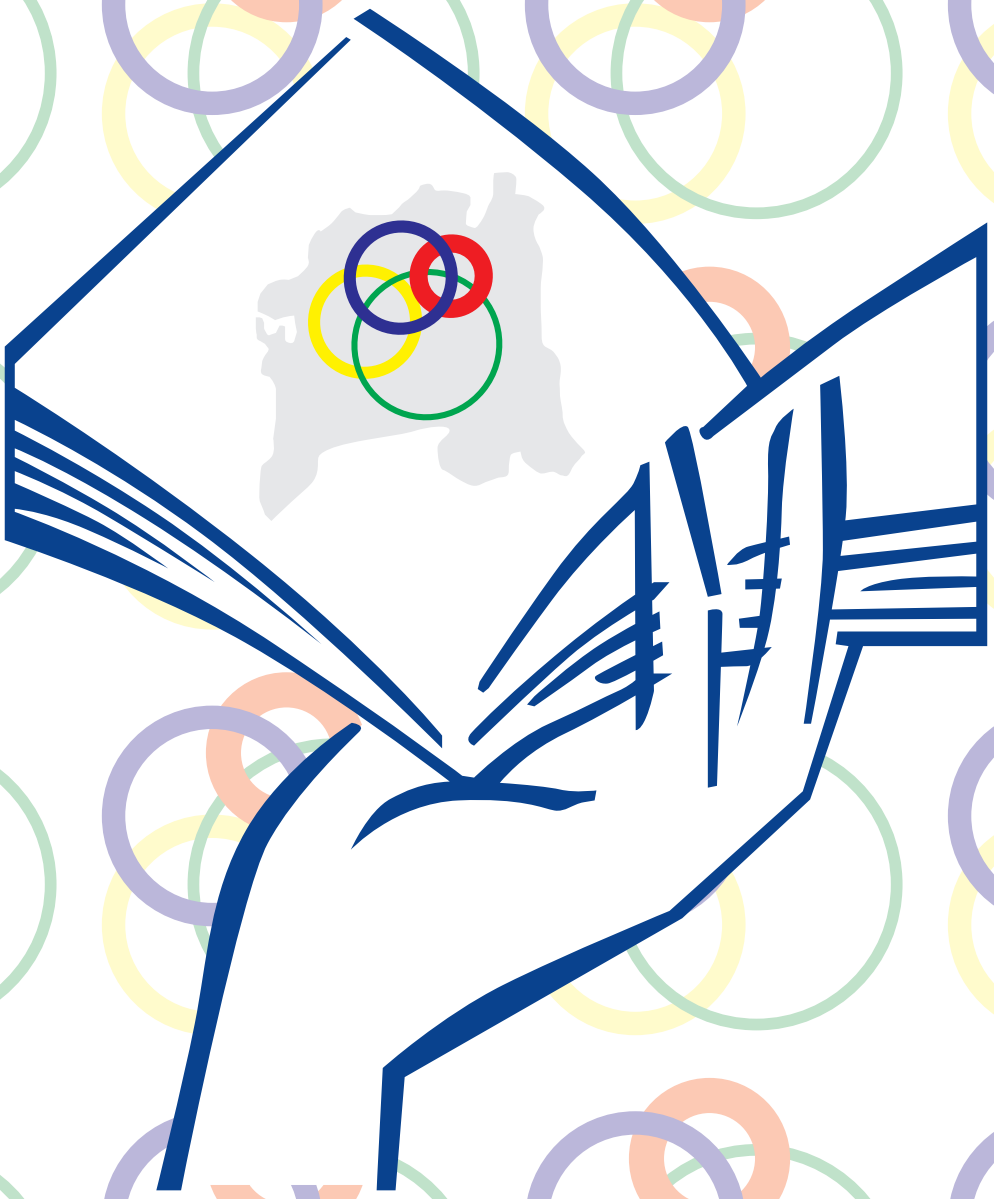
ISSN 1451-7485 eISSN 2337-0351

SPORT MONT

www.sportmont.ucg.ac.me

ISSN 1451-7485



CRNOGORSKA SPORTSKA AKADEMIJA
MONTENEGRIN SPORTS ACADEMY

Vol. 14 October 2016 No. 3

SPORT MONT

Publishers

Montenegrin Sports Academy
Montenegrosport
Faculty for Sport and Physical Education, University of Montenegro

Prepress

Boris Šundić

Print

"AP Print" | Podgorica

Print run

1500

ISSN 1451-7485 eISSN 2337-0351

SPORT MONT
International Scientific Journal

Vol. 14(2016), No.3 (1-63)

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Sport Mont 14 (2016) 3: 3–6
Original scientific paper
UDC 796.344:796.012.2

Mental Toughness Attributes of Junior Level Medalist Badminton Players

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A B S T R A C T

The study aims to compare the mental toughness attributes between medalist and non-medalist badminton players and between male and female players. Participants were 15 male and 15 female badminton players aged between 13-19 years (M= 15.71, SD=2.82). Mental toughness questionnaire of Tiwari and Sharma was administered and the data were analyzed by using descriptive statistics and t-test. Medalist players have exhibited higher mean values on self-confidence, attention control, motivation and goal setting attributes. Overall mental toughness of medalists was higher 180.80±17.15 than non-medalists 170.25±20.10. Comparison analysis showed significant difference between medalists and non-medalists on mental toughness attributes: Self-confidence (SCO: p=0.001<0.05), medalists scored (M±SD=31.33±2.10) higher than non-medalists; motivation (MOT: p=0.006<0.05), medalist scored higher (M±SD=33.50±4.07; goal setting (GSE: p=0.044<0.05), medalists scored significantly higher (M±SD=33.55±4.11) than non-medalists. Other attributes did not show any significant difference between medalist and non-medalist players. When compared with gender, no significant difference was observed on mental toughness attributes except attention control (ATNCON: p=0.044<0.05), female players scored (M±SD=38.97±3.08) higher than male players. The findings confirm that mental toughness is a desired attribute which differentiates a medalist and non-medalist player. Connaughton et al., (2007) stated that elite competitive athletes possess better mental toughness. Medalist players displayed better self-confidence than the non-medalists as supported by Kuan and Roy (2007), Loehr (1986). Motivation helps players to achieve their best and enhance mental toughness (Connaughton et al., 2008; Mohammad et al., 2009). Goal setting determines successful performance Weinberg and Weigand (1993), Weinberg (2003). It was concluded that medalist badminton players showed better mental toughness attributes than the non-medalists.

Key words: *mental toughness, self-confidence, motivation, goal setting, medalist*

Introduction

Mental toughness is a psychological construct that is associated to successful sports performance (Gucciardi, Gordon, & Dimmock, 2009; Crust, 2008; Jones, Hanton, & Connaughton, 2007; Bull, Shambrook, James, & Brooks, 2005; Gould, Dienffenbach, & Moffett, 2002). Clough et al. (2002) suggested that mental toughness is a trait that allows individuals to remain relatively unaffected by competition or adversity. Mental toughness can be considered as a mental skill factor and some research findings have identified, mental skills as a psychological construct that distinguishes between more and less successful performance across a number of sports; for example, golf (Thomas & Over, 1994), and equestrian, (Meyers et al., 1998). Mental toughness and its importance in competitive sports have been documented in literature (Goldberg, 1998; Hodge, 1994; Tunney, 1987; Williams, 1988). Loehr (1982; 1986) suggested that fifty percent of success in competitions could be attributed to mental toughness in athletes. On similar lines, Gould et al. (1987) indicated that coaches felt the importance of being mentally tough in achieving success in sports. Norris (1999) also emphasized the importance of mental toughness in the making of a champion athlete. Gould et al. (2002) studied the psychological characteristics of Olympic champions, and identified mental toughness as a significant contributor to sports performance enhancement. So coaches acknowledge that mental toughness is an essential factor that determines the winning and losing.

The term mental toughness is intuitively appealing and used equally generously by players, coaches and the sports media, yet usually without adequate definition (Cashmore, 2002; Clough, Earle, & Sewell, 2002). Mental toughness is a quality of the players to cope up better than their opponents and unshakeable pre service conviction towards the same goal despite pressure and adversity. Jones et al. (2002) defined that "cope better than your opponents with the many demands (competition, training, and lifestyle) that sports places on a performer. Specifically be more consistent and better than your opponents in remaining determined, focused, confident, and in control under pressure." Mental toughness is a psychological construct that is associated to successful sports performance (Crust 2008).

Whilst some recent research supports Loehr's (1986) propositions on mental toughness, these have not substantially added to the debate. Specifically, Jones, Hanton, and Connaughton (2002) have suggested that mental toughness is "having the natural or developed psychological edge that enables you to, generally, cope better than your opponents with the many demands (competition, training, lifestyle) that sport places on a performer and, specifically, be more consistent and better than your opponents in remaining determined, focused,

Received for publication June 15, 2016

confident, and in control under pressure." While Clough et al. (2002), writing of mentally tough performers, stated that "with a high sense of self-belief and an unshakeable faith that they control their own destiny, these individuals can remain relatively unaffected by competition or adversity."

Mentally tough athletes use skills, techniques and tactical movements without fear and anxiety during adverse situations that normally increase their performance. The objective of this study was to assess and compare the mental toughness attributes between medalists and non-medalist badminton players and between male and female players.

Methods

Thirty badminton players (male 15; female 15) aged between 13-19 years (M=15.71, SD=2.42) were selected randomly who participated in the Under 15 years, 17 years, and 19 years National School Games held at Chandigarh (India). Further the players were divided into medalists (male 5; female 7) and non-medalists. The questionnaire was clearly explained to the participants and they were asked to complete all the items. Participants were informed about the purpose of the study prior to the collection of data.

Measures

Mental toughness questionnaire of Tiwari and Sharma (2007) was administered. The questionnaire consists of 48 statements. These 48 statements are further divided into 6 subscales namely; Self Confidence, Attention Control, Motivation, Goal Setting, Visual and Imagery and Attitude Control; which were designed to measure factors that reflect mental toughness of sports persons. Self Confidence subscale contained 8 statements; Attention Control (10 statements); Motivation (9 statements); Goal Setting (8 statements); Visual and Imagery (6 statements); and Attitude Control (6 statements).

Data Analysis

Data screening was undertaken to check the missing values and ensure that the values were within the expected range. Descriptive statistics were computed on six mental toughness attributes of male and female badminton players. T- test was applied to compare the means between the groups. The SPSS version 16.0 was used as a tool for analyzing the data. The criterion for statistical difference was set at 0.05 level of confidence.

Results

Table 1. Descriptive statistics of mental toughness attributes of badminton players

Mental toughness Attributes		Medalist (N=12)	Non-medalist (N=18)	Male (N=15)	Female (N=15)
Self Confidence	Mean	31.33	27.54	29.93	28.66
	SD	2.10	2.53	2.90	2.76
Attention Control	Mean	39.00	36.44	36.00	38.97
	SD	2.04	3.53	4.22	3.08
Motivation	Mean	33.50	28.61	31.66	29.46
	SD	4.07	4.58	4.98	5.12
Goal Setting	Mean	33.55	30.11	31.13	31.27
	SD	4.11	3.47	4.73	3.95
Visual Imagery	Mean	21.25	22.94	21.40	22.13
	SD	2.17	3.42	3.20	3.27
Attitude Control	Mean	22.17	22.22	22.13	22.26
	SD	2.65	2.57	2.79	2.18
Overall Mental Toughness	Mean	180.80	170.25	172.25	172.72
	SD	17.15	20.10	22.82	20.39

Table 1 revealed the mean and standard deviation of all the six mental toughness attributes of badminton players. Medalist badminton players have exhibited higher mean values on self-confidence, attention control, motivation and goal setting attributes. Overall mental toughness of the medalist players were significantly higher 180.80±17.15 than non-medalist players 170.25±20.10. It may be noticed that not much difference was seen in the mean scores of mental toughness attributes between male and female players.

Table 2. Comparison of mental toughness attributes between groups

Groups	Medalist and Non-medalist		Male and Female	
Mental toughness	t-value	p-value	t-value	p-value
Self Confidence	3.981	0.001*	1.215	0.235
Attention Control	1.836	0.079	2.18	0.049*
Motivation	2.978	0.006*	1.189	0.244
Goal Setting	2.340	0.044*	0.712	0.483
Visual Imagery	1.553	0.132	1.467	0.154
Attitude Control	0.570	0.955	0.140	0.890

Legend: *Statistically Significant at the 0.05 levels

In Table 2 comparison analysis showed significant difference between medalists and non-medalists on mental toughness attributes: Self-confidence (SCO: p=0.001<0.05), medalists scored (M±SD=31.33±2.10) higher than non-medalists (M±SD =27.54±2.53); motivation (MOT: p=0.006<0.05), medalists scored higher (M±SD=33.50±4.07) than non-medalists (M±SD

=28.61±4.58); goal setting (GSE: p=0.044<0.05), medalists scored significantly higher (M±SD=33.55±4.11) than non-medalists. Other attributes did not show any significant difference between medalist and non-medalist players. When compared with gender, no significant difference was observed on mental toughness attributes except for attention control (ATNCON: p=0.044<0.05), female players scored (M±SD=38.97±3.08) higher than male players (M±SD=36.00±4.22)

Discussion

The objective of this study was to assess and compare the mental toughness attributes between medalists and non-medalist badminton players and between male and female players. The findings support that mental toughness is a desired attribute which differentiates a medalist from a non-medalist player. Self-confidence attributes the belief that one can perform well and be successful (Loehr, 1986). Kuan and Roy (2007) also found that medalists displayed a better self-confidence than the non-medalists. Connaughton et al. (2008) and Mohammad et al. (2009) stated that motivation level helped the players to achieve their best and also affected their mental toughness. Olympic champions may be characterized by a number of attributes including confidence, motivation, perseverance, focus, and commitment (Durand-Bush, & Salmela, 2002; Gould et al., 2002). Connaughton et al. (2007) and Middleton et al. (2004) had stated that elite competitive athletes possessed better mental toughness. Goal setting determines successful performance (Weinberg & Weigand, 1993; Weinberg, 2003).

Mental toughness appears to be multidimensional and most often associated with unshakeable self-belief, the ability to rebound after failures, persistence or refusal to quit, coping effectively with adversity and pressure, and retaining concentration in the face of many potential distractions. It was concluded that medalist badminton players showed higher mental toughness attributes, including self-confidence, strong motivation, and sound goal setting than the non-medalist players. Gender difference was reported on attention control attribute which explained that male badminton players got distracted easily than the female players.

Acknowledgement

Authors acknowledge financial support and help provided by King Fahd University of Petroleum and Minerals, making it possible for me to present the paper in the conference.

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Sport Mont 14 (2016) 3: 7–10
Original scientific paper
UDC 796.012.2

Relation of Age at Menarche to Physical Activity

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A B S T R A C T

The aim of this study is to determine whether regular physical activity during early puberty is influential in preventing early menarche. This cross sectional study was carried out on 102 post-menarcheal girls aged 11–20 (14.79±0.33). 51 of them were already engaged in competitive sport activities prior to the onset of menstruation (group 1), while the others got engaged in such activities after the onset of menstruation (group 2). All participants provided the year and the month of their first menstrual period. First, we estimated the equality of dispersion between the two groups, by conducting Two Samples for Variances F-test. Second, because no homogeneity of variances between groups was found, they were compared by using Two Samples Assuming Unequal Variances t-test. The difference between groups is statistically significant, as the t statistics (=2.883) is greater than both critical t statistics (one-tail=1.664 two-tail=1.990) and the p value less than 0.05 in both cases (one-tail=0.002 two-tail=0.005). None of the girls in the first group starts to menstruate before 11 years of age and 90% of them are menstruating by age 14, with a median age of 12.95±0.35 years. Age of menarche is lower in the second group with a median age of 12.25±0.31 years, thus approximately 8 months lower than median age for the first group. 11.76% of the girls in the second group start to menstruate before 11 years of age and 90% of them are menstruating by age 13. It is rather, the decline in early matures among those engaged in regular physical activity prior to the onset of menses, that makes the statistically significant correlation between physical activity and age at menarche practically meaningful. Relatively early matures (<11 years) have been found to be slightly shorter but up to 5.5 kg heavier in adulthood than are late matures. In addition, a relatively young age at menarche has been associated with an increased risk for breast cancer and spontaneous abortion.

Key words: *exercise, health, lifestyle, age at menarche*

Introduction

Menarche is the first menstrual cycle in female humans. The age at menarche is clinically valuable, since it may have important health implications in later life. For example, relatively early matures (<11 years) have been found to be slightly shorter but up to 5.5 kg heavier in adulthood than are late matures (van Lenthe et al., 1996; Biro, 2001; Garn et al., 1986). In addition, a relatively young age at menarche has been associated with an increased risk for breast cancer (Petridou et al., 1996; Titus-Ernstoff, 1998) and spontaneous abortion (Liestol et al., 1980).

The age at menarche is reportedly 12.9 years in Europe, 12.5–12.9 in different regions of India and 13.3 years in Africa (Anderson et al., 2003; Bektas, 2008). It appears that the level of development of a society is inversely related to the age of first menstruation which is higher in underdeveloped regions. An example is illustrated by girls from the very poor Bundi region of New Guinea whose average age of first menstruation is 18.8 years, comparable to Europeans of one century ago (Bayat et al., 2012). However reports from different regions of Europe such as Germany (14 years), Czech Republic (14.6 years), Italy (12.2 years) and Greece (12 years) convinces us that the age at menarche cannot be accounted for solely by level of development (Thomas et al., 2001). As a matter of fact, researchers have reported genetic factor as the most influential factor on the time of first menses (Chumlea et al., 2003).

