih sposobnosti. U tabelama 1. i 2., prikazani su osnovni centralni i disperzionalni parametri manifestnih motoričkih varijabli (ispitanika sa posebnim potrebama).

Tabela 1. predstavlja skup centralnih i disperzionalnih parametara primjene u inicijalnom mjerenju. Na osnovu parametara varijabilnosti možemo zaključiti da je izuzetno povećana varijabilnost prisutna kod varijable: MESSDM – skok u dalj iz mjesta, kao i varijable MFISK – is-
kret palicom, MKOSDN – skok u dalj unazad i MFLPSR – predklon u sjedu raznozno. Normalitet distribuciji rezultata te-
stirali smo na osnovu skewness-a i kurtosisa. Vrijednosti skew-
ness-a daju nam podatke o diskretnim vrijednostima pri-
mjenjenih varijabli. Analizom prikazanih rezultata vidimo da
nešto veću vrijednost ovog parametra, odnosno horizontalno
ostupanje pokazuje varijabla MFISKIP – iskret palicom. Vri-
jenost ovog parametra je sa pozitivnim predznakom (epikur-
tična distribucija) što ukazuje na pozitivnu asimetriju, odnosno
lociranost rezultata navedene varijable u zonama manjih vrijed-
nosti od aritmetičke sredine. Uvidom u normalitet distribucije
rezultata na osnovu rezultata kurtosisa (Kurtosis), možemo
konstatovati da je vrijednost ovog parametra distribucije sa ne-
što većim vertikalnim odstupanjem kod varijable MFLPRK –
predklon na klupici u stoju, te da je distribucija ove varijable
blago platikurtična (izdužena), za razliku od ostalih motoričkih
varijabli čije su vrijednosti distribucije podataka uglavnom
skoncentrisane oko normalne krive.

**Tabela 1. Centralni disperzionalni parametri motoričkih sposobnosti učenika s posebnim potrebama - inicijalno mjerenje**

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**Tabela 2. Centralni disperzionalni parametri motoričkih sposobnosti učenika s posebnim potrebama – finalno mjerenje**

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Posebno visoko izražene parametre variabilnosti iskazuju
mjere za praćenje eksplozivne snage MESSDM – skok u dalj iz
mjeста, MKOSDN – skok u dalj unazad i mjere za procjenu
fleksibilnosti karličnog pojasa MFLPSR – predklon u sjedu raz-
nožno.
Diskusija

Asimetričnost distribucije rezultata motoričkih zadataka u ovom istraživanju zavisi od međusobnih položaja parametara centralne tendencije, mjera varijabilnosti kao i od koeficijenta zakrivljenosti distribucije skupina (Skewness). Koeficijent zakrivljenosti (horizontalna distribucija rezultata) pruža odgovarajuće podatke o diskriminativnim vrijednostima primjenjenih motoričkih testova. Zakrivljenost distribucije rezultata primjenjenih motoričkih varijabli sa pozitivnim predznakom ukazuje na lociranost iskazanih rezultatskih vrijednosti u zonama manjih vrijednosti od aritmetičke sredine, dok zakrivljenost distribucije rezultata primjenjenih motoričkih varijabli sa negativnim predznakom ukazuje na lociranost iskazanih rezultatskih vrijednosti u zonama većih vrijednosti od aritmetičke sredine. Nešto značajnije izraženu vrijednosti ovog parametra iskazuju varijable MEST20M - visoki start-20 m, koju smo primijenili za procjenu eksplozivne snage, sa pozitivnim smjerom asymetrije u odnosu na normalnu krivu, odnosno ima pozitivno odstupanje dobijene raspodjele podataka u odnosu na normalnu krivu. Uvidom u normalitet distribucije rezultata na osnovu rezultata kurtozisa, možemo konstatovati da je vrijednost ovog parametra distribucije nešto veća kod varijable MFLPRK – predklon na klupici u stoju, MKOSDN- skok u dalj unazad i MESSAR- skok u vis (Sarđžent). Vrijednost Kurtozisa-a kod navedenih varijabli je veća od normalne vrijednosti ovog parametra, što ukazuje na leptokurtičnost distribucije rezultata ovih varijabli. Analizirajući distribucije rezultata koje su ispitanici (učenici) postigli u primjenjenim motoričkim varijablama, unutar ovog istraživanja, pokazalo se da odabrani instrumenti za procjenu motoričkih sposobnosti, osim što imaju dobre opšte metrijske karakteristike, predstavljaju i dobro prilagođenu bateriju testova za primjenu na ovakvom uzorku ispitanika, učenika s posebnim potrebama. Usporedbom rezultata mjera centralnih disperzivnih parametara inicijalnog i finalnog mjerenja, evidentno je da je primjenjeni program nastave fizičkog vaspitanja doprinio promjeni distribucije centralnih i disperzivnih parametara, te da je ista distribucija na finalnom mjerenju bliža normalnoj distribuciji rezultata.

LITERATURA


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Effects of Various Physical Education Curriculum on Motor Skills in Students of Final Grades in Primary School

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University of Montenegro, Faculty for Sports and Physical Education, Niksic, Montenegro

ABSTRACT

Results of many researches conducted in field of physical education show that the physical education curriculum is not on the appropriate and satisfactory level. The goal of this study is to determine effects of standard and experimental education curriculum on motor skills. This study lasted for one school year, and it was conducted on the sample consisting of 113 boys, divided into control (physical education) and experimental group (basketball). In order to assess motor space, following variables of Eurofit battery of tests were monitored: flamingo, hand tapping, seated forward bend (modified functional reach test), long jump, dynamometry of dominant hand, lay – sit for 30', pull-up endurance, and pin running on 10x5m. Analysis of the results during the final battery of tests were monitored: flamingo, hand tapping, seated forward bend (modified functional reach test), long jump, dynamometry of dominant hand, lay – sit for 30', pull-up endurance, and pin running on 10x5m. Analysis of the results during the final measurement showed that students of control group had better results in final measurement in comparison to the initial one in six out of eight variables. Students of the experimental group had improved results in 7 out of 8 variables. Experimental education curriculum with emphasize on basketball contributed to development of motor skills of students, but not at the level that would imply superiority over the control – standard education curriculum.

Key words: effects, learning, motor skills

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Testiranje motoričkih sposobnosti realizovano je na početku i na kraju školske godine, u okviru nastave fizičkog vaspitanja. Za procjenu motoričkog prostora pravilno su sljedeće varijable iz Eurofit baterije testova: flamingo, taping rukom, pretklon sa dosezajem u sjedu, skok udalj iz mjesta, dynamometrija dominantne ruke, ležanje – sjed za 30’; izdržaj u zig-bu i čunasto trčanje na 10x5m. Testiranje je obavljeno u prijepodnevnim časovima, po ustaljenim standardima testiranja, a testiranje su realizovali nastavnicu fizičkog vaspitanja, koji su u ranije učestvovali u sličnim testiranjima. Za testiranje motoričkih sposobnosti bila je potrebna sljedeća oprema: - mala metalna greda dužine 50cm visine 4cm i širine 3cm. Gređica je presvučena itisonom ili gumenom trakom maksimalne debljine 3mm. Stabilnost gređice osigurana je sa dva poprečna stabilizatora dužine 15cm i širine 2cm. Stopice su bez mogućnosti vraćanja na „nuž“:- sto sa mogućnošću podešavanje visine, dva kruga pretečen 20cm, svaki prčvršćen za sto, centri ovih krugova međusobno su udaljeni 80cm (blizi krajevi su udaljeni 60cm). Na sredini, između krugova smještena je daščica pravougaonog oblika (dimenzija 10x20cm), jednako udaljena od oba kruga:- sto ili klupa za testiranje dimenzija: dužina 35cm, širina 45cm, visina 32cm, gornja daska dužine 55cm, širine 45cm. Gornja daska prelazi 15cm vertikalnu dasku prema ispitaniku, a koju se „opiru“ stopala. Po sredini gornje daski obilježeni su centrimetri od 0 do 50cm. „nuž“ je prednja ivica dasku na gornju dasku klupe poprečno se stavlja lenjir dužine 30cm koji ispitanik pritečen gura što dalje; dvije tanke stranjuće postavljene u produžetku jedna iza druge, kreda i santimetarska traka (metalna):- vratio pretečen od 2,5 do 4,0cm takve visine da istaknu sa najvećom visinom u zig-bu stopalima ne dodiruje te; stolica; magnezijm; mjerna traka; kreda ili ljepljiva izolir – traka; čunjevi i štoperica.
Rezultati
dobijeni testiranjem obrađeni su statističkim procedurom i to: iz prostora deskriptivne statistike, za svaku variabilu izračunata je: aritmetička sredina, standardna devijacija, minimalne i maksimalne vrijednosti rezultata sa inicijalnog i finalnog mjerenja, a rezultati sa inicijalnog i finalnog mjerenja po grupama upoređivani su t testom za zavisne uzorke.

