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Faculty of Physical Education, Sport, and Health

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ALCOHOL CONSUMPTION HABITS AMONG YOUNG ADULTS WITH SEDENTARY AND ACTIVE LIFE STYLE

Adam Gligoroski, Daniela Shukova Stojmanova
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Abstract:

The physical as part of good life habits are associated with lower alcohol intake, and therefore people who exercise regularly are assumed to consume less alcohol. The aim of this research was to determine the level of alcohol consumption among young respondents, aged 13-30 years, in relation to sex and physical activity. This investigation was conducted on 68 respondents divided in two groups regarding the gender, and these groups were divided into two additional subgroups in terms of level of physical activity: active and sedentary individuals. The information about alcohol consumption habits were obtained through a questionnaire. Our results on the habits of young people on alcohol consumption show that the percentage of male respondents as alcohol consumers is slightly but insignificantly larger than in female. On the questions related to the frequency of drinking, a significantly bigger number of male respondents drink 1-2 a week, while the female respondents drink 1-2 monthly. A significant number of female respondents tasted alcohol for the first time two years after the male respondents, which is between the ages of 14-16. Male respondents started consuming alcohol earlier than female respondents. Men drink more often than women. Women with a sedentary lifestyle started consuming alcohol earlier in their life, and drink more often than women who have an active lifestyle. Men with active and sedentary lifestyles have similar alcohol consuming habits considering the frequency and the amount. The main difference in alcohol consumption in men was that those with sedentary lifestyle started consuming alcohol earlier in their life.

Key words: alcohol, consumption, physical activity, sedentary,

Introduction

Alcohol is the most consumed substance which causes addiction among people throughout the world. According to the National Council for Alcoholism and Drug Addiction in USA, 17.6 million people are diagnosed as alcohol addicts, or every twelfth adult citizen. Numerous epidemiology studies show a high level of alcohol abuse among different groups of population (1-3). More than a half of the adult population inUSA have a history with alcoholism in their family. Alcoholism and alcohol abuse can have serious effects on the health of an individual, it can adversely affect their emotional stability, their financial state, their career, and it has an ill effect on family, on relationships with friends, and on the community. Besides the physical inactivity and excessive food intake, alcoholism is on the third place among the factors connected with life style which contribute to increase of mortality. In the countries of the European Union, which are a region with the highest rate of alcohol consumption per capita, it is estimated that alcohol is responsible for 10% of mortality (4).

Some researchers believe that physical activity can have a positive impact on people who are trying to reduce their alcohol intake (5). It is believed that good life habits are associated with lower alcohol intake, and therefore people who exercise regularly consume less alcohol. Physical activity is considered as prevention for alcohol consumption, but some researchers suggest that men with high PA-levels reported more alcohol consumption in comparison to men with moderate PA-levels (6).

The aim of this research was to determine the level of alcohol consumption among young respondents, aged 18-30 years, in relation to sex and level of physical activity.

Material and methods

The survey was conducted on 68 respondents from both sexes. Respondents were divided in two groups, 38 women and 30 men, age span 19 to 30 years (mean age 24 ± 3.6 years). These groups were divided into two additional subgroups in terms of level of physical activity: active and sedentary individuals. The respondents who practiced physical activities were recruited from the Atleta fitness club,

while the respondents who didn't practice physical activity were second year students from the faculty of medicine.

The information about alcohol consumption habits were obtained through a questionnaire, which is consisted of 8 questions. The first five questions were about the frequency of alcohol consumption and the respondents were given the option to answer with a yes or no. The rest of the questions were about the type of alcohol, the amount, and when they began with alcohol consumption, and they were offered to choose one of several given answers. The obtained results were presented as percentage representation and difference between the groups.

Results

The frequency and chi quadrat test analysis are presented regarding the gender, and within the same gender regarding the presence of physical activity. In the table 1 are shown the results of frequency analysis in whole investigated population (68 subjects) regarding the gender.

Table 1. Distribution of the alcohol consumption habits regarding the gender

Questions		Women (N= 38) Number / %	Men (N= 30) Number / %	X2 test	P
1. Do you consume alcohole?	yes	30 (79%)	25 (83%)	X^2=2.8	0.09
	no	8 (21%)	5 (17%)		
2. How often do you consume alcohol? Once or twice monthly?	yes	26 (68%)	25 (83%)	X^2=9.84	0.001
	no	12 (32%)	5 (17%)		
3. More than twice monthly?	yes	18 (47%)	18 (60%)	X^2=1.286	0.25
	no	10 (26%)	7 (23%)		
4. Once or twice weekly?	yes	8 (21%)	15 (50%)	X^2=18.267	0.00001
	no	30 (79%)	15 (50%)		
5. Everyday?	yes	0	1 (3%)	X^2=3.793	0.05
	no	38 (100%)	29 (97%)		
6. When did you consume alcohol for first time?	before12 y.	0	1 (3%)	31,7	0,0001
	12-14 y.	0	11 (33%)		
	14-16 y.	18 (47%)	8 (24%)		
	after 16 y.	11 (29%)	5 (17%)		

Our results on the habits of young people on alcohol consumption show that the percentage of male respondents as alcohol consumers is slightly but insignificantly larger. On the questions related to the frequency of drinking, a significantly bigger number of male respondents drink 1-2 a week, while the female respondents drink 1-2 a month. Only one male reported drinking alcohol every day. The male respondents started drinking earlier; most of them had their first taste of alcohol between the age of 12-14. A significant number of female respondents tasted alcohol for the first time two years after the male respondents, which is between the ages of 14-16.

When comparing alcohol drinking habits among our female respondents divided into two subgroups,active and sedentary individuals, we noticed that the percentage of alcohol consumption is far greater among the female respondents who are not physically active than the ones who are. Among the women who exercise, even as much as one third of them (34%) do not consume alcohol at all. Considering the frequency of drinking, the ones who do not exercise, drink more frequently than the ones who do, however none of them consumes alcohol on a daily basis. According to the statements of the female respondents who do not exercise, they started drinking earlier than the ones who exercise.

Among the male respondents, the percentage of those who do not drink alcohol is similar regardless of whether they exercise or not. In terms of frequency of alcohol consumption, the percentage is slightly bigger for the ones who do not exercise. The biggest percentage (70%) of the ones who do not exercise reported that they first tasted alcohol around the age of 12 to 14, while among the respondents who exercise; a similar number reported that they began drinking around the age of 14 to 16 and after 16.

Table 2: Distribution of the alcohol consumption habits in women with active and sedentary lifestyle

Questions		Active woman (N= 21) Number / %	Sedentary woman (N= 17) Number / %	X2 test	P
1. Do you consume alcohole?	yes	14 (66%)	16 (94%)	X^2= 36.25	0
	no	7(34%)	1 (6%)		
2. How often do you consume alcohol? Once or twice monthly?	yes	11(52%)	15 (88%)	X^2= 33,067	1e-8
	no	10(48%)	2 (12%)		
3. More than twice monthly?	yes	8 (38%)	10 (58%)	X^2= 5.543	0.01
	no	13 (62%)	7 (42%)		
4. Once or twice weekly?	yes	6 (28%)	2 (12%)	X^2= 8	0.004
	no	15 (72%)	15 (88%)		
5. Everyday?	yes	0	0	X^2= 0.941	0.33
	no	21 (100%)	17 (100%)		
6. When did you consume alcohol for first time?	before12 y.		0	6,75	0,08
	12-14 y.		4 (23%)	4.941	0.026
	14-16 y.	10 (48%)	8 (46%)	1.441 3.191	0.229 0.074

Table 3. Distribution of the alcohol consumption habits in men with active and sedentary lifestyle

Questions		Active men (N= 15) Number / %	Sedentary men (N= 15) Number / %		
1. Do you consume alcohole?	yes	12(80%)	13 (86%)	X2= 0.577	0,447
	no	3 (20%)	2 (14%)		
2. How often do you consume alcohol? Once or twice monthly?	yes	12 (80%)	13 (86%)	X2= 0.577	0,447
	no	3 (20%)	2 (14%)		
3. More than twice monthly?	yes	8 (53%)	10 (70%)	X2= 1,2	0,27
	no	7 (47%)	5 (30%)		
4. Once or twice weekly?	yes	6 (40%)	9 (60%)	X2= 2,5	0,11
	no	9 (60%)	6 (40%)		
5. Everyday?	yes	1 (6%)	0	X2= 0,067	0,79
	no	14 (94%)	15 (100%)		
6. When did you consume alcohol for first time?	before12 y.	1 (6%)	0	15,65	0,0013
	12-14 y.	2 (12%)	10 (70%)	19.2	0.0000117
	14-16 y.	5 (30%) 4 (24%)	4 (24%) 1 (6%)	0.341 10.067	00.001 0.0015
	after 16 y.	7 (34%)	4 (23%)		

Discussion

Alcohol consumption is a complex behavior arising within the frames of the overall lifestyle of an individual. The definition of alcoholism doesn't have much to do with the type of alcohol which is being consumed and even whit the amount and the duration of the consumption of alcohol. An important fact is the uncontrolled desire of an individual to consume alcohol, which is as strong as the need for food or water, and which cannot be controlled. Some other habits associated with the risk of health deterioration such as smoking, driving without a seatbelt, etc., often go hand in hand with increased alcohol consumption (7). Contrary to this, among those who practice healthy life habits, (regular exercise, and healthy diets), a negative association with alcohol abuse has been noticed (8).

The exercise is documented as a provider of wealth of benefits to brain and body and it is regarded as protective factor against disease and consequently the addictions. Exercise is regarded as health

promoting behavior counter to consumption of alcohol (8). The influence of alcohol consumption on health is dependent on amount of alcohol consumption, i.e. alcohol use or alcohol abuse. The newest knowledge about relationship between alcohol use and health risk is depicted with U-shaped curve (9). According the 10 year longitudinal study the subjects with moderate alcohol intake had the lowest mortality rates. Several population-based studies have shown that people who are physically active are more likely to be moderate drinkers 10). Considerable evidence indicates that physical activity and alcohol intake are positively related. A number of studies indicate heavier drinking in athletes among college students than compared to non-athlete peers (11).

Alcohol consumption during adolescence and during the early matured years is a significant public health problem within the countries of the western civilization, (USA and EU) (12, 13). Study on the prevalence of alcohol consumption among students from the end of elementary school to the end of high school showed that 19.6% of eight graders, 35% of students in the second year of high school, and 48.6% of students in the last year of high school, consumed alcohol during the last 30 days (14). In relation to sex, only the male respondents from the fourth year of high school drank more than their female peers. Among the respondents from the faculties, the percent of alcohol consumers was significantly high – around 70%, with a slight lead for the male respondents (68% vs 70%).

Ethanol is the macronutrient with the highest energy density. In an epidemiological study of the relationship between alcohol intake and body fat and physical activity, it has been found that those with a risky level of alcohol consumption have a lower level of physical activity than those who drink little or not at all (15). In a study that examined the association between the total intake of nutrient macronutrients (protein, sugars and fat) and alcohol intake, it was found that individuals who drank, were younger than the control group, individuals who do not drink alcohol (NHANES III). Drinking alcohol is negatively linked to the nutrition index (BMI), and the body weight of the female respondents (16).

In a research paper on the relationship between physical activity and alcohol consumption among adult US citizens, it has been found that there is a link between PA and drinking alcohol in 88% of the student population and 75% of the non- student population (17).

In a study conducted on more than 15.000 respondents from Australia, whose subject was the relationship of alcohol consummation and the level of physical activity (PA), no significant difference between the amount of alcohol and the level of PA has been determined. The same study determines that individuals who participate in a high level of PA consume more alcohol in relation to those who participate in PA with moderate intensity (18).

Our results showed that if we analyze all respondents in relation to their sex, the number of alcohol consumers is slightly higher among the male respondents. In relation to the frequency of alcohol consumption, men consume alcohol way more frequently than women. Male respondents started consuming alcohol earlier in life. The majority of male respondents tasted alcohol for the first time between the age of 12 and 14 (33%), or within a wider period between the age of 12 to 16. The majority of women tasted alcohol for the first time between the age of 14 to 16 (47%).

When we analyzed the obtained data within sexually different groups but in terms of lifestyle, sedentary or active during free time, we acquired the following results. Within the female group there are statistically significant differences for all answers, except for the question of whether they consume alcohol on a daily basis, on which all respondents gave a negative response.

Meaning that women who exercise, in a higher percentage, do not consume alcohol (34% vs 6%), that is, consume less often and a lesser amount of alcohol. Those women who exercise and who sporadically consume alcohol, tasted alcohol for the first time after the age of 14, while 23% of women with sedentary lifestyle tasted alcohol for the first time between the age of 12 to 14.

Among the male respondents, the percentage of those who consume alcohol is similar regardless of whether they exercise or not. In relation to the frequency of alcohol consumption, the percentage is slightly higher for those who have a sedentary lifestyle. It is important to mention that the frequency of all the answers was statistically significantly similar, except for the question of when they tasted alcohol for the first time. The biggest percentage (70%) of the sedentary respondents said that they tasted alcohol for the first time around the age of 12 to 14, while a similar number from the respondents who exercised said that they started drinking between the age of 14 to 16, and after the age of 16.

Our results show that there is no significant difference in the drinking habits among the male respondents who have a sedentary or an active lifestyle. Among our female respondents we noticed that

there is a significantly higher percent of women who consume alcohol with a sedentary lifestyle compared to women who have an active lifestyle.

Conclusion

Male respondents started consuming alcohol earlier than female respondents. Men drink more often than women. Women with a sedentary lifestyle started consuming alcohol earlier in their life, and drink more often than women who have an active lifestyle. Men with active and sedentary lifestyles have similar alcohol consuming habits considering the frequency and the amount. The main difference in alcohol consumption in men was that those with sedentary lifestyle started consuming alcohol earlier in their life.

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PREDICTIVE VALUE OF BASIC MOTOR ABILITIES ON SUCCESS IN FOOTBALL

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Abstract

The main goal in this research is to determine the degree of correlation between the variables system for assessing basic motor skills and variables for evaluating performance in a football game. The research was conducted on a sample of 170 respondents, senior football players, members of second and third Montenegrin football league clubs, aged 18-27. The research used 16 variables for assessing motor skills as a predictor system and eight variables for evaluating performance in a football game as a criterion system. Canonical correlation analysis was applied in the the statistical procedure for determining the connection (relation) between the mentioned spaces. On the basis of the obtained results, it was established that the investigated spaces are interconnected with four pairs of canonical factors.

Key words: *criterion variables, motor skills, football players*.

Introduction

The football team acts as a specific cooperative system whose structure consists of 11 players that act as a personal communication network. The way in which this communication network operates first of all depends on whether the ball is in possession of its own team, or in possession of the rival team. In case where the team is in possession of the ball, the main channel of communication, in fact, marks the stage of the attack, which is marked by a cooperative construction. The second communication network parries the first one by disturbances and cooperative destruction, which marks the defense phase. But in the defense phase, there is an intent to conquer the ball, which can be accomplished by matching the opponent to his half, ie in the wider zone of his own defense, and by matching the opponent in the other half of the playground, ie in the narrower zone of defense, but with the intention of taking the ball and changing to the phase of attack (Špirtović, 2003). The connection between the motor skills of the footballers and success in football was the subject of research by many researchers (Gabrijelić, Jerković & Elzner, 1983; Petrić, 1984; Jerković, 1986; Bajramović, 2007; Jelešković, 2008).

Football is a sports game characterized by polystructural movements (running, ball, dribble, jumping, falls, etc.). Football is characterized by diversity and a variety of technical elements, tactics, whole-body movements, variable volume and variable pace, a lot of variability and unpredictability (Nicholas, Nuttal & Williams 2000; Wragg, Maxwell & Doust, 2000). In the very game of defeating opponent, it is necessary, besides the technique, that all the players, who are reflected in the matching of actions in the space and time with the opponent's actions and the movement of the ball, co-operate. Due to the speed at which the game takes place, its duration, the complexity of the movement in it, the conditions in which it takes place, and the active interference of the opponent in the efforts to achieve a more favorable sport result, it is necessary that the player also has a high level of motor skills (Špirtović, 1989). It is estimated that during one game 80-90% of their performance is low to moderate, while the other 10-20% is high activity intensity. (Bangsbo, 1994, 1997; O'Donoghue, 1998; Reilly & Thomas, 1976; Rienzi et al., 2000). During one game, players perform over 1000 different activities such as: moving from standstill to slow running, adding a ball, changing the direction of movement, jump etc. (Hadzić, 2004; Milanović, 2007).

A duel game in which there are pushing, collisions, falls, strikes gives a mark to modern football, and from the player specifically requires frustrating tolerance, controlled aggression, absence of anxiety, pain insensitivity, self-limitation, stress-strain, explosive strength, solid construction of locomotor apparatus , restraint in emotions, ability to concentrate, and so on. In order to create such players in the training process, trainers serve different competitive, specific and general exercises, more or less efficient (Špirtović, 2010). Given that there are differences in soccer players, regarding their position in the team, and that these differences correspond to the different tasks during the game, the training program should include the specifics of the tasks for each position in the team (Javier, 2007). Footballers, regardless of their age, have a different level of technical-tactical knowledge (Sporiš, Jukić, Ostojić & Milanović,

2009), and the level of development of basic and specific-motor skills can serve as a criterion for directing young players to a particular position in the team (Bloomfield, Polman & O'Donoghue, 2004).

The main goal of this research is to determine the degree of integration of the variables system for the assessment of basic motor skills with variables for evaluating the performance in a football game

Material and Methods

The research was carried out on a sample of 170 respondents, soccer players - senior members, members of the second and third Montenegrin football league aged 18-27. For the evaluation of motor skills, 16 motor tests were used (Kurelić et al 1975), designed to assess the latent dimensions that belong to the areas of structural regulation and energy regulation of the movement.

For estimating explosive power	*For estimating repetitive power*
standing long jump MDM	push-ups on the floor MSK
running at 20 m from a high start M20V	squats MČVT
standing high jump SVM	hull lifting in 30 seconds MD30
throwing a medicine ball from a lying position MBL	hull lifting on the Swedish bench MDTK

For estimating static power	*For estimating flexibility*
endurance in push-up position MIS	stick turn MISK
endurance in push-up position MIZ	deep pretension on a bench MDPK
endurance in half-squat position with own weight MIZP	spread of legs in a sitting position MPRS
endurance of legs on a crate MINS	lateral split MBR

Measurement of motor skills was performed in physical education halls using the circular method. When determining the sequence of tests, the criterion that the performance of tasks in one test has a minimal impact on the result in any of the following tests was applied. All measurements were carried out by a team of physical education teachers.

A system of eight variables for assessing performance in a football game was also applied.

1.	Assessment of technique performance	*s-teh*
2.	Assessment of attack phase performance	*s-nap*
3.	Assessment of defense phase performance	*s-obr*
4.	Assessment of individual creativity	*s-stv*
5.	Assessment of team responsibility	*s-odg*
6.	Assessment of engagement	*s-ang*
7.	Assessment of behavior	*s-pon*
8.	General assessment of game success	o-oce

In order to determine the effectiveness of the game, or to determine the effectiveness of the players, the usual method was used, in which competent experts give, independent of one another, subjective judgments about the performance of technical-tactical skills in the game, the level of physical preparation, engagement in attack and defense, and players' behavior in play and self-sacrifice. The judges gave grades from 1 to 5 in three preliminary matches, and five judges who were graduated trainers or qualified judges, and who played at a club for at least five years, were designated for evaluation.

In order to determine the relations and to obtain the maximum connection of the analyzed spaces, a canonical correlation analysis was applied.

Results and Discussion

The use of canonical correlation analysis in order to obtain the connection between the system of motor variables and the system of variables for evaluating the performance in a football game (Table 1) computed the parameters of canonical correlation, determination coefficients and X2 square test, as well as their statistical significance. With the Bartlett X2 test of 442.46, the statistical significance of the canonical correlation coefficient of .91 was tested. A common variance of variables from two sets was a total of .84. Four statistically significant pairs of canonical factors were obtained, of which: Can R. = .91

of the first pair, Can R. = .88 of another pair of canonical factors, Can R. = .79 of the third pair, and Can R. = .75 of the fourth pair of canonical From the results of the canonical correlation analysis of motor parameters, it is noticed that the first canonical factor is not characterized by high correlations with any of the variables for the estimation of motor abilities. The second canonical factor is predominantly defined by variables for the estimation of repetitive power: squats with own weight (MCVT) a 30-second hull (MD30) and a hull on a Swedish bench (MDTK); explosive power: long distance jumping (MDM), running 20 meters from the high start (M20V), jumping from the place; Static power: Endurance in crouching position (MIZP) and Foot Resistance (MINS) and flexibility: stick turn (MISK) and lateral split (MBR) and can be defined as a canonical dimension of power and flexibility. From the results of the canonical correlation analysis of motor parameters, it is noticed that the third canonical factor is not characterized by high correlations with any of the variables for the assessment of motor abilities. The fourth canonical factor is defined by variables for estimating explosive power: throwing a medicine ball from the lying position (MBL); static power: endurance in push-up position (MIS) and endurance in chin-up position (MIZ); for repetitive power: push-ups on the floor (MSK), and can be defined as the canonical dimension of the power of the arm and shoulder belt. By analyzing the canonical factors of the right set of variables, the first isolated canonical factor does not have a high correlation value with the criterion variables. The second canonical factor has high correlations with all variables of the performance score in the football game: the score of the game performance - the technique (S-THE) (S-ODB), performance score in the game - creativity (S-STV), performance score in the game - responsibility (S-ODG), performance assessment in the game (S-NAP) game engagement (S-ANG), performance score in the game - behavior (S-PON) and performance score in the game - general rating (S-TOT). It can be defined as the canonical general factor of success in the football game. An analysis of the canonical factor of the right set of variables shows that neither the third nor the fourth isolated canonical factors have high correlative values with the criterion variables. The first pair of canonical factors can not be meaningfully interpreted. This is most probably caused by the fact that the variability of the skill of performing situational-motor movements on this sample is a consequence of the different influence of the learning process, and much less the consequences of the relation between potential basic-motor and situational-motor abilities. The relationship between the second pair of canonical factors can be interpreted so that For the successful performance of tactical technical elements (the general factor of success in the football game) with young players is of utmost importance first of all mechanisms of energy regulation of the movement. Muscle strength is the ability to retain a larger isometric muscle contraction by keeping the body in a certain position and it depends on the number of activated motor units. From biomechanics it is known that the force of the reaction of the substrate determines the direction of acceleration in changes in the direction of movement. From this statement, there is also a relationship between force and velocity of change of direction, which characterizes most of the tests of performance evaluation in the game. In the complex motor tasks applied in this research, the most structures are necessarily activated, since tasks of this type should be resolved in as short a time period as possible, ie at the highest possible speed. The third and the fourth pair of canonical factors also can not be meaningfully interpreted. Most likely, this was sampled by the fact that the variability of situational-motor abilities in this sample is a consequence of the different influence of the learning process, and much less the consequences of the relationships of potential abilities, characteristics and properties. An analysis of the canonical factor of the right set of variables shows that neither the third nor the fourth isolated canonical factors high correlative values with criterion variables.

Tab 1. Canonic correlation analysis of motor and criteria variables

	Can R	Can %.	Hi sko	df	lambda	sig
1	0,91	0,84	442,46	144	0,00	0,00
2	0,88	0,78	319,94	120	0,00	0,00
3	0,79	0,63	219,42	98	0,03	0,00
4	0,75	0,57	153,35	78	0,09	0,00

Variables	FACTORY STRUCTURE OF MOTOR VARIABLES (LEFT GROUP)			
	KAN1	KAN2	KAN3	KAN4
MDM	0,30	-0,51	-0,42	0,12
M20V	-0,22	0,65	-0,05	0,35
MSVM	0,11	-0,50	-0,31	0,05
MBL	-0,07	-0,02	-0,30	-0,49
MSK	0,28	0,04	-0,15	-0,36
MCVT	0,26	-0,54	-0,52	0,04
MD30	0,10	-0,67	0,19	-0,22
MDTK	-0,26	-0,57	0,28	-0,02
MIS	0,07	0,12	-0,15	-0,49
MIZ	0,18	0,30	-0,15	-0,49
MIZP	0,31	-0,60	-0,45	0,11
MINS	-0,05	-0,55	-0,51	0,04
MISK	-0,18	-0,44	-0,17	-0,07
MDPK	-0,09	0,04	-0,19	0,31
MPRS	0,02	0,12	-0,07	0,17
MBR	-0,00	-0,43	0,12	-0,15

Variables	FACTORY STRUCTURE OF MOTOR VARIABLES (RIGHT GROUP)			
	KAN1	KAN2	KAN3	KAN4
S-the	0,50	-0,54	0,26	-0,48
S-nap	0,45	-0,46	0,22	-0,26
S-odb	0,29	-0,52	0,29	-0,00
S-stv	-0,41	-0,45	-0,34	-0,28
S-odg	0,16	-0,48	0,34	-0,02
S-ang	0,20	-0,86	-0,16	-0,05
S-pon	-0,46	-0,65	0,19	-0,27
S-tot	0,13	-0,31	0,09	-0,24

Conclusion

The main goal in this research was to determine the degree of correlation between the variables system for assessing basic motor skills and variables for evaluating performance in a football game. For this purpose, a set of 16 variables for the assessment of basic motor skills and a system of eight variables for evaluating performance in a football game was applied on a sample of 170 players. The canonical correlation analysis was used to determine the relation (relation) of the mentioned spaces. It was found that the investigated spaces of basic motor abilities and spaces of the criterion variables are interconnected with four pairs of canonical factors.

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STRUCTURE OF ANTHROPOMETRIC DIMENSIONS OF TABLE TENNIS PLAYERS IN THE REPUBLIC OF MACEDONIA WHO COMPETE IN THE SUPER LEAGUE AND FIRST LEAGUE

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Abstract
The research is conducted on 54 table tennis players who compete in the Super League and the First League of Macedonia during the competition season 2008/2009. 18 variables were applied in order to assess the anthropometric features, 12 of which were measured according to the International Biological Program (IBP). Due to the goals of the research (assessing asymmetry) 6 measures are also carried out according to IBP - on the opposite segments of the body. In order to determine the structure of anthropometric features, the factor analysis component is applied. From the obtained results, it can be concluded that three latent factors exist in the structure of the anthropometric features: factor of circular dimensionality of the body and subcutaneous adipose tissue, factor of longitudinal dimensionality of the body and the factor of transversal dimensionality of the body.

Keywords: *anthropometric features, factor analysis, latent factor.*

Introduction summary

Table tennis is acyclic and situational sport with poly- structural complexity of the game which requires effective implementation of mutually dependent technical and tactical elements. The performance of these elements depends on many factors including the anthropometric characteristics and situational-motor skills. Anthropometry is a biology area that deals with the measurement of the physical dimensions of the human body (Peric, 1999). Analyzing and exploring the structure of anthropometric parameters and dimensions at table tennis players along with other factors and features, can greatly contribute to the development and improvement of the table tennis play in the direction of achieving top sports scores. Therefore, as the aim of this and many other studies are the anthropometric parameters, as in the manifest, so as in the latent space.

Methods of research

In this research, the sample of respondents is comprised of 54 active table tennis players (male) who with their teams compete in the Super League and First league in the Republic of Macedonia during the competition season 2008 / 09. The respondents are members of the teams: TTC Rabotnicki, TTC Vlae-Farmahem, TTC Vardar, TTC Floraskop and TTC Gorce Petrov from Skopje, TTC Kriva Palanka and TTC Kriva Palanka 2007 from Kriva Palanka, TTC Bregalnica and TTC Filip Vtori from Shtip, TTC Strumica from Strumica, TTC Mladost and TTC Mladost 96 from Prilep and TTC Ohrid from Ohrid. Age is defined as chronological age with the age range from 17 to 37 years. The age range in this study is determined by the actual state of active competitors in our country.

For the needs of this research, 18 variables were applied in order to assess the anthropometric features, 12 of which were measured according to the International Biological Program (IBP). Due to the goals of the research (assessing asymmetry) 6 measurements are also carried out according to IBP - on the opposite segments of the body. In order to assess the body mass, the body weight variable is applied (ATTEZH), for the assessment of longitudinal dimensionality, the following variables were applied: the variables of body height (ATVIS), length of the left hand (ADLRK) and length of the right hand (ADDRA), in order to assess the body voluminosity, variables are applied to assess the chest size (AOGRK), size of the left upper arm (AONLR), size of right upper arm (AONDR), size of the left upper leg (AOLNK) and size of the right upper leg (AODNK), in order to assess the transversal dimensionality- width of shoulders (ASHRAM) hip width (ASHKOL), width of the wrist of the left hand (ASHZLSH) and width of the wrist of the right hand (ASHZDSH) and in order to conduct an assessment of subcutaneous adipose tissue, the following variables were applied: skin fold on left upper arm (AKNLN), skin fold on the right upper arm

(AKNDN), skin fold on left side of the back (AKNGL), skin fold on the right side of the back (AKNGD) and skin fold on the belly (AKNME).

Measurements were carried out in January and February 2009, during the break between fall and spring competition season of 2008/09. All the respondents were measured by a qualified and experienced researcher. During the measuring, the respondents were barefoot, wearing only sports underwear.

For the needs of this research, basic descriptive analysis was applied, whereas the correlation among all the applied anthropometric variables is determined with matrix of inter-correlation. The factorization of the inter-correlation matrixes of the anthropometric variables is conducted by using Hoteling's method of the main components. The number of the significant main components whose values of the characteristic roots (lambda) possess values which are equal or larger than 1.00 is determined by using the Kaiser-Guttman criteria. The transformation into orthogonal factors is determined by applying the normal-varimax method.

Results (analysis and discussion)

From the inter-correlation matrix of anthropometric indicators in Table 1, it can be noticed that all the obtained values of the coefficient of correlation of anthropometric space have positive pre- sign and show different values – most of which are statistically significant in different levels. In a sample of 54 respondents each correlation bigger than 0:27 was considered statistically significant at the $p < 0.05$ level (Mužiç, 1968)

By observing the inter-correlation coefficients between the variables that define the longitudinal dimensionality of the body (ATVIS, ADLRA and ADDRA), it can be noticed that they have very high correlation (from .79 to .91).

Among the variables that define the circular dimensionality of the body (AOGRK, AONLR, AONDR, AOLNK, AODNK and ATTEZH) the inter correlation coefficients also belong to the zone of high and very high correlation (from .81 to .98). These variables also have good correlation connections with the remaining variables shown in Table 1, i.e. variables that define transversal dimensionality of the body and with the variables defining the subcutaneous adipose tissue.

Table 1. Correlation between the anthropometric measures

	ATTEŽH	ATVIS	ADLRA	ADDRA	AOGRK	AONLR	AONDR	AOLNK	AODNK	ASHRAM	ASHKOL	ASHZLS	ASHZDS	AKNLN	AKNDN	AKNGL	AKNGD	AKNME
ATTEZH	1,00																	
ATVIS	0,43	1,00																
ALDRA	0,21	0,79	1,00															
ADDRA	0,20	0,79	0,91	1,00														
AOGRK	0,90	0,39	0,20	0,22	1,00													
AONLR	0,85	0,17	0,00	-0,02	0,83	1,00												
AONDR	0,88	0,21	-0,03	0,01	0,86	0,96	1,00											
AOLNK	0,91	0,22	-0,02	-0,02	0,81	0,88	0,90	1,00										
AODNK	0,89	0,20	-0,05	-0,04	0,81	0,88	0,91	0,98	1,00									
ASHRAM	0,56	0,45	0,25	0,22	0,63	0,60	0,59	0,45	0,47	1,00								
ASHKOL	0,72	0,35	0,17	0,17	0,70	0,62	0,64	0,64	0,60	0,49	1,00							
ASHZLS	0,46	0,35	0,35	0,27	0,43	0,42	0,38	0,38	0,36	0,26	0,46	1,00						
ASHZDS	0,62	0,44	0,39	0,36	0,59	0,51	0,51	0,51	0,48	0,31	0,56	0,91	1,00					
AKNLN	0,80	0,13	-0,08	-0,04	0,64	0,77	0,79	0,81	0,80	0,41	0,58	0,18	0,31	1,00				
AKNDN	0,83	0,13	-0,08	-0,07	0,66	0,74	0,76	0,84	0,83	0,33	0,57	0,26	0,38	0,94	1,00			
AKNGL	0,85	0,14	-0,01	0,00	0,78	0,79	0,81	0,82	0,78	0,46	0,70	0,41	0,52	0,82	0,80	1,00		
AKNGD	0,85	0,14	-0,03	-0,02	0,77	0,78	0,81	0,81	0,77	0,50	0,72	0,41	0,51	0,81	0,78	0,99	1,00	
AKNME	0,77	0,24	0,10	0,10	0,71	0,66	0,67	0,68	0,65	0,38	0,56	0,30	0,43	0,71	0,71	0,83	0,83	1,00

In the above sown inter- correlations, only three results show low correlation, 23 results have moderately average correlation (from .40 to .70), while the remaining 14 results reflect high inter-correlation (from .70 - .90). Among the variables that define transversal dimensionality of the body (ASHRAM, ASHKOL, ASHZLS and ASHZDS), there is only one result with a very high correlation between variables and ASHZLS ASHZDS with the value of .91, while the remaining results from the Table have correlation values of low and moderately average level.

In terms of the displayed variables to assess the subcutaneous adipose tissue (AKNLN, AKNDN, AKNGL, AKNGD and AKNME), it can be noticed that inter- correlation links between these variables are on a high and very high level (from .71 to. 99). These variables have high positive correlation with the body weight (from .77 to .85).

During the analysis of Table 2, which according to Hotteling's method shows a factor matrix of variables for assessment of the anthropometric area (facmat), communalities (h2), the significant characteristic roots (lambda), the percentage of total explained variance (targ %), cumulative lambda and cumulative percentages, it is noticed that from the applied system of 18 anthropometric variables, 3 significant principal components were isolated, which explain the percentage of the total variance with 82.96% (targ%)

Table 2. Un-rotated matrix of Hotteling's procedure for anthropometry

	H1	H2	H3	h^2
ATTEZH	0,97	-0,07	-0,07	0,94
ATVIS	0,35	-0,82	-0,27	0,87
ADLRA	0,14	-0,92	-0,17	0,9
ADDRA	0,14	-0,9	-0,24	0,88
AOGRK	0,9	-0,11	-0,06	0,83
AONLR	0,91	0,14	0	0,85
AONDR	0,93	0,15	-0,04	0,88
AOLNK	0,93	0,17	-0,01	0,89
AODNK	0,91	0,19	-0,03	0,86
ASHRAM	0,6	-0,22	-0,3	0,5
ASHKOL	0,77	-0,13	0,09	0,62
ASHZLS	0,51	-0,43	0,71	0,94
ASHZDS	0,64	-0,45	0,58	0,95
AKNLN	0,84	0,28	-0,22	0,84
AKNDN	0,84	0,28	-0,1	0,8
AKNGL	0,91	0,17	0,05	0,86
AKNGD	0,91	0,17	0,04	0,86
AKNME	0,8	0,06	-0,09	0,66
Lambda	10,63	3,12	1,18	
%	59,06	17,35	6,55	
Cum Lambda	10,63	13,75	14,93	
Targ %	59,06	76,41	82,96	

Of all the major components, the most partial participation has the first one, due to the total variability, it explains 59.06% with significant characteristic root lambda = 10.63. The second component participates in the explanation with 17:35% and lambda = 3.12. The third component has the smallest share in explaining the variance with 6.55% and characteristic root lambda = 1.18.

From the obtained results, the un-rotated factor matrix shows that the first main component H1, represents a general morphological factor to which 13 variables have mostly contributed, with saturation ranging from .60 to .97, i.e. the variables ATTEZH, AONDR, AOLNK, AONLR, AKNGL, AKNGD,

AODNK, AOGRK, AKNLN, AKNDN, AKMNE, ASHKOL and ASHRAM. In defining the second component, we have three variables (ATVIS, ADDRA and ADLRA) with high saturation (. -82, - .90 and -.92). In the third component, only two variables have high saturation (ASHZDS with .58 and .71 with ASHZLS). The remaining variables from the second and third components have relatively low saturation.

After the orthogonal varimax rotation of the initial coordination system on eighteen anthropometric variables (Table 3), in order to get a simpler structure of the latent space (factors), three factors are also received.

On the first factor (V1), the following variables have significant projections: ATTEZH (.91), AOGRK (.84), AONLR (.89), AONDR (.92), AONLK (.92), AODNK (.91), AKNLK (.91) AKNDN (.89) AKNGL (.89) and AKNME (.79). From the structure of the highly saturated variables, this factor can be defined a factor of circular dimensionality of the body and the factor of subcutaneous adipose tissue. On the second factor (V2), significant projections were kept by the variables for assessing the longitudinality of the skeleton (ATVIS, ADLRA and ADDRA), with saturations: .90, .92 and .93. which is also defined as a factor of longitudinal skeleton dimensionality.

On the third factor (V3), the tests for assessment of transversal dimensionality of the body (ASHZLS and ASHZDS) show high saturations of .93 and .86. and the ASHKOL variable shows the saturations of .35. The variable ASHKOL even though projected higher saturation in the first factor .67, due to the logicality- because it belongs to the package for assessment of the transversal dimensionality remains present in defining the third factor, and together with variables ASHZLS and ASHZDS define the factor of transversal dimensionality of the skeleton

Table 3. Varimax procedure for anthropometry

	V1	V2	V3
ATTEZH	0,91	0,24	0,25
ATVIS	0,18	0,9	0,13
ALDRA	-0,08	0,92	0,2
ADDRA	-0,05	0,93	0,12
AOGRK	0,84	0,27	0,24
AONLR	0,89	0,02	0,22
AONDR	0,92	0,03	0,18
AOLNK	0,92	0	0,2
AODNK	0,91	-0,01	0,17
ASHRAM	0,57	0,42	-0,02
ASHKOL	0,43	0,21	0,38
ASHZLS	0,22	0,2	0,93
ASHZDS	0,37	0,28	0,86
AKNLN	0,91	-0,04	-0,04
AKNDN	0,89	-0,07	0,06
AKNGL	0,89	-0,02	0,25
AKNGD	0,89	-0,03	0,25
AKNME	0,79	0,11	0,13
Lambda	9,7	3,03	2,21
%	53,89	16,81	12,26
Cum lambda	9,7	12,73	14,94
Targ %	53,89	70,7	82,96

Among the largest participants which explain the anthropometric space are the variables ASHZDS space with communality (0.95) and variables ATTEZH and ASHZLS with communality from (0.94). Among

other variables, their projections of communalities range between (0.80 and 0.90), while the lowest communalities are observed in variables of anthropometric parameters ASHKOL and AKMNE with communalities of 0.50, 0.62 and 0.66.

Conclusions

From the obtained values of the correlation coefficient of the anthropometric space, they have positive pre-sign and show different values which in significant number are statistically important on different level. Inter-correlation of variables that define the longitudinal dimensionality, Inter-correlation of variables that define circular dimensionality and the variables that define the subcutaneous adipose tissue, fit within the zone of high and very high correlation (from .71 to .99). All variables for assessment of subcutaneous adipose tissue have high and positive connections.

In latent anthropometric space in the table tennis players, three dimensions are present. They are defined as: factor of circular dimensionality of the body and subcutaneous adipose tissue, factor of longitudinal dimensionality of the body and the factor of transversal dimensionality of the body.

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STRUCTURE OF BIOMOTOR ABILITIES OF TABLE TENNIS PLAYERS IN THE REPUBLIC OF MACEDONIA WHO COMPETE IN THE SUPER LEAGUE AND FIRST LEAGUE

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Abstract

The research is conducted on 54 table tennis players who compete in the Super League and the First League of Macedonia during the competition season 2008/2009. 12 biomotor variables were applied, 4 of which (MPT30, MSKDM, MDPKL, MTLRA) were measured following the recommendations of Kurelič, Momirovič, Stojanovič, Šturm, Radojevič, Viskič-Štalec (1975). Due to the research objective (determining asymmetry) MTDRA variable is measured by the same methodology as MTLRA while variables: MPONA, MCHEST, MONLS and MONDS are measured according to the recommendations of Metikoš, Prot, Hoffman, Pintar, Oreb (1989). Variables MDLRA and MDDRA are measured using mechanical dynamometer type "Tideman" with accuracy of 1.14 kg.In order to determine the structure of the biomotor abilities, the factor analysis component is applied. From the results analysis, in the latent biomotor space, three latent factors are obtained: factor of coordination, i.e. the factor responsible for rapid assessment of the method and direction of movement, speed of movement in an unusual way, a quick change of direction of movement, simultaneously responsible for the efficiency of the explosive strength of leg muscles as well as the flexibility of the body. The second factor is defined as a factor of strength of the muscles on the left and right hand and the repetitive strength of the belly muscles, while the third factor is defined as the speed factor, incorporating the speed of frequency movements of the hands and legs.

Keywords: *biomotor abilities, factor analysis, latent factors*

Introduction

Table tennis is a sport that is played individually and in pairs, and belongs to the group of poly-structural sports with variable structure where automation of movements reaches up to 40%. The game itself and the activity of the players is determined by: the space of the game, the speed of flight of the ball, speed of the strokes movement and the required response time. The game development, in parallel with the equipment development, have contributed to the present situation in the contemporary table tennis where the players exchange strokes where the ball reaches the speed of 140 km / h, while the speed of the hand paddle is about 60/70 km / h, while during the impact/ hit with rotation (spin) - the ball spins around its axis 170 times per second, or more than 10000 turns per minute.

During the hit/ impact, the ball is kept in the paddle only 1/1000 second, and the distance spend together is from 0.2 to 1 cm. When all this adds to the energy requirements, particularly where maximum aerobic capacity is important, undoubtedly table tennis is placed in the category of difficult sports with complex structure. The success of the game depends on many factors, including the biomotor abilities. Analyzing and exploring the structure of biomotor abilities and dimensions at table tennis players along with other factors and features, can greatly contribute to the development and improvement of the table tennis play in the direction of achieving top sports scores. Therefore, as the aim of this and many other studies are the biomotor abilities, as in the manifest, so as in the latent space.

Methods of research

In this research, the sample of respondents is comprised of 54 active table tennis players (male) who with their teams compete in the Super League and First league in the Republic of Macedonia during the competition season 2008 / 09 The respondents are members of teams: TTC Rabotnicki, TTC Vlae-Farmahem, TTC Vardar, TTC Floraskop and TTC Gorce Petrov from Skopje, TTC Kriva Palanka and TTC Kriva Palanka 2007 from Kriva Palanka, TTC Bregalnica and TTC Filip Vtori from Shtip, TTC Strumica from Strumica, TTC Mladost and TTC Mladost 96 from Prilep and TTC Ohrid from Ohrid. Age is defined as chronological age with the age range from 17 to 37 years.

The age range in this study is determined by the actual state of active competitors in our country. 12 biomotor variables were applied, 4 of which (MPT30, MSKDM, MDPKL, MTLRA) were measured following the recommendations of Kurelič, Momirovič, Stojanovič, Šturm, Radojevič, Viskič- Štalec (1975). Due to the research objective (determining asymmetry) MTDRA variable is measured by the same methodology as MTLRA while variables: MPONA, MCHEST, MONLS and MONDS are measured according to the recommendations of Metikoš, Prot, Hoffman, Pintar, Oreb (1989). Variables MDLRA and MDDRA are measured using mechanical dynamometer type Tideman with accuracy of 1.14 kg.

Measurements were carried out in January and February 2009, during the break between fall and spring competition season of 2008/09, in the sports halls where the clubs train. They are realized in one day per table tennis club, with pre-determined program that was identical for all clubs where the order of realization of biomotor tests is set according to their weight and complexity, and in order to neutralize the tiredness of the respondents. All members of the team that performed the measurements are graduated professors of Physical Education, who were previously guided and trained regarding the methodology of measuring necessary for the bimotor test as well as the evaluation and marking of the results. The same test for all respondents was measured by the same examiner.

For the needs of this research, basic descriptive analysis was applied, whereas the correlation among all the applied biomotor variables is determined with matrix of inter-correlation. The factorization of the inter-correlation matrixes of the bimotor variables is conducted by using Hoteling's method of the main component. The number of the significant main components whose values of the characteristic roots (lambda) possess values which are equal or larger than 1.00 is determined by using the Kaiser- Guttman criteria. The transformation into orthogonal factors is determined by applying the normal- varimax method.

Results (analysis and discussion)

The obtained results from the inter-correlation of the biomotor variables, shown in table 1 indicate that from all the obtained coefficients of correlation, 32 results demonstrate the statistical significance on various levels and with various prefixes. The variables for assessment of the repetitive force of the belly muscles (MPT30), assessment of the speed of movement in an unusual way- coordination (MPONA), assessment of the direction and method of movement- coordination (MONDS), assessment of the speed of movement of direction change- coordination (MCEST) and the test for assessment of the speed of frequency movement of the left hand (MTLRA) are characterized with the largest number (with 7) significant statistical correlation connections on the level of R< 0.05 with various prefix. The variable for rapid assessment of the method and direction of movement- coordination (MONLS) has six significant statistical correlation connections on the level R< 0 .05 .

Table 1. Correlation between the bimotor tests

	MPT30	MCKDM	MDPRA	MDDPA	MPONA	MONLS	MONDS	MCEST	MTLRA	MTDRA	MTNO3	MDPKL
MTP30	1,00											
MCKDM	0,25	1,00										
MDLRA	-0,41	-0,03	1,00									
MDDRA	-0,41	-0,01	0,76	1,00								
MPONA	-0,61	-0,39	0,17	0,39	1,00							
MONLS	-0,45	-0,47	0,28	0,35	0,71	1,00						
MONDS	-0,49	-0,36	0,30	0,44	0,72	0,92	1,00					
MCEST	-0,27	-0,31	0,21	0,25	0,53	0,73	0,73	1,00				
MTLRA	0,15	0,24	0,14	-0,11	-0,27	-0,24	-0,30	-0,26	1,00			
MTDRA	0,21	0,19	0,08	0,10	-0,12	-0,08	-0,05	-0,28	0,57	1,00		
MTNO3	0,56	0,23	-0,26	-0,22	-0,37	-0,38	-0,42	-0,32	0,34	0,27	1,00	
MDPKL	0,01	0,22	0,11	0,00	-0,19	-0,26	-0,21	-0,12	0,21	0,18	0,23	1,00

The variables for estimation of the explosive strength of leg muscles (MSKDM) and the variable to assess the strength of the muscles of the right palm (MDDRA) show four results that are on a significant statistical level (from 31 to 47). With three results above the limit of statistical significance are the variables MDLRA MTDRA (from 27 to 76). The variable for assessing the flexibility of the corpus-MDPKL, there are no results above the limit of statistical significance (from 00 to 23). In the zone of very high correlation is the result of 92 derived between the variables for estimating the speed of change of the direction of movement present in the right and left side (MONDS and MONLS).

When analyzing Table 2, which according to the Hotelling method shows a factor matrix of variables to estimate the biomotor space (facmat), communalities (h2), the significant characteristic roots (lambda) and the percentage of total explained variance (targ%), it is noted that the applied system of 12 variables has formed three significant main components which explain the total variance percentage by 65.71%.

Table 2. Un-rotated matrix – Hotelling's procedure for biomotor tests

	H1	H2	H3	h^2
MTP30	0,69	-0,20	0,34	0,62
MSKDM	0,50	0,32	-0,26	0,42
MDLRA	-0,43	0,71	-0,31	0,79
MDDRA	-0,54	0,62	-0,26	0,74
MPONA	-0,81	0,00	0,17	0,69
MONLS	-0,88	0,00	0,37	0,91
MONDS	-0,89	0,06	0,28	0,88
MCEST	-0,74	-0,11	0,25	0,62
MTLRA	0,42	0,58	0,38	0,66
MTDRA	0,28	0,62	0,53	0,75
MTNO3	0,61	0,11	0,41	0,56
MDPKL	0,27	0,42	-0,13	0,27
Lambda	4,66	1,96	1,26	
%	38,86	16,32	10,53	
Cum Lambda	4,66	6,62	7,89	
Cum%	38,86	55,18	65,71	

Of all the major components, most partial participation is present at the first because of the total variability, it explains 38.86% with significant characteristic root lambda = 4.66. The second component in the explanation accounts for 16.32% and lambda = 1.96. Smallest share in explaining the variance has a third component with 10:56% and lambda = 1.26, and such value is close to the zone of acceptance.

From the un-rotated factor matrix of the analyzed biomotor space, it is found that the first main component is a general biomotor factor, where of the 12 applied variables, 10 variables participate in its formation, with saturation ranging from 42 to 88, but with a different prefix, with the exception of the variables MTDRA and MDPKL which have higher projections in the second factor. The MTLRA variable is complex factor due to the higher saturation in the other two components.

Upon the orthogonal varimax rotation of the initial coordinative system of the twelve biomotor variables (Table 3), for the purpose of reaching a simpler structure in the latent space (factors), three factors are also obtained. At the first factor (**V1)**, the variables with high saturations are: MONLS (- 92), MONDS (-87), MCEST (- 75), MPONA (-75) and MCKDM (60). Starting from the structure of the variables which participate in its formation with their projections, the same is defined as the coordination factor, i.e. the factor responsible for rapid assessment of the method and direction of movement, speed of movement in unusual way, rapid change of the movement direction, at the same time responsible for the efficiency of the explosive force of the leg muscles so as the flexibility of the body.

On the second factor (**V2)** the following variables maintained significant projections: MDLRA (88), MDDRA (84) and MPT30 (-64). Based on the variables which participate with higher projections during the formation of this factor, the same is defined as the factor of strength of the left and right palm muscles and the repetitive strength of the belly muscles.

Table 3. Rotated varimax procedure for biomotor tests

	V1	V2	V3
MPT30	0,33	-0,64	0,32
MSKDM	0,6	0,11	0,21
MDLRA	-0,04	0,88	0,12
MDDRA	-0,18	0,84	0,06
MPONA	-0,75	0,32	-0,15
MONLS	-0,92	0,26	-0,04
MONDS	-0,87	0,35	-0,07
MCEST	-0,75	0,17	-0,15
MTLRA	0,22	0,03	0,78
MTDRA	0,03	0,06	0,86
MTNO3	0,28	-0,42	0,55
MDPKL	0,37	0,23	0,28
Lambda	3,48	2,46	1,95
%	28,99	20,46	16,26
Cum Lambda	3,48	5,94	7,89
Cum %	28,99	49,45	65,71

On the third factor (**V3**) three variables maintained high projections: MTDRA (86), MTLRA (78) and MTNO3 (55). Starting from the structure of variables from which it is formed, it is defined as the factor of speed, including the speed of frequent movements of the hands and legs. The greater participants in the definition of the biomotor space are the variables MONLS and MONDS with a communality of 0.91 and 0.88, respectivelly. At the other variables, the projections of their communalities range from 0.62 to 0.79 and the variables with the lowest communalities are: MDPKL, MSKDM, MTN03 with communalities of 0.27, 0.42 and 0.56.

Conclusion

In this research in the latent biomotor space, three latent dimensions are obtained. The first factor (V1) is defined as the coordination factor, i.e. the factor responsible for the rapid assessment of the method and direction of movement, speed of movement in unusual way, rapid change of the movement direction, at the same time responsible for the efficiency of the explosive force of the leg muscles as well as the flexibility of the body. The second factor (V2) is defined as the factor of strength of the left and right palm muscles and the repetitive strength of the belly muscles. The third factor (V3) is defined as the factor of speed, including the speed of frequent movements of the hands and legs.

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APPLICATION OF DYNAMIC MODEL RUNNING 3000 METERS IN A POLICE SPECIAL UNIT IN MACEDONIA

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Abstract

In a sample of 160 respondents, population special forces, divided into two sub samples 80 respondents made a study of motor abilities as part of the program structure to carry out the unit. In this research procedure were isolated one motor variables – running at 3000m. which checks the endurance. In the research procedure was used descriptive method, classification of frequencies of the motor performance and determining the impact of the criterion on prognostic variables.From the results of descriptive statistics, we can conclude that the first sub sample is better or possess improved motor skills, unlike the second sub sample who were randomly divided into two groups of 80 subjects.The results of the analysis in both regressive sub sample show statistical significance, that motor variables as significant prognostic influence criteria variable, which tells us that the points scale better evaluates the results and is a good representative as a criteria for achieved results.As a general conclusion of the survey respondents in both subexamples we can conclude that most of the officers are in good physical preparation.

Key words: *motor skills, running at 3000m., variables, analysis, regression*

Introduction

There are several special police units in the Republic of Macedonia trained to perform various tasks such as preventing and fighting terrorist organizations, kidnapped people and their release from various vehicles, buildings and houses, arrests of criminals and severe killers. These units are also used in helping people in different disasters, such as: earthquakes, floods and other natural disasters.

The country has a particular care concern for these units, and in particular for their trainings, food, weapons and clothing, and it is spent a huge amount of money so their work has a positive effect in the end. The units must be ready at all times, independently in what time and space, they should act instantly. There is a special program for their fitness, so it enables them to possess strength, speed, stamina, coordination and other motor skills.

These units have special checks/tests twice a year to determine their preparedness. For this purpose, four motor skills are used – push-ups on the ground, pull-ups on the shaft, abdominal muscles and running at 3000 m. Despite these motor skills, the police train in an area with various obstacles, swim, dive, alpine climbing and other sports trainings.

The subject of research is the motor capability running in 3000 meters and its change under the influence of dynamic simulator model of the entities of different ages.

The aim of the research is to determine the results of measurement in running the 3000 meters and the effect of the applied dynamic training process.

Methods

The sample of entities show representative deliberate sample, and is grouped due to its institutional and organizational reason, and they are distinguished according to age limits for which special criteria exist. The entities are 160 in total number and divided into two subsamples of 80 respondents.

For the realization of the study and the purpose of the survey it is analyzed a variable of 3000 meters to assess the motor skills of participants and a variable to assess the motor skills of each individual. The scores represent the criterion of achievement in running of 3000 meters. In order to assess the results of each subject it has been prepared a scoring scale with standards.

Table 1. Scale scoring of the achieved results

scores	3000 meters (minutes)
0	19.10 and >
2	19.09 – 18.21
4	18.20 – 17.41
6	17.40 – 17.00
8	16.59 – 16.30
10	16.29 – 16.01
12	16.00 – 15.41
14	15.40 – 15.01
16	15.00 – 14.31
18	14.30 – 14. 01
20	14.00 and <

Microcycle of fifteen-day training is conceived to allow the respondents to provide development of such motor skills by using various motor components such as strength, speed and stamina but our interest in this research paper, specifically, is the stamina in running 3000 meters.

In this paper, it will not be presented the volume of fifteen-day training, but it contains some basic exercises with different dosing and burden in various running distances by applying interval training and fartlek training.

In the research process, in order to achieve the set goal, the descriptive statistics indicators have been calculated. The grouping of the results for the variable running in 3000 meters in total sample and for each subsample are separately presented in the appropriate tables of frequencies. The differences between arithmetic means of variable of 3000 meters in initial and final measurement are determined by applying the student's T - test. f.

The impact of the variable running 3000 meters on criterion variable is determined by using the linear regression analysis. Thus, the partial regression coefficient (BETA) is calculated, coefficient of multiple correlation (RO), coefficient of determination (Δ), and for the truth value of multiple correlation it is calculated the F – test and its significance level (Q (F) with corresponding free degree. The univariant and multivariant differences between the groups in the initial and final measurement are determined by using univariant analysis of the variance (ANOVA) and multivariant analysis of the variance (MANOVA).

Results and discussion

Table 2. Descriptive statistical indicators

Variables	N	Mean	Minimum	Maximum	Rank	Stand.d.	KV%
Run.3000м	160	15.10319	10.50000	21.9000	11.40	1.57981	10.39
Scores	160	62.36250	42.00000	80.0000	38.00	10.03860	16.08

From the descriptive details of the differences in the results of running 3000 meters, from the best result of 10.50 to the weakest result 21.9 min. and the average result of 15.10 min. could be concluded that this motor activity is far more difficult for the respondents. Most of them are around or above median value, since the standard deviation does not show great deviation from the arithmetical median in which the coefficient of variability indicates it and that the standard deviation of only 10.39 % varies around arithmetical median.

The grouping of the results around the arithmetical median is 39 respondents, or a total 24.37% of the total number of entities. 38 respondents or 23.75% achieved times for 1 minute better than from the arithmetical median and 27 respondents or 16.87% achieved results for a minute weaker than the arithmetical median. The respondents with very poor results of 30 or 18.5% need a lot more attention to devote to stamina.

Table 3. The frequency of the results in the initial measurement

		Cumulative		Cumulative
Times	Count	Count	Percent	Percent
10.5000<=x<11.5000	2	2	1.25000	1.2500
11.5000<=x<12.5000	7	9	4.37500	5.6250
12.5000<=x<13.5000	17	26	10.62500	16.2500
13.5000<=x<14.5000	38	64	23.75000	40.0000
14.5000<=x<15.5000	39	103	24.37500	64.3750
15.5000<=x<16.5000	27	130	16.87500	81.2500
16.5000<=x<17.5000	20	150	12.50000	93.7500
17.5000<=x<18.5000	7	157	4.37500	98.1250
18.5000<=x<19.5000	2	159	1.25000	99.3750
21.5000<=x<22.5000	1	160	.62500	100.0000
Missing	0	160	0.00000	100.0000

Table 4. The frequency of the results from the initial measurement

		Cumulative		Cumulative
Times	Count	Count	Percent	Percent
10.5000<=x<11.5000	2	2	1.25000	1.2500
11.5000<=x<12.5000	7	9	4.37500	5.6250
12.5000<=x<13.5000	17	26	10.62500	16.2500
13.5000<=x<14.5000	38	64	23.75000	40.0000
14.5000<=x<15.5000	39	103	24.37500	64.3750
15.5000<=x<16.5000	27	130	16.87500	81.2500
16.5000<=x<17.5000	20	150	12.50000	93.7500
17.5000<=x<18.5000	7	157	4.37500	98.1250
18.5000<=x<19.5000	2	159	1.25000	99.3750
21.5000<=x<22.5000	1	160	.62500	100.0000
Missing	0	160	0.00000	100.0000

The frequencies of the variable scores in 28 respondents or 17.5% achieved results as arithmetical median. In 50 respondents or 12.18% have scores below the arithmetical median. Unsatisfactory results achieved 12 respondents or 7.5%.

Table 5. Regression analysis of the variable scores in the variable running 3000 meters

		St.Err		St.Err		
	BETA	OF.BETA	B	OF. B	T (155)	P – level
Intercpt			63.83339	6.541923	9.75759	.00000
Run.3000м	-.386542	,047555	-2.45620	.302178	-8.12833	.00000

PO=.87 Δ = .75 F = (4.155) = 117.92 Q (F) < .0000

Regressive analysis of the variable running 3000 meters affects the criterion score statistically significant partial negative impact. Negatively is the significant partial impact because most of the great number of weaker results in running 3000 meters.

Table 6. Descriptive data for variable running 3000 meters in the final measurement

Variables	N	Mean	Minimum	Maximum	Rank	Std.Dev.	KV%
Rur.3000м	160	.14.48056	10.31000	18.48000	8.17000	1.288266	8.908
Scores	160	66.10000	42.00000	80.0000	38.0000	8.84187	13.373

The standard deviation in the variable running 3000 meters is 1.29, minimum result is 10.3 minutes, maximum result is 18.48 minutes, rank 8.17 minutes. This brings us to conclusion that some respondents

who achieve closer results to maximum should work on improving stamina. The coefficient of variability CV = 8.91 indicates a relatively low value in the varying percentage of the value of standard deviation compared to the arithmetical median.

Variable scores show arithmetic median X = 66.10 with standard deviation SD = 8.84, the minimum number of scores 42, and maximum 80, and coefficient of variability CV =13.37. Th e difference between the minimum and maximum result in running 3000 meters is great which shows that a good part of the participants estimate poor results. It is because of age differences for defining the differences and scoring.

Table 7. The frequency of the results from variable running 3000 meters in the final measurement

		Cumulative		Cumulative
Frequencies	Count	Count	Percent	Percent
10.3100<=x<11.3100	1	1	.62.500	.62500
11.3100<=x<12.3100	6	7	3.75000	4.3750
12.3100<=x<13.3100	21	28	13.12500	17.5000
13.3100<=x<14.3100	42	70	26.25000	43.7500
14.3100<=x<15.3100	54	124	33.75000	77.5000
15.3100<=x<16.3100	22	146	13.75000	91.2500
16.3100<=x<17.3100	8	154	5.00000	96.2500
17.3100<=x<18.3100	5	159	3.12500	99,3750
18.3100<=x<19.3100	1	160	.62500	100.0000
Missing	0	160	0.00000	100.0000

The median value of frequencies in running 3000 meters is X =14.48 minutes and the majority of respondents 54 are grouped around the arithmetical median, in percentage 33.75%. 42 respondents or 26.25% achieved results for a minute better than the median value. 22 respondents or 13.75% achieved results for a minute weaker than the arithmetical median. Very poor results below arithmetical median achieved 14 respondents -8.74%.

Table 8. The frequencies of the results from the variable scores

		Cumulative		
	Count	Count	Percent	Percent
42.0000<=x<45.0000	1	1	.62500	.6250
45.0000<=x<48.0000	0	1	0.00000	.6250
48.0000<=x<51.0000	3	4	1.87500	2.5000
51.0000<=x<54.0000	4	8	2.50000	5.0000
54.0000<=x<57.0000	17	25	10.62.500	15.6250
57.0000<=x<60.0000	15	40	9.37500	25.0000
60.0000<=x<63.0000	28	68	17.50000	42.5000
63.0000<=x<66.0000	10	78	6.25000	48,7500
66.0000<=x<69.0000	17	95	10.62500	59.3750
69.0000<=x<72.0000	11	106	6.87500	66.2500
72.0000<=x<75.0000	20	126	12.50000	78.7500
75.0000<=x<78.0000	10	136	6.25000	85.0000
78.0000<=x<81.0000	24	160	15.00000	100.0000
Missing	0	160	0.00000	100.0000

Table 9. Regressive analysis of the variable scores in the variable running 3000 meters

		St.Err.		St. Err.		
	BETA	OF. BETA	B	OF. BETA	T(1550)	P – level
Itercpt.			72.40551	7.570219	9.56452	.000000
Run.3000м	-.370343	.55252	-2.54180	-.379217	-6.70276	.000050

RO = .87 Δ = .67 F(4.155)=79.029 Q(F)<0.0000

From the above table, it can be noted that 28 respondents (16.87%) achieved identical results to arithmetical median. Weaker figures of 68 respondents (41%) are below the arithmetical median. 65 respondents (40.25%) have better results than the median value from which they receive higher scores.

By analyzing the above table, it shows partial negative significant effect of the variable running at 3000 meters on the criterion score.

Conclusion

By analyzing the tables in which results of the respondents are shown in the initial and final measurement of achieved times in a test run of 3000 meters, it can be concluded that the initial measurement determines results that most respondents achieved ranged from 12.5 min. to 17.5 min. From 12.5 to 13.5 minutes run 21 respondents, 13.5 min. to 14.5 min. run 38 respondents, 14.5 min. to 15.5 min. run 39 respondents, from 15.5 min. to 16.5 min. run 27 respondents, and 16.5 min. to 17.5 min. run 20 respondents or in total 141 respondents are in the range of results. Better results with a time of 10.5 to 12.5 minutes achieved 9 respondents, a very poor result in running the 3000 meters in the span of 17.5 min to 22.5 min. reached 10 respondents.

In the final measure before which respondents were subjected to proper training, it is evident that in the span results of 12.3 minutes to 16.3 minutes there are 139 respondents. With better results in running 3000 meters with a range of delivery times of 10.3 minutes to 12.3 minutes 7 respondents, while weaker times in a span of 16.3 min. to 19.3 min. 14 respondents.

Comparing the two tables – from the initial and final measurement, it is evident that the results are much better in the final measurement, which means that the application of training before the final measure has a significant contribution to achieving qualitative times in running 3000 meters which is used as test for special units of the Interior Ministry of the Republic of Macedonia. Moreover, according to the achieved times in running 3000 meters as predictors applied on the criterion points, it has been done a regressive analysis based on which the results of running 3000 meters have a significant impact on the balance of respondents which valorizes the them.

Those who have achieved lower results/times are able to go back to the additional test running 3000 meters because the failure of four motor test variables have an impact in terms of job retention. Perhaps, it should be considered certain tolerance in subjects with lower results/times because the stamina as psychomotor ability has innate properties. From the physiological point of view, with an appropriate training, the respondents with weaker abilities can improve their values. It is good that in the unit of 160 respondents in the final measurement, only 14 respondents achieved lower results.

It can be concluded that in the physical training program, elements for the development of stamina are well implemented in the daily training of the police officers which raises their skills to a higher level and which, they will effectively carry out the assigned tasks.

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MOTOR DEVELOPMENT OF CHILDREN IN EARLY ADOLESCENCE PHASE

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Introduction

While growth and development of the child, it can come to small or big changes in child organism, especially in adolescence phase. These changes are not linear, but the same are more of discontinuous character and they are not same among all children of the same age and gender. This has to do with biological growth and development, and the development of body organs, with priority in development of central nerve system, which influences considerably in all motor abilities of the children. Because the development of anthropologic aspect is of individual character, it is sure that in this development exist minor or big differences in development of motor abilities connected not only to age, but in gender too. The amount noticed and the diversification of these tendencies characterizes the motor development of this age (Kurelic et al., 1975).

Motor abilities determine the efficiency of problem solving in different motor activities. These problems can be of different levels of complexity, can require various energy spending, different time limit, execution speed and different movement trajectory. Without considering that motor abilities during early age, in the beginning are not differentiated fully yet, this period is very important in development and especially the basic motor abilities (general abilities).The general motor space can be divided upon intensity and quality of manifesting, in basic and specific. The basic motor abilities are those that most of people posses, while the specific ones are those that are created and developed through specific exercises (Bokan, 2009; Boreham and Riddoch, 2001; Nicin, 2000; Bala and Popovic, 2007). In difference of mature ones that develop the motor abilities mainly independently, appear and can be individually tested, among the children of early age of early adolescence the motor space is yet not defined and it's very complex, which makes the evaluation of their motor potential, harder (Turek, 2000, 2006).

Aim of reserch

The purpose of this research is to certify the differences in motor aspect among children of early and medium adolescence phase, precisely among children of 12, 13, 14, and 15 years of age.

Methods of Work

Samples of students

The sample of this research is consisted from 240 students of masculine genre of Middle-High School "Selami Hallaqi" on Gjilan municipality, Kosovo during the year 2016. The students were divided in four groups. First group consisted of 60 students of 12 years of age, second group consisted of 60 students of 13 years of age, third group consisted of 60 students of 14 years of age and the fourth group consisted of 60 students of 15 years of age.

The samples of variables

These motor parameters have been applied: Running 30 meters with high start (RU30HS); Long jump from the place (LOJUPL); Hand tapping (HANTAP); Koordination- running eights (KORUEI) and Flexibility-bending of body forward (FBEBOF) For results processing it has been applied the analysis of univariant and multivariant of variables.