As for Albanian girls, updated studies on the average age at menarche are lacking. Due to remarkable lifestyle changes, during the last decade, there has been a marked increase in the number of Albanian girls of all ages undertaking physical activity at both competitive and recreational levels. This is a comparative study regarding menarche in Albanian girls engaged in competitive sport activities prior to the onset of menstruation versus those engaged in such activities after the onset of menstruation. The aim of this study is to determine whether regular physical activity during early puberty is influential in preventing early menarche.

Methods

Participants

This cross sectional study was carried out on 102 post-menarcheal girls aged 11–20 years. The mean age of the girls was 14.79±0.33 years. All the girls, who were recruited in this study, were active in team sports like volleyball and basketball or in speed and power sports like sprint and middle distance run. Girls were categorized in two groups. The first group consisted of 51 girls, who were active members of sport clubs prior to the onset of menstruation, while the second group was composed by 51 girls, who had become active members of their respective sport clubs after the onset of menstruation. The average duration of time girls of the first group had spent undertaking sport activities, prior to the onset of menstruation was 1.67±0.82 years.

Received for publication June 24, 2016

All participants in this study were living in Tirana, had no medical problems in personal menstrual cycle histories and/or family menstrual cycle histories and conducted similar lifestyles regarding diet and exercise.

The study protocol was approved by the Sports University of Tirana and informed consent was obtained from all participants and their coaches. This study was conducted in Tirana during June 2014.

Data Collection

A questionnaire was designed and verified for validity and reliability by researchers. The questionnaire contained questions about the following issues: date of birth, city of residence, age of first menstruation as well as weight and height during first menstruation, personal menstruation cycle history, family menstruation cycle history and retrospective exercise histories regarding duration, frequency, type of sport activities engaged in.

Median time between menarche and study interview was 2.25 years. Anyway, correlations between recalled and recorded menarcheal ages have generally been high (r>0.75) over periods of up to 10 years (Koprowski et al., 2001), with 60% of girls being able to recall the month and year of menarche over short periods (Koo et al., 1997).

Cluster sampling was performed in sport clubs based on the number of girls of the desired range. All girls, that were eligible for enrollment in the study, provided the year and the month of their first menstrual period. Age at menarche was then calculated.

Statistical Analysis

As above mentioned, participants in the first group were active members of sport clubs prior to the onset of menstruation, while those in the second group had become active members of their respective sport clubs after the onset of menstruation. In order to statistically estimate any correlation between the age at menarche and regular physical activity a two step statistical analysis was conducted. First, we estimated the equality of dispersion between the two groups, by conducting Two Samples for Variances F-test (Table 1).

Table 1. F-Test Two Sample for Variances

	Group 1	Group 2
Mean	12,94944	12,25451
Variance	1,16252	1,314605
Observations	51	51
df	35	50
F	0,884311	
P(F<=f) one-tail	0,354873	
F Critical one-tail	0,587134	

It results that the hypothesis on the equality of dispersions between groups is not true because the F statistics (=0.884311) is greater than the F critical one-tail (=0.587134), thus the second group owns a greater variance. Second, because the above mentioned F-test showed no homogeneity of variances between groups, we compared mean menarcheal ages between these groups by using Two Samples Assuming Unequal Variances t-test (Table 2).

Table 2. t-test Two-Sample Assuming Unequal Variances

	Group 1	Group 2
Mean	12,94944	12,25451
Variance	1,16252	1,314605
Observations	51	51
Hypothesized Mean Difference	0	
df	78	
t Stat	2,883849	
P(T<=t) one-tail	0,002538	
t Critical one-tail	1,664625	
P(T<=t) two-tail	0,005075	
t Critical two-tail	1,990847	

It results that the difference between mean menarcheal age from the two groups is statistically significant, as the t statistics (=2.883849) is greater than both critical t statistics (one-tail=1.664625 and two-tail=1.990847). Another important index is the p value which in both cases (one-tail=0.002538 and two-tail =0.005075) is less than 0.05. In other words, girls in group 1 experience a later menarche than girls in group 2.

Results

Figure 1 shows the cumulative distribution of menarche by age among girls of both groups. The points represent the proportion of postmenarcheal girls within age intervals of approximately 1 year.

None of the girls in the first group starts to menstruate before 11 years of age and 90% of them are menstruating by age 14, with a median age of 12.95±0.35 years. Age of menarche is lower in the second group with a median age of 12.25±0.31 years, thus approximately 8 months lower than median age for the first group. 11.76% of the girls in the second group start to menstruate before 11 years of age and 90% of them are menstruating by age 13 (Table 3).

Discussion

On average, girls who are competitive in sport activities prior to the onset of menstruation undergo menarche approximately 8 months later than girls who become competitive in sport activities after the onset of menstruation. It is rather, the decline in early matures among those engaged in regular physi-

cal activity prior to the onset of menses, that makes the statistically significant correlation between physical activity and age at menarche practically meaningful. Relatively early matures (<11 years) have been found to be slightly shorter but up to 5.5 kg heavier in adulthood than are late matures (Van Lenthe et al., 1996; Biro, 2001; Garn et al., 1986). In addition, a relatively young age at menarche has been associated with an increased risk for breast cancer (Petridou et al., 1996; Titus-Ernstoff, 1998) and spontaneous abortion (Liestol et al., 1980).

Table 3. Descriptive Statistics of Age at Menarche for Both Groups

	Group 1		Group 2	
Age at Menarche (years)	Absolute frequency	Cumulative frequency	Absolute frequency	Cumulative frequency
8	0,00%	0,00%	1,96%	1.96%
9	0,00%	0,00%	1,96%	3,92%
10	0,00%	0,00%	7,84%	11,76%
11	22,22%	22,22%	23,53%	35,29%
12	27,78%	50,00%	37,25%	72,55%
13	27,78%	77,78%	23,53%	96,08%
14	19,44%	97,22%	3,92%	100,00%
15	2,78%	100,00%	0,00%	100,00%

The numerous physiological and psychological changes that occur in the years preceding menarche, make it difficult to determine which (if any) factor is causative (Forbes, 1992). However, the participants that we chose were living in the same city, were conducting similar lifestyles regarding diet and exercise and had no medical problems in personal menstrual cycle histories and/or family menstrual cycle histories. Having done so, various characteristics that have been suggested to influence pubertal development such as the secretion of hormones by the hypothalamus, anterior pituary and ovary (Apter, 1997), social stress (Wierson et al., 1993) and organic pollutants (Colon et al., 2000) were intended as alike among participants. In these terms, the most important limitation of the current study may be the lack of evidence regarding anthropometric characteristics, such as weight and height during menarche, as our interpretation of results is focused mainly on Frisch's theory. According to Frisch's theory, menstruation occurs when body fat increases from 16% to 23% (Speroff et al., 1999). The reduction in adiposity through participating in physical activity results in a suppression of reproductive function (Zimmet et al., 1996). It has been proposed that declining leptin levels (a hormone secreted from adipose tissue) may be an evolutionary mechanism that turns off reproduction function when adipose tissue is inadequate (Wade & Jones, 2004). With regard to physical activity, however, research indicates that activity per se has little influence upon leptin levels (Zimmet et al., 1996), thus the later menarche among athletes is mainly due to the reduction in adiposity.

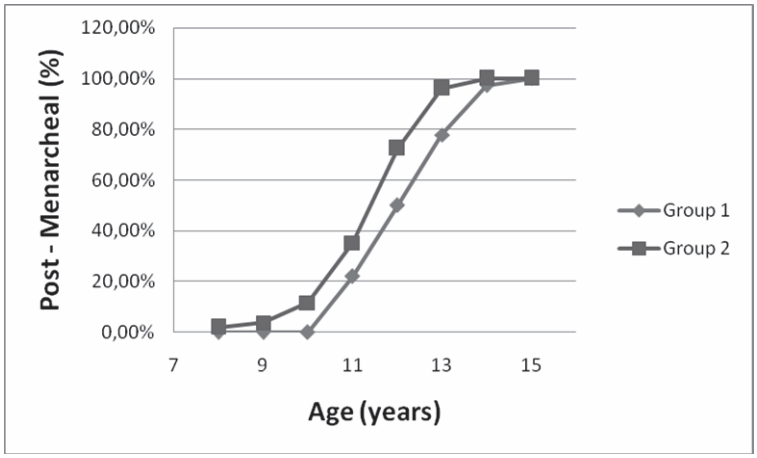

Figure 1. Cumulative distribution of menarche by age among girls of both groups

In conclusion, our pattern of age at menarche among girls who are competitive in sport activities, during early puberty, differs from the pattern of age at menarche among girls who started sport activities after the onset of menstruation. Regular physical activity during early puberty may decline the proportion of girls who undergo a relatively early menarche (<11 years) and as a consequence prevent undesirable health outcomes, associated with an early menstrual cycle, in later life.

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Sport Mont 14 (2016) 3: 11–14
Original scientific paper
UDC 796.926:796.012.1

Effect of Morphological Characteristics and Motor Abilities on the Execution of Technical Elements in Alpine Skiing

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A B S T R A C T

Testing was conducted on a sample of 35 subjects, students of the Faculty of Sport and Physical Education in Niksic, who attend regular classes of the Based skiing. There were two systems implied during the testing and those are a predicator system of variables and a criterion system of variables. The predictor system of variables consists of 9 morphological measurements (body weight, chest circumference, thigh volume, body height, the length of the lower leg, arm length, knee diameter, shoulder width and pelvic width) and 8 motor skills (hand tapping, foot tapping, bend-twist-touch, balance with closed eyes, balance with open eyes, agility in the air, side steps, backwards polygon). The criterion system of variables consists of 4 situational motor task (oblique descent, turn towards the slope, V shift, basic meandering). Based on the obtained results, basic descriptive statistic indicators have been calculated: range-Range, minimum-Min, the maximum-Max, arithmetic average-Mean, standard error of arithmetic mean-Std.Error Mean, standard deviation-SD. According the results of regression analysis it could be concluded that the system of 17 predictor variables (9 morphological and 8 motor skills) have achieved a statistically significant impact on the efficiency of the performance of ski technique-two out of four situational motor tasks (criterion system) and those are: V-turn and basic meandering. On the other hand, the system of 17 predictor variables has not achieved statistically significant effect on the efficiency of execution of technical elements of ski techniques on two situational motor task, and those are: oblique descent and turn towards the slope.

Key words: *skiing, morphological characteristics, motor abilities*

Introduction

The Alpine skiing is a very popular sports-recreational skiing on the mountains' slopes covered with snow. It belongs to the group of cyclic and acyclic movements performed by skiers who ski down the snowy mountains' slopes. (Bilić, Mijanović, & Bozić, 2007,). Skiing is one of the activities that take place during the special conditions in the outdoor environment, where success in the Alpine disciplines depends primarily on the level of adopted specific motor skills, but also on the skiers'' level of motor and functional abilities (Franko, 2007).

Skiing, as a sport, presents great physical and mental efforts for skiers, demanding from them exceptional agility, coordination, strength and endurance, because nowadays, in competitive skiing who is the winner has been decided by only hundredths of seconds (Cigrovski and Matkovic, 2003). Also, skiing, as the sport of reflexes and balance, demands constant skiers' activity and compatibility of apparatus for movement due to continuous weather changes (Hadžić, 2008).

The aim of this study is to determine whether there is a statistically significant correlation between some anthropological characteristics with the adoption process of a ski technique. In other words, what impact morphological characteristics, motor abilities and functional abilities have on the successful adoption of the ski elements: oblique descent, V shift, basic meandering and parallel meandering.

Methods

The study has transversal character where bibliographic speculative, empirical and statistical methods were applied and applied techniques are testing and observation. Measuring morphological characteristics, as well as the assessment of motor abilities, was based on the principle of assigned tasks executed by a team of the postgraduate students from the Faculty of Sport and Physical Education. Measurements related to motor skills and morphological characteristics were conducted in the afternoon hours in the sports hall. Assessment of the Alpine skiing technical elements performance quality was performed by observation and scaling. Checking was carried out on the slopes where the students previously had training in duration of 8 days (evaluation has been conducted on the 9th day). Four techniques were evaluated (oblique descent, V-turn, turn towards the slope and the basic meandering with the speed control). The subjects in this study were the second year students, age 19-21 years, male and female, who attend the course the Fundamentals of skiing at the Faculty of Sport and Physical Education in Niksic. There were 35 students in total and all of them attended regularly skiing practice. The sample of the measuring instruments for the morphological characteristics assessment consist of: body mass - AMAST, average thorax – circumference -AOKG, thigh volume - AONDK, body height - AVAST, the length of the lower leg - ADUPK, arm length - ADRUK, knee diameter - ADKL, shoulder width - ASIRA, pelvis width – ASIKA. The sample of the measuring instruments for the motor abilities assessment consist of: hand tapping - MTAPR, foot tapping - MTAPN, bend, twist touch - MPZD, balance with closed eyes - MRZO, balance with open eyes - MROO, agility in the air - MOKRVAZ, side steps - MKORSTR, backwards polygon – MPLN. The sample of the measuring instruments for the acquisition of skiing technique

Received for publication July 2, 2016

assessment consist of: oblique descent – SMKS, turn towards a slope - SMZP, V turn - SMKZ, basic meandering with the speed control – SMOV. The basic descriptive statistical parameters were calculates for each obtained variable: range (Range), minimum (Min) and the maximum score (Max), mean (Mean), a standard error of the arithmetic mean (Std.Error Mean), a standard deviation (Std. Deviation). The distribution of data was analyzed through the following: a standardized coefficient of skewness (Skewness) and standardized coefficient of elongation or ellipticity (Kurtosis). The Kolmogorov - Smirnov (max D ip) method was applied for the data distribution. The multiple regression analysis shall be implied in order to determine the influence of the predicator system of variables on the criterion system of variables.

Results

Table 1. The basic descriptive parameters of motor skills

	Valid N	Range	Min	Max	Mean	Std.Error Mean	Std. Deviation	Skewness	Kurtos.	max D	p
MTAPR	35	12	34	46	39.37	0.48	2.85	0.20	-0.35	0.11	p > .20
MTAPN	35	9	20	29	23.46	0.31	1.85	1.16	1.86	0.23	p < .10
MPZD	35	7	19	26	22.00	0.31	1.83	0.40	-0.79	0.15	p > .20
MOKRVAZ	35	2.86	3.03	5.89	3.90	0.11	0.67	1.33	1.46	0.17	p > .20
MKORSTR	35	3.12	7	10.12	8.72	0.12	0.68	-0.26	0.65	0.08	p > .20
MROO	35	39.8	2.11	41.91	10.15	1.41	8.37	1.82	4.74	0.19	p < .20
MRZO	35	5.01	1.6	6.61	3.12	0.20	1.16	1.66	2.71	0.18	p < .20
MPLN	35	9.88	7	16.88	9.90	0.37	2.19	1.52	3.07	0.15	p > .20

According the Table 1 there is a statistical difference between the standardized coefficient of elongation or ellipticity (Kurtosis). It shows the standing on two legs longitudinally on the bench with open eyes test and polygon backwards test had the greatest influence on the adoption of certain techniques of the alpine skiing

Table 2. The basic descriptive parameters of morphological characteristics

	Valid N	Range	Min	Max	Mean	Std.Error Mean	Std. Deviation	Skewness	Kurtosis	max D	p
AMAST	35	41	55	96	78.77	1.74	10.31	-0.39	-0.37	0.10	p > .20
AOGK	35	27	82	109	93.49	1.17	6.94	0.08	-0.78	0.09	p > .20
AONDK	35	16	45	61	54.03	0.61	3.59	-0.19	0.24	0.10	p > .20
AVIST	35	39	161	200	181.33	1.63	9.63	-0.60	-0.10	0.13	p > .20
ADUPK	35	39	42	81	56.20	1.05	6.20	1.63	7.08	0.15	p > .20
ADRUK	35	43	41	84	74.80	1.33	7.85	-2.56	9.42	0.21	p < .15
ADKL	35	11	6	17	9.31	0.34	2.01	1.59	5.30	0.17	p > .20
ASIRA	35	22	29	51	41.60	0.94	5.56	-0.51	-0.03	0.11	p > .20
ASIKA	35	13	26	39	30.69	0.43	2.53	0.75	2.50	0.19	p < .15

According the Table 2 there are statistical differences between the standardized coefficient of skewness (Skewness) and standardized coefficient of elongation or ellipticity (Kurtosis). When it comes to the standardized coefficient of skewness, the greatest impact on the adoption of certain techniques of the Alpine skiing had the ADRUK- arm length test, while in the standardized coefficient of elongation or ellipticity the most influence on adoption of specific techniques of the Alpine skiing had the following tests: ADUPK- lower leg length test, ADRUK- arm length and ADKL- knee diameter.