Tabela 1. Deskriptivna statistika motoričkih varijabli kontrolne i eksperimentalne grupe učenika na inicijalnom i finalnom testiranju

<table>
<thead>
<tr>
<th>VARIJABILA</th>
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<th>INICIJALNO</th>
<th>FINALNO</th>
</tr>
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<td>SD</td>
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<td>11.75</td>
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<td>4.47</td>
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<td>eksperimentalna</td>
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</tr>
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<td></td>
<td>eksperimentalna</td>
<td>176.00</td>
<td>25.35</td>
</tr>
<tr>
<td>Dinamometrija dominante ruke</td>
<td>kontrolna</td>
<td>176.68</td>
<td>23.50</td>
</tr>
<tr>
<td></td>
<td>eksperimentalna</td>
<td>176.00</td>
<td>25.35</td>
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<tr>
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<td>kontrolna</td>
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<td>2.87</td>
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<td></td>
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<td></td>
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<td>21.93</td>
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<td></td>
<td>eksperimentalna</td>
<td>20.59</td>
<td>3.35</td>
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</table>

U tabeli 1 prikazani su rezultati motoričkih varijabli kontrolne i eksperimentalne grupe učenika na inicijalnom i finalnom testiranju.

Tabela 2. Poređenje rezultata na inicijalnom i finalnom mjerenju učenika kontrolne grupe t testom za zavisne uzorke

<table>
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<th>VARIJABILA</th>
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<td>4.47</td>
<td>18.27</td>
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<td>Skok udalj iz mjesta</td>
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<td>Dinamometrija dominantne ruke</td>
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<td>23.05</td>
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<tr>
<td>Izdržaj u zgibu</td>
<td>38.82</td>
<td>19.29</td>
<td>40.44</td>
</tr>
<tr>
<td>Čunasto trčanje na 10x5m</td>
<td>21.93</td>
<td>3.43</td>
<td>21.17</td>
</tr>
</tbody>
</table>

Poređenje rezultata na inicijalnom i finalnom mjerenju učenika kontrolne grupe t testom za zavisne uzorke je pokazalo da postoje statistički značajne razlike na slijedećim varijablama:

1. Flamingo – na inicijalnom mjerenju (M = 9.54) su učenici kontrolne grupe imali niže skorove u odnosu na finalno mjerenje (M = 18.00)
2. Taping rukom – na inicijalnom mjerenju (M = 12.37) su učenici iz kontrolne grupe imali više skorove u odnosu na finalno mjerenje (M = 11.58)
3. Pretklon u sjedu – na inicijalnom mjerenju (M = 16.09) su učenici kontrolne grupe imali više skorove u odnosu na finalno mjerenje (M = 18.27)
4. Skok udalj iz mjesta – na inicijalnom mjerenju (M = 176.68) su učenici iz kontrolne grupe imali niže skorove u odnosu na finalno mjerenje (M = 181.59)
5. Dinamometrija dominantne ruke – na inicijalnom mjerenju (M = 76.82) su učenici kontrolne grupe imali niže skorove u odnosu na finalno mjerenje (M = 83.86)

U tabeli 2 dat je prikaz poredenja rezultata na inicijalnom i finalnom mjerenju učenika kontrolne grupe t testom za zavisne uzorke. Poređenje rezultata na inicijalnom i finalnom mjerenju eksperimentalne grupe t testom za zavisne uzorke je pokazalo da postoje statistički značajne razlike na slijedećim varijablama:
1. Flamingo – na inicijalnom mjerenju (M =15.15) su učenici eksperimentalne grupe imali više skorove u odnosu na finalno mjerenje (M =13.50).
2. Taping rukom – na inicijalnom mjerenju (M =12.61) su učenici eksperimentalne grupe imali više skorove u odnosu na finalno mjerenje (M =11.43).
3. Pretklon u sjedu – na inicijalnom mjerenju (M =17.46) su učenici eksperimentalne grupe imali niže skorove u odnosu na finalno mjerenje (M =19).

**Tabela 3.** Poredjenje rezultata na inicijalnom i finalnom mjerenju eksperimnetalne grupe t testom za zavisne uzorke (N = 56, df = 55)

<table>
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<th>Finalno M</th>
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<th>Correlation</th>
<th>Sig.</th>
<th>t</th>
<th>Sig.</th>
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<td>flamingo</td>
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<td>.007</td>
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<td>.000</td>
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<tr>
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<td>.914</td>
<td>.000</td>
<td>7.583</td>
<td>.000</td>
</tr>
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<td>19.00</td>
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<td>.845</td>
<td>.000</td>
<td>-2.488</td>
<td>.020</td>
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<td>.942</td>
<td>.000</td>
<td>-7.559</td>
<td>.000</td>
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<td>Dinamometrija</td>
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<td>15.09</td>
<td>88.85</td>
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<td>.893</td>
<td>.000</td>
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<td>45.29</td>
<td>16.68</td>
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<td>.000</td>
<td>-2.121</td>
<td>.044</td>
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<tr>
<td>Čunastotrčanjet燕na 10x5m</td>
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<td>20.18</td>
<td>3.62</td>
<td>.962</td>
<td>.000</td>
<td>1.851</td>
<td>.076</td>
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</table>

**Diskusija**

Analiza rezultata pokazala je da su učenici iz kontrolne grupe imali bolje rezultate na finalnom mjerenju u odnosu na inicijalno u šest od osam varijabli kojima je prostor motorike, izuzev testa za zavisne uzorke, uvjetovano je ovakav rezultat na inicijalnom mjerenju (M =15.15) i finalnom mjerenju (M =11.43).

**Literatura**


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Univerzitet Crne Gore, Fakultet za sport i fizičko vaspitanje, Narodne omladine, bb 84000 Nikšić, Crna Gora
e-mail: milovanlj@yahoo.com
Ranging the Results Achieved in Biomotoric and Specific-Motoric Skills in Handball Players and Non-Athletes Cadet

Aldijana Muratović and Danilo Bojanić
University of Montenegro, Faculty for Sports and Physical Education, Niksic, Montenegro

ABSTRACT

The goal of research is to establish differences in biomotoric space with young people at the age of cadets (14 ± 6 months; 15 ± 6 months) from Montenegro. The study covers a sample of 500 respondents in total, where 400 of the students are not engaged in organized training process (non-athletes) and 100 are handball players of organized trainings. Biomotoric space is treated with twenty one (21) variables that hypothetically cover the space of: segmented speed, flexibility, explosive leg power, explosive power of arm and shoulder; repetitive power; coordination and balance. The space of specific motoric abilities is tested with five (5) variables that hypothetically cover the space of: shot precision, ball handling capability, slalom running speed, speed in ball control in movement and speed of movement without ball.