Results and Discussion

In table 1, there are presented basic statistic parameters of motor variables among adolescents of age 12, 13, 14 and 15, and the difference between groups – ANOVA which statistically is importantin all motor applied variables, $p<0.00$. The outcome results show that during growth and rapid developmentof the body, among all the motor variables applied in this work to the adolescents, a significant statistical difference can be seen, among the groups.

The results of the motor variables – running 30 meters with high start (RU30HS) show that the adolescents of age 12 have better running time in 30 meters than the adolescents of age 13 for 0.99%, those of age 14 have better time in 30 meters running than those of age 13 for 1.47%, whereas the adolescents of age 15 have better running time in 30 meters than those of age14 for 8.61%.

The results of the motor variables-long jump from th place(LOJUPL) show that the adolescents of age 13 have longer jump than the adolescents of age 12 for 9.32%, those of age 13 have longer jump than the adolescents of age 14 for 7.29%, those of age 15 have longer jump than the adolescents of age 14 for 23.42%.

The results of the motor variables – Hand tapping (HANTAP) show that the adolescents of age 13 have better results than those of age 12 for 4.06%, those of age 13 have better results than the adolescents of age 14 for 4.06%, the adolescents of age 13 have better results than those of age 14 for 2.08%, whereas the adolescents of age 15 have better results than those of age 14 for 6.28%.

The results of motor variables Coordination running eights (KORUEI) show that the adolescents of age 13 have better results than the adolescents of age 12 for 5.47%, those of age 13 have better results than the adolescents of age 14 for 4.12%, whereas the adolescents of age 15 have better results than the adolescents of age 14 for 27.82%.

The results of the motor variables –flexibility-bending of body forward (FBEBOF) show that the adolescents of age 12 have better results than those of 13 for 14.57%, the adolescents of age 14 have better results than those of age 13 for 15.64%, whereas the adolescents of age 15 have better results than the ones of age 14 for 7.35%.

Table 1. Basic statistic parameters of motor variables among the adolescents of age 12, 13, 14 and 15, and the difference between groups – ANOVA

		12 Age (years)		13 Age (years)		14 Age (years)		15 Age (years)		Anova
Variables	N	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Sig
RU30HS	60	6.07	0.55	6.13	0.38	6.04	1.02	5.52	0.32	0.00
LOJUPL	60	153.36	19.83	167.66	16.81	155.43	35.39	191.83	20.77	0.00
HANTAP	60	30.56	3.71	31.80	2.55	32.46	5.21	34.50	4.26	0.00
KORUEI	60	15.16	1.41	14.33	1.04	14.92	1.08	10.77	4.25	0.00
FBEBOF	60	39.13	5.82	33.43	5.72	38.66	3.29	41.50	8.49	0.00

In table 2 there is presented Analysis Post Hoc Multiple Comparisons (Scheffe)between all groups of adolescents in motor variables. In this table it is certified that there is an important statistic difference $p<0.00$ between groups of adolescents in motor variable – running 30 meters with high start (RU30HS) except between groups of adolescents of age 12 and 13, 12 and 14 years of age and 13 abd 14 years of age, $p>0.05$.At motor variable – long jump from the place (LOJUPL) there is an important statistic difference $p<0.00$ between groups of adolescents, except between groups of adolescents of age 12 and 14, $p>0.05$. At motor variable-Hand tapping (HANTAP) there is an important statistic difference $p<0.00$ between groups of adolescents except between groups of adolescents of age 12 and 13, 12 and 14 and 14 and 15 years of age, $p>0.05$. At motor variable Coordination running eights (CORUEI) there is an important statistic difference $p<0.00$ between groups of adolescents except between groups of adolescents of age 12 and 13, 12 and 14 and 13 and 14 years of age, $p>0.05$. At motor variable –Flexibility bending of body forward (FBEBOF) ther is an important statistic difference $p<0.00$ between groups of adolescents, except between adolescentss of age 12 and 14, 12 and 15 and 14 and 15 years of age, $p>0.05$.

The outcome differences between divided group upon age on motor development show that the early adolescent period presents the most important period and the only one of the development of motor abilities. The period of 7-14 years of age is considered the best age for improvement of natural relative indexes of muscle strength and the relation height-weight as an important factor that which conditions the good sport results (Petkovic, 1999). In order to have influence on motor abilities in a higher scale, it is necessary, that with the process of transformation we start on early ages by respecting sensitive periods for development of certain characteristics and abilities. (Markovic, 1997).

Table 2. The difference between adolescents of age 12, 13, 14 and 15 in motor variables -Post Hoc Multiple Comparisons (Scheffe)

RU30HS			LOJUPL			HANTAP			KORUEI			FBEBOF		
I	(J)	(I-J)	I	(J)	(I-J)	I	(J)	(I-J)	I	(J)	(I-J)	I	(J)	(I-J)
12	13	-.06	12	13	-14.30*	12	13	-1.23	12	13	.824	12	13	5.70*
	14	.026		14	-2.07		14	-1.90		14	.23		14	.47
	15	.55*		15	-38.47*		15	-3.93*		15	4.39*		15	-2.37
13	12	.06	13	12	14.30*	13	12	1.23	13	12	-.87	13	12	-5.70*
	14	.08		14	12.23*		14	-.67		14	-.59		14	-5.23*
	15	.61*		15	-24.17*		15	-2.70*		15	3.56*		15	-8.07*
14	12	-.03	14	12	2.07	14	12	1.90	14	12	-.23	14	12	-.47
	13	-.08		13	-12.23*		13	.67		13	.59		13	5.23*
	15	.52*		15	-36.40*		15	-2.03		15	4.16*		15	-2.83
15	12	-.55*	15	12	38.47*	15	12	3.93*	15	12	-4.39*	15	12	2.37
	13	-.61*		13	24.17*		13	2.70*		13	-3.56*		13	8.07*
	14	-.52*		14	36.40*		14	2.03		14	-4.15*		14	2.83

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Conclusion

For realization of the aim of this research which was to certify the differences in motor development among children in early and medium adolescence phase, that is to say among children of 12, 13, 14 and 15 years of age, it has been applied among sample of 240 students of masculine genre, and also 5 motor variables have been applied.

The research results show that the applied motor abilities in this work develop faster and it comes to their differentiation in higher regulative levels during early adolescence phase, and there is a belief that it can be influenced in them in positive way. During this period for sure comes to building of motor space structure upon genetic factors and physical activities, which influences in execution of explosive strength, it develops and differentiates in certain motor centre during the period of medium adolescence, that is to say in the age of 15.

This certifies also that upon applied motor abilities, speed as motor ability that influences also in explosive strength execution develops and differentiates in certain motor centre during the period of medium adolescence, that is to say in age of 15. This certifies the conclusion of many authors that the best faze to influence in speed increasing is the age of 12 and 15.

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EFFECTIVENESS OF THE GAMES APPROACH IN STUDENTS' FOOTBALL CLASSES

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Abstract:
As an elective sport in almost all universities, football occupies the leading position among the other means of physical education. The purpose of the study is to improve the quality and effectiveness of the football learning process with students by using the games approach as a tool for improvement. The results of the study give us a reason to recommend the use of games approach in students' classes in order to improve physical fitness and technical skills.

Keywords: *football, students, games approach*

Introduction

Sports games are some of the most important means of physical education and sport. The game activity itself allows for the development of a number of intellectual, psychophysical and physical qualities.

Football as an elective sport in almost all universities occupies the leading position among the other means of physical education [Bachvarov, 2000; Gavrilov, 2004; Ignatov, 2009].

Futsal is the representative part of mini football and is an official version of FIFA and UEFA. Those who play futsal have a greater chance to participate in the game. A favourable learning environment is created due to the following facts: 10-12 times more frequent contact with the ball, creating more scoring opportunities, eliminating some complex rules and allowing the game to teach the players [Hermans, V., R. Engler 2011].

The basis of the games approach is laid by the following methods [Alexieva, M., M. Petkova 2016]:

- direct games approach - this is a comprehensive method where students meet the game goal.
- indirect games approach - implementation of different technical elements and tactical combinations of the game.
- combined application of both games approaches.

The purpose of this study is to improve the quality and efficiency of the learning process in football with students based on the games approach as a means for improvement.

Tasks of the study:

1. Development and implementation of specialized methodology.
2. Verification the effectiveness of the applied methodology.

Methodology

The main sport-pedagogical experiment was conducted at "D. A. Tsenov" Academy of Economics. A total of the 42 students were surveyed, divided into two groups:

- Experimental group (EG) - 24 (two study groups per 12 people)
- Control group (CG) - 18

The football classes with the CG followed the curriculum approved by the department.

The experimental group was trained in physical education and sports according to our methodology. Leading methods were games, mostly two-team games with competition element and various numbers of players being the integral part of any class. The sport-pedagogical experiment was held in an indoor playground with standard sizes of the futsal and football field 5.

Each class started with a micro-lecture (10-12 min) during which students received theoretical background according to a detailed thematic plan.

Both groups had one class per week. In order to establish the fitness level of all participants in the experiment, testing was carried out (Table 1) within one academic year. The EG and CG were assessed twice for the entire period, first at the beginning and then at the end of the experiment.

Table 1. List of the indicators surveyed

No	Test name	Measuring units	Accuracy
1.	"Shuttle" run- 6x10 m	s	0.01
2.	Queens College Step Test (VO2 max)	L / min	0.1
3.	"Dribble" test	s	0.01
4.	Juggling	n	1

Results analysis

The statistical reliability of the variance and of the increase in each of the groups was determined by using Students' *t*- criterion for dependent samples (critical value - at k=n -1=23 and *a*=0,05 is equal to 2,07 and *a* = 0,01 is equal to 3,77; at k = 17 and *a* = 0.05 is equal to 2.11 and *a* = 0.01 is 2.90).

In order to compare the effectiveness of the experimental program and the standard teaching methodology, the increase in the results for each indicator between the initial and final testing was analysed. The statistical reliability of the variance was tested using the Student's *t*- criterion for independent samples (critical value at $\kappa=n_1+n_2-2=40$ and *a*=0,05 equals 2,02 and *a* = 0,01 is equal to 3,55).

Speed endurance was measured by using the "6 x 10 m shuttle" test. By comparing the initial and the final results, the analysis of Table 2 shows that both groups have indicated an increase but this increase has been significant and supported by the required statistical reliability only in the EG (temp = 5,52> t0.05 = 2,07).

Table 2. Comparative analysis of the test results "6 x 10 m shuttle"

Indicator / Group	n	I test		II test		Increase		Statistical significance	
		X_1	S1	X_2	S2	d	d%	Temp	P (t)
Experimental	24	15.56	0.46	15.32	0.37	-0.24	-1.52	5.52	100.00
Control	18	15.53	0.50	15.52	0.45	-0.01	-0.08	0.30	23.30
Variance	d	0.027		-0.197		-0.224			
Statistical significance	temp	0.18		1.56		3.69			
	P (t)	13.99		87.39		99.93			

The data in Table 3 allow us to analyse the changes occurring in the VO_2 max values of the students surveyed.

Table 3. Comparative analysis of the results "VO_2 max"

Indicator / Group	n	I test		II test		Increase		Statistical significance	
		X_1	S1	X_2	S2	d	d%	temp	P (t)
Experimental	24	41.30	3.40	44.73	3.67	3.44	8.32	10.01	100.00
Control	18	41.91	3.89	42.15	3.69	0.24	0.57	1.09	70.96
Variance	d	-0.612		2,583		3,195			
Statistical significance	temp	0.54		2.25		7.26			
	P (t)	40.95		97.01		100.00			

The low value of the Student 's *t*-criterion for independent samples from the first study (P(t) <95%) gives a good reason to assert that at the beginning of the monitored period there was no significant variance between the groups. At the end of the experiment, variance between the groups surveyed had a 88% guaranteed probability, which supported by the *t*-criterion for dependent samples, allowed us to believe that there was a significant increase in the EG score compared to the control group. The variance

between the increase in the changes in the mean values of the surveyed groups was significant (P (t) = 99.93 %).

The running work of the participants in the EG was mainly measured at 10-15 m sections which resulted in improvement of speed endurance.

By comparative analysis of dependent samples, the variance between the two values in EG was reliable (P (t) = 100 %). The change in the CG was insignificant and not supported by the required statistical reliability. Based on the calculated empirical values of the *t*-criterion for independent samples, we found no significant differences between the groups at the beginning of the experiment (P(t) = 40.95%). This ensured plausibility at the start of the experiment. At the end of the study, the variance between the surveyed groups had a guaranteed probability of 97.01%, which allowed us to claim that during the experiment there were positive changes due to the applied methodology. The variance in the observed increase rates in the individual groups was significant and supported by the required statistical reliability (P (t) = 100%).

Table 4. Comparative analysis of the test results "dribbling between stands"

Indicator / Group	n	I test		II test		Increase		Statistical significance	
		X_1	S1	X_2	S2	d	d%	Temp	P (t)
Experimental	24	4.65	0.61	4.22	0.38	-0.44	-9.41	5.08	100.00
Control	18	4.60	0.51	4.50	0.41	-0.09	-2.07	1.85	91.81
Variance	d	0.060		-0.283		-0.343			
Statistical significance	Temp	0.34		2.31		3.14			
	P (t)	26.09		97.41		99.68			

Table 4 presents the results of the “dribble between stands” test data. In the course of the experiment, an increase of 0.44 s was achieved. It was supported by a 100% guaranteed probability, which unequivocally shows the applied methodology had a positive effect on the technical skills demonstrated by the dribbling between stands. The CG variance was insignificant, because the resulting growth of 0.09s was unreliable (t_{emp}=1,85<t0,05=2,11). The hypothesis for greater efficiency of the games in the EC has also been confirmed by the comparison to the increase in the two groups (d_{er}=0,44 и $d_{кг}$=0,09). The variance of 0.34 s was statistically significant because it was supported by a 99.68 % guaranteed probability. At the end of the experiment, the differences between the groups were statistically significant (P (t) = 97.41 %).

Analysing the results of Table 5, we can summarize that at the beginning of the experimental period, the average values of the juggling indicator of the groups did not differ x_{eg}=43,25; x_{cg}=39,17. The resulting difference of 4,083 was not reliable (P(t) = 64,09 %). After the experiment, both groups improved their average values. In EG x_{eg}=53,08 with increase 9.83, which was supported by the necessary guaranteed probability P (t) = 100%, and in the CG x_{cg} = 40.06, with an increase rate of 0.89 P (t) < 95 %.

Table 5. Comparative analysis of the results by “juggling” indicator

Indicator / Group	n	I test		II study		Increase		Statistical significance	
		X_1	S1	X_2	S2	d	d%	temp	P (t)
Experimental	24	43.25	13.95	53.08	14.40	9.83	22.74	8.60	100.00
Control	18	39.17	14.33	40.06	13.38	0.89	2.27	1.39	81.65
Variance	d	4,083		13,028		8,944			
Statistical significance	temp	0.93		2.99		6.23			
	P (t)	64.09		99.52		100.00			

The difference between the mean values of EG and CG after the experiment was 13,028, which was substantial and statistically supported P (t) = 99,52 %. The absolute increase in the score between EG and CG was 8.94 and it was supported by the required statistical confidence P (t) = 100 %.

In conclusion, we note that the "ball feeling" measured by the juggling test significantly improved in the EG, confirming the effectiveness of the applied experimental methodology tools.

Conclusions

1. The use of different game activities and comprehensive technical and tactical drills in football classes during the academic year has led to improved physical fitness and controlled technical skills. Therefore, physical and technical training takes place in unity through the games approach.
2. The game moment in the separate parts of the lesson leads to higher emotional level, which in turn contributes to a higher load intensity.
3. By applying different sequence variants of games in conditions close to racing, we transcend the standard setting of the curriculum. The participants are in a continuous "outplay mode".
4. By regulating futsal and soccer 5 at university, we will largely respond to the increasing needs of social practice.

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PROMOTION OF EXERCISE TO CHILDREN AND YOUNG PEOPLE MECHANISMS OF ACTION

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Abstract

Approach. It is well known that exercise has beneficial effects on grows and development of young people. It influences cardiovascular endurance, stretches/lengthens muscle and joint tissues, improves muscle and bone strength, prevents visceral fat accumulation, diminishes inflammation, reduces oxidative stress, and improves mental health and cognition. The purpose of the study was to overview the last decade controlled trials for the beneficial exercise effect, regarding mechanism of action on physical and mental health in children and young adults.Material and methods. We obtained the research data from Medline, EMBASE and Cochrane Central Register of controlled trails, concerning different issues: I–exercise and prevention of chronic diseases (cardiovascular disease, type 2 diabetes, metabolic disorders, etc); II-exercise and immunology (inflammation); III–exercise and oxidative stress; VI–exercise and mental condition (cognition and stable personality). Results. From a number of 18 clinical trials: 3 related to the exercise influence on physical health in general; 3 related to exercise influence on immune system, 4 related to exercise influence on decrease oxidative stress and possible cell damage, and 8 trials were related to exercise influence on brain function within improved cognition and mental health in general. Exercise reduces inflammation by increasing interleukins (IL-1ra, IL-4, IL-10, IL-6) and decreasing inflammatory cytokines (TNF-α, IL-1β, IL-1α) and CRP. It reduces oxidative stress by promoting cell antioxidant system via heme oxygenase-1 activation and by increase of nuclear factor eritroid 2. It is also regulated by nitric oxide expression. Mental improvement with cognition and anti-depressive effect of exercise is promoted by induction of brain derived neutrotropic factor (BDNF) in hippocampus via increase of neurotransmitter release, as well as by suppression of hypocretin/orexin and melanin-concentrating hormone in the amygdale.Conclusion. The certain mechanisms of action support the beneficial effect of exercise, promoting better quality of life to children and young people.

Key words: *exercise; young people; beneficial effects.*

Introduction

It is well known that exercise has beneficial effects on growth and development of children and young people. It influences cardiovascular endurance, stretches/lengthens muscle and joint, improves muscle and bone strength, it prevents visceral fat accumulation, diminishes inflammation, reduces oxidative stress, and improves mental health and cognition.

Many studies have been conducted related to exercise influence on physical and mental health, especially of young people. Thus, it contributes to well body growth and development, improves cardiorespiratory and muscular fitness, bone health and cardiovascular system (Boreham A. and Riddoch C, 2002). Regarding exercise, many changes are observed in the brain such as neurogenesis, new neurotransmitters, and vascular adaptation. They are related to enhanced cortical development, improved brain function and brain circulation. It is also suggested that aerobic exercise in childhood may contribute to better cognitive function later in life (Hillman CH, Erickson KI, Kramer AF, 2008; Van Prag H, 2008).

Different exercise disciplines were examined regarding their duration, resistance, and goal achievement. Thus, different exercise may be divided due to contractile activity duration: I - endurance exercise with prolonged contractile activity with high repetition (marathon, cycling, swimming) and II – resistance exercise and short contractile activity with low repetition (sprint, weigh training). According to goal achievements, exercise and sport may be divided: I – aerobic exercise for cardiovascular endurance; II – flexibility exercise for stretch and lengthen muscle and joint; and III – anaerobic exercise for muscle and bone strength.

The aim of the study was to overview the last decade controlled trials for the beneficial exercise effect, regarding mechanism of action on physical and mental health in children and young adults.

Material and methods

We obtained the research data from Medline, EMBASE and Cochrane Central Register of controlled trails, concerning different issues: I – exercise and prevention of chronic diseases (cardiovascular disease, type 2 diabetes, metabolic disorders, etc.); II - exercise and immunology (inflammation); III – exercise and oxidative stress; VI – exercise and mental condition (cognition and stable personality). In this study we searched the literature using key words: "exercise" and "chronic disease", "exercise" and "immunology / inflammation", "exercise" and "oxidative stress", "exercise" and "mental condition / cognition". All the studies were conducted during the last decade. Regarding this, we selected individual trails approved in systematic reviews and meta-analysis and considered them as base evidence medical studies.

Results

A number of 20 clinical trials were examined, related to exercise influence on health of children and youth (Table 1). Three trials were conducted to show the exercise influence on physical health in general, two trials were related to exercise influence on immune system, four trials were conducted to examine exercise influence on decrease oxidative stress and possible cell damage, four trials were examined concerning chronic disease, cardiovascular system within health prevention, and seven trials were included for exercise influence on brain function within improved cognition and mental health in general. In all studies, the subjects were children and young people up to the age of 28, both sexes from rural and urban areas.

Table 1. Studies of last decade related to exercise influence on health of children and youth

Authors	Period of the studies	Content of the studies Exercise influence
Youssef H; Stankovic M; Nasca MM, Stankovic M.	2010 - 2015	Oxidative stress
Warburton NP; Boreham C, Niu K	2006 - 2011	General health
Walsh NP; Nieman DC.	2000 - 2011	Immune system, immunity
Voss MW; van Praag H; Tomporowski PD; Sleiman SF. Parker AG; Hilman CH; Hagel A.	2008 - 2016	Cognition, brain function, mental health
Rector RS; Cesa CC; Booth FW. Patel H.	2011 - 2017	Chronic disease, cardiovascular system, prevention

To provide a national database of exercise for children and young people, its relation to health and information analysis, the Children's Sport Participation and Physical Activity multi-centre cross-sectional study (CSPPA) funded by the Irish Sports Council gives guidance to national policy development. It used methods such as original questionnaire and motion sensors (accelerometers). A number of 5397 children at average age of 13.8±8 years (10-18 years), 52% male and 48% female. Outcome of the study showed exercise and health indices as following: One third of the examined subjects performed moderate to vigorous exercise app. 60 minutes daily, more likely for boys and it decrease with increasing age. One fourth of the children were overweight or obese with elevated blood pressure. There was a significant correlation between the subjective (self report) and objective (motor sensor) measures of exercise (Woods CB et al, 2010).

WHO estimated national economy costs due to inactivity influenced on quality of life, morbidity and mortality as 150 – 300 euro per citizen per year.

According to studies outcome, well balanced exercise in children and young people is recommended for their physical and mental health (Table 2 and Table 3). It is considered that well balance exercise may lead to prevention of obesity, diabetes and other metabolic disorders in children and young people. Also, less respiratory failures are found in those who exercise. Exercise has also a good impact on cellular and humoral immunity and a good influence on scavenging free radicals.

Table 2. Studies of last decade related to exercise influence on physical health of children and youth

Physical health conditions	Exercise benefit	Additional comments
Chronic disease	Prevention	Obesity, diabetes, metabolic disorders
Cardiorespiratory failure	Better function of the lung and heart	Less respiratory failures, asthma, strong heart
Immunity failure	Improve immunity	Better function of cellular and humoral immunity
Oxidative stress	Low damage from free radicals	Increasing antioxidant defense

For mental health, exercise is strongly recommended in children and young people as it has antidepressive effect, it diminishes anxiety and manages stress. The effects are more evident when exercise is regularly and constantly performed in period of several months.

Table 3. Studies of last decade related to exercise influence on mental health of children and youth

Mental health conditions	Exercise benefit	Additional comments
Depression	Antidepressive effect	In both gender after longer exercise period
Anxiety	Anxiety reduction	When exercise more than 3 months 3 times per week
Stress	Managing of stress	When exercise more than 3 months 3 times per week
Mood state	Lowering tension, anger and fatigue	Improving self confidence

Concerning different type of exercise, a number studies for children and young people have shown that a high repetitive exercise with low weight may work better for muscle growth because of the less damage and nervous system fatigue compared to high weight and low repetitive exercise. Furthermore, there is no increase of protein synthesis when weight is heavier. So, low weight, high repetitive exercise is considered the standard recommendation for muscle growth. Regarding bone density, it also increases when low weight and high repetitive exercise are performed in children and young people (Niu K et al, 2010). There are many studies that evaluate aerobic and anaerobic exercise on health. Both, anaerobic and aerobic exercise have favorable effect on lipid metabolism, anaerobic exercise have more positive influence on lipid profile. Aerobic exercise has a positive impact which contribution is limited on frequency and quantity. Anaerobic exercise produces less ATP than aerobic exercise, but increases natriuretic peptide, a protective agent of blood vessels endothelium (Patel H et al, 2017). The possible mechanisms of action are justified in order to reveal certain causes of exercise beneficial influence.

Discussion

Lack of exercise in young age may become a cause of most chronic disease and clinical condition later in life, such as obesity, type 2 diabetes, congestive heart failure, endothelial dysfunction, malignancy, etc. Relative risks of death in more clinical studies are history of hypertension, chronic obstructive pulmonary disease, diabetes, elevated body mass index. Even small improvements in exercise may lead to significant risk reduction. Moreover, those who exercise during 5 year period, have risk death reduction to 44% compared to those who are inactive. In a large prospective study it is showed that an increase for energy of 500 kcal may reduce incidence of diabetes type 2 of 6%. Physically active individuals show 30% reduction in relative risk of colon cancer.

Physical inactivity and overnutrition, either separately or in combination, may produce fatty liver disease (Booth FW et al, 2012; Rector RS and Thyfault JP, 2011; Warburton DER et al, 2006; Cesa CC et al, 2015).

Children who exercise experience less immune diseases and demonstrate faster recovery. This may reduce respiratory diseases, enhance antibodies function and diminish infection (Walsh NP et al, 2011).

Exercise reduces inflammation by increase of interleukins (IL-1ra, IL-4, IL-10, IL-6) while decreases inflammatory cytokines (TNF-α, IL-1β, IL-1 α) and CRP. Most of the cross-sectional studies have shown enhanced natural killer cells in physically active individuals (Nieman DC, 2000).

Exercise reduces oxidative stress by promoting cell antioxidant system via heme oxygenase-1 activation and by increase of nuclear factor eritroid 2. It is also regulated by nitric oxide expression. Most of the studies showed the beneficial effect of exercise on oxidative stress via biomarkers lipid peroxidation and protein modification. Sedentary individuals are more exposed to oxidative stress during exercise. Young children especially those who are overweight should be exposed to exercise in gradual and non competitive manner. Regarding this, nutrition is much important to prevent exercise induced oxidative stress in children. Aerobic training reduces lipid peroxidation and inflammation after intense exercise in obese adolescent girls (Stankovic M and Radovanovic D, 2012; Nasca MM et al, 2011; Youssef H et al, 2015).

Exercise may contribute to prevent and treat mental health problems in young people. According to clinical trials results there is positive association between sport and mental condition, it may prevent or manage clinical depression, it may have several benefits like pharmacological, social and behavioral (Hagell A, 2006). In the factorial randomized controlled study of Parker et al, 2011, to test the effectiveness of simple psychological and exercise interventions in young people was described.

Mental improvement with cognition and anti-depressive effect of exercise is promoted by induction of brain derived neutrotropic factor (BDNF) in hippocampus via increase of neurotransmitter release, as well as by suppression of hypocretin/orexin and melanin-concentrating hormone in the amygdale. BDNF is endogenously produced in the brain, (particularly in the hippocampus).

In the study of Voss MW et al, 2011 the relationship between exercise and cognitive and brain health is described. A meta-analysis of collected 44 studies found size of 0.32 for the association between exercise in childhood and cognition (Tomporowski PD et al, 2008; Voss MW et al, 2011). For the possible mechanism of action, physical exercise increases the metabolite ketone β-hydroxybutyrate that activates BDNF promoters (promoter I) (Sleiman SF et al, 2016).

The certain mechanisms support the beneficial effect of exercise, promoting better quality of life and low morbidity in children and young adults.

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THE PHYSICAL ACTIVITY AND THE INTERESTS OF THE STUDENTS OF UNIVERSITY ‘’Ss. CYRIL AND METHODIUS’’ IN SKOPJE

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Abstract

On a sample of 644 examinees, divided into two subpopulations, 380 female and 264 male examines, a survey was conducted in order to determine the physical exercise habits among the students from the ‘’Ss. Cyril and Methodius’’ University in Skopje, how many students know to swim, ice-skating and ski and for which physical and sport activities they show greatest interest . For the realization of the goals of the research, a questionnaire of closed type was applied, which was consisted of several questions related to the physical, sports activity and interests of the students for the teaching content. The received data are processed by frequency analysis (F) and percent (%). The results of the research showed that 90.22% of the examinees do not have regular (recommended) sports activity (physical activity), or in other words, 95.00% of the female examinees and 83.33% of the male examinees do not have the recommended physical activity. The biggest interest from the male students was showed towards the futsal, basketball, fitness and swimming, while the greatest interest from the female students was showed towards the volleyball, dancing, aerobic and fitness.

Key words: *physical activity, interests, students*

Introduction

The World Health Organization in all its acts states about the importance of the physical activity in the preservation of health, especially in the procedures of prevention and treatment of chronic diseases. Numerous scientific-professional studies emphasize the cause-effect connection physical activity, physical fitness and health of the individual. In the above mentioned studies, highlighted are the reasons such as: lack of physical activity, sedentary lifestyle, inadequate diet, weight gain, smoking of cigarettes, consumption of alcohol and drugs as well as the dietary disorder that is manifested through anorexia or bulimia. According to the researches, the problem is emphasized on children and youth who have insufficient physical activity and inclination towards risk behavior, especially when it comes to the student population. The students are part of the population which is prepared to for an important role in the society, who as educated people with their knowledge and experience will influence future generations of children and young people. The sharp decline in physical activity is particularly noticeable during adolescence (15-19 years) and in young adults (20-25 years), putting students in the risk group.

The problem of insufficient physical activity among students has been recognized in many European countries; in the UK its called the ‘coach potato society’ and in our region is called the ‘homo-sedentary’ population or ‘population of young elders’. For this purpose the professors in the field of physical education and sport at the ‘Ss. Cyril and Methodius’ University in Skopje in the recent years are conducting scientific and professional researches in order to determine the level of physical activity among students during their student life, the current engagement of students in sports, the interests and attitudes about physical exercise, the groomed habits and the representation of individual risk behaviors. The analysis of the data suggests that as the main reason for physical inactivity students emphasize the lack of free time and the lack of habit of regular physical exercise.

From the data analysis carried out on several faculties, it can generally be concluded that in addition to regular classes in physical education and sports, about 90% of the students in their free time do not take part in sports and recreational activities. It is important to mentioned that the classes very often (due to material conditions) is carried out only once a week – most often as block hours, or in other words, maximum two hours in block of 45 minutes per week with macro breaks between the exam sessions, 30 days break for the winter break and 90 days break for the summer break.

On the basis of the above, the goals of this research has been set and they are: What are the physical exercise habits among the students from the ‘Ss. Cyril and Methodius’ University in Skopje, how many

students know to swim, ice-skating and ski, for which physical and sports activities students show the greatest interest.

Methods of Work

The survey was conducted in the first semester of the academic year 2015/16 on a sample of 644 respondents (students from several faculties at the 'Ss. Cyril and Methodius' University in Skopje) divided into two subpopulations (380 female examinees and 264 male examinees), at a chronological age of 18-20 years (first and second year students). For the realization of the goals of the research, a questionnaire of closed type was applied, which was consisted of several questions related to the physical and sports activity, as well as for the interest of the students to the study programs. The received data are processed by frequency analysis (F) and percent (%).

Results and Discussion

On the question: "What is your sports activity so far"? (Table 1), 15.22% of the respondents answered that they never engaged in sports activity, 57.45% said that they engaged in sports activity occasionally (recreational), 15.22% answered that they actively trained and competed in school sports, 10.25% said that they actively trained and competed for sport clubs and 1.86% said that they actively participated in sports and achieved results from a state rank.

Table.1 Sports Activity So Far

	FACULTY	I have never been involved in sports activities	I played sports occasionally /recreational	Actively training and competing in school sports	Actively training and competing for sports club	Active in sports and achieving results from state rank
M	PHARMACY	22,22	44,44	22,22	11,11	
	PHILOSOPICAL	12,12	60,61	15,15	12,12	
	ARTS	16,67	50		33,33	
	MUSIC	18,18	54,55	9,09		18,18
	MECHANICAL	7,81	50	32,81	7,81	1,56
	PEDAGOGY	14,29	48,57	20	14,29	2,86
	DENTISTRY		33,33	28,57	38,1	
	FORESTRY		78,95	10,53	10,53	
	TECHNOLOGY AND METALLURGY		66,67	20	13,33	
	AGRICULTURAL	3,92	47,06	17,65	23,53	7,84
	TOTAL MALES	**7,95**	**52,27**	**21,21**	**15,53**	**3,03**
F	PHARMACY	6,9	75,86	10,34	6,9	
	PHILOLOGY	14,29	71,43	14,29		
	PHILOSOPICAL	26,74	52,33	13,95	5,81	1,16
	ARTS	25	75			
	MUSIC	44,44	44,44		11,11	
	MECHANICAL	20,83	58,33	16,67		4,17
	PEDAGOGY	22,52	57,66	11,71	6,31	1,8
	DENTISTRY	4,76	61,9	14,29	19,05	
	FORESTRY	6,25	75	9,38	9,38	
	TECHNOLOGY AND METALLURGY	22,22	72,22	5,56		
	AGRICULTURAL	23,08	64,1	5,13	7,69	
	TOTAL FEMALES	**20,26**	**61,05**	**11,05**	**6,58**	**1,05**
	TOTAL	**15,22**	**57,45**	**15,22**	**10,25**	**1,86**

On the question: "What is your current sports (physical) activity?'' (Table 2), 8.54% of the respondents answered that they are actively engaged, 38.66% answered that they dealt with sports activity occasional, 21.43% of the respondents answered that they do not deal with recreational activity, while 30.12% said that they want to participated, but do not have possibilities. From the overview of the data in the table it can be concluded that as many as 99.22% of the respondents do not have a regular (recommended) sports activity, which is a worrying fact.

Table.2 Current Sports Activity

	FACULTY	Actively sporting	Sporting occasionally	I don't practice sport	Want to play sports, don't have possibilities
M	PHARMACY	22,22	33,33		44,44
	PHILOSOPICAL	3,03	33,33	15,15	48,48
	ARTS		66,67	16,67	16,67
	MUSIC		63,64	18,18	18,18
	MECHANICAL	7,81	54,69	18,75	15,63
	PEDAGOGY	34,29	28,57	17,14	20
	DENTISTRY	33,33	42,86		23,81
	FORESTRY	5,26	47,37	5,26	42,11
	TECHNOLOGICAL AND METALLURGY	13,33	66,67		20
	AGRICULTURAL	21,57	39,22	9,8	27,45
	TOTAL M	**15,53**	**44,7**	**12,12**	**26,52**
F	PHARMACY		27,59	13,79	58,62
	PHILOLOGY		42,86	28,57	28,57
	PHILOSOPICAL	3,49	31,4	25,58	33,72
	ARTS		25	25	50
	MUSIC		22,22	22,22	55,56
	MECHANCIAL	4,17	20,83	25	50
	PEDAGOGY	5,41	40,54	36,94	17,12
	DENTISTRY	9,52	66,67	4,76	19,05
	FORESTRY	6,25	31,25	21,88	40,63
	TECHNOLOGICAL AND METALLURGY		38,89	16,67	44,44
	AGRICULTURAL		23,08	43,59	33,33
	TOTAL F	**3,68**	**34,47**	**27,89**	**32,63**
	TOTAL	**8,54**	**38,66**	**21,43**	**30,12**

From Table 3, which shows the results of how many percent of the students know / do not know how to swim, ski and ice-skating, it can be seen that 22.83% of the total number of the respondents do not know how to swim, 80.90% of the respondents they do not know how to ski, while 67.24% of the respondents do not know how to ice-skating.

Graphs 1 and 2 show the physical activities (sports activities) for which they have the greatest interest. From the overview of Graph 1 it can be seen that the most popular physical activities of the regular program are futsal and basketball among male respondents and dances and volleyball among female respondents. From the inspection of Graph 2 it can be seen that the most popular physical activities of the self-financing program are: swimming and fitness among male respondents where for the female respondents most popular are: aerobics, fitness and swimming.

The World Health Organization, the Commonwealth Department of Health and Aging 2004, and the International Conference on Physical Activity Guidelines for Adolescents, in 1993, suggest that adolescents and students should be physically active every day as part of their general lifestyle and should be engaged in three or more 30 minute sessions of moderate to enhanced exercise each week (Salis and Patrick, 1994).

The results of this study showed that 90.22% of the respondents do not have regular (recommended) sports (physical) activity, or in other words 95.00% of the female respondents and 83.33% of the male respondents do not have recommended physical activity. The results of this research indicate that the visit to the physical education and sport classes is the only form of providing students with physical activity and sports.

The period of late adolescence is crucial time for the adoption of healthy lifestyles and the right time to prevent certain diseases through moderate, properly dosed and programmed physical activity.

Table.3 How many of the respondents know to swim, ski and ice-skating

	FACULTY	*Swimming*		*Skiing*		*Ice-Skating*	
		Yes	No	Yes	No	Yes	No
M	PHARMACY	77,78	22,22	33,33	66,67	33,33	66,67
	PHILOSOPICAL	72,73	27,27	9,09	90,91	18,18	81,82
	ARTS	66,67	33,33		100		100
	MUSIC	72,73	27,27	18,18	81,82	72,73	27,27
	MECHANICAL	93,75	6,25	29,69	70,31	31,25	68,75
	PEDAGOGY	88,57	11,43	48,57	51,43	45,71	54,29
	DENTISTRY	100		52,38	47,62	47,62	52,38
	FORESTRY	94,74	5,26	10,53	89,47	36,84	63,16
	TECHNOLOGY AND METALLURGY	86,67	13,33	20	80	26,67	73,33
	AGRICULTURAL	82,35	17,65	23,53	76,47	33,33	66,67
	TOTAL M	**86,36**	**13,64**	**27,27**	**72,73**	34,47	65,53
F	PHARMACY	89,66	10,34	17,24	82,76	31,03	68,97
	PHILOLOGY	85,71	14,29	42,86	57,14	57,14	42,86
	PHILOSOPICAL	62,79	37,21	5,81	94,19	20,93	79,07
	ARTS	50	50		100	25	75
	MUSIC	88,89	11,11	11,11	88,89	55,56	44,44
	MECHANICAL	70,83	29,17	4,17	95,83	37,5	62,5
	PEDAGOGY	60,36	39,64	11,71	88,29	28,83	71,17
	DENTISTRY	85,71	14,29	42,86	57,14	61,9	38,1
	FORESTRY	84,38	15,63	21,88	78,13	40,63	59,38
	TECHNOLOGY AND METALLURGY	72,22	27,78	16,67	83,33	22,22	77,78
	AGRICULTURAL	79,49	20,51	10,26	89,74	30,77	69,23
	TOTAL F	**70,79**	**29,21**	**13,42**	**86,58**	31,58	68,42
	TOTAL	**77,17**	**22,83**	**19,1**	**80,9**	**32,76**	**67,24**

Chart 1. Regular program

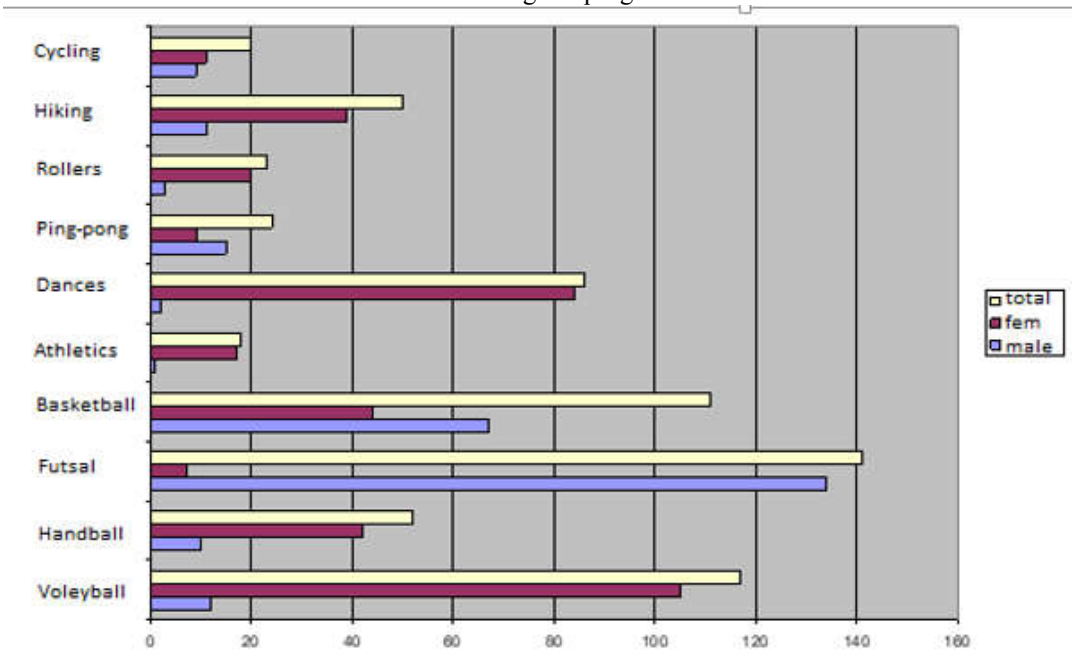
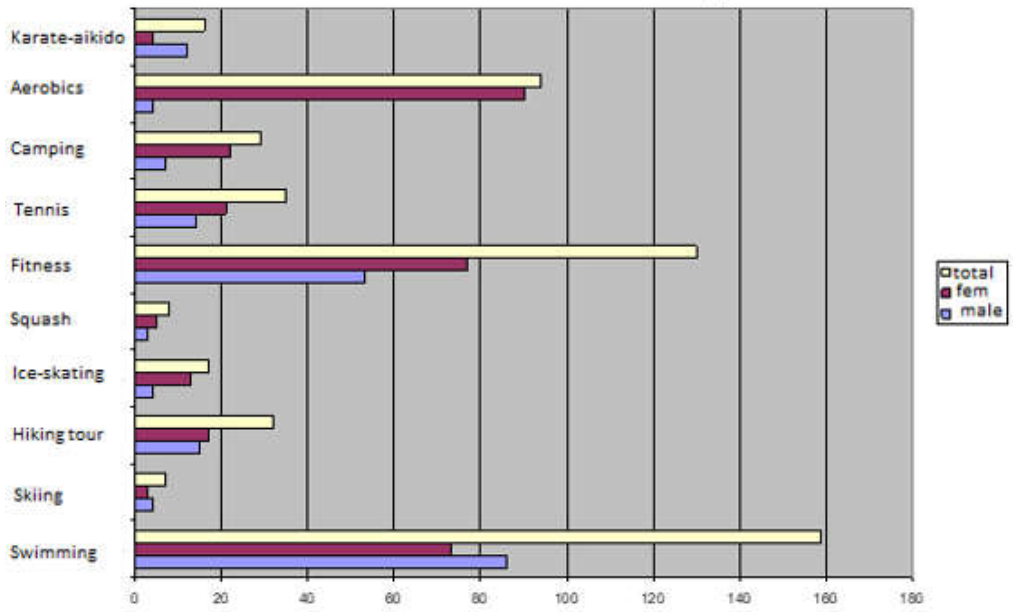


Chart 2. Self-financing program



Conclusion

Based on the results from this research, as well as previous researches in our country and in the world, we can conclude the following:

- a large proportion of the students do not have a recommended physical activity, where 83.33% of male respondents and 95.00% of the female respondents do not have the recommended physical activity in their spare time;
- the biggest interest among the male students was for: futsal, basketball, fitness and swimming, while the biggest interest for the female students was for: volleyball, dancing, aerobics and fitness;
- physical education and sport is the only class in higher education that is aimed at stimulating physical activity and acquiring knowledge about the importance of the physical exercise, and at the same time preventive action of negative phenomena as a result of lack of physical activity;
- the importance of the class is also in providing new information to students about the possible health problems as a result of physical inactivity;
- with a quality curriculum, which will be in accordance with the interests of the students, we can significantly influence the stimulation of the everyday physical activities and at the same time to enable the students to exercise independently in his spare time.

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LOW BACK PAIN, INFLUENCE OF ANXIETY IN ITS TREATMENT

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Abstract

Background: The low back pain is a huge problem nowadays, and it is experienced by majority of population during the whole life. Chronically low back pain is a state that is affected by biological, psychological and social factors that interfere among themselves and together affect each other, these factors influence increase and duration of complaining time.Material and Methods: The research was conducted in Physiotherapy Institute of Occupational Medicine (IOM) in Obiliq, Kosovo, during the period of one year, from January 2016 until the end of December 2016. The research was long-term and prospective. 63 patients participated in this research. All of them were treated with physical therapy, depending on examination and findings on patient.Results: Based on the results obtained, it can be concluded that the intensity of pain in patients before and after the treatment affects anxiety. Respectively, the patients who had high intensity of pain also manifested higher level of anxiety.Conclusion: Anxiety influences the rehabilitation of low back pain, the patients who suffer from low back pain and have psychological problems such as anxiety, their level of pain prior and following the physiotherapy treatment remains without significant difference.

Keywords: *Low Back Pain, Anxiety and Chronic Pain*

Background

The low back pain is a huge problem nowadays, and it is experienced by majority of population during the whole life. From the problem suffer around 70-80% of population who at least once during their life experience low back pain(Chou, 2017).The newest data show that in different places in the world more than half of population during one year period present the problems with low back pain (Gourmelen J, 2007).

More than 85% of the causes of low back pain are idiopathic and the cause is unknown and they are classified in non-specific with unknown background (Angela Searle M. S., 2015). Low back pain is known as pathology that has multifactorial ethiology with characteristics (age, physical fitness), psychosocial factors (stress, anxiety and depression) and the work factor which are (heavy physical work, bend and tëistmotions and vibration) which affect its development.(G., 2008)(Mauritz van Todler, 2002)

Management and prognosis of treatment change and should be based on duration and symptoms (Koes BW, 2010). Most of low back pain is eliminated by conservative treatment during a certain period of time. There are some patients that experience continuous pain and which is not decreased or eliminated by conservative treatment and in these cases surgery should be performed.(Chou R, 2007). Proper awareness for the relation of disability until the level of pain and cognitive knowledge of patient's profile are used in order to come to a conclusion and to choose the treatment and achieve better treatment. (Helmouhout, 2010), (Smeet, 2009). For the treatment of LBP is always recommended involvement of physical activity (Hendrick P M. S., 2011). For the acute pain, the data from publications support walking(Hendrick P T. W., 2010), the treatment that is considered to be effective for acute LBP is McKenzie method, but it is seen as short term benefit and cannot last forever (Casazza, 2012). There are some data which support application of hot (warm) procedures as a therapy for the acute phase and sub-acute phase of LBP.(French, Cameron, Walker, Reggars, & Esterman, 2006), but we have less data for chronical phase in relation to application of hot and cold therapy (Van Middelkoop M R. S., 2011).

Physical exercises are the most effective therapy for decreasing pain and increase of function for chronical LBP (DG, 2012).These exercises help to lower the chances of repetition of problem until 6 months after completing the exercise program (Smith C, 2010) and they help to increase the duration of functionality (Van Middelkoop M R. S., 2011).

The exercises are good but we cannot say which group of exercises is more effective comparing to the others (Van Middelkoop M R. S., 2010).

Chronic pain, the pain is defined as "unpleasant sensoric and emotional experience which associates

with acute or potential damage of an tissue" and becomes chronic when it continues to exist after usual treatment and passes the time that belongs to acute phase of illness or injury (in general 3-6 months) (Twomey LT, 1987) (H Merkey, 1994) (Merkey, 2011). The chronic pain is a phenomenon that includes biological, psychological, social and cultural aspect (Kristina Janzen, 2016).

The studies show that patients with pain have more affinity to be affected by chronic problems of depression and anxiety. Often it is said that we should be careful during diagnostics and treatment of these illnesses. The next researches should be concentrated on modalities of treatment of these phenomenon with the joint pain in general.(Marloes Gerrits, 2012).

Anxiety is a general feeling in relation to a possible risk, that prepares the body to undertake back reaction. Normal anxiety is a mechanism of adaptation while pathological anxiety is characterized by excessive level of anxiety and damage of general functioning of an individual. The symptoms of anxiety are not diagnose, they are symptoms of many mental disorders and symptoms of many different general medicine illnesses (Lala, 2016).

The patients that were diagnosed as sick from low back pain or at risk to gain this illness are more mentally upset people comparing to population in general. Description of the signs of anxiety or other mental problems are more expressed in persons suffering from low back pain comparing to other population in general. (J, 2015)

The patients with anxiety disorders who come for a checkup in the primary health care service, have a high level of co-morbidity with physical medical illnesses. (Lala, 2016).

It is important that some researchers have found that anxiety can appear together with inflammatory processes in the organism no matter depression and neuroticism, and this explains in the best way the specific influence of relationship between emotions and biological response of the organism. (Aoife O Donovan, 2010)

The new studies present that the anxiety is expressed together with appearance of chronic pain and they suggest that the patients with chronic pain should be estimated – tested with tests for anxiety because it is caused by low back pain (Steilen, 2016). An American study of the patients with chronic body pain that reported at primary health care service confirmed that almost half of the patients, 45% of them, fulfilled the criteria of one or more disorders of anxiety (Kroenke K, 2013).

Connection of low back pain was very often presented with mental illnesses as it is anxiety and according to authors it presents key factor for the low back pain (Karp, 2016). Psychological profile at patient with low back pain is a very important part as an indicator in therapy of spine illnesses. (Lai C, 2007).

Material and Methods

The research was conducted in Physiotherapy Institute of Occupational Medicine (IOM) in Obiliq, Kosovo, during the period of one year, from January 2016 until the end of December 2016.

The research was long-term and prospective.

63 patients, diagnosed with the acute and chronic low back pain, participated in this research. All of them were treated with physical therapy, depending on examination and findings on patient.

All the patients who reported for treatment with physiotherapy in the IOM were diagnosed with the acute and chronic low back pain and were involved in the research.

The patients were first explained the reason of the research and the procedures that will be followed in order to use these data for the scientific reasons, and the ones who admitted to be a part of this research have signed the information template and the consent of involved person in the research. General data as, personal data of the patients are the initials of the name and last name, diagnose, date of birth, working experience, occupation, level of education, duration of illness, forced working position, if the pain is located along the leg, which leg, dominant side, were collected from the anamnesis of the patient. The patients were examined for the anxiety in the Psychiatric service within the IOM. The questionnaire Test Anxiety Inventory (TAI) was used in relation to the their personal assessment how they felt in general. TAI test was developed by Spielberger (1980)(Spielberger C. D., 1980). The pain was measured with Visual Analog Scale (VAS), when starting with application of physiotherapy and after completing the first sessions for that patient. VAS was used in the manner of vertical vector with the height of 100 mm described with words the highest peak as the highest level of the pain and the lowest level as the level without pain or 0 pain. Physiotherapy was applied at patients on individual basis at each patient in

adopted manner depending on the needs and findings, it was based with the intention of managing the pain, increase of movement amplitude, increasing the force and flexibility of muscles, education of the patient for the prevention of repetition and techniques of raising balance in low back pain. Depending on diagnose the physiotherapy was applied. The number of sessions of physiotherapy was determined by physiotherapist in cooperation with the patient. The number of session ranged from ? to ?. The physiotherapy was based depending on diagnose. In all diagnosis the aim of physiotherapy was achievement of performance of the patient to the best possible state without pain and without obstacles in all daily life activities.

The license for research was approved by the management of the IOM and afterwards Committee (board) for professional ethics at Ministry of Health of Kosovo in 2016, the license holds following number 04/2016 date 19.04.2016.

Selection criteria

To be considered for the study, patients had to have low. If the patients had undefined low back pain or had differential diagnosis, if they were pregnant, if they were not considered to be part of this study. Patients who low back pain, who reported for physiotherapy at OMI and the ones who signed to be a part of research were included in the study. Patie

Criteria to be excluded from the research

- The patients who had undefined low back pain or with differential diagnose.
- Pregnant woman,
- Illnesses of cardiac non-stability
- Vertebral fractures,
- Lumbar Arthrodesis or lumbosacral.
- Methods for statistical data processing,

For variables that in measurable intervals are compatible there will be set.

Basic statistical parameters arithmetic mean (X), standard deviation (SD), variability coefficient (V), minimal result (MIN), maximum result (MAX) ;

- Assimetry skewness of result distribution
- Extension, repsectively - kurtosis of result distribution;
- Method Kollmogorov-Smirnov for testing normality of distribution of results (KS)
- In remaining variables following will be applied:
- frequency;
- percentage (%);

The data will be processed with statistical packages SPSS for Windows Version 22.0 and STATISTICA for Windows Version 10.0.

Results

Table 1.Descriptive statistic and normality of distribution on variables of whole sample

Variables	N	Mini	Max	Mean	SD	CV	s.e.	Skewn	Kurtos
ITS	63	30,00	66,00	44,70	9,56	21,38	1,20	0,56	-0,64
Pain beginning treatment	63	3,00	10,00	7,65	1,81	23,61	0,23	-0,19	-0,86
Session therapy	63	5,00	21,00	10,76	3,05	28,36	0,38	1,36	3,12
Pain end treatment	63	0,00	6,00	2,14	1,78	82,91	0,22	0,37	-1,02
ITS	63	30,00	66,00	44,70	9,56	21,38	1,20	0,56	-0,64

Table 2.

	ANXIETY			Total
	NORMAL	ANXIETY	HIGH LEVEL OF ANXIETY	
HERNIATED DISC	5	2	0	7
	71,4%	28,6%	0,0%	100,0%
LUMBOISCHIALGIA	19	22	6	47
	40,4%	46,8%	12,8%	100,0%
CHRONIC SYNDROMELUMBAR	4	5	0	9
	44,4%	55,6%	0,0%	100,0%
Total	28	29	6	63
	44,4%	46,0%	9,5%	100,0%
$\chi^2 = 4.00 p=.405$				

In table 2 is presented cooperation of level of anxiety and diagnosis of low back pain. With χ^2 test we didn't find any statistically significance.

Table 3.

	Frequency	%
NORMAL	28	44,4
ANXIETY	29,00	46,0
HIGH LEVEL OF ANXIETY	6,00	9,5
Total	63,00	100

In table 3 is presented frequency of anxiety at patients with low back pain. It is important to specified that 46% of them are qualified with Anxiety with TAI test.

Table 4.

	N	Mean	SD	F	sig
NORMAL	28	10,93	2,39	5.08	**.009**
ANXIETY	29	9,93	2,84		
HIGH LEVEL OF ANXIETY	6	14,00	4,77		

With the aim to establish whether the number of therapies is related with anxiety, one-factorial analysis of variance was applied. The results of the analysis of variance are shown in the table 4. By reviewing the table it can be seen that uni-variance statistical significant differences were established within the number of therapies and level of anxiety. (F=5.08; p=0,000).

Table. 5.

(I) ANXIETY		MeanDifference (I-J)	Std.Error	Sig.	95% Confidence Interval	
					LowerBound	UpperBound
NORMAL	ANXIETY	,99754	,76002	,194	-,5227	2,5178
	HIGH LEVEL OF ANXIETY	-3,07143)*	1,29047	,021	-5,6528	-,4901
ANXIETY	NORMAL	-,99754	,76002	,194	-2,5178	,5227
	HIGH LEVEL OF ANXIETY	-4,06897)*	1,28654	,002	-6,6424	-1,4955
HIGH LEVEL OF ANXIETY	NORMAL	3,07143*	1,29047	,021	,4901	5,6528
	ANXIETY	4,06897*	1,28654	,002	1,4955	6,6424

With the aim to get additional information, the test post hoc test was applied (LSD-test) table 5. Based on the gained results from the test it can be seen that a group of respondents which was classified as

HIGH LEVEL OF ANXIETY statistically significantly differs in average number of therapies comparing to group defined as NORMAL and ANXIETY. Among the groups NORMA and ANXIETY no statistically significant differences were established in average number of therapies. In the group classified as HIGH LEVEL OF ANXIETY the average number of therapies is higher comparing to the group classified as NORMAL and ANXIETY.

Table 6.

	N	Mean	SD	F	Sig
Pain beginning treatment					
NORMAL	28	7,96	1,77	.764	0.470
ANXIETY	29	7,38	1,92		
HIGH LEVEL OF ANXIETY	6	7,50	1,38		
Total	63	7,65	1,81		
Pain end of treatment					
NORMAL	28	1,11	1,17	15.792	0.000
ANXIETY	29	2,69	1,71		
HIGH LEVEL OF ANXIETY	6	4,33	1,37		
Total	63	2,14	1,78		

With the aim to determine whether the level of anxiety affects the intensity of pain in patients before and after physiotherapy treatment there was applied one-factorial analysis on variance. In the table 6 it can be seen that before the treatment there were not established statistically significant differences on level of anxiety and intensity of pain. In the table x it can be seen that after treatment there were established significant statistical uni-variance differences on variable intensity of pain. (F=15.792; p=0,000).

Discussion

Trend and tendency in treatment of pathologies requires multidisciplinary approach, Kamper SJ, et al. the cases when treatment of low back pain fails due to uncoordinated approach between health professionals, hence conservative treatment fails as well. They recommend multidisciplinary approach for adequate rehabilitation of problems with the low back pain(Steven J Kamper, 2014).Low back pain is a heterogenous condition, their treatment may give significant improvement results, whereas the similar clinical syndromes will be determined as appropriate treatment guideless. (Hamilton Hall, 2009).

Low back pain is one of the leading causes of limitations of daily activities (disabilities), in comparison to other **conditions**. With the aging population, the importance of urgent research becomes more apparent in order to have an approach for the low back pain in various directions (Damian Hoy, 2014).

The anxiety influences the treatment of the patients with low back pain, according to William ShaW the conclusion is that based on the consistency of the study with valid measurements they represent the consistent data that psychological anxiety is increased in acute low back pain(William Shaw, 2016).These data are presented by Gatchel R, et al. where the conclusion is that psychosocial disability factors are linked to employee's injuries, injuries that influence the onset of low back pain (Robert Gatchel, 1995).

Karp J, et al. in their paper they present the need of testing with specific tests for each patient with low back pain, given that the early link based on records must be placed in daily routine of application of these anxiety tests (Jordan F Karp, 2016).The same information is shown in our results where anxiety was present in patients with low back pain , the level of pain was visibly higher in the end of physiotherapy treatment, in addition to those whose level of anxiety was normal , the level of pain was much lower in the end of physiotherapy treatment for this pathology.

(Silje Endresen Reme, 2011)reached the conclusion that 31% of the population that have low back pain complaints fulfill the criteria that they had at least once psychological disorder during the diagnostic examination. Whereas our results show that only 44,4% (according to TAI testing for anxiety)give the normal condition results, while 46.0 % as anxiety level and 9.5% as high level of anxiety. Thatjana O'Trocoli et al presents similar results to ours, out of all examined patients 41.5 % present condition without anxiety (normal), 24.6% present level of anxiety and differently from us they present the information that 33.9% present with high level of anxiety (Thatjana O'Trocoli, 2015). In their paper Gerrits Marloes et al. prove that patients with chronic pain are more prone to depression and anxiety

problems(Marloes Gerrits, 2012).Aoife O'Donovan et al. in their paper present the effect of anxiety on inflammatory process and reach the conclusion that the anxiety influences inflammatory activity and envisages the pathway through which anxiety increases the risk for inflammatory diseases (Aoife O Donovan, 2010), where acute low back pain is associated with inflammation of surrounding tissue.

On the opposite, Kristina Janzen et al. in their paper cannot prove the influence of anxiety on low back pain, so they present that anxiety does not have any influence on low back pain(Kristina Janzen, 2016).

We have proven that the patients that have normal level of anxiety (NORMAL) show statistically lower values of pain intensity in comparison to the patients that have anxiety or high level of anxiety. Also, the interviewees with anxiety show lower statistical values of pain intensity in comparison to the interviewees that have high level of anxiety.

The rehabilitation process was easier in the patients with the level of anxiety, during their testing, with normal values, in addition to those with increased level of anxiety. Our main hypothesis is proven in our results that anxiety influences the rehabilitation of patients with low back pain.

MareikeR in their research come to conclusion that based on their results the idea that psychological aspect of terminating employment contracts due to stress presents high risk of developing the diseases and influences health must be supported(Mareike Reimann, 2017).

Conclusion

Anxiety influences the rehabilitation of low back pain, the patients who suffer from low back pain and have psychological problems such as anxiety, their level of pain prior and following the physiotherapy treatment remains without significant difference.

The patients who had positive signs of anxiety disorder, the level of pain description was much higher in comparison to other patients even following the treatment for relieving the pain

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CRISIS MANAGEMENT FACTORS DEPENDING ON THE TYPES OF SPORTS

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Abstract

The clubs confirming their crisis situation when it comes to the result dependent upon the management system participated in this research, since it is necessary for the analysis of this type of research. The sample of respondents consists of clubs from the domain of team sports in Bosnia and Herzegovina. During the research, a questionnaire was used as the research instrument for conducting a survey in the clubs. The questionnaire consisted of a test battery used in this research, which gives the answer to the state of crisis management in sports clubs. Learning from crisis situations prevents the emergence of the same mistakes, and the risk of a new crisis is reduced to a minimum. The research results have shown the factual state of crisis management in sports clubs. It should be pointed out that the situation in the clubs provided us with an image of the management system when it comes to crisis situations in the clubs.

Keywords: *management, sports, crisis.*

Introduction

Managing crisis situations is highly complex and responsible, encompassing different tasks depending on the activities and the area of operations pertaining to an individual legal entity, enterprise or a unit of local and regional, as well as state administration. That is why it is very important to establish a protection system that prevents the emergence of crises, increases resilience to actions and raises the level of ability to eliminate consequences and recuperate. A good knowledge on the process of contingency crises and the ability to manage the protection system is the fundamental task of crisis management. A crisis is an unplanned and unwanted period in business activities with a limited duration and ambivalent outcome. According to existential goals we can refer to liquidity crisis, performance crisis, and strategic crisis. Crisis management is a process encompassing three stages: preventive management, identification, and reactive crisis management.

Crisis (from the Greek krisis) stands for a disruption, a transient, difficult state in every natural, social and thought process. In ancient Greece, the word "crisis" signified a "decision". The very essence of crisis is a decision that has not yet been made, but has to be. In modern days, a crisis primarily signifies a differentiation or the ability to differentiate, a choice, judgement, decision, as well as an exit, a conflict resolution. In business economy, a crisis marks a state calling into question the survival of the enterprise, a state where its existence is jeopardised. That is why not all undesirable problems can be marked as a business crises. A business crisis is most often defined as "an unplanned and unwanted process marked by limited duration and possibility of influence, harmful to primary business objectives, with ambivalent outcomes." Changes are imminent, whether they represent danger, a risk, a crisis situation or they become a challenge and an opportunity to succeed.

The feature of management as "an art of getting things done through people" leaves an impression of severity and insensitivity, especially if we shed a light on the significance of a universal principle stating that the purpose is not in managing people, but things. It is important to balance the work done by people with the interests of the organisation, i.e. the society. Management marks a process of planning, organising, coordinating and controlling the activities and resources of an organisation with the purpose of achieving the goals of the enterprise.

An integral part of crisis management is also a formal analysis of what has been done properly, and what has not, as well as what could be done better. And, of course, everything deduced from the crisis management analysis should be used in order to enhance and improve the elements of plans for managing crisis situations.

Identifying and recognising the existence of a problem in business activities is the first step towards facing a crisis. A timely reaction can save the enterprise's business, and neglecting and denying poor

results only worsens the situation and leads deeper into crisis. There is a large number of indicators that point towards the possibility of a drop in business, identify the location where the problem arose, and thus help managers in making decisions that will pull the enterprise out of crisis situations. In order to effectively manage a crisis or stop it in inception, it is necessary to recognise its symptoms on time.

Research Methods

The researched clubs are those confirming their crisis situation when it comes to the result dependent upon the management system, since it is necessary for the analysis of this type of research.

The sample of respondents

- Clubs from the domain of team sports in Bosnia and Herzegovina

The sample variables

During the research, a questionnaire was used as the research instrument for conducting a survey in the clubs. The questionnaire consisted of a test battery used in this research, which gives the answer to the state of crisis management in sports clubs.

Methods of data processing:

Data processing was conducted in the SPSS programme with descriptive and comparative statistics being used for the obtained data. A Kruskal–Wallis test was used to determine the differences between the groups, which are, according to the criteria, comprised of the sample of respondents divided into multiple groups.

Research Results

The differences in parameters for crisis management depending on the types of sports

Table 1 shows the difference in nine applied variables representing the parameters for crisis management in relation to the type of the club, divided into four groups (the first group - basketball, the second group - football, the third group - handball, the fourth group - volleyball). The results show that there are no statistically significant differences in the nine factors.

Table 1.

Questions	Chi-Square	Df	Asymp. Sig.
Do the employees trust the club's management?	1.728	3	.631
Has a team in charge of "pulling the club out of a crisis", if one occurs, been established?	.486	3	.922
Has an overall programme of activities for solving crisis situations been proposed?	1.427	3	.699
Has an overall analysis of the cause for the emergence of the crisis been conducted?	1.537	3	.674
Have teams for the improvement of business activities in certain areas of operations been formed?	.728	3	.867
Have all the necessary requirements for solving a crisis been determined?	.722	3	.868
Have the necessary external consultants, professionals, experts, etc. for solving specific tasks been found and commissioned?	4.184	3	.242
Does the management familiarise and engage all available potentials in the club to solve a crisis situation?	3.521	3	.318
Have deadlines for overcoming a crisis been determined?	2.121	3	.548

a Kruskal-Wallis Test
b Grouping Variable: GROUPS

Table 2 shows the results obtained for the groups (the first group - basketball, the second group - football, the third group - handball, the fourth group - volleyball). Based upon the results from Table 1 where the results show that there are no statistically significant differences in the nine factors, upon which the average value of results has been made, it is not significant which group has the advantage.

Table 2.

Ranks			
GROUPS		N	Mean Rank
1. Do the employees trust the club's management?	1	3	4.67
	2	3	8.17
	3	3	6.00
	4	3	7.17
	Total	12	
2. Has a team in charge of "pulling the club out of a crisis", if one occurs, been established?	1	3	6.67
	2	3	6.17
	3	3	7.50
	4	3	5.67
	Total	12	
3. Has an overall programme of activities for solving crisis situations been proposed?	1	3	4.67
	2	3	8.00
	3	3	6.67
	4	3	6.67
	Total	12	
4. Has an overall analysis of the cause for the emergence of the crisis been conducted?	1	3	6.67
	2	3	7.83
	3	3	4.50
	4	3	7.00
	Total	12	
5. Have teams for the improvement of business activities in certain areas of operations been formed?	1	3	6.67
	2	3	5.83
	3	3	7.83
	4	3	5.67
	Total	12	
6. Have all the necessary requirements for solving a crisis been determined?	1	3	6.17
	2	3	7.00
	3	3	7.50
	4	3	5.33
	Total	12	
7. Have the necessary external consultants, professionals, experts, etc. for solving specific tasks been found and commissioned?	1	3	7.67
	2	3	9.17
	3	3	5.00
	4	3	4.17
	Total	12	
8. Does the management familiarise and engage all available potentials in the club to solve a crisis situation?	1	3	7.50
	2	3	7.33
	3	3	3.67
	4	3	7.50
	Total	12	
9. Have deadlines for overcoming a crisis been determined?	1	3	4.33
	2	3	7.17
	3	3	6.17
	4	3	8.33
	Total	12	

Table 3 shows the difference in eight applied variables representing the parameters for crisis management in relation to the type of the club, divided into four groups (the first group - basketball, the

second group - football, the third group - handball, the fourth group - volleyball). The results show that there are no statistically significant differences in the eight factors.