Table 3. Regression V-turn

	B	St. Err.of B	t(17)	p-level
Intercpt	17.19	12.95	1.33	0.20
MTAPR	0.09	0.12	0.76	0.46
MTAPN	0.02	0.14	0.14	0.89
MPZD	-0.05	0.17	-0.32	0.75
MOKRVAZ	-0.21	0.49	-0.43	0.67
MKORSTR	0.13	0.40	0.32	0.76
MROO	0.00	0.03	-0.07	0.94
MRZO	-0.12	0.23	-0.53	0.61
MPLN	0.11	0.11	0.97	0.34
AMAST	0.07	0.08	0.92	0.37
AOGK	0.05	0.06	0.76	0.46
AONDK	-0.32	0.13	-2.55	0.02
AVIST	-0.10	0.08	-1.32	0.21
ADUPK	0.04	0.08	0.49	0.63
ADRUK	0.09	0.06	1.35	0.19
ADKL	0.12	0.12	1.03	0.32
ASIRA	-0.01	0.06	-0.12	0.91
ASIKA	-0.03	0.10	-0.30	0.77

Using regression analysis, it was found that the predictor set, which consists of 8 (eight) motor and 9 (nine) morphological characteristics applied on the participants who performed the criterion variable V-turns (SMKLZAOK) has no statistically significant effect on the prediction of the criteria outcome ($p<64$). Despite the relatively high value of the determination coefficient and multiple correlation coefficient (0.68 and 0.46), undetermined statistical significance was probably the result of some other anthropological factors that were not covered by this research. One of the reasons could be the insufficient number of respondents. Even though this research represents the representative sample of respondents who are the second year students at the Faculty of Sport and Physical Education of Montenegro, according the achieved results it cannot be concluded the significant changes. Also, it could be reckoned that for the effective execution of the situational motor test V-turn, performed by the respondents, might have been influenced by some other factors like anthropological characteristics. Those are anthropometric, motor and functional variables, cognitive abilities, conative characteristics, ect. Moreover, we should bear in mind the specificity of skiing as a sport discipline that is done in the specific weather and climatic conditions as well as the motivation of participants.

Table 4. Regression to oblique descent

	B	St. Err.of B	t(17)	p-level
Intercpt	6.06	13.16	0.46	0.65
MTAPR	0.21	0.12	1.77	0.09
MTAPN	-0.08	0.14	-0.60	0.56
MPZD	0.05	0.17	0.29	0.78
MOKRVAZ	0.10	0.50	0.20	0.84
MKORSTR	0.29	0.41	0.71	0.48
MROO	0.05	0.03	1.44	0.17
MRZO	-0.10	0.23	-0.41	0.69
MPLN	0.07	0.11	0.64	0.53
AMAST	0.00	0.08	-0.03	0.97
AOGK	0.06	0.06	0.96	0.35
AONDK	-0.25	0.13	-1.90	0.07
AVIST	-0.06	0.08	-0.72	0.48
ADUPK	-0.01	0.08	-0.10	0.92
ADRUK	0.09	0.07	1.44	0.17
ADKL	0.04	0.12	0.30	0.77
ASIRA	-0.05	0.06	-0.82	0.42
ASIKA	-0.01	0.10	-0.10	0.92

Using regression analysis shown in the Table 4, it was found that the predictor set, which consists of 8 (eight) motor and 9 (nine) morphological characteristics applied on the participants who performed the criterion variable oblique decent (SMKOSSPU) has no statistically significant effect on the prediction of the criteria outcome ($p<38$). Despite the relatively high value of the determination coefficient and multiple correlation coefficient (0.73 and 0.54), undetermined statistical significance was probably the result of some other anthropological factors that were not covered by this research.

Table 5. Regression to the base wriggle

	B	St. Err.of B	t(17)	p-level
Intercpt	2.46	11.18	0.22	0.83
MTAPR	0.10	0.10	0.98	0.34
MTAPN	0.08	0.12	0.69	0.50
MPZD	-0.08	0.15	-0.56	0.58
MOKRVAZ	0.05	0.42	0.11	0.91
MKORSTR	0.05	0.35	0.13	0.90
MROO	0.00	0.03	0.02	0.98
MRZO	0.17	0.20	0.86	0.40
MPLN	0.07	0.10	0.77	0.45
AMAST	0.00	0.07	0.02	0.98
AOGK	0.03	0.05	0.55	0.59
AONDK	-0.11	0.11	-1.00	0.33
AVIST	-0.05	0.07	-0.78	0.45
ADUPK	0.05	0.07	0.73	0.47
ADRUK	0.08	0.06	1.37	0.19
ADKL	-0.01	0.10	-0.14	0.89
ASIRA	0.00	0.05	-0.09	0.93
ASIKA	-0.01	0.09	-0.16	0.87

Using regression analysis shown in the Table 5, it was found that the predictor set, which consists of 8 (eight) motor and 9 (nine) morphological characteristics applied on the participants who performed the criterion variable basic meandering (SMOSNVI) has no statistically significant effect on the prediction of the criteria outcome ($p<74$). Despite the relatively

high value of the determination coefficient and multiple correlation coefficient (0.65 and 0.42), undetermined statistical significance was probably the result of some other anthropological factors that were not covered by this research.

Table 6. Regression to turn towards the slope

	B	St. Err.of B	t(17)	p-level
Intercpt	-11.66	13.54	-0.86	0.40
MTAPR	0.17	0.12	1.36	0.19
MTAPN	0.07	0.14	0.46	0.65
MPZD	-0.26	0.18	-1.49	0.15
MOKRVAZ	-0.47	0.51	-0.91	0.38
MKORSTR	0.18	0.42	0.42	0.68
MROO	-0.02	0.03	-0.62	0.54
MRZO	0.06	0.24	0.26	0.80
MPLN	0.08	0.12	0.73	0.48
AMAST	-0.11	0.08	-1.39	0.18
AOGK	0.09	0.06	1.42	0.17
AONDK	0.01	0.13	0.09	0.93
AVIST	-0.02	0.08	-0.20	0.84
ADUPK	0.08	0.09	0.96	0.35
ADRUK	0.07	0.07	1.06	0.30
ADKL	0.04	0.12	0.30	0.77
ASIRA	0.10	0.06	1.63	0.12
ASIKA	-0.01	0.11	-0.10	0.92

Using regression analysis shown in the Table 6, it was found that the predictor set, which consists of 8 (eight) motor and 9 (nine) morphological characteristics applied on the participants who performed the criterion variable turn towards the slope (SMZAOPD) has no statistically significant effect on the prediction of the criteria outcome ($p<67$). Despite the relatively high value of the determination coefficient and multiple correlation coefficient (0.67 and 0.44), undetermined statistical significance was probably the result of some other anthropological factors that were not covered by this research.

Discussion

According to the results obtained in this research which was performed by 35 students, applying eight tests of motor skills and nine tests of morphological characteristics, as well as the system of predictor variables in order to determine their influence individually on each of the 4 applied motor tests for assessment of situational motor abilities, it can be concluded that: the predicator variables did not affect significantly the criterion variables of situational motor abilities. Therefore, implementation of similar studies should be performed on a larger number of participants.

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Sport Mont 14 (2016) 3: 15–18
Original scientific paper
UDC 796.012.1-053.6-055.2(497.16)

Body Height and its Estimation Utilizing Arm Span Measurements in Female Adolescents from Southern Region in Montenegro

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A B S T R A C T

The purpose of this study was to examine the body height in Montenegrin female adolescents from southern region as well as the relationship between arm span as an alternative to estimating the body height, which would vary from region to region in Montenegro. Our investigation analyses 139 female adolescents from the southern region in Montenegro. The anthropometric measurements were taken according to the protocol of the ISAK. Means and standard deviations regarding the anthropometric measurements were obtained. A comparison of means of body heights and arm spans within this gender group were carried out using a t-test. The relationships between body height and arm span were determined using simple correlation coefficients and their 95% confidence interval. Then a linear regression analysis was performed to examine the extent to which the arm span can reliably predict body height. The results displayed that female Southern-Montenegrins are 168.73±6.79 cm tall and have an arm span of 167.23±7.79 cm. Compared to other studies, the results of this study have shown that this gender made Southern- Montenegrins the tall population, taller than female population across the Europe and the rest of World. On the other hand, expectably, the arm span reliably predicts body height in this gender. However, the estimation equations which have been obtained in Southern-Montenegrins are, different alike in general population, since arm span was shorter than the body heights (1.50±1.00 centimetres), much more than in general population. This study also confirms the necessity for developing separate height models for each region in Montenegro.

Key words: *stature, armspan, region, girls, Montenegro*

Introduction

The unusual tallness of Montenegrin highlanders was a fact recognized by European anthropologists more than 100 years ago (Bjelica, Popović, Kezunović, Petković, Jurak, & Grasgruber, 2012). Pineau et al. (2005) have contributed to an update of average body heights among European populations. Although this study doesn't contain the exact data of Montenegrin female population, it represents the most recent study related to the average body height of modern female Montenegrins. Pineau et al.'s investigation showed that, contrary to the general belief, the female population in the Dinaric Alps, with an average height of 171 centimeters come a close second to girls in the Netherlands (Pineau et al., 2005). Thus, this study has challenged many scientists to believe that female Montenegrins might be the tallest population in Europe and Bjelica and his collaborators (2012) confirm they are very tall but not the tallest with 168.37 centimeters. From the reason the sample in this study was created by university students, a more recent study was conducted as a national survey (Popović, Bjelica, & Hadžić, 2014) and it confirmed the results of the previous study and found the average body height of Montenegrin female adolescents were 169.48 centimeters tall. From this reason the modern Montenegrins fall partly into the Dinaric racial classification (Bjelica et al., 2012), the authors did believe the female population that live in the southern region might be taller than average Dinaric Alps subjects, mostly due to the much better lifestyle in the coastal area. Hence, the purpose of this study was twofold. The first purpose was to examine the body height in Montenegrin female adolescents from southern region as the authors did believe this is the place where the population can reach the full potential of the Dinaric Alps, while the second purpose was to examine the relationship between body height and arm span as an alternative to estimating the body height, which would vary from region to region in Montenegro.

Methods

The nature and scope of this study qualifies 139 female adolescents from the southern region in Montenegro to be subjects. The average age of the male subject was 18.40±0.62 years old (range 17-20 yrs). It is also important to emphasize that the authors could not accept adolescents with physical deformities that could affect body height or arm span, and without informed consent were excluded from the study. The exclusion criterion was also being non-Southern Montenegrin.

According to Marfell-Jones, Olds, Stew, and Carter (2006),

Received for publication July 11, 2016

the anthropometric measurements, including body height and arm span were taken according to the protocol of the International Society for the Advancement of Kinanthropometry (ISAK). The trained anthropometrist (the same one for each measure) whose quality of performance was evaluated against prescribed "ISAK Manual" prior to the study performed these measurements. The age of the individuals was determined directly from their reported date of birth.

The body height presents the perpendicular distance between the top of the head (the vertex) and the bottom of the feet. It was measured using stadiometer to the nearest 0.1 centimeters in bare feet with the participants standing upright against a stadiometer. The respondents had to put their feet together and move back until their heels touched the bottom of the stadiometer upright. Their buttocks and upper part of their back have also been touching the stadiometer upright while their head didn't have to touch the stadiometer. The respondent's head had to be in the Frankfort horizontal plane. This was achieved when the lower edge of the eye socket (the orbitale) is horizontal with the tragion. The vertex was the highest point on their head, otherwise the respondents had to raise or lower their chin until it was in the Frankfort horizontal plane to align their head properly.

The arm span is the anthropometric measurement of the length from the tip of the middle fingers of the left and right hands when raised parallel to the ground at shoulder height at a one-hundred eighty degree angle. It was measured using a calibrated steel tape to the nearest 0.1 centimeters in bare feet on a level concrete floor with their upper backs, buttocks and heels against the wall which provide support. The participant's head was also in the Frankfort horizontal plane and the arms were outstretched at right angles to the body with palms facing forwards. The measurement were taken from one middle fingertip to the other middle fingertip, with the tape passing in front of the clavicles while two field workers supported the elbows. The measurements were taken twice, and an average of the two readings was calculated. When the two measurements agreed within 0.4 centimeters, their average was taken as the best estimate for the true value. When the two initial measures didn't satisfy the 0.4 centimeters criterion, two additional determinations were made and the mean of the closest records was used as the best score.

The analysis was carried out using Statistical Package for Social Sciences (SPSS) version 20.0. Means and standard deviations (SD) were obtained for both anthropometric variables. A comparison of means of body heights and arm spans within this gender group was carried out using a t-test. The relationships between body height and arm span were determined using simple correlation coefficients and their 95% confidence interval. Then linear regression analyses was performed to examine the extent to which arm span can reliably predict body height. Finally these relationships were plotted as scatter diagrams and regression lines. Statistical significance was set at $p<0.05$.

Results

A summary of the anthropometric measurements is shown in Table 1. The mean of the arm span for female subjects was 167.23±7.79 centimeters, which was 1.50±1.00 centimeters less than the body height and statistically insignificant ($t=1.720$, $p<0.087$).

Table 1. Anthropometric Measurements of the Population

Body Height Range (Mean±SD)	Arm span Range (Mean±SD)
153.8-189.5 (168.73±6.79)	148.7-188.6 (167.23±7.79)

The simple correlation coefficient and their 95% confidence interval analysis between the anthropometric measurements are presented in Table 2. The relationships between body height and arm span was high and significant in the applied sample.

Table 2. Correlation Between Body Height and Arm Span of the Study Subjects

Correlation Coefficient	95% confidence interval	Significance p-value
0.686	0.640–0.805	<0.000

The results of the linear regression analysis are shown in Table 3. The first of all models were derived by including age as a covariate. However, it was found that the contribution of age was insignificant and therefore the age was dropped and estimates were derived as univariate analysis. The high values of the regression coefficient signify that arm span significantly predicts body height in the applied sample.

The relationships between arm span measurements and body height among the above subjects is plotted as a scatter diagram.

Table 3. Results of Linear Regression Analysis Where the Arm Span Predicts the Body Height

Regression Coefficient	Standard Error (SE)	R-square (%)	t-value	p-value
0.828	3.819	68.6	17.301	0.000

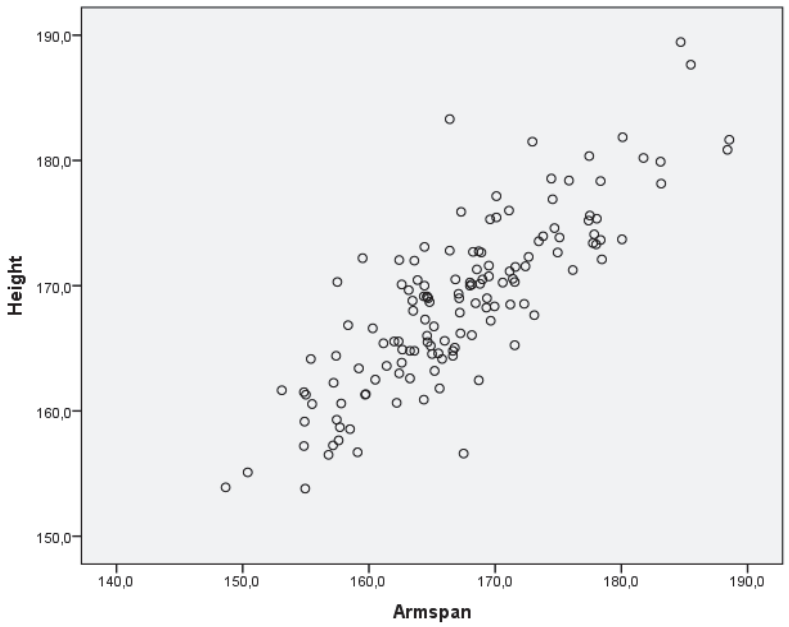

Figure 1. Scatter Diagram and Relationship Between Arm Span Measurements and Body Height Among the Appled Sample

Discussion

The results of this study proved that Southern-Montenegrin females are very tall with an average of 168.73 centimeters, taller than general female population in Montenegro with 168.37 centimeters (Popović, Bjelica, Molnar, Jakšić, & Akpinar, 2013; Quanjer et al., 2014) but not taller than Central-Montenegrins with 169.24 centimeters (Bubanja, Vujović, Tanase, Hadžić, & Milašinović, 2015). The results proved that Montenegrin females are tall on average but not as tall as 171.1 centimeters of the female population in the Dinaric Alps (Pineau et al., 2005) and 170.7 centimeters of the Netherlands (Popović, Bjelica, Tanase, & Milasinovic, 2015). However, there is a hypothesis that Montenegrin females did not reach their full genetic potential yet, since they have been influenced by various environmental factors (wars, poor economic situation, etc.) in the last few decades (Popović, Bjelica, & Hadžić, 2014; Popović, Bjelica, Petković, Muratović, & Georgiev, 2014). Therefore, the authors believe that these circumstances had a negative bearing on the secular trend in Montenegro, while it is expected that the secular changes affecting height will go up in the following 20 years, comparing it to developed countries where this trend has already stopped.

On the other hand, expectably, the arm span reliably predicts body height in this gender. However, the estimation equations which have been obtained in Southern-Montenegrins are, different alike in general population, since arm span was shorter than the body heights (1.50±1.00 centimetres), much more than in general population (Bjelica et al., 2012) and a litle bit more than in Central-Montenegrins (Bubanja et al., 2015). This also confirms the necessity for developing separate height models for each region in Montenegro.

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Sport Mont 14 (2016) 3: 19–20
Original scientific paper
UDC 617.586:796-057.875

Frequency of Foot Deformity Among Students of Faculty for Sport and Physical Education

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A B S T R A C T

The main objective of this study was to determine possible foot deformities students of the Faculty of Sport and Physical Education. Obesity is one of the main causes of flat feet, which is directly associated with reduced physical activity (Khalid, Rai, Mobeen, & Amjad, 2015). The research was conducted at the Faculty of Sport and Physical Education in Niksic, on a sample of 116 respondents. The sample of variables consisted of a total of two foot deformities: flat feet (pes planus) and carved feet (pes cavus) divided into three levels according to the severity of the deformity, from the lightest to the heaviest, including foot without deformity. For determining the status of the foot, was applied orthopaedy on the basis of which is considered plantar side of the foot. It was used appliance brand PODOSKOPIO LUX 02990. The results are presented in tables in the percentage and numerical representation of the assessment deformities flat and hollowed foot. According to the results it is evident that out of 116 respondents, 53 students (45.7%) were without deformities. Numerical and percentage estimates flatfoot deformity is: 16 students (13.8%)-level I; 6 students (5.2%)-level II; Numerical and percentage estimates hollowed foot deformity is: 28 students (24.1%)-level I; 7 students (6%)–level II; 6 students (5.2%)-level III. The highest percentage shows deformity "hollowed foot" of the first degree (24.1%), which is often the case with people athletic type. Some studies have shown that people with recessed feet in some sports disciplines, achieve the same results as people with normal feet (Jovovic, 2008). Accordingly, foot deformity may occur not only in the period of growth and development, but also in later years (Zivkovic, 2009).