Data obtained from the tests is calculated on basic statistic approaches. The paper presents the rank of biomotoric and specific-motoric abilities for each group of respondents to the results obtained. The obtained results suggest the following conclusions as most significant: 1) in the space of biomotoric abilities better results achieved the handball players from the Continental region against those of Mediterranean; 2) in specific biomotoric abilities handball players from the Continental region marked better results as against those of the Mediterranean; 3) in biomotoric abilities handball players achieved better results in comparison with the non-athletes; and 4) in specific biomotoric abilities handball players achieved better results in comparison with the non-athletes.

Key words: biomotoric space, specific biomotoric abilities, athletes, students, cadets, ranging

Uvod

U sportskim aktivnostima, tokom treninga i takmičenja, u rukometu veliki značaj imaju opšte i bazične motoričke sposobnosti. Ako ne postoje ili ako nijesu primjerno razvijene, one mogu uticati na uspeh u rukometu. Rukometnu igru obilježavaju specifične situacijske tehnike, komunikacije i strategije. Rukomet je igra koja zahtijeva visoku šifru fleksibilnosti, koordinacije i balanse. Rukometnu igru objektivno izražava uspjeh u rukometnoj igri, a to se može objektivno ocijeniti i analizirati.

Metode

Uzorak ispitanika je sastojao se od 250 odabranih učenih iz školske populacije, od kojih je 200 učenika iz učilišta u rukometni trening; Treća grupa ispitanika (25) uzrasta 14 godina ± 6 mjeseci, je izabrana iz školske populacije kontinentalnog područja istraživanih regiona koji nisu organizovano uključeni u rukometni trening; Četvrta grupa ispitanika (25) uzrasta 15 godina ± 6 mjeseci, je izabrana iz školske populacije mediteranskog područja istraživanog regiona koji su organizovano uključeni u rukometni trening; Peta grupa ispitanika (100) uzrasta 14 godina ± 6 mjeseci, je izabrana iz školske populacije kontinentalnog područja istraživanog regiona koji nisu organizovano uključeni u rukometni trening; Šesta grupa ispitanika (100) uzrasta 15 godina ± 6 mjeseci, je izabrana iz školske populacije mediteranskog područja istraživanog regiona koji su organizovano uključeni u rukometni trening; Sedna grupa ispitanika (100) uzrasta 14 godina ± 6 mjeseci, je izabrana iz školske populacije mediteranskog područja istraživanog regiona koji nisu organizovano uključeni u rukometni trening; Osmaja grupa ispitanika (100) uzrasta 15 godina ± 6 mjeseci, je izabrana iz školske populacije mediteranskog područja istraživanog regiona koji nisu organizovano uključeni u rukometni trening;

Majtović 2017; Vuleta, i sar. 2012).

Data obtained from the tests is calculated on basic statistic approaches. The paper presents the rank of biomotoric and specific-motoric abilities for each group of respondents to the results obtained. The obtained results suggest the following conclusions as most significant: 1) in the space of biomotoric abilities better results achieved the handball players from the Continental region against those of Mediterranean; 2) in specific biomotoric abilities handball players from the Continental region marked better results as against those of the Mediterranean; 3) in biomotoric abilities handball players achieved better results in comparison with the non-athletes; and 4) in specific biomotoric abilities handball players achieved better results in comparison with the non-athletes.

Key words: biomotoric space, specific biomotoric abilities, athletes, students, cadets, ranging

Metode


Data obtained from the tests is calculated on basic statistic approaches. The paper presents the rank of biomotoric and specific-motoric abilities for each group of respondents to the results obtained. The obtained results suggest the following conclusions as most significant: 1) in the space of biomotoric abilities better results achieved the handball players from the Continental region against those of Mediterranean; 2) in specific biomotoric abilities handball players from the Continental region marked better results as against those of the Mediterranean; 3) in biomotoric abilities handball players achieved better results in comparison with the non-athletes; and 4) in specific biomotoric abilities handball players achieved better results in comparison with the non-athletes.

Key words: biomotoric space, specific biomotoric abilities, athletes, students, cadets, ranging

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29
(ISKPAL); Za procjenu eksplozivne snage nogu: 7. Skok udalj s mjesta (SKUDMJ); 8. Skok uvis s mjesta (SKUVMJ); 9. trčanje 20m-visoki start (SPR20M); Za procjenu eksplozivne snage ruku i ramenog pojasa: 10. Bacanje rukometne lopte iz sijeda raznožnog sa tla (BARUKL); 11. Bacanje košarkaške lopte s grudi iz sjeda na stolici (BAKOŠL); 12. Bacanje medicinke iz ležanja na leđima (BAMEDL); Za procjenu repetitivne snage: 13. Podizanje trupa za 30 sek (PODT30S); 14. Sklekovi na tlu (SKLNTL); 15. Zgibovi iz visa na vratilu (ZGVNVR); Za procjenu koordinacije: 16. Osmica sa sagibanjem (OSMAG); 17. Okretnost u zraku (OKRZRA); 18. Koraci u stranu (KORSTR); Za procjenu ravnoteže: 19. Stajanje na dvije noge, uzdužno, na klupici za ravnotežu, sa otvorenim očima (S2NUKL); 20. Stajanje na dvije noge, poprečno, na klupici za ravnotežu, sa zatvorenim očima (S2NPKL); 21. Stajanje na jednoj nozi, uzdužno, na klupici za ravnotežu, sa zatvorenim očima (S1NUKL). U prostoru specifično-motoričkih sposobnosti primjenjeno je 5 varijabli: 1. Preciznost iz skoka šuta sa 9m (PRSKŠ9M); 2. Sposobnost u bacanju i hvatanj u lopti odbijenih od zid (SPBHLOZ); 3. Slalom u prostoru između 6–9 m (SSL 6-9M); 4. Brzina vođenja lopte u kvadratu (BVLUKV); 5. Kretanje u trouglu osnovnim odbrambenim stavom (KRUTROS).

Rezultati

U tabeli 1. je dat prikaz rangova biomotoričkih sposobnosti za svaku grupu ispitanika prema postignutim rezultatima.

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U tabeli 1 su prikazani rangovi za svaku grupu u svakoj varijabli. Zvjezdicom (*) su obilježene one varijable kod kojih manji rezultat predstavlja bolju vrijednost, u ovom slučaju – manja vrijednost = bolji rang.

Rangiranje prema postignutim rezultatima:
– G_1 u biomotoričkim sposobnostima su postigli najbolje rezultate od ostalih grupa u 7 varijabli, dok u specifično-biomo-
toričkim sposobnostima u 3 varijable;
– G_2 u biomotoričkim sposobnostima su postigli najbolje rezultate od ostalih grupa u 4 varijable, dok u specifično-biomo-
toričkim sposobnostima u 1 varijabi (PRSKŠ9M u kojoj imaju isto postignuće sa grupom G_1);
– G_3 u biomotoričkim sposobnostima su postigli najbolje rezultate od ostalih grupa u 7 varijabli, dok u specifično-biomo-
toričkim sposobnostima u 2 varijable;
– G_4 u biomotoričkim sposobnostima su postigli najbolje rezultate od ostalih grupa u 2 varijable;
– G_5 u biotoričkim sposobnostima su postigli najbolje rezultate od ostalih grupa u 1 varijabi (ISKPAL);
– G_6, G_7 i G_8 u bilo kojoj specifično-biomotoričkoj sposobnosti nijesu postigli najbolji rezultat.