Table 3.

Questions	Chi-Square	Df	Asymp. Sig.
Do managers meet often in order to find ways for solving a crisis?	3.623	3	.305
Does the club have all the possible internal reserves?	.084	3	.994
Does the management submit reports on the current condition in the club and the undertaken activities to the employees?	.328	3	.955
Has discipline in the workplace grown after the appearance of a crisis?	3.289	3	.349
Are the management's activities in a crisis situation mostly directed toward getting help from the region?	1.658	3	.646
Is the existing management responsible for the emerging crisis?	3.634	3	.304
Is there an increase of informal groups upon the appearance of a crisis?	4.889	3	.180
Does mutual blame appear among managers?	3.184	3	.364

a Kruskal-Wallis Test
b Grouping Variable: GROUPS

Table 4.

Ranks			
GROUPS		N	Mean Rank
1. Do managers meet often in order to find ways for solving a crisis?	1	3	9.33
	2	3	6.83
	3	3	5.50
	4	3	4.33
	Total	12	
2. Does the club have all the possible internal reserves?	1	3	6.67
	2	3	6.67
	3	3	6.67
	4	3	6.00
	Total	12	
3. Does the management submit reports on the current condition in the club and the undertaken activities to the employees?	1	3	6.00
	2	3	6.00
	3	3	6.67
	4	3	7.33
	Total	12	
4. Has discipline in the workplace grown after the appearance of a crisis?	1	3	6.33
	2	3	9.50
	3	3	5.00
	4	3	5.17
	Total	12	
5. Are the management's activities in a crisis situation mostly directed toward getting help from the region?	1	3	7.67
	2	3	6.50
	3	3	7.33
	4	3	4.50
	Total	12	
6. Is the existing management responsible for the emerging crisis?	1	3	7.00
	2	3	3.67
	3	3	8.50
	4	3	6.83
	Total	12	
7. Is there an increase of informal groups upon the appearance of a crisis?	1	3	3.83
	2	3	5.17
	3	3	8.50
	4	3	8.50
	Total	12	
8. Does mutual blame appear among managers?	1	3	7.00
	2	3	9.00
	3	3	5.00
	4	3	5.00
	Total	12	

Table 4 shows the results obtained for the groups (the first group - basketball, the second group - football, the third group - handball, the fourth group - volleyball). Based upon the results from Table 3 where the results show that there are no statistically significant differences in the eight factors, upon which the average value of results has been made, it is not significant which group has the advantage.

Table 5 shows the difference in six applied variables representing the parameters for crisis management in relation to the type of the club, divided into four groups (the first group - basketball, the second group - football, the third group - handball, the fourth group - volleyball). The results show that there are no statistically significant differences in the six factors.

Table 5.

Questions	Chi-Square	Df	Asymp. Sig.
Do negative stories and rumours regarding the club's management "circulate" in the club and the surroundings?	3.623	3	.305
Is there a sombre and anxious atmosphere in the club?	.084	3	.994
Is there an increase in the managers' salaries, especially the lead managers' salaries, during a crisis?	.328	3	.955
Do more managers withdraw during a crisis?	3.289	3	.349
Do more professional and capable non-managerial employees withdraw during a crisis?	1.658	3	.646
Are there any dismissals of employees from the club during the process of solving a crisis?	3.634	3	.304

a Kruskal-Wallis Test
b Grouping Variable: GROUPS

Table 6.

Ranks			
GROUPS		N	Mean Rank
1. Do negative stories and rumours regarding the club's management "circulate" in the club and the surroundings?	1	3	7.50
	2	3	8.67
	3	3	6.00
	4	3	3.83
	Total	12	
2. Is there a sombre and anxious atmosphere in the club?	1	3	7.00
	2	3	8.67
	3	3	5.00
	4	3	5.33
	Total	12	
3. Is there an increase in the managers' salaries, especially the lead managers' salaries, during a crisis?	1	3	7.17
	2	3	7.17
	3	3	5.83
	4	3	5.83
	Total	12	
4. Do more managers withdraw during a crisis?	1	3	5.00
	2	3	7.67
	3	3	4.67
	4	3	8.67
	Total	12	
5. Do more professional and capable non-managerial employees withdraw during a crisis?	1	3	5.33
	2	3	8.00
	3	3	5.83
	4	3	6.83
	Total	12	
6. Are there any dismissals of employees from the club during the process of solving a crisis?	1	3	4.83
	2	3	5.17
	3	3	7.50
	4	3	8.50
	Total	12	

Table 6 shows the results obtained for the groups (the first group - basketball, the second group - football, the third group - handball, the fourth group - volleyball). Based upon the results from Table 5

where the results show that there are no statistically significant differences in the six factors, upon which the average value of results has been made, it is not significant which group has the advantage.

Conclusion

The clubs confirming their crisis situation when it comes to the result dependent upon the management system participated in this research, since it is necessary for the analysis of this type of research. The sample of respondents consists of clubs from the domain of team sports (football, basketball, handball, volleyball) in Bosnia and Herzegovina. During the research, a questionnaire was used as the research instrument for conducting a survey in the clubs. The questionnaire consisted of a test battery used in this research, which gives the answer to the state of crisis management in sports clubs. We have obtained the state of crisis management depending on the type of the club and found out if there are any statistical differences in crisis management in relation to the type of the club. The results show that there are no differences in the factors when it comes to the types of sports (football, basketball, handball, volleyball). The conclusions made by analysing the business crisis strengthen the enterprise, giving it new knowledge gained through experience. Learning from crisis situations prevents the emergence of the same mistakes and the risk of a new crisis is reduced to a minimum. The research results have shown the factual state of crisis management in sports clubs.

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MEASURE CHARACTERISTICS OF PRECISION TESTS WITH TOP BASKETBALL PLAYERS FROM KOSOVO

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Abstract

The paper presents the basic results from three applied tests of examining precision with basketball players. The results obtained from the items of the tests provide the basic statistics parameters together with the measure characteristics of the tests, as it is presented. A satisfactory homogeneity and high coefficients of validity and reliability are determined for the three tests. The obtained results should be treated as preliminary results from the conducted pilot investigation.

Key words: *homogeneity, validity, reliability, motor tests.*

Introduction

Precision as a motoric ability is of a particular importance in achieving better sports results (Stanković, Joksimović, Raković, Michailov, & Piršl, 2009 and Pojskić, Šeparović, & Užičanin, 2011). And with regard to basketball players it is even more important. A considerable number of the latest investigations suggest that the improvement of man's movement activities is closely related to the improvement of his/her precision.

The goal of the research is to determine measure characteristics of the three applied tests for assessing the precision with the top basketball players at the age of 18 from the Republic of Kosovo.

According to the research the following tasks are aimed:

1. To assess the basic results for each of the applied tests and each item;
2. Defining the homogeneity, validity and reliability as measure characteristics;
3. Recommendations of the completed research.

Methods

The research is conducted within the period of April-May 2017 year on 34 basketball players, who compete for junior category. In order to obtain the necessary results we applied the method of testing. Three precision tests after Metikoš and collaborators (1989) were applied: 'hitting with aluminum long stick' (PLS), 'hitting a target on a wall with the internal part of the foot' (PTF) and 'hitting with aluminum short stick' (PSS).

Three items were used for each of the tests (Safrid, & Wood, 1989; Thomas, Nelson, & Silverman, 2005; Vincent, 2005). The obtained data is processed with IBS SPSS Statistics 20, and the following were calculated:

1. Basic statistical methods:
   - Minimal result (Min)
   - Maximal result (Max)
   - Arithmetical mean (Mean)
   - Standard deviation (StdDev)
   - Skewness (Skew)
   - Kurtosis (Kurt), and
   - Kolmogorov-Smirnof's test (KS)
2. Factor analysis:
   - Principal component analysis
   - Communality (Com)
   - Main component (Lambda)
   - Percent (%), and

- Normal varimax rotation (Varimax).

3. Measure characteristics:
   - First main component (H)
   - Communality (Com)
   - Main component (Lambda)
   - Percent (%)
   - Coefficient of representation (MSA)
   - Square multiple correlation (SMC)
   - Inter-item correlation (IIC)
   - Cronbach alfa coefficient (α)
   - Spearman-Brown coefficient of reliability (SB).

Results

According to the basic statistical parameters of the precision tests (table 1), similar values can be noticed with regard to the minimal (Min) and maximal (Max) results between the three repetitions in each test. The values of arithmetic means (Mean) between the three repetitions are quite similar. That indicates a certain level of adaptation of respondents while performing the motoric tests of precision.

Values of the standard deviation (Std Dev) are less than 1/3 of the arithmetic mean. It indicates an explicit homogeneity, namely, the achieved results are grouped around the value of the arithmetic mean.

Values of skewness on the peak of the curve (Skew) are explicitly less than +1, which indicates that Gauss curve is not significantly asymmetrical.

Values of kurtosis on the peak of the curve (Kurt) indicate an insignificant variety of the obtained results, which suggests that the sample of respondents – the basketball players, is explicitly homogeneous with regard to the data obtained from the three applied tests of precision.

According to Kolmogorov-Smirnoff's tests (KS) we can say that the three test bear distinction of a normal distribution.

According to Hotelling's analysis of the main components, and with the application of Guttman-Kaiser's criteria (table 2) three significant components, that explain about 86% of the total variability, are isolated. According to the results obtained from the normal varimax rotation, the first component is defined with the high projections of test 'hitting with aluminum long stick' (PLS); the second component is defined with the high projections of test 'hitting a target on a wall with the internal part of the foot' (PTF); and the third component is defined with the high projections of test 'hitting with aluminum short stick' (PSS).

In Table 3 the measure characteristics of the three applied precision tests are presented. The posted results indicate that in each test individually the three applied tests have a unique subject of measuring. That represents a reliable validity of the applied tests.

The values of the coefficient of representation (MSA) are satisfying; whereas the low limit of variability (SMC), correlation between the items (IIC), as well as the coefficient of reliability Cronbach alpha (α) and Spearman-Brown coefficient of reliability (SB) have higher values with 'hitting with aluminum long stick' (PLS) and 'hitting with aluminum short stick' (PSS), but with test 'hitting a target on a wall with the internal part of the foot' (PTF) they are of lower values.

Table 1. Basic descriptive parameters

	Min	Max	Mean	StdDev	Skew	Kurt	KS
PLS1	17	39	25,46	3,486	,680	1,206	
PLS2	20	36	25,44	3,150	,774	,801	
PLS3	20	38	25,56	3,101	,994	1,429	
PTF1	6	22	15,25	3,444	-,391	-,188	
PTF2	9	25	16,35	3,526	-,106	-,524	
PTF3	9	25	16,60	3,616	-,066	-,342	
PSS1	12	22	17,09	1,897	,236	-,120	
PSS2	13	21	17,50	1,654	,052	-,328	
PSS3	14	21	17,78	1,475	,133	-,427	

Table 2. Principal Component Analysis and Normal Varimax Rotation

	Principal Component Analysis						Varimax		
	H1	H2	H3	Com	Lambda	%	V1	V2	V3
PLS1	,628	-,630	,303	,883	3,756	41,735	**,933**	,097	,050
PLS2	,678	-,614	,260	,904	2,269	25,211	**,934**	,165	,063
PLS3	,628	-,643	,295	,894	1,754	19,488	**,939**	,102	,037
PTF1	,662	,152	-,620	,846	,172	1,915	,041	**,913**	,098
PTF2	,768	,104	-,573	,929	,135	1,500	,155	**,941**	,144
PTF3	,739	,071	-,525	,826	,102	1,139	,179	**,881**	,133
PSS1	,509	,615	,406	,802	,329	3,659	,001	,101	**,890**
PSS2	,540	,576	,471	,845	,277	3,076	,071	,066	**,914**
PSS3	,619	,578	,364	,850	,205	2,277	,076	,198	**,897**

Table 3. Measure Characteristics

	H	Com	λ	%	MSA	SMC	IIC	α	SB
PLS1	,928	,880	**2,679**	**89,303**	,800	,744			
PLS2	,954	,903	,179	5,978	,745	,787	,850	,948	,960
PLS3	,942	,893	,142	4,718	,764	,773			
PTF1	,903	,837	**2,590**	**86,342**	,731	,717			
PTF2	,954	,927	,300	9,997	,624	,833	,796	,922	,924
PTF3	,902	,822	,110	3,661	,743	,699			
PSS1	,883	,794	**2,484**	**82,810**	,798	,583			
PSS2	,907	,838	,300	9,988	,728	,660	,743	,890	,892
PSS3	,911	,842	,216	7,202	,719	,670			

Conclusion

In order to reach the goal and tasks of the research, a sample of 34 respondents – basketball players, aged 18 from the Republic of Kosovo was used.

They were treated with three motoric tests for assessing the precision, which were repeated three times each.

Validity of the tests was established by Hotelling's approach, and the main components were isolated with Guttman-Kaiser's criterion.

According to the defined measure characteristics of the motoric tests applied with the respondents, we can conclude that they bear distinction of satisfying measure characteristics and are recommended to be put to use.

In addition, the research, being a pilot investigation for the Republic of Kosovo, gives space and opportunity for similar investigations with a bigger sample of respondents (athletes) and an application of motoric tests.

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AGRESSION AND DINAMICS IN TENNIS - FOREHAND

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Abstract:
The aggression and the fast development of the points is a specific feature of a particular types of players. They tent to reduce the time for reaction of their opponents and in the same time to reduce the number of the shots played. In our survey we have studied 20 players from the world ranking, who have powerful forehands and hit more than 50 % of the shots from 0 to 1 meter from the baseline. Based on the study we were able to define the average speed of their forehands and to track the reaction time of their opponents, when the players subject of the study are playing from different areas of the court and are seeking different directions.

Key Words: *tennis, forehand, speed, reaction*

Introduction

Aggression - this word is increasingly used in tennis in recent years. There are lots of discussions about the benefits and risks of applying this kind of tactics in matches. First of all, this is a style practiced by high players (over 190 centimeters) who have a powerful service and are seeking for quick conclusion of the points, but now we can also talk about aggression, practiced by shorter men as well as by women. In recent years we observe that even in women's tennis their physics has a significant impact on their performance. In addition to the physical skills, it is worth noting the development of the technology, which also has its influence on tennis. Since the early 1990s the development of the tennis racket has been significant. Carbon, graphite, Kevlar, nanotechnology are only part of the innovations introduced. The size of the racket's head, the width of the profile, the different balance allocation on the tennis racket have their influence as well. Equally important for the development of the aggressive tennis are the string, which are produced based on the latest technologies, so that their quality is as effective as possible. Recently a hybrid stringing of the racket is used in order for the players to achieve better indicators. Increasingly, tennis players develop their skills and seek ways to improve their ability to be aggressive in their tactical and gameplay components. Until 15 years ago, there were individual types of players whose style of play was designed for a particular type of surface (hard, grass, clay), but that did not gave them the opportunity to advance in the rankings.This is due to the fact that the tennis players are constantly traveling and the tennis court flooring is different so that in order to be among the first in the rankings they have to improve both their protective game and aggression on the faster tennis court floorings, as well as to adapt them depending on the opponent. It is increasingly observed that in long matches the tennis players try to shorten the duration of the points and if they do not have the opportunity to enter the court and to achieve a point of contact with the ball in its upward movement, it is impossible to reduce the time played. Something very important for all these players is that they perform the forehand at that speed when they are on the move, not only when they are in a comfortable position, close to the ball but also when they are away from it. This often helps them to get out of tough situations and to turn the course of the play with only one powerful shot.

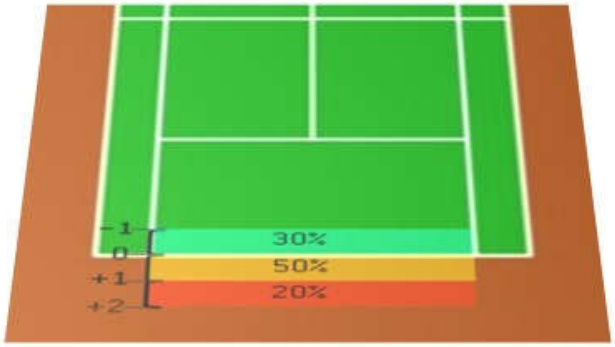
Being aggressive does not just mean hitting shots with more power, but also getting closer to the base line, picking up the ball on her ascending line, going to the net, applying proper tactics, and more.

Service is a major component that many players benefit tremendous and earn "easy" points. Interesting statistics is the example with Nick Kyrgios during the Australian Open. 62% of a good first serve, the opponents can not return, and in the first three rounds, his first serve score was 70%. This speaks of a huge number of points during which he does not have to make a shot other than the service. Another shot, which brings a high percentage of points won by applying aggression even from difficult positions is the forehand. Over 95% of the times by scoring the forehand is more successful than the backhand. That's why in our study we wanted to check the speed of the forehand of the aggressive players in male professional tennis, and what kind of benefits this style of play can bring.

Material & methods

In our study, we had to determine which players play an aggressive style and after the reviewed literature we came to the conclusion that players who perform more than 50% of the shots between the baseline and a meter behind it are the aggressive once. Other such indicators are - 30% of the shots to be perform inside the court - inward from the baseline and 20% from 1st to 2nd meter behind the baseline (Figure 1). These indicators are observed only for one season and do not form their entire career.

Figure 1 - Percentage of contact with the tennis ball in tennis



Based on this indicator we have separated 20 tennis players from the top 100 of the men's rankings by studding their average forehand speed and the time of reaction of their opponents in the different areas in which they play. The data in our study is taken by the Association of Professional Tennis Players.

Results

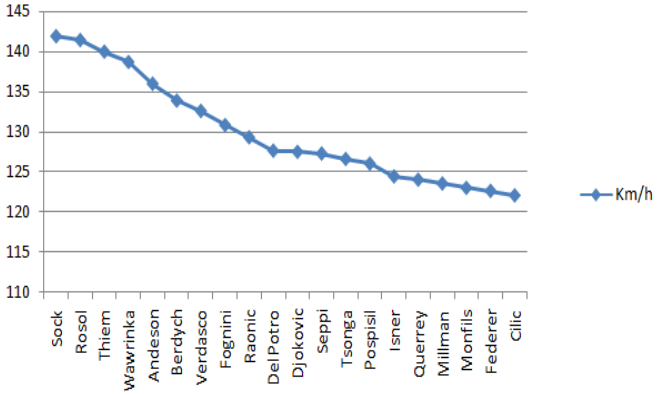
When examining the results, it should be highlighted that the tactical plan of these 20 tennis players during the survey period is mainly the aggressive one. If observed separately there were also matches where tennis players did not cover the 50-30-20 factors, but the statistically calculated averaged figures fit into our criteria. The survey included 1054 matches of these 20 tennis players in the 2017 season.

We must also list some other aspects of the tactical methods that are used by the surveyed individuals in order for them to apply their aggressive style of play. These are:

- Targeting the services diagonally to open the court;
- Seek depth of their shots in order to force the opponents backwards, so that they can enter the court in front of the baseline and reduce the reaction time for the opponent's next shot
- Often play diagonals to open the court
- Often enter the court by the second serve of the opponent
- Hitting the ball in the opponent's body with a powerful shot when their opponent attacks the net

The average speed of the players' forehand was 129.96 km / h. The maximum arithmetic average speed was 141.96 km / h and was achieved by Jack Sock. This is an extremely high speed which is actually close to the average speed of performing a second serve in men's tennis - 153.27 km / h. Table 1 shows the arithmetic average speed of the performed by the studied players forehand.

Table 1 - Arithmetic average speed of the forehand



The table shows that all surveyed players maintain an average forehand speed above 120 km / h. Cilic has an average of 122.03 km / h, which is 19.91 km / h. less than the maintained speed level of Sock. Basically, this is due to the fact that Chilich has played 8 matches more and the main difference is in the clay flooring, where Chilich has played 10 more matches and the speed of the ball on such type of flooring is much slower by all types of shots. Table 2 shows the results of the reaction time of the opponents if they play against the surveyed players.

Table 2 - Reaction time by forehand (in seconds)

Player/Zone	-1	0	+1	+2	Diagonal (0)
Sock	0,58	0,60	0,63	0,65	0,61
Cilic	0,67	0,70	0,73	0,76	0,71
Average	0,63	0,66	0,69	0,72	0,67

The table clearly shows that the reaction time of an opponent is extremely small, by Sock it is 0.60 seconds, by Cilic 0.70 seconds, while the average for the surveyed players is 0.66 seconds. When these players enter the court and reduce the distance to the baseline, they reduce the time for reaction by 0.2 seconds, which is significant, especially when their shot is placed well. However, if they hit their forehand 2 meters behind the baseline, the response time of the opponents increases to 0.72 seconds on average.

The table also shows the reaction time when the player plays the ball on the diagonal and the ball goes further distanse to the baseline. However it is important to highlight , that the difference is only 0.1 sec., which is a minimal difference given the fact that the opponent has to go 4 meters away to hit the ball. This is common method, especially on the slower flooring whereby the opponent "frees" the court. It is also common for them to shorten the shot or to play the so-called short diagonal, but by this shot they cannot achieve high speed due to the sharp angle and the precision which it requires.

Interesting in our research is the fact that 8 of the players use the same kind of string, while another 7 use a hybrid stringing. This may indicate that the qualities of a given string have its advantages by the performance of a high-speed forehand. The same goes for the hybrid stringing, which is preferred by 37% of the surveyed tennis players.

Conclusions

From the performed survey we can make the following conclusions:

1. Players with a high average forehand speed use this advantage and often enter the court.
2. The average forehand speed of the surveyed players is 129.96 km / h, which makes 0.66 seconds time for the opponent to react.
3. When playing diagonals tennis players lose 0.1 sec, but they force the opponent to run approximately 4 meters for 0.67 sec. in order to hit the ball.
4. These players use different ways to reduce the time and respectively the shots played, but this increases the risk of playing their forehand.

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THE DEPENDENCY OF EXPLOSIVE LEG POWER ON FALLEN ARCHES

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Abstract:

The explosive power of the lower extremities is a very important feature in many sports activities that require the usage of maximum muscle strength, and is most often manifested in vertical jumps. During the performance of vertical jumps, leg muscles, the so-called extensors, are activated, and play a role in maintaining the proper arch of the foot. In this regard, the aim of this study is to determine the differences in the explosive leg power among the young school-age male children, with or without flat feet condition. The sample consisted of 48 students with an average age of 11. The following tests are used for the evaluation of explosive leg power: squat-jumps, squat-jumps with preparation, squat-jumps with preparation and arm swing. The plantography was used to evaluate the collapse of the arch, with the interpretation of the plantographic patterns using the method devised by Russian authors. The applied T-test results have shown that, statistically, students with flat feet have significantly lower results on all three tests; in other words, they scored lower values for the explosive power of the leg muscles. Considering the results of various studies that support the confirmation and the rejection of the claims according to which a normal arched foot has an impact on explosive leg power, it could be concluded that new research needs to be conducted in which the participants should be equalized in certain morphological parameters such as height and body weight. In addition, participants should be equalized in active participation in sports as one of the possible factors affecting the activation, as well as muscle strength, when performing tests for the assessment of explosive leg power.

Key Words: *Vertical jump, leg muscles, flat feet,*

Introduction

The cause of the deformities of the postural status of children are usually the result of insufficient muscle strength due to growth and development, as well as insufficient physical activity (Živković, 2009). Postural deformities among children can be localized to certain segments of the body, including: the spinal column, the thorax, legs and feet. Flat feet (pes planus) are one of the most widespread disorders among the school-age population. It equally affects children of both genders and the consequences are evident, expressed in limited motor abilities and the occurrence of pain in one's feet, lower back and spine (Milenković, 2007). Analyses indicate that the most frequent deformities and disorders of the movement apparatus are related to the various forms and stadiums of flat feet. Flat feet are one of the conditions which do not affect one's life, but do affect quality of life. As a result of pain and fatigue in the legs, flat feet prevent people from standing or walking for prolonged periods of time (Koturović & Jeričević, 1988; Živković, 2009). Flat feet as a deformity is reflected in the loss of normal physiological arches of the feet. Based on etiology of emergence, flat feet can be a genetic disorder or can be acquired. The human foot plays a role in the static and dynamic features of the human body. The static role of the feet can be seen in their taking over the entire weight of the body, while their dynamic role can be seen in walking, running and jumping. The role of the feet is to lift the body from the surface in a suitable way, to lessen – absorb impact during contact with the surface and provide adaptation for further activities in various forms of movement (Živković, 2009).

The explosive strength of the lower extremities is a very important feature in many sports activities which require the manifestation of maximal muscle power, and is usually manifested during vertical jumps (Radovanović, & Ignjatović, 2009). Performing vertical jumps includes the activation of the muscles of the leg extensors, which plays an important role in maintaining normal arches of the feet.

In this regard, the aim of this study is to determine the differences in the explosive leg power among the young school-age male children, with or without flat feet condition.

Material & methods

Participants

The sample of participants consisted of 48 fifth-grade boys attending the Čegar Elementary School, who were divided into group G1: participants with normal arches, and group G2: participants with flat feet. The general data of the participants are shown in table 1.

Groups	Body height (cm)	Weight (kg)	BMI
G1	149.62	42.04	18.68
G2	150.70	49.75	21.82

Measure instruments

To evaluate the explosive power of the leg muscles, the following tests were used:

1. The Counter movement jump (CMJ)
2. The Counter movement jump with arm swing (CMJAS)
3. The Squat jump (SJ)

Each of the participants had three attempts for each test, and the means were used for further data processing. The parameter of explosive power, which was to be obtained, is expressed as height jump in cm. The applied tests were standardized tests for the evaluation of explosive power of the legs, which have the appropriate variability and validity (Markovic, Dizdar, Jukic, & Cardinale, 2004; Slinde, Suber, Suber, Edwén, & Svantesson, 2008). During the measuring, the Optojump photocell system (Microgate, Bolzano, Italy) measuring instrument was used.

To evaluate the arches of the feet, plantography and the methods devised by Russian authors were used (Živković, 2000). By implementing the methods of Russian authors, on the obtained plantogram the most prominent points on the imprint of the heel and the impression of the front part of the foot were noted (B, D, C, A). Then the points AC and BD were connected. The obtained lines were divided into five equal parts and each point on one line is connected to an appropriate point on the other line. What was analyzed was the image provided by the intersection of these two lines and the segment it is to be found in (image 3). If it is located in part 2/5, then there is no foot deformity, if the impression is in section 3/5, it is recorded as a case of the first degree of deformity. If the impression is in section 4/5, then that is the second degree of deformity, and if it is in section 5/5 or higher, then it is the third and most serious form of foot deformity (Živković, 2000).

Statistical analysis

All of the obtained results will be presented by the basic parameters of descriptive statistics (means, standard deviation, range, minimal and maximal score). Data on the prevalence of flat feet will be presented both numerically and in percentages in the form of frequency of the results. In order to determine the statistically significant differences between the groups on the tests for the evaluation of explosive power of the legs in relation to the arch of the feet, the t-test was used.

Results

Based on the results shown in table 1 we can conclude that of the overall number of participants, 48, which make up 100%, only 24 (50%) of the students had normal feet, that is, showed no signs of flat feet, while 17 of them had first degree arch deformity (36%), 4 (8%) second degree, and 3 (6%) third degree.

Table 1. The prevalence of flat feet

The degree of flat feet	0	I	II	III	Total
The number of participants	24	17	4	3	48
%	50	36	8	6	100
Legend: 0 – normal foot, I – first degree of flat feet, II – second degree of flat feet, III – third degree of flat feet					

Tables 2 and 3 show the descriptive statistics for boys with normal and lowered arches for all three applied tests.

Table 2. The descriptive statistics for children with normal feet

Variables	Mean	Min	Max	Range	SD
SJ	21,38	14,5	26,95	12,45	3,81
CMJ	20,67	13,25	28,7	15,45	4,11
CMJAS	23,52	13,5	31,4	17,9	4,96

Legend: SJ – squat jump, CMJ – countermovement jump, CMJAS – countermovement jump with an arm swing

Table 3. The descriptive statistics for the children with flat feet

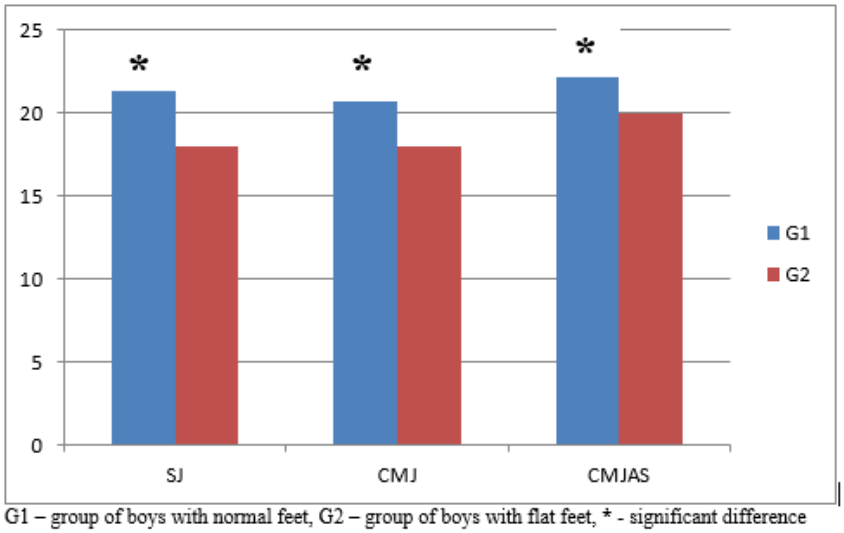
Variables	Mean	Min	Max	Range	SD
SJ	17,97	10,2	26,5	16,3	3,86
CMJ	17,98	11,45	25,5	14,05	3,51
CMJAS	19,94	13,8	29,4	15,6	4,35

The results of the T-test shown in table 4 and on graph 1 indicate that the students with normally arched feet scored significantly better results in all the applied tests for the evaluation of jump height, that is, explosive leg power.

Table 4. The results of the T-test

Variables	Mean (G1)	Mean (G2)	t-value	df	p
SJ	21,38	17,97	3,077	46	0,003
CMJ	20,67	17,98	2,433	46	0,019
CMJAS	23,52	19,94	2,664	46	0,011
Legend: G1 – group of boys with normal feet, G2 – group of boys with flat feet					

Graph 1. A bar graph of the T-test results



G1 – group of boys with normal feet, G2 – group of boys with flat feet, * - significant difference

Dicussion

The research results indicate that as much as 50% of the studied children have flat feet, where 35.42 % showed signs of the first degree of arch deformity, 8.33 % of the second, and 6.25% of the third. The results obtained in this manner agree with existing research results (Puzović, Đorđević, Karaleić, Obrenović, Medić, & Jakovljević, 2010; Đokić, Međedović, & Smiljanić, 2011). In the study by Puzović et al. (2010) the number of children with collapsed arches aged 7 to 11 was as high as 78.9%, while in the research carried out by Đokić et al. (2011) the number of sixth-grader boys with flat feet was 43.4%. The

review paper written by Đorđević, Jorgić, Aleksandrović, Stanojević & Paravlić (2015) also indicates that a large number of elementary school aged children suffer from the postural disorder of flat feet, where the disorder of the first degree of the was the most widespread one, as was indicated in the current study.

The results of the tests that were carried out indicate that the students with an average age of 11, and with flat feet, scored statistically significant smaller values for the vertical high jump compared with their peers with normal arches. Based on the obtained results, considering that these are tests for the evaluation of explosive leg power, we could conclude that the flat feet have a negative effect on the manifestation of explosive power of the legs. One of the groups of muscles that is activated during the vertical jump are the muscles from the back side of the lower leg, that is, m. gastrocnemius (Umberger, 1998). These muscles play a role in maintaining a normal arch. They, along with the other muscles which are involved in plantar flexion, such as the m. tibialis posterior, m. flexor digitorum longus et m. flexor hallucis longus, strengthen during corrective exercise (Živković, 2009). In the case of children with flat feet, it could be assumed that these muscles are weaker, that is, they have smaller power or elasticity, which on the one hand leads to the collapse of the arches, and on the other hand to smaller height of the vertical jump, that is, decreased explosive leg power. In accordance with the research carried out by Živković et al. (2014), on a sample of participants the same age, it was determined that the lowered arches have a negative impact on explosive leg power. Gava, Šćepanović, & Kojić (2016), working with a sample of students aged 15, determined that there are differences in the explosive strength of the legs in relation to the extent of the lowered arch. Sharma & Upadhyaya (2016) determined better results for the 100m sprint and the 12-minute run among participants with normal, as compared to those with fallen arches. The authors concluded that the cause of these results is the greater possibility of manifesting explosive power among participants with normal archses, but also the fact that the leg muscles were not as fatigued during the run, as compared to the participants with flat feet. What speaks in favor of these studies are the results obtained by Queen, Mall, Nunley, & Chuckpaiwong (2009) who determined that individuals with flat feet are exposed to a greater risk of injury when performing various specific sports tasks.

The aforementioned could still be considered only a hypothesis, considering the controversial nature of similar studies in which tests were carried out to evaluate the explosive power of the legs which did not indicate the existence of any significant differences in explosive leg power in relation to the state of the arches of the feet. Thus, Mihajlović et al. (2012) determined that among participants of the same age as the ones included in this study, there is no difference in the height of the vertical jump in relation to the extent of flat feet. Petrović et al. (2013), working with a sample of participants divided into age groups of 10, 15 and 20-year-olds, by applying the SJ and CMJ test determined that there were no statistically significant differences in explosive leg power in relation to the degree of lowered arches. Aleksandrović et al. (2015) also used the same tests to determine, on a sample of participants aged 14, that explosive leg power does not depend on the extent of fallen arches. Similar results were obtained for a sample of 574 participants divided into three groups in relation to the muscle power of the legs by (Lizis, Posadzki, & Smith, 2010). Confirmation of these findings was provided by Tudor et al. (2009), who indicated that lowered arches have a negative influence on sports performance of participants aged 11 to 15, based on the results of 17 different tests used to evaluate the participants' motor abilities. Arevalo, Reina, & Munuera (2016) also confirmed these findings on a sample of 187 children, using 9 tests to evaluate their motor skills.

Considering the fact that there are research results which confirm, as well as negate the hypothesis that flat feet have a negative effect on explosive power of the legs, new studies should be carried out in which an attempt should be made to equate the participants in certain morphological parameters such as height and body weight. Furthermore, the participants should be equated in relation to whether they are physical active or whether they train a particular sport, since research, such as that of (Charoenpanicha, Boonsinsukhb, Sirisupc, & Saengsirisuwana, 2013) has indicated that athletes use the same muscle groups as inactive individuals, but with different power when performing the same jump.

Conclusions

Or The results of this research have indicated the presence of a problem among a great number of 11-year-old boys with flat feet, whose condition negatively affects the manifestation of explosive leg power. Thus, it is necessary to organize and carry out prevention and correction programs for flat feet aimed at younger school age boys.

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EYE INJURIES IN SPORTS

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Abstract

Nowadays participation in sports and recreational activities is an important part of healthy, physical and active lifestyle. Sports have became increasingly popular and account for numerous eye injuries each year. Sports are classified as high risk, moderate risk, low risk and eye safe. Most of sports-related eye injuries are preventable. The use of eye protection has helped to reduce the number and severity of eye injuries. The American Society for Testing and Materials has established performance standards for selected eyewear. Also education for recognition of the risks of eye injury playing sports of athletes, coaches, trainers and parents can help in prevention of this type of injuries.

Keywords: *eye injuries, sports, eye protection*

Introduction

The eye injuries have extraordinary meaning, because it is a matter of a single organ, whose parts and specific construction are fitting for the eyesight function. Despite the fact that only 0,27% of the total human body surface and 4% of the face area are contributed to the eyes, they represent the third most affected organ by injuries, after hands and feet (Nordber, 2000, Omolase et al., 2011).

With the increase of popularity of sports and the tendency for a healthy way of life throughout the world, the importance of eye traumatism is also increasing. In different countries of the world, especially the developed ones, one of the leading places are occupied by eye injuries caused by different types of sports (Hoskin et al., 2016).

Every year more than 600,000 people suffer eye injuries while participating in sports or recreational activities, out of which roughly 13,500 result in permanent loss of sight (Mishra and Verma, 2012). Thirty percent of eye injuries, among children younger than 16 years, are sports related (Rodriguez et al., 2003).

The prevalence of specific sport activities varies depending on the country, that is, depends on the customs and culture of the country's citizens (Moon et al., 2016). The football, basketball, cricket, boxing, racquet sports and full contact martial arts are very popular and thus most commonly associated with eye injuries (Kim et al., 2011, Leivo et al., 2015).

The tennis, golf, basketball and various other sports can lead to major eye damages, reduction of visual acuity and sometimes even lead to blindness.

Numerous publications have reported that the type of sport in which the most frequent and severe injuries occur is not the same with different populations and nationalities (Goldstein, 2011, Nemet et al.,2016). In the study MacEwen and McLatchie (2010) have concluded that a small number of sports, such as soccer, rugby, hockey and the racquet sports are responsible for the most occurred injuries. Baseball and basketball have been implicated in most sports eye injuries in the United States, soccer in Portugal, Norway and Israel and soccer or racquet sports in Britain (Capão Filipe et al., 2003). The results, presented in the study of Bar et al. (2000), suggest that football was the single most common sport associated with ocular trauma being responsible for 32,5% of cases. In the United States for an example, the most common eye-injured-causing sports are baseball and softball, racquetball, soccer (European football) and American football (Cass, 2012).

Sports classification

American Academy of Pediatrics (AAP) and American Academy of Ophthalmology (AAO) have developed a classification of sports according to the risk of eye injuries (table 1) (Vinger, 2000).

Table 1. Classification of Sports According to the Risk of Eye Injuries, if Protective Means are not Used

High Risk	Moderate Risk	Low Risk	Eye Safe
Small, fast projectiles	Tennis	Swimming	Track and field
Air rifle	Badminton	Diving	Gymnastics
BB gun	Soccer	Skiing(snow and water)	
Paintball	Volleyball	Noncontact martial arts	
Hard projectiles,close contact	Water polo	Wrestling	
Basketball	Football	Bicycling	
Baseball/softball	Fishing		
Cricket	Golf		
Lacrosse			
Hockey (field and ice)			
Squash			
Racquetball			
Fencing			
Intentional Injury			
Boxing			
Full contact martial arts			

Eye injury risk in sports

Before playing any given sport, the athlete must know the risks of that sport. Lost of the sight, even in one eye, involves changes in lifestyle for the individual and serious financial and social consequences both for the individuals and for society as awhole (International Federation of Sports Medicine -FIMS, 1989).

Eye examination should play an important part in the screening physical examination for every athlete prior to sports participation. The athlete deserves a careful explanation of the risk of eye injury, both with and without various types of eye protectors in the proposed sport. For each athlete,physicians should obtain an ocular history, paying special attention to prior conditions such as a high degree of myopia, retinal detachment, eye surgery and injury or infection. Athletes with any of these conditions may be at increased risk for serious eye injury (Jeffers, 1990). It is important to assess athletes who have a strong family history of retinal detachment, retinal tears and diabetic retinopathy (Locke et al., 1997). Athletes with such risk factors should be evaluated by an eye care professional before engaging in any high-risk or very high risk sport (Christensen, 1997).

The one-eyed athletes should be checked by ophthalmologist before playing in any sport.

One-eyed athletes should never participate in a very high risk sports such as boxing, wresting and full-contact martial arts, because no adequate eye protection is available for these types of sports.

Other risk factors

Beginners are more prone to injuries in comparison to intermediate or advance players because beginners have not yet learned or refined the necessary skills to master the sport. On the other hand, highly qualified athletes play faster, play with greater aggressiveness and therefore may be at greater risk of sustaining a serious injuries of the eye.

Basic mechanisms for the occurrence of eye trauma

The basic mechanisms for the occurrence of eye injury during in sports are the following ones:

- The eye can be injured by something sharp – the most common cause are the fragments from own glasses (Herzum et al., 2001), which are not protective glasses meant for sports and are most probable reason for occurrence of perforative injury,
- Impact from a blunt object, smaller than the opening of the orbit – golf ball, hockey stick, ping-pong ball, golf stick (Jayasundera, 2003), which can even lead to rupture of the eyeball due to high energy impact on a small area, with possible harmful functional outcome,
- Impact from a blunt object, bigger than the opening of the orbit, such as tennis ball, elbow etc. In the course of impact a part of the energy is transferred to the soft tissue, bones or the orbit floor, which can fracture,

- Impact to the skull can be a cause for direct or indirect trauma of the eyeball or sight pathways with transient or permanent loss of sight. The frontal bone is very sturdy and resistant to blows, a three times more in comparison with the zygomatic bone and mandibula. These injuries usually occur during sports such as football (Leivo et al., 2015) and hockey.

In the course of baseball and golf (Jayasundera et al., 2003, Mishra et al., 2014), the density and velocity of the ball can become a reason for severe orbital, ocular or facial trauma (Zagelbaum et al., 1994). The situation is also similar in tennis, where the ball moves at very high speed, which is why, in some cases, the protective glasses cannot protect the eye.

The most common eye injuries in sports involve closed globe, open globe and radiation injuries.

Closed globe injuries account for most sports related eye injuries. According to Napier et al.(1996), the sport-related eye injuries, although frequent in occurrence, rarely are serious injuries. In large number of cases, it is related to corneal erosions, lighter contusions and hyphamas. In rare cases, with closed globe injuries, a severe consequences can occur, such as vitreous hemorrhage and retinal ablation, traumatic macular hole or traumatic optic neuropathy (TON) which refers to an acute injury of the optic nerve secondary to trauma.

Open globe injuries are relatively uncommon. This type of injuries are very serious, must be treated quickly because they can lead to total loss of vision and blindness.

Radiation eye injuries occur as a result of prolonged exposure to the ultraviolet rays of the sun in snow skiing, water skiing and other water sports.

Eye protection

Up to 90% of sports related eye injuries are preventable by using adequate eye protection equipment (Mishra and Verma, 2012, FIMS, 1989). Eye protection has reduced the number and severity of eye injuries and it is strongly recommended that protective eyewear be worn by all participants in sports in which there is risk of eye injury. Athletes should be educated by team physicians about proper eye and facial protection and encouraged to use protective devices.

The American Society for Testing and Materials (ASTM, 2003) has established performance standards for selected eyewear. Each sport has a certain type of recommended protective eyewear, as determined by the ASTM (2003). Protective eyewear is made of polycarbonate, a highly impact-resistant plastic which is now easily available as prescription and non-prescription eyewear and all players should be encouraged to use them (FIMS, 1989). Protective eyewear also should sit comfortably on the face. Poorly fitted equipment may be uncomfortable, and may not offer the best eye protection.

Wearing a helmet or faceguard cannot protect eyes, because eyes are still exposed to an opponents fingers or other sports equipment. The face mask may consist of metal wire, coated wire or a transparent polycarbonated shields.

Face masks attached to a helmet should be used in sports such as hockey, football, baseball and lacrosse. In these sports, athletes must wear eye protectors under the face mask.

Athletes who are functionally one-eyed must have their status diagnosed and wear appropriate eye protection. If one-eye person decide to participate in particular sport, then that person should wear maximum protection for all trainings and for competitions.

Conclusion

Sports and recreational activities have became increasingly popular and became an important part of healthy, physical and active lifestyle.

Eye injuries in sports can cause severe and permanent visual loss. Because up to 90% of sports related eye injuries are preventable. All participants in sport activities must wear adequate eye protection equipment.

Education for recognition of the risks of eye injury, while playing sports, for athletes, coaches, trainers and parents can also help in prevention of this type of injury.

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THE IMPACT OF SOCIODEMOGRAPHIC CHARACTERISTICS FOR NVESTMENT IN THE SPORT IN R. MACEDONIA

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Abstract

In this paper examines whether there is an influence on attitudes and opinions of our citizens on the general policies for investing and develop in sport in the R.of Macedonia. For this purpose, they were interviewed with a specially constructed survey questionnaire of 121 respondents from different gender, ages and residential level, as well as the current marital status of the respondents. The sample of the respondents in this research was cured by the general population of the citizens of the Republic of Macedonia, while taking care that some of them are active athletes, and a part of citizens who are not actively engaged in sports, but are passive supporters of the sport. The research was conducted on a part of the territory of the Republic of Macedonia. In the research, 5 socio-demographic variables were set up, depending on where most of the state should invest more precisely in which of the sports to direct the finances collected through the taxpayers.

Keywords: Sport, Respondents, R. Macedonia, Investing.

Introduction

This paper examines whether the opinions and opinions of our citizens influence the general policies for investing in certain sports in the Republic of Macedonia. For this purpose, they were interviewed with a specially constructed survey questionnaire of 121 respondents from different gender, ethnic, adult, residential level, as well as the current status of the respondents. Sport as a social system in the last few years of the independence of our country is gaining momentum. From that aspect, the significance of his research as well as his analysis in all of his segments is more significant. Especially here we mean our normative and institutional ownership in Macedonia. For these reasons, it is important to first deflect the very framework of the action of sport as a social phenomenon, and then to carry out a serious analysis of its institutional setup.

In the world languages, by Nešic, the word sport (and similar terms) comes from the word "disport" which means activity that produces game, entertainment, leaving work and care, good mood, hanging out with joke, etc. (Nešič, 2007, quoted by Anastasovski-Stojanoska, 2010: 81). One of the classifications of the sport (Anastasovski-Stojanoska, 2010: 83-84) for which the authors write in its book is a classification that has been tested in terms of investment in this paper, and it is:

1. Recreational sports,
2. School sports,
3. Amateur Sports,
4. Sport for people with disabilities, and
5. Professional sport

Method of work in the research

Subject of the research

The subject of this research was the views and opinions of the respondents (citizens) of the republic of macedonia, in terms of investments for the development of sports, with particular reference to socio-demographic characteristics gender of the respondents.

Objectives of the research

The main goal of the research is to identify the latest phenomena for investing in sports, based on scientific knowledge through some socio-demographic characteristics of the respondents.

Research hypotheses

Based on the subject of study and the purpose of this research, the following hypotheses were set up:

Hypothesis 1: There are differences among respondents (citizens) of the republic of macedonia, for investing in sports regarding the gender of the respondents;

Hypothesis 2: There are differences among the respondents (citizens) of the Republic of Macedonia, for investing in sports regarding the AGE of the respondents:

Hypothesis 3: There are differences among respondents (citizens) of the republic of macedonia. macedonia for investing in sports regarding to the marital status of the respondents:

Hypothesis 4: There are differences among respondents (citizens) of the Republic of Macedonia, for investing in sports regarding the residential status of the respondents.

Methods of research

The subject of this research was analyzed through several groups of questions in the questionnaire, which will be distributed to the respondents (citizens) of the Republic of Macedonia. Macedonia.

From the aspect of statistical data processing, χ^2 - test in two forms was applied. The tables were constructed by crossing on the one hand the variables for estimating the socio-demographic factors, numbered in frequency (f) and percentage (%), and on the other hand, along with socio-demographic characteristics, also in terms of frequencies (f) and percentage %). The data received is presented in a neatly presented manner, as well as graphically in the analysis of the results.

The pads were processed with the SPSS for Windows Version 22.0 statistical package, in the Data Center at the faculty of physical education, sport and health.

Sample of respondents

The sample of the respondents is drawn from the general population of the citizens of the Republic of Macedonia, while taking care that some of them are active athletes, and one part of citizens who do not deal with sports actively but are passive supporters of the sport. The sample of respondents is 121 respondents. The questionnaire was constructed by eminent professors from this area (Anastasovski & Nanev). The questionnaire was leaked directly to the respondents in one section. But also one piece will be sent by e-mail to the printers ie via the internet.

Results of research

The results of this research were interpreted in accordance with the analyzes obtained from the survey of the respondents (citizens) of the Republic of Macedonia, that was randomly elected. The one that can be stated with certainty is that the emphasis will be placed on where the state would invest most in the development of sports, with particular reference to some socio-demographic characteristics of the respondents, which was tested by the question: "In your opinion where the state should mostly invest and help the sport in Macedonia", and five frequencies of answers that are bound to the division of the dispute in this paper above: *a) That is recreational sport, b) That is school sport, c) That is amateur sport, d) That is sport for people with disabilities, e) That is professional sport, and f) State does not need to invest and help in sport.*

Variables that investigated the issues in this research are as follows:

- Sex of respondents (SR) - Male (No 83), and (Female (No 28).
- Age of respondents (AR) - 15 to 25 years (No 23), 26-35 years (No 26), 36 to 45 years (No 20), 46 to 55 years (No 6), 56 to 65 years (No 20), and over 65 years (No 16).
- Marital status of respondents (MSR) – Unmarried/a (No 69, Married/a (No 46), and Widow / a (No 6).
- Residential status of respondents (RSR) City (No 72), and Village (No 46).

Analysis of the impact of the GENDER of respondents (GR) for investing in sport in the Republic of Macedonia

First of all, in the survey pole of the respondents from the total survey population, 121 examinees, 83 are male and 38 are female, which through this question, there is a statistically significant difference according to the sexes of the respondents about the country's investments in the development of the spore in Republic of Macedonia at the level of *0.01 ($p < 0.01$)*, (see below, Tables 1 and 2). We estimate that

over-average high percentage was confirmed with the answer "It's a professional sport", where the male responded with 45.8 percent, while the female population responded with 21.1 percent, it can be noticed that the male population is determined for professional or top sport for a simple reason which more closely follow the sport and are inclined to see, comment and participate in sports. While among the female population, the largest percentage of the respondents think that the state should invest in school sports, 31.6 percent of them, while the male population responded with 7.2 percent. This is due to the fact that the female population is more inclined towards the pedagogical profession as a kind of educational process where the school sport itself belongs. Namely, the female population by default is more responsible than parents, and as educators. The fact that the female population determined that a country should invest in school sports suggests that through investment in school sports there will be a benefit for the young population in terms of good health and proper psycho-physical development, and therefore those same young people will be responsible citizens in society. While certain differences occur in the sub-sex responses of respondents divided by sex, the male population responded that the state does not need and does not need to invest in any of the unconventional sports, with 3.6 percent, while the female population responded here with 7.9 percent. In the sub-polar answers, there is an identity in the thinking of the female population, in the part that the state should invest in amateur sport with 7.9 percent.

Table 1: A tabular overview of the answers to the question: "In your opinion where the state should mostly invest and help the sport in Republic of Macedonia" compared with GENDER of respondents

In your opinion where the state should mostly invest and help the sport in Macedonia	Answers						Total number of respondents
Gender	That is recreational sport	That is school sport	That is amateur sport	That is sport for people with disabilities	That is professional sport	State does not need to invest and help in sport	
Male	10	6	16	10	38	3	83
	12.0 %	7,2%	19,3%	12,%	45,8%	3,6%	100%
Female	8	12	3	4	8	3	38
	21,1%	31,6%	7,9%	10,5%	21,1%	7,9%	100%
Total partial number	18	18	19	14	46	6	121
	14,9%	14,9%	15,7%	11,6%	38,0%	5,0%	100%

Table 2: An overview of the statistical processing of data on the question "In your opinion where the state should mostly invest and help the sport in Republic of Macedonia" compared with GENDER of respondents

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19,169[a]	5	**,002**
Likelihood Ratio	18,801	5	,002
Linear-by-Linear Association	6,723	1	,010
N of Valid Cases	121		

3 cells (25,0%) have expected count less than 5. The minimum expected count is 1,88

Analysis of the impact of the AGE of respondents (AR) for investing in sport in the Republic of Macedonia

In the tested variable AGE of respondents, is a statistically significant difference in comparison with the state's investment in the development of the dispute at a level of 0.01 ($p < 0.01$), (see below, Tables 3 and 4). Namely, above-average high responses to this issue were with *"It's a professional sport",* where the category from 15 to 25 years answered with 42.4 percent, and the category from 36 to 45 years answered with 40.0 percent. This points out to the fact that a large part of the young population who sincerely loves and participates in sports is of the opinion that the state should invest in professional sport for reasons they want to see and even participate in a quality sport that will have its positive results both for the individual and for the country itself, which can be promoted through good sports results. The same attitude with the young population is shared by respondents aged between 36 and 45 who responded with a high 40.0 percent. The adult categories are 26 to 35 years old, with 50.0 percent, and adults between 56

and 65 who answered with 33.3 percent. In contrast, age groups between 56 and 65 answered with "it's school sport", 50.0 percent of them. This reflects the fact that older categories consider that the state should invest in school sports. The attitude of the elderly categories of respondents to the young population that is part of the school system for which there will be benefits from the aspect of good health and proper psycho-physical development will be responsible, and therefore those same young people will be responsible citizens in the society in future. While the oldest category ie. pensioners over the age of 65 responded with a high 75.0 percent with "it's a recreational sport" which suggests that this category takes care of its own psychophysical health and would like to spend its free time (having it) in rehearsal and enjoyment that will surely prolong their lifespan. The differences occur in mature respondents of the respondents divided by age, and most of the age categories from 26 to 35 years old, from 46 to 55 years old, between 56 and 65 years old, as well as those over 65 with 0.0 percent answered "The state should not invest and assist in sports, "in contrast, adults between 15 and 26 years old gave a low percentage of answers with" it's a recreational sport, "that's 0.0 percent. The youth are of the view that the state should not direct its investments in recreational sports because it is a personal sport activity for each of us and which each of us should finance with our own finances, and thus they will diversify their health and psycho-physical condition. At the end of this analysis, the data for the oldest age category over 65 years, with 0.0 percent, is between two categories of sports: "It's a school sport," "It's a sport for people with disabilities", as well as among the elderly who think that "the state should not invest and help in sports".

Table 3: A tabular overview of the answers to the question: "In your opinion where the state should mostly invest and help the sport in Macedonia" in comparison with AGE of respondents

In your opinion where the state should mostly invest and help the sport in Macedonia	Answers						Total number of respondents
Age	That is recreational sport	That is school sport	That is amateur sport	That is sport for people with disabilities	That is professional sport	State does not need to invest and help in sport	
15 -25 year	0	3	3	10	14	3	33
	0,0%	9,1%	9,1%	30,3%	42,4%	9,1%	100,0%
26-35 year	4	3	6	0	13	0	26
	15,4%	11,5%	23,1%	0,0%	50,0%	0,0%	100,0%
36-45 year	0	0	5	4	8	3	20
	0,0%	0,0%	25,0%	20,0%	40,0%	15,0%	100,0%
46-55 year	2	2	0	0	2	0	6
	33,3%	33,3%	0,0%	0,0%	33,3%	0,0%	100,0%
56-65 year	0	10	3	0	7	0	20
	0,0%	50,0%	15,0%	0,0%	35,0%	0,0%	100,0%
Up then 65 year	12	0	2	0	2	0	16
	75,0%	0,0%	12,5%	0,0%	12,5%	0,0%	100,0%
Total partial number	18	18	19	14	46	6	121
	14,9%	14,9%	15,7%	11,6%	38,0%	5,0%	100,0%

Table 4: An overview of the statistical processing of data on the question "In your opinion where the state should mostly invest and help the sport in Republic of Macedonia" compared with AGE of respondents

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	111,018[a]	25	,000
Likelihood Ratio	108,910	25	,000
Linear-by-Linear Association	25,661	1	,000
N of Valid Cases	121		

Analysis of the impact of the MARITAL STSTUS of respondents (MSR) for investing in sport in the Republic of Macedonia

In the tested variable MARITAL STATUS of respondents, is a statistically significant difference compared to the country's investment in sport development in the Republic of Macedonia. Macedonia at the level of 0.01 (p <0.01), (see below, Tables 5 and 6). Namely, above-average high responses to this issue were with "It's a professional sport", where unmarried/a responded with 43.5 percent and married/a with 34.8 percent. This points out to the fact that regardless of the marital status of the respondents, to the opinion that the state should invest in the professional sport for reasons they wish to see and even participate in a quality sport that will have its own positive results for both the individual and the country itself, which can be promoted through good sports results. In contrast, the majority of respondents declared as widowers with 66.7 percent answered "It is a recreational sport", which points out to the fact that those respondents who live only without a partner are inclined to recreation and healthy life and for that reason it is the state that would should have invested in recreational sports. At the below average percentage of answers, we have a condition where each of the categories of marital status has a different attitude, single-married and married - the wives with 4.3 percent answered "The state should not invest and assist in sports" for no one of them has given a single answer, or 0.0 percent to "It's School cports"

Table 5: A tabular overview of the answers to the question: " In your opinion where the state should mostly invest and help the sport in Macedonia" compared with MARITAL STATUS of the respondents

In your opinion where the state should mostly invest and help the sport in Macedonia	Answers						Total number of respondents
Marital status	That is recreational sport	That is school sport	That is amateur sport	That is sport for people with disabilities	That is professional sport	State does not need to invest and help in sport	
Unmarried/a	4	6	14	12	30	*3*	69
	5,8%	8,7%	20,3%	17,4%	43,5%	*4,3%*	100%
Married/a	10	12	3	3	16	*2*	46
	21,7%	26,1%	6,5%	6,5%	34,8%	*4,3%*	100%
Widow / a	4	*0*	2	*0*	*0*	*0*	6
	66,7%	*0,0%*	33,3%	*0,0%*	*0,0%*	*0,0%*	100%
	18	18	19	15	46	5	121
	14,9%	14,9%	15,7%	11,6%	38,0%	5,0%	100%

Table 6: An overview of the statistical processing of data on the question "In your opinion, where would the state need to invest and help the sport in the Republic of Macedonia" compared with MARITAL STATUS of participants

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	35,544[a]	10	,000
Likelihood Ratio	35,931	10	,000
Linear-by-Linear Association	15,057	1	,000
N of Valid Cases	121		

Analysis of the impact of the RESIDENTIAL STSTUS of respondents (RSR) for investing in sport in the Republic of Macedonia

In the tested variable RESIDENTIAL STATUS of respondents, there is a statistically significant difference in the state investment and the development of sport in the Republic of Macedonia. Macedonia at the level of 0.01 (p <0.01), (see below, Tables 9 and 10). Namely, the highest percentage of answers to this question was with "It is a professional sport", where the respondents from the urban part answered with 34.7 percent, and the respondents living in the rural part with 43.5 percent. This indicates that regardless of the place of residence of the respondents whether they are in a city or village, they are all of the opinion that the state should invest in the professional sport for reasons they wish to see and even participate in a quality sport that will have their positive results for both the individual and the country itself, which can be promoted through good sports results. The difference in the mid-day answers is as follows: respondents from the city (urban part) with 1.3 percent answered "The state should not invest

and help in sports", while the respondents from the village (rural part) with 4.3 percent answered "it is amateur sport".

Table 9: A tabular presentation of the answers to the question: " In your opinion where the state should mostly invest and help the sport in Macedonia " compared with RESIDENTIAL STATUS of respondents

In your opinion where the state should mostly invest and help the sport in Macedonia / Presidential status	Answers						Total number of respondents
	That is recreational sport	That is school sport	That is amateur sport	That is sport for people with disabilities	That is professional sport	State does not need to invest and help in sport	
City – Urban part	12	10	17	9	26	*1*	75
	16,0%	13,3%	22,7%	12,0%	34,7%	*1,3%*	100%
Village – Rural part	6	8	*2*	5	20	5	46
	13,0%	17,4%	*4,3%*	10,9%	43,5%	10,9%	100%
Total partial number	18	18	19	14	46	6	121
	14,9%	14,9%	15,7%	11,6%	38,0%	5,0%	100%

Table 10: An overview of the statistical processing of data on the question "In your opinion, where would the state need to invest and help the sport in the Republic of Macedonia" compared with RESIDENTIAL STATUS of respondents

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	12,419[a]	5	**,029**
Likelihood Ratio	13,651	5	,018
Linear-by-Linear Association	2,502	1	,114
N of Valid Cases	121		

Conclusion

Based on the obtained results from this research in which certain socio-demographic characteristics of the respondents (citizens) of the Republic of Macedonia who are compared with investing and assisting the state for the development of sport in the Republic of Macedonia, based on views and opinions, resulted in the following conclusions in this research:

Conclusion 1: According to the views of the respondents irrespective of their gender, age, marital status and place of residence, it is necessary to point out that it is necessary for a wider and expert debate about the situation in sports, especially in the part for possible future investments in sports, as by both the state and the private sector;

Conclusion 2: According to the views of the respondents irrespective of their gender, age, marital status and place of residence, the state must rely heavily on the knowledge and scientific knowledge of the faculties of sports in the field his scientific analysis, in order to improve the sport with a special emphasis on management inside him;

Conclusion 3: According to the views of the respondents irrespective of their gender, age, marital status and place of residence, it is necessary to change the status of sports in the Republic of Macedonia and provision of material support is the result to which the forces for action should be streamlined. The legal regulation that creates the development of sports in the Republic of Macedonia implies acting within the executive branch, where in strictly defined principles, in symmetrical forms, the budget and the material support of the sport are created. To discuss the situation, the possibilities and the development of the sport in the Republic of Macedonia, to discuss the legislative power, which should adopt a development document and a Program for development of sport in the Republic of Macedonia, supported by the legislation for its materialization, and

Conclusion 4: According to the views of the respondents irrespective of their gender, age, marital status and place of residence, we can logically conclude, and in that way we are in accordance with the attitudes of our citizens regardless of their gender, age, marital status and place of residence that it is necessary to organize institutional and sport more investments in professional or top sport, essential reforms in the sports organizations themselves with an emphasis on professional sports professionals, much more information for everyone in the Republic of Macedonia.

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CONNECTION OF THE NUMBER OF STEPS MADE DURING THE DAY WITH THE RECOMMENDED LEVEL OF PHYSICAL ACTIVITY AND IMPROVED HEALTH

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Abstract

Since walking is the most convenient physical activity that can be practiced by almost everyone, one of the most important questions regarding the scope of physical activity is, how many steps are sufficient in one day and how to measure them? In that sense, the researchers approved the use of pedometers as an accessible, inexpensive and objective way to determine the level of physical activity and its promotion. A number of studies on this topic have been conducted with respondents of different ages. The standard number of steps for adults, which is 10,000, average 8 km, is insufficient for children. For an active lifestyle to produce results and positively reflect on the health of an individual, recommendations for the number of steps are 11,000 for girls and 13,000 for boys. These figures were obtained through the results of studies in which the activity of young people was studied. Studies have confirmed that pedometers positively influence the increase in physical activity, the decrease in the body mass index, and health status of those who use them.

Keywords: *physical activity, steps, pedometer, health.*

Introduction

As a consequence of contemporary life in the last decades, level of physical activities among people dropped significantly. Reaping the fruit of advanced technological discoveries of the wonders made by human mind, allowed us, as a race, to reduce daily energy consumption to simple button or touch screen pressing on our PCs, TVs and mobile phones. Such behavior patterns he turned us into a sitting place population, and considering the connection between health and physical activities, a number of health problems occurred. (Popkin , Kim, Rusev , Du, & Zizza , 2006). Since walking is the most convenient physical activity that can be practiced by almost everyone, one of the most important questions regarding the scope of physical activity is, how many steps are sufficient in one day and how to measure them? A number of studies on this topic have been conducted with respondents of different ages. The standard number of steps for adults, which is 10,000 (Hatano, 1993; Welk, Differding, Thompson, Blair, Dziura, 2000), average 8km (recommended limit for those who want to live an "active lifestyle"), is insufficient for children, because children are much more active. For an active lifestyle to produce results and positively reflect on the health of an individual, recommendations for the number of steps are 11,000 for girls and 13,000 for boys. These figures were obtained through the results of studies in which the activity of young people was studied (Le Masurier, Beighle, Crbin, Darst, Morgan, 2005; Vincent, Pangrazi , Raustorp , Tomson & Cunddihy, 2003), while one of the other studies (Tudor-Locke, Pangrazi , Corbin, Rutherford, Vincent, 2004) studied the connection between number of steps made during the day and body mass index (BMI). Respondents who made over 12,000 steps during the day were healthier and were not overweight.

Measuring the number of steps made during physical activity

In order to control their own activity, people more and more use simple applications and devices using which they can follow result of their own exercises and progress made in a certain time period. Researchers approve use of pedometers as an affordable, inexpensive and an objective way to determine the level of physical activity and its promotion (Beighle, Pangrazi & Vincent, 2001; Tudor-Locke 2004; Cuddihy , Pangrazi & Tomson, 2005). Studies using pedometers have shown that the results of the level of activity of all pedometer models can not be taken without reserve, but it has been established that electronic pedometers are completely reliable (Crouter, Schneider, Karabulut & Bassett, 2003; Schneider, Crouter & Bassett, 2004;

Schneider, Crouter, Lukajić & Bassett, 2003; Beets, Patton & Edwards, 2005). Until recently, pedometers used were not able to estimate the degree of physical load (intensity of activities), so that they equalized the number of steps made walking and running. But today, with newer pedometers, which have the possibility to measure the number of steps made and the time in which physical activities were carried out, dividing the number of steps made and the time gives us the number of steps per minute, which shows us the intensity of an activity. People with bigger number of steps per minute perform physical more intensive activities. Even though there are different brands of pedometers, which differ in their possibilities and characteristics, they all precisely determine the number of steps, less precisely the distance measured, and even less precisely the number of calories consumed (Crouter et al., 2003). Some researchers (Barfield, Rowe & Michael, 2004; Tudor- Locke ..... 2008) claim that models of Japanese manufacturers are most precise.

Calculation of the distance traveled is based on the number of steps made. Therefore, a mistake may happen, because if speed changes, steps' length changes too. Besides, one of pedometers' flaws is that they generally underestimate the number of steps made by a lower speed, which is about 54 meters per minute (Crouter et al., 2003; Le Masurier, Le, & Tudor-Locke, 2004). A movement made in a slow walk, when the body is in an upright position, is not sufficient to activate the step counter (Beets et al., 2005 ; Crouter et al., 2003).

Pangrazi, Beighle and Sidman (2007) have, because of the individual differences in number of steps made per day and health status of a person, established the so called "baseline" number of steps, and set goals accordingly. "Baseline" number of steps is determined by continuous wearing of pedometer during eight days (four days for children) in order to determine average number of steps made per day . In order to determine the targeted number of steps, obtained number is increased by 10% every week. Goal is achieved by increasing the number of steps made every day, until the number reaches 10000-12000 interval.

It is determined that 100 steps made in one minute matches a moderate intensity physical activity (Marshall, Levy, Tudor-Locke, Kolkhorst, Wooten, 2009). Graser, Pangrazi & Vincent (2009) conducted a study in which respondents (children aged 10 to 12) walked on a treadmill set to moderate or high speed. They found that a reasonable speed for both sexes of this age was 120 to 140 steps per minute.