Key words: *foot, deformities, students*

Introduction

The most common disorders and deformities among children and youth are determined on basis of statistical analyses relating to various forms and degrees of feet fallen arches. In most cases it is functional disorder, known as insufficient foot (Kosinac, 2008). The foot consists of 26 bones connected into the single unit through joints of less and greater mobility, and it has two functions: movement of body through space, and carrying the weight of the body. In accordance with that, feet arches are impacted by the body weight, which can be additional reason for more common flat feet among obese individuals (Wozniacka et al., 2013). Obesity is one of the main causes of flat feet, which is directly associated with reduced physical activity (Khalid, Rai, Mobeen, & Amjad, 2015). Furthermore, it is also known that foot function depends on the state of active and passive elements of bio-motoric apparatus. Having that in mind, the biggest problem that occurs is the insufficient tone of the ligament apparatus and the foot musculature. Unlike the flat foot that presents static deformity, hollow foot is dynamic deformation that does not depend on the load but it is the result of the imbalance on the muscle strength.

There are several different methods for determining status of feet arches. One of the most modern methods for foot examination is method of computerized digital orthopedics. In this study, apparatus – podoscope with mirrors was used, which enabled observation of feet from the bottom, and in that way we get information on the look of the support surface.

The main goal of this research is to define possible feet deformities among students of the Faculty for Sports and Physical Education.

Received for publication July 23, 2016

Methods

The research was conducted at the Faculty for Sports and Physical Education in Niksic, on the sample of 116 subjects. The variables sample consisted of total two feet deformities, as follows: flat foot *(pes planus)* and hollow foot *(pes excavatus),* divided into three degrees according to the severity of the deformity, ranging from the lightest to the most serious, including the feet without deformity.

Figure 1. Podoskope lux 02990

To determine the foot status, orthopaedy method is applied, where the plantar side of the foot is observed. Tha apparatus PODOSCOPE LUX 02990 is used (Figure 1).

Results

Results are presented in table, in percentages and numerical representation of deformity assessment of flat and hollow foot. According to the results acquired, it is evident that, out of total 116 subjects, a number of 53 students (45.7%) are without any deformity. Numerical and percentage representation of flat foot deformity is as follows:

- 16 students (13.8%)-I degree;
- 6 students (5.2%)-II degree;

Numerical and percentage representation of hollow foot deformity is as follows:

- 28 students (24.1%)-I degree;
- 7 students (6%)-II degree;
- 6 students (5.2%)-III degree.

Table 1. Numerical and percentage representation of flat and hollow foot deformity

Variables	N	I degree		II degree		III degree	
		N	%	N	%	N	%
Flat foot	116	16	13.8%	6	5.2%	0	
Hollow foot	116	28	24.1%	7	6%	6	5.2%

Discussion

Based on data gathered through this research, it is obvious that still there is certain degree of deformities, although the subjects participate in some sports activities. The highest percentage shows deformity "hollow foot" *(pes excavates)* of first degree (24.1%), which is very common even for athletes. Some researches showed that individuals with hollow feet, in certain sports disciplines, achieve same results as individuals with normal feet (Jovović, 2008). Having this in mind, feet deformity can occur not only in the period of growth and development, but also in later years. The most common reasons for this are: injuries, diseases, genetic predisposition, constitution, and lifestyle. Flat foot deformity is not determined in more serious degree, which confirms that it is still the sample of subjects that are somewhat physically active. Total 6 subjects have certain degree of foot fallen arches – II degree *(pes planus)*, which leads us to think about numerous causes, but first of all, about inborn deformity that was not correctively treated in timely manner. Studies show that "flat foot" deformity is linked to the growth, i.e. the older a child is, the deformity is less common. All aforementioned leads us to conclusion that forming of the foot arch reaches up to school age, when it is necessary to take care about the approach in work with the children with deformities, especially in pre-school period (Mihajlović, Smajić, & Sente, 2010).

The most serious form of hollow foot – III degree *(pes excavates),* with the observed difference in height of front and back part of the foot, was identified in 6 students, which was not expected for the treated sample. Prevention and treatment should start as soon as possible in order to appliy complex of exercises to increase the elasticity of the feet, and the muscle strength of plantar extensors.

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Sport Mont 14 (2016) 3: 21–24
Original scientific paper
UDC 796.332:796.012.1

Assessment and Differences in Anaerobic Capacity of Football Players Playing on Different Positions in the Team, Using Rast Test

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A B S T R A C T

Today's rapid development of football in all stages allocates a dominant role to conditional training. Players who participated in the study played in the 4:4:2 formation, therefore the classification has been made according to the playing position in the aforementioned system. The total sample of respondents consisted of 60 players at the cadet level (14 to 16 years) medically fit for playing football and without any morphological and motor aberrations. The study applied pitch RAST test, which is very convenient for conducting and obtaining fast results on the anaerobic capacity of football players. In addition to this test, the assessment of anaerobic capacity uses the modified Bangsbo test. This research has demonstrated the importance of anaerobic capacity of certain players playing in different positions.

Key words: *anaerobic capacity, football players, rast test*

Introduction

The requirements of modern football match in all segments of energy consumption and motor tasks give a new dimensionality to conditional training that becomes increasingly important foundation for high, team score achievements. Today's rapid development of football in all stages: defense-conversation (defense/attack), the moment of change in ball possession, the set attack -conversation (attack/defense), the moment of losing the possession of the ball, and the transition stage (attack/defense), allocates a dominant role to conditional training (Krulanović, 2016). This research has demonstrated the importance of anaerobic capacity of certain players playing in different positions. In addition, a separate analysis of maximum strength, minimum strength, mean strength and fatigue index determined that in certain positions a dominant capability is to maintain anaerobic performance during the match, the temporal strength failure or there is only the possibility of expressing the maximum strength but without the possibility of repeating in a high pace.

The energetic system the role of which is important for the sport should be developed through the training process. It is therefore very important to determine the energetic potential, which is required for that sport or position in the team, because only in this way can a maximum of sports form be achieved, which is extremely important in football, because different positions on the team alternate the different energetic systems (Fratrić, 2006).

Methods

Players who participated in the study played in the 4:4:2 formation, therefore the classification has been made according to the playing position in the aforementioned system. Five groups of players were formed, namely: centre-backs (12 players), the full backs (15 players), midfielders (14 players), offensive players (13 players) and goalkeepers (6 players). The total sample of respondents consisted of 60 players at the cadet level (14 to 16 years) medically fit for playing football and without any morphological and motor aberrations.

The study applied pitch RAST test, which is very convenient for conducting and obtaining fast results on the anaerobic capacity of football players. In addition to this test, the assessment of anaerobic capacity uses the modified Bangsbo test (Sayers et al., 2008), which consists of seven 35-meter sprints with a change of direction while running and 25-second walk between the sprints. RAST test consists of six 35-meter sprints and 10-second rest between each section which serves to rotate and prepare (Mackenzie, 2005). After the measured times for the six finished sections, strength for each run is calculated, and the following values obtained: minimum strength (the lowest value) which represents the measure of the lowest demonstrated strength and is used to calculate the index of fatigue; maximum strength (maximum value), which represents the measure of the highest manifested strength and provides information about strength and maximal sprint speed; average strength (the sum of all six values/six) indicates the athlete's ability to maintain strength over time. Higher value of the average strength indi-

Received for publication July 31, 2016

cates better ability of the respondents to maintain anaerobic capacity and fatigue index (maximum strength-minimum strength) / total time of 6 sprints, and indicated the extent to which strength is waning among the respondents.

The statistical analysis show the descriptive parameters, mean value, standard deviation (SD), minimum and maximum of all values, the coefficient of variation (CV) confidence interval, measures of asymmetry skewness, measures of flattening kurtosis, and the value of the Kolmogorov-Smirnov test. In addition to the method for obtaining basic statistical parameters, multivariate methods, MANOVA and discriminate analysis were also used. Confullring univariate methods, ANOVA t-test and Roy's test were applied.

Results

RAST test results are shown in four variables for assessing anaerobic capacity, namely: the values of maximum strength (RMAXS), the values of the minimum strength (RMINS), the values of the average strength (RPROS) and fatigue index (RINZA).

The results of the variation coefficient (Table 1) indicate high values in almost all analyzed variables, which show significant differences, i.e. pronounced heterogeneity in all observed groups. Distribution of value ranges within the normal distribution (p) for all variables for the assessment of anaerobic capacity.

Table 1. Basic Statistical Parameters of Anaerobic Capacity of Football Players Regarding Playing Position

	m.v	std.d	grš	min	max	c.var	interv. pov.		sk	ku	p
centre backs											
RMAXS	521.22	123.17	35.56	360.9	773.7	23.63	442.95	599.50	.44	-.42	.923
RMINS	350.52	75.51	21.80	240.6	503.9	21.54	302.54	398.51	.61	-.47	.785
RPROS	419.84	87.49	25.25	309.6	604.0	20.84	364.24	475.44	.61	-.33	.888
RINZA	4.90	1.86	.54	1.9	8.5	38.06	3.71	6.08	.28	-.32	.518
full backs											
RMAXS	514.77	131.33	33.91	247.8	721.6	25.51	442.03	587.52	-.63	-.41	.982
RMINS	328.43	75.95	19.61	139.7	423.7	23.13	286.36	370.50	-.97	.51	.997
RPROS	416.15	103.28	26.67	181.6	544.8	24.82	358.94	473.36	-.75	-.05	.995
RINZA	5.37	2.42	.63	1.4	8.5	45.12	4.03	6.71	-.34	-1.32	.824
midfielders											
RMAXS	512.12	157.90	42.20	267.3	793.7	30.83	420.93	603.32	.19	-1.01	.999
RMINS	317.96	80.02	21.39	158.1	454.0	25.17	271.75	364.18	-.41	-.41	.992
RPROS	401.41	106.79	28.54	212.2	587.9	26.60	339.73	463.08	-.02	-.90	.980
RINZA	5.53	2.93	.78	1.7	10.7	53.03	3.84	7.23	.41	-.99	.903
offensive players											
RMAXS	563.63	125.78	34.88	364.6	790.2	22.32	487.60	639.66	.05	-.63	.881
RMINS	378.85	93.99	26.07	232.2	543.3	24.81	322.04	435.66	.20	-.82	.968
RPROS	457.32	108.95	30.22	300.5	668.8	23.82	391.47	523.18	.39	-.36	.557
RINZA	5.44	1.82	.51	3.2	8.4	33.53	4.34	6.54	.27	-1.30	.560
goalkeepers											
RMAXS	588.82	118.94	48.56	416.3	773.7	20.20	463.97	713.67	.19	-.51	.829
RMINS	349.98	57.72	23.56	271.6	431.2	16.49	289.40	410.57	.00	-1.09	1.000
RPROS	437.63	64.56	26.36	345.4	519.8	14.75	369.87	505.40	-.20	-1.16	1.000
RINZA	6.72	2.39	.98	4.0	10.2	35.52	4.22	9.23	.40	-1.30	.952

By examining the obtained measures of distribution of the standardized asymmetry coefficient (skewness) one can observe that the majority of variables do not significantly deviate from the expected Gauss-Laplace Law on normal distribution of data. Negative values of kurtosis in almost all variables indicate curve flattening, i.e. the concentration of value is lower around the mean. There is a distinct lengthiness of the results in: full backs and offensive players for the fatigue index (RINZA); midfielders for the value of maximum strength (RMAXS); and goalkeepers for the value of minimum strength (RMINS), the value of average strength (RPROS) and fatigue index (RINZA).

Goalkeepers achieved the highest average value of maximum strength (588.82 W), but at the same time have the highest index of fatigue (6.72 W/s), which indicates the poorer capacity of anaerobic sprint endurance (repetitions of better values in a given time period). Offensive players have the highest value of the average strength (457.32 W), i.e. the best capacity to maintain work under anaerobic conditions. Comparing the average values of the observed groups, one can see the similarity in all variables, i.e. it can be concluded, with a certain caution, that there is no difference between the groups.

After the application of multivariate variance analysis (MANOVA), the resulting significance is on the border of significance threshold (p=0.100), i.e. with the increased risk of inference it can be concluded that there is a statistically significant difference in the observed area of anaerobic capacity of football players. However, discriminative analysis (p=0.204) as a more sensitive method indicates no significant difference and clearly defined border between any assessment variable of anaerobic capacity using the RAST test in relation to the playing position of the football players (Table 2).

Table 2. The Significance of Difference in the Area of Anaerobic Capacity of Football Players Regarding Playing Position

	n	F	p
MANOVA	4	1.515	.100
DISKRIMINATIVE	2	1.401	.204

The univariate analysis (Table 3) confirmed the values of discriminative analysis, i.e. there was no significant difference in the observed variables between the groups. Since p=0.204 (discriminative analysis), there is no clearly defined boundary of football players by the playing position, so it is not possible to determine the features of the respondents by the playing position in the broadest sense, in relation to the assessment of anaerobic capacity using the RAST test.

Table 3. The Significance of Differences by Individual Features of Anaerobic Capacity Assessment Regarding Playing Position

ANOVA	F	p
RMAXS	.604	.661
RMINS	1.166	.336
RPROS	.601	.664
RINZA	.619	.651

Since the groups do not have distinct characteristics, it reflected on a reduced percentage value of their homogeneity. In centre backs and fullbacks homogeneity is higher, i.e. eight or nine players have defined characteristics. Defined characteristics of midfielders are reported in 6 of 14 respondents, homogeneity is 42.9% (lower) because 8 respondents have other characteristics. Defined characteristics of offensive players are observed in 7 of 13 respondents, homogeneity is 53.8% (lower) because 6 patients have other characteristics. Defined characteristics of goalkeepers are reported in 3 of 6 respondents, homogeneity is 50.0% (lower) because 3 respondents have other characteristics (Table 4).

Table 4. Homogenity of Football Players Playing in Different Positions by the Assessment of Anaerobic Capacity

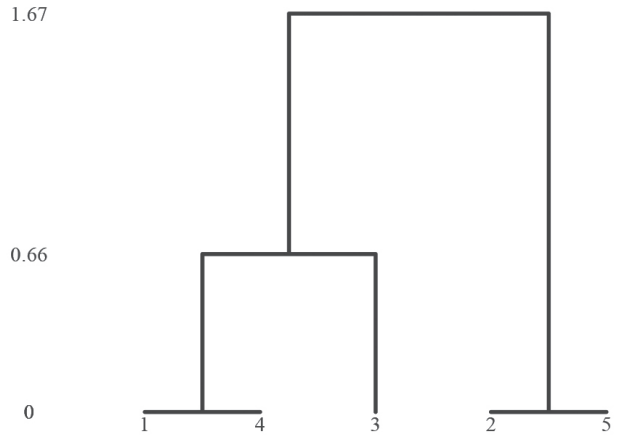
	m/n	%
CENTRE BACK	8/12	66.67
FULL BACK	9/15	60.00
MIDFIELDER	6/14	42.86
OFFENSIVE PLYER	7/13	53.85
GOALKEEPER	3/6	50.00

Distance values (Table 5) between the football players according to the playing position indicate the similarity between the groups and confirm the values obtained in the Table of football players' homogeneity.

Table 5. Distance (Mahalanobis) of Football Players Playing in Different Positions by the Assessment of Anaerobic Capacity

	CENTRE BACK	FULL BACK	MIDFIELDER	OFFENSIVE PLAYER	GOALKEEPER
CENTRE BACK	.00	.73	.24	.00	.97
FULL BACK	.49	.00	.75	.97	.00
MIDFIELDER	.73	.24	.00	.97	1.11
OFFENSIVE PLAYER	.00	.75	.97	.00	1.11
GOALKEEPER	.24	.00	.97	1.11	.00

Based on the displayed dendrogram and grouping values in Figure 1, it can be seen that the closest in their characteristics are center-backs and offensive players with the distance of 0.00, and full backs and goalkeepers with the same distance, and the biggest difference is between the center backs and fullbacks, with the distance of 1.67.



level	closeness	
CENTRE BACK	OFFENSIVE PLAYER	.00
FULL BACK	GOALKEEPER	.00
CENTRE BACK	MIDFIELDER	.66
CENTRE BACK	FULL BACK	1.67

Figure 1. Grouping of Football Players Playing in Different Positions by the Assessment of Anaerobic Capacity

With the detailed review of Figure 2, based on overlapping ellipses, it can be seen that the groups do not differ with respect to two most discriminating variables, the minimum and maximum strength values.