Diskusija

Na osnovu dobijenih rezultata između rukometaša četrnaestogodišnjaka i petnaestogodišnjaka kontinentalne regije, kao i četrnaestogodišnjaka i petnaestogodišnjaka mediteranske regije dolazimo do zaključka da su rukometaši četrnaestogodišnjaci kontinentalne i četrnaestogodišnjaci mediteranske regije postigli bolje rezultate, ali ne u svim testovima. Ovi rezultati se mogu djelimično usaglasiti sa dosadašnjim istraživanjima koji su

U tabeli 1. je prikaz rangova biomotoričkih sposobnosti za svaku grupu ispitanika prema postignutim rezultatima.
imali za cilj da utvrde postojanje razlika različite dobi kod ručometaša (Vuleta, Milanović & Jukić, 1999; Vuleta, Preličec & Gruić, 2004). Ovo možemo opravdati činjenicom da se djeca navedenog uzrasta razvijaju različitom dinamikom, tj. brzina rasta njihovog koštanog sistema, mišića, organskih sistema različita je od stepena do stepena i taj razvoj uveliko diktira njihove fiziološke i motoričke sposobnosti (Bompa, 2005).

Analizom rezultata ovog istraživanja, odnosno komparacijom rezultata sportista i nesportista, kao i komparacija rezultata između grupa prema regionu, treneri dobijaju veliki broj pokažatelja o trenutnom stanju svojih igrača. Takođe, rezultati ovog istraživanja mogu poslužiti kao inicijalna testiranja za planiranje i programiranje trenažnog procesa. Svakako da će jedan dio postignutih rezultata ovog istraživanja poslužiti trenerima kao orijentir pri testiranju sličnog uzrasta u nekoj od sljedećih selekcija mladih ručometaša.

**LITERATURA**


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Model of Advertising Communication in Sport

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ABSTRACT

The objective of this study represent the advertising communication, while the main goal will be directional to creating of advertising model with specific retrospective in sport. The main tasks of this study are, the first conducting a situational analysis, then setting objectives for advertising, deciding on the budget funds, choosing the target market, creation of the advertising messages, selection of appropriate media, as well as evaluating effectiveness of advertising. During the making of this study, the author used descriptive method with consulting of competent literature. The previous author's experience in this field was also so useful. Moreover, the author used the analytic method and parallel method that is the most productive if you make some inferences about some appearance. Consequently, the main outcome of this study was creation of conceptual model of advertising communication with special application in sport industry.

Key words: Advertising, Communication, Sport, Model

Uvod

Kada se govori o procesu planiranja aktivnosti u „reklamnoj industriji“, prema Irwin-u i saradnicima (2002), marketari bi uvijek trebalo da krenu sa sprovođenjem situacione analize, zatim sa određivanjem ciljeva reklamiranja, te izborom ciljanog tržišta, formiranjem reklamne poruke, odabirom adekvatnih medija i, na kraju ocjenjivanjem efikasnosti reklamiranja, dok se, prema Kotler-u (2000), ova struktura za nijansu razlikuje, a mediji i, na kraju ocjenjivanj eu faktasnosti reklamiranja, dok

trebalo da izvuku pouke kako iz uspješnih tako i neuspesnih reklamnih aktivnosti. Na kraju, marketari bi trebalo da sprovedu analizu potencijalnih konkurenata koja bi, takođe trebalo da im u mnogome pomogne prilikom planiranja reklamnih aktivnosti s obzirom da bi na taj način unaprijed znali sa kime se takmiče u tržišnoj trci.

Sprovođenje situacije analize


Određivanje ciljeva reklamiranja


Prema istim autora, ciljevi reklamiranja se mogu podijeliti na ciljeve koji informišu, uvjeravaju ili podsjećaju. Rekla-


Odlučivanje o budžetskim sredstvima

Sljedeći elemenat u modelu reklamne komunikacije pred- stavlja odlučivanje o budžetskim sredstvima koja se izdajuju za reklamiranje. Da bi reklamiranje bilo efikasno veoma je bit- no da se realno proceni iznos sredstava koja će se izdvojiti za reklamiranje u određenom vremenskom periodu. Ukoliko orga- nizacija odluči da izdava nizak nivo sredstava, u tom slučaju efekat koji bi se dobio bi, u većini slučajeva bio neznanst, dok, sa druge strane, ako organizacija odluči da izdvoji visok nivo sredstava, tada efekat koji bi se dobio reklamiranjem ne bi bio adekvatno izloženim sredstvima te bi jedan dio ovih sredstava bilo bolje uložiti za neku korisniju promociju aktivnost. Prema tome, evidentno je, da je veoma važno pravilno odrediti ni- vo budžetskih sredstava koja bi bila izdvojena za reklamiranje, a u skladu sa mogućnostima organizacije i efektima koje bi iza- zvala.

Kada se govor o odlučivanju o budžetskim sredstvima koja se izdajuju za reklamiranje u praktičnom smislu, veoma je va- žno, prema Kotler-u (2000), voditi računa o specifičnim faktori- ma kao što su faza životnog ciklusa proizvoda, tržišno učešće i baza potrošača, konkurencija, učestalost reklamiranja i zamen- livost proizvoda. Prema istom autoru, budžetska sredstva koja se izdajuju za reklamiranje veoma zavise od faze životnog ci- klasa proizvoda, tako se za nove proizvode, uglavnom određuju veća budžetska sredstva kako bi se izgradila popularnost proiz- voda i pridobili potrošače, dok su poznate robne marke obično podržavane nižim nivoima budžetskih sredstava.

Sljedeći faktor o kojem bi trebalo voditi računa, kako Ko- tler (2000) navodi, je tržišno učešće i baza potrošača. Činjenica je da visoko tržišno učešće robne marke, obično zahteva niži ni- vo troškova reklamiranja, s obzirom da se u ovim slučajevima posrednicima odobravaju procenti od prodaje proizvoda, a oni održavaju tržišno učešće nezavisno od organizacija. Dok sa druge strane, stvaranje tržišnog učešća povećanjem veličine tr- žišta zahteva viši nivo troškova reklamiranja jer je potrebno osvojiti nove potrošače. Takođe, kod ovog faktora, važno je po- menuti da je manje skupo obuhvatiti potrošače široko korišćene robne marke, nego obuhvatiti potrošače robnih marki koje ima- ju malo tržišno učešće.


Kao posljednji faktor koji utiče na odlučivanje o budžet- skim sredstvima za reklamiranje, prema Kotler-u (2000), navo- di se i zamenlivost proizvoda. Robne marke u kategoriji proiz- voda, kao što su sportska oprema, energetska pića ili slični pro- izvodi, zahtijevaju agresivno reklamiranje kako bi stvorile pose- ban imidž, a samim tim, može se konstatovati da je reklamira- nje veoma važno u slučajevima kada robna marka može ponu- diti jedinstvene fizičke koristi ili karakteristike.


Izbor ciljanog tržišta

Sljedeći element u modelu reklamne komunikacije predsta- vlja izbor ciljanog tržišta. Prema Kotler-u (2000), postoje četiri osnove koji se koriste prilikom izbora ciljanog tržišta a to su, prije svega geografske karakteristike potrošača, zatin demogra- fiske, psihografske i biheviorističke karakteristike potrošača. Podjela ciljanog tržišta prema geografskim karakteristikama potrošača predstavlja podjelu na različite geografske jedinice, kao što su pokrajine, regioni, države i slično. Prema tome, or- ganizacija može da posluje u jednom ili nekoliko geografskih područja, ili na svim područjima, ali bi trebalo da obrati pažnju, prilikom formiranja reklamne poruke na razlike koje se poja- vljuju na lokalnim područjima. Na konkretnom primjeru, opšte poznanstvo organizacija za proizvodnju osvežavajućih napitaka
„Coca Cola” je odbudala da putem reklamnih poruka obuhvati kompletno svjetsko tržište i time postane svjetski lider kada je ovaj proizvod u pitanju. Dok je, sa druge strane, organizacija koja priređuje avanturističku vožnju dizipovima pod nazivom „Montenegro trophy” odredila da, isključivo putem autorske emisije „Zapis” koju uređuje znakogrski novinar Mioimir Maroš, obuhvati, isključivo tržište Crne Gore.