Pedometer is placed on the front side of the waist, above the thigh. However, if a person has a loose belt or a larger stomach, the pedometer will move and will be less accurate. In that case, it must be positioned on another suitable place, in which it will not be allowed to move (Crouter , Schneider & Bassett, 2005; Duncan, Scholfield , Duncan, & Hinckson, 2007). Elastic belt, by which the pedometer will be kept in place is the best solution. Pedometer can also be set up on another place, a little more to the side, or on the back, but for such positioning, a precision test must be conducted by counting steps up to a certain distance, and then checking the number of steps recorded by the pedometer. Cuddihy et al. (2005) have, for testing the correctness of pedometer setup and its precision, recommended that the pedometer is positioned above the right thigh's middle point, and then 10 steps should be made, after which the pedometer's number of steps is checked . If the recorded number of steps is less by three, or more, the pedometer needs to be positioned on the hip, and then the test should be repeated. If the previous testing's error is repeated, pedometer is required to be positioned on the back and attached by an elastic belt. There are also pedometers which are designed for vision impaired persons, with three modes of sound signaling, which are determined to work best when they are positioned on the right side (Beets, Foley, John, Daniel, & Lieberman, 2007). Pedometers can also be used in schools, as a teaching tool, which is used to devise creative, motivational, and, above all, inovative classes of physical education (Lubans , Morgan & Tudor-Locke, 2009; Pangrazi et al., 2007).

Discussing the use of this device, it should be noted that users must comply with safety measures in order not to damage the device. The rule is, that the pedometer is not installed while in motion, but before the start of the activity, while the user is sitting or kneeling, so that the likelihood of dropping, and thus of fracturing or damaging the pedometer, is minimized. Contemporary pedometers are abundant with many possibilities, which besides measuring the number of steps and distance we crossed, also measure calories burned during that physical activity, the time spent on continuous activity, as well as the total time spent for physical activity.

Conclusion

Since many people do not have sufficient motivation for physical activity and movement, pedometer represents additional exercising stimulus. Study confirmed positive influence of pedometers on physical activities, reduction of body mass index (BMI), and health status repair of those who used them. However, in order to clarify causative-consequence link between number of steps made per day and health status of an individual, additional researches are required. It is necessary to establish if larger number of steps made during the day makes a person healthier or does a healthier person simply make a larger number of steps. Besides that, persons with higher percentage of body fat should increase the number of steps made per day, in comparison with "baseline" number. We also consider that the number of steps can not be a criterion for people who exercise physical activities such as swimming or cycling, therefore reducing the importance of the number of steps per day significantly. In addition to recreational physical activities, which aim to preserve the health of the organism, maintain or increase physical abilities, as well as fun and pleasure, pedometers can also be used in physical education in schools and faculties. They can be a very fun and motivating way to stimulate students to participate in physical activities, while allowing teachers to show their creativity when programming and realizing the teaching of physical education. In that sense, teachers should know an efficient way of handling these devices and methods to train their students, so that each one can use them in a practical way without physically damaging it.

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PHYSICAL ACTIVITY FOR BETTER HEALTH – SUMMARY OF GUIDELINES AND RECOMMENDATIONS

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Abstract

Physical activity is the fundamental human ability and basis for surviving at all. It can be described by performance parameters: frequency, duration and intensity. Physical activity is key determinant for maintaining of good conditions for vital physiological systems, such as cardiovascular, locomotors, respiratory, nervous etc. The main goal of developing the strategy for physical activity for better health is to control of noncomunicable diseases. The most important world health organizations (including World Health Organization, World Health Assembly etc) are united with the global targets to reduce the prevalence of insufficient physical activity and consecutively increase the level of physical activity. There are many different forms, kinds and levels of intensity of physical activity. The proper prescribing of the physical activity should lead to attaining the very important targets: reduction of premature mortality from cardiovascular diseases, cancer, diabetes, high blood pressure and obesity. To fulfill the proposed health benefits physical activity should be dosed according to individual features and needs. The World Health Organization and range of other international and national health organizations made a set of recommendations for different populations group which could help to practice physical activity safely and with optimal results.

Keywords: *Physical activity, recommendations*

Introduction

The health benefits from physical activity are well known, numerous and recognizable. The physical activity in all its form is found useful for human health from the earliest written data of human civilization (1).

The nowadays question is how much of physical activity is enough, what mode of physical activity is recommended and could we find a precise dose of this precious drug to get optimal benefit and to not harm the health. These and many more questions are not still strictly answered, but we can try to summarize some recommendations, due to experience and knowledge of sports medicine and sport science experts.

Many western countries have developed national recommendations on physical activity for health as important part of comprehensive strategy to promote and develop physical activity and sport in their country. Many of these recommendations are addressed to different age subgroups, such as preschool children, school children, young adults, adults and elderly (2-4) .

The term health-enhancing physical activity emphasizes the connection with health by focusing on "any form of physical activity that benefits health and functional capacity without undue harm or risk" (5).

History of the recommendations for health-enhancing exercise

Early guidelines and recommendations were based primarily on endurance exercise to enhance performance, especially aerobic capacity.The rationale for emphasizes the endurance exercise is that increases of aerobic capacity is easily achieved by increasing the intensity of endurance exercise. The positive relationship between higher aerobic capacity is clearly associated with reduced risk of cardiovascular diseases which contributes to promoting the enduring exercise either. In the next decade (1980-1990) changes in recommendations for health enhancing physical activity (HEPA) goes to define the differences between quantity and quality of exercise needed to attain health-related benefits with those that are needed for fitness benefits. Data from observational and experimental studies demonstrate health-related outcomes from moderate intensity activity accumulated throughout the day (≥ 30 minutes) (6-9). In the first decade of 21st century physical activity guidelines became expanded and elucidated.

Recommendations were stratified through the age span and amount of exercise. The duration, minutes per day and days per week were presented, relative and absolute intensity is suggested. (10,11). Process for developing guidelines in USA continued to rise on scientific base through several phases: Systematic Evidence reviews through Physical activity Guidelines Advisory Committee (PAGAC) and writing group which wrote 2008 Physical Activity Guidelines for Americans. Fundamental finding of PAGAC report was the summary of the dose-response relationship across all the health benefits of activity. The total amount of weekly activity which produces substantial health benefits for adults was determined as physical activity in the range of 500 to 1000 MET minutes (12). The latest update from the feds and external experts gathered to explore the current scientific knowledge from the health enhancing physical activity was made at the State of the Science Meeting -2014 ACSM. The topics discussed were some issues which were not addressed in PAG 2008: young under age of six, older adults, cognition across the lifespan, dose (including variability from baseline and light activity) and sedentary behavior (13).

Recommendations for health-enhancing physical activity and levels for adult people

The widely accepted recommendation for the minimal amount of physical activity, from which we expect health benefit, is to be active at least a 30 minute daily at moderate-level intensity. The recommended duration of 30 minutes should be practiced every day during the week or at least on most days of the week. Moderate level of intensity means that bodily activity is involving a slight decrease in breathing, equivalent to brisk walking or cycling (14,15)

According to the "new" guidelines, updated by the American college of Sports Medicine (ACSM), American adults aged 18-65 years should continue to accumulate at least 30 minutes of moderate-intensity aerobic activity 5 days per week. This recommendation is more precise that earlier phrase "most days of week". Alternative for previous reference is to be engaged in 20 minutes of vigorous activity 3 days per week. The updates also clarified that the amount of physical activity could be divided in at least 10 minutes of physical activity. Strength training should be practiced at least twice weekly to achieve the proper muscle tone. Strength training programs should consist of 8-10 exercise for at least 1 set of 8-12 repetitions each.

ACSM has released new recommendations on the quantity and quality of exercise for adults and gave us a precise guidelines how much activity is enough to maintain or improve the health. The document is titled as " Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory, Musculoskeletal, and Neuromotor Fitness in Apparently Healthy Adults: Guidance for Prescribing Exercise". These recommendations are structured in four section made up of four different modality of physical activity which are suggested to be part of total amount of exercise (16, 17).

Cardiorespiratory Exercise

- Total amount of weekly physical activity for adults should be at least 150 minutes of moderate-intensity exercise per week.
- The recommending dose of exercise can be met through 30-60 minutes of moderate-intensity exercise (five days per week) or 20-60 minutes of vigorous-intensity exercise (three days per week).
- Exercise could be done as one continuous session or multiple shorter sessions (of at least 10 minutes).
- Gradual progression of exercise time, frequency and intensity is recommended for best result and least injury risk.
- People unable to meet these minimums can still benefit from some activity.

Resistance Exercise

Primary recommendation for strengthening and toning skeletal muscle in whole body is that adults should train each major muscle group two or three days each week using a variety of exercises and equipment. The beginners, sedentary adults and older persons should be precautious. Very light or light is optimal level of intensity for this population.

For each major group of muscle is suggested to make two to four sets of each exercise. If the aim of resistance workout is to improve strength one set should be consisted of 8-12 repetitions in younger adults

and 10-15 repetitions in middle-aged and older aadults.For improving the muscular endurance 15 – 20 repetitions should be made. Adults should wait at least 48 hours between resistance training sessions.

Flexibility Exercise

Flexibility exercises are movements which increase the range of joints and the ability of joints to move freely. Its function is to improve mobility of muscles which allows more movement around the joints. Flexibility exercise is often neglected even in professional athletes. These recommendations emphasize the need of proper flexibility.

Adults should do flexibility exercises at least two or three days each week to improve range of motion. Each stretch should be held for 10-30 seconds to the point of tightness or slight discomfort. Repeat each stretch two to four times, accumulating 60 seconds per stretch. All kinds of stretching exercise should be practiced: static, dynamic, ballistic and PNF stretches are all effective. Flexibility exercise is most effective when the muscle is warm.

Neuromotor Exercise

Neuromotor exercise training is the fourth component included in the ACSM position stand. Neuromotor exercise training (slightly different term – neuromuscular exercise) incorporates various motor skills, including balance, coordination, gait, agility and proprioceptive training. Common aim of these motor skills is to improve balance and avoiding the accidental falls and fractures especially in older people.

Neuromotor exercise (sometimes called "functional fitness training") is recommended for two or three days per week. Exercises should involve motor skills (balance, agility, coordination and gait), proprioceptive exercise training and multifaceted activities (tai ji and yoga). 20-30 minutes per day is appropriate for neuromotor exercise.

In the 2000 group of researchers from the European Network for the Promoton of Health-Enhancing Physical Activity (The HEPA Network) published the Guidelines HEPA Europe, written by ….. Besides identifying the program preparation, development, design, implementation and evaluation these guidelines presents the lessons learnt by four programmes: The Netherlands on the Move (from Netherlands), Allez Hop (Switzerland), Fit for Life (Finland) and Active for Life (England) (18).

HEPA in Europe

The states from European Region, members of WHO have managed to implement physical activity policies still 30% of adults i n Europe are insufficiently active (19). The EU physical activity focal points first met in Rome, 2014, after that in Zusrich 2015, (20) where based on the earlier investigations were prepared individual country profile on physical activity. WHO Global Recommendations on Physical Activity for Health (21), are as follows:

Children and adolescent aged 5-17 years

1. Children and youth aged 5–17 should accumulate at least 60 minutes of moderate- to vigorous-intensity physical activity daily.
2. Amounts of physical activity greater than 60 minutes provide additional health benefits.
3. Most of the daily physical activity should be aerobic. Vigorous-intensity activities should be incorporated, including those that strengthen muscle and bone*, at least 3 times per week.

Adults aged 18-64 years

1. Adults aged 18–64 should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity.
2. Aerobic activity should be performed in bouts of at least 10 minutes duration.
3. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate- and vigorous-intensity activity.

4. Muscle-strengthening activities should be done involving major muscle groups on 2 or more days a week.

Adults aged 65+ years

1. Older adults should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity.
2. Aerobic activity should be performed in bouts of at least 10 minutes duration.
3. For additional health benefits, older adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous-intensity aerobic physical activity per week, or an equivalent combination of moderate-and vigorous-intensity activity.
4. Older adults, with poor mobility, should perform physical activity to enhance balance and prevent falls on 3 or more days per week.
5. Muscle-strengthening activities, involving major muscle groups, should be done on 2 or more days a week.
6. When older adults cannot do the recommended amounts of physical activity due to health conditions, they should be as physically active as their abilities and conditions allow.

EU physical activity guidelines serves as inspiration and guidance to formulate PA policies. EU physical activity guidelines are based on the WHO recommendations , and some Member of States include the United States CDC (Center for Disease Control and Prevention) (22), American College of Sports Medicine (ACSM) (23) and the Canadian Society for Exercise Physiology, produced on behalf of the Public Health Agency of Canada (24).

The European Network for te Promotion of Health-Enhancing Physical Activity (the HEPA Network) made Eurpean guidelines or HEPA, which were drawn from 20 member states of the EU. The guidelines are prepared with contribution of national HEPA programs:

- The Netherlands on the Move! – The Netherlands
- Allez Hop! – Switzerland
- Fit For Life – Finland
- Active for Life – England

The HEPA messages for European sedentary adults were as follows:

- ACTIVE for LIFE: Overall adult should try to build up to 30 minutes of moderate-intensity physical activity, like brisk walking, on five or more days of the week, or “half an hour a day”.
- Fit for Life: Even minor physical activity is worthwhile. A low threshold to start exercise. A lack of skills or equipment are not barriers to physical exercise. Physical activity gives new meaning to life.
- Allez Hope: Movement is for everybody. It will make you live longer, looking beatufill, improve your mode and gives you a strong back.
- The Netherlands on the Move: Seniors (55 years and older) are counseled to be active 30 minutes of moderate intense physical activity on at least five, but preferable all days of the week. Every extra amount of physical activity will be beneficial.

Conclusion

Exercise is therapeutic agent designed to promote a beneficial clinical effect and has specific indications and contraindications and possible toxic and adverse reactions (25).

The aim of recommendations for health enhancing physical activity is to define the guidelines which will presents minimum requirements for maintaining good health and preventing diseases in people.

The recognition and regular update of recommendation for health enhancing physical activity is crucial for health and fitness professionals as scientific and evidence based knowledge that will help them customize exercise prescriptions for healthy adults.

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SAGITAL PLANE POOR POSTURE AMONG SEVEN – YEAR - OLD CHILDREN

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Abstract

In preschool children ages postural disorders and spinal deformities are among the most common diseases. Without timely detection, poor posture in preschool and school children may cause extremely serious health problems in adulthood. In order to determine the "real picture" of sagittal plane poor posture among preschool children was realized a research on a sample of 68 children aged 7. In order to evaluate the state of the postural status of the spinal column in sagittal plane, the device "Spinal Mouse" (IDIAG, Fehraltdorf, Switzerland) was used. Based on the results, in sagittal plane 39.13% boys and 17.39% girls have thoracic spine bad posture, 30.43% boys and 17.39% girls have lumbar spine bad posture and 17.39% boys and 2.87% girls have inclination bad posture. Also, Multivariate statistical analysis found that between the subsamples observed there is a statistically significant difference of all examined characteristics of the postural status in relation to gender at the level Wilks` Lambda 0.595, F = 6.927, p = 0.000.

Key Words*: postural disorders, seven-year-olds, poor posture*

Introduction

From early period of life the postural alignment starts its development of the spine and its curvature. Physical development is correlated with their physical growth regime. Children build their posture by development of movements and by muscles growth. When the body is in correct balance, all its parts, including the internal organs, are held in good position and function normally (Markovska, 2012).

Poor posture is a position resulting from any deviation from ideally aligned erect posture (Shimaa, 2012). Poor posture may cause one or more of the following dysfunctions:

1. Defects in bones, joints, muscles;
2. Bad habits: either from early childhood or from occupational positions;
3. Pain, fatigue or bad psychological state;
4. Secondary deformities and compensatory postural defects.

Bad posture puts strain on your body. Bad posture can limit range of movements, cause headaches, muscle aches and joint aches, affect circulation and breathing, and even inhibit your inner organs functioning optimally (Gibson, 2013).

In the preschool and early school age the most common are functional disorders of posture, while the adolescent age is characterized by the occurrence of the structural deformities of the spine (Živković, 2000; Demeši, 2007; Bogdanović, 2008; Bogdanović and Milenković, 2008; Beganović and Bešović, 2012). The posture of boys and girls in preschool and lower primary school period is characterized by head protrusion, bent shoulders, winged scapula, anterior pelvic tilt, which is often accompanied by pronounced lumbar lordosis and abdomen protrusion. Given the fact that the attention of experts and scientists is increasingly occupied by children obesity, poor posture and lack of physical activity, there is an intense need for monitoring obesity and improving postural status in children (Burdyukova et al., 2012). Therefore, identifying, defining and monitoring postural status is of utmost importance for lifelong normal body functioning, as well as for the establishment of predispositions for good health of an individual.

Precisely, because of the above, the primary goal of this research is to define postural status in the sagittal plane among 7 – year - old children in Belgrade.

Material & methods

Subjects

The total sample consisted of 68 children aged 7, of which 46 were boys and 22 were girls. All subjects were attendees of children's sports school in the City of Belgrade.

Measurement procedure

The most objective method for evaluating the postural status is the X-ray scan, but it is not recommended for mass testing purposes, especially in early childhood (particularly for its potential harm to the organism). That is the reason why alternative tests and techniques were used. In order to evaluate the state of the postural status of the spinal column in the sagittal and frontal plane, we used the "Spinal Mouse" (IDIAG, Fehraltdorf, Switzerland, www.idiag.ch) measuring instrument. It is a non-invasive method of measuring postural status, along with the use of the appropriate software. The validity and reliability of this instrument was evaluated in the research of (Bedogni et al., 2013; Milenkovic et al. , 2011; Bubanj et al., 2012; Topalidou et al., 2014). This method of determining the state of the postural status of the spinal column was already used in studies carried out on the population of preschool and school age children (Jorgić et al., 2015; Bubanj et al., 2012; Bubanj et al., 2010; Milenkovic et al., 2011, Bićanin et al., 2017).

The sample of variables

To assess the characteristics of postural status in the sagittal plane we used the following variables:

- The degree of curve in the thoracic region of the spinal column - Thoracic spine, expressed in degrees
  - Reduced value of the curve – TSHipo
  - Increased value of the curve – TSHiper
  - Normal value of the curve – TSNormal
- The degree of curve in the lumbar region of the spine - Lumbar spine, expressed in degrees
  - Reduced value of the curve – LSHipo
  - Increased value of the curve – LSHiper
  - Normal value of the curve – LSNormal
- The inclination of the spine column - Incl., expressed in degrees
  - Normal value – IncNormal
  - Increased value – IncOver
  - Markedly increased value – IncHiper

Statistical analysis

In the data processing, basic descriptive statistics were used that establish the measures of central tendency (mean) and of variability (standard deviation, range, maximum and minimum scores). The data about level, frequency and structure of postural disorders were processed through basic statistical analysis. The research results are shown in tables, expressed in numbers and percentages. In order to determine the differences in arithmetic means according to gender Multivariate Analysis of Variance (MANOVA method) were used. All statistical methods were implemented using software package SPSS for Windows Release 20.0 (Copyright © SPSS Inc., 1989-2011).

Results

The results of descriptive statistics are shown in Table 1.

Multivariate statistical analysis found that between the subsamples observed there is a statistically significant difference of all examined characteristics of the postural status in relation to gender at the level Wilks` Lambda 0.595, F = 6.927, p = 0.000.

Also, it was found that there are statistically significant differences for the following examined subspaces compared to the observed subsamples in relation to gender (the results are shown in Table 2).

Dicussion

The percent of postural disorders in seven-year-olds in Belgrade is very high. Based on the results we can conclude that in sagittal plane almost 40% boys have kyphotic poor posture; more than 30% boys have lordotic poor posture; and almost 20% boys have inclination bad posture. Based on the results, it can be concluded that poor posture is more common in boys than in girls (Table 1, 2, Figure 1). The results showed that almost 20% girls have thoracic and lumbar spine bad posture, and almost 3% girls have inclination bad posture.

Table 1. The results of the sagittal plane measurements descriptive statistics

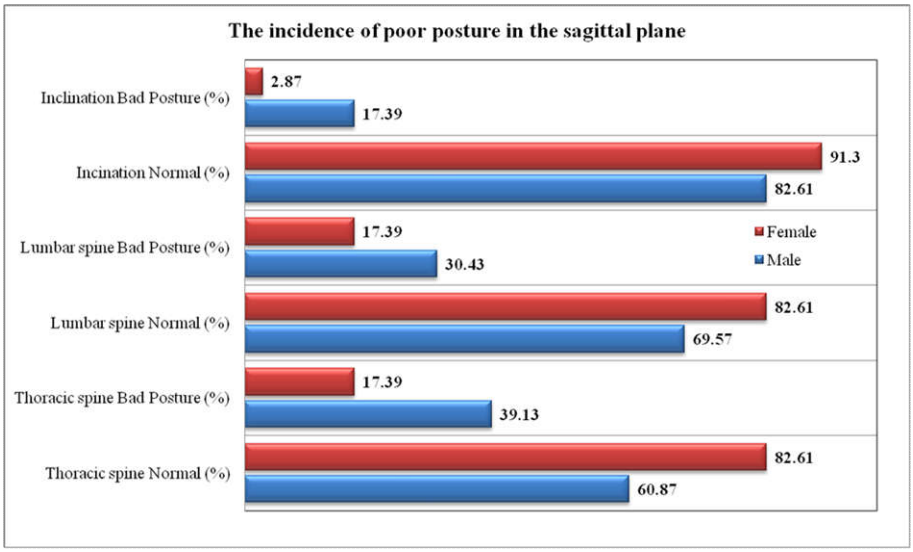
	Male	Female
Thoracic spine Mean±SD	36.26±9.74	28.87±7.47
Thoracic spine Cv%	26.87	26.87
Thoracic spine Min-Max	14–58	14–41
Normal value of the thoracic curve (absolute / percentage value)	28/60.87	19/82.61
Reduced value of the thoracic curve (absolute / percentage value)	1/2.17	3/13.04
Increased value of the thoracic curve (absolute / percentage value)	17/36.96	1/4.35
Lumbar spine Mean±SD	27.13±8.32	33.09±7.92
Lumbar spine Cv%	30.68	30.68
Lumbar spine Min-Max	10–45	18–51
Normal value of the lumbar curve (absolute / percentage values)	32/69.57	19/82.61
Reduced value of the lumbar curve (absolute / percentage value)	8/17.39	1/4.35
Increased value of the lumbar curve (absolute / percentage value)	6/13.04	3/13.04
Inclination Mean±SD	2.8±2.19	1.87±1.69
Inclination Cv%	77.99	77.99
Inclination Min-Max	0–10	0–6
Normal value of the inclination (absolute / percentage value)	38/82.61	21/91.3
Increased value of the inclination (absolute / percentage value)	8/17.39	2/8.7
Markedly increased value of the inclination (absolute / percentage value)	0/0	0/0

Mean ± SD - mean value and standard deviation, cV% - coefficient of variation, Min-Max - minimum and maximum values

Table 2. The differences in the examined characteristics of the postural status in relation to gender

	F value	Significant
Thoracic curve in the sagittal plane	11.230	0.001
Lumbar curve in the sagittal plane	7.531	0.008

Figure 1. The incidence of poor posture in the sagittal plane (% percentage values)



The greatest differences between genders were determined in the thoracic region of the spine (a difference of 21.74%, statistically significant at the level of F = 11.230, p = 0.001) (Table 1, 2 and Figure 1).

Research on physical deformities in children of preschool age have not often been the subject of interest of researchers, thus a more comprehensive comparative analysis with the results of this research is limited. The results of the available studies are somewhat different, although still largely similar. The

postural disorders incidence and their frequency percentage in preschool children significantly varies with different authors, and it depends on samples, age, environment, methodology of disorder detection etc. The research results of Živković and Milenković (1995) on a sample of children who attended kindergarten in the municipality of Niš show that there are incipient forms of deformity on: spine in 52%, chest in 24%, feet in 61% and that there is observed obesity in 61%, and malnutrition in 9% of children. Research (Tot 2001; Sabo, 2003) on the postural status of preschool children in Novi Sad shows that there are minor deviations in the posture of head in 27.9%, shoulders in 51.8%, scapulae in 45.6%, abdomen in 54.3%, legs in 24.9% and feet in 39.8% of children. The boys had a better posture of head and abdomen and the girls better foot instep.

Research Jorgić et al. (2015) shows that in the preschool age and young school age groups, there is more than 50% or more precisely 52.2% of children with a postural disorder of the spinal column in the sagittal plane. Postural disorders of the sagittal plane were also determined for the children of preschool age in the study of Romanov and associates (2014), in as many as 45.86% of children. Unlike in the current study, Simov, Minić, & Stojanović (2011) determined, based on their analysis of a sample of 968 preschool children, that only 10.3% of the children had postural disorders. In the case of distribution in relation to gender, among the boys, there was evidence of a greater frequency of lordotic posture, while among the girls kyphotic posture was more pronounced. These results partly match those of Romanov et al. (2014). These authors also determined more extensive lordotic postures among boys.

Results from longitudinal investigation Basarić et al. (2006) indicate that every third child at East Serbia have bad spine posture before 1st grade of elementary school. They also noticed that the postural disorders have a growing trend and suggesting establishing active influence of physical activity with aim to create balanced musculoskeletal system, which would be preventive action to avoid structural deformities in later period of life.

Conclusions

Results from investigation shows that the postural status in Belgrade preschool children is harmed more than expected. General conclusion is that sagittal plane poor posture is present in all segments of the spinal column. Determined situation suggest a more serious approach from all the responsible subjects at all levels of society. Postural deformities are not common subject of interest among the researches, especially in preschool children. Bigger interest on this field exists only in the last few years, and it was initiate by increasing level of this phenomenon. Positive can be fact that in last year more and more researches examine these problems on regional level, which gives a more reliable and more complete insight into the real situation. The results of this study will provide an opportunity of their comparing with the results of other researches in this field.

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DIFFERENCES IN THE PSYCHOSOMATIC CHARACTERISTICS AMONG MEMBERS OF THE SPECIAL POLICE UNITS OF THE REPUBLIC OF MACEDONIA

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Abstract:

Psychosomatic characteristics among members of the special police units are extremely important and play a crucial role in the process of selection. In this context, they have significant influence on the performance of the professional duties. As a result of the tasks specificity and the high risk levels, every member of the unit should be psychologically and physically prepared to handle successfully the specific and complex tasks related to security issues. In order to obtain specific information about the condition of the psychosomatic characteristics of 80 members of the Rapid Deployment Unit and 80 members of the Special Support Unit for fight against crime 'ALFI', this paper includes testing that aims to establish the differences in the anthropometric, bio-motor and psychological characteristics of the members. In order to determine the differences between the two groups of respondents in researched area, the T-test of independent samples and the method of classifying the results in categories (frequency analysis) were used. Based on the results that were obtained, it can be established that there are certain qualitative and quantitative differences referring all researched segments which are mostly a result of the conditions and manner in which the members of these police units execute their professional duties and tasks.

Key Words: *police profession, bio-motor abilities, psychological characteristics, comparative statistical procedures.*

Introduction

The police work is closely related to the internal security of the country because the police officers have the duty to maintain the public order and peace in a state of peace, as well as in a state of emergency. In order to achieve this social goal it is extremely important that the police are properly trained and prepared to face different types of crime and danger. The special police units as ultimate and exclusive organizational structures of the Ministry of Internal Affairs are responsible to face and handle with the most serious types of crime within the country, and in this context their physical, moral, psychological and combat readiness should always be on the highest level in order to successfully face all security threats and challenges (Мандаровски, 1999; Ристовска, 2010). Emphasizing the role of the special police units in achieving the goals and tasks in regard to the security is a potential premise for improving the quality and quantity of the total anthropological potential, which, with the help of continuous and progressive situational and training activities (instructions) should be constantly developed and stimulated (Ivanovski, 2014).

In function of this commitment serves the goal of this study, and that is to determine the similarities and differences of the psychosomatic characteristics of the members of the special police units of the Republic of Macedonia.

Material & methods

The study includes a sample of total 160 respondents, in other words, 160 members of the special police units in Republic of Macedonia. This sample includes 80 respondents/members of the Rapid Deployment Unit (EBR) and 80 members of the Special Support Unit for fight against crime (ALFI). In order to guarantee more homogeneity of the selected respondents, a formal standardization is made according to the following criteria: age, gender, temporary health, level of education, work experience and job title. This standardization is made in order to provide higher credibility of the results, as well as more plausible generalization.

The sample of variables for the evaluation of the psychosomatic characteristics among both groups is composed of:

1. Variables for assessment of the anthropometric characteristics: Body weight (BW), Body height (BH) and Body mass index (BMI).
2. Variables for assessment of the basic biomotor abilities: Abdominal exercises, raising the body from a lying position in two minutes (ABS), Pushups on flat surface in 2 minutes (PUSH), Running 3200 meters (R3200m) and Running 20 meters (R20m).
3. Variables for assessment of the psychological characteristics and abilities: Intelligence (IQ), measured by the general intelligence test Raven progressive matrices (Raven & Court, 1985); Extraversion – Introversion (E), Emotional stability – Lability (N), Rigidity – Leniency (P), Honesty – showing yourself in "perfect" mode (L), measured by Eysenk personality test- EPQ (Lojk, 1979).

The data obtained from the study are elaborated with the help of descriptive statistical procedures, more precisely, with the T-test which tests the differences between the average values of both groups and the method which classifies the results in groups (frequency analysis).

Results

Table 1 presents the results of the T-test of the importance of the average values between the two groups of respondents in the anthropometric, biomotor and psychological characteristics. The results in the table show that between the two groups there are specific quantitative and qualitative differences of the characteristics that have been investigated.

Regarding the anthropometric characteristics, significant statistical differences are noticed in the following variables: body weight (BW) (T=-1,98), and body mass index (BMI) (T=-2,84), while these differences are insignificant in the variable for assessment of the longitudinal dimensionality. Regarding the biomotor characteristics, significant statistical differences are noticed in the variables ABS (T=7,60), PUSHUPS (T=3,41) and T3200м (T=-2,85), while an exception is the test for assessment of the maximal speed T20m, where such statistical findings are not noticed. After the analysis of the psychological characteristics, insignificant differences between the two groups of respondents in all variables are noticed, with the only exception of the variable for assessment of the emotional stability, i.e., the person's lability (T=-3,91). According to these statistical differences, we can conclude that there is more variable level of the quality of the analyzed psychosomatic segments among the members of the Special Support Unit for fight against crime (ALFI), compared to the members of the Rapid Deployment Unit (EBR).

Table 1. T-test of the psychosomatic characteristics of the representatives of EBR and ALFI

Variable	X_1 EBR	X_2 ALFI	df	T-test	P-level
BW	87,51	91,08	158	-1,98	0,05*
BM	1,80	1,79	158	0,62	0,54
BMI	27,05	28,33	158	-2,84	0,01*
ABS	56,86	41,14	158	7,60	0,00*
PUSH	47,33	40,60	158	3,41	0,00*
R3200m	15,99	17,02	158	-2,85	0,00*
R20m	3,05	3,09	158	-1,24	0,22
IQ	106,56	103,36	158	1,85	0,07
E	15,65	15,19	158	1,05	0,30
N	7,02	9,41	158	-3,91	0,00*
P	4,23	4,51	158	-0,81	0,42
L	14,91	14,31	158	1,14	0,26

Table 2 shows the results of the frequency analysis which attempts more precisely and in more details to determine the differences regarding the psychosomatic space between the two groups of respondents. In order to achieve this goal, the arithmetic mean (ΣX) for each variable has been calculated, and then, depending on the variable's location (its class), a collection of the percentage frequency (Σf%) has been carried out, starting from the lowest classes and going to the classes with the highest results.

We can notice from the application of the method of frequency analysis that between the respondents of the both groups there are certain differences in all psychosomatic segments that have been analyzed. Regarding the anthropometric characteristics, the representatives of the Rapid Deployment Unit (EBR)

have 11% larger skeleton, 7% lower body weight and 20% lower body fat distribution compared to members of the Special Support Unit for fight against crime (ALFI). The differences in the biomotor characteristics between the two groups of respondents are mostly expressed in the tests (ABS 47%), (T3200м 26%) and (PUSHUPS 22%), while the differences are insignificant in the test (R20m 1%). Regarding the psychological characteristics, the difference between the two groups of respondents is approximately 10% in the IQ, E, P and L tests, while in the N test the difference is slightly bigger, i.e., it is 17%.

Table 2. Frequency of the results in the psychosomatic characteristics of the members of EBR and ALFI

Variable	ΣX	Σf% EBR	Σf% ALFI	Diff. %
BW	89,30	57,50%	65,00%	7,50%
BM	179,5	78,70%	67,50%	11,20%
BMI	27,69	55,00%	75,00%	20,00%
ABS	49,00	78,70%	31,20%	47,50%
PUSH	43,96	66,20%	43,80%	22,40%
R3200m	16,50	76,20%	50,00%	26,20%
R20m	3,07	62,50%	61,20%	1,30%
IQ	104,96	72,50%	62,50%	10,00%
E	15,42	57,50%	47,50%	10,00%
N	8,21	75,00%	57,50%	17,50%
P	4,37	77,70%	67,70%	10,00%
L	14,61	61,20%	51,50%	9,70%

Dicussion

The special police units, in accordance with their position and the role they play within the Ministry of Internal Affairs are systematized in special department, and the goal of this department is to provide free functioning and performance of the unit's duties (Органограм на МВР, www.mvr.gov.mk). This includes existence and maintenance of high levels of professionalism and rigorous selection process of the members in these units. These two important criteria should satisfy and meet many requirements starting from selective training in which the best candidates are selected, conducting a specialized training in the area of policing tactics, specific training for special operations, advanced physical condition training, special defense training for improving the combat skills, etc. (Кљаиђ, 2005). The goal of all the above mentioned trainings is to improve the ability and the fighting potential of the members, because the success in meeting all the criteria can be seen in the effects of the direct performance of the most complex police duties such as: detaining and depriving armed groups and individuals of liberty, handling hostage situations, stopping and blocking mass protests and disorders, giving aid to victims of natural disasters, etc.

Taking into consideration the significance and influence of the above mentioned factors which contribute to successful duty performance of the units, it is very important to obtain results for every member's efficiency in the performance of the professional duties, and that is achieved with continuous observation of the most important parameters such as general and specific biomotor readiness, emotional stability, stress resilience, intellectual capacities and abilities, motivation, health condition, etc. (Ивановски, Јаневски, Недев, 2010; Batic & Ivanovski, 2011, 2015; Dimitrovska, 2013; Ivanovski, 2014). Due to the exceptional importance of the above mentioned psychosomatic characteristics for performing complex and risky operations, it is very important to balance them with the professional needs, in other words, to be acceptable according to the norms. In order to maintain the general performance ability of the members of the special police units, it is very important that the psychosomatic characteristics remain in stable condition of functioning, because they directly contribute to the final effects of the performance of the most complex police operations.

Conclusions

The police work and the security menaces which threaten the police officers trigger many questions about the investigation of the determinate factors which influence the changes in the psychosomatic characteristics. In this regard, according to the results of the study, the psychosomatic characteristics of the members of the special police units EBR (Rapid Deployment Unit) and ALFI (Special Support Unit for fight against crime) are acceptable in most of the cases and meet the specific requirements of this profession, even though, between them, there are certain qualitative and quantitative differences in the biomotor, anthropometric and psychological characteristics.

Despite the fact that the two special units are considered to be elite and professional police units, the internal organizational structure and foundation determine their sphere of action which directly contributes to the emergence of different changes in the psychosomatic characteristics. As a support for this information, there are several facts that count for the members of Rapid Deployment Unit. These facts are better conditions for conducting general and specific biomotor preparations, the stricter criteria in selecting the members of the unit, the involvement of a professional psychologist in the unit, etc.

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DOPING ATTITUDES AND DOPING BEHAVIOR IN MACEDONIAN PROFESSIONAL WRESTLER

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Abstract

The idea that sport should provide children and adolescents with an unwavering moral compass is commonly held, and is mirrored in the extensive list of personal and social benefits attributed to sport involvement. Numerous studies have reported that an athlete's drug use in sport could be credited to a complex interaction of personal and environmental. Numerous studies have reported that an athlete's drug use in sport could be credited to a complex interaction of personal and environmental. Possible contributing environmental factors include attitudes of peer groups, parents, coaches, accessibility to drugs, and cultural norms and values. Main goal of the research was to determine whether there are differences in doping attitudes and doping behavior among wrestlers who compete in junior and senior rank. The survey was conducted on a sample of 48 examinees dealing with the aging of 15 to 34 years old from Republic of Macedonia. The sample is divided into two subpopulations in terms of age, and this is 26 respondents aged 15 to 18 years and 22 respondents aged 19 to 34 years. To determine the differences in doping attitudes and doping behavior. T-tests for small independent samples were applied between the two groups of examinees. The results of the study suggest that wrestlers over 18 years of age are more likely to believe in the use of doping and have more experience or are currently using unauthorized stimulants to improve their physical performance reather then the wrestlers from 15 to 18 years of age

Key words: *Doping Attitude, Doping Behavior*

Introduction

The idea that sport should provide children and adolescents with an unwavering moral compass is commonly held, and is mirrored in the extensive list of personal and social benefits attributed to sport involvement (White et al., 1998). Due to the fact that success in sport is typically coupled with fame and financial rewards, the use of banned performance enhancing drugs (PEDs) to gain a competitive edge is tempting. According to the International Olympic Committee's (IOC's) official statistics, annually 1–2% of all the doping tests are found positive for illegal PED use (Mottram, 2005). It is possible that the real prevalence of doping among athletes is considerably higher than this (Bents et al., 2004; Laure, 1997; Mottram, 2005; Scarpino et al., 1990; Yesalis, & Bahrke, 1995). Use of PEDs is not just limited to adult athletes, but also includes adolescents. In 2006, the New Jersey Interscholastic Athletic Association was the first state to enact random drug testing of high school athletes. More recently, the University Interscholastic League (UIL) within the state of Texas spent nearly $6 million for its high school athlete steroids testing program, the most comprehensive in the nation. Athletes utilizing unhealthy doping habits at this crucial age may experience more negative health effects, and athletes starting the doping process at a younger age may use the substances for longer periods of time raising the potential for negative health consequences (Judge et al., 2010). Most children and adolescents are involved in athletics for fun, skill development, fitness, and to build positive relation-ships (Chambers, 1991). These positive outcomes may not occur in outcome-oriented situations; however, sport participation may lead to problematic results such as doping. Studies concerning children and adolescents report a doping prevalence between 3 and 5% (Laure, 1997). Irving et al. (2002) reported higher percentages of use of PED among young males as compared to females. Wroble, Gray, and Rodrigo (Wroble et al., 2002) conducted a survey of 1553 pre-adolescent (10–14-year-old) athletes from 34 states and found a much lower anabolic steroid (AS) usage percentage among 10–14 year olds (0.9% male and 0.2% female). In an investigation by Stigler and Yesalis (1999) that surveyed 873 Indiana high school football players, 6.3% admitted to using AS. Among adult athletes, in self-reported-use studies, doping prevalence has been estimated to be 5–15% (Laure, 1997).

Numerous studies have reported that an athlete's drug use in sport could be credited to a complex interaction of personal and environmental factors (Dodge & Jaccard, 2007; Nicholson & Agnew, 1989; Tricker et al., 1989). Possible contributing environmental factors include attitudes of peer groups, parents, coaches, accessibility to drugs, and cultural norms and values (Polich et al., 1984; Tricker & Connolly, 1997). Participants in Diacin, Parks & Allison (2003) study supported athlete drug testing and identified factors that influenced their perceptions of the use of performance-enhancing substances. Their data showed that female athletes were more supportive of testing programs than males, testing by schools and the NCAA was supported but conference-wide testing programs were not, and finally that in general the athletes questioned were indifferent to drug testing (Diacin, Parks & Allison 2003). It seems that researchers are unanimous with undesirability of doping in sport. It must be clarified that the reason behind doping prohibiting was initially concern enhancement of athlete's health (Todd & Todd, 2001). After that doping was emerged as an unethical matter (Petróczi, 2007). Although gender, cultural and competitive level differences among athletes have been scrutinized since the late '80s (Gill, 1988; Gill et al., 1991) the relationship between these factors and doping behavior has not been empirically tested, except in one project.

The main purpose of the research was to determine whether there are differences in doping attitudes and doping behavior between wrestlers who compete in junior and senior rank.

Materials and Methods

Participants

The survey was conducted on a sample of 48 examinees dealing with the aging of 15 to 34 years old from Republic of Macedonia. The sample is divided into two subpopulations in terms of age, 26 examinees aged 15 to 18 and 22 respondents aged 19 to 34 years. The sample was extracted from several martial clubs in Republic of Macedonia.

Measures

Doping Use Belief measures: The DUB were operationally defined as expressions of presumed opinion regarding doping use, namely whether doping should be allowed for top and all level athletes (2 separate questions). Participants were asked to select one of the three responses: 'yes, without restrictions', 'yes, with restrictions' and 'absolutely not'. The Doping behavior latent variable was defined by two self-reported measures of doping behavior: current use of and past experience with performance enhancing substances. The internal consistency coefficients for both variables were reported 0.94 (Petróczi, 2007). In the present study, the observed internal consistencies of the DUB were: Doping behavior (α= 0.713) and Doping belief (α= 0.734).

Methods

Descriptive statistics were used for describing and categorizing raw data and for measuring Mean, frequency, SD and table drawing. Independent (T) test was used for measuring attitude difference between grups. For analyzing data the SPSS software was applied and 95% of confidence level was considered.

Results and Discussion

The survey was conducted on a sample of 48 examinees dealing with the aging of 15 to 34 years old from Republic of Macedonia. The sample is divided into two subpopulations in terms of age, 26 examinees aged 15 to 18, with an average age of 16.04 (± 1.31) year, wrestling time of 4.8 years and 59 average numbers of battles. And 22 respondents aged 19 to 34 years, with an average age of 23.54 (± 1.31) year, average wrestling time of 11 years and 151 average number of battles. From the overview of Table 1 it can be seen that wrestlers aged 15 to 18 years on the first question "Do you believe that performance enhancing drugs/methods should be allowed for top level athletes" 7,7% answered yes, without restrictions, 30,8% answered yes, but with restrictions and 61,5% answered absolutely not. The second question "Do you believe that performance enhancing drugs/methods should be allowed for all athletes?" 23,1% answered yes, without restrictions, 26,9% answered yes, but with restrictions and 50,0% answered absolutely not.

Table 1. Describing the Doping Believe queries in wrestlers up to 15 to 18 years old

Queries	Yes, without restrictions	Yes, but with restrictions	Absolutely not	Mean	SD
Do you believe that performance enhancing drugs/methods should be allowed for top level athletes	2 7,7%	8 30,8%	16 61,5%	1,09	0,53
Do you believe that performance enhancing drugs/methods should be allowed for all athletes?	6 23,1%	7 26,9%	13 50,0%	0,95	0,79

From the overview of Table 2 it can be seen that wrestlers aged 15 to 18 years old on the first question „Have you ever had personal experience with banned performance-enhancing drugs and/or methods? “ 19,2% answered yes, without restrictions, 0,0% answered yes, but with restrictions, 76,9% answered absolutely not and 3,8% answered I do not wish to answer. The second question “Do you currently use banned performanceenhancing drugs?“ 7,7% answered yes, without restrictions, 11,5% answered yes, but with restrictions, 76,9% answered absolutely not and 3,8% answered I do not wish to answer.

Table 2. Describing the Doping Behavior queries in wrestlers up to 15 to 18 years old

Queries	Yes, without restrictions	Yes, but with restrictions	Absolutely not	I do not wish to answer	Mean	SD
Have you ever had personal experience with banned performance-enhancing drugs and/or methods?	5 19,2%	0 0,0%	20 76,9%	1 3,8%	1,32	1,25
Do you currently use banned performance enhancing drugs?	2 7,7%	3 11,5%	20 76,9%	1 3,8%	1,00	1,27

From the overview of Table 3 it can be seen that wrestlers over 18 years of age on the first question “Do you believe that performance enhancing drugs/methods should be allowed for top level athletes?“ 18,2% answered yes, without restrictions, 72,7% answered yes, but with restrictions and 9,1% answered absolutely not. The second question “Do you believe that performance enhancing drugs/methods should be allowed for all athletes?“ 27,3% answered yes, without restrictions, 40,9% answered yes, but with restrictions and 31,8% answered absolutely not.

Table 3. Describing the Doping Believe queries in wrestlers older than 18 years old

Queries	Yes, without restrictions	Yes, but with restrictions	Absolutely not	Mean	SD
Do you believe that performance enhancing drugs/methods should be allowed for top level athletes	4 18,2%	16 72,7%	2 9,1%	0,46	0,65
Do you believe that performance enhancing drugs/methods should be allowed for all athletes?	6 27,3%	9 40,9%	7 31,8%	0,73	0,83

From the overview of Table 4 it can be seen that wrestlers over 18 years of age on the first question “Have you ever had personal experience with banned performance-enhancing drugs and/or methods? “ 22,7% answered yes, without restrictions, 27,3% answered yes, but with restrictions, 40,9% answered absolutely not and 9,1% answered I do not wish to answer. The second question “Do you currently use banned performanceenhancing drugs?“ 22,7% answered yes, without restrictions, 9,1% answered yes, but with restrictions, 54,5% answered absolutely not and 13,6% answered I do not wish to answer.

Table 4. Describing the Doping Behavior queries in wrestlers older than 18 years old

Queries	Yes, without restrictions	Yes, but with restrictions	Absolutely not	I do not wish to answer	Mean	SD
Have you ever had personal experience with banned performance-enhancing drugs and/or methods?	5 22,7%	6 27,3%	9 40,9%	2 9,1%	0,62	1,20
Do you currently use banned performanceenhancing drugs?	5 22,7%	2 9,1%	12 54,5%	3 13,6%	0,50	0,99

In order to determine whether there are differences in belief in doping and its use among wrestlers aged 15 to 18 years and over 18 years, T-tests for small independent samples have been reported. The results of the analysis are shown in Table 5. From the analysis of the results it can be seen that there are statistically significant differences in the three variables. From the values of the arithmetic environments and the level of statistical significance, it can be concluded that wrestlers over 18 years more believe in the use of doping and have more experience, or at the moment use the unauthorized stimulus to suppress their physical performance.

Table 5. Differences in doping attitudes and doping behavior wrestlers who compete in junior and senior rank

Variables	From 15 to 18		Over 18 years		T-test	df	sig
	Mean	SD	Mean	SD			
Doping Believe	0,83	0,92	1,57	0,79	2,97	46,00	**0,01**
Doping Behavior	0,56	0,80	1,16	1,16	2,11	46,00	**0,04**

In adult athletes, research in self-certification found that the prevalence of doping ranges from 5-15%. A number of studies suggest that the use of doping in sports is conditioned by the interaction of personal and factors and the influence of factors from the environment surrounding the athlete. From all the stated, there is an unequivocal conclusion that doping and sports (where sport means a noble activity that is focused on building the body and spirit) are completely incompetent. The results of our research are different with the results obtained in the research Tsorbatzoudis, et al. (2009) and Atkinson (2011) who found that there were no statistically significant differences in attitudes towards performance enhancing drugs (PEDs) in athletes who compete in different ranks. On the other hand, research on Breivik, Hanstad and Loland (2009) Smitha et al. (2010) unlike the research of Atkinsona (2011), it can be concluded that level of competing can predict the changes of research variables (Doping Behavior) in elite martial artists. Calfee, Fadale (2006) suggested that in recent years, research indicates that younger athletes are increasingly experimenting with these drugs to improve both appearance and athletic abilities, which is confirmed in this research.

Therefore, an anti-doping program is needed, which should aim at preserving and promoting the sport spirit. What prevents the full doping from doping from the sport is the pressure that the business community is doing, that is, the fact that sports becomes one only in the product range, a product that generates high profits, and for that reason is the subject of a ruthless struggle.

Anti-doping can be seen as a philosophy, as a lifestyle that is aimed at protecting the basic rights of athletes to participate in non-doping sports activity, thus promoting health, fair play, respecting other participants as well as their own body and spirit.

Anti-doping can also be seen as a program consisting of several steps: A promotion aimed at prevention; Adoption of rules of conduct; Adopt a list of prohibited methods and substances; Manner of conducting control; Taking measures and implementing sanctions against perpetrators; Ensuring fair conditions for athletes who are controlled; Coordination and cooperation, as well as other necessary measures and steps.

The anti-doping should be seen as a complex process, such as philosophy, that is, a lifestyle and program, or a set of rules that enable that lifestyle to be carried out in a work, that is, become a reality.

Antidoping as a phenomenon is based on the idea of Olympism, depending on the idea that it does not matter if you have won here is important how you fought. The anti-doping movement was created by the

proponents of the idea that the victory of the spirit above the body is the biggest victory that can be realized and at the same time is the goal of sporting, not vice versa. The purpose of sports is certainly the preservation of health, and the use of doping means prevents the pursuit of a healthy life. In addition to this, the Anti-doping Agency presents a set of activities aimed at preserving the health of all participants in sports competitions.

Antidoping is not an end in itself, nor is it an "unexpected force that suddenly appears and solves the work." The sense of anti-doping is the return of values that are rejected. The question arises as to what is the return of the values that are lost and whether it is possible?

Perhaps the problem lies in one of the human qualities, and that is the constant tendency to win in the inability to satisfy the already accomplished.

Some theorists (some call them supporters of the general conspiracy theory) believe that the media are the stimulators of the use of doping, while the business has allowed to put a "point of and" when it comes to the given question (as an example one is stated one of the most common wrongly translated sentences, and the translation essentially forced the journalist altius, citius, fortius – which were most often translated „ Faster, higher, stronger “, and it needs to be translated and much more correct „ Faster, higher, braver “! The brave do not need additional incentives, courage is something that a person has or does not have in himself, and which is shaped and directed through sports activity. When we take into consideration everything previously stated (regarding physiological predispositions for sport engagement) it can be concluded that the answer to the question: What is the significance of anti-doping movements and anti-doping rules? - is imposed by itself. Hence, the problem is not only that the individual deliberately and deliberately inflicts damage on his own health, but that lifestyle (in) is directly propagated as something normal, as one of the ways of achieving success. Because, according to an unofficial survey conducted among young people aged 16 and 23, success identifies it with money, we understand how much the message they communicate to them, that is, passed on to people like Florence Griffith Joyner Lance Armstrong or Mike Tyson... because these people allow to build an image with a negative model. A particular problem is the fact that the messages that these people (in) directly refer to most affect people belonging to the poorer layers of society, thus making the problem even bigger and spread in other fields. In addition, the motto that monitors the use of unauthorized stimulants (substances and / or methods), which states "superiority or death", makes the modern sport more uncivilized and more and more approaches to gladiatorial struggles. We agree that economic laws support rational thinking: give people bread and games - if it is an economically viable investment, then the sport should be given a new dimension and the first doping league for athletes formed. Who knows, perhaps such an undertaking would have a counter-effect, and maybe this would lead to depopulation of this lifestyle.

Conclusion

Based on the results obtained, it can be concluded that a large percentage of athletes (both wrestlers) and young people and the elderly believe that banned stimulants that increase sports performance should be allowed for top athletes. Also, a large percentage of athletes said they had personal experience or are currently using stimulants. The results of the research further suggest that wrestlers older than 18 years more believe in the use of doping and have greater experience or are currently using the invulnerative means to suppress their physical performance in relation to wrestlers from 15 to 18 years old. The results indirectly indicate that most athletes are against the use of doping, but are forced to use it. All of this suggests that since the earliest age athletes should start with anti-doping education, which should be directed towards prevention, adoption of rules of behavior and getting acquainted with prohibited methods and substances. Sports should be focused on health preservation, and the use of doping means impedes the pursuit of a healthy life.

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THE CONNECTION OF MENARCHE BETWEEN SPORTSWOMEN AND THEIR MOTHERS

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Abstract

The aim of the research is to determine whether there is difference in the age at menarche between daughters and their mothers, whether there is difference in terms of discomfort which is related to training (before, during and after menstruation) and whether there is mitigation of the menstrual symptoms among sportswomen who train actively in comparison to the period when they did not train actively. The research has been carried out on sportswomen from the Judo Club "Pujanke" from Split, Croatia, at the age from 12 to 17 (+/- 6 months) and their biological mothers. Two anonymous closed type questionnaires were given to the respondents. The first questionnaire consisting of 19 questions was given to the sportswomen and the second one consisting of 18 questions was given to their mothers. The questionnaire which was given to the sportswomen included questions about their menarche and the symptoms, and questions about their physical activity. The questionnaire which was given to their mothers had instructions on how to answer the questions; the questions should be answered in two ways: for 'the past' and for 'today'. 'The past' refers to the period when the mothers were the same age as their daughters are today. The questionnaire includes questions about their menarche and the symptoms, and questions about their physical activity in the past and today. In the research, the ratio is calculated with $\chi 2$ test for both samples, as well as their representation in terms of frequency for each question. From the results, we can conclude that the average age at menarche among sportswomen is 12, regarding their mothers, for almost half of them, the age at menarche is 12 and 14. 46.67% of the sportswomen do not experience painful menstruation, therefore 93.33% attend training during menstruation. Only a small percentage of the respondents wrote that the discomfort and the menstrual bleeding affected their competition results.

***Key Words**: menarche, questionnaire, sportswomen, judo, $\chi 2$ test*

Introduction

A large number of girls in the world are aware of the fact that the symptoms of the menstrual cycle vary individually. Some girls do not experience any kind of symptoms, whereas others suffer from strong premenstrual and menstrual symptoms. Moreover, the changes in training performance during the menstrual cycle can vary individually. The changes in training occurring in one month are considerable for a lot of girls, whereas for others, the changes are not noticeable. There are a lot of girls who win Olympic medals during menstruation but, on the other side, there are girls who feel light discomfort in their bodies and they are incapable of reaching their own limits.

The research by Петрушевска Л., and Шукова Стојмановска Д. (2011) carried out on a sample of 264 students, from 4th to 8th grade, at the age from 10 to 14 (+/- 6 months), aiming at determination of the frequency, the characteristics and the positions regarding menarche among female students at the age from 10 to 14, resulted in the following conclusions: the age at menarche has moved to younger age, female students usually have regular and normal menstruation. In addition, the lack of information about their first menstruation has led to a situation where female students who are menstruating are inactive at Physical and Health Education classes despite the fact that they have regular and normal menstruation.

Premenstrual syndrome (PMS) is a cyclic phenomenon consisting of different kinds of discomfort which is usually experienced 5-10 days before menstruation. The symptoms and their intensity are different. The most common symptoms are: anxiety, irritability, enhanced psychological sensitiveness, crying, constant hunger, bloating, tender breasts, craving for sweet food. Additionally, there are other symptoms which can occur often: acne, headache, pain in the throat, nausea, rash, pain in the lower part of the spine, stomachache etc. Premenstrual pain usually stops on the first day of the menstruation. During that period, sportswomen generally show lower level of motivation for training and their sleep

might be restless which could lead to collecting more water in the body and therefore greater body weight as well as lower energy.

Hewett T.E., et all. (2005), tried to understand the reason for the bigger number of injuries among girls during menstruation and they came to the conclusion that their knees move differently during menstruation in comparison to their mobility during ovulation which is a result of bad muscles control during menstruation. Nevertheless, the authors believed that the neuromuscular control could become better with training and they managed to ease the weight on the knees and joints and to strengthen and improve the coordination on both sides of the female body. After the implemented procedures women experienced fewer knee injuries by 50 to 60%.

The research conducted by Adair L.S. (2001) in the Philippines, included several thousand girls who were followed from their birth to the age of 15. They analyzed their growth and development (weight, length and later, height), the age of the first menstruation, the socioeconomic conditions, the diet, the age at menarche of the mothers and their weight gain during pregnancy as well as their diet. The author came to the conclusion that the girls who lived in the cities in better socioeconomic conditions, in better-off families and those who had more educated mothers – had earlier age at menarche (12.1 on average, and between 12.4 and 13.9). It is interesting that this research showed that the weight at birth could affect the age at menarche of girls. So, the babies who were long (> 49cm), and thin (<3 kg) had menarche earlier than baby girls who were short (<49 cm) and thin (<3 kg). The effect of the birth weight of the girls on the age at menarche is even greater if we take into consideration the weight of the mother before giving birth. This means that the growth and development of the baby is determined intrauterine.

Material & methods

Participants

In this research the sample of respondents are the sportswomen from the Judo Club "Pujanke" from Split, Croatia, at the age from 12 to 17 (+/- 6 months) and their biological mothers. This sample of respondent is divided into two subsamples based on whether the sportswomen have had menarche or not. The first subsample consists of 15 sportswomen who have had menarche and their 15 mothers, while the other subsample consists of 5 sportswomen who have not had menarche and their 5 mothers.

Questionnaire

The questionnaire was conducted in the period from 22-30.11 2018. The mothers signed consent forms for the questionnaires for their daughters. Two anonymous closed type questionnaires were given to the respondents. The first questionnaire consisting of 19 questions was given to the sportswomen and the second one consisting of 18 questions was given to their mothers. The questionnaire which was given to the sportswomen included questions about their first menarche, the frequency and the symptoms their bodies experience before, during and after the menstrual cycle, as well as questions about their physical training, i.e. how many times a week they have training sessions, how long the training sessions last and if they feel any kind of symptoms or changes in their bodies before, during and after the menstrual cycle when they train and compete. It should be mentioned that sportswomen who had not had their fist menstruation did not answer questions (2,3,4,5,6,7,13,14,15,16,17,18 and 19) about menstruation, they answered only questions about their training. The questionnaire which was given to their mothers had instructions on how to answer the questions; the questions should be answered in two ways: for 'the past' and for 'today'. 'The past' refers to the period when the mothers were the same age as their daughters are today. The questionnaire includes questions about their menarche and the symptoms, and questions about their physical activity in the past and today. Further analysis will be carried out regarding the answers of the mother who menstruated when she was same age as her daughter is today.

Statistical analysis

The results of the anonymous questionnaire are calculated with the representation of frequency in percentage and $\chi 2$ test for each question.

Purpose of the research

The aim of this research is to find out:

- if there is difference in the age at menarche between daughters and their mothers;

- if there is difference in the discomfort related to training (before, during and after menstruation)
- if there is mitigation of the menstrual symptoms among sportswomen who train actively in comparison to the period when they did not train actively.

Results

The results from the questionnaire calculated with the representation of frequency and χ^2 test are shown in two tables divided according to the defined subsamples, i.e. based on whether the respondents have had menarche or not. The data and the results of the respondents who have had menarche and their mothers are shown in Table 1 and the results of the respondents who have not had menarche and their mothers are shown in Table 2. In the discussion about the results we will pay more attention to the frequency of the answers.

Table 1. Questions and frequency of the answers from the anonymous questionnaire for the sportswomen who have had menarche and their mothers calculated with $\chi 2$ test.

Questions Daughters who have had menarche	Possible answers	Number		Percentage (%)		$\chi 2$ test	r
		daughters	mothers	daughters	mothers		
1. Do you menstruate?	yes	15	15	100	100	15	.00
	no	0	0	0	0		
	Total	15	15	100	100		
3. How many days does it last?	less than 3 days	0	0	0	0	19.6	.00
	from 3-7 days	13	12	86.67	80		
	more than 7 days	2	3	13.33	20		
	Total	15	15	100	100		
8. Are you an athlete? *8.Were you an athlete?	yes	15	7	100	46.67	10.91	.00
	no	0	8	0	53.33		
	Total	15	15	100	100		
10. How long have you been training? * 10.How long did you train?	3 years	2	1	13.33	6.67	16.87	.03
	4 years	3	2	20	13.33		
	5 years	2	0	13.33	0		
	6 years	3	1	20	6,67		
	7 years	2	1	13.33	6.67		
	8 years	3	0	20	0		
	9 years	0	1	0	6.67		
	10 years	0	1	0	6.67		
	I do not train	0	8	0	53.33		
	Total	15	15	100	100		
12. How long does one training session last?	30 min to 1 hour	0	/	0	/	25.8	.00
	from 1 hour to 1h and 30min	3	/	20	/		
	1h and 30min to 2 hours	12	/	80	/		
	longer than 2 hours	0	/	0	/		
	Total	15	/	100	/		
*15. Do you exercise when you menstruate at present?	yes	/	9	/	60	13.53	.00
	no	/	5	/	33.3		
	I avoid exercising	/	0	/	/		

	no answer	/	1	/	6.67				
	Total	/	15	/	100				
* 17. Presently, do you feel any discomfort when you exercise/do recreational activities?	yes	/	2	/	13.33	10.8		.00	
	no	/	11	/	73.33				
	no answer	/	2	/	13.33				
	Total	/	15	/	100				
15. How can you describe the discomfort when you menstruate and train actively in comparison to the discomfort when you menstruate but do not train actively for whatever reason (when you are not active in the training program, due to illness, injury…)?	worse	1	/	6.67	/	10		.04	
	the same	6	/	40	/				
	better	1	/	6.67	/				
	reduced	1	/	6.67	/				
	no discomfort	6	/	40	/				
	other	0	/	0	/				
	Total	15	/	100	/				
16. How can you describe the discomfort when you menstruate and participate in a competition in comparison to the discomfort when you menstruate and you are in training sessions?	worse	3	/	20	/	12	.02		
	the same	6	/	40	/				
	better	0	/	0	/				
	reduced	0	/	0	/				
	no discomfort	6	/	40	/				
	Total	15	/	100	/				
17. What are your results at competitions during the days when you bleed (especially the first days of menstruation) in comparison to the other days of the month?	worse	3	/	20	/	11.2	.00		
	equally good	11	/	73.33	/				
	better	1	/	6.67	/				
	Total	15	/	100	/				

*legend of Table 1
-in the question column, the questions written in black were given to the daughters, but they were also given to the mothers; if there are two questions (in black and in red), the question in red was given to the mothers. Mothers answer all questions about the time when they were the same age as their daughters are now and today

Based on the results from the questionnaire for the sportswomen who have had menarche and their mothers presented in Table 1, we can say that for 11 questions there are statistically significant differences in the answers of the two subsamples, i.e. at the level of <.01 for questions numbered 1, 3, 8, 12, *15, *17 and 17, and at level <.05 for questions numbered 10, *10, 15 and 16.

Discussion

The results from questions 1 and 2 lead to the conclusion that 40% of the interviewed sportswomen experienced menarche when they were 12 years old. The age at menarche for 13% of the sportswomen was 11 and 14. Unlike the sportswomen, the age at menarche for most of their mothers, around 33%, was 14 and 26% of them answered that the age at menarche was 12. According to Milojević M., and Berić B. (1983) the menarcheal age of the mothers can affect the age at menarche for their female children. Furthermore, according to the same author, girls who are physically active begin to menstruate later although in this research there is difference in terms of the years women have spent practicing sport.

However, we need to take into consideration the acceleration, or the early occurrence of menstruation which according to Medved R., et all. (1987), is 4 months every 10 years. It means that if the average age of their mothers is 40, the acceleration is 16 months i.e. a year and a half and certainly, there is the effect of the regular training which prolongs the occurrence of menarche. According to Drobnjak P. et all. (1990), due to the acceleration and the improved economic situation, puberty occurs earlier by 2.5 to 3 years in comparison to the last century. Some authors claim that the age at menarche for sportswomen is prolonged for about a year. Unlike them, other authors believe that there is no difference between girls who do sports and girls who do not do any sports.

Concerning the answers to question number 3, we can say that 86.67% of the sportswomen and 80% of the mothers answered that their menstruation lasted from 3-7 days which is considered a normal period for menstrual bleeding. 66.67% of the sportswomen and 73.33% of the mothers have regular menstruation (question 4).

46.67% of the sportswomen answered that they had painless menstruation (question number 6), and 33.33% answered that they experienced a little pain during menstruation, whereas 20% of mothers who trained when they were at their daughters' age have painless menstruation, 53.33% experience a little pain during menstruation and 13.33% have very painful menstruation. The sportswomen and their mothers have similar intensity of menstrual bleeding (question 7), therefore 66.67% of the sportswomen and 73.33% of their mothers described the menstrual bleeding as medium, and only 6.67% of the sportswomen and 13.33% of their mothers have excessive menstrual bleeding.

Although this research has been carried out among sportswomen who train actively, they all spend different number of hours of different days on training. Using the questionnaire, we found out how much they are physically active. The answers to question 10 have revealed that the respondents – sportswomen have been training this sport (judo) from 3-8 years. 20% have been training judo for 4 years, 20% have been training for 6 years and 20% have been training for 8 years, while the rest 13.33% have been training actively (for 3 years, for 5 years, for 7 years) too. The results in Table 1 show that almost half of their mothers when they were at their daughters' age trained actively, the other half did not do any sports. 13.33% of the sportswomen attend 1-3 training sessions a week, 40% attend 3-5 training sessions a week, 26.67% attend 5-7 training sessions a week and 20% attend more than 7 training sessions in a week. 80% i.e. 12 sportswomen answered that the training sessions lasted from 1h and 30min to 2 hours and only 3 i.e. 20% answered that the training sessions lasted from 1h to 1h and 30min. It is certain that the effect of the duration of training sessions on a daily and yearly basis is great.

40% do not experience any discomfort and 40% of the sportswomen experience menstrual discomfort when they compete and train during menstruation (question 16), but only 6.67% have said that their results are worse. 73.33% of the sportswomen have the same results when they compete during menstruation in comparison to the results when they do not menstruate, 20% have worse results and only 6.67% have better results (question 17). This is very important and it should be pointed out to sportswomen and all the female students so that they do not feel afraid to exercise at Physical Education classes. Borić N. (2013), conducted research on 241 professional sportswomen. Although, 3 out of 4 sportswomen felt worse during menstruation than before menstruation, 63% of the respondents pointed out that the pain reduced during training and competitions, and 62.2% believed that their results were equally good during the bleeding and the rest of the month.

According to Hristov N. (1992), 25% of the observed sportswomen showed poor performance, 25% showed better performance and 50% did not show any differences. Čupić S., Stanoević S. (1970), did research on the problem of menstrual cycle and the activity of 65 top athletes from Belgarde and Sarajevo. Based on the results, the authors concluded that during menstruation, 60 athletes trained constantly, 5 trained occasionally, 8 abstained occasionally, and only two did not train at all. In terms of the achieved results during menstruation, 14 had better results, 21 had worse results, and 30 female athletes had variable results. Kral (stated by Stojanvić S. (1977)) did research on the course of the cycle of female athletes during training and competitions. He came to the conclusion that 64% of the female athletes did not show any changes in the flow of the menstruation, for 20% of the female athletes the flow of the menstruation was better but it was accompanied with discomfort and for 16% of the female athletes the menstruation was aggravated and accompanied with fatigue. Jovicević R., Stanić R. (1986), had similar results from the research they did on 45 sportswomen (15 female handball players, 10 female volleyball players, 12 female basketball players and 8 female athletes who competed in the federal

league) and they concluded that neither of the sportswomen experienced disruption of the menstrual cycle.