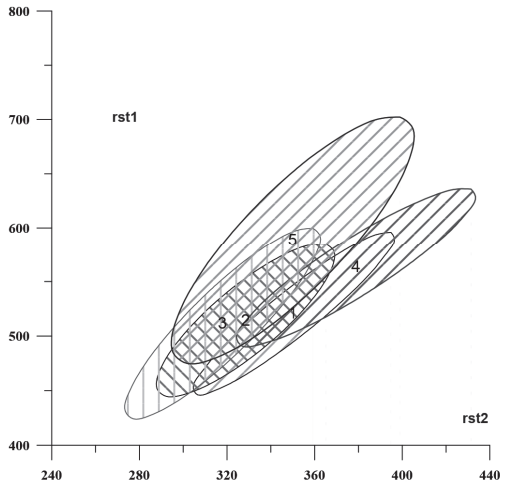


Figure 2. Group Ellipses in Relation to the Value of Minimum and Maximum Strength

Legend: centre backs (1); full backs (2); midfielders (3); offensive players (4); goalkeepers (5); minimum strength value (rst2); maximum strength value (rst1), abscissa (horizontal axis) is the value of minimum strength (rst2) and the ordinate (vertical axis) is the value of maximum strength (rst1)

Discussion

As previously stated, goalkeepers have the highest value of maximum strength (588.82 W), and the largest index of fatigue (6.72 W/s), i.e. poorer capacity of anaerobic sprint endurance. The characteristic of goalkeeper play during the match does not require the capacity to repeat anaerobic-lactate activities, but only the capacity to manifest maximum strength in a short period of time, such as jumping the ball, high or low fall on the ball and other short responses.

Speed-endurance, as body resistance in kind, i.e. the ability to withstand short-term intensive efforts being repeated over a long time, the body's ability to adapt and endure the occurrence of acidification and the emergence of a higher blood concentration of lactate without the work capacity substantially falling, is of great importance - for the football players, for whom this is the main ability they should have given the physiology of their efforts during the match. This knowledge (about footballers) is transmitted by inertia to goalkeepers, who had been prepared and drilled as players for years, and who essentially performed the tasks during the matches in physiological regimes completely different from those in which they had been trained (Andrašić et al., 2003).

Average strength values of the offensive players (457.32 W) indicate the best ability to maintain anaerobic capacity. Unlike goalkeepers, the offensive playera are expected to constantly change the rhythm which involves constant crossing of two players attacking at full sprint. Systematic work in this age can contribute significantly to the development of anaerobic sprint capacity, which is indicated by the applied batteries of tests for the assessment of anaerobic capacity in a sample of 186 players in the Belgium national team (U15, U16, U17, U18 and U19). The survey led to a conclusion that anaerobic strength increased progressively with age (from 15 to 19 yrs.), but the largest increase was between 15 and 17 years of age (Cedric et al., 2007). The values of anaerobic capacity using the RAST test in forty football players of the first Czech junior league (Cipryan & Gajda, 2011) of mean age (17.3±1.36 years) and sports experience of at least ten years, confirm the aforementioned research that the significant increase occurs before the age of 17.

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Sport Mont 14 (2016) 3: 25–29
Original scientific paper
UDC 796.015.3

Balance Changes in Trained and Untrained Elderly Undergoing a Five-Months Multicomponent Training Program

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A B S T R A C T

Balance is a main focus of elderly activity programs which can be assessed by functional tests or stabilometry platforms. Our study aims to compare balance-changes in trained (TRA) and untrained (UNT) elderly following a 5-month Multi-Component Training Program (MCTP), twice a week, one hour per day. 10 TRA (>2-years) and 9 UNT (first year) performed the Romberg´s test (Open-Eyes 30 seconds/Closed-Eyes 30 seconds ratio) on a stabilometry platform (BT4, Hur Labs). COP displacement (Trace Length: TL) and sway area (C90) were registered twice PRE (1&2), POST (3&4) and 3 months later (Detraining: 5&6) the EFAM-UV© program, a Cognitive MCTP based on gait training and Dual-Task neuromuscular proposals in enriched environments. Regarding Open-Eyes, Bonferroni post-hoc comparisons showed significant group-differences in TL for 1, 2, 5 & 6 sample conditions, and a slight trend toward significance in C90 1&5. TL also showed significant group-differences in Closed-Eyes 1, 5 & 6, while C90 only in 5 & 6 Closed-Eyes. Balance indicators TL and C90 show a different way regarding the training status. A 5-month MCTP reduces differences, but detraining quickly affects UNT. Although effective, short multicomponent interventions could lead to early worsening, so the ratio training-detraining might be considered in untrained elderly population.

Key words: *stabilometry, Romberg test, ratio training-detraining*

Introduction

Falls are a leading cause of injury and death among older adults, and a significant public health issue (Ambrose, Paul, & Hausdorff, 2013). The economic burden caused by these types of injuries is very important for developed countries since approximately 30% of these falls result in an injury that requires medical attention (Martinez-Amat et al., 2013).

On the one hand, aging involves a neuromuscular impairment accompanied by the appearance of sarcopenia, a loss of muscle mass and function which is a central aspect of fragility, as well as the decline of bone mass (Osuna-Pozo et al., 2013). This leads to a severe loss of functional abilities such as Strength and Balance (Granacher, Zahner, & Gollhofer, 2008; Izquierdo, Martínez-Ramírez, Larrión, Irujo-Espinosa, & Gómez, 2008), both straightly related to the problems of falls. Preventing the loss of these functional capabilities becomes, therefore, a crucial target for the elderly population, and physical exercise arises as a cost-effective tool to promote health and well-being. It improves functionality and removes or delays the onset disease and the risk of falls (Warburton, Nicol, & Bredin, 2006). Indeed, physical fitness is nowadays considered an indicator of life expectancy and life quality.

On the other hand, it is well known that fall prevention programs for healthy older adults often combine both, strength and balance (Lacroix et al., 2015). The so called, Multicomponent training programs (MCTP) have shown to be an integrative way to improve them, becoming promising and widely extended (Cadore et al., 2014; Kang, Hwang, Klein, & Hun Kim, 2015; Seco et al., 2013); although despite their proved benefits, the adherence to these programs is still complicated in this population (Farrance, Tsofliu, & Clark, 2016; Garmendia et al., 2013). It is needed to work on their improvement, as well as it is necessary to deepen on what happens after their detraining periods since a few studies point that detraining effects are age-related. Toraman & Ayceman (2005) found a different trend according to the age of the subjects 6 weeks after assessing their balance with the Timed-*Up and Go Test*. Eggenberger (2015) pointed out that positives effects in fall frequencies were fading out during 6-12 months of detraining.

More specifically, the incorporation of Stabilometry Platforms may improve our knowledge regarding balance changes following MCTP, traditionally assessed by means of some functional test like the "Tinetti-Test" (Tinetti, 1986), the "Step-Test" (Jones & Rikkli, 2002), the "Fullerton´s *Functional Fitness Test"* (Rose, 2010), or the "Functional Reach Test" (de Waroquier-Leroy et al., 2014). As an advantage, this group of tests does not need technological materials for the measurements. However, it may exist a subjectivity or error in the data collection, and floor or ceiling effects may occur in any of them. In addition, stabilometry analyses may deep on quantitative and qualitative changes in balance, and may offer a more objective system of assessment.

Our study aims to analyze stabilometry balance changes comparing a group of trained (TRA) and untrained (UNT) elderly following a 5-month cognitive MCTP (the EFAM-UV© program). The first 3 months of detraining were also included in order to analyze Training and Detraining effects looking for group differences. It seems important to extend the balance stabilometry normative values for healthy older adults undergoing functional training. Moreover, understanding the consequences of detraining might help Geriatric Physical Trainers (GPT) to build up better long-term physical conditioning programs for elderly and reduce the risk of falls.

Received for publication August 8, 2016

Methods

Participants

In order to analyze balance changes following the EFAM-UV© program, a cognitive MCTP based on gait training and Dual-Task neuromuscular proposals in enriched environments, 35 healthy older adults participated in this prospective longitudinal study. The final sample comprised those 19 elderly who attended over the 75% of the program and got their full data outcomes. TRA group (1 men and 9 women, 70.77±6.26 years; 68.15±5.87 kg) was training over two years at the EFAM-UV© program, while the UNT group (5 men and 4 women, 72.22±8.73 years; 80.24±16.93 kg) had never participated in the program before. All individuals had signed their written consent to participate in this study approved by the ethic committee of the University of Valencia.

Study protocol

Anthropometric measurements were evaluated before postural stability testing with a Tanita BC 545. Balance was measured at a silent classroom by means of a Balance Trainer 4 platform (BT4, Hur Labs, Tampere). Participants stood quietly, barefoot (with socks) and feet positioned with the heels closed and the toes open 15cm, a 30º angle recommended by the manufacturer. Arms rested at their sides (Smith, Cheng, & Kerr, 2012) while they looked at a black mark on the wall, 3 m away from them, placed at eye level to stabilize the subject´s visual focus during the measurements (Bergamin et al., 2014; Piirainen, Linnamo, Cronin, & Avela, 2013). There was nothing around the platform for security and to avoid supporting help (Bergamin et al., 2014).

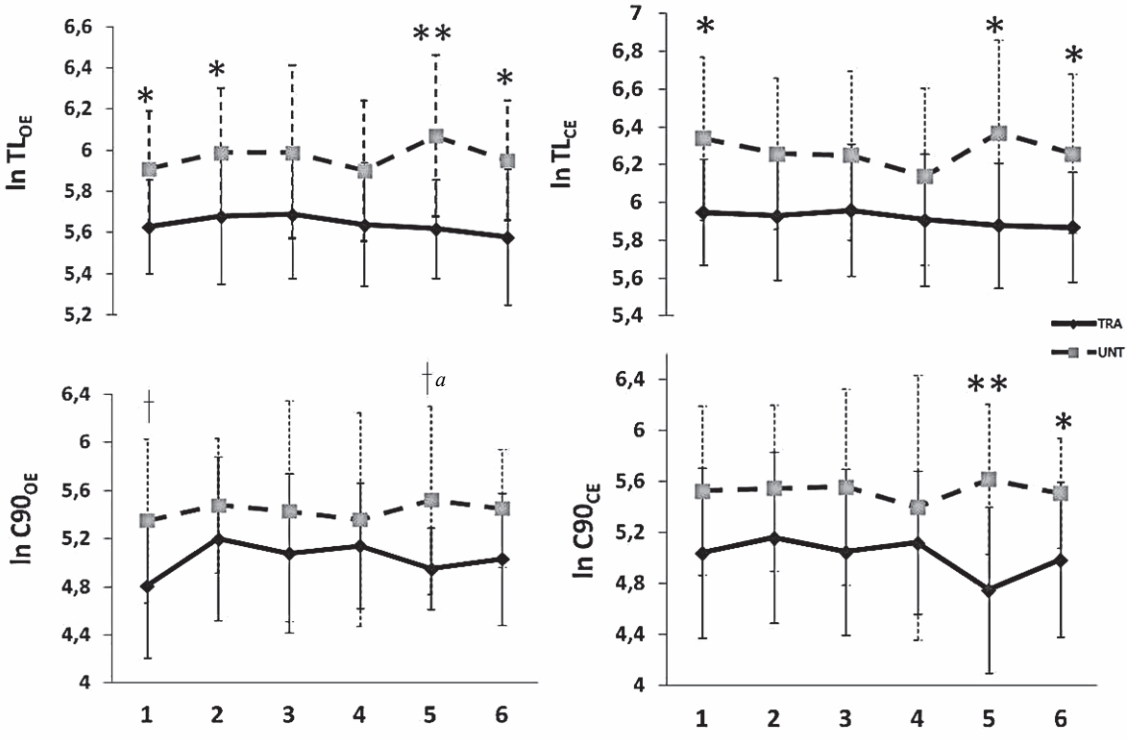
During a Romberg´s test session, the information regarding each subject's sway area (C90) and trace length (TL) was gathered as Centre-of-Pressure (COP) Balance indicators (Smith et al., 2012). Two trials were performed under two visual conditions: Open- Eyes (OE) and Closed-Eyes (CE), where each position was maintained for 35s with the first 5s discarded (Dewhurst, Peacock, & Bampouras, 2015), interspersed with 30s resting within trials. Three sample conditions were considered, resulting in 6 assessments: two at the baseline (PRE: 1&2), two following five months of the EFAM-UV© program (POST: 3&4); and the last two, 3 months later in order to assess detraining effects (DT: 5&6). During detraining, participants were advised not to take part in any balance or functional training activities. Every test was performed at the same hour in the morning, and individuals were asked to avoid changes in their medication, or stimulants consumption; as well as to avoid exercising in the previous 24 hours.

Statistical procedures

Data were analyzed using the Statistical Package for the Social Sciences SPSS, version 22.0 (IBM Inc. Chicago, USA). Distribution tests were conducted by Shapiro-Wilk, and logarithmic transformation was considered when balance indicators were not normally distributed (Nardone, Grasso, & Schieppati, 2006). A Repeated Measures ANOVA was then conducted to analyze changes in the four variables [$C90_{OE}$, $C90_{CE}$, TL_{OE}, & TL_{CE}] comparing training and detraining effects regarding the training status (e.g. between-groups differences). The interaction between training status and sample condition is presented, considering the Bonferroni post-hoc tests, with statistical significance set at the level of $p \leq 0.05$.

Results

Figure 1 shows stabilometry analysis at the PRE (1&2), POST (3&4) and Detraining (5&6) testing conditions. Bonferroni post-hoc tests reveals significant differences between



Legend: the level of * *p<0.05;* ***p<0.01,* † *a =0.052* and † *p<0.10.*

Figure 1. Stabilometry analysis at the PRE (1&2), POST (3&4) and Detraining (5&6) testing conditions following a 5-months Multicomponent Training Program. Log-transformed mean and standard deviation for the Trace Length (TL) and the Sway Area (C90) under Open Eyes (OE) and Closed Eyes (CE) conditions, are compared for Trained (TRA, N=10) vs Untrained (UNT, N=9) elderly subjects. Bonferroni comparisons regarding the interaction training-status *sample condition.

groups (TRA vs UNT) before the 5-months MCTP for TL_{OE} at PRE1 (285.2±61.8 mm vs 382.15±109.55 mm; $p<0.05$) and at PRE2 (306.82±90.52 mm vs 420.97±144.74 mm; $p<0.05$) after log-transformation. This difference is also shown in TL_{CE} at PRE1 (398.2±102.96 mm vs 617.19±276.46 mm; $p<0.05$). However, none of these variables showed significant group-differences after the MCTP intervention (Post 3&4). Later on, after detraining period, we found again significant differences regarding the training status, with worse (higher) TL_{OE} for UNT at DT5 (284.19±70.35 mm vs 467.37±181.02 mm; $p<0.01$) and DT6 (277.62±85.3 mm vs 399.77±135.61 mm; $p<0.05$), and also in TL_{CE} at DT5 (377.72±125.89 mm vs 651.41±320.83 mm; $p<0.05$) and at DT6 (369.34±99.43 mm vs 565.75±243.16 mm; $p<0.05$), as it is shown in figure 1.

On the other hand, $C90_{OE}$ showed a slight trend toward significance in PRE1 (141.81±68.6 mm^2 vs 262.10±205.53 mm^2; $p=0.08$) and at DT5 (148.27±49.15 mm^2 vs 344.25±362.28 mm^2; $p=0.05$), while $C90_{CE}$ showed significant differences already at DT5 (140.55±100.38 mm^2 vs 318.59±169.38 mm^2; $p<0.01$) and DT6 (175.43±116.68 mm^2 vs 267.50±108.95 mm^2; $p<0.05$).

Discussion

The aims of this study were: 1) to extend the balance stabilometry normative values for healthy older adults undergoing functional training, and 2) to determine if the elder's previous training status could influence the balance enhancement due to the 5-months EFAM-UV© program, or the gains retention or worsening after the three months of detraining.

According to previous studies, C90 and TL low values point to be indicators of a better balance (de Oliveira, da Silva, Dascal, & Teixeira, 2014; Dewhurst et al., 2015; Smith et al., 2012; Wuest et al., 2014). Also in our sample, the TRA group had lower values than UNT.

More specifically, TL_{OE} in the TRA group ranged from 277.62±85.3 to 310.2±108.56 mm while the UNT group ranged from 382.15±109.55 mm and 467.37±181.02 mm. In comparison, Han, Lee & Lee (2013) reported TL_{OE} scores of 289.4± 86.7 mm at pre-test and 277.3±74.1 mm post-test in a group of young people (25.3±6.2 y) with the same BT4 platform. And both studies described higher scores (worse balance) when performing the test with closed eyes. Han, Lee & Lee (2013) showed pre-post TL_{CE} differences of 368.8±124.9 vs 300.9± 80.4 mm for the younger, while TL_{CE} becomes worse in the TRA elderly in our sample (between 369.34±99.43 mm and 408.9±150.71 mm), or even worse in the UNT (between 512.45 ±246.55 mm and 651.41±320.83 mm).

However, regarding C90, Han, Lee & Lee (2013) got lower sway area after the balance intervention in both cases ($C90_{OE}$: 231.1±166.5 to 195.9±114.2 mm^2; $C90_{CE}$: 377.8±241.9 to 252.3±131.1 mm^2), but our TRA elderly obtained similar or even lower scores for both C90 indicators [$C90_{OE}$: 141.81±68.6 mm^2 to 224.59±161.82 mm^2; $C90_{CE}$: 140.55±100.38 mm^2 and 214.45±154.38 mm^2], showing a great capacity to control their COP after more than two years following the EFAM-UV© program.

It's been already described that the aging-induced impairment in vestibular, visual, somatosensory and neuromuscular function results in deteriorated postural control with an increased postural sway during standing balance tasks in the elderly (Donath, Kurz, Roth, Zahner, & Faude, 2015; Gim et al., 2015; Qiu et al., 2011). Furthermore, degeneration on their peripheral sensory receptors detected less information from the environment, leading to higher values in the eyes closed condition (Qiu et al., 2011). However, the EFAM-UV© MCTP seems to be able to help elderly to improve their balance, mostly reflected by the variable C90. These differences in C90 and TL suggest that these indicators may be reflecting different COP control mechanisms.