Kada se govori o podjeli ciljanog tržišta prema demografskim karakteristikama potrošača, obično se misli na podjelu ciljanog tržišta na djelove putem različitih promjenljivih, kao što su, prije svega uzrast, pol, veličina porodice, dohodak, zanima

anje, obrazovanje, nacionalna i vjerska pripadnost. Ovde je vrijedno naglasiti da je podjela ciljanog tržišta prema demografskim karakteristikama potrošača prihvatljivija osnova kada je razlikovanje potrošača u pitanju, jer su, prije svega želje, zanimanje za izbor ciljanog tržišta, pa je veoma važno i ovaj osnov uvažiti istom autoru, prolazi kroz

Da je podjela ciljanog tržišta prema demografskim karakteristikama potrošača prihvatljivija osnova kada je razlikovanje potrošača u pitanju, jer su, prije svega želje, zanimanje za izbor ciljanog tržišta, pa je veoma važno i ovaj osnov uvažiti istom autoru, prolazi kroz

što je veoma važno prem a Kotler-u (2000), razviti kreativne budžetski sredstva koja se koriste za reklamiranje. Prema tome, marketari su dužni da osmisle što


Formiranje reklamne poruke

Sljedeći elemenat u modelu reklamne komunikacije predstavlja formiranje reklamne poruke. Kako reklamne aktivnosti obično predstavljaju kreativno izražavanje marketara, tako iskazana kreativnost marketara, često može imati presudniji uticaj na postizanje postavljenih ciljeva, nego što ga ima visina izdvojenih budžetskih sredstava koja se koriste za reklamiranje. Prema tome, veoma je važno, prema Kotler-u (2000), razvid kreativni moment kod marketara jer na ovaj način bi se mnogo efikasnije sprovela proces formiranja reklamne poruke a, samim tim i uspješnije postigli postavljeni ciljevi. Ovaj proces, prema istom autoru, prolazi kroz četiri faze, od kojih prva faza predstavlja formiranje reklamne poruke, a za njom slijeđe faze ocjene i izbora reklamne poruke, zatim faza izvršavanja reklamne poruke, kao i fazu razmatranja društvene odgovornosti.

Faza stvaranja reklamne poruke.

Prilikom stvaranja reklamnih poruka veoma je važno voditi računa o „koristima” koje određeni proizvodi mogu ponuditi potrošačima. Kako potrošači očekuju jednu od četiri vrste „koristi”, prije svega, racionalnu, zatim čulnu, društvenu korist ili lično zadovoljstvo, u skladu sa tri vrste iskustava, kao što su

iskustvo o rezultatima prethodne upotrebe proizvoda, zatim iskustvo o proizvodu za vrijeme njegove upotrebe, kao i iskustvo koje uzročno proizilazi iz upotrebe proizvoda, stvara se dvanaest kombinacija različitih reklamnih poruka. Ovde se postavlja veoma značajno pitanje, koliko potencijalnih ideja za reklamnu poruku bi marketari trebalo da osmisle prije nego što donesu konačnu odluku o njenom odabiru. Odgovor na ovo pitanje je veoma jednostavan, što je već predloženih reklamnih poruka, veća je vjerovatnoća da će biti otkrivena baš ona „prava” koja će zadovoljiti sve „apetite”. Međutim, što se više vremena potroši za formiranje potencijalnih reklamnih poruka, samim tim su veći i troškovi, pa se marketari, često ne odlučuju da troše mnogo sredstava za stvaranje i prethodno testiranje velikog broja reklamnih poruka. Ipak, pojavom kompjutera, troškovi koji se pojavljuju tokom stvaranja reklamnih poruka se ubrzano smanjuju te se javljaju nove mogućnosti za istraživanje, kreativna i formiranje velikog broja potencijalnih reklamnih poruka što u mnogo neupređuje efikasnost procesa planiranja reklamnih aktivnosti.

Faza ocjene i izbora reklamne poruke.

Kod ove faze, važno je navesti da bi marketari trebalo da se prilikom ocjenjivanja potencijalnih reklamnih poruka vode nje

hovom poželjnosti, ekskluzivnosti i uvjerljivosti na ciljanom tr

žištu. Budući da se veoma često dešava da nije dovoljno osmisliti kako bi reklamna poruka trebala da glasi, već veoma bitnu ulogu igra način na koji se ona saopštava javnosti. Razlog ovoj

činjenici leži u tome što se jedan deo reklamnih poruka pozicionira u racionalnoj, a drugi u emocionalnoj sferi percepcije potrošača. Na konkretnom primjeru, kada organizacija za proizvodnju energetskih dodataka ishara djeluje na potrošače poretkom „Čini Vaše telo snažnijim” ona veže navedenu reklamnu poruku u emocionalnoj sferi percepcije potrošača, dok, sa druge strane, kada organizacija za proizvodnju teniskih reketa u svom reklamnom spustu, ne prikazuje direktno reke te, već isključivo prikazuje najpoznatije svjetske teniserve, stvara se emocionalna asocijacija u sferi percepcije potrošača.

Faza izvršavanja reklamne poruke.

Kako reklamna poruka može imati odlučujući uticaj na ciljanog tržište kada su slični proizvodi u pitanju, kao npr. sportska obuća, sportska odeća, sportski rekvisiti i slično, veoma je značajno pripremiti strategijski plan prilikom sprovođenja reklamnih aktivnosti. Prema tome, marketari su dužni da osmisle što bolji način, zatim što prihvatljiviji ton, „prave” riječi, kao i oblik na koji će reklamna poruka biti izvršena. Kako svaka reklamna poruka može biti predstavljena na više načina, prije svega kao način života, fantazija, raspoloženja, muzikalnost, tehnička stručnost, naučni dokaz, potvrda ili nešto slično, marketari bi trebalo da odaberu odgovarajući ton za određenu reklamnu poruku. Takođe, potrebno je izabrati i „prave” riječi, tj. pripremiti određeni tekst koji će izazvati pažnju i biti lako zapanući. Kada se govori o obliku reklamnih poruka, veličina, boja i ilustracija čine njenom osnovnim elementima koji čizavaju razlike u uticaju i troškovima. Veće površine te za kojima su postavljene reklamne poruke privlači veći u lesanju, ali se ne dešava uvek da privuku onoliku pažnju koja je srazmerna razlikama u troškovima.

Faza razmatranja društvene odgovornosti.

Na kraju, vrijedno je naznačiti da bi organizacije sa svojim reklamnim odeljenjima trebalo da budu uvjereni da njihova reklamna aktivnost nije u sukobu sa društenim i pravnim normama. Činjenica je da veliki broj organizacija radi na otvorenom i iskrenoj komunikaciji sa potrošačima, ali je zloupotreba uvijek

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Izbor adekvatnih medija

Nakon formiranja reklamne poruke, naredni zadatak marketa ra u procesu planiranja reklamnih aktivnosti predstavlja izbor adekvatnih medija koji imaju zadatak da prenese odredene reklamne poruke do ciljanog tržišta. Kako bi marketeri uspjeli da sprovedu ovaj zadatak, prema Kotler-ovim (2000) preporukama, potrebno je da ovaj proces prođe kroz pet faza, prije svega kroz fazu odlučivanja o željenom obnovu, učestalosti i uticaju, zatim kroz fazu izbora glavnih vrsta medija, te kroz fazu izbora specifičnih medijalnih sredstava, kao i kroz fazu odlučivanja o raspoređivanju reklamnih poruka u medijima, te kroz fazu odlučivanja o geografskoj alokaciji medija.

Faza odlučivanja o željenom obnovu, učestalosti i uticaju.

Izbor adekvatnih medija predstavlja pronalaženje najefikasnijih kanala putem kojih bi se određena reklamna poruka plasirala u javnost a gdje bi se upoznato sa proizvodom. Uticaj reklamne poruke na upoznatost potrošača sa proizvodom koji se nudi zavisio od obnovu, učestalosti i uticaja predstavljanja.