From that perspective, it is interesting to mention the research on endurance done by Noack N., Tittel N. (1968). The authors claim that the poorest performance was recorded before menstruation, the performance was somewhat better during menstruation and the best performance was recorded right after menstruation. Kliment V. (1986) came to similar results.

Conclusion

From the set goals and the analysis of the results, the following can be concluded:

- the sportswomen's average age at menarche is 12, and the age at menarche for half of the mothers is 12 and for the other half is 14
- the respondents' menstruations last from 3-7 days which is considered as normal menstrual bleeding period. Almost half of the sportswomen answered that they had painless menstruation
- a large percentage of the sportswomen, as many as 93.33% (14 of them) train during menstruation and only one does not train during menstruation. This number of training attendance during menstruation is justified because the sportswomen answered that they did not experience any discomfort during menstruation when they trained.
- the largest percentage of 73.33% said that they had equal results, 20% said that they had worse results and 6.67% said that they had better results.
- according to the results of this question ,40% of the sportswomen experience the same discomfort when they train and when they do not, and 40% do not experience any discomfort
- the mothers of the sportswomen gave answers similar to their daughters' answers. At present, they exercise or do recreational activities regardless of the menstruation and 60% of them are active during menstruation. Hence, we can conclude that the large percentage of training attendance during menstruation depends on the advice and personal experience of the mothers who encourage their daughters to attend training sessions during menstruation.
- It can also be concluded that the discomfort before, during and after menstruation when sportswomen train or compete differs individually, and for a large number of girls the discomfort is the same when they train and compete meaning that there is no deterioration of the symptoms, the pain, the bleeding, the uneasiness of the body which accounts for the answers that they achieve equally good results on competitions during the first days of menstruation and the other days when there is no menstrual bleeding. This is very important and it should be pointed out to sportswomen and all the female students so that they do not feel afraid to exercise at Physical Education classes.

The results of this research will contribute to the allocation of volume and quality of the training, the connection and ensuring continuity of the training and the competing process, timely planning and organizing of competitions and thereby proper and more useful allocation of financial resources. Hence, the opportunity to apply the results of this research to certain theoretical knowledge and practice which will lead to improved and modernized clubs and it will make the job of sports coaches and associates in clubs easier. It will also be easier for Physical Education teachers to deal with their female students at primary schools.

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COMPARATIVE ANALYSIS OF THE DIFFERENCES OF ANTHROPOMETRIC MEASURES BETWEEN THE MALE AND FEMALE PUPILS OF 11, 12 AND 13 YEARS OLD IN THE REPUBLIC OF MACEDONIA

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Abstract

The research was conducted on a sample of 156 male and 156 female subjects at the age of 11, 12 and 13, in 15 primary school in the Republic of Macedonia. The initial measurement was carried out for the subjects at the age of 11, the transitional measurement was carried at the age of 12 and the final measurement was carried out for the subjects at the age of 13. In order to determine the changes of several segments of the anthropometric dimensions based on the longitudinal measurement. 11 anthropometric measurements were applied in the three treatments for the same pupils at the age of 11, 12 and 13. The obtained data from the measurements of the manifested anthropometric measures are processed with the basic descriptive static parameters. The T-test was applied to determine the differences between the mean of the manifested anthropometric measures in the male and female samples.

Key words*: anthropometric, measures, pupils, T-test*

Introduction

The knowledge about the physical growth and development has a great contribution for the effective education in the primary and secondary schools where sports and sport activities are applied.

Within the frames of the general development of each person, these processes do not develop in parallel and with the same rate. According to Vandervael (Kurelic et al., 1975, p.53) the body development and all significant processes in the body structure and the activities of individual tissues and organs are intense during the period of adolescence (girls from 10-11 to 15-16, and the boys from 12-13 to 17-18). According to the author, the first two years correspond to puberty and this period is characterized by a rapid increase of longitudinal dimensions while the intensive growth and full maturation continue in the remaining years of puberty.

The person's development, behavior and characteristics are regulated by a mutually coordinated influence of internal and external factors. The influence of upbringing and the regular physical exercise as external factors can improve the developmental characteristics of a person more while for another less. These differences come out from the differences of the biological developmental laws of the individual which are different in each age for the same sex. It is considered that until puberty the hereditary factor remains unchanged for both boys and girls, i.e., the boys and girls develop biologically in parallel. It can be assumed that there should not be any differences in the morphological and motoric sub-space among the boys and girls. However, taking into account that the puberty occurs earlier in females, in chronological sense, unlike males, we can assume that certain changes occur in females' development in their biological development.

Material and methods

A longitudinal research was applied to specimen of 156 male pupils and 156 female pupils at the age of 11, 12 and 13 from 15 primary school in R. Macedonia in order to determine the differences in mean of the anthropometric measures between the male and female subjects and their changes in the period from 11 to 13.

The subjects (males and females) in all the designated schools were treated longitudinally in three time and age points for the purpose of this study. The initial measuring was carried out at the age of 11, the transitional measuring was carried out at 12 and the final measuring was carried out at 13.

11 anthropometric measures were applied for the same students at the age of 11, 12 and 13 in all subjects of the two sub-specimens (male pupils and female pupils). The following anthropometric variables were applied for the estimation of the anthropometric dimensions of the male and female pupils. For the estimation of the longitudinal dimensionality: the body height (AVIS) and the arm length (ADOLR). Transverse dimensionality: shoulder width (ASIRA) and wrist diameter (ADIRZ). For circular dimensionality and body mass: the forearm circumference (AOPOD), the upper arm circumference (AONAD), the shinbone circumference (AOPTK) and body mass (AMASA). For the assessing of subcutaneously fat tissue: upper arm skin folds (AKNAD), stomach skin folds (AKSTOM) and shinbone skin folds (AKPOD).

Besides the basic descriptive static parameters, a T-test was applied on the results in order to determine the differences between the mean of the manifested anthropometric measures on the male and female pupils during the treated period.

Results

The T-test was applied in order to determine the differences between the mean of the manifested anthropometric measures for the sample of both 11-year male and female olds. If the value of the T-test is 1.96 or higher, the difference between the mean are statistically significant at the level of 0.05 (Table 1). Analyzing the T-test results, it can be noticed that the female pupils have higher statistical values for the anthropometric measures: AVIS, ADOLR, AKNAD, AKPOD, AKSTOM, while the male pupils have higher statistical values for ADIRZ. The obtained differences for the variables ASIRA, AOPOD, AONAD, AOPTK and AMASA are statistically irrelevant.

Table 1. The differences between the values of the mean of the morphologically manifested variables of male and female subjects at the age of 11

	Mean	Mean			
	MALES	FEMALES	t-value	df	p
AVIS	1461.47	1483.23	-3.00	310	**.002875**
ADOLR	625.17	640.65	-2.74	310	**.006389**
ASIRA	318.96	318.26	.32	310	.746030
ADIRZ	45.32	43.29	3.54	310	**.000451**
AOPOD	206.14	206.21	-.03	310	.973362
AONAD	210.51	212.60	-.65	310	.515713
AOPTK	296.59	303.52	-1.82	310	.068781
AMASA	382.12	399.03	-1.77	310	.078265
AKNAD	13.78	15.60	-2.40	310	**.016633**
AKPOD	15.27	18.63	-3.93	310	**.000100**
AKSTOM	12.72	14.74	-2.30	310	**.021997**

Table 2. The differences between the values of mean of the morphologically manifested variables of male and female subjects at the age of 12

	Mean	Mean			
	MALES	FEMALES	t-value	df	p
AVIS	1519.23	1533.00	-1.81	310	.071487
ADOLR	657.64	661.06	-.88	310	.378489
ASIRA	315.82	310.15	2.12	310	**.034180**
ADIRZ	39.61	38.18	3.06	310	**.002360**
AOPOD	214.51	216.56	-.69	310	.491588
AONAD	221.65	226.17	-1.19	310	.235659
AOPTK	316.26	327.53	-2.67	310	**.007975**
AMASA	433.77	448.85	-1.52	310	.129755
AKNAD	12.28	14.10	-2.78	310	**.005748**
AKPOD	14.05	16.33	-2.98	310	**.003057**
AKSTOM	11.18	12.23	-1.45	310	.147547

The results of the T-test for testing of the differences in the mean of the manifested anthropometric variables for boys and girls at the age of 12, are shown in the Table 2. According to the coefficient of significance for the differences, the male pupils (M) have statistically and significantly higher values than the female pupils (F) for the variables: ASIRA and ADIRZ, i.e., for the measures for estimating of the transversal dimensionality, while the girls have statistically and significantly higher values for the variables: AOPTK, AKNAD and AKPOD.

At the age of 13 (Table 3) , the male pupils (M) have higher values for the variables: ADOLR, ASIRA and ADIRZ. These differences are statistically significant now. The female pupils (F) have higher values for the variables for assessing of subcutaneous fat tissue (AKNAD, AKPOD and AKSTOM) and the obtained differences are statistically important.

At the age of 13, the girls' growth and development are declining in order to stabilize. That is, the differences in values of the body height and the length of the arm fall. These differences are statistically significant and the difference in the body height approaches the significant threshold (.07). At the same time, the increase of the values for the variables ASIRA and ADIRZ continues for the boys.

Table 3. The differences between the values of the mean of the morphologically manifested variables of male and female subjects at the age of 13

	Mean	Mean			
	MALES	FEMALES	t-value	df	p
AVIS	1604.55	1590.30	1.81	310	.070669
ADOLR	693.78	684.67	2.36	310	**.018939**
ASIRA	357.85	351.79	2.62	310	**.009216**
ADIRZ	49.94	46.94	7.97	310	**.000000**
AOPOL	217.73	216.17	.60	310	.551984
AONAD	226.54	227.17	-.19	310	.847192
AOPTK	325.51	329.90	-1.11	310	.265670
AMASA	504.90	496.65	.82	310	.410010
AKNAD	12.26	16.40	-6.29	310	**.000000**
AKPOD	16.23	18.67	-3.25	310	**.001269**
AKSTOM	13.06	16.09	-3.78	310	**.000178**

Discussion

On the basis of the obtained results, we can conclude that the female pupils at the age of 11 are at a stage of accelerated growth which is characterized by an increase in body values, the length of the arm and skin folds. At the same time, the value of the shinbone and the body mass increase, but that difference is on the significant threshold (.06.07), while the increase of the size of the radius and humerus is minimal.

Therefore, it can be concluded that at the age of 11, the female pupils experience more intense changes compared to the male pupils in terms of longitudinal dimensionality and subcutaneous fatty tissue. At the same time, the body mass increases probably as a result of the increase in skeletal mass and subcutaneous fat. As a result of the increase in the subcutaneous fat on the lower leg, there is also an increase in the circumference of the calf which is close to the significant value (0.06). The insignificant differences in boys and girls in the volume of the forearm and upper arm are probably the result of the significant increase in the length of the female pupils' arms and there are no significant changes in the volume of the arm. On the basis of the analyzed differences in the mean between the male and the female pupils, we can conclude that:

- In the treated age period, at the age of 11, the female pupils have higher values for the applied longitudinal measures (body height and arm length, intended for the estimation of the longitudinal dimensionality; anthropometric measures: upper arm skin folds, lower leg skin folds and stomach skin folds for assessing of the subcutaneous fat).
- The pupils had significantly higher values for the diameter of the wrist, intended for estimating of the transverse dimensionality.

- The obtained differences in anthropometric measures: the width of the shoulders, the volume of the upper arm, forearm and the calf, and the body mass are statistically insignificant at the level of 0.05.

The fat tissue increases significantly on the upper arm and on the lower leg for the 12-year-old female pupils while the fat on the stomach begins to decrease and this decrease becomes insignificant unlike when they were 11. At the same time even the significance of the body mass decreases which suggests that the fat tissue and the increase of the skeletal mass had a great influence on the increase of the body mass at the age of 11.

Characteristic for this age period (12 years old) is the significant increase of the size of the lower leg which it had an increase at the significant threshold at the age of 11. The increase of the transverse dimensionality is greater for the 11-year-old and 12-year-old male pupils. At the age of 11, the increase of the wrist diameter is statistically significant and it continues at the age of 12. In addition, the increase of the shoulder width is also statistically significant.

We can conclude that the male 13-year-old pupils start intensive growth with a significant increase of the values for the longitudinal and transverse dimensionality. During this period, the boys, for the first time, receive higher values for the variable of the body mass than the girls. But this difference is still not significant. Most probably, the increase of body mass during this period depends on the increase of the boys' longitudinal and transverse measures. During this period, the increase of the values for the subcutaneous fat tissue for the girls is statistically significant.

The increase of the values for the fat tissue of the girls during the testing period from 11-13 continues up to 15 (Kurelik et al., 1975). We should emphasize that the behavior of the size at age from 11 till 13 is insufficiently defined. The numerical increase of the size of the girls compared to the one of the boys is statistically insignificant. Significant differences were found in the circumference of the lower legs for the 12-year-old female pupils. Bearing in mind that the skin fold is statistically significantly high in all measurements, we can conclude that the differences in size are due to the presence of increased fat tissue on the lower leg. The unstable behavior of both the boys' and girls' body size during the testing period, from 11-13 years old, refers to new studies in the period from 10-11 and from 13-14. Identical results have been obtained in similar studies (Kurelik et al., 1975). The circumference of the forearm and upper arm increases during the period from 11-13 and after that period their values decrease. The variability of the size has the largest increment from 11 till 13 and it decreases during the developing period at a different pace.

Table 4. An overview of the differences in the mean of the anthrometric measures between the male and female pupils (m and f) from the 5th, 6th and 7th grade (according to the comparative analysis of the t-test)

	5th grade with 5	6th grade with 6	7th grade with 7
	BETTER RESULTS		
AVIS	F	/	/
ADOLR	F	/	M
ASIRA	/	M	M
ADIRZ	M	M	M
AOPOL	/	/	/
AONAD	/	/	/
AOPTK	/	F	/
AMASA	/	/	/
AKNAD	F	F	F
AKPOD	F	F	F
AKSTOM	F	/	F

Based on the review, we can conclude that during the testing period the boys have progressively higher values for the longitudinal and transverse values while the girls have higher values for skin folds. The volumes and the body mass are unstable. During this period, the girls' volume values are higher in relation to the boys' but these differences are the most significant. The increased volumes in females are probably due to the increased subcutaneous fat tissue values.

Conclusion

- Compared to the male pupils, we can notice an accelerated growth at the 11-year-old female pupils which is characterized by an increase of the values for the longitudinal measures (body height and arm length) and skin folds (upper and lower leg). At the same time, values for the volume and body mass increase but these differences are statistically insignificant.
- The 12-year-old male pupils have statistically higher values than the variables for the females ASIRA and ADIRZ, i.e., the measures for assessing of the transverse dimensionality. The female pupils have statistically higher values for the variables: AOPTK, AKNAD and AKPOD. The characteristic thing among the 12-year-old male and female pupils is the significant increase in the size of the calf in relation to 11-year-old pupils.
- It can be concluded that the 13-year-old male pupils start intensively to grow with significant increase of the values for the longitudinal and transverse dimensionality. During this period, the boys receive higher values than the girls, for the first time, in the body mass variation, but the difference is still not significant.
- Based on this review, we can conclude that, during the testing period, the boys progressively have higher values for the longitudinal and transverse measures while the girls have higher values regarding the skin folds. The volumes and the body mass are unstable. During this period, the values of the volumes for the girls are higher in relation to the boys', but these differences are the most significant. The girls' increased volumes are probably due to the increased subcutaneous fat tissue values.

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POSSIBILITIES FOR CATEGORIZATION OF MOUNTAIN RUNNING COURSES ON THE EXAMPLE OF THE COURSE FOR "HRISTO BOTEV CUP" - VRATSA, BULGARIA

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Abstract

Mountain running, as an athletic discipline, which differs from other so-called trek-trails running with specific, defined requirements to the parameters of the coutes on which races are held. However, each route has its own uniqueness. Explaining the specific features of a particular course can help the planning for the specialized training. A complex characteristic of the course for mountain run "Hristo Botev Cup" is made in accordance with the system of difficulty level, covering the main criteria showing the nature of the courses. Exploring a greater number of rece courses with the help of the system will make it possible to create a categorization for mountain runnings.

Key words: *mountain runnings, planning*

Introduction

Over the last 10 years, mountain running has been one of the most rapidly developing athletic disciplines, both in terms of increasing number of races, as well as the great increase in the number of participants, and also the diversity of race course on which the conpetitions are held.

The racing rules initially had specific requirements for the parameters of the course on which the races are held. Subsequently, these requirements have become with more principled character, given that each route has its own uniqueness. In connection with this, along with the research of the nature of the kinematic characteristics of the mountain running [1, 2, 4], the courses under which competitions and training work in mountain running are done, are also a subject of science investigation [5, 6, 7, 8, 9]. In order to gain a clearer and more objective view of the uniqueness of each mountain running rout, a system to categorize the degree of their difficulty was developed [3]. It is based on 7 key criteria, each with its own regulatory indicator. The indicators are: a variant of the race route, the variation of the slopes of the route, the length of the route, the sum of the positive displacement, the total displacement, the altitude and the surface of the route. Their application to the specificity of each particular route creates an opportunity for the route to be assessed by its difficulty with determining its own unique complex coefficient. Through this innovative system, it is possible to categorize the individual courses for mountain running, which are of particular sport-pedagogical value for the planning, control and management of the training process in the preparation of the mountain running athletes.

The **aim** of the present study is to categorize the route for mountain running for "Hristo Botev Cup" by determining the degree of its difficulty.

Tasks of the survey are:

1. Estimating the indicators which charactarise the current route.
2. Determining the zones of the indicators corresponding to the coefficients of difficulty.
3. Calculation of the coefficients of each indicator and the overall coefficient of difficulty.
4. Formulation of sports-pedagogical conclusions.

The object of the study is the race route of the mountain running for "Hristo Botev Cup" - Vratza, Bulgaria, with start - village of Pavloche and final - peak Okolchitsa.

Subject matter of the survey is the main criteria which characterize the route.

The methodology of the study includes:

GPS-topography, to determine the variant of the route, the different slopes of the route, its length, displacement and altitude.

Description of the terrain.

Mathematical and statistical data analisys.

Results analysis

The indicators of the different criteria determined the following difficulty coefficients of the route:

Criteria (A). Variant of the race route.

Four variants of race courses and their corresponding coefficents of difficulty have been determined in advance. In Fig. 1 it is obvious that the "Hristo Botev Cup" Mountain Run is a variant "Mostly ascent", which corresponds to the difficulty coefficient 8 (Table 1).

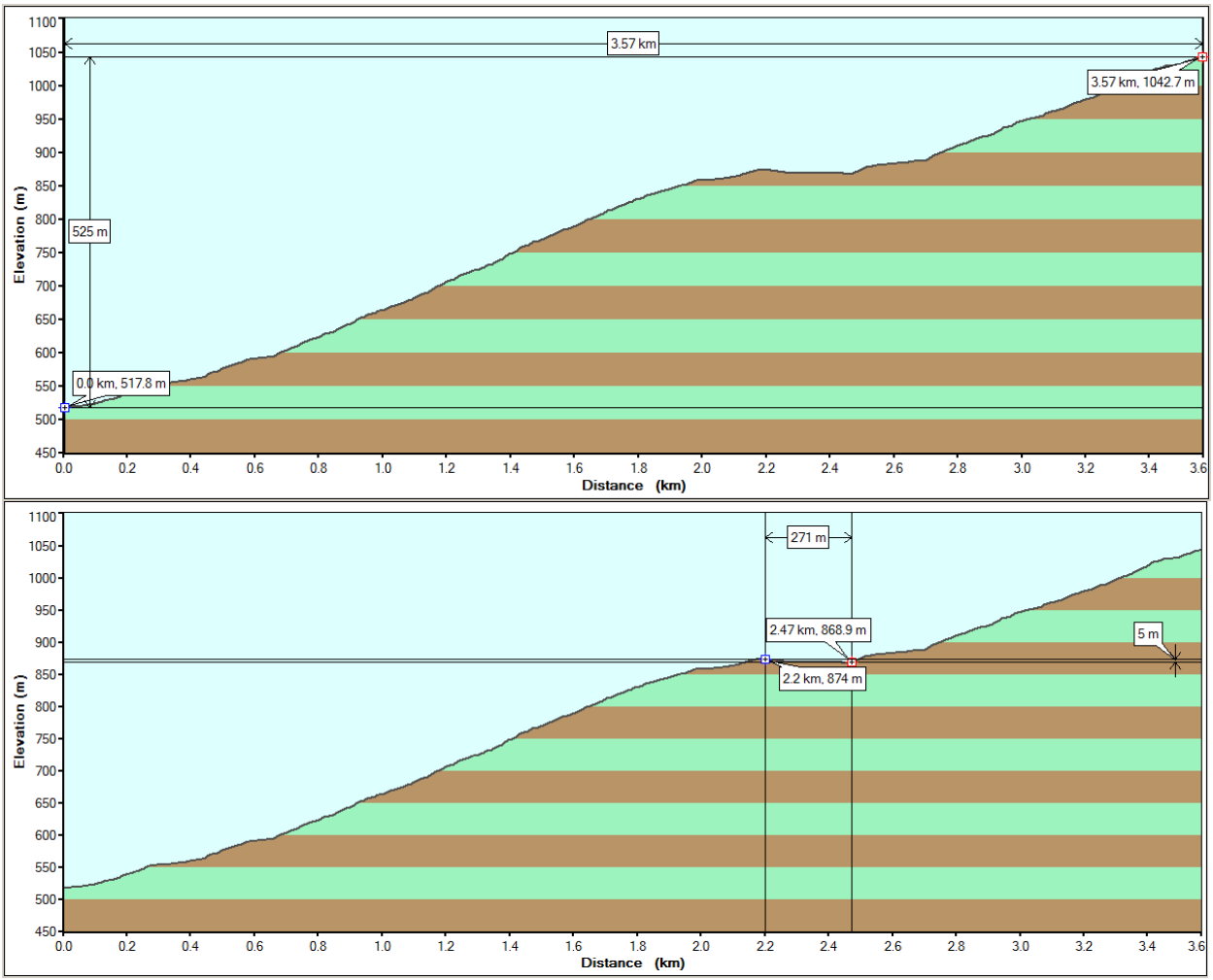

Figure 1 Displacement profile of the route

Table 1 Difficulty coefficients of the route according to the variant of the race route.

Variant of the route	Difficulty Coefficients
Lap with one ascent	5
Lap with two ascents	6
Only ascent.	8
Mostly ascent with significant descent	10

Criteria (B). Different slopes of the track

In the table. 2. an accurate description of the slopes of each section of the route is given, indicating the how many meters is each segment. Table 3 lists the different slopes, degrees and the percentages which correspond to them. Also the total length of each slope and the percentage of the route which it occupies. To the right, the relative difficulty coefficients are also presented. They are determined on the basis of the speed of movement - as the speed of movement is lower, the higher the coefficient is. The difficulty of the

route depending on the slopes is 7.81. It is impressive that a relatively high proportion of the route is large ascent (Figure 2).

Table 2 Description of route's slopes -section/slope measured in percent

Section of the route / slope	Section of the route / slope
0 - 260 m / 12%	2100 – 2170 m / 12%
260 - 440 m / 7%	2170 – 2250 m / -4%
440 - 570 m / 19%	2250 – 2480 m / 0%
570 – 650 m / 16%	2480 – 2700 m / 8%
650 – 1700 m / 21%	2700 – 3450 m / 19%
1700 – 2000 m /17%	3450 – 3490 m / 0%
2000 – 2100 m / 4%	3490 – 3570 m / 14%

Table 3 Difficulty coefficients according to the slopes

Slope of the route	Degree of the slope	Percentage of the slope	Overall meters	Percentage of the route	Difficulty Coefficient
Small descent	-4°	-6.9%	80 м	2.2%	2
Flat	0°	0%	270 м	7.6%	3
Average descent	-8°	-14%	-	-	4
Big descent	-12°	-21.2%	-	-	5
Small ascent	4°	6.9%	500 м	14%	6
Extreme descent	-16°	-28.6%	-	-	7
Average ascent	8°	14%	720 м	20%	8
Big ascent	12°	21.2%	2000 м	56%	9
Extreme ascent	16°	28.6%	-	-	10
Difficulty coefficients according to the slopes					**7.81**

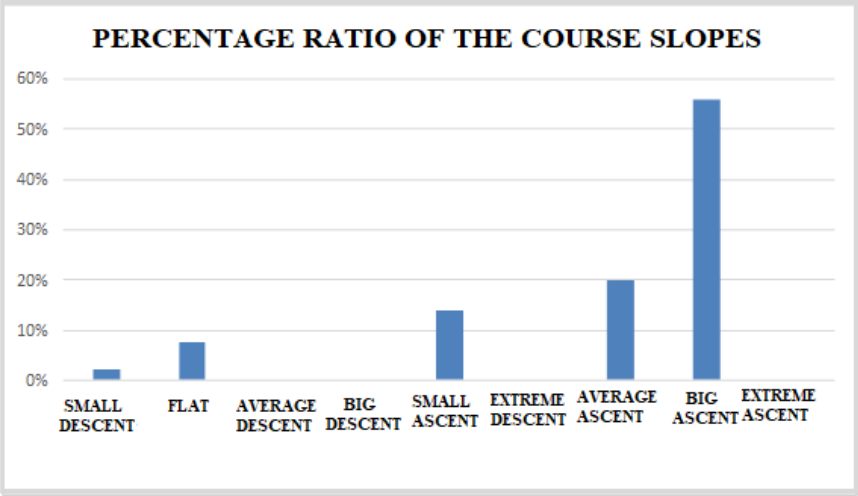

Figure 2 Percentage ratio of the course slopes

Criteria (C). Length of the route

The system for estimating the coefficients according to the length of the course is presented in Table 4. The smallest coefficient: 1 is for length of the route which is 20% under the recommended in the rules, and the highest: 10 is 20% above the recommendation.

The length of the track is 3570 m - fig. 1. It is obvious that according to this criterion, the course corresponds to a coefficient of 5 for junior boys and girls, and for senior is below the difficulty coefficient of zone 1 (Table 4).

Table 4 Difficulty coefficients according to the length of the course

Zones	Length of the course			Difficulty Coefficient
	Men and Women	Senior Boys and Girls	Junior Boys and Girls	
Zone 1	8000 m	4000 m	2400 m	1
Zone 2	8700 m	4350 m	2700 m	2
Zone 3	9400 m	4700 m	2900 m	3
Zone 4	10100 m	5050 m	3300 m	4
Zone 5	10800 m	5400 m	3500 m	5
Zone 6	11500 m	5750 m	3700 m	6
Zone 7	12200 m	6100 m	3900 m	7
Zone 8	12900 m	6450 m	4200 m	8
Zone 9	13600 m	6800 m	4500 m	9
Zone 10	14400 m	7200 m	4800 m	10

Criterion (D). Total Positive Displacement

The determination of the zones is again based on the 'twenty percent' principle. The positive displacement of the studied course is 530 m - fig. 1. This corresponds to a coefficient of 5 for senior boys and girls and it is significantly above coefficient 10 for the junior age (Table 5).

Table 5. Coefficients according to the overall positive displacement of the courses

Zone	Overall positive displacement						Difficulty Coefficient
	Variant "Mostly ascent"			Variant "Ascent and descent"			
	Men and Women	Senior Boys and Girls	Junior Boys and Girls	Men and Women	Senior Boys and Girls	Junior Boys and Girls	
Zone 1	800 m	400 m	240 m	400 m	200 m	120 m	1
Zone 2	870 m	435 m	270 m	435 m	220 m	135 m	2
Zone 3	940 m	470 m	290 m	470 m	235 m	145 m	3
Zone 4	1010 m	505 m	330 m	505 m	250 m	156 m	4
Zone 5	1080 m	540 m	350 m	540 m	270 m	175 m	5
Zone 6	1150 m	575 m	370 m	575 m	290 m	185 m	6
Zone 7	1220 m	610 m	390 m	610 m	305 m	195 m	7
Zone 8	1290 m	645 m	420 m	645 m	320 m	210 m	8
Zone 9	1360 m	680 m	450 m	680 m	340 m	225 m	9
Zone 10	1440 m	720 m	480 m	720 m	360 m	240 m	10

Criterion (E). **Total displacement**

Table 6.Difficulty coefficient according to the overall displacement of the courses

Zones	Overall displacement (positive and negative) for all types of classical mountain running			Difficulty Coefficient
	Men and Women	Senior Boys and Girls	Junior Boys and Girls	
Zone 1	800 m	400 m	240 m	1
Zone 2	870 m	435 m	270 m	2
Zone 3	940 m	470 m	290 m	3
Zone 4	1010 m	505 m	330 m	4
Zone 5	1080 m	540 m	350 m	5
Zone 6	1150 m	575 m	370 m	6
Zone 7	1220 m	610 m	390 m	7
Zone 8	1290 m	645 m	420 m	8
Zone 9	1360 m	680 m	450 m	9
Zone 10	1440 m	720 m	480 m	10

The course of "Hristo Botev Cup" has a positive displacement of 530 meters and a negative displacement of 5 meters - fig.1. Thus, the total denivelation is 535 meters, and for junior boys and girsl this is in the fifth zone with a difficulty coefficent of 5, and for the junior age the value for the coefficient 10 and it is significantly higher (Table 6).

Criterion (E). Altitude of the finish

The altitude zones are distributed into 300 meters sections to the maximum allowed in the rules and regulations - 3000 meters above sea level. The finish line of the studied course is at an altitude of 1043 meters (fig.1), which falls in the sixth zone and has a coefficient of 6 (Table 7).

Table 7. Coefficients based on the altitude of the finish line

Zones	Altitude of the finish line	Difficulty Coefficient
Zone 1	From 0 to 300 m	1
Zone 2	From 300 to 600 m	2
Zone 3	From 600 to 900 m	3
Zone 4	From 900 to 1200 m	4
Zone 5	From 1200 to 1500 m	5
Zone 6	From 1500 to 1800 m	6
Zone 7	From 1800 to 2100 m	7
Zone 8	From 2100 to 2400 m	8
Zone 9	From 2400 to 2700 m	9
Zone 10	From 2700 to 3000 m	10

*Criterion (G).*Surface of the course

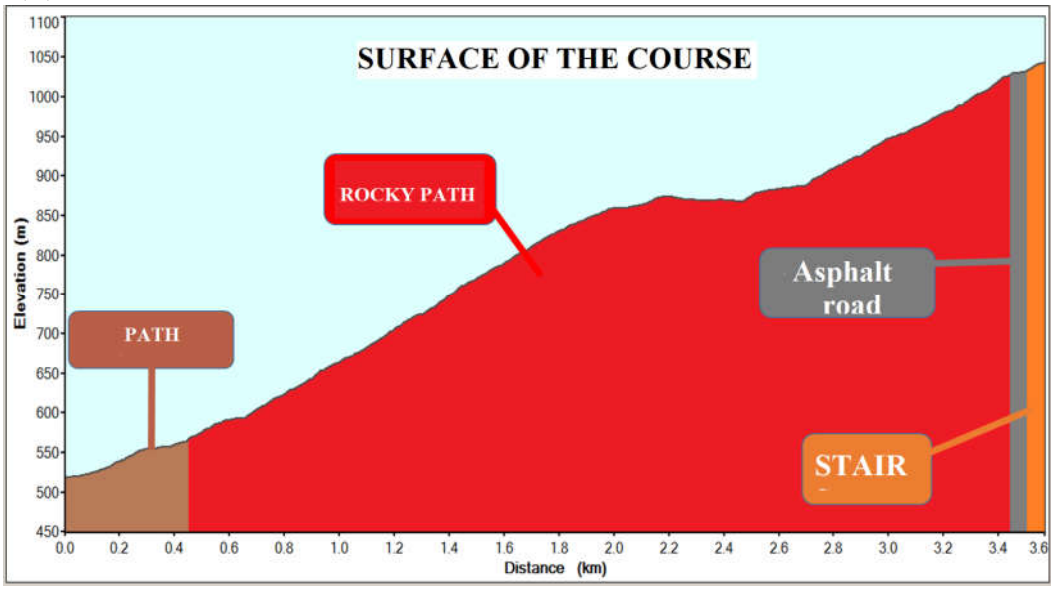

Figure 3 Distribution of types of different surface in the displacement profile of the course

Figure 3 represents the distribution of the types of the surface on the displacement profile. Table 8 provides information where each different surface coveres a particular area. Table 9 shows the relative share of the surface of the course, calculated as a percentage. The data show that 84% of the track is rocky. The coefficient of difficulty according to the surface is 6.36 - Table 9.

Table 8 Description of sections which correspond to different surface

Section of the course	Surface of the course
From 0 to 450 m	Path
From 450 to 3450 m	Rocky path
From 3450 to 3490 m	Asphalt road
From 3490 to 3570 m	Stairs

Table 9 Difficulty coefficient according to the different surface of the course

Surface	Percentage of the course	Difficulty Coefficient
Path	12.6%	3
Rocky path	84.0%	7
Asphalt road	1.1%	1
Stairs	2.2%	4
Difficulty coefficient according to the surface of the course**: 6.36**		

Summary analysis

Figure 8. represents the criteria and coefficients which determine the complex characteristic of the course. In general, all criteria have a high difficulty ratio. The relatively low coefficient of the "slopes of the course" criterion is primarily due to the fact that the race takes place in the "ascent and descent" option and, as it is known, the downward slopes are easier to overcome. It is assumed that comparing it with other course of the same variant it will show that even on this criterion the route is rather difficult.

For the complex course difficulty coefficient value, the arithmetic mean of the established seven coefficients can be accepted.

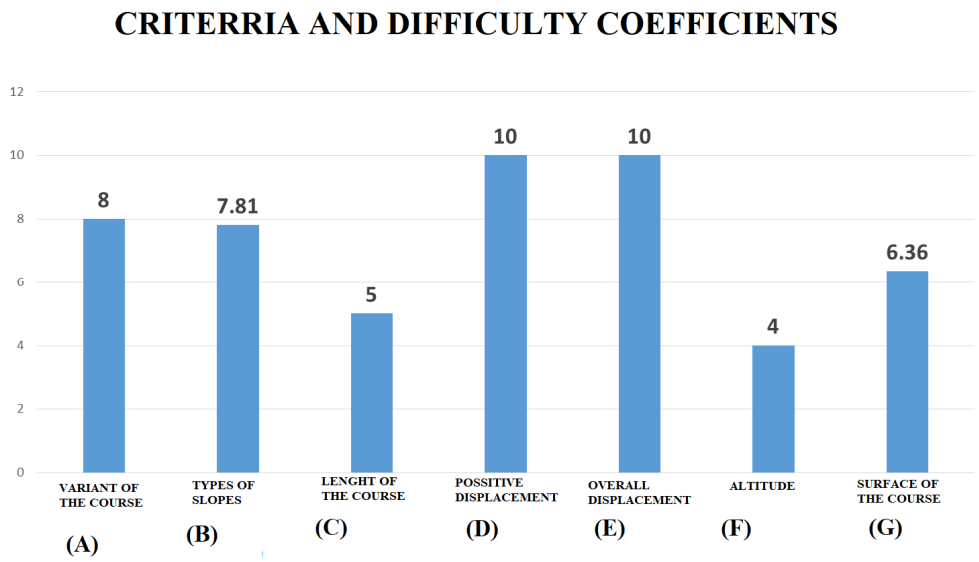

Figure 4 Criteria and difficulty coefficients determining the complex characteristic of the course for “Hristo Botev Cup”

Algorithm defining the complex coefficient = (A + B + C + D + D + E + G): 7 = 7.31

Conclusions

1. It can be assumed that the course of Mountain Run "Hristo Botev Cup" as a whole meets the requirements of the sport rules and regulations for junior and senior boys and girls, but with exceeding recommended values of the criteria for the displacement.

2. According to the displacement, the route corresponds to an average difficulty ratio for senior boys and girls (under 20 years).
3. The course requires athletes to be able to run on a large slope with rocky surface.
4. The course of "Hristo Botev Cup" is very suitable for conducting a specialized training for mountain runners of different qualifications.
5. The approach to participation in the competition does not need to be in line with the principles of altitude adaptation.
6. The established difficulty system makes it possible to acquire a more objective sport-technical characteristic of the course.
7. Clarifying the specific features of the particular course can help with the planning of more specialized training.

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EUROFIT PHYSICAL FITNESS TEST BATTERY FOR ASSESSMENT OF SWIMMING SKILLS IN ADOLESCENTS

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Abstract:

The research was conducted with the aim of determining the influence of the Eurofit battery test on freestyle speed on 20 m. The sample of respondents consisted of 31 students of Nikola Tesla of Nis, 17 years old, who are not engaged in swimming. The predictor system consisted of five variables for estimating the motor skills, from the eurofit battery tests that made it: abdominal muscle strength - (BEELY), static endurance of the arm and shoulders – (BAH), running speed test - (4 x10 m), shuttle run test - (SHR), long jump - (SBH), while the result of swimming at 20 meters was the criterion variable. Regression analysis was used for the influence of motor skills on swimming speed. On the basis of the obtained results, it can be concluded that there is a statistically significant influence (R = 0.65; p = 0.012) with 42,5% of the common variation explained (R^2 = 0.425) of the common variability with the criterion. Analyzing the individual influence, it can be argued that there are individual influence of the predicted system on the 4x10 m test,(p = 0.008). Based on all of the above, it can be concluded that swimming speed depends largely on motor skills.

Key Words: *swimming, freestyle, motor skills, secondary school*

Introduction

When talking about swimming, one should understand that the concept of swimming involves keeping the body on the surface of the water in a horizontal position. Movement on a water surface is possible with the help of certain movements of the upper and lower extremities and without the use of auxiliary agents.

Swimming in our physical education system takes an increasingly important place and we can say that it has very positive influence on the motor and functional abilities of children and youth. Swimming improves their physical form and therefore physical health.

For this research it is important to describe the period of development during the secondary school age (15-18 years of age). This period is characterized by major changes in development. Changes are rapid and intense so that the given period is often called "the fourth critical period". In addition to physiological changes, changes in biological development as well as in psychological and social development occur at the same time. The biological development of children of secondary school age runs intensively and unevenly. Severe changes are observed with the onset of adolescence (Đurašković, 2009).

The development of motor skills does not run evenly. It is characterized by the periods when individual motor skills are rapidly developing, and then the period of stagnation follows. In boys, speed increases from 5 to18 years of age and research indicates a rapid increase after 13 years of age (Malina et al., 2004). The sensitive period of coordination capacities is between 7 and 12 years of age (Farfel, 1960). Winter (1985) states that another sensitive period may also occur after 15 years of age. According to him, this period is based on the knowledge gained from monitoring the development of young athletes. The development of maximum power flows for a long time and mostly gradually. Winter (1985) considers that the sensitive period for this motoric ability is 12/13 years of age until the age of 18.

In Europe and in the World, several battery tests have been drawn up aimed at assessing the level of physical fitness in children, athletes and recreational players. A special role in the teaching of physical education has EUROFIT battery of tests that has been used for more than twenty years to assess the physical ability of children. All data is collected by teachers of physical education within regular classes, in order to assess the effectiveness of the curriculum (Drljačić, 2012).

The aim of this study was to determine the influence of some motor skills on the speed of swimming in secondary school pupils.

Material & methods

Sample of participants

The sample of participants consisted of 31 pupils, aged 17, third grade of secondary vocational school "Nikola Tesla" in Nis. The condition for participation in this study was that all students knew how to swim, but no one was involved in swimming or had some sports results related to this sport.

Procedure

Eurofit-Test was collected of five tests that covers speed, agility, endurance and strength. Test battery is a standardized and designed by the Council of Europe, by Council of Europe (1983) and Council of Europe (1987), and has been used in many European schools since 1988. The test is designed so that it can be completed within 35-40 minutes (Popović et al., 2017), using very simple equipment (https://www.topendsports.com/testing/eurofit.htm).

Swimming velocity was measure with swimming test corresponding to 20 m. The participant where instructed to perform a maximum swimming effort to 20 m.

In this paper the following tests were used: abdominal muscle strength - (BEELY), static endurance of the arm and shoulders – (BAH), running speed test - (4 x10 m), 20 meters shuttle run test - (SHR), long jump - (SBH) and swimming test corresponding to 20 m.

Sample of variables

The sample of variables consisted of 5 predictive and 1 criterion. In addition to variables that assess such as anthropometric measures: height (AVIS), weight of the body measured in kilograms (TT), body mass index (BMI), we used the variables for assessing motor skills: abdominal muscle strength (BELLY), static endurance of the arm and shoulder muscles (BAH), running speed test (4x10 m), shuttle run test (SHR) and long jump (SBH). As a criterion variable, swimming time was used at 20 m free style – crawl (T20 m).

Data processing method

All data obtained was processed in the statistical program (SPSS 21). For all variables, the basic parameters of descriptive statistics were calculated: R-range, Max-maximum score, Min-minimum score, SD-standard deviation and CV-coefficient of variation expressed in percentages. In order to determine the correlation of the entire predictive system of the variable to the criterion variable, regression analysis was used, whereby the following statistical parameters were calculated: the multi-correlation coefficient (R), the coefficient of determination (R^2), the result of the F-test (F) and the statistical significance (p). To determine the impact of each individual variable in the regression analysis, the following were calculated: partial R coefficients, correlation coefficients (R), standardized partial regression coefficients (Beta), t-test results (t) and statistical significance (p). The significance level up to 0.05 ($p \leq 0.05$) was used for statistical significance.

Results

Table 1. Descriptive statistics for basic motor abilities

VARIABLES	N	MEAN	STAD.DEV.	CV %	MIN	MAX	SKEW	KURT
AVIS (CM)	31	181.97	7.24	3.98%	170	199	0.68	0.323
TT (KG)	31	81.42	15.14	18.60%	62	123	1.077	0.642
BMI	31	24.58	4.35	17.7%	19.13	35.55	.969	.283
BELLY (REP)	31	29.35	4.08	13.92%	17	37	-0.659	2.036
SBJ	31	198.45	31.77	16.01%	100	260	-0.538	2.147
SHR	31	371.35	112.40	30.27%	150	570	-0.477	-0.551
4X10 M	31	10.81	1.19	11.06%	9.32	13.91	1.166	0.688
BAH	31	25.23	22.39	88.76%	1	60	0.51	-1.393
T20	31	16.87	3.89	23.06%	11.2	26	0.939	0.688

LEGEND: N - NUMBER OF PARTICIPANTS; MEAN - ARITHMETIC MEAN; STAD.DEV. - STANDARD DEVIATION; CV% - COEFFICIENT OF VARIATION;
MIN. - MINIMUM SCORE; MAX. - MAXIMUM SCORE; SKEW. - SYMMETRY DISTRIBUTION OF RESULTS; KURT. - EXTERNALITY DISTRIBUTES RESULTS

Table 1. shows the values of the basic parameters of the descriptive statistics. N - number of participants; Mean - arithmetic mean; Stad.dev. - standard deviation; CV% - coefficient of variation; Min. - minimum score; Max. - maximum score; Skew. - symmetry distribution of results; Kurt. - externality distributes results.

Table 2. Partial correlation

VARIJABLES	B	BETA	T	SIG.
BELLY	-.088	-.093	-.444	.661
SBJ	.003	.027	.092	.927
SHR	.006	.159	.677	.504
4X10 M	2.518	.775	2.874	.008
BAH	.026	.147	.650	.522
R= 0.652, R^2= 0.425, ST. ER.= 3.23, F= 3.63, P= 0.012				

Results in Table 2. indicate a statistically significant influence of the whole system of motor skills predictor variables on the swimming velocity at 20 m, free style – crawl (p = 0.012). Observed individually, only a variable of 4x10 m, has a statistically significant influence (p = 0.008).

Dicussion

On the basis of everything shown, we can say that speed has a significant impact in this period. According to Malina et al. (2004), the speed in boys develops between 5 and 18 years of age, and some studies show that the speed increases significantly after 13 years. The results of the regression analysis in Table 2. show that the whole set of predicative variables has a statistical significance, and individually only varied the 4x10 m variation (p = 0.008). In the paper Okičić et al. (2012) who examined the swimmers, in the 100 m breaststroke techniqu, it has been proven that (R = 0.78, R^2= 0.61%, p = 0.00). Also, in the paper of Jorgić et al. (2010), who examined students of faculties of sports and physical education in Nis in the 100 m free style – crawl, statistical significance has the basics motor ability and as described with (R = 0.85, R^2= 0.61, F = 6.7, p = 0.00). This indicates that basic motor skills are a very important factor for the development of recreational swimmers and for swimmers who compete in this sport. In the paper Leko (2014), the statistical significance has been shown to have motoric ability to jump further, these results were on the sample of respondents from 11-12 years of age. What has not been done in this paper is flexibility, which, as part of the motor skills of the work Okičić (1996), has shown that it has a significant influence on the speed of swimming, which gives us the possibility for further research in areas that have influenced the mastery of the business of swimming.

Conclusion

The obtained results of the regression analysis indicate that the whole system of motor skills correlates and has an influence on the speed of swimming at a distance of 20 m, freestyle - crawl. Observed individually, only a variable of 4x10 m, has a statistically significant influence. This indicates that in addition to developing motor skills that are very important, it is also necessary to develop a swimming technique for students who are not competing in this sport. In addition to the speed that in this period has the greatest impact, it is necessary to develop other motor skills in order to make the results of swimming even better. On the basis of everything obtained in this work, we can say that swimming should be introduced as the third obligatory time in the education system. In addition to the development of motor skills, swimming affects the strengthening and overall musculature, as well as the improvement of the swimming technique, which tells us that the results of swimming at the distances will probably be better.

The obtained results can be useful for teachers of physical education for the purpose of planning, programming and directing physical education in schools.

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HEALTHY ASPECTS OF KINESIOLOGY IN THE PROCESS OF (ONTOGENETIC DEVELOPMENT) EDUCATION, WORKING AGE AND THE GERIATRICS

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Abstract

Kinesiological-physical health education is good when it ought to begin at the earliest age and finish with the end of the human's life. For studying the genetic inheritance, meaning on the motoric, functional and sport intelligence, the kids have to be subjugated on analysis of the genetic hereditary functional skills before doing any sport, to be able to determine the talent of which sport matches the genetic characteristics. It is because the characteristics of the motoric skills which, generally, are the common bold line of all kids and which represents the common power of the body, the nervous system, skeletal-muscle apparatus on whose level the body is able to load itself or to heal via selected programed kinesiological medical activities which can make evaded dosed effort on the skeletal muscle apparatus. The dosed physical effort keeps the body in good health during its whole existing. The human, as a part of the nature, needs to make it, instinctively and programmed in scientific meaning in the new civilizational advantages in the surviving part, more physical and to fight against the insufficient physical effort – hypokinesias which are the basic problem for the diseases in the civilizationals.

Key words: *kinesiology, prevention, pain, health, hypokinesias, spinal deformation.*

Introduction

Via the non-programmed and programmed physical exercises, it is important to match the skeletal muscle apparatus of the ligaments of the knuckles, especially the regulation of the muscle tonus on the muscles and the ligaments and to get back the elasticity of the soft tissues by special exercises, as well as the power and the functional biomechanical faculty of the skull of human's system, and on the other side to optimize the inner organs. It has a big and important role in the prevention of the different civilizational diseases. To achieve all that, the cadres which deal with the physical kinesiological health education, i.e. health education and sport, need to have quality ability in aspect of the general kinesiological anthropology, kinesiological biomechanical structure of the person, kinesiological physiology, kinesiological anatomy, the general kinesitherapy, and the specialists need to know well the general kinesiological medicine, the aesthetic and orthopedic kinesiology. By that way, the professionals will be able to make the right effort to the system of human as a machine where all the muscles in the body will be under enough physical effort. The professional anthropologist – kinesiologist must correctly and conscientiously teach the classes of kinseiologic and health education to complete the tasks, to optimize the human body as its physical programs will have positive affection on the development of the organism and its condition for good health from the moment of birth all the way to the end of its life. Every class of physical-kinesiological health education must affect to every student for improving the functional faculties, the supportive muscular apparatus, the nervous system and generally the system of human as alive organism. From that point of view, it follows that the investment from the society in the kinesiological anthropology has a special meaning and return investments because the removal of the need of the physical effort will give us a high prevention to the diseases of the civilizational advantages. To realize the tasks of the kinesiology, the kinesiological, physical health education must appear in the kindergartens all the way to the college, and to continue under the form of recreational productive kinesiological reaction, and the talented kids in the process of education to get selected for the professional sport's needs, and after finishing the working process, to keep the physical activities up in the geriatric centers. Practically, during the all ontogenetic process, this way through the programmed kinesiological activities will do prevention against the diseases of the civilizational advantages and if all of this is respected, it is the practical health aspects of the kinesiology, and the professional sport under the form of agonistic kinesiology remains as a synonym for the kinesiological activities.

Discussion

The body is a machine which moves, the bones are levers, and the muscles are workers which move the "machine" like a form of a motor, and that motor is the heart with its vascular vessels. That means that the quest of the expert who deals with the system of human is to do the right body posture on the system of human, its aesthetic position in the manifested room, its functional optimization of the inner organs to save our organism in good healthy position characteristically, intellectually and in good physical position.

The function for supporting the health is not possible to be saved without dosed and programmed physical effort of the system of human, which means that there isn't a substitute neither like a chemical therapy, nor surgery, nor completely pharmaceuthical industry, and that means that there is not an artificial substitute which could affect as good in the condition of the functional abilities as the static of the body and the resistance of the organism as it could be made by the physical effort, the fresh air and the good nutrition. But if the nutrition is not equal to the input of the energy, and that input of energy must be equal to the output of the energy and then, every plus or minus of input of energy is a problem for the human's health. That regulation of plus and minus with the energy is possible with the programmed physical effort which means a balance for input and output of energy is a basic precondition for general healthy condition of the human and the possible changes could appear in the human system influenced from the physical effort in the bones, muscles, ligaments and functional faculties, they cannot be achieved with other things. Through a great synchronizing of the inner organs which work under a command of the central nervous system and their synchronized function keep the body in working availability ready for physical and intellectual working.

The first symptoms of pain in the human's organism are, practically, an alarm on the organism for danger. From the point of the theory of the kinesiology, it means that the danger is hidden in the big need of the organism of insufficient physical effort, the muscles which do not have function get sick, the organism has an imbalance between the need of the physical effort and hypokinesia, and in some cases mutual reaction of pain could happen with hypokinesias which is a common case in the professional sport. In that case, the imbalance of the supportive muscular apparatus is worked. The central nervous system and the inner organs.

The basic tasks of the science of the kinesiology are: supporting and regenerating on the body's construction, continuously keeping the functions of the organism, latent and manifest, saving the health, quick solving the personal and social problems, are precondition for quality and long lifetime. That ought to mean a life without pain with kinesiological stimulus' help for equal loading on the skeletal muscular apparatus of the machine of human which work like inner reaction through the nervous system to the inner organs and supportive muscular apparatus. As a result of all of this, the danger for developing spinal deformations in the ontogenetic development in the growth during the education of the kids decreases, during the working process, during the geriatric age. The danger decreases for developing degenerative diseases, osteoporosis, cardiovascular diseases, impotence, diabetes etc.

These falls of sickness are reached because of the insufficient physical effort which makes a special need in some partial muscular groups, and then comes the atrophy and other problems which lead to the necessity of temporal: stimulating, adapting. The improvising in the work of the anthropological kinesiology, the improvisation in the kinesiological and health education, the improvisation in the sport, the improvisation in the aesthetic and orthopedic kinesitherapy is forbidden. That means that the programmed physical effort is well-balanced effort on the system of human, and that means a treatment which includes the whole muscular groups and inner organs and the nervous system equally to appear in the dosed effort. All parts of the skeletal-muscular apparatus in the human's organism work together and every deviation from the normal static of the skeletal muscular apparatus leads to different deformation on the knuckles, the spine, diseases known as falls of the civilizational diseases. The appearance of the pain is a signal – alarm that the organism is in danger, and the modern medicine with usage of different chemical preparations stops that alarm with different drugs, infusions, ampoules etc. and hinders the defensive mechanisms in the organism, because the using of lots of drugs affects negatively in the functional abilities, the power, movement, the psychical behavior, the happiness, and automatically the confidence of the person is lost in the personal abilities. That leads into big commercialization and previously taken more surgical interventions.

Here comes the question how many and which are the needed programmed physical efforts everywhere that there is insufficient physical effort, regardless the age to be done the prophylaxis of these diseases, and which appear as a result of the partial muscle's need for a physical effort? The answer is: in the process of studying the kniesiological and health education in the schools, the presentation of special talented kids for the sport's needs selection is a must and getting to know the independent exercising after finishing the education, which practically has to continue in the working process as a process of recreational kinesiology, and later in the geriatrics. For the people who have normal physical activity in the physical process, it is enough to hang in a natural surroundings three to four times per week and it would be good if there are consulting centers in the urban environments for advices to the persons how much and how to train the supportive motoric apparatus and the inner organs with exercises for correct physical position of the body and with enough functional loading according to the age and the opportunities of the participant.

Decision

Meaning that, the quality education in the kinesiological anthropology of making expert and scientific frames, specialists, subspecialists and experts, firstly in the branch of the general anthropologic kinesiology which is set mostly in the educational process, in the regulation of the growth and development of the students where massively is made prevention of bad physical positions, spinal deformations, where during the educational process it must takes enough theoretical and practical knowledge for the usage of the recreational kinesiology in the process of productivity that is a precondition for creating new healthy generations, that could mean decreasing the abuse of the chemical treatment and surgery which now is too commercialized. Meaning the rehabilitation of the body according to our personal experience, three months are enough programmed practice for stabilization of the organism in the manifested and latent room. Relating the prevention of the civilizational diseases, the best action on the health of the human moderate physical efforts. All trainings must be in correlation with the structure of the person and functional abilities, because it may affect badly on the athlete's health. According to all this, the decision is that the right prevention of the diseases of the civilizational advantages, firstly the spinal deformations on the skeletal muscular system, cardiovascular diseases, impotence, different rheumatic and degenerative diseases, diseases on the metabolism of the organism are firstly a result of a bad statics in the human's organism, and the bad function of the inner organs which is the reason for getting the up-listed diseases as a result of physical effort's needs. Through the dosed loading, keeping the power, agility, orientation in the room, durability, the balance in the organism, the elasticity etc. are possible only if there is a regular maintenance of the body under the form of dosed physical effort and the walking in nature on a fresh air and good nutrition. Otherwise, it is necessary the usage of many drugs from the chemical industry which affect destructively on the human's organism and shorten the humans' lifetime.

Because of that, the faculties for kinesiological education need to create high-quality cadres who know the fundamental disciples as: physiology, anatomy, theory of kinesiological anthropology, biomechanics, nutrition etc. in a level of a physician, and to use the practical kinesiology for optimizing the system of human, and on the other hand it must be a legal regulative where the work on the human's body will be legal. Seen from the aspect of the ontogenetic development, the kinesiological activities must be represented in the process of the human's lifetime. During the growth and development of the educational process, during the working process as a form of recreational productive kinesiology during the gerontology as a form of healthy aspects for condition and prevention of the degenerative processes of an adult. Everything that is deviation from the normal development must be done on different healthy exercises as a form of kinesitherapy, physiotherapy, aesthetic and orthopedic kinesiology. These settings of the kinesiological activities' function could do the most quality prevention of the civilizational diseases, as: spinal deformations, cardiovascular diseases, degenerative diseases etc.

As ending of all these up-written, the need of a class of physical health education is the only way, generally speaking, against the falls which are created today as a result of the hypokinsias.

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SPORT AND DENTAL TRAUMA IN FRONTAL REGION - PROSTHODONTIC MANAGEMENT

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Abstract

Healthy way of living requires physical and sport activities. Reasons to participate in sports and physical activity are many, such as pleasure and relaxation, competition, socialization, maintenance, and improvement of fitness and health. Sports participation also carries a risk of injuries. Falls, kicks and rough play are main reasons for orofacial and dental trauma. Dental trauma in sports is the major linking channel between the sports and dentistry. Sports trauma frequently involves insult to oral soft and hard tissues, resulting in loss of tooth structure and tooth loss. A large number of dental and orofacial injuries related to sports affect the maxilla, maxillary incisors, and the upper lip with 50%-90% of injuries involving the maxillary incisors. The main purpose of this study is to present the prosthodontic management of patients with present dental trauma as a result of injuries in sport and physical activities, treated at the Department of Prosthodontics at the University Dental Clinic – Skopje. The dental trauma at anterior teeth is resolved with fixed prosthodontic restoration. After the clinical examination and considering the current condition of the injured teeth and soft tissue in general, and after a consultation with the patient, several prosthodontic solutions were suggested. Using metal-ceramic and all-ceramic as possibility of choice, dental traumas are successfully solved, and thus good results in terms of good esthetic and function of the lost or damaged anterior teeth, full dental arch and satisfaction for the patients and dentist were gained. Dental trauma at sport activities causes functional, psychological and social problems for patients. The correct and on-time dealing of the dentist with these conditions removes the further problems, and education of the patients who take part in sport activities enables prevention and reduction of the dental traumas.

***Key Words**: prosthodontic management, dental trauma, sport*

Introduction

Sports means "to carry away from work" and is one of the most common forms of recreation practiced by individuals in today's high stressed life. There is a large number of people taking active part in training and competitions in professional sport too. Sports participation is a frequent cause of injury (muscle injuries, torn cartilage, fractured bones, tendinitis, soft-tissue lacerations, contusions and broken teeth), in general to children, adolescents and adults too.

Dental injuries are the most common type of orofacial injury sustained during participation in sports. The common orofacial sports related injuries include soft tissue injury and hard tissue injury such as tooth intrusions, luxation, crown and/or root fractures, complete avulsions and dental-facial fractures.

Consequences of orofacial trauma for sport participants and their families are substantial because of potential for pain, psycho-logical effects and economic implications.

Sports dentistry had its origins in the 1980s (Ranalli D.N., 2002) and involves the prevention and treatment of orofacial athletic injuries and related oral diseases, as well as the collection and dissemination of information on dental athletic injuries and the encouragement of research in the prevention of such injuries.

Incidence of sport injuries in orofacial region

The face is the most vulnerable area of the body and is usually the least protected. Sports-related facial injuries account for 8% of all facial soft tissue injuries. Approximately 11-40% of all sports injuries involve the face. These injuries are most often due to direct hits with a ball or player-to-player contacts.

The incidence of sports related orofacial injuries serve to depend upon the circumstances of the nation in terms of the number of people involved, the extent of the sports facilities and the sport, which is most popular.

The national youth sports foundation for the prevention of athletic injuries estimates that during the season of play, athletes have a 10% chance of sustaining an injury to the face or mouth.

Studies have shown that 13-39% of all dental injuries were sports related and of all sports accidents reporting, 11-18% were maxillofacial injuries (Camp J., 1996). The most common types of sports related facial trauma are the soft tissue injuries and the fractures of the "T-zone" bones (the nose, the zygoma and the mandible). These injuries often occur in combination. Males are traumatized twice as often as females. In children, sports were found to be responsible for 13% of overall oral trauma. The majority of sport-related dental and orofacial injuries affect the upper lip, maxilla and maxillary incisors, with 50-90% of dental injuries involving the maxillary incisors.

Classification of traumatic dental injuries comprises trauma to the hard dental tissues and the pulp, to the periodontal tissues, to the supporting bone and to gingiva and oral mucosa (Table 1). It reflects the Application of international classification of diseases to dentistry and stomatology by World Health Organization (WHO).

It comprises seven types of tooth fractures, six types of luxation, eight types of damage to supporting bone and three types of injuries to oral mucosa or gingiva.

Classification used in clinical practice differs from classification used in epidemiological studies and comprises six categories: no traumatic dental injury, treated traumatic dental injury, enamel fracture, enamel-dentin fracture, pulp injury and missing tooth due to the traumatic dental injury.

Table 1. Classification of traumatic dental injuries

Type of injury (code according WHO)
Injuries to the hard dental tissues and the pulp
Enamel infraction (N 502.50)
Enamel fracture (N 502.50)
Enamel- dentin fracture (N 502.51)
Complicated crown fracture (N 502.52)
Uncomplicated crown- root fracture (N 502.54)
Complicated crown-root fracture (N 502.54)
Root fracture (N 502.53)
Injuries to the periodontal tissues
Concussion (N 503.20)
Subluxation (N 503.20)
Extrusive luxation (N 503.20)
Lateral luxation (N 503.20)
Intrusive luxation N 503.21
Avulsion (N 503.22)
Injuries to supporting bone
Comminution of the maxillary alveolar socket (N 502.40)
Comminution of the mandibular alveolar socket (N 502.60)
Fracture of the maxillary alveolar socket (N 502.40)
Fracture of the mandibular alveolar socket (N 502.60)
Fracture of the maxillary alveolar process (N 502.40)
Fracture of the mandibular alveolar process (N 502.60)
Fracture of the maxillae (N 502.42)
Fracture of the mandible (N 502.61)
Injuries to gingiva or oral mucosa
Laceration of gingiva or oral mucosa (S 01.50)
Contusion of gingiva or oral mucosa (S 00.50)
Abrasion of gingiva or oral mucosa (S 00.50)

Case Report 1

In the first case we had a 25 years old patient taking part in motorcycle racing. During a race he had a fall and got a fracture of central and lateral incisors. Both lateral incisors were fractured and we diagnosed a complicated crown fracture with pulp exposure. After the endodontic treatment we made a dental post and metal-ceramic crowns.

At the first maxillary incisors we diagnosed enamel fracture at currently vital teeth. After some time the teeth defect was resolved with glass-ionomer filling. The second phase was the esthetic and functional reconstruction with metal-ceramic restorations. With the fabrication of the metal-ceramic fixed prosthodontic restorations the maxillary inter canine area was filled. (Figure 1, 2)

Fig 1. Pre-treatment view

Fig 2. Post-treatment view

Case report 2

The patient was a 20 years old active women basketball player. During a match and a duel with an opponent, she got a dental injury. After couple of hours after the accident, the patient came to the dental office and brought the broken part of the tooth with her. Enamel dentin fracture with no pulp exposure was diagnosed. The tooth was anesthetized and the fractured segment and the tooth were both then cleaned and disinfected. The fractured segment will be reattached with a highly filled bonding resin, according to manufacturer's recommendations. The enamel and dentin were etched for 15 seconds with 35% phosphoric acid. The tooth was rinsed and lightly dried, leaving the surface moist. The bonding resin was applied to the enamel and dentin, cured for 20 seconds. The fractured segment was etched in the same manner. Then bonding agent was applied to the fractured segment and tooth was cured for 20 seconds in each side of it. After 14 days we finished the work and we made an esthetic prosthodontic reconstruction of single central left incisor with all-ceramic crown. This procedure is one of the most challenging esthetic dental procedures. Both the patient and the doctor were extremely satisfied with solving of the sport dental trauma. (Figure 3,4,5)

Fig 3. Pre-treatment view

Fig 4. Reattaching of the broken tooth segment

Fig 5. Post-treatment view

Prevention of sports dental and orofacial traumas

Many sports-related traumatic dental injuries are preventable. The risk-to-benefit ratio can be improved by the use of appropriate, properly fitted, protective athletic equipment. Furthermore, as the predictive risk factors associated with such injuries are more clearly identified and defined, the design and development of new protective devices may contribute positively to future athletic injury prevention.

At present, helmets, facemasks, and mouth-guards are required in some sports to reduce both the likelihood and the severity of sports-related traumatic injuries to the head, face, and mouth of an athlete.

The imperative for future independent scientific research is emphasized to transform current clinical empiricism into statistically significant, evidence-based knowledge.

All preventive services offered by the private practitioner should be made available to athletes and others who are susceptible to sustain sports-related trauma. Specific counseling regarding the prevention of trauma, correction of malocclusion, removal of impacted teeth, use of mouth protectors, and treatment of any anomaly and prevention of pathology is important. Proper training of the school teachers, emergency management kits, and training are important (Dhillon et al. 2014).

A rapid proliferation of sports programs for children and adolescents has taken place over the past few years. The participation has grown dramatically at both the recreational and organized sports levels. The dentist has a professional responsibility to educate himself and the public regarding the issues related to sports dentistry, specifically to the prevention of sports-related orofacial and dental trauma. Dentists should also take the lead in educational, research, and public service activities. It is the duty of dentists to create awareness among the professional athletes, people, teachers as well as students, and children.

Proper education by the dentists can increase the knowledge of the sportsman for prevention, and protection of sport dental traumas. The role of the dentist-prosthodontist, although in the last phase of the care for the patients with dental traumas, is one of the most important for complete and esthetic solution of teeth after dental injury and a patient with “nice smile”.

Conclusion

Orofacial injuries that occur during sports activities are largely preventable. Mouth protection for athletes is one of dentistry's contributions to sports medicine. It is the responsibility of the dental profession, therefore, to become more active in sports injury prevention programs. Mouth-guards provide protection against injuries to the orofacial and dental area, including the teeth, lips, cheeks and tongue, thereby reducing the incidence and severity of injuries that occur during athletic practice and competition. They also have been shown to prevent head and neck injuries, concussions and jaw fractures. Many athletes are not aware of the health implications of a traumatic injury to the mouth or of the potential for incurring severe head and orofacial injuries while playing.

It is also our responsibility to identify, educate, and provide the athletes preventive measures like mouth-guards.

As stated above, dentistry has an important role in the athlete’s health and consequently on sport performance. It provides the athletes optimal oral health conditions which in turn can contribute to achievement of optimal performance during competitions. The presence of Dentist in athlete support staff is of paramount importance. Surveys have shown that systemic diseases can often be caused by a dental problem.

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THE IMPACT OF MORPHOLOGICAL CHARACTERISTICS ON RESULT SUCCESS IN AGILITY TESTS WITH YOUNG FOOTBALL PLAYERS

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Abstract

The research was conducted on a sample of 50 young football players, aged between 14 and 16, with the aim of determining the intensity and character of influence of the selected morphological characteristics on the effectiveness in agility tests results. The study used 12 variables to estimate morphological characteristics defined as a predictive (input) set of variables. The following criteria variables were used for the agility assessment tests: Agility test – forward-backward running (93639NN), hexagon, six-way sideways hops (MAGHEK), sideways shuffle (MAGKUS). In order to determine the possible influence of the selected morphological characteristics (measures) on the success rate in the agility assessment tests, three multiple regression analyses were applied to each test. The results of the regression analysis show that the morphological characteristics monitored in this study are, relatively, poorly related to the results in the applied agility assessment. A statistically significant relationship was obtained between the selected morphological characteristics and the sideways shuffle test (MAGKUS). No other statistically significant correlations were found with other agility evaluation and selected morphological characteristics tests. The obtained results can be useful to coaches and other experts who work in the football industry, as a guideline for more comprehensive planning and programming, as well as the selection of adequate training operators and methods.