Regarding COP control under pathology, Gim et al. (2015) analysed the sway area with the BT4 in a group of post-stroke adults (45 to 70 years old) finding $C90_{OE}$ scores between 521.3±397.6 and 602.5±594.1 mm^2; and $C90_{CE}$ between 528.1± 497.4 mm^2 and 758.1±635.9 mm^2, which were clearly worse (higher) than our untrained healthy adults [$C90_{OE}$: 259.65± 122.23 mm^2 and 346.6±385.03 mm^2; $C90_{CE}$ 267.5±108.95 mm^2 and 421.89±693.73 mm^2]. This confirms a severe neuromuscular dysfunction post stroke assessed by the stabilometry platform BT4 and the need of implementing MCTP in these patients.

On the other hand, significant differences between groups demonstrate that physical fitness and training status is an important parameter to be considered, mostly when talking about the detraining effects. As a main and general finding, COP balance indicators showed some group differences at the beginning of the MCTP program, which disappear after the end of the 5-months of intervention. However, the detraining period lead to the appearance of significant group differences again, mostly in the first time of the assessments (DT5). It is important to note that each indicator had a trend. While LT demonstrated differences in 1, 2, 5 & 6, C90 showed significance only at 5&6 (reducing the baseline or pre-intervention differences to a trend). As already mentioned, after the intervention, the differences were removed in both because the UNT group improved their balance.

Baseline between-group differences at C90 might be reduced due to fear-to-fall, stiffening behaviours and increasing the co-activation so as to augment the control of the posture (Young & Williams, 2014). These strategies are generated frequently under new situations and cause a smaller sway area (Donath et al., 2015; Young & Williams, 2014). Later on, when people already know the situation, they become relaxed and the sway area may become larger. Wuest (2014) also obtained larger area after his intervention, pointing out that C90 could not be a good parameter or balance indicator.

After 3 months of detraining, there were again significant group differences, meaning that there was an excessive detraining period for the UNT group after such a short intervention, and therefore pointing to the need of reviewing the training / detraining ratio, that is, the relation between the length of the MCTP and its holidays' periods. Conversely, trained people were unaffected by detraining. Detraining confirms to be very sensitive to age, gender, physical status (Carvalho, Marques, & Mota, 2007) also regarding Balance training, with differences in the upper and lower extremities behaviour (Toraman & Ayceman, 2005). The design of physical activity programs for elderly people has to consider many different parameters, including the training status. It has to be controlled for the planning of the gains retention, and the effort and the length of the interventions, as well as the detraining periods must be also considered to ensure its long time effects.

However, some limitations need to be addressed. On the one hand, the sample was not big enough for generalizing the results, and there was no control group, therefore decreasing our internal validity. Similarly, some other functional parameters like strength and fitness might had been included to analyze their improvement or worsening in the same sample conditions. On the other hand, we have found some different protocols to

evaluate balance with BT4 platforms, and it would be necessary to standardize the time of the registers, as well as the number of trials or the resting times among repetitions. For example, Scoppa, Capra, Gallamini, and Shiffer (2012) propose the use of the mean value among three repetitions and at least 30 seconds resting. Finally, it is important to improve or review the instructions to the people when they come into the platform, since they might be of paramount importance, causing some differences. An instruction like "do not move" may lead the participant to adopt a co-activation strategy and to reduce the sway area, whereas an instruction related to "relax on the platform and do not move", may lead to an increase in the sway are related to a confidence feeling. It is of crucial importance to reproduce the same verbal protocol every time.

The authors declare no conflict of interest and want to thank the Siete-Aguas local politicians and the University of Valencia for their support, as well as the elderly association "Entrenamiento con Mayores".

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Sport Mont 14 (2016) 3: 31–35
Original scientific paper
UDC 796-057.875

Gender Differences in Popularity and Engagement in Sport Activities among Students

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A B S T R A C T

The main purpose of this research was to analyse the gender differences among students at the University of Ljubljana concerning the popularity of sports and participation in different types and modes of sport activities. The research was done in the 2013 academic year on a random sample of 3% of the students (N=1390). A questionnaire about students' lifestyles was used (Majerič, 2013). In this study, two variables were analysed: the popularity of different sport activities, and different types and modes of sport activities. The data of the variables were analysed with SPSS for Windows. The basic statistical parameters for both variables were calculated. To calculate the gender differences, a t-test for independent samples and a Mann-Whitney U test were run. An analysis of the popularity of different sport activities showed that gender differences were statistically significant in jogging (p=0.000), walking (p=0.000), football (p=0.000), basketball (p=0.000), fitness (p=0.001), aerobics (p=0.002), and dance activities (p=0.009). Analysis of the types and modes of sport activities among students showed that 63.90% of male students and 68.10% of female students were engaged in unorganized types of sport. Gender differences were found to be statistically significant in two types of sport activities: engaged organized in clubs–competitive out of faculty (p=0.000) and engaged in sport organized at the faculty–competitive (p=0.000). Our findings and conclusions provide useful guidance for the closer and wider professional public.

Key words: *sport activity, students, popularity of sports, types and modes, gender differences*

Introduction

Sport activities of students at Slovenian universities have a long tradition and represent an important ingredient in the quality of their lives (Berčič, 2010). Sport activity for students was formally introduced at the University of Ljubljana in 1960, and its development can be divided into different periods. The first lasted between 1960 and 1980 and was characterized by the introduction of regular physical education lessons to all twenty-six faculties. The second period lasted between 1980 and 1990 and saw the implementation of regular physical education lessons in the first and second year at all faculties. The third period, between 1990 and 2000, was marked by the introduction of new extracurricular programmes and the decrease as well as gradual termination of regular physical education programmes. The fourth period was from 2000 to 2010; its characteristics were the introduction of the Bologna reform, a complete termination of regular physical education lessons, and their transformation into extracurricular sports activities (Majerič, 2015). In 2015, the majority of sports programmes at the University of Ljubljana were carried out as a form of extracurricular activities. Only at a few faculties (with the exception of the Faculty of Sport) could students choose an optional ECTS subject related to sport. A comparison of sports programmes in which students could participate has revealed that between 2002 and 2008 their number decreased by 25% (Filipič-Jeras, 2010; Kolar et al., 2010).

Given the above, it was to be expected that the reduction (termination) of sport programmes would also lead to a decrease in the number of sport active students. Nevertheless, several studies (Majerič, 2002; Markelj, 2004; Majerič & Markelj, 2010; Majerič, 2015) have revealed that the proportion of regularly sport active students in 2013 amounted to 77.9% of the entire student population, which is higher than in the years when students had more opportunities for regularly organized sport activity (physical education lessons, extracurricular activities, competitions, etc.); the proportion of regularly sport active students at that time was 70.3%.

When planning the implementation of student sport programmes, it is important to recognize not only the proportion of sport active students but also the sports in which they participate most frequently. It can be concluded that the interest in various sports has changed over time among students. An older study (Petkovšek, 1980) revealed that the most popular sports among students were basketball, swimming, and football for men and volleyball, swimming, and walking for women. Similarly, Petrović, Ambrožič, Sila, and Doupona (1998) determined that the most popular sports in 1998 for male students were identical to those in the study by Petkovšek (1980), whereas among female students the most popular were walking, swimming and cycling. Majerič (2002) found that in 2002 among both male and female students the most popular sports were walking, cycling and outdoor running. Additionally, among male students, the sports that followed in popularity were team sports (basketball, football, and volleyball), whereas among female students these were aerobics, swimming, inline skating, and dance activities. Markelj (2004) determined the same sports to be the most popular among students of both genders in 2004; specifically, walking, fitness, outdoor running, cycling, table tennis, volleyball, badminton, and tennis. Some sports activities were characteristic only for female students, such as aerobics, inline skating, dance activities, and jogging. In contrast, male students participated more often in football, basketball, and alpine skiing. The differences between genders were noticeable mostly in the ranking of the most popular sport activities. Specifically, in ad-

Received for publication August 19, 2016

dition to individual sports, team sports were popular among male students (basketball, football, volleyball), whereas they did not rank among the popular sports among female students. Analyses by Majerič and Markelj (2010) for the year 2006 as well as for the year 2002 by Majerič (2002) were in concordance, revealing the same ranking of the most popular sports in female and male students.

The development of sport at the University of Ljubljana allowed students in various periods different possibilities for participation in sport. Petkovšek (1980) has found that the majority of students in 1979 (56%) participated in organized physical education lessons. Majerič (2002) revealed that this trend started to change in 2002, when the majority of students (54.31%) practiced sport in a non-organized manner. At the time, 16.58% of interviewed students participated in regular physical education lessons, 18.9% of students practiced sport in sport clubs, and an additional 10.3% practiced sport in commercial organizations. The biggest difference between the genders was observed in non-organized sport participation, as 56.9% of female and 51% of male students were sport active in such a manner. It is interesting to note that the study by Markelj (2004) for the year 2004 has revealed an equal proportion (i.e. 50%) of male and female students participating in organized (physical education, extracurricular activities, clubs and commercial organisations) and non-organized (on their own, with friends, family or one-on-one lessons) sport activities. A comparison of genders showed that male students more frequently participated in organized sport activities (55.7%) than female students did (51.5%); the proportion of students who participated in non-organized sports activities was larger in women (46%) than in men (41.6%). Similarly, the study by Filipič-Jeras (2010) revealed that in 2003 50% of all students at 26 faculties at the University of Ljubljana participated in organized regular physical education programmes. Majerič and Markelj (2010) determined that the majority of interviewed students (64.7%) participated in non-organized sports activities (i.e. on their own, with friends or family) in 2006. The authors also found that female students participated in competitive sport considerably less frequently than the male students did.

The cited research that determined that individual sports were particularly popular among students in the most recent decade and that they were increasingly engaged in unorganized types of sports activities can also be linked with the findings of Beck and Beck Gernsheim (2002) and Bauman (2008). These authors pointed out the growing social individualization of the individual. This phenomenon was especially strong among young females.

In line with the theoretical introduction, the main purpose of the empirical research presented in this paper was to analyse the gender differences among students at the University of Ljubljana, concerning the popularity and participation in different types and modes of sports activities. With the empirical study, the authors wished to provide some useful guidance for the closer and wider professional public.

Methods

The research was conducted in March and April in the 2013 academic year on a random sample of 3% of the students of the University of Ljubljana (N=1390). A questionnaire about students' lifestyles was used (Majerič, 2013). The survey took into consideration the ethical aspects of research involving human studies, in accordance and with the principles of the Helsinki-Tokyo Declaration; before the start of the implementation of the survey, participants gave written consent to participate in it. Participation was voluntary. In accordance with the relevant legislation, the protection of personal data and the anonymity of participants were considered. In this study, two variables were analysed: 1) the popularity of different sport activities, and 2) types and modes of sport activities. To indicate the popularity of different sport activities, the respondents had to choose the one to three sport activities (from a total of 63) that they were doing most often. Regarding the variable 'types and modes of sport activities', the respondents had to choose one answer on a six-item Likert scale for each (eight) different types and modes of sports activities. The data of the variables were analysed with SPSS for Windows. For the variable 'the popularity of different sport activities', a t-test was run for independent samples to calculate the gender differences. To calculate the gender differences for the variable 'types and modes of sport activities', a Mann-Whitney U test was run.

Results

The analysis of the popularity of different sport activities showed that some sports were more popular among male students, and others were more popular among female students. As shown in Table 1, of the top ten most popular sport activities in which male students participated, 52.99% of them were engaged in jogging, 34.33% in fitness, 30.46% in football, 25.18% in biking and 24,82% in basketball, 12.50% in walking,

Table 1. Popularity of first fifteen sport activities for male and female students – basic statistics

	Male students			Female students		
Rank	Sport	N	%	Sport	N	%
1	Jogging	301	52.99	Jogging	534	66.09
2	Fitness	195	34.33	Walking	273	33.79
3	Football	173	30.46	Biking	221	27.35
4	Biking	143	25.18	Fitness	155	19.18
5	Basketball	141	24.82	Aerobics	147	18,19
6	Walking	71	12.50	Dance activities	129	15.97
7	Volleyball	54	9.51	Inline Skating	101	12.50
8	Martial arts	52	9.15	Volleyball	89	11.01
9	Swimming	46	8.10	Mountaineering	74	9.16
10	Mountaineering	38	6.69	Swimming	70	8.66
11	Alpine skiing	34	5.99	Pilates	57	7.05
12	Tennis	31	5.46	Alpine skiing	55	6.81
13	Climbing	24	4.23	Yoga	38	4.70
14	Table tennis	19	3.35	Basketball	32	3.96
15	Badminton	17	2.99	Badminton	28	3.47

Legend: N – number of respondents; % – percentage of respondents

9.51% in volleyball, 9.15% in martial arts, 8.10% swimming, and 6.69% in mountaineering. Of the top ten most popular sport activities in which female students participated, 66.09% of them were engaged in jogging, 33.79% in walking, 27.35% in biking, 19.18% in fitness, 18.19% in aerobics, 15.97% in dance activities, 12.50% in inline skating, 11.01% in volleyball, 9.16% in mountaineering and 8.66% in swimming.

As shown in Table 2, the t-test showed that gender differences were statistically significant in jogging (p=0.000), walking (p=0.000), football (p=0.000), basketball (p=0.000), fitness (p=0.001), aerobics (p=0.002) and dance activities (p=0.009).

Table 2. Engaging in different sports activities among students – gender differences

	Male students		Female students					
	N	%	N	%	T	Df	SE	p
Jogging	301	52.99	534	66.09	-3.70819	833	0.035317	0.000
Football	173	30.46	11	1.36	5.884227	182	0.049448	0.000
Fitness	195	34.33	155	19.18	3.262046	348	0.046437	0.001
Basketball	141	24.82	32	3.96	4.162622	171	0.050121	0.000
Walking	71	12.50	273	33.79	-4.38192	342	0.048579	0.000
Dance activities	12	2.11	129	15.97	-2.63519	139	0.052568	0.009
Aerobics	9	1.58	147	18.19	-3.16994	154	0.052394	0.002

Legend: N – number of respondents, M – mean; % – percentage of respondents; T – values for p calculation; df – values for p calculation; SE – Standard Error; p – value for statistically significant differences; *p≤0.05.

The analysis (Table 3) of types and modes of sport activities among students showed that students of both genders practice sport activities more or less (5 and 6 on the Likert scale) in an unorganized way; 63.69% of male students and 68.10% of female students were engaged in sport in unorganized types and modes.

Table 3. Types and modes of sport activities for male and female students – basic statistics

			Frequency on six-item Likert scale						
	Students		1	2	3	4	5	6	Total
Organized in clubs – competitive programmes out of faculty	Male	N	349	28	25	27	22	70	521
		%	66.99	5.37	4.80	5.18	4.22	13.44	100.00
	Female	N	588	46	27	13	21	68	763
		%	77.06	6.03	3.54	1.70	2.75	8.91	100.00
Organized in clubs – sport recreation programmes	Male	N	327	39	49	43	30	39	527
		%	62.05	7.40	9.30	8.16	5.69	7.40	100.00
	Female	N	442	63	75	46	55	80	761
		%	58.08	8.28	9.86	6.04	7.23	10.51	100.00
Organized sports programmes in curricular – ECTS subject	Male	N	378	63	35	21	12	18	527
		%	71.73	11.95	6.64	3.98	2.28	3.42	100.00
	Female	N	553	41	55	44	26	47	766
		%	72.19	5.35	7.18	5.74	3.39	6.14	100.00
Organized sports programmes – extracurricular activities	Male	N	444	36	15	11	4	10	520
		%	85.38	6.92	2.88	2.12	0.77	1.92	100.00
	Female	N	648	28	30	16	16	18	756
		%	85.71	3.70	3.97	2.12	2.12	2.38	100.00
Organized at the faculty – competitive programmes	Male	N	463	22	15	9	5	5	519
		%	89.21	4.24	2.89	1.73	0.96	0.96	100.00
	Female	N	711	13	15	4	2	9	754
		%	94.30	1.72	1.99	0.53	0.27	1.19	100.00
Organized in student organization	Male	N	461	30	13	10	2	5	521
		%	88.48	5.76	2.50	1.92	0.38	0.96	100.00
	Female	N	662	29	28	15	10	13	757
		%	87.45	3.83	3.70	1.98	1.32	1.72	100.00
Organized in private sector	Male	N	366	35	38	25	22	28	514
		%	71.21	6.81	7.39	4.86	4.28	5.25	100.00
	Female	N	566	42	52	25	30	41	756
		%	74.87	5.56	6.88	3.31	3.97	5.42	100.00
Unorganized	Male	N	31	30	58	75	90	253	537
		%	5.77	5.59	10.80	13.97	16.76	46.93	100.00
	Female	N	35	19	73	117	146	375	765
		%	4.58	2.48	9.54	15.29	19.08	49.02	100.00

Legend: N – number of respondents, M – mean; % – percentage of respondents; Six-Likert scale –'1' means that students are not engaged and '6' that they are fully engaged

The analysis of median values (Table 4) showed that most male and female students were practicing sport in an unorganized manner (alone, with friends or with family) (median values for male=5.17; median values for female=5.25).

Fewer male and female students were engaged in other organized sports programmes: 1.) organized in clubs–competitive programmes out of faculty (median values for male=1.46; median values for female=1.28), 2.) organized in clubs–sport rec-

reation programmes (median values for male=1.46; median values for female=1.28), 3.) organized sports programmes in curricular–ECTS subject (median values for male=1.55; median values for female=1.63), 4.) organized sports programmes–extracurricular activities (median values for male=1.16; median values for female=1.16), 5.) organized at the faculty–competitive programmes (median values for male=1.12; median values for female=1.06), 6.) organized in student organization (median values for male=1.12; median values for female=1.14), 7.) organized in private sector (median values for male=1.37; median values for female=1.31).