Obuhvat predstavlja, prema Evans-u i Berman-u (1997), određeni broj osoba ili porodica koji su izloženi utjecaju određenih medija jednom ili više puta u određenom vremenskom periodu, a odsnosi se na gledače, slušače ili čitače određenog medija. Za televiziju i radio, to je ukupan broj ljudi koji gleda ili sluša određenu reklamnu poruku, dok kod štampanih medija, obuhvat predstavlja tiraž i stopa opticaja. Sa druge strane, učestalost predstavlja, prema istim autorima, frekvenciju izlaganja određene osobe ili grupe reklamnoj poruci u određenom vremenskom periodu, dok uticaj predstavlja kvalitativnu karakteristiku koja je predstavljena određenim medijem. Na konkretnom primjeru, reklamna poruka kojom se želi promovisati sportsko-rekreativni program, u magazinu „Cafe Montenegro“ neće imati isti uticaj kao u sportskom dodatku „Arena“ koji izlazi u dnevnom listu „Pobjeda“. Sve u svemu, više je nego evidentno da će upoznatost potrošača sa proizvodom koji se nudi biti mnogo veća ukoliko su i obuhvat, i učestalost, kao i uticaj veći.

Marketeri bi, također trebalo da odrede najefikasniju kombinaciju ove tri karakteristike, s obzirom da je obuhvat najvažniji kod plasiranja novih proizvoda na tržište, zatim kod sporednih uspješnog ostvarivanja planiranog cilja, dok mali broj ponavljanja učestalosti reklamnih poruka više puta polako počinju da postupaju prema njenoj uticaju na potrošača u uvidu potrošača, ili kod potrošača koji su i obuhvat, i učestalost reklamne poruke više puta polako iđu po cijeli periodu, dok uticaj predstavlja kvalitativnu karakteristiku koja je predstavljena određenom medijem. Na konkretnom primjeru, reklamna poruka kojom se želi promovisati sportsko-rekreativni program, u magazinu „Cafe Montenegro“ neće imati isti uticaj kao u sportskom dodatku „Arena“ koji izlazi u dnevnom listu „Pobjeda“. Sve u svemu, više je nego evidentno da će upoznatost potrošača sa proizvodom koji se nudi biti mnogo veća ukoliko su i obuhvat, i učestalost, kao i uticaj veći.

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proizvođača i potrošača postaje sve veći pa reklamne agencije gube svoju ulogu posrednika. Pojamov multimedijski, potrošači dobijaju veću mogućnost kontrole nad reklamnim porukama, a proizvođači dobijaju više informacija o svojim potrošačima i mogu bolje da prilagode proizvode i poruke.

**Izbor specifičnih međijskih sredstava.**

Slijedeća faza u procesu izbora adekvatnog medija predstavlja izbor specifičnih međijskih sredstava. U ovom odjeljku je važno napomenuti da bi marketari trebalo da pronađu najprihvatljiviju i najefikasniju međijsku kombinaciju. Na konkretnom primjeru, evidentno je da se 70% planiraju reklamne troškove tako da trebalo da slijede politiku sezonskog reklamiranja i da kalendarske godine. Sa druge strane, problem mikro raspoređenja primjenjuje se tokom ljetnog perioda a marketari bi, shodnim sposobnostima, bolje da prilagode proizvode i poruke.

**Faza odlučivanja o raspoređivanju reklamnih poruka u medijima.**

Istraživanje prodajnog efekta predstavlja drugi način istraživanja na koji se, prema Kotler-u (2000), marketari odlučuju. Istraživanjem prodajnog efekta se utvrđuje efikasnost prodaje koju je izazvala reklamna poruka te se provjerava da li se povecaša upoznatost potrošača sa određenom robnom markom. Marketarima je mnogo lakše utvrditi komunikacijski efekat reklamne poruke od prodajnog efekta iz razloga što na prodaju utiču brojni faktori, čiji su uticaj teško prepoznati, prije svega kao što su karakteristike proizvoda, zatim cijena, raspoloživost, kao i konkurencija. Samim tim, marketari se trude da ovo istraživanje dovedu u takvo okruženje gdje će biti u mogućnosti da što više spoljnih faktora dovedu pod svoju kontrolu jer je, u tim slučajevima mnogo lakše izmeriti uticaj reklamiranja na prodaju.

Uticaj reklamnih aktivnosti na prodaju proizvoda je najlakše utvrditi kod direktnog marketinga, a najteže ga je prepoznati kod formiranja imidža. Zbog teškoća koje su navedene, marketari se najčešće odlučuju da uticaj reklamiranja na prodaju utvrđuju analiziranjem istorijskih dokumenata ili eksperimentalnim istraživanjima kao najprimjenljivijim metodama istraživanja.

**Literatura**


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**Abstract**

The objective of this study is the history of skiing, while the main goal will be the historical development of skiing in Montenegro. The study consists of three goals. The first goal is the emergence of the first ski in the world and benefits that are brought. Another goal is focused on the development of skiing in the former Yugoslavia. The third and the main goal is the occurrence and development of skiing and ski sports in the territory of Montenegro. During the making of this study, the author used descriptive method with consulting of competent literature. The previous author experience in this field was also so useful. Moreover, the author used the analytic method and parallel method that is the most productive if you make some inferences about some appearance. Consequently, the main outcome of this study was showing of historical progress of ski sports in Montenegro from early beginnings to the modern Olympic skiing.

**Key words:** Ski sport, development, competition, Montenegro

Godine 1883. osnovan je norveški savez koji je prvo spro- veo klasifikaciju norveških skijskih disciplina.

Godine 1905. osnovan je u Minhenu srednjojiskovski ski- jaški savez između Nemaca, Austrije i Švajcarske, koji djeluje do 1908. godine kao jedina međunarodna skijska organizacija u Evropi.

Godine 1910. u norveškom gradu Kristijaniji osnovana je Međunarodna skijska komisija. Ova komisija je pripremala prve propise za međunarodna skijska takmičenja (Flower, 1977.)

Međunarodna skijska federacija (Federation Internationale de Ski) skraćeno FIS, formirana je 1924. godine u francuskom skijskom centru Šamioni, Sjedište saveza je u Bernu.

Skijanje je uvedeno već na prvim zimskim olimpijskim igrama 1924. godine u Sarajevu i Francuskoj, gdje 1937. godine održano i prvo prvenstvo svijeta u skijanju (Huntford, 2008.)

Razvoj skijanja u bivšoj Jugoslaviji

U krajevima bivše Jugoslavije ima mnogo pogodnih ski-jaških terena, pa je skijanje dosta razvijeno. U slovenskim planinama, smatraju se prvim skijašima u Srednjoj Evro- pi. Ti bloški seljaci, kojima su skije služile za krati- čenje sl ovenskih seljaka na planiskom terenu. Valvazor spominje 1689. godine u svojoj knjizi "Di Ere des škijskih terena, pa je skijanje dosta razvijeno. Istori
djelatnici prve skije, a iste godine održao je prvi skijaški te-

Kao i u većini europskih zemalja prve skije u Sloveniji su došle iz Norveških zemalja, a intenzivan razvoj doživljava na-
kon Nansenove expedicije na Grenland, koja je doživjela veli-

Kao pioniri skijanja u Jugoslaviji smatraju se Edmond Či- bej i Rudolf Cvetko. Čibej je 1888. godine donio prve orginalne
norveške skije u Sloveniju, a Cvetko je bio jedan od prvih ško-
lovanog skijskog učitelja u sloki Matijaža Zdarskog.