Keywords: *agility, football players, morphological characteristics, regression analysis.*

Introduction

Morphological characteristics are responsible for the growth and development of the human body. Morphological characteristics include active components (muscles) and inertial components (body mass, body height, fat tissue, etc.). Measurement and diagnostics of the state of morphological characteristics give insight into the growth and development of the respondents, but it also enables the correct orientation of children in a particular sport branch and monitoring of their changes in the process of sports preparation. Morphological anthropometry is a method that involves measuring the human body, processing the obtained measures by applying appropriate statistical and mathematical procedures, and finally interpreting the obtained results (Mišigoj - Duraković, 1995). The exact data on the morphological characteristics of athletes are one of the important problems in contemporary sport for practical reasons.

Agility is a complex motor ability which occurs as a result of the complementary co-action of various motor skills. It can be said that success in complex motor activities is associated with the expression of agility, and that agility itself is a result of the conformity of different anthropological dimensions (morphological, motor, psychological). The complexity of the agility manifestation makes the understanding of its significance more important than emphasizing the subtlety of the results of the movement in which it is manifested. Its complexity is recognized in the necessity of a holistic understanding of the characteristics of the human, in respecting all potentials and limitations of the functions of the locomotor system, in the necessary correlation of interactions of current features, in the specific choice of means of preparation, in various protocols for its assessment, in the increased risk of injuries, etc. Based on previous research results of various authors, agility is defined as a complex manifestation of motor skills, of which depends fast and efficient connection of acceleration and deceleration itself, i.e. the change of direction and re-acceleration and re-deceleration with constant control of movement in vertical or horizontal direction (Drabik, J. 1996, Plisk, S. S. 2000, Verstegen, M., Marcello, B., 2001). Acceleration and deceleration of movement in horizontal and vertical directions implies the manifestation of strength as a motor characteristic, so that success in movements requiring agility depends on characteristics of expressing strength and power - athletes who, in a shorter time, exhibit greater power or strength, have the expected prerequisites necessary for the manifestation of agility.

Football is a complex, variable, poly-structural game, characterized by the cyclic and acyclic structure of movement (Jerković, 1982; Bajrić, 2008; Mandić Jelaska, Katić, & Jelaska, 2013). From the standpoint of physiological processes, football is an aerobic-anaerobic sport that requires high intensity of different activities from players. However, there is a clear lack of research dealing with the impact of morphological characteristics on the results in agility tests with football players. Therefore, it is necessary that in this paper we identify and explain the manifestation of agility in terms of the impact of morphological characteristics of the body (longitudinal, transversal, circular dimensionality and body weight, and subcutaneous fat tissue).

Previous research studies have found that in the movements of the maximum possible intensity with the change of direction, morphological characteristics behave as an inertial factor, i.e. they make it difficult to change the direction of movement (Grbović, 2013; Šišić & Sekulić, 2013, Pehar, 2016).

Methods

Sample of respondents

The study was conducted on a sample of 50 respondents - young football players, aged 14 to 16. Respondents are all members of the following football schools: FC "BORAC" from Banja Luka, FC "BSK" from Banja Luka, and FC "KRUPA" from Krupa na Vrbasu.

Sample of variables

Variables for assessing morphological characteristics

12 variables were used to assess the morphological characteristics defined as a set of predictor variables. Measurement of morphological variables was carried out in accordance with the conditions laid down in the International Biological Program (IBP).

Variables for assessing longitudinal dimensionality

1. Body height ..... (AVISTL)
2. Leg length ..... (ADUŽNO)
3. Arm length ..... (ADUŽRU)

Variables for assessing the transversal dimensionality of the skeleton

4. Biachromial range ..... (ABIARA)
5. Knee diameter ..... (ADIJKO)
6. Hock diameter ……..... (ADIJSZ)

Variables for assessing dimensionality and body mass

7. Body weight ..... (ATEŽTJ)
8. Thigh circumference ..... (AOPNAT)
9. Chest circumference ..... (ASROGK)

Variables for assessing subcutaneous fat tissue

10. Abdominal skinfold ..... (NABTRB)
11. Lower back skinfold ..... (NABLEĐ)
12. Lower leg skinfold ..... (NABPOT)

Variables for assessing agility (criterion variables)

The assessment of agility was carried out by running tests which are normally used to assess agility, but which differ according to the way, structure and duration of movement.

13. Forward-backward running 93639 ..... (MAG9NN)
14. Hexagon – six-way sideways hops …… MAGHEK)
15. Sideways (lateral) shuffle ..... (MAGKUS)

All measurement procedures and all testing protocols were in accordance with standard methodological requirements related to this type of research. Respondents were explained the purpose of the research, as well as the protocols for measuring morphological characteristics and performing agility tests.

Data processing methods

Respondents were tested using the same protocols for the quantification of morphological characteristics and agility. All testing protocols for assessing agility were repeated twice. Measurement of morphological characteristics was organized separately, independently of agility testing and was carried out in the early morning hours. Measurement of predicted morphological characteristics and agility tests was organized and conducted in the sports hall of the Secondary School Center "Gemit" in Banja Luka.

For all applied variables, the basic descriptive parameters were calculated. Three regression analyzes were used to determine the size and significance of the influence of selected morphological characteristics on the results in agility tests.

Results and Discussion

Morphological characteristics were analyzed from the aspect of longitudinal, transversal, and circular dimensionality and body weight, as well as subcutaneous fat tissue indicators. The analysis of morphological characteristics was performed based on the basic descriptive parameters (Table 1) on the minimum and maximum characteristics of the observed characteristics, as well as based on the parameters of the central data tendency - arithmetic mean (Mean) and standard deviation (St. Dev.).

Table 1 Basic descriptive parameters of variables for assessing morphological characteristics

Variables	Min	Max	Rang	Mean	St. Dev.	Skewness	Kurtosis
AVISTL	1660.0	1950.0	290.0	1801.9	65.11	-.138	-.522
ADUŽNO	960.0	1230.0	270.0	1064.5	54.7	.698	.652
ADUŽRU	72.8	93.0	20.2	819.0	39.8	.144	.508
ABIARA	31.0	45.0	14.0	382.1	36.1	-.091	-.485
ADIJKO	7.9	9.9	2.0	88.94	4.67	-.176	-.635
ADIJSZ	5.2	8.0	2.8	68.15	6.27	-.269	-.188
ATEŽTJ	509.0	1003.0	494.0	691.03	9.42	.808	1.672
AOPNAT	460.0	690.0	230.0	543.5	47.93	1.011	1.802
ASROGK	744.0	1050.0	306.0	867.5	64.36	.679	.744
NABTRB	40.0	293.0	253.0	102.4	4.70	1.993	4.936
NABLEĐ	60.0	127.0	67.0	82.4	1.92	.455	-.732
NABPOT	60.0	147.0	87.0	81.3	2.06	.873	.589

Table 2 shows the values of the basic central and dispersion parameters of variables for assessing agility, as well as the coefficients of skewness and kurtosis. Based on the displayed values of arithmetic mean and median parameters (Table 2), it can be seen that the test results are within the range of normal distribution. Minor deviations are noticeable in the variable of six-way hops (MAGHEK) and the sideways shuffle (MAGKUS). The skewness coefficient in the asymmetry of all variables is closer to zero. A slightly higher value (above 1, more precisely 1.295) was achieved in the variable of six-way hops (MAGHEK). Based on the skewness value, we can conclude that the complete set of variables for assessing agility meets the assumption of normal distribution of results, i.e. the values of asymmetry and kurtosis in the applied variables are within the limits that satisfy the hypothesis of a normal distribution of results.

Table 2 Basic descriptive parameters of variables for assessing agility

Variables	Min.	Max.	Rang	Mean	St. Dev.	Skewness	Kurtosis
MAG9NN	8.04	10.17	2.12	9.16	0.49	-.046	-.470
MAGHEK	5.35	10.00	4.65	6.35	0.93	1.295	2.051
MAGKUS	7.61	9	2.35	8.87	0.56	-.127	-.544

Regression analysis

Three multiple regression analyzes were applied in order to determine the possible impact of selected morphological characteristics, marked as an input or explanatory or predictor system of variables, on the result effectiveness in agility tests with young football players, marked as a criterion. Based on the size of multiple regression (RO), the common variance (R Square) was explained only if it was statistically significant. If the multiple correlation was statistically significant, we started the analysis of the impact of individual variables on the result effectiveness in the realization of agility tests with respondents.

Regression analysis of the MAG9NN criterion variable – forward-backward running 93639m (frontal agility)

The results of the regression analysis of the criterion variable (MAG9NN), which assesses the frontal agility - forward-backward running of given distances, are shown in Table 2. By looking at the given table, we can see that the predictor system of variables did not show a statistically significant correlation in the prediction of the MAG9NN criterion variable – forward-backward running 93639m. Therefore, no analysis of the relative impact of each individual predictor on the criterion will be made.

Table 2 *Results of the multiple regression analysis of the MAG9NN criterion variable*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,371a	-,138	-,127	5.42159

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	183.955	12	15.330	,522	.888b
Residual	1146.353	39	29.394		
Total	1330.308	51			

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	126.509	43.559		2.904	.006
AVISTL	.001	.003	.191	.596	.555
ADUŽNO	.000	.002	.012	.049	.961
ADUŽRU	-.003	.004	-.218	-.711	.482
ABIARA	-.002	.003	-.116	-.613	.543
ADIJKO	-.010	.023	-.095	-.462	.647
ADIJSZ	-.010	.018	-.119	-.546	.588
ATEŽTJ	.028	.031	.516	.913	.367
AOPNAT	-.002	.004	-.227	-.632	.531
ASROGK	-.004	.003	-.474	-1.496	.143
NABTRB	.031	.025	.286	1.257	.216
NABLEĐ	.038	.058	.145	.662	.512
NABPOT	.026	.049	.106	.529	.600

Regression analysis of the MAGHEK criterion variable – hexagon six-way hops (frontal agility)

The results of the regression analysis of the criterion variable (MAGHEK), which assesses the frontal agility – hexagon six-way hops, are shown in Table 3. By looking at the given table, we can see that the predictor system of selected morphological variables at the general level did not show a statistically significant correlation in predicting the MAGHEK criterion variable – hexagon six-way hops. However, what we can see in Table 1 is that the applied system of predictor variables explains 32% of the criteria variation by its partial impact. A statistically significant partial impact on the MAGHEK criterion variable

was shown in the following variables: body weight (ATEŽTJ), thigh circumference (AOPNAT), and abdominal skinfold (NABTRB), which also show a relatively high partial correlation with the MAGHEK criteria test

Table 3 Results of multiple regression analysis of the MAGHEK criterion variable

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.565a	.319	.110	8.79262

Model	Sum of Squares	df	Mean Square	f	Sig.
1 Regression	1415,20	12	117,934	1,525	.156
Residual	3015,098	39	77.310		
Total	4430,308	51			

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	178.776	70.643		2.531	.016
AVISTL	.002	.004	.120	.422	.675
ADUŽNO	.000	.004	-.013	-.058	.954
ADUŽRU	-.002	.006	-.076	-.277	.783
ABIARA	-.008	.004	-.302	-1.801	.079
ADIJKO	-.029	.037	-.143	-.779	.441
ADIJSZ	-.016	.029	-.105	-.543	.590
ATEŽTJ	.110	.050	1.116	2.220	**.032**
AOPNAT	-.016	.006	-.827	-2.588	**.013**
ASROGK	-.007	.004	-.451	-1.604	.117
NABTRB	.098	.040	.493	2.442	**.019**
NABLEĐ	.059	.094	.121	.625	.536
NABPOT	-.094	080	-.208	-1.172	.248

Legend: R – multi-correlation coefficient; R2 - determination coefficient; Beta – standardized regression coefficient; t – t test; Sig. – statistical significance

Regression analysis of the MAGKUS criterion variable – sideways shuffle (lateral agility)

The results of the regression analysis of the MAGKUS criterion variable, which assesses the lateral agility, sideways shuffle, are shown in Table 4. By looking at the given table, we can see that the regression analysis of the MAGKUS criterion variable gives satisfactory information on the significance and magnitude of the impact of applied morphological variables on the speed of sideways shuffle. The predictor system of selected morphological characteristics explained 45% of the common variability of the criterion variable. The value of the multi-correlation coefficient is relatively high (R = .67), and in the high statistical significance of a strict criterion, it is .011. By inspecting the value of the individual effects of morphological variables on sideways shuffle (MAGKUS), the following interesting information can be noticed: statistically partially significant influence of predictor variables on the criterion variable was achieved by the following variables:

- AVISTL variable – body height. The value of the BETA partial coefficient is .734, which is significant at the level p = .007.
- AOPNAT variable – thigh circumference. The value of the BETA partial coefficient is -.750, which is significant at the level p = .013.
- NABTRB variable – abdominal skinfold. The value of the BETA partial coefficient is .585, which is significant at the level p = .003.

Other variables for the assessment of morphological characteristics did not show a statistically significant impact on a successful realization of the MAGKUS test - which assesses lateral agility through sideways shuffle.

Table 4 Results of multiple regression analysis of the MAGKUS criterion variable

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.670a	.449	.280	4.79613

Model	Sum of Squares	df	Mean Square	f	Sig.
1 Regression	731,658	12	60,972	2,651	.011
Residual	897,111	39	23,003		
Total	1628,769	51			

Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
(Constant)	69.987	38.534		1.816	.077
AVISTL	.006	.002	.734	2.867	**.007**
ADUŽNO	-.003	.002	-.272	-1.405	.168
ADUŽRU	.000	.003	.008	.032	.975
ABIARA	-.002	.002	-.117	-.774	.443
ADIJKO	.002	.020	.017	.100	.921
ADIJSZ	-.012	.016	-.132	-.759	.453
ATEŽTJ	.010	.027	.171	.384	.703
AOPNAT	-.009	.003	-.750	-2.607	**.013**
ASROGK	-.002	.002	-.206	-.815	.420
NABTRB	.070	.022	.585	3.219	**.003**
NABLEĐ	-.038	.051	-.128	-.734	.468
NABPOT	-.014	.044	-.052	-.328	.745

From the aspect of research aim, it is important to determine and explain the magnitude and significance of the impact of selected morphological characteristics on result success in agility tests as a motor performance. On the basis of obtained results of regression analysis, a relatively poor correlation between the morphological characteristics applied in this study and the results in the treated agility tests can be noted. A statistically significant impact of applied morphological characteristics on the result in the agility test (MAG9NN), forward-backward running 93639m, which assesses frontal agility without turning, has not been identified.

Also, at the global level, the impact of applied morphological characteristics on the agility test (MAGHEK-hexagon), six-way hops for assessing the frontal agility, has not shown a statistically significant impact, but a partial impact of the following variables is evident: body weight (ATEŽTJ), thigh circumference (AOPNAT), and abdominal skinfold (NABTRB).

As far as lateral agility is concerned, there is a statistically significant impact of applied morphological variables on the results in the MAGKUS test, sideways shuffle, at the global level (Sig. = .011) and at the partial level. A statistically significant impact of the results in the agility test, sideways shuffle (MAGKUS), has been achieved by the following variables: body height (AVISTL), thigh circumference (AOPNAT), and abdominal skinfold (NABTRB). So, it is the same variables as for the result in the MAGHEK test. It can be noted that the influence of these morphological characteristics is manifested through aggravation of performance in agility tests in conditions of jumping, acceleration, deceleration, as well as in conditions of change of movement direction. It is reasonable to expect that the inertial forces in movement with direction change are bigger if the dimensions of the body are bigger.

The obtained results can be explained from the aspect of the specificity of the tested sample of respondents, their age categories, i.e. by knowing the principles of growth and development in relation to the age period - the heterogeneity of development (Šišić & Sekulić, 2013). The age of the respondents ranges from 14 to 16, which may be one of the reasons for this kind of results. On the whole, the results of this study clearly show that the impact of morphological characteristics on the agility test results is different, i.e. that the informational content obtained in terms of measured properties in various agility tests is not the same.

The correlation between selected indicators for the assessment of morphological characteristics and applied agility tests is similar to those obtained by other researchers (Pearson, 2001; Grbović, 2013; Spasić, 2013, Pehar, 2016).

The obtained results are significant from the aspect of correct planning of football trainings, because they point to a desirable profile of football players, who can successfully respond to the requirements of modern game.

However, given the wide spectrum and the high level of complexity of different structures of movement in football (in relation to intensity, duration, complexity, as well as in relation to openness and closeness of movement conditions), the impact of morphological characteristics cannot be fully explained without considering other anthropological characteristics of football players (motor, functional, cognitive, conative), i.e. without taking into account their interactions. In addition, the explanation of agility as a complex motor characteristic implies the consideration of both morphological and psychological characteristics and motor skills (Lačić & Bajrić, 2003; Marković, & Bradić, 2008).

Although the results of the research indicate a relatively low impact of the selected morphological characteristics on agility, it cannot be ignored.

The authors of this paper are aware that this research is one of the few studies that deals with the problem of researching the impact of morphological characteristics (predictors) on the agility (criterion) of football players of this age (cadets), at least in our area. Therefore, the obtained results should be interpreted with appropriate caution, but they can be used in some future research.

Conclusion

The obtained results of the research contribute to solving the set goal and are in the function of obtaining significant information on the magnitude and significance of the impact of morphological characteristics on the results in agility tests. The obtained results indicate that the morphological characteristics are not a significant predictor in treated agility tests, but that their impact cannot be ignored. The results indicate that selected morphological characteristics mostly aggravate the manifestation of agility. The aggravation of agility manifestation is a consequence of the inertial forces that are present during running with direction change and which are bigger if the body dimensions are bigger (body height and weight, skinfolds and circumference). Based on the results of the research it can be concluded that, nevertheless, there is a significant impact of some morphological characteristics on certain agility tests, depending on the presence and duration of the acceleration and deceleration phases, as well as of direction changes. In some future research studies, authors should examine the impact of morphological characteristics that are not included in this study on some other agility tests with other content and movement structures. Also, they should examine how different lengths of movement before direction change affect the magnitude and significance of the impact of morphological characteristics on agility.

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LEVELS OF ANXIETY AND DEPRESSION IN ELITE KARATE ATHLETES

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Abstract:

The aim of the study was to assess the levels of anxiety and depression, in elite karate athletes on the beginning of the summer preparatory period. The investigation was carried out as part of regular periodical systematic physical check-up of athletes. Twenty nine elite male karate athletes (most of them members of the Macedonian national karate team) aged 15 to 29 years, were asked to fulfil the Beck Anxiety Inventory (BAI) and the Beck Depression Inventory (BDI). The BAI questionnaire consists of 21 questions related to various aspects of anxiety. The intensity of perceived anxiety for every question in BAI is scored from 0 to 3, with 0 representing the least serious and 3 the most serious symptoms. The sum of all items is calculated at the end. BAI scores from 0-7 were ranked as a normal anxiety level; 8-25 as moderate; and 26-63 as high anxiety. The degree of depressive symptoms was measured by the 21-item-revised form of Beck Depression Inventory. The BDI statements for each question are ranked from 0 to 3, with 0 representing the least serious and 3 the most serious symptoms. Scores of BDI ≤ 10 indicate absence of depressive symptoms, BDI scores from 11-20 indicate mild depressive symptoms, while BDI scores from 21-30 indicate moderate depressive symptoms. BDI scores higher than 30 indicate clinically manifest depressive episode. Mean value of the acquired BAI scores in elite karate athletes was 4,1 ± 3,8. One seventh of all athletes showed moderate levels of anxiety. Mean value of acquired BDI scores was 6,1 ± 5,5. Four athletes showed mild depressive symptom, while one athlete showed moderate depressive symptoms. There was a positive correlation between the degree of depressive symptoms and the age of the athletes (r=0,575).

Key Words: *anxiety, depression, karate athletes*

Introduction

Many studies have confirmed positive connection between physical activity (PA) and psychological well-being in young people, especially adolescents, as well as in other age groups (Pluncevic, & Mancevska, 2012). The importance of regularity, amount and the intensity of physical activity has also been addressed within this correlation. Additionally, physical activity is often determined as a non-pharmaceutical agent for treatment of anxiety and depression in adults, based on reports that aerobic exercise can reduce depression and state anxiety in clinical population (Lau, & Lau, 2010, Silva, et al., 2017).

Sports is a specific, complex, institutionalized and competitive physical activity with the frequency of training from two to six times per week. This type of PA improves person's physical features and is aimed for competition among athletes. However, competition and combat rivalry in sports require maximal effort from an athlete, often accompanied by mental stress and great physical tiredness. A higher level of stress and negative emotions are induced during tournament rivalry compared to training. Emotions are fundamental factor in both situations, because they determine arousal and influence the performance (cognitive as well as physical) of the athlete. Furthermore, negative emotions such as anxiety and depression are connected to severe musculoskeletal injuries, pain and fatigue in athletes (Weber, et al., 2018) Therefore, the phenomenon of anxiety is of particular interest for sports psychologists and coaches.

Anxiety is a multidimensional construct which is very closely connected to performance in athletes, as well as in non-athletes. High levels of anxiety which are always followed by excessive arousal (with accompanying cognitive, behavioural and vegetative symptoms) have harmful effects on performance. The processing capabilities of the brain are always engaged by the excessive arousal and therefore limiting the informational intake and the efficiency during the task (Hardy, 1990). In every sports, anxiety is an essential component of each rivalry, for that reason its' level must be adequate to produce best results.

As a personality trait, anxiety is relatively stable feature which determines person's motivational and emotional response when coping with different situations. During stressful situations, individuals with high levels of trait anxiety become more anxious and show strong emotional response which does not correspond with the objective reality, with an anticipation of failure and or threats to self-esteem, which can have negative prolonged effects on the efficiency of their cognitive performance and can enhance further development of clinically manifest anxiety disorders (Hardy, 1990). As opposed to them people with low anxiety in stressful conditions show more efficient behaviour. Different factors such as age, gender, socioeconomic status, cultural precipitating factors and the way of manifestation influence the level of person's anxiety (Andrade, Caraveo, & Berglund, 2000). Our data on the prevalence of high anxiety and depression in university students with sedentary lifestyle show that over 20 % of medical, dentistry and law students suffer from high anxiety levels, while over 10% of them suffer from depression (Mancevska, et al., 2008).

Many reports show positive effects of regular physical exercise on cognition and mental wellbeing of university students (Walsh, 2011). Athletes are suggested to be less anxious and more self-confident than those who are not involved in sport. Furthermore, Bitonte et al, 2014 suggest that mandatory physical exercise should be prescribed for university students in order to enhance performance and prevent from mental illness (Bitonte & Santo, 2014). Our earlier study suggested that athletes engaged in different club sports such as soccer, basketball and handball showed significantly lower levels of manifest anxiety compared to their peers with sedentary lifestyle (Mancevska, et al., 2008). However, athletes are not immune to psychological distress and mental health issues and yet there are few studies that have investigated the prevalence of common mental disorders (CMD - anxiety, depression and adverse substance use) among elite athletes. Recent studies have shown a prevalence of symptoms of CMD in range of 17- 45% among Australian and French elite Olympic athletes. (Gouttebarge, & Kerjhoffs, 2016).

In combat sports, such as karate, an effective attack on an opponent's body is the main assumption. It is very often is accompanied with the risk of pain and injury, which can cause psychological discomfort of competitors. This kind of sports competition requires extensive mental strength, rapid and tactically corrects reactions, as well as precision and imagination (Wong, Thung, & Pieter, 2006). Anxiety is particularly important in combat sports and the athlete's ability to maintain an optimal level of his anxiety during fight is essential for successful performance. Considerable deviations of this level (both increases and decreases) will lead to lower efficiency and reduced probability of success (Bali, 2015). General anxiety has rarely been measured in combat sports athletes. The existing reports suggested that karate athletes showed low to moderate anxiety levels (Tiric- Campara, et al, 2012).

To our best knowledge until now, in the Republic of Macedonia, there are no available data regarding the rates of high anxiety and depression among karate athletes and no available data regarding levels of depression among athletes in different sports, so far. This data is crucial for planning the strategies for prevention of mental health disturbances in children, adolescents and young adults as well as for planning mental preparation and successful performance of athletes. It is also necessary for the prevention of athletes' physical and mental health.

The aim of the study was to assess the levels of anxiety and depression in elite karate athletes on the beginning of the summer preparatory period and to determine the correlation between level of anxiety and depression with the age of athletes, sports experience duration and the intensity of the active training regime.

Material & methods

The study was performed at the Institute of Physiology and Anthropology, Medical Faculty, Ss. Cyril and Methodius University in Skopje on twenty nine male elite karate athletes. All athletes, aged 15-29 years, were members of Makpetrol karate club and most of them (18) had been or still were members of the Macedonian national karate team.

The total duration of their active physical training was between 8 to 20 years, with the mean value of 12.5±3.3 years. The duration of the training estimated in hours per week was between eight and fifteen hours, with mean value of 11.2±1.9 hours. The athletes were divided in two groups. The first group (U18 – under 18) consisted of 14 athletes, aged 15 to 18 years, mean age 17.2±1.1, while the second group (O18 – over 18) consisted of 15 athletes older than 18 years (19 to 29), mean age 22.5±3.5.

The investigation was carried out as part of regular periodical systematic physical check-up. At the

time of the analysis neither respondent was at the stage of recovery from injury, or was previously treated by a psychiatrist or psychotherapist. For the purpose of clinical and psychological evaluation of the levels and perceived symptoms of anxiety and depressive symptoms, they were asked to fulfil the Beck Anxiety Inventory – BAI and the Beck Depression Inventory, respectively. The Macedonian versions of the questionnaires were administrated to the athletes in a form of self-rating questionnaire in ambulatory settings.

BAI consists of 21 questions related to various behavioural, emotional, cognitive and physiological symptoms of anxiety. The intensity of perceived anxiety for every question in BAI is scored from 0 to 3, with 0 representing the least serious and 3 the most serious symptoms. It is a short, simple and very popular tool which is used as a pre-screen for presence of an anxiety disorder in both clinical and non-clinical population. It has excellent internal consistency and high test-retest reliability. The sum of all items is calculated at the end. BAI scores from 0-7 were ranked as "normal anxiety level"; 8-25 as "moderate"; and 26-63 as " high anxiety".

The degree of depressive symptoms was measured by the 21-item-revised form of Beck Depression Inventory. The BDI statements for each question are ranked from 0 to 3, with 0 representing the least serious and 3 the most serious symptoms. The description of the symptoms includes mood change, social withdrawal, hopelessness, irritability, cognitions such as guilt or feelings of being punished, suicidal intentions, as well as physical symptoms such as fatigue, weight loss and lack of interest in sex. It is a simple, highly sensitive and one of the most widely used instruments for the evaluation of depressive symptoms in clinical as well as non-clinical population. It has excellent internal consistency (alpha =0.86). Similarly to BAI, the sum of all items was calculated at the end. Scores of BDI ≤10 indicate "absence of depressive symptoms", BDI scores from 11-20 indicate "mild depressive symptoms", while BDI scores from 21-30 indicate "moderate depressive symptoms". BDI scores higher than 30 indicate "clinically manifest depressive episode".

All participating subjects gave a written informed consent and completed the questionnaire anonymously, using code names.

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

Results

The description of our sample is shown in table 1. There was no difference in active training regime between the two groups of athletes (p=0.471). All athletes spent in average 11 hours per week in active training. Two thirds of the subjects were members of the Macedonian national karate team.

Table 1. Demographic variables of the elite karate athletes included in the study

Subjects	Group U18 N=14	Group O18 N=15	T-test
Mean age	17.2±1.1	22.5±3.5	p<0.001
Years of active training regime	10.5±1.4	14.2± 3.7	p=0.003
Weekly hours of active training regime	10.9±1.8	11.5±2.2	p=0.471
Members of the Macedonian national karate team	8	10	

Mean value of the acquired BAI scores in elite karate athletes was 4.1 ± 3.8 with minimal BAI score = 0 and maximal BAI scores =15. One seventh of all athletes showed moderate levels of anxiety. As can be seen from figure 1, the mean BAI score obtained from the U18 group was 3.9 ± 3.8 while in athletes older than 18 years it was 4.4±4.1. There was no statistically significant difference between groups (p=0.7).

Mean value of acquired BDI scores in all elite male karate athletes was 6,1 ± 5,5 with minimal BDI score = 0 and maximal BDI=24. Four athletes showed mild depressive symptom, while one athlete showed moderate depressive symptoms. The mean value of BDI scores obtained from the U18 group was 3.5±2.4, while in athletes from the O18 group, it was 8.5±6.6. Athletes older than 18 years (group O18) showed significantly higher BDI scores than athletes younger than 18 years (p=0.01). Nevertheless the

average BDI scores of both groups of athletes were within the range labelled as “absence of depression”. (fig1)

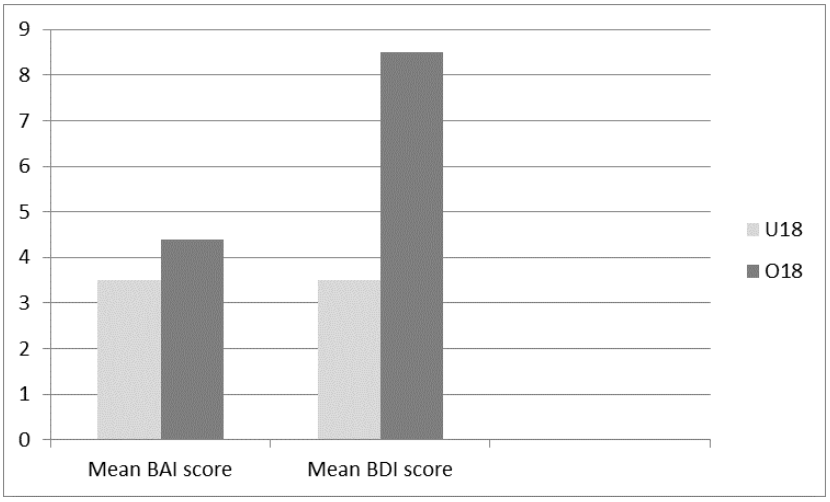

Figure 1. Mean BAI and mean BDI scores obtained in both groups of elite karate athletes

As can be seen from table 2, all elite male karate athletes from the two age groups showed normal to moderate anxiety levels (chi square = 0.007; df=1; p = 0.933). There was no linear correlation between the values of BAI scores and the age of the athletes (r=-0.11), while there was a weak negative correlation between the BAI scores and the total hours of active training regime during the week (r = - 0.21).

All athletes aged under 18 showed no symptoms of depression compared to two thirds (10 out of 14) of the athletes older than 18 who also showed no symptoms of depression (chi sqare = 3.5; df=1; p= 0.059). One third (four athletes) of the athletes from the second group (O18) showed symptoms of mild depressive mood and one showed moderate depression. No one showed clinically manifest depression. There was a positive correlation between the degree of depressive symptoms and the age of the athletes (r = 0.575) and a weak positive correlation between the BDI scores and total hours of training during the week (r = 0.229) (table 2).

Table 2. Distribution of athletes based on the obtained BAI and BDI scores

Subjects Variables	Group U18 N=14	Group O18 N=15
BAI scores		
0-7 Normal anxiety	12*	12
8-25 Moderate anxiety	2	3
>25 High anxiety	0	0
BDI scores		
0-10 No depression	14**	10
11-20 Mild depression	0	4
21-30 Moderate depression	0	1
>30 Clinically manifest depression	0	0

*chi square =0.007; df=1; p= 0.933
** chi sqare = 3.59; df=1; p= 0.059

Dicussion

The results obtained in our study, to our best knowledge, represent the first results regarding the levels of anxiety and depression in karate athletes in our country. All, elite male karate athletes from Makpetrol, one of the two internationally most awarded karate clubs in our country, showed low to mild anxiety levels, and there was no association with the age (r=0.11) and the duration of the sports experience. This is in accordance with the reports from other studies, which suggest that elite karate athletes show lower levels of anxiety compared to athletes from other sports and to general population (Piskorska, et al, 2016).

Furthermore, reports suggest that levels of anxiety are lower in winner elite karate athletes compared to defeated ones, as well as compared to non-elite karate athletes (Soltani, & Surender, 2013). It is argued that the observed relationship is probably a result of athlete's experience and derives from the impact of long-term adequate mental preparation (self-control and self-awareness training). Tiric - Campara et al. (2012) reported that the type of practiced combat sport influenced the obtained levels of anxiety in combat athletes. Thus, the highest average level of general anxiety was noticed in kick boxers (moderate anxiety) followed by karate fighters (mild anxiety), with the lowest levels in boxers (minimum anxiety) with no correlation between the levels of anxiety and the age and the duration of sports experience. Such data regarding different types of combat sports until now is insufficient in our country. Considering the importance of the level of anxiety for the performance of karate athletes during competition and also for the health of the athletes, it is suggested that preliminary determination of the anxiety level should be carried out and the results should be taken into account during the selection and continuation of practice of certain sport discipline (Tiric - Campara, et al, 2012). Individualization of sports training by coaches and sports psychologists can enable maintenance of optimal individual levels of anxiety in combat athletes. Results from different studies suggest that an ability to control particular types of anxiety seems to be one of the most important psychological skills, which highly affect the competition results of combat sports athletes.

Our results are also in line with the results from our earlier study on levels of trait anxiety in athletes from different team sports such as soccer, basketball and handball in our country. They showed low levels of trait anxiety compared to medical students (Mancevska, et al., 2008). Collective sports are considered to be a protective factor against the presence of psychological disorders, particularly in adolescents. Silva et al., (2017) reported that adolescents aged 11-19 years, who were involved in individual sports, such as swimming and judo, obtained more chances of presenting symptoms of anxiety, stress and depression compared to their peers involved in collective sports. They argued that the social nature of collective sports (collective goal) has the protective role against psychological distress compared to individual sports during the earlier stages of adolescence.

The levels of depressive mood in older athletes in our study were significantly higher compared to the ones obtained in younger athletes (under 18), although the average value of BDI scores in older athletes was still low. One third of athletes older than 18 years (five athletes) showed signs of mild depressive mood to moderate subclinical depressive symptoms. There was a positive correlation between the degrees of depressive symptoms and the age of athletes.

All athletes aged 15 to 18 years showed no signs of depression. Other researchers who used different self-evaluation instruments for the assessment of depressive symptoms showed that 20% of student athletes suffer from signs of depression (Weber, et al., 2018). Nevertheless, social relations (friendship and collective identity) during early and mid adolescence are considered protective factors against depression. In our study, the O18 group consisted of athletes aged 19 to 28 years. It is a period of late adolescence and young adulthood when many important life events happen. Late adolescence is a sensitive period of transition from high school to academic environment in which several processes of personal maturation occur. The definitions of personal – individual (opposed to collective) identity and professional identity, which sometimes could be traumatic experiences, are among those processes. During early adulthood, the life period after the age of 25 years essential processes such as employment, career development and definition of emotional relationships and formation of family, occur. Many stressors are present during these life events and can negatively influence the athletes' mood and their satisfaction with the quality of their life. The highest BDI score was obtained in athletes aged 28 years. In this study we did not explicitly investigate the impact of different risk factors such as socio-economic status or emotional relationships on levels of depression in karate athletes. Depressed mood has negative impact on athletes' performance and is likely to activate anger and confusion and to increase physical pain and fatigue (Wong, Thung,& Pieter, 2006). Compared to high anxiety, which is always connected to high arousal and in some sports and in non-athletes can have a positive impact on performance (the role of anxiety as an inner drive), depression is a negative set of emotions which can be connected to low arousal as well as to high arousal, depending on the mechanisms of its origin and their clinical manifestation. Regardless of the origin, depression never shows positive impact on performance neither in athletes nor in non-athletes. There are few studies that have investigated the prevalence of common mental disorders (CMD - anxiety, depression and adverse substance use) among elite athletes. Recent

studies have shown a prevalence of symptoms of CMD in range of 17- 45% among Australian and French elite Olympic athletes. (Gouttebarge, & Kerjhoffs, 2016).

In addition to the growing body of evidence that prove the positive impact of physical activity on mental health in general population and in athletes, it is essential to gather data on mental health of athletes from different sports (individual and collective). Regular mental health monitoring should be performed as conscientiously as it is done for their physical heath, especially in experienced senior athletes. Excessive exercise and training can be associated with masked symptoms of anxiety disorders and depression in non-athletes as well as in athletes and their continuation could be harmful (Weinstein, Maayan, & Weinstein, 2015).

Conclusions

The results from our study are the first of this kind in our country, up to our best knowledge. They show that elite karate athletes maintain low levels of anxiety. However, the levels of depression were higher and showed positive correlation with the age. It is essential to gather additional data on the influence of different risk factors on mental health in athletes from different sports in order to make substantial data base for further research of the impact of psychological parameters on performance in athletes and on the impact of physical activity and sports on the mental health of athletes and of general population especially of young and senior population.

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THE IMPACT OF MORPHOLOGICAL AND MOTOR ABILITIES MANIFESTATIONS ON ACCOMPLISHING THE ELEMENTS OF SPORTS GYMNASTICS ON THE FLOOR

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Abstract

The survey was conducted on a sample of 94 pupils, first graders, of the Mixed Technical Secondary School of Travnik with the aim of determining the importance and magnitude of the influences of selected morphological and motoric indicators on the realization of specific motor sport tasks of sports gymnastics (forward and backward roll) within the school curriculum of physical and health education. The study applied two measures for assessing morphological features and six tests for the assessment of motor abilities defined as a predictive set of variables. Criteria variables included the forward and backward roll that represented the specific motor assignments of sports gymnastics. In order to determine the significance and magnitude of the impact of morphological indicators on the realization of elements of sports gymnastics on the floor, two multiple regression analysis were applied. The results of the regression analysis indicate a statistically significant influence of the applied morphological and motor indicators on the realization of the elements of sports gymnastics on the floor. The results obtained can be useful to teachers of the Physical and Health Education in better monitoring, evaluating and evaluation of the adaption of sports gymnastics elements on the floor.

Keywords: *morphological and motorical indicators, specific motor tasks, regression analysis.*

Introduction

Sports gymnastics today is, undoubtedly, a sports competition that reaches the highest level of artistic achievement. The trend of development of the supreme sports in general, and especially sports gymnastics, most strongly confirms the unpredictability of human opportunities. As a rule, the evidence of opposing the limits in sports are new, numerous exercises that innovators in sports gymnastics present through competitions (Petković and co., 2010). Motor skills are part of general psychophysical abilities that relate to a certain level of development of the basic moving latent dimensions of a man, which condition the successful execution of the movement, regardless of whether they have acquired the skills by training or not. Motor skills are fundamental to man, determining the structure of motor dimensions and determining the validity and reliability of measuring instruments for their monitoring and evaluation is not only important for the field of physical education, sports and recreational activities, in the narrower context, are also important for the existential issues of monitoring and directing physical abilities as part of the bio-psycho-social balance of man, especially in the conditions created by the modern technical revolution (Jurak i sar., 2007; Živčić, 2007). In previous studies, in the field of sports gymnastics, there are a few complex researches, so the motor skills and other anthropological dimensions of man, in most cases, were studied partially. A mathematical and cybernetic approach to the study of the whole system and certain sub-systems of man provides new knowledge, confirms or denies many hypotheses, highlights and corrects the acquired knowledge, points to the correct paths of scientific knowledge. Possession of research information and results should contribute to a successful analysis of the impact of particular segments of the anthropological space on the improvement of results in the performance of specific motor assignments related to the technique of any branch of sport. Previous studies (Idrizović, 2006a; 2006b; Petković, 2008; 2009) suggest that the success of the realization of specific motor assignments of sports gymnastics in students is directly conditioned by the level and quality of motor skills. Therefore, the process of learning gymnastic elements as program contents of physical and health education with students should be programmed, with pre-set goals for the development of primarily significant motor skills such as flexibility and explosive strength, speed and peripheral joint strength and reduction of fat tissue (Miletić i sar., 2004).

For this reason, this research has an aim to determine the significance and magnitude of the influence of selected morphological and motor indicators on the success of the realization of specific motor sports tasks of the gymnastics (forward and backward roll).

Work Method

Sample of examinees

The population from which a survey sample was drawn up consisted of 94 students of first grade of the Mixed Secondary Technical School Travnik from Travnik (BiH), who regularly attended physical and health education classes in the school year 2016/2017. The total sample of 94 students is not based on any criteria that could correlate with manifest anthropological dimensions. The only criteria according to which students acquired the right to be part of the sample is regular attendance in the physical and health education classes and are completely healthy (all students who were ill at the time of measurement and testing, but came to class, were omitted from the sample).

Sample variables

Starting from the research objective and the objective possibilities and conditions of the school in which the research was conducted, variables for assessing morphological characteristics and motor abilities as a predicate set of variables were applied and analyzed.

Two variables were applied to evaluate the morphological decisions of the examinees – students:

- body height .....AVISTJ
- body weight .....ATEŽTJ

To assess the motor skills of the examinees - students, a set of six motor tests was applied:

- hand tapping.....MTAPRU
- standing long jump .....MFESDM
- sit and reach.....MFLDOS
- sit ups for 30 sec.....MFRDTZ
- pull ups on a pull up bar.....MRSZGB
- running 6X30m.....BI6X30M

In this research, from the curriculum content of physical and health education, the following specific motor sporting gymnastics tasks on the floor were applied as criteria:

- forward roll .....MZKOLP
- backward roll .....MZKOLN

Organization and measurement procedures

In the measurement process, efforts were made to ensure equable conditions for each student:

- measurements were made during regular classes of physical and health education,
- the measuring instruments were standard type and calibrated before the start, and, if necessary, during the measurement
- examinees were in their sports equipments
- the measuring of the particular dimensions were measured by the same surveyor, prior to entering the results, the scorers would repeat out loud the results of measurements
- the testing was conducted in the same order for all examinees, and the organization of measuring the motor tests was such that it excluded the impact of fatigue as a remitting factor on the results of the next test,
- the assessment of the performance of motor assignments was carried out by three experienced professors of physical and health education who teach at the school where the research was conducted.

Methods of data processing

For all applied variables, the following descriptive statistical parameters of the central tendency and measures of variability are calculated:

- arithmetic mean (Mean),
- standard deviation (St. Dev.),
- minimal measurement value (Min),

- maximal measurement value (Max),
- Range (Range),

The testing of normal distribution of the frequencies of the applied variables was performed using the following statistical-mathematical procedures:

- standardized coefficient of asymmetry (Skewness)
  standardized coefficient of elongation or flatness (Kurtosis)

To determine the significance and magnitude of the influence of the predictor set of variables (morphological characteristics and motor abilities) on each variable criteria, two multiple regression analysis were applied.

Results and Discussion

Table 1 shows the basic statistical parameters of the variables for assessing the morphological motor status of the examinees. Results of all variables, except AVISTJ and ATEŽTJ, were obtained by calculating the arithmetic means of the three measurement particles. In addition to the minimum and maximum values, the arithmetic mean and standard deviations also show the values of the asymmetry, homogeneity and normality distribution of the obtained results. Displayed values of standardized asymmetrical coefficient (Skewness) and standardized flattening coefficient (Kurtosis), which represent statistical-mathematical steps on the basis of which testing on the normality of the distribution of the obtained results of the applied predictor variables is performed, it can be concluded that the values obtained are within the limits of normal distributions.

A slight deviation, where Skewness is concerned, can be seen in motor tests (BI6X50M) and (MRSZGB), and where Kurtosis is concerned, the deviation can also be seen in the BI6X50M variable.

Table 1 Basic statistical parameters of predictor variables (morphological and motor indicators)

Variables	Min	Max	Range	Mean	St. Dev	Skewness	Kurtosis
AVISTJ	1530,0	1900,0	370,0	1719,4	72,6	-,172	,197
ATEŽTJ	3950,0	9750,0	5800,0	6850,0	11,92	,421	2,913
MTAPRU	25,00	48,00	23,00	37,26	4,05	-,132	,195
MFESDM	145,00	238,00	93,00	192,41	21,93	,249	-,583
MFLDOS	2,00	36,00	34,00	18,76	7,29	,249	-,526
MRCDTZ	9,00	26,00	17,00	19,37	2,73	-,516	2,004
MRSZGB	0,00	13,00	13,00	2,09	2,83	1,43	1,63
BI6X50M	35,00	502,00	467,00	374,96	86,34	-3,14	10,53

Min - Minimum Measurement Score, Max - Maximum Measurement Score, Range - Range, Mean - Arithmetic Mean, St. Dev.- standard deviation, Skewness - asymmetry measure, Kurtosis – measure of flattening

Table 2 presents the basic statistical parameters of specific motor sports tasks of gymnastics (forward and backward roll) which were the criteria in this study. The average values are higher for the first motor task - the forward roll (3.15) in relation to the backward roll with the value of (2.94). As for the minimum and maximum results of the mentioned variables, they are identical in both tasks, where the minimum score is 1.00 and the highest score is 5.00.

With a more detailed insight into the value of the asymmetry (Skewness) and flatness coefficients (Kurtosis), it is noted that in the applied specific assignment the results obtained are distributed in such a way that it is close to normal distribution. Based on the standardized asymmetric coefficients, in the task of the forward roll (MZCOLP), negative curvature is noticed, which means that there is a slightly higher qualitatively better result. By analyzing the value of kurtosis, it is noticeable in both motor problems that a platicurtic form of distribution of the obtained results occurred. Since deviations of the obtained results are not statistically significant from the normal distribution, one can approach the further interpretation of the calculated parameters.

Table 2 Basic statistical parameters of criteria variables - specific motor tasks

Variables	Min	Max	Range	Mean	St. dev	Skewness	Kurtosis
MZKOLP	1,00	5,00	4,00	3,15	1,01	-,141	-,454
MZKOLN	1,00	5,00	4,00	2,94	1,33	,209	-,1,10

Min - Minimum Measurement Score, Max - Maximum Measurement Score, Range - Range, Mean - Arithmetic Mean, St. Dev.- standard deviation, Skewness - asymmetry measure, Kurtosis – measure of flattening

Regression analysis

Regression analysis of MZKOLP criteria variables - forward roll

Table 3 shows the regression analysis of the MZKOLP criteria variable, which evaluates the specific motor task of the forward roll (MZKOLP). By analyzing the presented table, it can be seen that the regression analysis of the MZKOLP criteria variable provides satisfactory information on the importance and size of the predictor set of variables (morphological and motoric indicators) on the task of the forward roll. The predictor system of variables explains the 23% of the common variability of the criteria variable, while the remaining 77% of the total variance of the criteria variables can be attributed to other anthropological abilities and characteristics that have not been applied in this research. The value of the coefficient of multiple correlation has a mid-value and measures (R = .48), and in high statistical significance of a strict criteria amounts to Sig. = .003. By observing the value of individual influence of predictor variables on the forward roll (MZKOLP) it can be seen that, statistically, the most significant individual impact has the MFESDM variable - a standing long jump that estimates the explosive power of the lower extremities. The value of the partial coefficient of BETA amounts to .327, which is significant at the level of Sig. = .03.

Table 3 Regression analysis of MZKOLP criteria variables - forward roll

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.480[a]	.230	.157	.93553

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	22.213	8	2.777	3.172	.003[b]
	Residual	74.394	85	.875		
	Total	96.606	93			

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.617	3.087		1.172	.245
	AVISTJ	-.002	.002	-.136	-.981	.329
	ATEŽTJ	.000	.000	.165	1.275	.206
	MTAPRU	-.027	.029	-.108	-.934	.353
	MFESDM	.015	.007	.327	2.141	.035
	MFLDOS	.014	.015	.097	.904	.369
	MFRDTZ	.005	.045	.014	.119	.906
	MRSZGB	.048	.043	.133	1.116	.268
	BI6X50	-.001	.001	-.090	-.866	.389

Regression analysis of the MZKOLN criteria variable – backward roll

Table 4 shows the results of the regression analysis of the MZKOLN criteria variable, which evaluates the specific motor task backwards roll.

The numerical coefficient of multiple correlations and the value of the square of the coefficient of multiple correlations, i.e. the coefficient of determination, determine 28% of the common variability of the predictor system and of this character and criteria of MZKOLN. The remaining 72% of the total variability of the criteria variables can be attributed to other anthropological abilities and characteristics

that have not been applied in this research. The highest level of predictive value (Beta coefficient = .333) was calculated for the motor ability of MFESDM to estimate the explosive strength of the lower extremity, which is significant at the level of statistical significance .02.

Table 4 *Regression analysis of the MZKOLN criteria variable – backward roll*

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.527[a]	.277	.209	.93279

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.393	8	3.549	4.079	.000[b]
	Residual	73.958	85	.870		
	Total	102.351	93			

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.139	3.078		.045	.964
	AVISTJ	.000	.002	-.016	-.121	.904
	ATEŽTJ	-1.472E-5	.000	-.016	-.127	.899
	MTAPRU	-.004	.029	-.014	-.125	.901
	MFESDM	.016	.007	.333	2.249	.027
	MFLDOS	.018	.015	.126	1.211	.229
	MFRDTZ	.002	.045	.005	.042	.966
	MRSZGB	.061	.043	.165	1.433	.156
	BI6X50	-.001	.001	-.077	-.766	.446

Based on the results of two multiple regression analysis, it can be concluded that the performance of the specific motor tasks of the sports gymnastics forward roll (MZKOLP) and the backward roll (MZKOLN), on the treated sample of the respondents, has statistically significant influence on the explosive strength of the lower extremities. The results obtained are similar to previous studies and does not deviate from the results of previous research (Atiković et al., 2018, Idrizovic, 2006a, Idrizovic, 2006b, Živčić, 2007).

Conclusion

The survey was conducted on a sample of 94 pupils of the Mixed Technical Secondary School of Travnik with the aim of determining the importance and magnitude of the influences of selected morphological and motoric indicators on the realization of specific motor sport tasks of sports gymnastics (forward and backward roll) within the school curriculum of physical and health education. The study applied two variables for assessing morphological features and six variables for the assessment of motor abilities defined as a predictor set of variables and two specific motor assignments of sports gymnastics, forward and backward roll as criteria. Two multiple regression analysis were applied for two specific motor tasks. Multiple regression analysis was statistically significant for both criteria variables at statistically significant levels (Sig., 03 and Sig., 02). The results of the reserach demonstrate that the largest and statistically most significant single impact on the realization of specific motor tasks (forward and backward roll) has the MFESDM variable, which estimates the explosive strength of the lower extremities.

Latest scientific research on this issue, using a larger number of variables and examinees of different ages, should provide more complete and precise information on the influence of morphological characteristics and motor abilities on the realization of specific motor sport tasks (on the floor).

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SOCIAL MEDIA - COLLECTIVE OF ONLINE COMMUNICATIONS CHANNELS

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Abstract

Websites and applications dedicated to forums, microblogging, social networking, social bookmarking, social curation, and wikis are among the different types of social media. Facebook is a popular free social networking website that allows registered users to create profiles, upload photos and video, send messages and keep in touch with friends, family and colleagues. Twitter is a free microblogging service that allows registered members to broadcast short posts called tweets. Twitter members can broadcast tweets and follow other users' tweets by using multiple platforms and devices. LinkedIn is a social networking site designed specifically for the business community. The goal of the site is to allow registered members to establish and document networks of people they know and trust professionally, etc. Traditional channels did not fare nearly as well. Print, radio, and television were expected to see a net decrease in total marketing investments. How marketing funds are ultimately allocated is driven by the nature of the business, the competitive marketplace, and how target customers behave through the buying funnel.

Key words: Social media, Facebook , Twitter, LinkedIn, online communications

Introduction

Social media is the collective of online communications channels dedicated to community-based input, interaction, content-sharing and collaboration. Websites and applications dedicated to forums, microblogging, social networking, social bookmarking, social curation, and wikis are among the different types of social media. Some prominent examples of social media are: (Techtarget.com, 2017)

Facebook is a popular free social networking website that allows registered users to create profiles, upload photos and video, send messages and keep in touch with friends, family and colleagues. According to statistics from the Nielsen Group, Internet users within the United States spend more time on Facebook than any other website. In 2010, Facebook bought FB.com domain from the American Farm Bureau Federation and paid a king's ransom for it – $8.5 million dollars, which is 42 times more than the company originally paid for facebook.com! One feature of the new Facebook Messages is that it assigns you a personalized Facebook.com e-mail address. If a friend sends a message to your Facebook e-mail, you will receive it in your Facebook Inbox. (Domain.me, 2017). Unfortunately, Facebook's employees were using the Facebook.com domain for their e-mails already, so they had to switch to another domain. That's why Facebook needed to buy FB.com in the first place. With the launch of FB.ME in 2010, Facebook's new URL shortener. ME domain is helping the world's largest social network save its more than 350 million users valuable digits in a world where every character counts. Used as the Facebook shortener on their mobile interface, it automatically shortens a mobile link (for example a m.facebook.com link) to FB.ME link. This is clearly another confirmation of the intrinsic value of our extension's personalized branding and ability to instantly create a 'call to action' using minimal characters and maximum impact. Another feature of the shortener is the ability to take you straight to the Facebook username. (Domain.me, 2017)

After the launching of m.facebook.com and officially announcing mobile support in 2007, Facebook Messenger was launched for Android and IOS in 2011. Facebook did a whole lotta work to make mobile app users feel comfortable. Their Creative Labs department introduced services like Sling.me (early Snapchat clone, used for creating/sharing pictures/videos with one or more of your friends that will eventually be erased from the cyberspace) and Rooms.me (mix of a forum and news group, with a pinch of Reddit and a dash of Instagram that lets you create "rooms" for the things you're into, and invite others who are into them too). (Domain.me, 2017) Unfortunately, both the department and services mentioned were shut down in 2015. It is not a secret that back in 2012 Facebook acquired Instagram and in 2014 both Oculus VR, Inc and WhatsApp. That way, Facebook made clear that they will be using acquisitions as an expansion tool like many other internet giants. Then, in 2016, Facebook acquired MSQRD.me (or

Masquerade), an app that uses sophisticated facial recognition technology, combined with just the right dose of magic, to bring you video selfies like you've never seen before. (Domain.me, 2017)

Twitter is a free microblogging service that allows registered members to broadcast short posts called tweets. Twitter members can broadcast tweets and follow other users' tweets by using multiple platforms and devices. (Techtarget.com, 2017) In February 2017, Twitter announced it had 319 million monthly active users worldwide, or just slightly under the number of every person in the United States. But of those 319 million, as many as 48 million aren't actually real, according to a study conducted by researchers from the University of Southern California: They're just software programs, designed to do everything a normal person on Twitter would do, including following other accounts and liking and retweeting certain messages.Those accounts, called "bots," can range from accounts dedicated to alerting their followers about emergencies to political advocates intended to boost the numbers of a programmer's preferred candidate. (Miamiherald.com, 2017)

LinkedIn is a social networking site designed specifically for the business community. The goal of the site is to allow registered members to establish and document networks of people they know and trust professionally. Microsoft has a set of goals for its LinkedIn integration plan, including some specific areas where the company will leverage the social network. Nadella reveals a list of what's planned (Theverge.com):

- LinkedIn identity and network in Microsoft Outlook and the Office suite
- LinkedIn notifications within the Windows action center
- Enabling members drafting résumés in Word to update their profiles, and discover and apply to jobs on LinkedIn
- Extending the reach of Sponsored Content across Microsoft properties
- Enterprise LinkedIn Lookup powered by Active Directory and Office 365
- LinkedIn Learning available across the Office 365 and Windows ecosystem
- Developing a business news desk across our content ecosystem and MSN.com
- Redefining social selling through the combination of Sales Navigator and Dynamics 365

Most of the initial integrations are what you'd expect, but Windows 10 users will be surprised to see the addition of LinkedIn notifications in the Windows notification center. LinkedIn is well known for its bombarding emails and notifications, and Microsoft will have to manage these very carefully if it plans to highlight them directly within Windows 10. (Theverge.com)

Pinterest is a social curation website for sharing and categorizing images found online. Pinterest requires brief descriptions but the main focus of the site is visual. Clicking on an image will take you to the original source, so, for example, if you click on a picture of a pair of shoes, you might be taken to a site where you can purchase them. An image of blueberry pancakes might take you to the recipe; a picture of a whimsical birdhouse might take you to the instructions.

Google+ (pronounced *Google plus*) is Google's social networking project, designed to replicate the way people interact offline more closely than is the case in other social networking services. The project's slogan is "Real-life sharing rethought for the web."

Wikipedia is a free, open content online encyclopedia created through the collaborative effort of a community of users known as Wikipedians. Anyone registered on the site can create an article for publication; registration is not required to edit articles. Wikipedia was founded in January of 2001.

Reddit is a social news website and forum where stories are socially curated and promoted by site members. The site is composed of hundreds of sub-communities, known as "subreddits." Each subreddit has a specific topic such as technology, politics or music. Reddit site members, also known as, "redditors," submit content which is then voted upon by other members. The goal is to send well-regarded stories to the top of the site's main thread page.

Sent by computer engineer Ray Tomlinson in 1971, the email was simply a test message to himself. The email was sent from one computer to another computer sitting right beside it in Cambridge, Massachusetts, but it traveled via ARPANET, a network of computers that was the precursor to the Internet. (Computinghistory.org, 2017) Facebook, Twitter, LinkedIn, YouTube, Google+, Instagram, and Pinterest were the top seven platforms used by marketers, with Facebook leading the pack by a long shot. All of the other platforms paled in comparison to these top seven.

Chart no.1 Seven platforms used by marketers

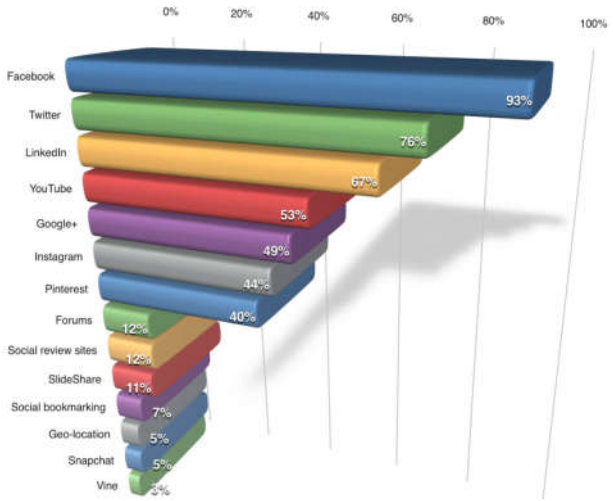
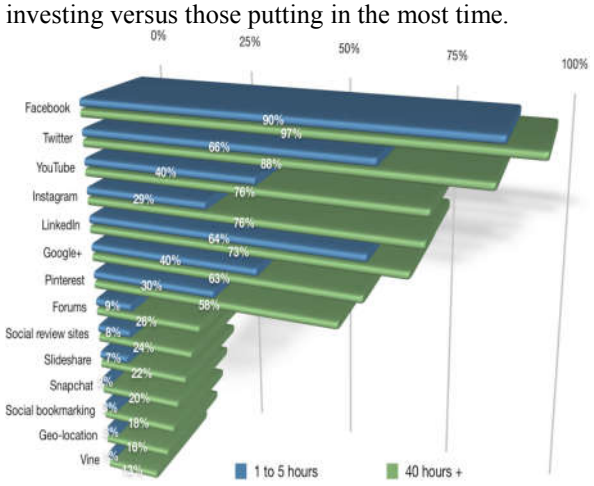


Chart no.2 Where marketers putting in the least time are investing versus those putting in the most time.



Source: Michael Stelzner (2016), "Industry Report", Social Media Examiner, https://www.socialmediaexaminer.com/wp content/uploads/2016/05/SocialMediaMarketingIndustryReport2016.pdf, Chat 1 p.23 and p.27

Chart no 2 shows where marketers putting in the least time are investing versus those putting in the most time. There are some interesting findings here. Marketers investing 40+ hours per week are much more focused on Instagram (47% more), YouTube (36% more), and Pinterest (28% more) than those investing 6 or fewer hours a week with social media

Here's a quick summary of Socialmediaexaminer primary findings (Stelzner, 2016):

- Video has become essential: A significant 60% of marketers use video in their marketing and 73% plan on increasing their use of video.
- Live video is hot: A significant 50% of marketers plan on using live video services such as Facebook Live and Periscope, and 50% want to learn more about live video.
- Facebook and YouTube hold the top spots for future plans: At least 63% of marketers plan on increasing their use of these social networks.
- Snapchat is on a growth trajectory: Only 5% of marketers are using Snapchat, yet 16% plan on increasing their Snapchat activities and 28% of marketers want to learn more about Snapchat.
- Facebook is the most important social network for marketers by a long shot! When asked to select their most important platform, 55% of marketers chose Facebook, followed by LinkedIn at 18%. Plus, 67% of marketers plan on increasing their Facebook marketing activities.
- Many marketers are unsure about their Facebook marketing: A significant 40% of marketers don't know if Facebook traffic has declined in the last 12 months and 35% aren't sure if their Facebook marketing is effective.
- Facebook ads dominate: A surprising 86% of social marketers regularly use Facebook ads, while only 18% use Twitter ads.
- Tactics and engagement are top areas marketers want to master: At least 90% of marketers want to know the most effective social tactics and the best ways to engage their audience with social media. The above summary is just a taste of what's in this report.

The top social media questions marketers want answered can be summarized with the following keywords: tactics, engagement, measurement, audience, and tools—in that order. These questions and their order have remained the same since 2014. Below are the top issues marketers are facing today with social media marketing. At least 86% of marketers surveyed felt they're struggling to answer all of the following questions (Stelzner, 2016, p.6):

1: TACTICS: What social tactics are most effective? The number-one question marketers want answered (92%) is which tactics work best. This isn't a surprise, given the constant changes taking place across many social networks.

2: ENGAGEMENT: What are the best ways to engage my audience with social media? Figuring out how to best connect with people remains high on the list of questions marketers want answered (90%). Engaging with customers is becoming a unique competitive advantage.

3: MEASUREMENT: How do I measure the return on my social media marketing? A significant 86% of marketers want to know how to measure their return on investment for social media activities.

4: AUDIENCE: How do I find my target audience with social media? Locating ideal customers and prospects is a big concern for marketers (86%). Marketers are looking for guidance on sifting through enormous social networks and connecting with the right people.

5: TOOLS: What are the best social management tools? Marketers want better tools to simplify their social media tasks. A surprising 86% don't know which tools are best.(

Social media is important for my business A significant 90% of marketers said that social media is important to their businesses. This is slightly down from 2015 findings, where 58% strongly agreed and 34% agreed. Years using social media marketing they asked participants how long they've been using social media marketing. Fifty-nine percent of marketers surveyed have at least two years of social media marketing experience. On the following pages, they asked marketers to rate their agreement with a few broad statements related to social media. (Stelzner, 2016)

A report from Forrester Research shows the estimated allocation of marketing funds offline vs. online and across the digital channels. Here are some conclusions from that report (Webstrategiesinc.com. 2017):

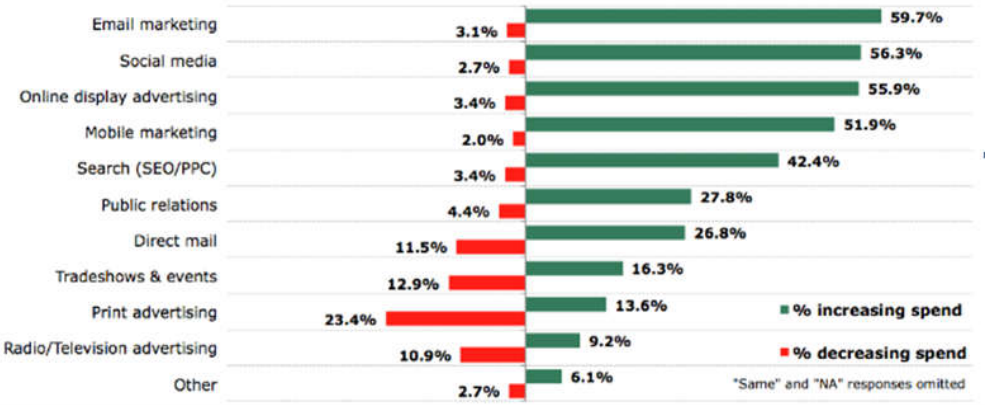
- In 2016, the average firm was expected to allocate 30% of their marketing budget to online, this rate is expected to grow to 35% by 2019
- Search engine marketing will capture the largest share of online spend with online display (banner ads, online video, etc.) taking the second largest share
- Social media investments will continue to grow as an overall share of online spend, but will only represent about 15% of the total online spend
- Mobile marketing has grown to a point that it’s no longer tracked in the forecast and it’s presumed to be considered across all channels

Conclusions from the 2014 report for comparison (Webstrategiesinc.com. 2017):

- 29% of a marketing budget was allocated to online/digital channels
- Search engine marketing (SEO & SEM) captured the largest share of online spend at 47% or about 14% of the firm’s total marketing budget
- Online display advertising (banner ads, remarketing & retargeting) captured the next biggest share of the online spend at about 34% of total online spend and about 10% of the total marketing budget
- Social media investments were estimated at 6% of total online spend and a bit less than 2% of the total marketing budget
- Mobile garnered about 10% of the total digital marketing budget and slightly less than 3% of the total marketing budget.

The chart below shows strong increases in digital channel investment. Of the five digital tactics represented in the report, each expected to see at least a 42% increase in investment.

Chart 3 Marketng Spending Plans for 2016 by program based on survey of 295 global leaders, 72% of whom are wth companies headquartered in North America, January 2016



Source: Webstrategiesinc.com.(2017)https://www.webstrategiesinc.com/blog/how-much-budget-for-online-marketing-in-2014, 26.11.2017

Traditional channels did not fare nearly as well. Print, radio, and television were expected to see a net decrease in total marketing investments. Once again, these are averages. How marketing funds are ultimately allocated is driven by the nature of the business, the competitive marketplace, and how target customers behave through the buying funnel.

Which Social Media Channels Should you invest in? An August 2016 report from eMarketer attempts to project social media penetration by social platform through 2020. While there are no direct investment assessments associated with this particular study, it does show noteworthy trends among the major social channels.

Chart 4 US Social Network Users and Penetration by platform, 2015-2020, millions and % of total social network users

	2015	2016	2017	2018	2019	2020
Facebook users	162.1	166.8	171.4	175.6	179.1	182.0
% of total socal network users	90.0%	89.8%	89.7%	89.4%	89.3%	89.2%
Instagram users	57.4	67.2	76.2	83.6	89.5	95.1
% of total socal network users	31.9%	36.2%	39.9%	42.6%	44.6%	46.6%
Twitter users	51.2	52.2	53.2	54.2	55.3	55.8
% of total socal network users	28.4%	28.1%	27.9%	27.6%	27.6%	27.3%
Printerest users	49.9	54.3	58.1	61.4	64.2	66.3
% of total socal network users	27.7%	29.2%	30.4%	31.3%	32.0%	32.5%
Tumblr users	21.0	23.2	25.2	26.8	28.2	29.4
% of total socal network users	11.7%	12.5%	13.2%	13.7%	14.1%	14.4%
Total socal network users	180.1	185.7	191.1	196.3	200.6	204.1

Source: eMarketer, 2016 Aug., 28.01.2018

Facebook is expected to remain king, with 90% of social media users utilizing in the platform. Instagram is expected to grow, from 32% penetration to 47% by 2020. Other social channels with baked in advertising features, such as Pinterest and Twitter, will continue to have relatively low penetration, peeking around 33% of users by 2020. This data suggests an emphasis should be made on Facebook and Instagram channels for social advertising.