Table 4. The frequency of participation in physical activity – gender differences

		Me	MR	SR	U	Z	p
Organized in clubs – competitive programmes out of faculty	Male	1.46	683.3	355994.0	177510.000	-4.171	.000
	Female	1.28	614.6	468976.0			
Organized in clubs – sport recreation programmes	Male	1.55	626.4	330097.0	190969.000	-1.644	.100
	Female	1.63	657.1	500019.0			
Organized sports programmes in curricular – ECTS subject	Male	1.34	640.3	337456.0	198328.000	-.673	.501
	Female	1.36	651.6	499115.0			
Organized sports programmes – extracurricular activities	Male	1.16	638.0	331757.0	196297.000	-.067	.947
	Female	1.16	638.8	482969.0			
Organized at the faculty – competitive programmes	Male	1.12	655.9	340430.5	185835.500	-3.284	.001
	Female	1.06	624.0	470470.5			
Organized in student organization	Male	1.12	634.4	330527.5	194546.500	-.722	.471
	Female	1.14	643.0	486753.5			
Organized in private sector	Male	1.37	648.6	333397.0	187542.000	-1.354	.176
	Female	1.31	626.6	473688.0			
Unorganized	Male	5.17	633.7	340317.0	195864.000	-1.524	.127
	Female	5.25	664.0	507936.0			

Legend: Me – median; MR – mean rank; SR – sum of ranks; U – value for the calculation of statistically significant differences; Z – value for approximation of U for large samples; p – value for statistically significant differences; *p≤0.05.

The Mann-Whitney U test showed that gender differences were statistically significant in two variables that represent competitive types of sport activities: organized in clubs–competitive out of faculty (p=0.000) and organized at the faculty–competitive (p=0.000).

Discussion

The current findings support the previous researchers (Majerič, 2002; Markelj & Majerič, 2010) who determined that individual sports were especially popular in the previous decade. The comparision of our findings with available research (Petkovšek, 1980; Petrović et al., 1998; Majerič, 2002; Markelj, 2004; Markelj & Majerič, 2010) has demonstrated that the popularity of sports activities among male and female students has changed over time. Among male students jogging and fitness were especially popular in 2013, and less popular were walking, biking and mountain biking. The other top ten most popular sport activities were more or less the same. Among female students, fitness and dance, activities were especially popular in 2013, and team sports activities were less popular. Nevertheless, our research has shown that female students preferred individual sports, but male students still preferred to be engaged in team sports such as football, basketball and volleyball.

In this study, we have determined that both male and female students prefer unorganized types and modes of sport activities. Compared with previous research (Petkovšek, 1980; Majerič, 2002; Filipič-Jeras; Markelj & Majerič, 2010), this was the logical result of the abolition of physical education and the reduction of organized sports programmes for students. We have also found that the only main differences between male and female students were that some of the male students preferred doing sport in competitive types and modes.

The changes that we have found can be related to the development of society and various social factors (such as family, tradition, education, culture, etc.) that cause gender differences; reduced possibilities to practice sport in organized types and modes (due to the Bologna reform); lifestyle changes that occur due to the time of study; changes and trends dictated by the media and sports industry and also with the growing social individualization of the individual (Beck & Beck Gernsheim, 2002; Bauman, 2008).

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Sport Mont 14 (2016) 3: 37–40
Original scientific paper
UDC 797.21:796.012.1-053.6

Relations between Anthropometric Characteristics and Motor Abilities of 14 – 15U Female Swimmers on 50m Result for each Technique

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A B S T R A C T

In aim of correlation between antropometric characteristics, motor abilities and results of swimming 50m in all swimming techniques, a group of 22 swimmers (girls) of Serbian national team, aged 14-15, underwent some anthropometric measurements as well as some motor abilities. Observed longitudinal dimensions were: body height, body mass, arm span and torax circumference and observed motor abilities were: body strength (arms, legs, stomach) and flexibility (trunk and arms). Regression analisys showed that arm span corellated with 50m butterfly and free style score as well as strenght of body and legs corellated with 50m backstroke and free style score. Other measures didn´t corelatted significantly on this sample. Study results confirms importance of arm span and some segments of body strenhgt of swimmers (girls) for successful swimm on 50m in butterfly, backstroke and freestyle techniques in the age 14-15 years.

Key words: *anthropometric characteristics, motor-abilities, swimming, 50m frestyle, butterfly, backstroke, breaststroke*

Introduction

Swimming is monostrucutral sport activity, with polystructural parts start, turns and finishing. Swimming performance depends on the power developed by both the upper and the lower limbs, especially in short distance events. Quallity of performance in swimming depends of more factros from several domains such as the anthropometrics (Geladas et al., 2005) hydrodynamics (Kjendlie & Stallman, 2008), kinematics (Barbosa et al., 2010), energetics (Denadai et al., 2000) and others. Good swimming result depends of morphological characteristics, motor and functional abilities (Volčanšek, 2002). Anthropometrical characteristics are very important for successfull swimming performance (Zaciorsky & Safarjan, 1972; Schramm, 1987; Wilke, 1992). Anthropometrics are highly related with young swimmers' performance (Lätt et al., 2010). Offen anthropometry is used for selecting talented swimmers (grls and boys). The use of anthropometry and physical testing is prevalent in many talent identification and talent development programmes including those of the Federation Internationale De Natation (FINA). But, monitoring anthropometry alone, is not best suited for young swimmers. General and specific motor abilities are also very important for good swimming performance. Flexibility is very important for good and efficient strokes (Schramm, 1987) with big amplitude. It could be found that important factors also are the coordinative and technical abilities (Sharp et al., 1982) and the complex speed abilities, which are energy generator the isokinetic pulling force of the arms (Costill et al., 1980), the power of the start (Thayer & Hay, 1984; Rudolph, 1997) and the clean speed shortly after the start (Wirtz et al., 1996). Good coordination between strokes and kick affects swimming performance, too. Strong swimmers can produce stronger strokes and make better performance. Speed can improve stroke frequency as well as starting performance. This study examine the relations between few antropometric characteristics and motor abilities on 50m result for each technique.

Methods

The research measurements took place in Novi Sad. Best 22 swimmers (girls) of Serbian national team, aged 14-15, participated in this study. All of them were in good health and good season form. All swimmers received a complete explanation of the purpose and the procedures of the study and gave their informed consent. Anthropometric measurements were taken three times by the same person. We measured body height and body weight, arm span and chest circumference. Body height and arm span was measured to the nearest 0.1cm using a Martin's anthropometer, body weight was measured to 0.05 kg using a standard beam balance and chest circumference were measured with a non-elastic tape at the level of the middle of the sternum (breast-bone), with the tape passing under the arms. Body mass index (BMI; $kg \cdot m^{-2}$) was also calculated. Pushups are measured on next way. Swimmers are in pushup position with only the hands and the toes touching the floor in the starting position. Lower the chest down towards the floor, always to the same level each time, either till chest touches the ground. They should work as many push ups as possible until exhaustion. For vertical jump test it is necessary to stay side on to a wall and reaches up with the hand closest to the wall. Keeping the feet flat on the ground, the point of the fingertips is marked or recorded. Then it is necessary to stands away from the wall, and leaps vertically as high as possible using both arms and legs to assist in projecting the body upwards. The difference in distance between the standing reach height and the jump height is the score. The best of three attempts is recorded Sit-up test

Received for publication August 28, 2016

starts from lying position on the floor with knees bent at approximately right angles, with feet flat on the ground and hands on thighs, rising with flat back until with hands touches tops of knees. Pulling with neck or head isn't allowed. After that return to the starting position. It is necessary to do as much as possible sit ups in one minute. Sit-and-Rich test involves sitting on the floor with legs stretched out straight ahead. Shoes should be removed. The soles of the feet are placed flat against the box. Both knees should be locked and pressed flat to the floor - the tester may assist by holding them down. With the palms facing downwards, and the hands on top of each other or side by side, the subject reaches forward along the measuring line as far as possible. Ensure that the hands remain at the same level, not one reaching further forward than the other. After some practice reaches, the subject reaches out and holds that position for at one-two seconds while the distance is recorded. Shoulder flexibility was tested in following way. In the standing position with cord that has a fixed handle on one end and a sliding handle on the other. Then, holding the two handles of the cord, cord passes, from in front of the body, over the head and as far back as possible. This movement must be made with extended arms, and it is important to keep arms from fanning out more than is physically necessary to complete the movement. After a practice trial, the best score of three trials is recorded. Higher scores indicate better performance. Measurements were recorded by another person, who did not collaborate in any other way with the measurer. Swimming tests took two days. First day every swimmer swum butterfly and backstroke style and following day they swum breast stroke and free style. The performance of swimmers, expressed in time in seconds on 50 metres (short course) freestyle, backstroke, breaststroke and butterfly was electronically obtained at the local competition, following the FINA procedure. Statistical Package for Social Sciences (SPSS) software (version 19) was used for data analysis. Data were analyzed using descriptive statistics of minimum, maximum, mean, standard deviation, skewness and kurtosis. Regression analyze was use to estimate the effects of independent variables on dependent variable.

Results

Table 1 shows the central and dispersion statistics of anthropometric characteristic and motor skills. The sample was composed of 22 girls. The analysis of the table clearly shows that the distribution of results in all assessed variables does not deviate significantly from the normal distribution.

Table 1. Descriptive Statistics of Anthropometric Characteristic and Motor Skills

variable	Min	Max	Mean	Std. Dev
Body height	132.9	173.5	153.941	9.2556
Body weight	29.5	53.9	42.364	6.6391
Arm span	141.5	176.1	159.255	9.2890
Chest circumference	63.0	81.5	73.736	4.6769
Pushups	8	29	18.41	6.337
Jumps	131	213	173.41	17.443
Sit-Ups	17	30	22.23	3.221
Sit-and-Rich	18	40	31.23	5.806
Shoulder flexibility	29	76	53.50	15.146

A review of the results Table 2 shows that there is a statistically significant effect of the system of predictor variables on the criterion variable 50m backstroke (p=0.011). Multiple correlation coefficient is R=0.719, which means that the corresponding coefficient of determination R^2=0.516 or 51.6% of the common variability of the system of predictor variables and the criterion variable. There is also a statistically significant effect of the system of predictor variables on the criterion variable 50m freestyle (p=0.024). Multiple correlation coefficient is R=0.682, which means that the corresponding coefficient of determination R^2=0.465 or 46.5% of the common variability of the system of predictor variables and the criterion variable. There is no statistically significant effect of the system of predictor variables on criterion variables 50m butterfly (p=0.144) and 50m breaststroke (p=0.580). At the univariate level, statistically significant effect on the 50m butterfly had predictor variable Arm span (p=0.018), and the same variable had statistically significant effect on the 50m freestyle (p=0.024). None of the predictor variable has no statistically significant effect on the criterion variable 50m backstroke and 50m breaststroke.

Table 2. Regression Analysis Of Anthropometric Characteristics On Different Swimming Techniques

	50m butterfly		50m backstroke		50m breaststroke		50m freestyle	
variable	β	p	β	p	β	p	β	p
Body height	.968	.058	-.187	.647	-.540	.323	.317	.461
Body weight	.961	.144	.114	.832	.504	.482	.727	.208
Arm span	-1.476	.018	-.893	.077	.305	.634	-1.234	.024
Chest circumference	-.598	.236	.414	.327	-.564	.315	-.404	.362
R	.564		.719		.384		.682	
R^2	.318		.516		.148		.465	
F	1.978		4.539		.737		3.694	
P	.144		.011		.580		.024	

Results of regression analysis Table 3 show that there is a statistically significant effect of the system of predictor variables on the criterion variable 50m backstroke (p=0.008). Multiple correlation coefficient is R=0.772, which means that the corresponding coefficient of determination R^2=0.597 or 59.7% of the common variability of the system of predictor variables and the criterion variable. There is also a statistically significant effect of the system of predictor variables on the criterion variable 50m freestyle (p=0.006). Multiple correlation coefficient is R=0.778, which means that the corresponding coefficient of

determination R^2=0.606 or 60.6% of the common variability of the system of predictor variables and the criterion variable. There is no statistically significant effect of the system of predictor variables on criterion variables 50m butterfly (p=0.460) and 50m breaststroke (p=0.523). None of the individual predictor variables haven't a statistically significant impact on the criterion variable 50m butterfly and 50m breaststroke, and statistically significant effect on the 50m backstroke have predictor variables Pushups (p=0.014) and Jumps (p=0.002), and on the 50m freestyle variables Jumps (p=0.003) and Sit-Ups (p=0.016).

Table 3. Regression Analysis of Motor Skills on Different Swimming Techniques

	50m butterfly		50m backstroke		50m breaststroke		50m freestyle	
variable	β	p	β	p	β	p	β	p
Pushups	.062	.795	.467	.014	-.060	.805	.314	.080
Jumps	-.183	.448	-.613	.002	-.296	.232	-.595	.003
Sit-Ups	-.519	.068	-.259	.197	.106	.697	-.511	.016
Sit-and-Rich	.284	.340	-.084	.694	-.075	.801	.397	.074
Shoulder flexibility	.082	.778	-.112	.596	-.258	.383	.140	.502
R	.484		.772		.462		.778	
R^2	.234		.597		.214		.606	
F	.979		4.735		.870		4.919	
P	.460		.008		.523		.006	

Discussion

The aim of this study was to examine relations between some antropometric characteristics and motor abilities of 14–15U female swimmers on 50m result for each technique. On this sample, it was found that arm span affect 50m butterfly and freestyle performance on girls. Arm span is directly conected with stroke lenght. Swimmers with greater arm span have longer stroke. Swimmer which swim with longer stroke can produce greater propulsive force, and in that way enable greater swimming speed, better performance. Arm span is very suitable for selection in swimming. Arm span is one of the best performance predictors (Lätt et al., 2010). If swimmer uses big arme span, when swimm as long as possiblle with long strokes (dependes of distance), he has big advantage.

All four analyzed anthropometric characteristics affects girls swimming performance on 50m backstroke and frestyle. It is necessary for swimmers to have big longitudinal dimensions, because of stroke length and bigger swimming surface. With long arms swimmers can swimm with longer strokes and with long legs body rotation could be smaller and hidrodinamic position (called stream line position) also could be better. Big swimming surface allows swimmer to take good hidrodinamic position, which decreases water resistance while swimmers body moving through water.

On this sample, all analyzed motor skills affected grls swimming performance on 50m backstroke and freestyle. It is well known that body strength (pushups, jumps and sit-ups) affects streamline position, which decreses water resistance. Streanline position, is active body position of swimmer, when most of trunk muscules are active.

Push ups as measure of arm strenthg, affects 50m backstroke performance on girls. In backstroke, arms produces most of energy for swimming. Jumps as measure of legs strength also affects swimming performance in 50m backstroke of girls. Strong legs helps swimmers to take streamline position and to have strong start from starting block as well as good and fast turns and accomplish better performance.

Sit ups and jumps affects swimming performance od 50m frestyle. Strong abdominal muscules helps swimmer to take good streamline position as well to swim with 6-beat kicks per cycle. Strong legs are important for swimming performance on 50m freestyle for girls also for good starting and good and fast turns.

In this age, for girls is important to lear to use length of upper limbs and to swim with long strokes. Also it is important to strengthen abdominal muscles (stream line position) and upper and lower limbs (stream line position and generating propulsive power). From the other side, it is important to select girls with long longitudinal charasteristics, especially big arm span for most of swimming techniques. Also, it is important for grils swimmers to have strong body, arms and legs.

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Sport Mont 14 (2016) 3: 41–43
Review paper
UDC 796:659.1]:174

Ethical Dilemmas of Sport Advertising

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A B S T R A C T

The objective of this study represent the sport advertising, while the main goal will be directional to discuss ethical dilemmas of sport advertising. The main tasks of this study is discussing a law regulations and ethics, as well as communication with hidden interest. 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 creating some basic outputs with regards to Ethical Dilemmas of Sport Advertising.

Key words: *advertising, sport, ethics, dilemma*

Introduction

Today, advertising activities are more than ever overwhelmed by ethical dilemmas, having in mind bigger and bigger appearance of concurrency on the market, it becomes harder to think about unique advertising message, that will not provoke the feeling of being cheated on and manipulated. According to that, ethical problems are concerned with questions, situations and opportunities which require from individuals or organizations choose between a few advertising actions which should be evaluated as good or bad, e.g. ethical or non- ethical, which will not allow consumers to feel cheated on or manipulated, regardless their legitimacy. The most accurate definition of advertising ethic, according to the author, provided G. Belch and M. Belch (2009), which represented it as a combination of moral ballasts and values which administrate actions and decisions of individuals or groups, conforming the law or not.

Law Regulations and Ethics

Although advertising is now, more than ever, governed by law regulations than it was the case in the past. Still, there are many situations which cannot be predicted by strictly regulated rules, so that is when we talk about advertising ethic, which reading everything, plays as important role as law regulations. Consequently, the fact is that marketars often, while conducting advertising activities, encounter problems which they are forced to solve according to their own moral ballasts, seeing that there are no law regulations to be followed in that situations. On the other hand, often there are situations when certain advertisements are within law regulations, but still no in accordance to ethical ballasts. The perfect example for this situations is the fact that there are no law regulations which would prevent organizations which produce tobacco goods from advertising their trademarks for target groups, as it is case, principally, with coloured population in America. Sport and sports events are even used in order to display advertising messages to above mentioned groups, so it is more than necessary to state that this business practice is at odds with moral ballasts seeing the fact that high level of lung cancer and lung diseases connected with smoking are present with mentioned population. Also, it is often the case that certain organizations act strictly according to law regulations when it comes to advertising, but are still brave enough to adveritize stimulant aids which sportsmen consume in order to improve their results, not taking care that they risk their health which could be undermined in the future by using above mentioned substances. Although there are no law regulations to sanction non- ethical activities, it is often the case when an accident happens, that they cause disapproval of consumers and big damage to organizations which presented them because advertising and promotions are fields in which failures are easily visible and very hard to hide (Irwin, Sutton, & McCarthy, 2002; Popović, 2011).