U Sloveniji je 1911. godine osnovano prvo školsko društvo "Dren", a 1913. godine u Bohiniju je održan pod vodstvom Rudolfa Badjure prvi skijski tečaj i organizovano prvo skijsko takmičenje. Turističko društvo "Skala" iz Ljubljane organizovalo je 1925. godine skijsko takmičenje na Bledu u tranziciji na 50 km. Veliku aktivnost prvo drugog svjetskog rata razvio je ski-jaški klub "Ljubljana", osnovan 1928. godine. Te je godine održano takmičenje "Triglavski sport". Godine 1934. izrađena je škakonica u Planici, a iste je godine održano i prvo takmičenje u skijskim skokovima (Denda, 2009.)

Željko Brkić i Zlatko Korošec osnovali su prvo klubre u Ljubljani, a najstariji je preduzeća 1923. godine u Zagrebu osnovao je prvi skijsko društvo "Zagrebački skijaški klub", a 1924. godine održano je prvo takmičenje u skijskim disciplinama.


Razvoj skijanja u Crnoj Gori


Razvoj skijanja u Crnoj Gori

U Crnu Goru skije su stigle 1893. godine, a donio ih je ili bolje reći na njima je došao od Kotora, preko Njeguša, na Cetinje kapetan norveške vojske Henrik Augusto Angel, gaziči u doboke snježne nanose. Dolazak kapetana Angel na Cetinje i pojava prvih skija ili "liže" kako su ih Crnogorci zvali, izazvalo je veliko interesovanje kod Crnogoraca. Na svom putovanju, Angel je na skijama obišao skijanje u Crnoj Gori, a u podraskom 1928. godine postojalo 354 skijaške organizacije i oko 62000 organizovanih skijaša. Taj broj je u narednim godinama rastao sve do raspada Jugoslavije.
ovom izuzetnom čovjeku, velikom entuzijastu na polju smučanja, podigavši mu spomen obilježje u planinarskom domu na Ivanovim koritima, 29. septembra 1984. godine. Ova spomen ploča podsjeća buduće narašću na Henriku Angela, koji je svojim dolaskom na skijama u Crnu Goru bio inspirator početka razvoja ovog sporta u našim krajevima i formiranja prvog skijaškog duštva na Cetinju. Pored toga, on je svojim knjigama "Kroz Crnu Goru na skijama", "Sinovi crnih brda" i ostalim objavljenim krajem XIX vijeka u Norveškoj, a kasnije njenim prevodima i svjetskoj javnosti, predstavio život i običaje crnogorskog naroda.

Prilikom boravka u Nikišću upoznajo mladog ljekara Novaka Ognjenovića, koji je bio na školovanju u Moskvu, a naložio se na službi u Nikišću. Novak je bio vrlo ljubazan prema Angelu, a isto tako je i bio veliki ljubitelj skija, pa mu ih je Angel poklonio svataju na Henrika Angela, koji je svojom sposobnošću i iskusanim vodstvom izgradila ove ovedubine.

U "Slobodnoj Misli" dopisnik iz Kolašina piše članak "Skijaški sport u Kolašinu u 1933. godini". U ovom članku piše: "Prve skije zajedno su 1905. godine, kada je grupa Sjeverno-izlaznih turista počela praznovati na skijama preko planine Bjelasice i prispjela u Kolašin".


Početkom 1933. godine održana je skijaška utakmica u trčanju na stazi dugoj 8 km. Pobjedio je Milo Raketić, skijaš početnik. Štoviše, ovaj dovodi smučarsku novinu "Smutku". Predsjednik je Blaž Raosavljević, zamjenik Novak Bošković, a sekretar Đordje Rakočević.

Istaj stražnji postavlja da je u Kolašinu održana prva smučarska utakmica 1933. godine na stazi dugoj 12 km. Prvi priznanjima dobiva Milo Raketić, drugi Božo Bogdanić, treći Milošević i četvrto Vlado Bulatović.

Zaključak

Skijanje u Crnoj Gori je imalo etapni razvoj u zavisnosti od mnoštva okolnosti. Može se slobodno reći da je jedan od najprihvatljivijih i najpopularnijih sportova kod Crnogoraca. Od sredine 20. stoljeća, Crna Gora bogata, kako prirodnim resursima zabilježiti, tako i izuzetno motoričkim sposobnostima ljudskog vrsta, povjerenja u ovaj izuzetni sport.

**Literatura**


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Comparison of Two Interpolation Methods for Resampling Center of Mass Velocity Data

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ABSTRACT

Data interpolation methods are highly useful for estimating missing values. Another usage of these methods is resampling the measured data. In the field of biomechanics sometimes researchers have to deal problems related to data acquisition rate or sample size. Using linear or polynomial interpolation methods, it is possible to overcome these problems. However, choosing right interpolation method is very critical. In this short report two interpolation methods with very similar estimations were compared. Results showed that, even the interpolation curve fits most of the data, the overall appearance can be misleading.

Key words: Data acquisition, interpolation, spline, polynomial, velocity

Introduction

Analyzing and interpreting kinetic and kinematic variables of a biomechanical research can sometimes be problematic with regard to data acquisition rate (DAR) of measurement devices. One reason of this condition is the fixed DARs. For example, some video cameras give fixed frame rates per second (30, 60 or 120) and for the most of the camera models it is not possible to interfere to the frame rate by third party software. If these two conditions come together, there is no other option than recording video at given frame rate. Supposing that video was captured one of these cameras at 30 fps. Therefore, each frame would correspond to every 0.03 s or if the other frame rates are used, times for the frames would be every 0.016 s and 0.0083 s respectively. As might be expected, dealing with repeated decimals during the analyses or presenting them on the plots are not favorable for the researchers. Instead of repeated decimal numbers, working with plain decimal numbers gives easy and clear understanding during analyses or interpretations. Another difficulty occurs when multiple data acquisition devices with different DARs are used (Smolka & Skublewskas-Paszowska, 2014). Usually, measurement devices produced by the same company are compatible with each other. However, these kind of measurement systems are quite expensive and for the most of the researchers or laboratories it is not financially easy to have these systems (Hamill et al., 1997). As is seen some studies (Blackburn et al., 2013; Muller et al., 2011; Zelle et al., 2007) most of the time, researchers have to collect data via devices with different DARs for a measurement For example, if force or electromyography (EMG) data, that can be collected only at 10 Hz and multiples (limited by the device), that would like to add a measurement in which aforementioned video cameras are used, it would be not possible to show data samples on the same time frame because of unequal sampling intervals. In this case, there are two solutions. In first, the DAR of the force plate or EMG can be equalized with the frame rate of the cameras, which is a pointless effort. Because, measuring these variables at 30 and 60 Hz (even 120 Hz) will be resulted huge amount of data loss. In second, the kinematic data can be resampled after direct linear transformation (DLT) process of kinematic analysis, using interpolation methods. There are several kinds of interpolation methods. Polynomial and spline interpolation methods are the most popular interpolation methods. However, literature review showed that the usage of interpolation methods in swimming biomechanics is pretty low than expected. Therefore, in this short report third order (cubic) polynomial interpolation and cubic spline interpolation methods were compared to find out which one of these methods fits better a velocity data obtained from swimming kick start.

Method

A swimming kick start’s block phase recorded at 60fps and using a motion analysis software (Skillspector), the velocity of swimmer’s CM in antero-posterior axis from starting signal to take-off was calculated. In addition, one axis (horizontal) force data collected at 100 Hz. For the purpose of equalizing sample sizes of these two measurements, 60 Hz velocity data were resampled to 100 Hz using cubic polynomial and cubic spline interpolation methods via Systat Software’s SigmaPlot Ver. 12. After resampling, two data were compared using Mann Whitney U test.