Chart 5 US Total media Ad Spending Share, by Media, 2014-2020 % of total

	2014	2015	2016	2017	2018	2019	2020
TV	39.1%	37.7%	36.8%	35.8%	34.8%	33.7%	32.9%
Digital	28.3%	32.6%	35.8%	38.4%	40.8%	43.1%	44.9%
Mobile	10.9%	17.3%	22.7%	26.2%	28.8%	31.0%	32.9%
Print	17.4%	15.4%	13.9%	12.9%	12.2%	11.6%	11.1%
Newspapers	9.1%	8.0%	7.2%	6.6%	6.1%	5.7%	5.5%
Magazines	8.3%	7.4%	6.8%	6.4%	6.1%	5.8%	5.6%
Radio	8.4%	7.8%	7.4%	7.0%	6.7%	6.4%	6.1%
Out of home	4.0%	4.0%	3.9%	3.8%	3.7%	3.5%	3.4%
Directories	2.8%	2.5%	2.2%	2.0%	1.9%	1.7%	1.6%

Source:www.eMarketer.com, 12.01.2018

The chart 5 from eMarketer projects the following: “in 2017, TV ad spending will total $72.01 billion, or 35.8% of total media ad spending in the US. Meanwhile, total digital ad spending in 2017 will equal $77.37 billion, or 38.4% of total ad spending.” This marks the first time in history digital spend surpassed TV ad spend in the US. And the gap will only widen - by 2020, digital spend will surpass television by 36%. Digital spend is only a portion of total marketing spend for most businesses. For 50% of businesses surveyed, digital represents less than 40% of total marketing spend (Webstrategiesinc.com, 2017).

Chart 6 Structure of the surveyed enterprises according to the number of employees

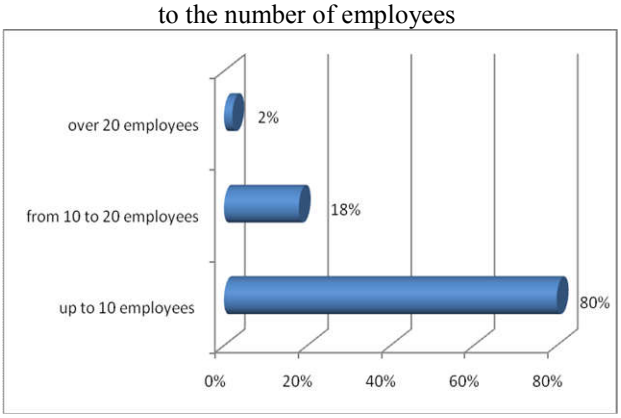
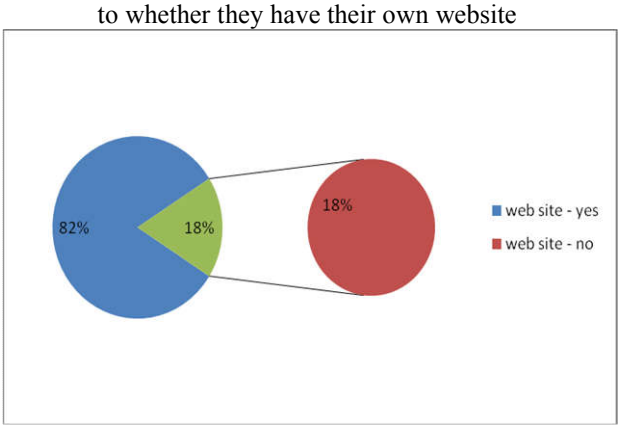


Chart 7 Structure of the surveyed enterprises according to whether they have their own website



The aim of the research in this paper is to indicate the structure and number of enterprises on RMacedonia according to whether they use social media. Description of the results obtained from the survey prepared for this paper: The total number of surveyed enterprises is 30, and the companies are located in Skopje. According to the number of employees, 80% of enterprises have up to 10 employees, 18% from 10 to 20 employees, while only 2% of enterprises have over 20 employees.

When asked if the company had its own website, 82% of enterprises received positive response, and 18% of enterprises gave a negative response. Although at first glance it is assumed that a large percentage of the surveyed enterprises have their own website, however, in today's conditions of the role of the Internet in the creation of a business, this can not be accepted as a positive indicator. The site is the easiest, cheapest and easiest way for a business to get closer to consumers, potential business partners, etc.

An identical number of positive responses are also given to the question of whether the company has its own Facebook or Instagram profile, but that does not mean that there is a full match between those who have their own website and those who have their own Facebook or Instagram page (profile). 2% of enterprises that do not have their own website have their own Facebook or Instagram account, which means that a very small number of surveyed companies do not have a web site, neither a Facebook nor an Instagram account. This greatly improves the notion of using the Internet as a means of self-representation by enterprises.

All those companies that have given a positive response to the question of having their own Facebook or Instagram page are asked if they are advertising, or whether they use paid advertising on one of these two platforms. 60% said they advertise on one of these platforms (paid advertising). Consequently, the number of companies that advertise on social networks (Facebook or Instagram) is still small.

Enterprises who responded that they advertise through paid advertising on Facebook or Instagram, only 27% spend a budget over 100 euros a month to advertise on one of the Facebook or Instagram platforms, the remaining number of companies allocate less than 50 euros per month. 90% of companies as a result of paid advertising on social networks Facebook or Instagram has positive effects. Regarding the question whether they plan to continue advertising on social networks in the future if they plan to increase their advertising budgets, 100% of the interviewed companies have answered positively both in relation to one and in relation to the other question that confirms the thesis that the future the promotion is largely linked to the Internet and social networks as the most used ways of communication.

Summary

An August 2016 report from eMarketer attempts to project social media penetration by social platform through 2020. While there are no direct investment assessments associated with this particular study, it does show noteworthy trends among the major social channels. Facebook is expected to remain king, with 90% of social media users utilizing in the platform. Instagram is expected to grow, from 32% penetration to 47% by 2020. Other social channels with baked in advertising features, such as Pinterest and Twitter, will continue to have relatively low penetration, peeking around 33% of users by 2020. This data suggests an emphasis should be made on Facebook and Instagram channels for social advertising. The use

of the Internet in Macedonia by the business sector is already an important tool for promotion, although the opportunities offered by it are still insufficiently used.

Confirmation of this conclusion is the fact that not all surveyed enterprises use the advantages of such media, as well as the small funds allocated for this purpose in those companies that use the services and advantages of the Internet.

The reasons for such situations are mostly: insufficient knowledge of the opportunities offered by social media, lack of financial resources, lack of appropriate staff, lack of information about the existence of specialized agencies that deal with the provision of this type of marketing services, uncalculation as an expense of own engagement for using Facebook or Instagram advertising platforms, etc.

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IMPACT OF CORRECTIVE EXERCISES SETS DURING PHYSICAL EDUCATION AND SPORTS CLASSES ON THE SPINE STABILITY OF 11-12-YEAR-OLD PUPILS

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Abstract

Problem statement: The spinal column is an important link in the kinematic chain of the human body. It allows stability in maintaining the standing position of the body, as well as mobility, to move the body into the environment. Very often children worsen their body posture in school age and some get vertebral deformities. Spinal deformities lead first to back pain, poor self-esteem, and in advanced stage to many complications for internal organs. The counteraction of spinal deformities and the poor posture of the body is a serious challenge for the teacher of Physical education and sport.Purpose: To follow the impact of sets of corrective exercises in Physical education and sports classes on the spine of 11-12 year old pupils.Methods: Within the period of nine months corrective gymnastics were applied to the pupils in classes of Physical education and sport at school. The pupils were examined at the beginning and at the end of school year (September 2017– May 2018). During that period of time the functional condition of 16 pupils was monitored. Data of anthropometric indicators, static and dynamic strength of abdominal and dorsal muscles and degree of mobility of the spine was collected.Results: After the end of experiment it was found out that the implementation of sets of corrective exercises in Physical education and sports classes improves the static and dynamic muscular strength of abdominal and dorsal muscles and does not increase the flexibility of the spine, which is of particular importance for maintaining the spine in standing position and works against spinal deformities.Discussion: The obtained results confirmed the effectiveness of the sets of corrective exercises.Conclusions: It is important to include corrective exercises in Physical education and sports classes at school for better spine stability and for prevention of spinal deformities.

Key words: *spine, spinal deformities, poor body posture, muscle function, dynamic and static muscle strength, flexibility, anthropometry.*

Introduction

Standing posture is inherent only to human beings. The construction and function of the spine are essential for the proper body posture. It is the base and supports both: the shoulder girdle and the head, as well as the pelvic girdle and the lower limbs, and allows the body to move.

The physiological curves of the spine allow it to act as a springing column. The elasticity of the curves contributes to greater resistance to vertical load compared to the straight column. The physiological curves of the spine are relatively unstable. They permanent shaping begins at the age of seven and ends at 14-15 years of age. Therefore, it is essential to prevent spinal deformities, especially at this age, by creating habits for a proper body posture, as well as through appropriate physical exercises and sports [1, 6].

A proper body posture allows an optimal load on both the spine (joints, intervertebral discs, ligaments and muscles) and other musculoskeletal structures, including the pelvis. A poor posture is a major prerequisite for the development of spinal deformities, and vice versa, spinal deformities lead to deterioration of the body posture [2, 3]. This applies mostly to children, but the adult individual could as well be affected by such problems. Thus, clarifying the underlying causes that may interfere with the proper posture and their elimination is of utmost importance for the prevention and treatment of vertebral distortions [4].

The preconditions for vertebral distortions intensify at school age, when the pupils are forced to remain for a longer time in a static posture. As a result of the fatigue of the dorsal muscles by the end of the class, the child starts looking for a pose to ease the static posture of the musculature. This posture repeats every time the child feels tired until it becomes a vicious motor habit, which is a vicious posture

of the spine. Prerequisites for spinal deformities can be found in children using a desk or a chair inappropriate for their height, often physical unilateral load, an early labour process in awkward postures [7, 8].

Spinal deformities in the anterior-posterior direction are characterised by increased or decreased physiological curves of the spine. Compared to the poor postures, with the aforementioned distortions there is always a compensation that occurs both in the spine itself and beyond, including the pelvis. As far as the lateral direction is concerned, the spinal deformation is called scoliosis. It is a complex deformity with torsion and distortion of the spine in three planes: frontal, sagittal and horizontal. This is not just a spine deformity, it is a disease with a characteristic clinical picture [9, 10]. Severe stages of spinal deformities alter the position of chest organs, impair the function of the cardiovascular, musculoskeletal, and respiratory system, as well as digestive organs, which adversely affects the general condition and functioning of the individual, and therefore spinal deformities are a serious medical-social problem [1, 8]. Mixed forms of spinal curvature such as scoliosis, combined with a kyphotic spine deformity are common.

In the initial stages of spinal deformities, when there is still only a functional disorder, the process is reversible, and the means of corrective gymnastics can restore the balance of the muscles that support a proper posture.

The development of a healthy and strong young generation is an objective necessity for a modern society. In this connection, physical education and sport are essential for proper motor development. Physical education aims to minimize the harmful effects of sedentary lifestyles on students at all school levels. Various medical studies strongly confirm that vertebral deformities are most prevalent in children in primary school age [1]. Contemporary science of human nature clearly demonstrates that one of the most powerful means of preventing a disease, increasing the resistance of the child's organism, and enhancing physical and mental capacity, is active motor activity [5].

Purpose of the Study:

By applying sets of corrective exercises in Physical education and sports classes to 11-12-year-old pupils in order to improve the strength and endurance of the body muscles as well as the body posture.

Matherials and Methods

The study was applied to 16 pupils in one class at a school in Ruse, Bulgaria. The parents of the pupils gave their consent to the pupils' participation in the experiment with duration of one school year (September 2016 - May 2017). The children were aged between 11 - 12 years, with 9 girls and 7 boys examined. No one of them had practiced corrective gymnastics until the beginning of the experiment and to all pupils the sets of exercises was new.

The following tests were applied in the study:

Investigation of anthropometric indicators:

Height - Measured in the morning (typically, the height measured in the morning is greater than the one measured in the afternoon or in the evening). A pre-lined wall was used for the measurement. The unit of measurement was **centimetres**.

Weight - measured in the morning on an empty stomach - unit of measurement: **kilograms**.

Body Mass Index - used to determine normal weight values and, respectively, the degree of obesity / malnutrition in different individuals. The index is calculated by dividing the weight in kilograms by the height in meters per square.

Specialized tests:

Depth of the bend forward - from a main posture on a stool / bench, the student leans forward, in which case the knee joints are extended. The aim is that the student, with both hands (moving parallel downwards), touches with their fingers as low as possible. This is executed slowly without springing. The bend forward is measured with accuracy to 1 cm. If the student's achievement is above the surface (on which the student is standing), it is denoted by a minus sign, and below the surface - by the plus sign. If the hand reaches the surface of the tread, the mark is zero. A higher result is obtained with a higher score denoted by a plus sign.

Depth of the bend to the side - to the left and to the right. From a standing position, the student leans to the left and to the right without bending their body forward or folding their knees. The unit of

measurement is centimetres. The measurement is from the tip of the middle finger to the ground on the left and on the right side.

Static strength endurance of the abdominal muscles - Here we measure the maximum amount of time, in which the body remains in a half-standing posture. The starting position is a supine position, the student starts moving to a half-standing posture up to 45 degrees lifting of the body, the hands are placed behind the neck, and the student remains in this position as long as possible.

Static strength endurance of the dorsal muscles - Here we measure the maximum amount of time, in which the body remains lifted. The starting position is a prone position, the arms are clenched in the elbows and the hands are placed under the chin.

Dynamic strength endurance of the abdominal muscles - clarification - a number of repetitions from s starting supine position, hands behind the neck, the student lifts their the body.

Dynamic strength endurance of the dorsal muscles - a number of repetitions from a starting prone position, hands behind the neck, the student lifts their body.

Methodology of corrective gymnastics for prevention and control of spinal deformities in physical education and sports classes for children in 5th grade

There were two variants of a set of corrective exercises in the preparatory, main and final part of the physical education lesson, including line-up exercises, rearranging exercises, walking exercises with different positions of the feet and the upper limbs, exercises with a gymnastic stick, on a gym mat from a horizontal position of the spine, on a gymnastic wall and games of a corrective character. The use of corrective exercises of this type did not prevent the implementation of the basic tasks of each lesson of physical education and sports, and they were conducted in due course. The overall ratio between corrective exercises and other physical activity in physical education and sports classes was approximately 25% to 75%.

Results and Discussion

Analysis of the results of the anthropometric tests

The anthropometric indicators height, weight, and Body Mass Index were examined at the beginning and at the end of the experiment. The variation analysis of the anthropometric indicators at the beginning (Table 1) and at the end of the experiment (Table 2) shows that the dispersion of the indicators did not show any significant differences with the exception of the Body Mass Index, which demonstrated a more pronounced dispersion of the indicator in the initial study compared to the final one.

Table 1. Variation analysis of the results of the study of anthropometric indicators (September 2016)

№	Test	min	max	R	$\bar{X}$	S	V%
1.	Height	140	164	24	152,3	6,30	4,14
2.	Weight	31,80	61,10	17,89	43,21	8,44	8,39
3.	Body Mass Index	13,84	23,22	9,38	18,6	2,89	15,57

Table 2. Variation analysis of the results of the study of anthropometric indicators (May 2017)

№	Test	min	max	R	$\bar{X}$	S	V%
1.	Height	145	167	22	155,6	5,89	3,78
2.	Weight	33	64	31	45,16	8,39	8,57
3.	Body Mass Index	13,72	22,95	9,23	18,7	2,81	7,6

The average values of the indicator *height* at the beginning and at the end of the experiment are respectively X1 = 152.3 cm и X2 = 155.6 cm (Figure 1). The calculated difference between these two averages is d = 3.3 cm. During the experiment from September to May it is normal for the pupils to grow up, especially considering that the age of 11-12 years is characterized by pronounced growth of the locomotor system.

The average values of the indicator *weight* shown on Figure 1 are X1 = 43.21 kg and X2 = 45.16 kg respectively, and the difference is d = 1.95 kg, indicating that the pupils did not significantly increase

their body weight during the experiment period. The average values of the Body Mass Index measured at the beginning and at the end of the experiment are respectively X1 = 18.6 and X2 = 18.7, with a slight difference d = 0.1, which is statistically insignificant. The average levels of the indicator Body Mass Index at the beginning and at the end of the experiment indicate that the pupils generally have normal body weight for their age.

The results of the study of anthropometric indicators show that the changes in the child's organism are due to normal physiological processes of growth and development of the musculoskeletal system and are not the result of a deliberate impact.

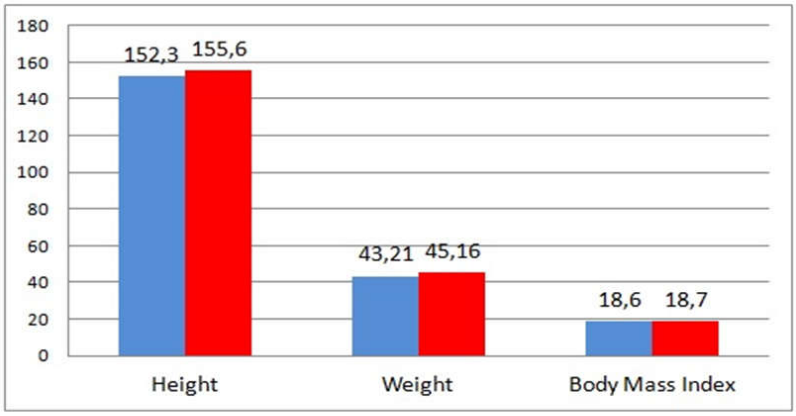

Figure 1. Comparative analysis of the results of the anthropometric indicators

Analysis of the results of the specialized tests

The variation analysis of the specialized tests at the beginning and at the end of the experiment is shown on table 3 and table 4. Looking at the two tables, we can draw the conclusion that the magnitude values, the standard deviation, and the coefficient of variation show greater heterogeneity of results in the initial examinations, while at the end of the experiment, the dispersion of the indicators decreases. Exceptions are the results of the static strength tests for abdominal and dorsal muscles, where the values of dispersion of the indicator remain high in the second examination. Perhaps this is due to the poor physical fitness of the children at the beginning of the experiment, as well as to the difficulty of the tests and the different baseline.

Table 3. Variation analysis of the results of the specialized tests (September 2016)

№	Test	min	max	R	$\bar{X}$	S	V%
1.	Depth of the bend	-20	7	27	-6,69	9,74	94,93
2.	Depth of the bend to the right	31	47	16	37,73	4,37	11,57
3.	Depth of the bend to the left	32	49	17	38	4,96	13,04
4.	Static strength endurance of the dorsal muscles	8	90	82	44,88	20,4	45,46
5.	Static strength endurance of the abdominal muscles	14	102	98	52,87	31,21	59,03
6.	Dynamic strength endurance of the dorsal muscles	16	22	6	18,4	1,92	10,43
7.	Dynamic strength endurance of the abdominal muscles	15	40	25	27,5	6,96	25,27

The average values of the depth of the bend at the beginning and at the end of the experiment are, respectively, $\bar{X}1$ = - 6.69 cm and X2 = -1.69 cm (Figure 2). The difference between these two averages is d = 4.47 cm, which is statistically insignificant at Student's t - criterion for dependent values of 1.83 and a guarantee probability of less than 95% at a degree of freedom k = 15 and α - 0.05 suggests that the applied sets of corrective exercises does not contribute to the flexibility of the spine. This is understandable considering the aim of the exercises, i.e. primarily to strengthen the torso muscles and less to contribute to the flexibility of the spine, which is contraindicated in the corrective gymnastics.

Table 4. Variation analysis of the results of the specialized tests (May 2017)

№	Test	min	max	R	$\bar{X}$	S	V%
1.	Depth of the bend	-16	12	28	-1,69	8,62	74,36
2.	Depth of the bend to the right	29	48	19	38,67	4,55	11,76
3.	Depth of the bend to the left	29	48	19	38,33	4,91	12,81
4.	Static strength endurance of the dorsal muscles	25	118	93	73,67	38,32	38,44
5.	Static strength endurance of the abdominal muscles	38	154	116	75,13	34,81	46,33
6.	Dynamic strength endurance of the dorsal muscles	22	36	14	28,13	3,8	13,49
7.	Dynamic strength endurance of the abdominal muscles	29	52	23	40,13	5,73	14,28

The average test values of the depths of the bend to the left and to the right at the beginning of the experiment and at the end of the experiment were respectively X1 = 37.73 cm and X2 = 38.67 cm and X1 = 38 cm and X2 = 38.33 cm, where the differences are respectively d = 0.93 and d = 0.33, which are statistically insignificant and the guarantee probability is less than 95%. This indicates that the applied methodology does not improve the flexibility of the spine of the pupils in the lateral direction.

The average values obtained from the static strength endurance tests of the dorsal and abdominal muscles at the beginning and at the end of the experiment are respectively X1 = 44.88 sec and X2 = 75.13 sec and X1 = 52.87 sec and X2 = 73.67 sec, with the differences being respectively d = 31.47 sec and d = 20.8 sec, which is statistically insignificant at Student's t-criterion of 2.56 and 2.89 and the guarantee probability Pt> 95%. This shows that the applied set of corrective exercises in physical education and sports classes leads to an improvement in the static muscular strength of the abdominal and dorsal muscles, which is essential for maintaining the spine upright and preventing spinal deformities.

The average values obtained from the dynamic strength of the dorsal and abdominal muscles tests at the beginning and at the end of the experiment were respectively X1 = 18.4 sec and X2 = 28.13 sec and X1 = 27.53 sec and X2 = 40.13 sec, the differences being respectively d = 9.73 sec and d = 12.6 sec, which is statistically significant at Student's t-criterion of 2.86 and 3.12 respectively and the guarantee probability Pt> 95%. This confirms the hypothesis that the applied set of corrective exercises will result in positive changes in the musculature supporting the spine.

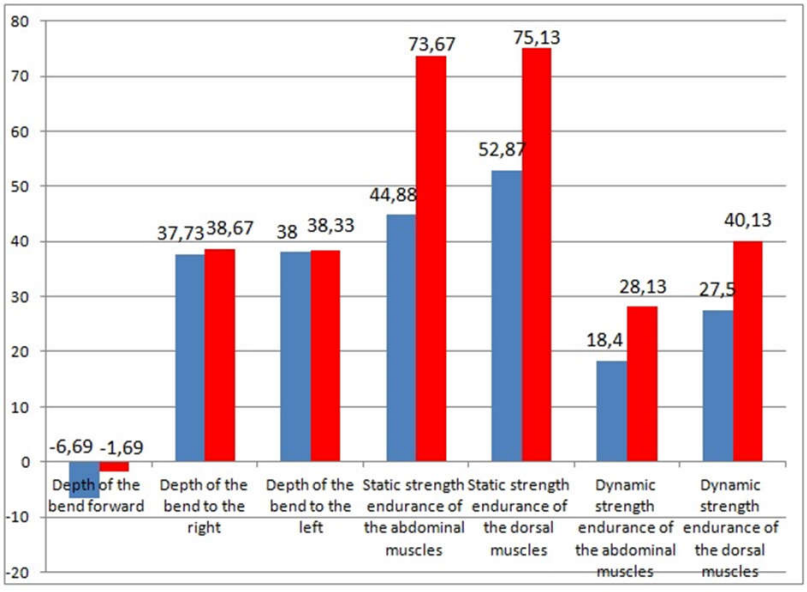

Figure 2.Comparative analysis of the results of the specialized tests

The results obtained from the specialized tests indicate the good effectiveness of the sets of corrective exercises in terms of strengthening the torso muscles and opposing the tendencies for spinal deformities and improving the body posture.

Conclusions

1. Through the literary review we were able to prepare a set of corrective exercises intended for physical education and sports classes with 11-12-year-old pupils.
2. The proper selection of corrective gymnastics means helps increase the static and dynamic muscular strength of the abdominal and dorsal muscles, which improves the spine stability as well as the body posture.
3. The efficacy of the applied set is evidenced by the significantly better results and significant differences achieved in the second study in terms of muscle strength and spine stability.
4. Corrective exercises are recommended to be included in each lesson in Physical Education and Sports as part of the lesson to prevent spinal deformities.

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NEUROENDOCRINE AND METABOLIC RESPONSE TO PHYSICAL EXERCISE

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Abstract

Physical exercise induces many physiological changes and adaptations that are highly beneficial to the sporting persons and their ability to perform exercise. In humans, one physiological system that is extremely responsive to the stress of exercise and exercise training is the neuroendocrine system. Hormones are involved in physiological changes produced in the body during exercise. The duration, the intensity and the type of training modulates the hormonal fluctuations. The endocrine profile developed under various physical exercise conditions and is dependent on the integrity of hypothalamic-pituitary-adrenal, hypothalamic-pituitary-gonadal, on insulin secretion and on the sympathetic adrenal medullary system. The integration of intracellular metabolic pathways is dependent upon the accumulation of metabolic bioproducts, all of wich can influence the maintaince of contractile activity or result in the oncet of fatigue. The review also considers the metabolic response to integrate extracellular substrate aviability with the increased energy demands made by contracting skeletal muscle.

Key words: *physical exercise, metabolic*

Introduction

Physical exercise has an important impact on the whole organism, mediated by the endocrine and neuroendocrine system. It causes a series of stimuli that can induce a cascade of biochemical and hormonal changes (Soria M, et al., 2015).The biological hormonal effects is achieved following cellular response, wich depends on hormone concentration,the number and affinity of cell receptors and the genetic characteristic of each cell. At cellular level hormone actions induce important biochemical changes membrane transport and protein synthesis changes and facilitates the activation of messengers (via protein-G): cyclic AMP, Ca^{2+}, inositol triphoshate and dyacylglycerol (Hackney AC et al., 2013). The neuroendocrine system controls a plethora of systemic functions the range from metabolism and fluid balans to cardiovascular and pulmonary function.

Metabolic response to physical exercise

The most immediate substrate source for ATP-resynthesis in skeletal muscle is phosphocreatine (PCr). During exercise, there is sufficient PCr to sustain the maximum rate of ATP-hydrolysis for about 3-5 s before a decline in power production (Karatzaferi et al., 2001). There were examined the metabolic response to 30 min of exercise at 40, 55 and 75% of maximal workload (equivalent to 44, 57 and 72 of VO_{2max}) (Van loon et al., 2001). In most cases a wide range of metabolites have been reported (Peake et al., 2014) to exist and that with exercise changes in metabolites related to carbohydrate, triglyceride and markers of the trycarboxylic acid have been reported. Repeated exercise has been shown to improve insulin sensitivity (Malin SK et al., 2013), reduce the catecholamine response to exercise and increased lipid catabolism (Henderson GC et al., 2014). Recent work have suggested that both skeletal muscle and adipose tissue function as integrated endocrine organs in response to an exercise stimulus (Pedersen BK, 2013). The maintaince of blood glucose during exercise represents a significant challenge because the rate of muscle glucose uptake increases several fold.The principal organ for regulating blood glucose is the liver, which in the face of increased blood glucose disposal will increase the rate of hepatic glucose production through glycogen catabolism and gluconeogenesis.Increasing exercise intensity is also a potent stimulus to increase both the rate of glucose uptake and the rate of hepatic glucose production (Van Loon et al, 2001). The effect of exercise on circulating catecholamine (epinephrine and norepinephrine) release are summarised: exercise induces a rise of catecholamines that is observed across a wide range of exercise modalities (Philips at al., 1996). The exercise- induced increase in catecholamine concentration is of sufficient magnitude to stimulate glycogenolysis in both the liver and skeletal muscles (Kreisman et al., 2003).

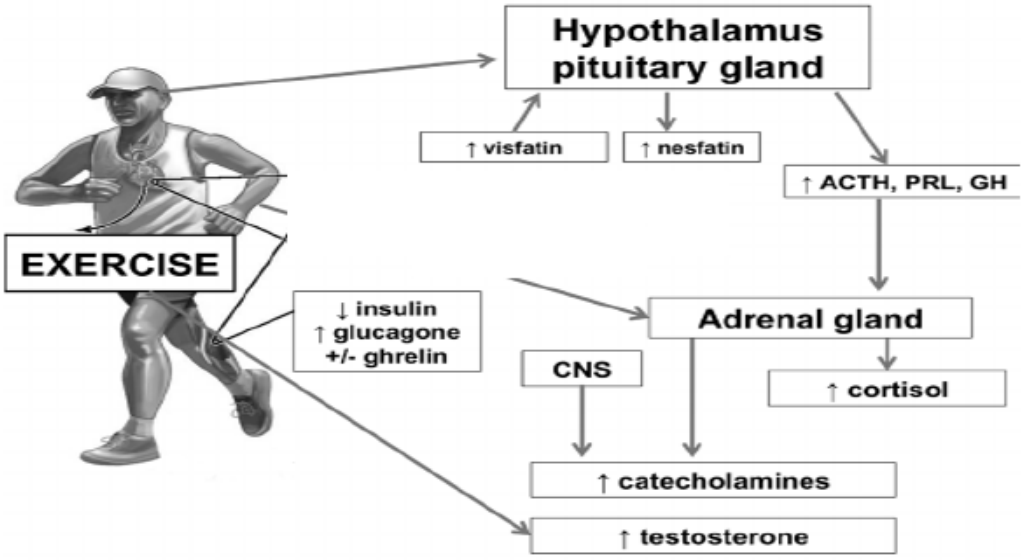

Figure 1. Neuroendocrine response to physical exercise

Neuroendocrine system and physical exercise

Exercise leads to an increase in the production of somatotropic hormone (STH /GH), adrenocorticotrophic hormone (ACTH), prolactin (PRL), cortisol, catecholamines (epinephrine, norepinephrine), glucagon , testosterone that each has local and systemic effects (Galbo H 2000, Crewther et al., 2011) (Figure 1**).** Somatotropic hormone (STH) is a polypeptide hormone consisting of 191 amino acids, which is secreted by the anterior pituitary lobe. STH has many actions, of wich the most significant are metabolic and linear growth effects. Moderate aerobic training is accompanied by a progressive increase in the plasma concentration of most hormones including STH . Anaerobic training is associated with an abrupt STH response (Peake et al., 2014). During anaerobic physical exercise STH levels doubled, while during aerobic training values are even 14 times higher. After the cessation of both type of training, no significant changes were found (Weltman et al.,2008). Cortisol is a gluconeogenetic hormone, whose levels increases during physical exercise proportionally to the degree of training (Madhusmita, 2014). Studies performed on groups of young athletes subjected to aerobic and anaerobic physical exercise evidenced an elevation of cortisol levels during effort, more significant in the case of aerobic exercise. After aerobic exercise cortisol values remained unchanged. The cessation of anaerobic exercise was followed by an increase of cortisolemia (Balsalobre-Fernandez et al., 2014). Anterior research showed a modearate activation of hypothalic-pituitary-adrenal system and mild hypercortisolism in persons with a high degree of physical training. These changes represent an adaptive mechanism to stress induced by exhausting physical exercise. Elite gymnastics have high basal cortisol values and no circadial cortisol fluctuations. This reflects an adaptation of the body to stress induced by intense and prolonged exercise. Regarding ACTH secretion, no significant changes were found (Madhusmita, 2014). The female gonads secrete estrogens, progesterone and androgens. Their secretion is regulated by the hypothalamic –pituitary system through the gonadotropic hormones: follicle-stimulating hormone (FSH) and the luteinizing hormone (LH). The predominant hormone of the male is testosterone, which secretion is being regulated by gonadotropic hormones (FSH, LH). Estrogens and testosterone levels increase during both aerobic and anaerobic exercise, without a significant difference between the two types of training (Woytis et al., 2015, Orwoll, 2016). Regarding gonadotropic hormones in young female athletes subjected to physical exercise at an increase intensity, an alteration of luteinizing hormone (LH) pulsations,without an obvious change of follicle-stimulating hormone (FSH), was demonstrated (Madhusmita, 2014). Hormonal fluctuations secondary to sport activity depend on the type of exercise (aerobic/anaerobic), the intensity, the duration, the frequency of the training sessions and the degree of the physical training (O´Connor PJ, 2007) (Figure 2).

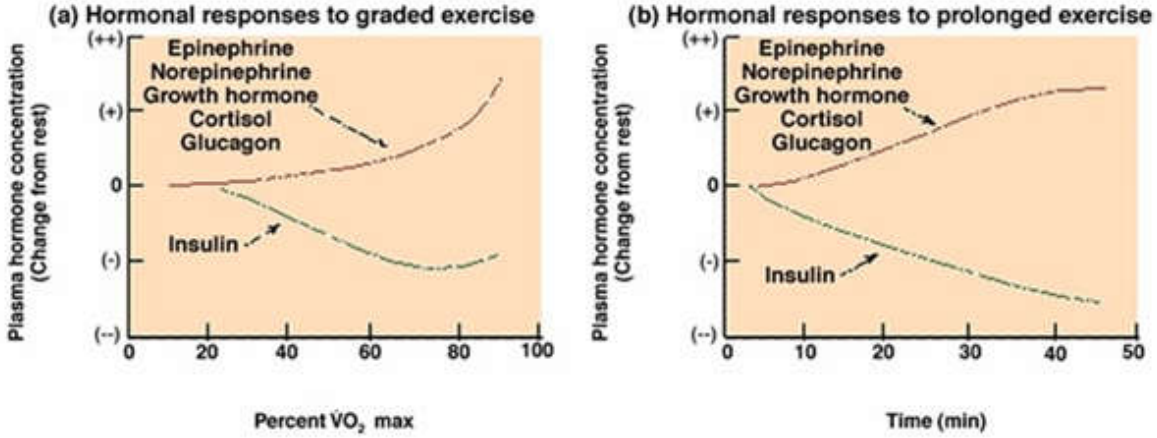

Figure 2. Plasma hormonal fluctuations depend on the degree and duration of the physical training

Conclusions

Skeletal muscle can increase the rate of energy turnover from rest to maximum force/power output that requires an integrated response both from within the cell and systematically to match the rate of ATP degradation with the ATP resynthesis. Focus has now switched to the role that skeletal muscle plays in a systemic endocrine response that appears to be related to substrate avialibility within the exercising muscle. Physical exercise induces common changes as well as individual differences conditioned by psycho-emotional factors in all endocrine axis (sympathetic-adrenal, hypothalamic-pituitary-adrenal, hypothalamic-pituitary-gonadal), STH and pancreas.

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EFFICACY OF PHYSIOTHERAPY IN TREATING ACUTE LOWER BACK PAIN

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Abstract

Background: Low back pain (LBP) is one of the leading causes of disability and has a major socioeconomic impact[1]. The majority of the cost associated with LBP is generated by a small percentage of patients whose condition proceeds to chronicity [2]. Acute low back pain with or without sciatica usually is self-limited and has no serious underlying pathology[3]. Lower back pain is denoted by the pain and discomfort occurred in between the costal margin and inferior gluteal folds. Often, this pain is also accompanied by varied level of leg pain. Acute incidences of low back pain persist for less than 6 weeks. [4]. A more thorough evaluation is required in selected patients with "red flag" findings associated with an increased risk of cauda equina syndrome, cancer, infection, or fracture. These patients also require closer follow-up and, in some cases, urgent referral to a surgeon [5]. Low back pain affects a reported 5.6 percent of U.S. adults each day and 18 percent report having had back pain in the previous month. The lifetime prevalence of low back pain is estimated to be at least 60 to 70 percent. Although most patients self-treat back pain and only 25 to 30 percent seek medical care[5-9].The goals of physical therapy are to decrease back pain, increase function, and teach the patient a maintenance program to prevent future back problems[10].Our practice has found many patients that are presented with these symptoms and signs and this is the clinical reason for to study and treat a problem that is so frequent and defiant.

Key words: *Physical therapy, Low back pain, Function, Patients.*

Introduction

Lower back pain is denoted by the pain and discomfort occurred in between the costal margin and inferior gluteal folds. Often, this pain is also accompanied by varied level of leg pain. Acute incidences of low back pain persist for less than 6 weeks.

The sub-acute low back pain usually persists till 6 to 12 weeks; the chronic type of lower back pain is known to persist 12 weeks or more depending on the condition [4].

Acute low back pain is defined as pain that occurs posteriorly in the region between the lower rib margin and the proximal thighs and that is of less than six weeks' duration. Sciatica is pain that radiates down the posterior or lateral leg beyond the knee.

Knowing the prevalence of various etiologies of back pain, looking for "red flag" findings (which indicate a serious underlying condition) in the history and physical examination, and performing some basic physical examination maneuvers allow physicians to accurately and quickly classify most causes of back pain[5].

Lumbar Examination

The first aim of the physiotherapy examination for a patient presenting with back pain is to classify the patient according to the diagnostic triage recommended in international back pain guidelines[6].

Serious (such as fracture, cancer, infection and ankylosing spondylitis) and specific causes of back pain with neurological deficits (such as radiculopathy, caudal equina syndrome)are rare[7]. but it is important to screen for these conditions[6,8]. Serious conditions account for 1-2% of people presenting with low back pain and 5-10% present with specific causes LBP with neurological deficits[9].

When serious and specific causes of low back pain have been ruled out individuals are said to have non-specific (or simple or mechanical) back pain.

Non-specific low back pain accounts for over 90% of patients presenting to primary care and these are the majority of the individuals with low back pain that present to physiotherapy[10].

Subjective examination

The subjective examination is one of most powerful tools a clinician can utilize in the examination and treatment of patients with LBP. The questions utilized during this process can improve the clinician's confidence in identification of sinister pathology warranting outside referral, screening for yellow flags which may interfere with PT interventions, and assist in matching PT interventions with a patient's symptoms.

History not only is the record of past and present suffering but also constitutes the basis of future treatment, prevention, and prognosis[11].

Objective examination

The purpose of the objective examination (clinical testing) is to confirm or refute hypothesis formed from the subjective examination.

When assessing the lumbar spine, the examiner must remember that referral of symptoms or the presence of neurological symptoms often makes it necessary to "clear" or rule out lower limb pathology. Many of the symptoms that occur in the lower limb may originate in the lumbar spine. Unless there is a history of definitive trauma to a peripheral joint, a screening or scanning examination must accompany assessment of that joint to rule out problems within the lumbar spine referring symptoms to that joint.

Examination procedures should be performed from standing-sitting-lying and pain provocation movements saved until last[12].

Differential Diagnosis of Low Back Pain

CONDITION (PREVALENCE*)	***SIGNS AND SYMPTOMS***
Mechanical low back pain (97%)	
Lumbar strain or sprain (≥ 70%)	Diffuse pain in lumbar muscles; some radiation to buttocks
Degenerative disk or facet process (10%)	Localized lumbar pain; similar findings to lumbar strain
Herniated disk (4%)	Leg pain often worse than back pain; pain radiating below knee
Osteoporotic compression fracture (4%)	Spine tenderness; often history of trauma
Spinal stenosis (3%)	Pain better when spine is flexed or when seated, aggravated by walking downhill more than uphill; symptoms often bilateral
Spondylolisthesis (2%)	Pain with activity, usually better with rest; usually detected with imaging; controversial as cause of significant pain
Nonmechanical spinal conditions (1%)	
Neoplasia (0.7%)	Spine tenderness; weight loss
Inflammatory arthritis (0.3%)	Morning stiffness, improves with exercise
Infection (0.01%)	Spine tenderness; constitutional symptoms
Nonspinal/visceral disease (2%)	
Pelvic organs—prostatitis, pelvic inflammatory disease, endometriosis	Lower abdominal symptoms common
Renal organs—nephrolithiasis, pyelonephritis	Usually involves abdominal symptoms; abnormal urinalysis
Aortic aneurysm	Epigastric pain; pulsatile abdominal mass
Gastrointestinal system—pancreatitis, cholecystitis, peptic ulcer	Epigastric pain; nausea, vomiting
Shingles	Unilateral, dermatomal pain; distinctive rash

Estimated percentage of patients with this condition among all adult patients with low back pain in primary care.

Information from references 13 and 17 through 23.

Studies of physical therapy for acute low back pain are heterogeneous because the intervention method differs: it can include education, exercises, traction, manipulation, or massage, as well as modalities such as heat, ice, and ultrasonography[24,25].

The McKenzie method is superior to other treatments with regard to short-term pain relief and disability[26].

Methods

Sampling: Simple random sample

Source of data: Patients with low back pain are selected from the Special Hospital for General Rehabilitation in Kllokot, in October 2016. Prior Permission was taken from the center of the aforementioned study conducted in conformity with ethical norms - medical.

Type of study: Experimental Study

Sample Procedure: This will be prospective study and we will include the total number of 50 patients. To each patient initially use a simple selection to include in the relevant classification criteria. Then selected patients who were willing to participate, were divided randomly into two groups, in Experimental group (25 patients) and Control group (25 patients). The details and scope of this study were fully explained to all patients and was taken their consent.

The period of treatment plan for all patients which will be involved in this study will be 3 weeks. The structure of the work in this research will include the evaluation of subjective data from patients (age, gender, occupation, date of intervention and the date of commencement of physiotherapy), the objective examination (inspection and palpation), will be include the measurement of the range of motion of the lumbat spine, special tests.

- Experimental group of subjects with low back pain (11 women and 14 men) was treated with Electrotherapy (Tens), criotherapy and Meckenzi method.
- Control group of subjects with low back pain (12 males and 13 females) was treated Electrotherapy (Tens), criotherapy and active exercises.

Criteria for selection:

Inclusion criteria

The inclusion criteria were:

- Back pain with or without sciatica,
- Onset within 3 weeks,
- Age between 18 to 60 years.

Exclusion criteria

- Spondylolisthesis
- Spinal stenosis
- Spondylolysis
- Ankylosing spondylitis
- Structural deformity
- Osteoporotic fracture
- Congenital
- Pregnancy
- Spinal tumor
- Cauda equina syndrome

Results

After the evaluation of the results, improvements are found in reduction of pain, increase of range of motion and restore of function. Significant improvements mainly are found in patients of Experimental group treated with McKenzie method.

Tab. 1. Age Parameters of Researched Groups and Gender

Age (Years)	Experimental group			Control group		
	F	M	Total	F	M	Total
N	11	14	25	12	13	25
Mean	41.0	43.8	42.6	40.4	45.8	43.2
DS	10.4	6.8	8.5	9.5	6.6	8.4
Min	27	32	27	27	35	27
Max	57	54	57	56	58	58

The average age of experimental group patients was 42.6 years (standard deviation ± 8.5 years). The youngest patient was 27 and older with 57 years of age. The mean age of control group patients was 43.2 years (standard deviation ± 8.4 years). The youngest patient was 27 years old and the oldest 58 years old (Tab. 1).

Tab. 2. Researched by groups and gender

Gender		Expe. group		Cont. group		Total	
		N	%	N	%	N	%
F		11	44.0	12	48.0	23	46.0
M		14	56.0	13	52.0	27	54.0
Total	N	25	100.0	25	100.0	50	100.0
	%	50.0	-	50.0	-	100.0	-
X2-test		P>0.05					

*By gender, 27 patients or 54% were masculine and 23 patients or 46% were female females. With distribution of patients by groups and gender we have gained this structure: in the experimental group, out of 25 patients 11 or 44% were female and 14 or 56% were males. In the control group, out of 25 patients 12 or 48% were women and 13 or 52% were males (**Tab. 2**).*

Table 3. Comparison of flexion parameters (cm) before treatment by groups

Grupi	N	Mean	DS	Median	Min	Max
Exper. group Flex. before treat.	25	38.0	6.6	38	25	51
Contr. group Flex. before treat.	25	39.1	6.9	39	25	51
T-test			P=0.569			

With average t-test, we tested the median mean values of expermintal group and control group patients prior to treatment, where we did not distinguish between significant statistical significance (P> 0.05), (Tab.3).

Tab. 4. Comparison of flexion parameters (cm) after treatment by groups

Grupi	N	Mean	DS	Median	Min	Max
Exper. group Flex. after treat.	25	13.4	3.6	12	9	20
Contr. group Flex. after treat.	25	39.1	6.9	39	25	51
T-test			P<0.0001			

With average t-test, we tested the mean values of flexion between experimental group patients and control group after treatment, where we gained significant statistical significance (P <0.0001), (Tab. 4).

Tab. 5. Comparison of extension parameters (cm) before treatment by groups

Grupi	N	Mean	DS	Median	Min	Max
Exper. group Ext. before treat.	25	14.6	4.4	15	3	20
Contr. group Ext. before treat.	25	14.3	5.3	15	0	51
T-test			P=0.861			

With the average t-test we tested the average extension values of Experimental Group and Control Group patients before treatment, where we did not distinguish between significant statistical significance (P> 0.05), (**Tab.5**).

Tab. 6. Comparison of extension parameters (cm) after treatment by groups

Grupi	N	Mean	DS	Median	Min	Max
Exper. group Ext. after treat.	25	32.9	3.9	34	20	38
Contr. group Ext. after treat.	25	27.3	4.4	28	15	51
T-test			P<0.0001			

As shown in Tab. 6 with an average t-test, we have tested the mean extension values for Experimental Group and Control Group patients after treatment, where we obtained a significant difference in statistical significance (P <0.0001), (Tab. 6).

Tab 7. Comparison of mean lateroflexion parameters (cm) on both sides before treatment by groups

Grupi	N	Mean	DS	Median	Min	Max
Exper. group LF after treat.	25	54.7	4.4	53.5	47.5	63
Contr. group LF after treat.	25	54.8	5.0	53.0	48	64
Mann-Whitney test			P=0.922			

We found the lateroflexion median on both sides before treatment for the patients involved in the study, where in Experimental Group patients was 54.7 cm (standard deviation ± 4.4 cm), median 53.5 cm, 47.5 cm to 63 cm. Control Group patients were 54.8 cm (standard deviation ± 5.0 cm), median 53.0 cm, 48 cm to 64 cm. With the Mann-Test test we did not gain distinct significance in the lateroflection between the pre-treatment groups (P> 0.05), (Tab.7).

Table 8. Comparison of mean lateroflexion parameters (cm) on both sides after treatment by groups

Group	N	Mean	DS	Median	Min	Max
Exper. group LF after treat.	25	43.6	42.8	43	39.5	50.5
Contr. group LF after treat.	25	47.5	3.2	48	42.5	54
T-test			*P<0.001*			

We found the lateroflexion median on both sides after treatment for the patients involved in the study where in Experimental Group patients was 43.6 cm (Standard Deviation ± 2.8 cm), median 43 cm, 39.5 cm to 50.5 cm. Control Group patients were 47.5 cm (standard deviation ± 3.2 cm), median 48 cm, 42.5 cm to 54 cm. With T-test we gained distinct significance in the lateroflection rate between groups after treatment (P <0.001), (Tab. 8).

Table 9. Comparison of mean rotation parameters (cm) on both sides before treatment by groups

Grupi	N	Mean	DS	Median	Min	Max
Exper. group R before treat.	50	13.9	1.0	11.5	11.5	16
Contr. group R before treat.	50	14.7	1.4	11.5	11.5	17
T-test			P=0.035			

As seen in Tab. 9 we found the rotation average on both sides before treatment for the patients involved in the study where in Experimental Group patients was 13.9 cm (Standard Deviation ± 1.0 cm), median 11.5 cm, 11.5 cm to 16.0 cm. Control Group patients were 14.7 cm (standard deviation ± 1.4 cm), median 11.5 cm, ranging from 11.5 cm to 17 cm. With T-test we gained significant difference in the degree of rotation between groups prior to treatment (P <0.05).

Table 10. Comparison of mean rotation parameters (cm) on both sides after treatment by groups

Group	N	Mean	DS	Median	Min	Max
Exper. group R after treat.	50	18.4	1.0	18.5	16.5	20
Contr. group R after treat.	50	17.9	1.3	18	15.5	20
T-test			P=0.124			

As shown in Tab. 10, we found the rotation average on both sides after treatment for patients involved in the study where experimental group patients were 18.4 cm (Standard Deviation ± 1.0 cm), median 18.5 cm, 16.5 cm to 20.0 cm. Control Group patients were 17.9 cm (Standard Deviation ± 1.3 cm), median 18 cm, range 15.5 cm to 20 cm. T-test did not make significant difference in the degree of rotation between the groups after treatment (P> 0.05).

Results of this study will be a great contribution in evidence based treatment of low back pain.

Discussion

The aim of this study was to determine Efficacy of Physiotherapy in improving range of motion, decrease of pain, return of function and mobility and enhancing the quality of life.

A secondary purpose was to explore the specific value of McKenzie method. During this study we have analyzed the efficacy of physiotherapy, respectively McKenzie method and active exercise.

In the place where I work, the number of patients who come here due to problems with low back pain has grown over the past few years as a result of progress that shows physiotherapy in the management of back pain.

Physical therapy (PT) is started as soon as the patient can tolerate activity. A managed PT program can help build muscle strength, flexibility, improve mobility, coordination, stability, balance, and promotes relaxation. Patients who participate in a structured physical therapy program often progress to wellness more rapidly than those who do not. This includes low back maintenance through a home exercise program developed for the patient by the physical therapist [27] During all my observation on the researches published regarding the efficacy of physiotherapy in treatment of back pain we have found data in the result of the physical therapy.

Conclusion

This study confirms the hypothesis that physiotherapy has a significant efficacy in low back pain treatment, resulting in pain reduction, Range of motion progression and improvement in life quality.

Comparing both methods of treatment: McKenzi method and active exercise are shown very effectively, even though McKenzi method results more effectively in low back pain.

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DIFFERENCES IN THE POSTURAL STATUS BETWEEN BOYS AND GIRLS AGED 11 TO 13 YEARS OF AGE

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Abstract

The study was conducted on a sample of 90 students of both genders, 11 to 13 years old. The participants were students from primary school "Tušanj" and "Brčanska Malta" located in Tuzla. The aim of the study is to determine postural differences between boys and girls, aged 11 to 13. The postural status was evaluated using 12 variables which reflected on the position of head, shoulders, hips, pelvis (frontal and lateral position) as well as neck pressure, the center of the body mass, Q angle of knees, loss of height from measured stature and posture number. For the purposes of the research, Posture Pro V software was used, whereas anatomical determinants of the body were selected bilaterally (head, torso, legs/hips, knees and ankles) through frontal plane (frontal position) and sagittal plane (lateral position). To determine the difference between boys and girls, aged 11 to 13, the Independent Samples t-Test was used. Given results indicate that boys had better postural status in comparison with girls. Poor posture could be explained by the fact that girls begin puberty earlier than boys. It led to rapid height growth, when the muscular system is not developed enough to maintain a proper function/coordination between body segments. Also, it could be stated that disproportion between phase of the growth spurt, skeletal development and insufficient body activity could be a reason for poor posture girls have in comparison with boys, aged 11 to 13.

***Key words**: body posture, Q angle, posture number, neck pressure*

Introduction

Most of their time preschool children spend playing and moving around which makes them the most active population. By the time they start going to primary school, children spend most of their time sitting. The time spent at home (doing homework, watching TV, using PC and playing video games) should be accounted for as well, as it significantly leads to discontinuity of physical activity. During the development period, i.e. from 6 to 18 years old, children are exposed to different health issues/problems including a problem of poor posture (Bogdanović et.al, 2008). The beginning of the school and entrance into school environment represent a "fertile ground" for development of some postural disorders and due to school responsibilities, physical activity decreases about 50% (Vuković, 1999). Posture is defined as a position of body segments in a given time (Gangnet i sar., 2003) and it represents an important health indicator (McEvoy,2005). Posture must correspond to a specific body position in a space which reduces the influence of gravitational strain on the tissue (Grimmer et.al, 2002). Inadequate posture comprises of bad coordination of body parts (Shumway-Cook,Woollacott, 2001). Proper posture in upright position or some other position, either moving or resting, represents a state of good musculoskeletal balance (Protić – Gava, Šćepanović, 2014). Posture in children and young people, as extremely important segment of health status, is an interest of many researchers, due to increasing number of postural disorders in children and young people (Obradović, Milošević, 2008., Protić – Gava, Krneta, 2010., Sabo, 2006). The term proper posture implies a habit of keeping natural upright position or position while walking. With proper posture, the trunk profile forms a natural physiological curve of spinal column, with moderate neck curvation (lordosis), chest protrusion (kyphosis) and lordosis. In a clinical view, this is a corresponding head position with the look ahead, shoulders slightly backwards, chest slightly protruded to the front and arms close to the body. Abdomen contracted inwards, knees in a straight position and pelvis tilted forward for about 60 °. The most common factors which influence posture are anatomical structure, inherited characteristics and external influences (diseases, habits, work, profession etc.). Primary changes are usually first exhibited on the muscles and after that on the ligaments and skeletal system (Babiak, 1984). Today, children are less active in comparison to the children of earlier generations, either through games or organized physical activities. Taking into account muscular strength, physiological and

anatomical differences, this paper will show if and to which extent are there postural differences between boys and girls.

Method

Participants

A sample of 90 students of both gender, 11 to 13 years old, participated in the study. The participants were students from primary school "Tušanj" and "Brčanska Malta" located in Tuzla.

Variables

Measuring variables used in the study:

- Frontal head position (FHeP)
- Frontal shoulder position (FSP)
- Frontal hip position (FHiP)
- Lateral head position (LHP)
- Lateral pelvis position (inclination position) (LPP)
- Total deviation of frontal and lateral position (TDFaL)

Using Posture Pro V software, anatomical determinants of the body were selected bilaterally (head, torso, legs/hips, knees and ankles) through frontal plane (frontal position) and sagittal plane (lateral position) where the following variables were derived:

- Neck pressure (expressed in N) (NPN)
- Position of the center of body mass (PCBM)
- Q angle in the upper thigh of the right leg (QaR)
- Q angle in the upper thigh of the left leg) (QaL)
- Measured loss of height from measured stature (LHMS)
- Posture number (scale) (PN)

Procedure

Before the start of the research, after informing the participants about the procedure, we started gathering the data. In adequate clothes and after measuring the participants, markers, 8mm in diameter, were placed on a reference points on the participants. The participant was standing barefoot, taking a normal upright stance, faced towards the camera as well as with lateral stance where both stances were captured with a camera.

Equipment

The equipment needed for this research was Casio Exilim EX-F1 camera and reflective markers. Casio EX-F1 advanced High Speed photo-camera, capable of shooting videos up to 1200 frames per second and it comes equipped with powerful 12 x zoom (Casio Computer Co., Ltd.2017). HIGH SPEED EXILIM EX-F1 has CMOS sensor and high-speed LSI processor 6.0 million pixels which possesses a strength of optic zooming up to 12x. Reflective markers **(** Quintic Consultancy Ltd) are equipment and a tool used to mark reference points on the body of the participants. They have a possibility of reflecting light beams (photoflash when taking photos) so they are easily spotted during analysis.

Software „Posture Pro V"

The software used for the research was "Posture Pro V", fifth edition, designed by Dr. Joseph Venture. It allows effective analysis of the posture from frontal and lateral plane. Also, it provides information about cervical spine, center of gravity, Q angle as well as information regarding a deviation from normal stance.

Methods of data processing

Descriptive statistics and Independent T-test were used in this research.

Results

Table 1 contains data about basic descriptive parameters for analyzed variables of observed group of boys and girls aged 11 to 13, while Table 2. represents data related to procedures of independent T-test.

Table 1. Basic central and dispersal parameters of applied variables - postural status of boys and girls aged 11 to 13

	Group	N	Mean	Std. Deviation	Std. Error Mean
FHeP	Boys (m)	44	9.41	3.687	.556
	Girls (f)	59	8.78	3.543	.461
FSP	Boys (m)	44	9.75	1.942	.293
	Girls (f)	59	9.02	2.224	.290
FHiP	Boys (m)	44	8.75	2.712	.409
	Girls (f)	59	8.03	1.956	.255
LHP	Boys (m)	44	9.16	6.758	1.019
	Girls (f)	59	11.37	7.649	.996
LPP	Boys (m)	44	5.23	4.051	0.611
	Girls (f)	59	6.58	3.865	.503
TDFaL	Boys (m)	44	21.650	8.3115	1.2530
	Girls (f)	59	25.076	9.1507	1.1913
NPN	Boys (m)	44	39.907	28.7608	4.3359
	Girls (f)	59	50.042	33.8065	4.4012
PCBM	Boys (m)	44	1.48	.549	.083
	Girls (f)	59	1.14	.392	.051
QaR	Boys (m)	44	13.43	6.507	.981
	Girls (f)	59	17.25	5.935	.773
QaL	Boys (m)	44	17.64	6.513	.982
	Girls (f)	59	20.14	6.064	.789
LHMS	Boys (m)	44	.505	.3348	.0505
	Girls (f)	59	.680	.5486	.0714
PN	Boys (m)	44	20.30	8.974	1.353
	Girls (f)	59	24.59	11.800	1.536

Tabela 2. Independent Samples T-test Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
FHeP	.060	.808	-.876	101	.383	-.629	.718	-2.054	.795
FSP	.365	.547	-1.745	101	0.084	-0.733	.420	-1.566	0.100
FHiP	4.687	0.033	-1.557	101	.122	-0.716	.460	-1.628	.196
LHP	.386	0.536	1.526	101	.130	2.214	1.451	-.664	5.092
LPP	.350	.555	1.717	101	.089	1.349	.786	-.210	2.908
TDFaL	.861	.356	1.954	101	.050	3.4263	1.7535	-.0522	6.9048
NPN	.711	.401	1.715	101	.049	4.294	2.504	-.673	9.262
PCBM	28.672	.000	-3.684	101	.000	-.342	.093	-.526	-.158
QaR	.313	.577	3.103	101	.002	3.822	1.232	1.378	6.266
QaL	.111	.740	2.005	101	.048	2.499	1.247	.026	4.973
LHS	6.969	.010	1.872	101	.049	.1751	.0935	-.0104	.3607
PN	3.396	.068	2.019	101	.046	4.298	2.129	.074	8.521

Analyzing obtained t-test results (Table 1), it is shown that there are significant statistical results in 7 out 12 variables as follows: TDFaL - Total deviation of frontal and lateral position (Sig.=.050), NPN - Neck pressure (expressed in Newtons) (Sig.=.049), PCBM - position of the center of body mass (Sig.=.000), QaR - Q angle in the upper thigh of the right leg (Sig.=.002), QaL - Q angle in the upper thigh of the left leg (Sig.=.048), LHMS - The degree of loss of height from the measured stature (Sig.=.049), as well as variable PN - Posture number (Sig.=.046). Larger numeric values in variables, FHeP - Frontal head position, FSP - frontal shoulder position, FHiP - frontal hip position, are observed with boys whereas variables such as LHP - lateral head position and LPP - lateral pelvis position were observed with girls but the difference is not significant to differentiate them statistically.

Discussion

Results obtained in this study indicate that there are differences in certain variables of postural status between boys and girls aged 11 to 13. There are many reasons for such differences and one of them is that girls begin puberty earlier than boys (Ugarković, 2001). Girls begin puberty around ages 10 to 11 and boys around 12 to 13. Puberty represents a period of tumultuous changes and they also reflect in the posture. Tumultuous anatomical and physiological hormonal changes influence intensive growth and development of the body which as a consequence can result in posture degradation. Obtained results match with the results indicating that boys aged 10 years onwards have larger variable values than girls, in terms of shoulder assessment (research conducted on the population of 52 students - 20 boys and 32 girls) (Penha et.al., 2008). Equally, girls in comparison with boys (deviation of spinal column in frontal plane) have poor or very poor support of spinal column (Obradović, 2008). Poor posture is a common problem in children and adolescents and has a prevalence of 22-65% (Maghsoud et.al., 2012, Kopecký, 2004). If we take a closer look at variables TDFaL and PCBM, we could state that they are relating to maintaining a balanced posture. The control of the balance is a complex ____ and it includes maintaining posture. Also, it facilitates movement (Mancini and Horak, 2010). Further, balance control comprises of the control of the body mass center (PCBM) within boundaries of stability. The differences in the variables between boys and girls aged 11 to 13, TDFaL and PCBM, could be related to the fact that girls are taller and have more body mass than boys due to beginning puberty earlier than boys. Namely, we could state that by beginning puberty earlier and by increasing longitudinal skeletal system, the discord between phase of rapid growth and skeletal development, widening of hips (Ponorac et.al 2013), larger inclination of the pelvis (in comparison with men, by a few degrees) (Perović, 1966) as well as weakness of abdominal and back musculature could be attributed to these differences. Consequently, anatomical position and movement of lower extremities is changed (Ireland and Ott, 2004). Also, weakness of the muscles in the pelvic region and lower extremities could lead to secondary disorders in upper body parts (Terzija, 2015). Analyzing differences in the variables NPN - Neck pressure, it is shown that force occurring with girls (50 N) is more pronounced than with boys (39 N) and their skeletal system suffers more loading. This tells us that skeletal system is burdened to such extent that it could be potential indicator of deformity. The research conducted on 60 students of primary school (VI grade) shows that 38% of students had distinct deviation of head position, where perpendicular falls in front of sternum (Beganović et.al, 2012). Further, the data that 14.7% of students have a characteristic of head being bent forward, shoulders bent forward, increased stoop, chest contracted speaks in the favor of given results (Nikšić et.al, 2015). Analyzing variable Neck pressure and relating it to variables TDFaL and PCBM, we could state that spinal column works as kinetic chain because movement of one segment in a chain indirectly moves another, in this case head (Mikić, Bjeković, 2004). Although many studies are conducted regarding Q angle, relatively small number talks about differences between boys and girls. Many of those studies research the bilateral difference, so this requires a more serious approach to a research. The research which shows the differences between genders, and which can be correlated with ours, is done on the sample of 200 measurements (Bhalar et.al, 2013). They state that the mean Q value for boys age 11 - 12 is 18.3 ± 3.3 degrees, and for girls 16.8 ± 3. degrees. Although many studies were conducted regarding Q angle, relatively small number of them focused on Q angle in children (Bhalara et.al, 2013), which should be main focus in future studies. Variable GVIS is a derivative from other variables such as: TDFaL, PCBM,QaR,QaL. If anatomical determinants of the position of head, shoulder, hips (joints and knees included) are normal and if values are revolving around 0 degree for all indicators, then we do not have a loss of height. Every deviation will affect, to a greater or lesser extent, loss of

height. (provjeriti smisao recenice) From the results of descriptive statistics (Table 1), we can see that values deviated from zero value which contributes to the fact that girls had greater loss of height perceptually in comparison with boys. Posture number represents a number resulting from the analysis of digital picture taken by software PosturePro®V. It captures key points such as shoulders, knees, hips, ankle and compares them with normal values. After that, posture number is allocated. It would be ideal if ear, shoulder, hip, knee and ankle are in vertical line and that would be zero posture. Average posture would be 18 while poor one more than 30. In order to explain the differences between boys and girls aged 11 to 13 in variable PN, we could say that it represents a sum of previously mentioned posture determinants. It is precisely this that tells us that girls had larger values and with that, moving toward values which indicated poor posture.

Conclusion

Proper posture should be a primary responsibility, because it is a prerequisite of good health, normal growth and development of every student. Poor posture could be an indicator of health issues and if not treated on time, it could become a serious problem. The ideal case would be to identify the first signs of poor posture at the very beginning and the most important role in forming and keeping proper posture are the muscles as active part of movement apparatus. Disorders or poor posture in children are commonly occurring as a consequence of weak musculature in the region of back, chest or abdomen. Given results indicate that boys had better postural status in comparison with girls. Quantitative indicators, also, show that with both genders we have deviations from normal postural status, which could lead to active damaging of locomotor apparatus, and by that fact alone it could lead to poor posture. In order to avoid such issues, and to avoid any serious structural changes, it is necessary to react on time. Also, it is necessary that teachers, professors and other personnel dealing with this matter, start with preventative education, corrective exercises and to stimulate children to pursue physical activity especially in the period of puberty which represents the most sensitive period for development of postural disorders.

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TRETMANT OF CHOICE - ESIN OF TIBIAL FRACTURES GAINED DURING SPORT INJURIES

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Abstract

The fractures of tibial shaft are common during some sports. Their treatment is primarily conservative, but certain types of fractures require operative stabilization. Elastic stable intramedullary nailing (ESIN) is commonly used for other diaphyseal fracture locations. The aim of this study was to present our experience and results from the flexible intramedullary nailing of unstable tibial fractures during sport injuries, treated at our Clinic in the period between 2005 and 2014. In our study we covered it one hundred and eight patients, aged from 14 to 18 years who all gained a tibial shaft fracture during some sport activity and were treated with primary intramedullary nailing. The functional outcome was assessed by the Karlstrom-Olerud scoring system at 16 weeks after the surgical intervention. The results we got were : Seventy-two (78%) patients had excellent result, eleven (16%) good and six (6%) patients had acceptable functional outcome. Flexible intramedullary nailing - ESIN for tibial fractures, enables early weight bearing, provides good functional results and is accompanied with a low rate of postoperative complications. It's advantages are minimally invasive surgery with a short hospitalization duration, primary bone union and early weight bearing. It is considered the " gold standard " of choise for irreducible and unstable tibial fractures during sports injuries, especially in teen athletes.

Key words: sport injuries, tibial shaft fractures, ESIN, functional outcome, teen athletes.

Introduction

Fractures of tibial shaft during some sports are common injuries, following fractures of the femur and the forearm. Their treatment is primarily conservative, offering a good functional result. In certain cases, such as unstable fractures without adequate reduction, open fractures and polytraumatized patients, operative treatment is needed.Surgical treatment of tibial shaft fractures in children differs from treatment in adults. Rigid intramedullary fixation is not used due to risk of epiphyseal growth plate injury. The available surgical method are: pin in plaster, external fixation and flexible intramedullary fixation.Flexible intramedullary fixation for long bone fracture treatment was introduced in the early 1980'.

Flexible intramedullary nails provide internal fixation which maintains reduction and does not allow shortening. It allows for movements at the fracture site, which stimulates callus formation. The flexible intramedullary nails are successfully used in tibial, femoral, humeral and forearm fractures in children.

With our study we want to present our experience and results from the flexible intramedullary nailing of unstable tibial fractures during sport injuries, treated at our Clinic in the period between 2005 and 2014.

Material and methods

The medical records of patients aged 14 to 18, with tibial shaft fractures gained during sports injuries who had been managed with flexible intramedullary nailing at the University Clinic of Pediatric Surgery between 2005 and 2014 were reviewed. Data about the age, most often sports that caused these injuries, mechanism of injury, fracture type, timing of operative intervention and postoperative period was gathered.

Most often sports that caused tibial shaft fractures are:

- Skiing – 30 patients
- Football – 27 patients
- Snowboarding – 25 patients

- Basketball – 10 patients
- Climbing – 6 patients
- Handball – 4 patients
- Extreme sports – 4 patients
- Horse riding – 2 patients

In period between 2005 and 2014, one hundred and eight patients (78 male/ 30 female) were treated. The fractures were classified according to the AO classification and according to the Gustilo – Anderson open fracture classification.