Communication with Hidden Interest

As advertising connotes communication with consumers in order to form a positive attitude about products and services (Popović, Matić, Milašinović, Jakšić, & Bjelica, 2015a, 2015b, 2015c), the main aim is their accentuation in a process of buying on a market, as well as target marketing position of products and organizations. But, advertising often represents communication with hidden interest, and recursive, gets into "grey zone" in which non- ethical behavior is very often awarded, or at least forgiven, seeing that it brings short- term benefits for organizations, which in constant race for profit an marketplace do not choose advertising aids, but often decide to cheat on potential consumers through the sole piece of information or through the pressure to which they display them in various ways. Because all the mentioned problems, public controversies about limitations or prohibitions of advertising activities when it comes to certain groups of people or products are very often organized (Popović, 2011). The most actual problem that occurs in the modern world are unrestrained groups of sport supporters which use mass media as a way of sending various messages which in most convenient cases are not even close to consistence with moral ballasts. Still, there are certain countries in the EU which accepted law regulations which started sanction-

Received for publication September 8, 2016

ing raggers strictly, so that the level of these non- ethical activities reasonably lowered in the past years. In our environment, these advertising activities are still present via messages on stadiums or similar locations. It is also very interesting to mention an example which is not closely linked to sport, but which can help solving the problems with sports supporters because of its similarity, because it shows how legislation organs limited the students` activities which used alcohol more and more on their meetings. This common social problem became so big lately, that negative consequences started occurring on daily basis in their behavior, even fatal accidents started occurring more often. As a few studies according to G. Belch and M. Belch (2009) in the U. S. showed that considerably big number with meetings which have for aim to fully enjoy in alcohol occurred, responsible legislative organs made a decision to forbid any advertising and promoting activities concerned with alcohol beverages, even certain universities limited circulation of alcoholic drinks towards their students. These limitations, among the rest, clasp the limitations of sponsorship or supporting sports, musical, cultural and social events conducted by producers of alcohol drinks, as well as limitations for university newspapers to sell copies with advertising messages which promote alcohol drinks. Also, it is interesting to imagine how hard it was for organizers of final match of Champions League which took place in May, 2008 in Moscow seeing that beer producers "Heineken" as a general sponsor of this competition had a conflict with Russian law which doesn`t allow a public advertisement of alcohol drinks. In a certain moment, even the sole match was under the question mark, but because of its importance, the leadership decided to make an ethical precedent and allow ease advertisement of above mentioned product for higher country interests.

It happens very often that organizations which deal with non- ethical activities step forward in media with advertising messages which have for aim to remove doubts publicly of doing activities consistent to moral ballasts (Popović, 2011). On the concrete example, organizations which produce stimulant assets for sportsmen very often feel the need to step forward publicly to remove doubt for doing such non- ethical things. It happens that these organizations start or directly support advertising activities of other organizations which transparently send messages which have for an aim to reduce misusage of prohibited stimulant assets, especially when it is concerned with population of young people. Many of these organizations develop social programs and display advertising messages designed to put an apostrophe to this problem. On the exact example, it is worth mentioning advertising campaign which presented the message which has for aim to encourage parents to talk to their children about allowed and prohibited stimulant assets which are more and more available on the market, as well as to explain them how to differentiate them. These organizations, also, cooperate with parents, teacher, sports and social organizations, legislative clerks, as well with all other interested subjects with aim to ensure improvement in battle against misusage prohibited stimulant assets. But, this problem is very hard to alleviate, seeing that there are many organizations which promote publicly above mentioned social programs because of a good profit and start advertising activities through which inform young people about harms which these products provoke, but beside that, they produce in their machineries these mere products and place them on the market constantly. Very negative message, when these issues are concerned, was sent by world and Olympic athletic champion, Marion Jones, when she confessed that she had been taking prohibited stimulant supplements and won prestigious awards via their help and thus shocked the whole world publicity and overturned multiannual efforts of social organizations and even put under question mark basic mission and existence of sport.

Marketers, even despite laws and ethics, mostly freely produce advertisements with contain shocking and other insulting contents and which put an emphasis to immaculate values, as sexual attractiveness, link between materialism, happiness and confidence, as well as stereotypes (Kotler, 2000). Although these problems are much more worked on in the paper, the author put an emphasis in this one on perpetual ethical dilemma which became very common in contemporary media as the question if it is ethical to emphasize female sexuality in advertising its, wether sports on non- sports products. Although borders in grammatical distinguishing between subject and object with an aim for consuming and sexual desire are being changed on daily basis, author still thinks it is not in accordance with moral ballasts to emphasize female sexuality. Still, it is obvious that messages which are sexually colored attract more attention than a product, which stays neutral in that moment and as well have a goal to connect women attractiveness directly with attractiveness of a product and thus are more useful for organizations. But, this problem is impossible to solve so it is best to know it as much as possible, so that in the future everyone who is on the author`s side concerned with ethical dilemmas in sports advertising could contribute to reduce negative impacts of mentioned advertising messages.

There is a combination of very extreme cases, according to G. Belch and M. Belch (2009), when it comes to putting emphasis on sexual attractiveness in advertisements, and whose business activities weren`t in accordance with advertising ethics, in the first place the activities of globally recognized organization D&G, towards which majority of organizations who fight for women rights showed huge resentment, seeing that they considered their advertisement to promote group rape. This advertisement showed an elegantly dressed woman in a Russian dress and high heels, lying on her back, below a tastelessly dressed man, while four other men were standing beside and looking what was going on. Marketers of mentioned organization were defending it from public allegations by using an argument that this advertisement had for an aim to show Sicily legacy, which comes from Latin area, which is very passionate and emotional. When this problem turns to sport, it is very evident that it is more than common for various non- ethical messages to be sent on covers or inside magazines, such as Playboy, CKM and similar. It became by appearing famous sports women with few clothes on them or even without them, as the most popular tennis player, Serena Williams, as well as many others, but honestly speaking less intensely, even more often their male colleagues appear.

Simultaneously with growing of "advertising industry", the ethical problems grew, too. Seeing that there is a big number of people employed to think about something new, something that no one else came up with so far, they often forget about moral ballasts and driven by desire for business success they come in a situation to behave not according to advertising ethic. According to this, it happens very often that certain organizations decide to appear with numerous shocking advertisements which contain problematic photos, such as, in the first place, according to G. Belch and M. Belch (2009), a black woman caressing a white baby, children with special needs, as well as a series of very similar photos in which sportsmen very often act and even take a lead of certain advertisements. Unfortunately, all of these advertisements succeed in achieving their goals and that is attracting attention of potential consumers and later recognition of certain products. Still, majority of organizations after shock-

ing advertisements by which they placed their product on the market, decide to shift to activities such as public apologies, supporting of voluntarism, caring for starving populations or something similar which could replace ethical fallacies of previous activities.

Conclusion

Still, at the end of this paper, in which the author tried to draw attention to ethical fallacies in advertising, there appears the question if there is advertising ethic in practice, e.g. if complete discussion is only lead in scientific areas, while on terrain marketers behave only according to law regulations and put moral ethic aside. Anyway, author allow all of ones who want to find the answer on the question if there is advertising ethic or they are all the actors of a market match in fight with this notion, to give themselves an answer, seeing that there is no authority who can draw the conclusion about who is right and who is not.

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Revised March 2016

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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 Akpinar[1], Stevo Popović[1,2], Sadettin Kirazci[1]

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

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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.

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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). 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.

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Main chapter headings: written in bold and in Title Case. *See* example:

- ✓ **Methods**

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- ✓ *Table position of the research football team*

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All contributors who do not meet the criteria for authorship should be listed in the 'Acknowledgements' section. If applicable, in 'Conflict of Interest' section, authors must clearly disclose any grants, financial or material supports, or any sort of technical assistances from an institution, organization, group or an individual that might be perceived as leading to a conflict of interest.

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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
- ✓ Subséquent 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):

Bangsbo, J., Iaia, F. M., & Krustrup, P. (2008). The Yo-Yo intermittent recovery test: a useful tool for evaluation of physical performance in intermittent sports. *Sports Medicine, 38*(1), 37-51.

Duffield, R., & Marino, F. E. (2007). Effects of pre-cooling procedures on intermittent-sprint exercise performance in warm conditions. *European Journal of Applied Physiology, 100*(6), 727-735.

Krustrup, P., Mohr, M., Amstrup, T., Rysgaard, T., Johansen, J., Steensberg, A., Bangsbo, J. (2003). The yo-yo intermittent recovery test: physiological response, reliability, and validity. *Medicine and Science in Sports and Exercise, 35*(4), 697-705.

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

Shaw, A. (1999). The planning and development of New Bombay [Electronic version]. *Modern Asian Studies, 33*(4), 951-988.

Journal article (online; electronic only):

Chantavanich, S. (2003, October). Recent research on human trafficking. *Kyoto Review of Southeast Asia, 4*. Retrieved November 15, 2005, from http://kyotoreview.cseas.kyoto-u.ac.jp/issue/issue3/index.html

Conference paper:

Pasadilla, G. O., & Milo, M. (2005, June 27). *Effect of liberalization on banking competition*. Paper presented at the conference on Policies to Strengthen Productivity in the Philippines, Manila, Philippines. Retrieved August 23, 2006, from http://siteresources.worldbank.org/INTPHILIPPINES/Resources/Pasadilla.pdf

Encyclopedia entry (print, with author):

Pittau, J. (1983). Meiji constitution. In *Kodansha encyclopedia of Japan* (Vol. 2, pp. 1-3). Tokyo: Kodansha.

Encyclopedia entry (online, no author):

Ethnology. (2005, July). In *The Columbia encyclopedia* (6th ed.). New York: Columbia University Press. Retrieved November 21, 2005, from http://www.bartleby.com/65/et/ethnolog.html

Thesis and dissertation:

Pyun, D. Y. (2006). *The proposed model of attitude toward advertising through sport.* Unpublished Doctoral Dissertation. Tallahassee, FL: The Florida State University.

Book:
Borg, G. (1998). *Borg's perceived exertion and pain scales*: Human kinetics.

Chapter of a book:
Kellmann, M. (2012). Chapter 31-Overtraining and recovery: Chapter taken from Routledge Handbook of Applied Sport Psychology ISBN: 978-0-203-85104-3 *Routledge Online Studies on the Olympic and Paralympic Games* (Vol. 1, pp. 292-302).

Reference to an internet source:
Agency. (2007). Water for Health: Hydration Best Practice Toolkit for Hospitals and Healthcare. Retrieved 10/29, 2013, from www.rcn.org.uk/newsevents/hydration

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All tables should be included in the main manuscript file, each on a separate page right after the Reference section.

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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.

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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}.

- ✓ ^{a}One participant was diagnosed with heat illness and n = 19.^{b}n =20.

Probability notes provide the reader with the results of the texts for statistical significance. Probability notes must be indicated with consecutive use of the following symbols: * † ‡ § ¶ || etc.

- ✓ *P<0.05,†p<0.01.

2.5.4. Table citation

In the text, tables should be cited as full words. *See* example:

- ✓ Table 1 (first letter in all capitals and no full stop)
- ✓ ...as shown in Tables 1 and 3. (citing more tables at once)
- ✓ ...result has shown (Tables 1-3) that... (citing more tables at once)
- ✓ ....in our results (Tables 1, 2 and 5)... (citing more tables at once)

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- ✓ **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

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- × figure 1
- × Figure 1.
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- ✓ ….in our results (Figures 1, 2 and 5)... (citing more figures at once)

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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)…

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- ✓ First time appearing: *musculus biceps brachii*

Abbreviated: *m. biceps brachii*

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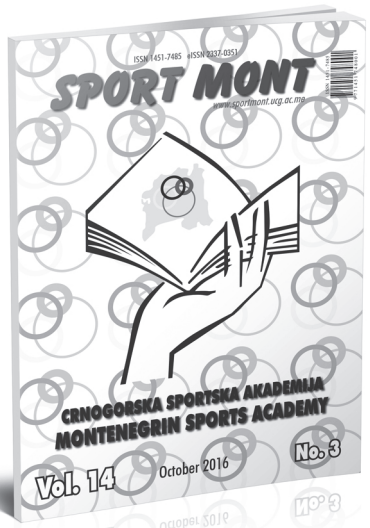

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Publication date: Autumn issue – October 2016
Winter issue – February 2017
Summer issue – June 2017

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FAKULTET ZA POMORSTVO – KOTOR

UNIVERSITY OF MONTENEGRO
MARITIME FACULTY - KOTOR

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OSC offshore simulator at Maritime Faculty Kotor, Montenegro

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PDV 30/31-03951-6

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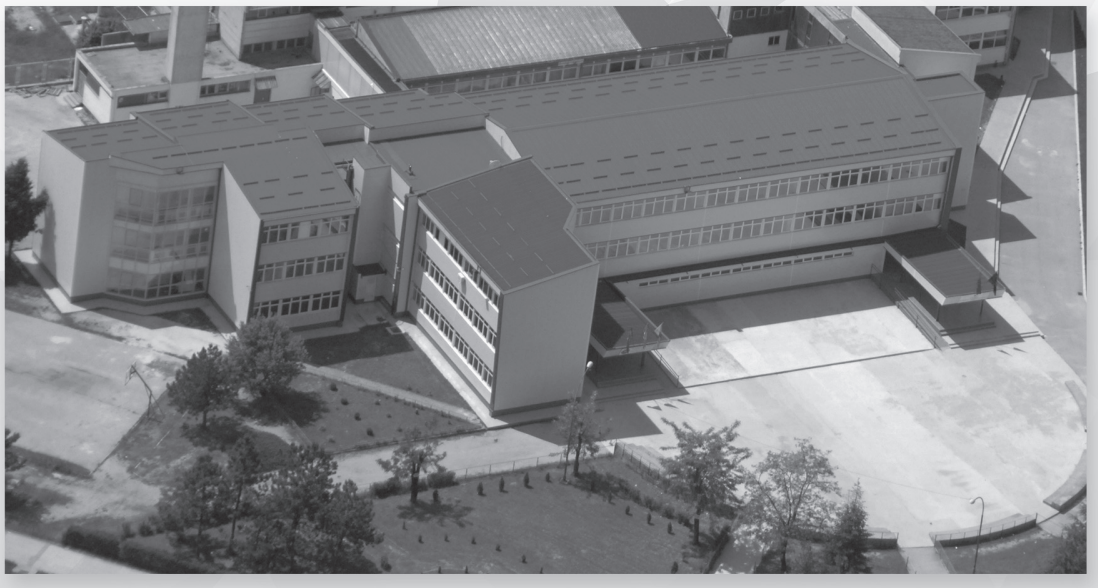

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Nikšić, 2016.

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Montenegrin Journal of Sports Science and Medicine

www.mjssm.me

ISSN 1800-8755

Vol. 5 September 2016 No. 2

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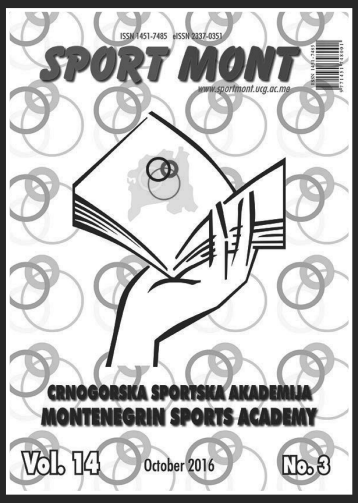

Sport Mont Journal

Editor-in-Chief: **Dusko Bjelica**, Montenegro
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Volume 14, 2016, 3 issues per year; Print ISSN: 1451-7485, Online ISSN: 2337-0351

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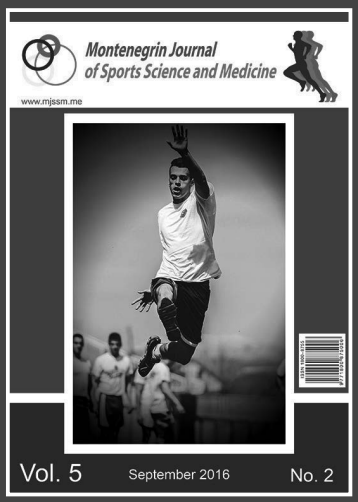

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Volume 5, 2016, 2 issues per year; Print ISSN: 1800-8755, Online ISSN: 1800-8763

Montenegrin Journal of Sports Science and Medicine (MJSSM) is published biannually, in September and March of each year. MJSSM publishes original scientific papers, review papers, editorials, short reports, peer review - fair review, as well as invited papers and award papers in the fields of Sports Science and Medicine, as well as it can function as an open discussion forum on significant issues of current interest. MJSSM covers all aspects of sports science and medicine; all clinical aspects of exercise, health, and sport; exercise physiology and biophysical investigation of sports performance; sport biomechanics; sports nutrition; rehabilitation, physiotherapy; sports psychology; sport pedagogy, sport history, sport philosophy, sport sociology, sport management; and all aspects of scientific support of the sports coaches from the natural, social and humanistic side.

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