Results

Mann Whitney U test results showed that the resampled data using polynomial and spline interpolation methods were not statistically different, \( U = 4099, p = .907 \). On the other hand, according to descriptive statistics, the maximum velocity estimated by the polynomial interpolation method respectively higher than both raw data and the data interpolated by spline equation (see Table 1).
Table 1. Descriptive statistics of raw and resampled data

<table>
<thead>
<tr>
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<th>n</th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw</td>
<td>56</td>
<td>.89</td>
<td>1.27</td>
<td>-.15</td>
<td>3.73</td>
</tr>
<tr>
<td>Poly. int.</td>
<td>91</td>
<td>.88</td>
<td>1.23</td>
<td>-.11</td>
<td>4.22</td>
</tr>
<tr>
<td>Spline int.</td>
<td>91</td>
<td>.84</td>
<td>1.22</td>
<td>-.17</td>
<td>3.72</td>
</tr>
</tbody>
</table>

Scatter plot of the raw data and interpolation curves revealed that polynomial interpolation method gives a smoother curve than spline interpolation method (See Figure 1). However interpolation curve missed the important fluctuations in the middle of the data series. Also, at the end velocity curve increased more steeper than the other data series.

Discussion

Even single bent velocity curve was favorable for cubic polynomial interpolation, when this method used backward move of swimmer’s CM at the beginning of the movement can be overlooked. In addition, especially at and the end of the data, velocities were quite higher than calculated ones. Yet, the R-squared value of the polynomial interpolation was .98, the difference between calculated max and estimated max velocity is significantly important. Because approximately .50m/s difference in the CM velocity can give a wrong impression about the performance. On the other hand, when cubic spline interpolation method was used, the interpolation lines smoothly followed the actual data and also there was no miss interpolation at the edges. The main disadvantage of using polynomial interpolation is that, these methods give a single model for the entire data set. However, the spline interpolation method uses a piecewise continuous function composed of several polynomials and also spline interpolation line passes through all predefined data points which decreases the residuals significantly. In conclusion using spline interpolation method to resample velocity data gave more robust results than cubic polynomial interpolation. The spline interpolation method is strongly advised to the researchers who needs to resample their data.

References


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Revised June 2015

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### 1.4. Peer Review Process

A manuscript submitted for publication will be submitted to the review process as long as it fits the following criteria:

- The study was not previously published, nor has been submitted simultaneously for consideration of publication elsewhere;
- All persons listed as authors approved its submission to SMJ;
- Any person cited as a source of personal communication has approved the quote;
- The opinions expressed by the authors are their exclusive responsibility;
- The author signs a formal statement that the submitted manuscript complies with the directions and guidelines of SMJ.

The editors-in-chief and associate editors will make a preliminary analysis regarding the appropriateness, quality, originality and written style/grammar of the submitted manuscript. The editors reserve the right to request additional information, corrections, and guideline compliance before they submit the manuscript to the ad-hoc review process.

SMJ uses ad-hoc reviewers, who volunteer to analyze the merit of the study. Typically, one or two expert reviewers are consulted in a double-blind process. Authors are notified by e-mail when their submission has been accepted (or rejected). Minor changes in the text may be made at the discretion of the editors-in-chief and/or associate editors. Changes can include spelling and grammar in the chosen language, written style, journal citations, and reference guidelines. The author is notified of changes via email. The final version is available to the author for his or her approval before it is published.
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The editors of SMJ consider plagiarism and self-plagiarism to be a serious breach of academic ethics. Any author who practices plagiarism and/or self-plagiarism (in part or totality) will be suspended for six years from submitting new submissions to SMJ. If such a manuscript is approved and published, public exposure of the article with a printed mark (“plagiarized” or “retracted”) on each page of the published file, as well as suspension for future publication for at least six years, or a period determined by the editorial board. Third party plagiarized authors or institutions will be notified, informing them about the faulty authors. Plagiarism and self-plagiarism will result in immediate rejection of the manuscript.

SMJ only publishes studies that have been approved by an institutional ethics committee (when a study involves humans or animals). Fail to provide such information prevent its publication. To ensure these requirements, it is essential that submission documentation is complete. If you have not completed this step yet, go to SMJ website and fill out the two required documents: Declaration of Potential Conflict of Interest and Authorship Statement. Whether or not your study uses humans or animals, these documents must be completed and signed by all authors and attached as supplementary files in the originally submitted manuscript.

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1.6. After Acceptance

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 SMJ. 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.

Should there be any errors, authors should report them to the Office e-mail address sportmont@ac.me. If there are not any errors authors should also write a short e-mail stating that they agree with the received version.

1.7. Code of Conduct Ethics Committee of Publications

SMJ is hosting the Code of Conduct Ethics Committee of Publications of the COPE (the Committee on Publication Ethics), which provides a forum for publishers and Editors of scientific journals to discuss issues relating to the integrity of the work submitted to or published in their journals.
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:

Transfer of Learning on a Spatial Memory Task between the Blind and Sighted People Spatial Memory among Blind and Sighted

Original Scientific Paper

Transfer of learning on a spatial memory task

Selcuk Akpinar¹, Stevo Popović¹², Sadettin Kirazci¹

¹Middle East Technical University, Physical Education and Sports Department, Ankara, Turkey
²University of Montenegro, Faculty for Sport and Physical Education, Niksic, Montenegro

Corresponding author:
S. Popovic
University of Montenegro
Faculty for Sport and Physical Education
Narodne omladine bb, 84000 Niksic, Montenegro
E-mail: stevop@ac.me

Word count: 2,980

Abstract word count: 236

Number of Tables: 3

Number of Figures: 3

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.

2.1.2. Type of publication

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.
2.1.5. Affiliations

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 or Montenegrin, so carefully check the official English or Montenegrin 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.

2.1.6. Corresponding author

Corresponding author's name with full postal address in English or Montenegrin 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.

2.1.7. Manuscript information

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.

Key words should be placed on the second page of the manuscript right below the abstract, written in italic. Separate each key word by a comma (and a space). Do not put a full stop after the last key word. See example:

Abstract

Results of the analysis of...

Key words: spatial memory, blind, transfer of learning, feedback
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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), and Title and Abstract in Montenegrin (only for the authors from former Yugoslavia, excluding Macedonians and Slovenes). 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.

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SMJ 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 assistance 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

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 Krustrup (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

- Krustrup et al. (2003) studied…
- In one study (Krustrup 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):


Journal article (online; electronic version of print source):

Journal article (online; electronic only):

Conference paper:

Encyclopedia entry (print, with author):

Encyclopedia entry (online, no author):

Thesis and dissertation:
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.

✓ "One participant was diagnosed with heat illness and n = 19. b n = 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)

2.6. Figures

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. SMJ prefers TIFF, EPS and PNG formats.

If a figure has been published previously, acknowledge the original source and submit a written permission from the copyright holder to reproduce the material. Permission is required irrespective of authorship or publisher except for documents in the public domain. If photographs of people are used, either the subjects must not be identifiable or their pictures must be accompanied by written permission to use the photograph whenever possible permission for publication should be obtained.

Figures and figure legends should be completely intelligible without reference to the text.

The price of printing in color is 50 EUR per page as printed in an issue of SMJ.

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 bellow 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.

2.6.2. Figure citation

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. In Montenegrin, it is opposite.

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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 |

2.8. Latin Names

Latin names of species, families etc. should be written in italics (even in titles). If you mention Latin names in your abstract they should be written in non-italic since the rest of the text in abstract is in italic. The first time the name of a species appears in the text both genus and species must be present; later on in the text it is possible to use genus abbreviations. See example:

✔ First time appearing: *musculus biceps brachii*

Abbreviated: *m. biceps brachii*
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3. Publication type:

   

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4. Numbers:

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This study complies with the ethics committee of (state the name of the institution):

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6. Authors’ confirmation:

By signing, all authors confirm the agreement with the contents of the statement in the previous chapter and that the information they provided on these pages is true.

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# Declaration of Potential Conflict of Interest

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(Authors should be listed in the exact order as appearing on the title page of the manuscript. Feel free to copy and add more tables for additional authors if needed, likewise delete the excess if not used. ALL AUTHORS MUST SIGN THIS FORM).

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