Indications for Ender nailing were:

1.	Unstable closed tibial shaft fractures (irreducible and unretainable),
2.	Open tibial shaft fractures
3.	Tibial shaft fractures in polytrauma patients.

Surgical technique:

All patients were treated under general anesthesia. They were positioned supine on radiolucent table. The injured leg was disinfected and draped without being fixed. The entry spot was determined under fluoroscopic control, taking care to avoid the growth plate (Figure 1).

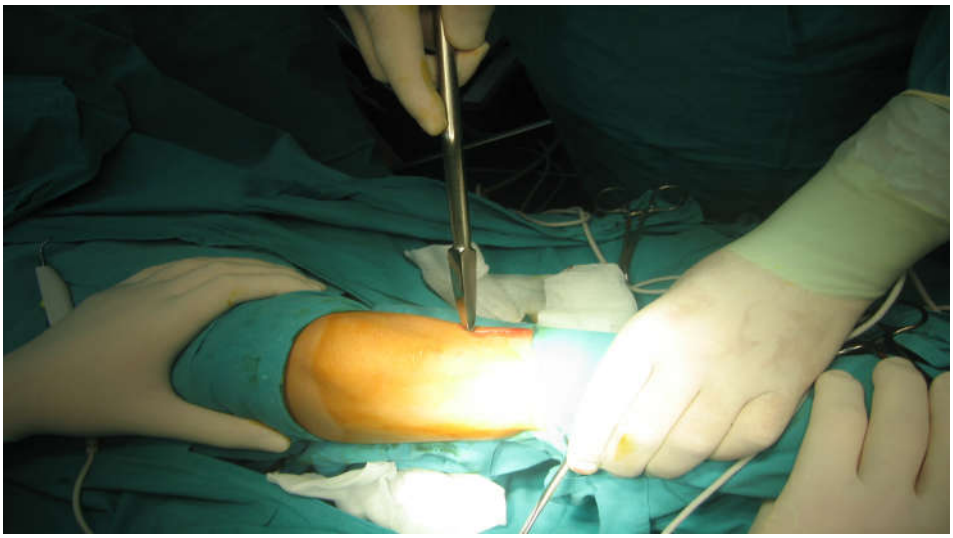

Figure 1. Determining the entry spot

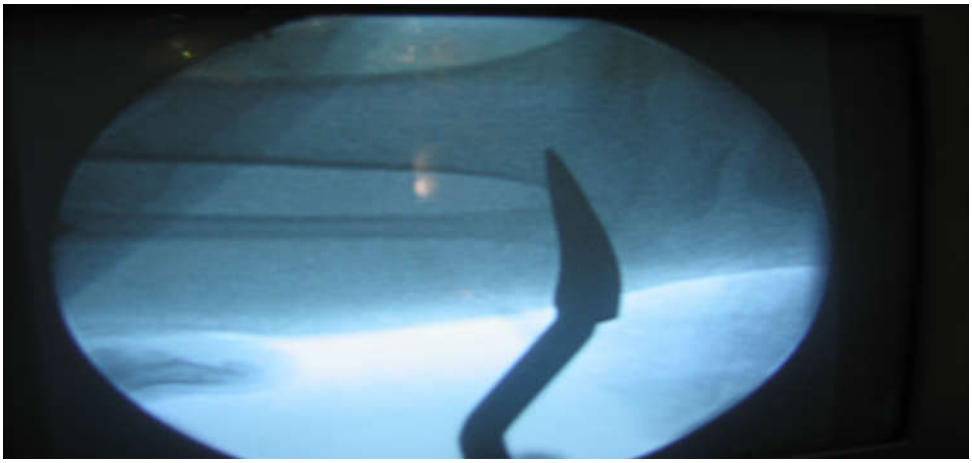

Figure 2. Making the drill holes

Through small incisions, the periosteum of both sides of tibia was exposed. Under fluoroscopic guidance, drill-holes were made in the anteromedial and anterolateral cortices of the proximal part of tibia, approximately 1cm distal to the tibial proximal tibial physis and 2cm posterior to the tibial tubercle apophysis (Figure 2).

The flexible nails were prebent so that the apex of their curvature would be at the fracture site and the tip was bent in a 45 degree angle. Under fluoroscopic guidance, the medial and lateral prebent flexible nails were successively advanced from the tibial metaphysis into the diaphysis (Figure 3), across the fracture site and into the distal fragment, to a point approximately 1cm proximal to the distal tibial physis. The reduction was achieved through nail maneuvering (Figure 4).

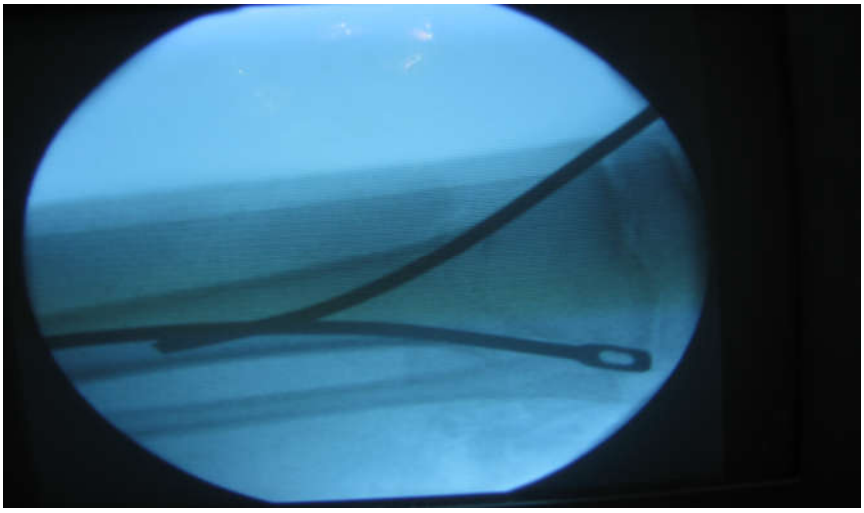

Figure 3. Advancing the nails from the metaphysis to the diaphysis

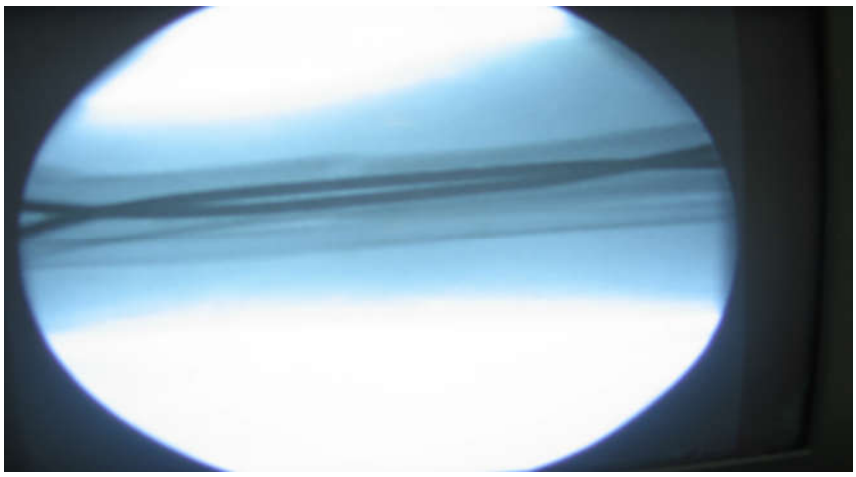

Figure 4. Reduction achieved by nail maneuvering

Postoperative period:

The average hospital stay of our patients with tibial shaft fracture, treated with intramedullary nailing was 8 days. Partial weight bearing was started the 12th postoperative day. Weight bearing was started the 5th week after surgery.

X ray control was done the 2nd , 8th and 14th week after surgery.

Physical therapy was initiated after hospital discharge.

The functional outcome was assessed 16 weeks after the initial treatment, when all patients were assigned a score according to the Karlstorm – Olerud scoring system at 16 weeks after the surgical intervention.

Results

The results of our study are shown in two tables. One hundred and eight patients were treated for tibial shaft fracture during sport injuries by intramedullary nailing at the University Clinic of Pediatric Surgery – Skopje from 2005 to 2014.

From the patient records we obtained data about the mechanism of injury:

	Sport activity	Number of patients
1	Skiing	30 patients
2	Football	27 patients
3	Snowboarding	25 patients
4	Basketball	10 patients
5	Climbing	6 patients
6	Handball	4 patients
7	Extreme sports	4 patients
8	Horse riding	2 patients

The functional outcome was assessed according to the Karlstrom – Olerud scoring system (Table 3).

Table 3. The Klastrom – Olerud scoring system			
Measures	3 points	2 points	1 point
Pain	No	Little	Severe
Difficulty in walking	No	Moderate	Severe limping
Difficulty in climbing stairs	No	Supported	Unable
Difficulty in previous activity (playing)	No	Limited	Unable
Limitations/ School Absence	No	Moderate	Unable
Skin status	Normal	Discolorated	Ulcer/fistula
Deformity	No	Little	Remarkable
Muscle atrophy (cm)	<1cm	1cm-2cm	2cm
Shorter lower extremity (cm)	<1cm	1cm-2cm	>2cm
Loss of motion in the knee (0)	<10°	10 °-20 °	>20 °
Loss of motion in the ankle (0)	<10 °	10 °-20 °	>20 °
Loss of motion in the subtalar joint (0)	<10 °	10 °-20 °	>20 °

Seventy-two (78%) patients had excellent result, eleven (16%) good and six (6%) patients had acceptable functional outcome (Table 4).

Table 4. Functional outcomes according to the Karlstrom-Olerud scoring system

		N°	Percent
Excellent	36	72	78
Good	35-33	30	16
Satisfactory	32-30	6	6

Discussion

Closed reduction and plaster cast immobilization can and should be used for management of tibial shaft fractures, in cases where acceptable reduction of the fragment can be achieved and sustained. Operative treatment of fractures durind sports injuries in teen athletes is being more frequently used, not only for intraarticular fractures and epiphyseolysis, but also for long bone fractures, in order to retain optimal reduction and allow early mobilization and weight bearing. Both methods have their spokesmen to argue pro and contra surgical treatment of tibial shaft fractures in teen athletes.

Flexible intramedullary nailing, predominantly used for femoral fractures in teel athletes, is being more often used in tibial fractures management. It has several advantages over the other methods of surgical treatment: It allows stability with the 3 point fixation in the medullary canal and prevents

angulation and malrotation ; the elasticity of nails allows micromovements, essential for callus formation which is important for teen athletes because they can return to their sport activities sooner. External fixation on the other hand provides quick and stable fixation without additional soft tissue damage. The operative procedure is performed through two small incisions, distant from the fracture site and the nails can be used in a retrograde manner for distal shaft fracture. Reaming is not performed and the endosteal blood flow remains intact. The disadvantage of this method of treatment is the high incidence of pin tract infection, which may affect the long term outcome.

Conclusion

Our study comprised 108 tibial shaft fractures treated with intramedullary nailing. The treatment results are satisfactory and comparable to ther studies. This method has been established as routine procedure at our Clinic. The number of unsatisfactory results are small, none of those patienrs had a significant functional or esthetic deficit nor required additional surgical intervention.

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DEPENDENCIES ON FITNESS ABILITIES AND BODY COMPOSITION OF CHILDREN IN YOUNGER SCHOOL AGE

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Abstract

In this contribution, we present the results of selected fitness abilities and body composition of children in younger school age. The aim of this research is specification of dependence of fitness abilities and the parameters of body composition of 6-7 years old children. The sample consisted of 60 probands (40 boys and 20 girls) with decimal average age 6.73 ±0.3 year. We used the following tests to diagnose fitness abilities: standing long jump, kneeling overhead medicine ball toss, 4 x 10 m shuttle run, frequency of lower limbs during 6 s, endurance shuttle run. We used direct analysis of the segmented multi-frequency bioelectrical impedance (BIA) to find out the parameters of body composition. The results of measurements were compared to each other and evaluated using statistical methods. When comparing the parameters of fitness abilities in intersexual comparison, we found out that the boys had achieved better average results in all perfomed tests, but not statistically significant. In some parameters showing a nutritional status were confirmed intersexual differences also statistically in favor of boys. In parameters of body composition, we recorded statistical significance with kneeling overhead medicine ball toss, 4 x 10 m shuttle run and with endurance shuttle run. We also recommend detecting the level of parameters of body composition, when testing mentioned fitness abilities.

Key words: *physical abilities, body composition, 6-7 years old children, dependencies*

Introduction

The period of six to seven years is defined by Batchel (2003) as the degree of maturation within the initial phase of motor development of an individual. This developmental stage is characterized by improving the ability of differentiation tactile-kinesthetic stimuli and the concentration of nervous processes. Kučera et al. (2011) state that at this age improves the overall ability of perception, response and control.

Gallahue and Donelly (2007), Laczo et al. (2014) indicate minimal differences between girls and boys, which can be already seen in the age period 3 – 8 years in relation to body weight and height. Kirchengast (2010) states statistically insignificant differences in intersexual comparison of children at the age 6-7 years in the level of obesity. In this research Čillík et al. (2014) recorded statistically significant difference in body height and body weight in favour of boys from 7 years, as well as in the indicators of general physical performance, except for joint flexibility in the indicators of physical development.

Wiart and Darrah (2001) reported that in the early stage of younger school age are in children already created the necessary assumptions for managing combined physical activities, although boys dominate in mastering these skills. Laczo et al. (2014) state that significant sensitivity for speed frequency begins between the ages of 6-7 years, while less significant sensitivity begins at the beginning of the age of 6.

According to Belej and Junger (2006) in pre-school age and younger school age, fitness physical abilities (strength, endurance, partly speed) are determined by energetic and morpho-structural processes. Fitness and coordination abilities (partly speed, partly coordination and flexibility) are ambiguously determined by energetic, morpho-structural, adaptive and control processes.

Kučera et al. (2011) state that between the age 6 and 7, the preference of one side is reduced in acyclic skills. This improves e.g. the quality of the run.

According of the results of national anthropometric measurements of PHASR (2013), BMI is gradually increased from 7 years. Laczo et al. (2014) state different dynamics of growth within individual accelerated growth waves which is attached to increasing of secretion of adrenal androgens between the age of 6-8 years, when the percentage of total body fat starts to increase.

In children, it is also used but mostly through percentile distribution's curves that are age specific (2 - 20 years) and gender specific, obtained by measuring huge population of children, and providing the specifics and periods of children's growth (Stojmanovska, & Georgi, 2016).

Feč and Feč (2013) state the proportion for inheritance body height 90 %, body weight 65 % and amount of fat 70 %.

Monitoring anthropometric characteristics of children and their changes promotes early detection of certain children´s deviations from the average growth curve of their peers. More significant deviation from normal, either one or the other side, can highlight the prevalence of more serious diseases, mental health problems, incorrect eating habits of the child and help to prevent the growth disorders and obesity (de Onis et al. 2004). More significant deviations of children from the average growth curve of their peers may have an impact on the level of motor skills.

This contribution is a part of Grand project VEGA 1/0571/16 The impact of training on physical abilities, physical and functional development of 5-6 years old children.

Methods

Younger school-age children participated in this research. Monitored sample consisted of 60 probands (40 boys and 20 girls) at the age of 6.73 ±0.3 years.

Testing of physical abilities and measuring of physical development were implemented in standard conditions in October 2016.

We found out basic somatic parameters: body height, body weight, BMI. We used the following tests to diagnose fitness abilities: standing long jump, kneeling overhead medicine ball toss, 4 x 10 m shuttle run, lower-limbs frequency during 6 s, endurance shuttle run. Standing long jump, a test of lower-limbs explosive strength was performed according to the methodology of the authors Moravec et al. (2002). We modified a test kneeling overhead medicine ball toss for determining of upper-limbs explosive strength and trunk (Šimonek, 2015) with respect to the children´s age, because we were using the volleyball instead of 1 kg medicine ball. The test 4 x 10 m shuttle run (Čillík et al. 2014) was used for testing running speed with changes of direction.

Brown (2001) recommends to use the test for diagnosing selection of talents in given age category. The frequency of lower limbs was diagnosed by device FiTRO tapping check (FiTRONiC, Bratislava, Slovak Republic). The role of tested subject is to do as many alternate touches by a lower limb with the contact mats as possible in 6 s. The system measures the frequency and the number of individual touches, as well as contact time with a mat and flight time in milliseconds. Better of two attemts is counted. We used endurance shuttle run test to find out endurance abilities according to the methodology Moravec et al. (2002).

We used the device InBody 120 (Biospace Co., Ltd.; Seoul, Korea) for diagnosing the parameters of body composition. We obtained the results of parameters of body composition using a direct analysis of segmental multi-frequency bioelectrical impedance (BIA). InBody is used mainly because of its ability to analyze a broad spectrum of values of body composition, but also because of its clinical reliability. Using the method of 8 point tactile electrode the device diagnose the body segments using the most accurate technology DSM-BIA. The history of mearements was recorded using a database software Lookin'Body120 version 1.2.2.7 from company Biospace. Then, we analyzed the percentage of body fat (PBF), the skeletal muscle mass (SMM), visceral fat level (VFL), waist- hip ratio (WHR), total body water (TBW), proteins (PM) and minerals (MM) from the measured values of impedance and other corrections according to Kyle et al. (2004).

Bioelectrical impedance analysis (BIA) is a relatively simple, quick and non-invasive method for evaluating body composition, in particular, it is a reliable and widely used method. This method detects the parameters of body composition using conductivity of a small alternating current (Kim et al. 2004).

We used basic statistical characteristics in this contribution: arithmetic mean (M), standard deviation (SD), maximum (X_{max}) and minimum (X_{min}).

The statistical significance of differences between genders in the parameters of physical abilities were determined using a t-test for independent samples. Furthermore, the data were processed using correlation analysis to determine relationships between individual parameters. Statistical significance was evaluated at the level of significance $p < 0.05$ and $p < 0.01$.

Results and Discussion

Basic age characteristics and somatic parameters (body height, body weight and BMI) indicate a relatively high homogeneity in intersexual comparison (Table 1).

Table 1 Characteristics of age indicators, somatic parameters in the group of boys and girls

		Decimal age [years]	Body height [cm]	Body weight [kg]	BMI [i]
Boys (n = 40)	Mean	6.77	124.56	24.81	15.88
	SD	0.3	5.69	4.13	1.7
	X_{max}	7.3	137	40.4	21.5
	X_{min}	6.25	112	19.8	13.2
Girls (n = 20)	Mean	6.64	122.08	23.09	15.92
	SD	0.28	5.38	3.67	1.3
	X_{max}	7.15	134	32.4	19.5
	X_{min}	6.27	113	18.2	13.3

Based on the results of physical development, we state that boys are about 0.13 year older, 2.48 cm taller and 1.72 kg heavier when compared with the girls. Although, we recorded differences in intersexual comparison, in parameters of age and physical development, these differences were not statistically significant.

Table 2 Characteristic of indicators of Fitness abilities and parameters of body composition in intersexual monitoring

			Mean	**SD**	**t-test**
Fitness abilities	SLJ [cm]	B	118.59	19.89	0.697
		G	116.61	11.78	
	MBT [m]	B	4.11	0.94	0.591
		G	3.97	0.88	
	4 x 10 m [s]	B	14.27	1.36	0.821
		G	14.36	1.03	
	TF [n]	B	35.56	7.13	0.139
		G	32.28	9.02	
	ESR [n]	B	15.93	9.98	0.559
		G	14.44	5.76	
Body composition	PBF [%]	B	16.82	5.68	0.128
		G	19.33	5.88	
	SMM [kg]	B	10.1	1.59	0.078
		G	9.33	1.36	
	VFL [i]	B	1.39	0.74	0.519
		G	1.56	1.2	
	VHR [i]	B	0.72	0.03	0.915
		G	0.72	0.03	
	TBW [L]	B	15.02	1.95	0.032*
		G	13.87	1.55	
	PM [kg]	B	4.01	0.52	0.039*
		G	3.72	0.42	
	MM [kg]	B	1.47	0.16	0.04*
		G	1.38	0.12	

Legend: SD – standard deviation; SLJ – standing long jump; MBT – kneeling overhead medicine ball toss; 4 x 10 m – shuttle run 4 x 10 meters; TF – tapping frequency; ESR – endurance shuttle run; PBF – percentage of body fat mass; SMM – skeletal muscle mass; VFL – visceral fat level; WHR – waist to hip ratio; TBW – total body water; PM – protein mass; MM – mineral mass; * – statistical significance $p < 0.05$

When comparing the parameters of fitness abilities in intersexual comparison, we conclude that boys reach better average results in all performed tests (Table 2). In intersexual comparison, we did not record any statistically significant differences, so we can state homogeneity in performance.

In body composition, we recorded 2.51 % more body fat in girls. Skeletal muscle mass (SMM) was higher by 0.77 kg in boys. Visceral fat level (VFL) was higher in girls by 0.17. We recorded the same waist-to-hip ratio (WHR) in boys and girls.

In boys, we recorded more body water (TBW) by 1.15 l, more proteins (PM) by 0.29 kg, more minerals (MM) by 0.09 kg. These parameters showing nutritional status were also statistically confirmed.

We recorded 11 statistically significant correlates between fitness abilities and parameters of body composition (Table 3). A significant statistical dependence in somatic indicators was found between body height and body weight, as well as between body weight and body mass index, which we consider as a natural developmental indicator.

Table 3 Correlation matrix of significant correlates between the variables in the group of 6 and 7 – year-old boys and girls

	SLJ	*MBT*	*4 x 10 m*	*TF*	*ESR*
PBF	-0.239	-0.118	0.162	-0.081	-0.344
SMM	0.232	0.378	-0.250	0.117	0.284
TBW	0.233	0.381	-0.252	0.053	0.277
PM	0.242	0.381	-0.259	0.079	0.293
MM	0.112	0.288	-0.149	-0.021	0.171
VFL	-0.142	-0.010	0.117	-0.142	-0.202
WHR	-0.120	0.053	-0.014	0.057	-0.026

Legend: SLJ – standing long jump; MBT – kneeling overhead medicine ball toss; 4 x 10 m – shuttle run 4 x 10 meters; TF – tapping frequency; ESR – endurance shuttle run; PBF – percentage of body fat mass; SMM – skeletal muscle mass; VFL – visceral fat level; WHR – waist to hip ratio; TBW – total body water; PM – protein mass; MM – mineral mass; ▢ – $p < 0.05$; ■ – $p < 0.01$

In monitored group, we recorded significant dependencies in fitness abilities and selected parameters of body composition. Dependencies were statistically significantly confirmed in the parameters of the analysis of obesity and body mass parameters of active body mass with the explosive power of the trunk and upper extremities. Most likely, fitness abilities participate with an active body mass.

When comparing our results with those of Kirchengast (2010), we state lower levels of body fat percentage equally in boys and girls, equally differently in intersexual comparison.

L'Abe et al. (2010) state that in children aged 6.8 years they recorded an average body height 125.1 cm, weight 25.2 kg and body mass index 16.01. Based on the method of isotope dilution they recorded an average values of fat percentage in boys 15.9% and in girls 18.8%. At the same time they state the high correlation dependence between detection of body composition by isotope dilution method and BIA method. The lowest correlation dependence was found with BMI value, the problem is a diagnosis of obesity in children with a high fat rate, but normal weight. In our group, we measured higher levels of body fat in boys and girls.

Junger, Palanská and Čech (2014) found similar results as we did, that between preschool boys and girls there are not statistically significant differences in body composition parameters, except the parameters pointing to nutritional status (amount of minerals and proteins).

Conclusion

We recorded differences in intersexual monitoring in the parameters of physical development, but they were not statistically significant.

When comparing the parameters of fitness abilities in intersexual monitoring we conclude that boys reach better average results in all conducted tests, but it is not statistically significant. The parameters showing the nutritional status confirmed intersexual differences, even statistically in favor of boys in indicators of total body water (TBW), proteins (PM) and minerals (MM). Differences in other parameters

were not statistically significant. Girls achieved a higher percentage of body fat (PBF) and a higher index of visceral fat (VFL).

We recorded a statistically significant dependence of body composition and explosive strength of torso and upper limbs, the running speed with changes of direction and aerobic endurance. Impact on explosive power of torso and upper limbs was positive in these parameters: skeletal muscle mass (SMM), total body water (TBW), proteins (PM) and minerals (MM). On the contrary, these mentioned parameters except for the weight of the skeletal muscles had a statistically negative effect on a running speed with changes of direction. Skeletal muscle mass (SMM), total body water (TBW), proteins (PM) statistically positively affected the level of aerobic endurance and percentage of body fat (PBF) negatively affected the level of aerobic endurance.

In the monitored group we did not record any statistically significant influence of body composition at the level of explosive power of lower limbs and the frequency speed of the lower limbs.

Based on our results we suggest to detect the indicators of body composition in children aged 6-7 years, when testing explosive strength of torso and upper limbs, the running speed with changes of direction and aerobic endurance.

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WITH QALITY SLEEP TO BETTER ABILITIES IN ELITE ATHLETES

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Abstract

Despite all available literature in the field of sleep and the efficiency of sports performance, elite athletes are the most comprehensive and most susceptible to the effects of reduced quality and quantity of sleep. Although they are aware of this, rarely any coach or athlete takes time for a good sleep. Sleep loss has a negative impact on neurocognitive and motoric abilities, or in other words on the athlete's general health condition. All people feel the consequences of one sleepless night, but for the elite athlete, quality sleep is a key tool that plays a crucial role between victory or defeat. Educating athletes about the sleep importance should be implemented by coaches to optimize athlete recovery, promote consistent sleep routine, and sleep length.

Key words: *quality sleep, sleeping, sleeping and sports performance, sleeping strategies.*

Introduction

Sleeping is a process that is especially important for returning the body to homeostasis after stressful and tiring events that cause disorders in neurocognitive and physiological functions, as well as prevention from overtraining. Sleep deprivation leads to reduced sports performance, reduced motivation and excitement, a decline in cognitive functions such as concentration and focus, it affects learning ability, memory, reduced speed and information transmission and a low threshold of pain relief, a decline in immunity and inflammation.

Quality sleep is of particular importance to the athlete because of the recovering possibility from the exhausting training and preparations that are inevitable for perfect performance on the match day. Recovery is facilitated by the release of hormones, from which growth hormone and androgenic hormones are essential for muscle recovery and build, bone growth, and oxidation of fats.

Changes in glucose metabolism and endocrine functions as a result of chronic or partial sleep may also affect the carbohydrate metabolism, appetite, food intake, and protein synthesis. All these changes caused by reduced quality and quantity of sleep lead to partially or completely reduced sports performance.

Sleep is not just a lack of alertness, it's much more. Night sleep is an extremely complex, metabolic active and deliberately ordered series of unique phases, and even a nap through a day that lasts only 20 minutes can provide strengthened memory that is of particular importance to athletes.

The composition of sleep

The sleep structure is consisted of two parts: NREM and REM cycle. NREM sleep is composed of four stages (1, 2, 3, and 4) that progressively increase their depth. Each phase has unique features that include variations in brain waves, eye movements and muscle tone. Cycles and sleeping stages have been detected using EEG shots that follow electrical patterns from brain activity. During sleep NREM and REM cycles constantly change, and irregularities in their circulation can lead to sleep disturbances. The sleep episode begins with a short period of NREM phase 1 (it takes from 2 to 5% of the total sleep), then switches to stage 2 (10-25 minutes, it takes 45-55% of the total duration of the sleep); this phase is especially important for athletes due to the increased memory consolidation that occurs during its course. Subsequently followed by phases 3 and 4, known as phases of deep sleep (phase 3 lasts only minutes and covers 3-8% of the total sleep, phase 4 lasts from 20 to 40 min and occupies 10-15%) and ultimately ends with REM cycle.

REM sleep is characterized by uneven brain activity, muscle paralysis, and rapid eye movements, and dreams came as a result of this phase. NREM sleep occupies 75-80% of the total sleep time, while the REM belongs to the remaining 20-25%. The average duration of the first sleep episode is 70 to 100 minutes, while the remaining duration lasts longer (90-120min). No single phase can do all the work independently. Each stage (shallow NREM, deep NREM and REM) offers different brain benefits at different periods of the night. There is no part of the sleep that is more circular than the other, the loss of only one of these stages can cause permanent damage to the brain.

Effects of a quality sleep on the athlete's health and abilities

Sleep is not just a lack of alertness, it's much more. Numerous functions are recovering and dependent on sleep. The increase of the sleeping chemicals, such as adenosine and melatonin, lead to a mild slumber that deepens, loosening the muscles and slowing breathing and heart rate. Staying up late can lead to serious consequences for human health. The insomnia involves learning, remembering, reporting, and reaction times. It can cause inflammation, hallucinations, hypertension, and the latest research links it with diabetes and overweight.

After awakening, the cells are busy with spending the daily energy resources that decompose to different products among which adenosine is most known. It can be said that it increases the sleeping power, and it is also known as the pressure of sleep. In fact, caffeine works in ways that block the pathways of adenosine receptors.

Sleep helps the brain to automate the movements, make them flawless, effortless and precise. Speed and acceleration enhancement supported by efficient automation, is directly related to NREM phase 2. With less than 8 hours sleep per night, and especially less than 6 hours, the physical efficiency time decreases from 10 to 30%, and the aerobic result is significantly targeted. Similar damage has been detected in the ability to muscle elasticity and the height of the vertical jump (rebound impulse) along with reduced performance and maintenance of muscle strength. Above all, irregularities in cardiovascular, metabolic and respiratory abilities, as well as faster accumulation of lactic acid, lowering blood saturation, and increasing carbon dioxide, lead to partial reduction in the amount of air emitted from the lungs. Even the ability of the body for self-cooling by sweating, which is a critical part of the ultimate performance, is all compromised by cutting down the sleep. It is very important to mention both the need for dream and the days after the game. Sleep after work, increases physical recovery from the usual inflammation, stimulates muscle recovery and helps restoring cellular energy in the form of glucose and glycogen.

Recommendations for improving athletes' dream

- Obtain adequate total sleep duration

* Strategy 1: Keep sleeping schedule for two weeks using your own diary in which you will write a report. Duration increases gradually for 15 minutes every few days as long as the athlete feels fresh and well rested, ready for upcoming daily activities. The final increase should be 30 to 60 minutes , which is essential if sleep lasted less than 7 hours per night.
* Strategy 2: Practicing naps that last from 15 to 20 minutes. Although it seems to be unrelated, it helps with the overall duration of the dream.

- Maintaining healthy sleep habits

* Strategy 1: Provide a good sleeping environment. The ideal room should be fresh, dark and comfortable. It is best to remove all electrical devices from the restroom.
* Stretagy 2: Avoid factors that will impair your peace, lower the light and minimize the use of electronic equipment in the period before bedtime. It would be ideally not to consume caffeine after the main meal and to limit the intake of alcohol in the late hours just before bedtime.

- Reducing the travel impact

* Strategy 1: The time needed to adapt the new time zone is an internal factor that can be adjusted gradually, after 1 hour time difference per day. Start changing the inner clock immediately before starting off or during the trip. The effects of the time difference after the arrival would be minimal.
* Strategy 2: Reduce the effects of trips without changing time zones: dehydration, acute stress, reduced physical activity, changes in eating habits.

- Identification of possible sleep disturbances

* Strategy 1: If the athlete has problems with chronic sleepiness and increased sleepiness during the day, a specialist should be contacted.
* Strategy 2: Athletes who do not have access to special clinics for treating sleep can benefit from cognitive behavioral therapy for insomnia (CBTI)

- Assessing the impact of improved sleep on sports performance

It is advisable to compare data before and after increasing the quality and quantity of sleep with some relevant activity of the athlete (for example -sprint). The 4 week work on the dream for relevant data from initial to final measurement is the most adequate.

Conclusion

Sleep is an important component for maintaining optimal health. However, for professional athletes sleeping is a key tool for success. Reaction time and motor functions, motivation, focus, stress regulation, muscle recovery, speed performance, muscle glycogen, glucose metabolism, memory and learning ability, risk of injury, rate of illness, unwanted increase in body mass ... sleep (or lack of sleep) plays a major role in all of these things. And as more and more athletes learn, sleep has a major impact on the performance, and therefor on the victory or defeat.

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ISOKINETIC PEAK TORQUE VS 1RM TESTS AS RELIABLE METHOD TO FOLLOW UP POWER DEVELOPMENT

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Abstract:

The objective of this research was to compare the isokinetic test for maximum peak torque and one-repetition maximum test, as methods for assessment of the maximum strength of the subjects arm flexors.On 14 subjects, non-athletes, at age of 19 +/- 0.5 years, 6 weeks' of experimental programme was conducted to stimulate the elbow flexors with maximum muscle load. Exercises (flexion) were performed by lifting external weight with one-arm weight on Scott bench. The isokinetic maximum peak torque and one-repetition maximum were tested in three time sequences (1. beginning, 2. after the 3th week and 3. after the 6th week. Results shows that there is no statistically significant difference in the maximum torque in the subjects tested after first three weeks of exercises (p=0.43, d=0.24±0.40), after the next three weeks, 3rd to 6th week (p=0.68, d=0.27±0.23) as well as in total of 6 weeks of the experimental procedure (p=0.78, d=0.51±0.53). The results for one-repetition maximum test, shows significant positive changes in the values for the arithmetic mean for maximum strength after the 3rd week, by 20.9% [±7.9] for p=0.00 (d=0.45±0.15) between 3rd to 6th week by 19.9% [±5.0] (p=0.00; d=0.43±0.10) and in total following the 6 weeks of training, significant change by 45.0% [±10.6] at level p=0.00 (d=0.88±0.17). Those differences in test probably appear because of the [1] manner in which maximum torque test is performed (biomechanical differences between to tests), [2] simultaneous testing of flexion + extension as a part of biodex testing protocol, as well as the [3] phenomena of "learned movement" during exercises, which is slightly different compared to the movements executed when testing the Biodex devices.

Keyword: *maximum peak torque, 1RM, isokinetic, training, flexors, experimental program, muscle power*

Introduction

Contemporary lifestyle requires efficient time utilization. Practitioners, during recreation and sports, prefer to conduct activities that are efficient for them, and for which least time will be consumed for the realisation of their objective, which is the transformation of specific motor capacity. On the other side, the research community, in the field of kinesiology, is under increasing pressure to go into details when setting fitness programmes and the control thereof. The objective is to make them functional, so as to present them at the fitness market.

When creating fitness programmes, the initial step is to set an experimental programme the functionality of which is to be proven. In order to present the programme effects, it is necessary to select real measuring mechanisms-tests, which will be used for the purposes of making an actual assessment of the achievements from experimental procedures.

For the experimental procedures in which maximum muscle strength is transformed, the one-repetition maximum 1-RM test is most often used (Milenkovski J., Jovanovski J., Strezovski G.,). However, the need for more precise evaluation of the muscle strength capacity has launched the isokinetic machines on the market, as a laboratory variant for power capacity assessment, with vast (and quality) number of information, collected within a short period, in only few movements in particular joint of the human body (Brown, L. E., 2000).

Isokinetic tests are not entirely new; they have been used long time ago as muscle strength test method. In 1967, Perrine introduced a new speed-controlled device which was described as 'cybernetic exercise' (Wimpenny P., 2016). In 2017, the technology has developed the current three-dimensional isokinetic machines, which are increasingly becoming part of each sport laboratory.

As an easy and precise method for muscle potential assessment, isokinetic machines are used particularly for medical purposes, as post-operative arthroscopy for muscle strength testing (Ericsson YB, 2006; Koutras G, 2012; Woods GW,2006; Miura K, 2004), as well as for restoring of the muscle function

(Fabiś J, 2007; Asagumo H, 2007; Moisala AS 2007). In their meta-analysis Ellenbecker et all (2000), concluded that: "Isokinetic training and testing is an important part of the comprehensive evaluation and rehabilitation of the patient with a shoulder injury. Research has demonstrated its efficacy in training and in providing clinically relevant information regarding muscular performance"

According to different joints of human body, isokinetic find good practice in testing/ rehabilitation in knee Harilainen,2006), shoulder Bellumore Y, Mansat M, Assoun J. (1994), elbow (Peeters T et al., 2009), wrist (Croisier JL et al, 2007), hip (Boling MC, Padua DA, Alexander-Creighton R, 2009) or ankle (Gribble PA, Robinson RH., 2009).

In kinesiology research, isokinetics assumes a high position as a method for assessment of the strength capacities of the subjects, Brown, L. P., et all, 1988, (max. peak torque); Bennell, K., et all, 1998; Ellenbecker, T. S., et all, 2006), and especially the maximum torque test, Perrin, D. H. (1993). This is particularly due to the fact that metric specifics are with high coefficients, which is of particular importance for the scientific research procedures (Bohannon, R. W.,1986; Feiring, D. C., et all, 1990; Sole, G., et all., 2007; Saenz, A., et all. 2010).

The objective of this research was to compare the isokinetic test for maximum peak torque and the one-repetition maximum test, as methods for assessment of the maximum strength potential of the subjects.

Both test (1RM and max. peak torque) are recommended as muscle strength assessment methods (Brown, L., Weir, J.P., 2001). Nevertheless, there are claims that the results obtained by maximal peak torque and 1RM are not equivalent when evaluating individual responsiveness and/or the efficacy of an intervention on muscle strength, as the results obtained show large variations and can be even conflicting, Gentil, P., et all, (2017), but they did not include elbow flexor's in their research.

In this research, the method for comparison of the two tests was through implementation of an isolated experimental procedure, and whether it shall demonstrate that maximum torque and the 1RM test are identical tests which assess the maximum power of the subjects.

Materials & Methods

The research was conducted on 14 subjects, non-athletes, at age of 19 +/- 0.5 years.

The objective of the experimental programme was to stimulate the elbow flexors with maximum muscle load (1 to 3 repetitions). Exercises (flexion) were performed by lifting external weight with one-arm weight on Scott bench (for elbow flexor muscles- m.biceps brachii, m.brachialis, m.brachioradialis). Before launching the experimental programme, subjects were tested for one-repetition maximum (1RMBI) on Scott bench as well as for maximum peak torque (BIPTRQ), on isokinetic machine. All subjects have executed the programme within a six-week period, and have worked with maximum external load, three times a week. Dosage of external load in the experimental programme was the same for all subjects, and was defined from the one-repetition maximum test, amounting 90% of 1RM of the achieved results. The number of repetitions was limited to one, and up to mostly 3 repetitions. The number of sets was limited to 3 sets per training. Break between series was limited to 3-5 minutes. Changes of muscle strength in the subjects (for both groups) was individually monitored, at each training, so as to intervene in the external load, thus maintaining the load level of 90% of 1RM throughout the programme. This means that weight was chosen for each subject, at each training, which limited the number of repetitions in each series from one to three repetitions. In this manner, it was ensured that muscle loads during exercises were maintained within the zone of muscle strength stimulations, with no more than 3 repetitions. Personal records were kept for each subject throughout the experimental procedure (42 days, 18 exercise units) so as to record potential personal changes of muscle strength. Following the three-week treatment (21 days), control test was conducted for 1RM and the maximum torque. Following the realisation of the six-week experimental programme, at the final testing (42nd day), the envisaged tests were implemented, as on the control testing.

The isokinetic maximum peak torque test -BIPTRQ [Nm] was tested on Biodex Multi-Joint System (#900-550), machine. Subjects were tested fixed on the machine in a seating position. The non-dominant arm was supported by the upper arm at height of 45^{o} against the torso. Subjects performed 5 maximum repetitions (flexion/extension) on the biodex machine, at speed of 60 degrees/second. Results are presented in kilograms [kg];

The one-repetition maximum test (1RMBI) was tested on Scott bench (under angle of 45^0 against the floor vertical), with one-arm weights from 1-20 kg, at elbow flexion, on the non-dominant arm. Subject is in standing position, upper arm on the non-dominant arm, with its rear side (with all its surface) supported by the front bench side. Results are presented in kilograms [kg];

Differences in groups, for applied tests, from initial, to control, and up to the final measuring, were tested with Wilcoxon post hoc test. The Cohen'd effect size with 90 % CL were evaluated as trivial (0–0.19), small (0.20–0.49), medium (0.50–0.79) and large (0.80 and greater) (Cohen, 1992).

Results

Post hoc (Wilcoxon) test, Table No 2, has shown that there is no statistically significant difference in the maximum torque (BIPTRQ) in the subjects tested after three weeks of exercises (p=0.43, d=0.24±0.40), as well as in the next three weeks (3rd to 6th week) of the experimental procedure (p=0.68, d=0.27±0.23). The Wilcoxon test, realised on the data from the initial and final testing (after 6 weeks of the experimental procedure), also showed no statistically significant changes in the values for the maximum torque (p=0.78, d=0.51±0.53).

Table No 1. presents the basic statistical indicators for the tests for one-repetition maximum and the maximum torque.

Table 1. Basic statistics

test	Initial			control			final		
	mean±Sd	Min	Max	mean±Sd	Min	Max	mean±Sd	Min	Max
1RMBI	13.32±1.20	12.00	15.00	16.42±2.19	12.50	20.00	19.41±2.38	15.00	23.50
BIPTRQ	49.25±7.44	36.50	64.80	47.91±6.52	29.60	55.00	48.18±6.11	37.30	57.30

1RMBI-one repetition maximum; BIPTRQ-max pick torque (isokinetics);

Table 2. In the groups differences, change in mean % and effect size at initial, control, and final tests, for flexor muscles (BIPTRQ-test).

Test: BIPTRQ	Wilcoxon p-level	Change in mean %	Chances for value: smaller/similar/greater	Uncertainty in the true differences	Cohen's d ± 90% CL
initial/control	0.43	6.6 ±11.4	59/37/4	possibly +ive	0.24 ± 0.40
control /final	0.68	7.4 ± 6.4	73/27/0	possibly +ive	0.27 ± 0.23
initial/final	0.78	14.5 ±16.3	85/13/2	likely +ive	0.51 ± 0.53

initial/control - first 3 weeks; control /final-second 3 week (3th to 6th week); initial/final- total 6 weeks of experimental program

Unlike the statistical analysis of the BIPTRQ test, for the one-repetition maximum test (1RMBI), the test results have shown significant positive changes in the values for the arithmetic mean for maximum strength after the 3rd week, by 20.9% [±7.9] for p=0.00 (d=0.45±0.15). In the second part of the programme (3rd to 6th week), the maximum strength of the subjects was statistically significantly improved by 19.9% [±5.0] (p=0.00; d=0.43±0.10). When testing the changes of the total effect following the 6 weeks of training, significant change is observed by 45.0% [±10.6] at level p=0.00 (d=0.88±0.17) between the initial and final test. This interpretation is supplemented by the information from Table No 1 on the mean value for the minimal [min] and maximal [max] result of the lifted weight in the three tests.

Table 3. In the groups differences, change in mean % and effect size at initial, control, and final tests, for extensor muscles (1RMBI-test).

Test:1RMBI	Wilcoxon p-level	Change in mean %	Chances for value: smaller/similar/greater	Uncertainty in the true differences	Cohen's d ± 90% CL
initial/control	**0.00**	20.9 ±7.9	99/1/0	very likely +ive	0.45 ± 0.15
control /final	**0.00**	19.9 ±5.0	100/0/0	most likely +ive	0.43 ± 0.10
initial/final	**0.00**	45.0 ±10.6	100/0/0	most likely +ive	0.88 ± 0.17

initial/control - first 3 weeks; control /final-second 3 week (3th to 6th week); initial/final- total 6 weeks of experimental program

Discussion

The objective of the research was to answer whether the isokinetic tested maximum torque is a good example for the progress of maximum strength in subjects following the six-weeks training, of the elbow flexors, with free weight training.

A unique finding in this research is that maximum torque does not really present the progress of maximum strength in elbow flexor muscles (non-dominant arm), following the 6-week training with free weights. Unlike the maximum torque, the one-repetition maximum test, executed with free weights, has displayed significant changes in the three testing points. The conclusions of this research are similar to the conclusions of Gentil, P., et all, 2017, de Souza et al., 2010; Feiereisen et al.,2010; Gentil et al., 2010.

Similar method, yet reverse training manner (in reference with this research), was performed by Ratamess, et all. (2016). They performed 6-week training on isokinetic machine, and muscle strength assessment with free weight test. Authors have presented that the free weight test presents the existence of positive changes following the training on isokinetic machine.

Conclusion

Having in mind the research results, perhaps the answer should be sought in:

1. The manner in which maximum torque test is performed.

Although, to a significant extent, movements on the Biodex machine that were performed so as to test the flexor muscles, simulate movements which were also executed during training, the results have, however, shown that most probably these are not identical movements (Biodex vs 1RM). In biomechanics terms, training with free weights required involvement of muscles that help the movement, such as muscle fixators and similar (Vuksanovic, V., Handjiski, Z., & Handjiska, E. (2014). In addition, the 1RM test procedure is identical method with the training. However, with the biodex testing, although generally, the same large musculature in the elbow joint is included, it still does not refer to lifting of free weights, but opposition to force generated by the branch of the machine whose lever has precisely defined trajectory of movement. Similar interpretations can be found at Gentil, P., et all, 2017; Chmelo et al., 2015; Churchward-Venne et al., 2015; Gentil et al., 2015a.

2. This procedure uses the method for simultaneous testing of flexion + extension, which could potentially have an impact on the maximum torque results. In general terms, biodex procedures are executed in this manner so as to perceive whether there is an imbalance between the two opposite muscle groups in the elbow joint (agonists/antagonists).

3. Potentially, the increase in lifted weight (tested through one-repetition maximum) is based on "learned movement" during exercises, which is slightly different compared to the movements executed when testing the Biodex devices.

Recommendation for future research: perhaps it is necessary to also choose another type of angle speed in case of isokinetic testing. This research used angle speed of 60 degrees/second.

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TRUNK ROTATIONAL VELOCITY IN YOUNG AND OLDER ADULTS: A ROLE OF TRUNK ANGULAR DISPLACEMENT

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Abstract:
This study investigates the relationship between peak and mean velocity during trunk rotations and respective angular displacement in young and older adults. Altogether 91 young and older subjects of both genders performed 5 rotations of the trunk to each side, in a seated position, with a barbell of 1 kg and 20 kg placed on their shoulders behind the neck. Basic parameters throughout the trunk rotational movement were monitored using the FiTRO Torso Dynamometer. Two-way ANOVA indicated a significant interaction between age and trunk angular displacement in determining velocity of trunk rotations ($P<0.01$). Peak velocity was significantly higher in young than older adults with both 1 kg (699.1±90.5°/s and 564.3±71.5°/s, $p=0.021$) and 20 kg (267.7±41.1°/s and 206.1±35.0°/s, $p=0.014$). Similarly, mean velocity in the acceleration phase of trunk rotations was significantly higher in young than older adults with both 1 kg (420.2±62.7°/s and 342.4±56.6°/s, $p=0.023$) and 20 kg (150.8±33.8°/s and 117.6±29.0°/s, $p=0.017$). Trunk angular displacement was also significantly higher in young compared to older subjects with both 1 kg (peak values: 188.3±36.5° and 156.5±31.7°, $p=0.036$; mean values: 104.5±25.4° and 88.5±21.9°, $p=0.043$) and 20 kg (peak values: 166.2±27.2° and 132.6±24.6°, $p=0.027$; mean values: 83.9±19.3° and 69.7±18.1°, $p=0.038$). Furthermore, peak and mean values of velocity correlated significantly with a range of trunk rotational motion at both weights used in young (r ranged from 0.650 to 0.790, $p<0.05$) as well as older adults (r ranged from 0.772 to 0.927, $p<0.01$). These findings indicate that slower velocity of trunk rotations is most likely due to a limited range of trunk rotational motion, which is more evident in older adults. This fact has to be taken into account for practitioners of sports, such as canoeing, golf, table tennis and tennis that require rotational movements of the trunk under unloading or loading conditions.

Key Words: *peak and mean velocity, range of trunk rotational motion, trunk rotations*

Introduction

The core musculature is the base for efficient movement and maximum power production during trunk rotations. Previous research indicates that trunk muscle strength, trunk coordination and trunk range of motion (ROM) determine a) the trunk position which impacts on force application on the hand rims, b) the trunk stability which decreases paradoxical movements, making arm movements and force application more effective, and c) the trunk movement which determines the range of the push rim that can be used in each push stroke (Altmann et al., 2015).

Lack of flexibility has been related to a decrease in performance (Shellock & Prentice, 1985). Reduced ROM of the hips and the thoracic spine, which allows the greatest rotation because of the orientation of the joints (Sahrmann, 2002), could contribute to lower velocity of the trunk rotational movement and consequently decrease throwing or striking speed. Sports that involve throwing motions require the production of an explosive movement in either the transverse or oblique planes (Earp & Kraemer, 2010). The force is transferred sequentially from the proximal segments, such as hips, toward the more distal segments, such as the shoulders and arms. Because of the kinetic linkage of the proximal to distal sequence in throwing (Putnam, 1993), the rotational mobility might play an important role in the production of trunk rotational power. This power transference of the proximal segments, such as the hips and upper trunk, may be crucial to throwing speed.

Therefore, adequate ROM of the hips and the thoracic spinae is necessary for the production of trunk rotational velocity and consequently also for throwing speed. Rivilla-García et al. (2011) reported a high

correlation (r = 0.90) between a light overhead medicine ball throw (0.8 kg) and handball-throwing velocity. Conversely, Kohmura et al. (2008) reported that the scoop medicine ball throw has very little shared variance with baseball fielding (throwing distance, standing long jump, and agility T-test) (~7%) compared with batting (~14%). Recently, Talukdar et al. (2015) examined the role of rotational power and mobility on cricket ball throwing speed using a linear position transducer attached to the weight stack of a cable pulley system, to measure chop and lift power. According to the authors, greater ROM at proximal segments, such as hips and thoracic, may not increase throwing speed in cricket players as reduced ROM at proximal segments can be useful in transfering the momentum from the lower extremity in an explosive task such as throwing.

This issue is not related to only professional athletes but also physically active young and older adults practicing sports such as tennis, golf or canoeing that involve rotational movements of the trunk. However, aging is associated with increased skeletal muscle stiffness. In particular, older adults experience different dynamic spinal stiffness and loading compared to younger adults during a functional lifting task (Quirk et al., 2014). An increase in muscle stiffness is possibly associated with the decrease in ROM of joints with advancing age. Flexibility systematically decreases with aging, with female participants being more flexible across all ages and having a more gradual, 0.6 %/year vs. 0.8 %/year, age reduction. This age-related loss of mobility is joint-specific (Medeiros et al., 2013). In general, proportionally, shoulder and trunk became less flexible, while elbow and knee mobility was preserved to a greater extent. The authors speculate that extreme ROM positions in the movements of these two most affected joints—shoulder and trunk—are rarely performed in daily living conditions, which may predispose to a more accelerated reduction in the maximal ROM for their various movements.

Moreover, thoracic ROM during trunk extension decreases significantly with age for males (Hashimoto & Kuno-Mizumura, 2010). For females, a significant increase of kyphosis and a significant decrease of thoracic ROM during trunk extension with age is apparent. On the other hand, the authors observed no significant effects of aging in kyphosis for males and in thoracic ROM during trunk extension for females. In addition, a significant decrease of lumbar lordosis and ROM were confirmed for both males and females. From the results of this study, it is suggested that the effects of aging differ in the thoracic and lumbar spine, and could differentialy contribute to joint mobility in these spine regions. Whilst young and older adults have similar ROM in the thorax and in the pelvis, older adults demonstrate a reduced ROM of the lumbar spine (Sung, 2016).

Such lower spine mobility in older adults may have functional consequences on the trunk rotational movement. However, it is still unknown what role trunk flexibility plays in velocity and power production during trunk rotations and whether it depends on age and gender. We assume that low trunk rotational velocity in older adults could be related to low levels of trunk flexibility. Verification of this assumption was accomplished by investigation of the relationship between peak and mean velocity during trunk rotations and respective angular displacement under unloading and loading conditions in young and older adults.

Material & methods

Participants

A group of physically active young and older adults volunteered to participate in the study (Table 1). The participants were included in the study only if they subjectively did not report back pain. Individuals who had previously undergone surgery or other medically invasive procedures for the lower back were excluded from participation in the study. They were all informed of the procedures and the main purpose of the study. The study was performed in accordance with the ethical standards on human experimentation outlined in the Declaration of Helsinki.

Table 1. Descriptive characteristics of young and older adults of both genders.

	Male young adults	Male older adults	Female young adults	Female young adults
N	25	17	22	27
Age (years)	22.1 ± 3.5	60.9 ± 3.3	21.4 ± 2.8	63.4 ± 4.2
Height (cm)	180.2 ± 8.1	175.1 ± 8.8	170.4 ± 7.7	160.7 ± 6.7
Body mass (kg)	85.6 ± 11.4	92.8 ± 13.8	59.3 ± 5.4	69.8 ± 10.0

Experimental design

Before testing, participants were given a visual demonstration of the proper exercise technique and were kept informed of the instructions during testing. Following the warm-up, they were exposed to a familiarization trial during which they performed seated trunk rotations in a slow and controlled manner, while keeping the back straight. They were then required to complete five repetitions of trunk rotations to each side, in the seated position, with a barbell of 1 kg and 20 kg placed on their shoulders behind the neck. They were instructed to perform trunk rotations with maximal effort in the acceleration phase. Emphasis was placed on the proper position of the body while seated on a chair and holding the barbell on the shoulders with the hands. Their legs were strapped to the chair and their feet were inserted into board bindings. They began with trunk rotations to the right (or left) side, then rotated their torso forcefully from the right (or the left) towards the opposite side until the body reached the end position, and finally they slowly returned to the starting position. The test was then repeated for the opposite side of the body. They had to engage their core muscles to stiffen the torso and stabilize the spine. A laboratory assistant ensured that participants remained upright throughout the movement and that the head, chest and torso were aligned over their hips. The same experienced researchers conducted the measurements during testing sessions.

Basic parameters throughout the trunk rotational movement were monitored using the FiTRO Torso Dynamometer (FiTRONiC, Slovakia). This system allows the seat height to be individually adjusted whilst the lower limbs are fixed in place. The system monitors rotational movement of the barbell by means of the mechanically coupled precise angular velocity sensor. Angular acceleration was obtained by derivation of angular velocity. Angular displacement was calculated as an integral of angular velocity over time. Peak and mean values of angular velocity from the acceleration phase of trunk rotation as well as angular displacement were analysed.

Statistical analysis

Data analyses were performed using the statistical program SPSS for Windows, version 18.0 (SPSS, Inc., Chicago, IL, USA). Descriptive statistics, including mean and standard deviations were calculated for all variables.

Data was analyzed by two-way ANOVA (age x trunk rotational velocity) and analysis of covariance (ANCOVA) that included sex as a covariate. In the case of a significant F value, a post hoc test with Scheffe´s method identified significant differences among mean values. The criterion level for significance was set at $p \leq 0.05$.

Previous studies have not identified significant differences in peak torque in strength testing, or in total work in the rotational endurance testing between the dominant and non-dominant side in healthy golfers, the control group and golfers with low back pain (Lindsay & Horton, 2006). Likewise, there were no significant differences in the mean power produced during the standing cable wood chop exercise on the left and the right side with all weights used in a group of fit healthy men (Zemková et al., 2017a). Taking these findings into account, we assumed no side-to-side differences in trunk rotational velocity in healthy physically fit adults.

Correlations between peak and mean values of trunk rotational velocity and respective angular displacement in young and older adults were assessed by calculating Pearson's product moment correlation coefficient. Total variance is reported by the coefficient of determination. The level of significance was set at $\alpha = 5\%$.

Results

Two-way ANOVA indicated a significant interaction between age and trunk angular displacement in determining velocity of trunk rotations ($P < 0.01$).

Peak velocity was significantly higher in young than in older adults with 1 kg (699.1 ± 90.5°/s and 564.3 ± 71.5°/s, $p = 0.021$) as well as with 20 kg (267.7 ± 41.1°/s and 206.1 ± 35.0°/s, $p = 0.014$). Similarly, mean velocity in the acceleration phase of trunk rotation was significantly higher in young than older subjects with both 1 kg (420.2 ± 62.7°/s and 342.4 ± 56.6°/s, $p = 0.023$) and 20 kg (150.8 ± 33.8°/s and 117.6 ± 29.0°/s, $p = 0.017$). The differences remained significant after normalizing peak and mean values of velocity for sex when analyzed by ANCOVA.

Trunk angular displacement was also significantly higher in young than older subjects with both 1 kg

(peak values: 188.3 ± 36.5° and 156.5 ± 31.7°, $p = 0.036$; mean values: 104.5 ± 25.4° and 88.5 ± 21.9°, $p = 0.043$) and 20 kg (peak values: 166.2 ± 27.2° and 132.6 ± 24.6°, $p = 0.027$; mean values: 83.9 ± 19.3° and 69.7 ± 18.1°, $p = 0.038$). The differences remained significant after normalizing trunk angular displacement for sex when analyzed by ANCOVA.

Furthermore, trunk angular displacement highly correlated with peak and mean velocity in the acceleration phase of trunk rotation with both 1 and 20 kg in older adults (Table 2). The R^2 values in range from 0.596 to 0.859 indicate that a high proportion of variance could be explained (60–86%). Moderate correlations were also found between trunk angular displacement and peak and mean velocity in the acceleration phase of trunk rotation with both 1 and 20 kg in young adults. The R^2 values ranged from 0.423 to 0.624, explaining 42–62% of total variance.

Table 2. Correlations between peak and mean values of velocity during trunk rotations and respective angular displacement in young and older adults (*r* values [95% CI]).

Variables	Trunk angular displacement	
	Young adults	Older adults
Peak velocity during trunk rotations with 1 kg	0.673* [0.607, 0.750]	0.803** [0.737, 0.866]
Peak velocity during trunk rotations with 20 kg	0.650* [0.598, 0.706]	0.772* [0.718, 0.824]
Mean velocity in the acceleration phase of trunk rotations with 1 kg	0.790* [0.727, 0.856]	0.927** [0.883, 0.975]
Mean velocity in the acceleration phase of trunk rotations with 20 kg	0.766* [0.711, 0.829]	0.896** [0.832, 0.956]

* $p \leq 0.05$, ** $p \leq 0.01$

Discussion

As expected, peak and mean velocity in the acceleration phase of trunk rotations as well as trunk angular displacement were significantly higher in young than older adults with both 1 kg and 20 kg. These values of trunk rotational velocity correlated significantly with the trunk angular displacement at both weights used in young and older adults. These findings indicate that slower velocity of trunk rotations is most likely due to a limited range of trunk rotational motion, which is more evident in older adults. These results are in agreement with our preliminary findings that showed significantly higher mean velocity during trunk rotations and trunk angular displacement in young than older male subjects, and a significant relationship between these two variables (r ranged from 0.83 to 0.93) (Zemková et al., 2015).

It is most likely that reduced ROM with aging (Araújo 2008; Barnes et al. 2001; Beighton et al. 1973; Doriot & Wang 2006; Intolo et al. 2009; Roach & Miles 1991), as a result of increased trunk stiffness in older adults, compromised velocity of trunk rotational movement. Because some degree of ROM in the major body joints is needed for performing most of the sporting activities, lower trunk flexibility in older adults may have functional consequences. We speculate that due to the limited range of trunk motion, distal parts of the body could contribute more to the velocity of movement (e.g., stroke, kick). This phenomenon was also observed in people with a lack of trunk muscle strength, who compensated for this by the recruitment of shoulder and arm muscles (Seelen et al., 1998; Potten et al., 1999; Schantz et al., 1999).

A recent study of Castillo et al. (2017) suggests that exercises to strengthen the abdominal or back muscles are more likely to be effective at modifying spinal posture in individuals with naturally flexible lumbar spines, or when muscle strengthening is accompanied by stretching to increase lumbar ROM. Strengthening the trunk muscles to modulate lumbar posture is unlikely to be effective in individuals with naturally low lumbar flexibility and in people with immobile lumbar spines. Interestingly, a 10-week course of strength training led to a significant increase of only shoulder horizontal adduction, hip flexion and extension and trunk flexion/extension in sedentary middle-aged women but not elbow and knee flexion (Monteiro et al. 2008). This could be due to the fact that these later joints were already positioned in daily living near their maximal ROM when compared to the shoulder and trunk joints.

These findings lead us to recommend flexibility training for older adults taking part in sporting activities involving trunk motions. Although for the majority of the aging population, the goal of an exercise program may be to improve functionality in activities of daily living, today´s expectation of an increased active life for older people requires more attention be paid to flexibility-specific training interventions for this population. The systematic review by Stathokostas et al. (2012) revealed that flexibility-specific interventions may have effects on ROM outcomes; however there is conflicting information regarding both the relationship between flexibility interventions and the functional outcomes or daily functioning of older adults.

The limitation of the study was that subjects performed seated trunk rotations that reduce the involvement of legs and the contribution of thoracic/hip mobility to the upper-body rotational velocity and power. It is therefore obvious that velocity and power production would be greater during standing than seated trunk rotations and these differences would be more pronounced at higher weights, as shown in our previous study (Zemková et al., 2017b). This may be attributed to a greater trunk rotational mobility while standing as compared to sitting, which allows individuals to accelerate the movement more forcefully at the beginning of rotation. This results in higher trunk rotational velocity and consequently also overall power outputs. Such a comparison of trunk rotational velocity and respective angular displacement during standing trunk rotations at lower and higher weights in subjects of various ages could be a subject of further study.

Conclusions

Peak and mean velocity in the acceleration phase of trunk rotation and respective angular displacement were significantly higher in young as compared to older adults. These values of velocity of trunk rotations significantly correlated with trunk angular displacement in both groups. These findings indicate that slower velocity of trunk rotations is most likely due to a limited range of trunk rotational motion, which is more evident in older adults. This fact has to be taken into account for practitioners of sports (such as canoeing, golf, table tennis or tenis) that require rotational movements of the trunk under unloading or loading conditions.

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Conflicts of interest

The authors declare no conflict of interest.

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FACTORIAL VALIDITY OF AGILITY TESTS FOR SOCCER PLAYERS

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Abstract

The purpose of this research is to evaluate the factorial validity of agility tests used in soccer. The research has been done on a selective sample of 50 male participants, professional soccer players from the first Macedonian league, aged between 19 and 33. In order to accomplish the aims of the research, six tests for evaluating agility were done: zig-zag running without a ball, zig-zag running with a ball, Ajax test 5x10 meters without a ball, Ajax test 5x10 meters with a ball, Illinois test without a ball, and Illinois test with a ball. On the basis of the gained results, after applying all of the statistical methods, it has been concluded that the tests have a single measurement subject, i.e. a latent dimension, identified as agility, has been isolated. All of the tests have high projections, hence diagnostic validity. The Illinois test without a ball has the highest projection and diagnostic validity out of all the six tests applied. When constructing a test with this aim, it is wise to take into consideration the game specifics and the positional tasks of soccer players.

Key words: *field tests, evaluation, senior players*

Introduction

Soccer such as we know today has been played for 150 years. Ever since its distant beginnings, it has grown to be the most popular game in the world: soccer is nowadays played by several millions of people in many countries in the world. The biggest tournaments are in fact the World Cups, which attract TV audiences in the billions, thus being the largest audience out of any other sport. During this period, the tempo of changes has been so quick, although the multitude of innovative approaches that are contained in the soccer played in this day and age have appeared during the last fifty years or so.

The fast the frequent changes in the direction of movements is a fairly common feature of contemporary soccer. At this moment, among sports scientists there is no agreement as to the precise definition of agility (Sheppard and Jang, 2006). Previously agility was defined as the ability for fast changes of the direction of the body, in combination with speed, force, balance and coordination (Drejper & Lancaster, 1985). The performances of agility are not closely connected to the direct components of speed (Butifant et al., 1999). One of the standard tests for evaluating agility is the Illinois test (Cureton, 1951). The authors back the stance that the tests for agility should be independent from the maximum speed, and they should correlate more with acceleration since that is connected to the demands when changing the direction and once again accelerating. It has been stated that the tests for agility make the distinction between the elite soccer players, on the one hand, and the general population, on the other hand, much more than any other field test of force, power or flexibility (Reilly et al., 2000), but today there are “golden standards” for evaluating it. Despite these facts, this ability is viewed as quite an important component for the physiological evaluation in soccer (Svenson & Drast, 2005). During a match, soccer players on average make 1.000 to 4.000 changes in direction.

Improving agility is one of the most important aspects of the off-season strength and conditioning programs. In soccer, there is a strong interest present in developing a field test that could effectively measure the agility of soccer players. However, scientists differ on how to define agility, and only a small number of articles deal with the problem of agility tests (20). Sports scientists are in continual search for effective methods of identifying physical characteristics that may contribute to sports performance. A common method of evaluating athletic talent is through physical ability testing (Chu, & Vermeil 1983). Agility tests can help soccer coaches and conditioning specialists diagnose specific weaknesses, screen for possible health risks due to strenuous exercise, provide data for outlining individual exercise prescriptions, and assess cycles of a training period (Altug et al., 1987).

The purpose of this research was to evaluate the factorial validity of agility tests used in soccer.

Methods

Experimental approach to the problem

Soccer coaches mostly rely on field tests to routinely monitor an athlete's adaptations to the training programs and for talent selection purposes. Although the basis for speed and agility training can be explained scientifically, the effectiveness of various programs and agility tests is more difficult. Coaches have developed a variety of training methods for improving athletic performance. It is now up to the research component to explain and determine the best test for measuring the agility of soccer players. That knowledge, it is hoped, will also give a better insight into this form of training so that more specific agility tests can be developed.

Agility tests are often done indoors. This raises the problem of test validity because the tests are carried out on soccer players wearing their tennis shoes and not the regular soccer kit. Furthermore, the ground reaction force is different when the tests are done on a natural grass soccer pitch. In previous studies, the reliability of agility tests was calculated from a sample of mostly college students, not soccer players (Pauole et al., 2000). These are the questions that need to be addressed: are these tests reliable and valid, and which tests are the most valid for evaluating the agility of soccer players? For this purpose, the subjects participating in the study took different agility tests: zig-zag running without a ball, zig-zag running with a ball, Ajax test 5x10 meters with a ball, Ajax test 5x10 meters without a ball, Illinois test without a ball, and Illinois test with a ball.

Subjects

The research has been done on a selective sample of 50 male participants, professional soccer players from the first Macedonian league, aged between 19 and 33. All the participants provided written consent after being informed of the test protocol, but not of the aim of the study. The protocol of the study was approved by the Ethical Committee of the Faculty of Physical Education, Sport and Health of Skopje and according to the revised Declaration of Helsinki. Each player had at least 9 years of training experience, corresponding to 2-hour training sessions, and at least 1 competition per week. The duration of the training program, technical-tactical preparation, and the intensity and extensity of those in training were strictly controlled.

The team's main conditioning and the second conditioning coach conducted the training sessions in strict accordance with the designed detailed plans and programs of scheduled activities, intensities, and frequencies of training stimuli. In the process, the players were not informed about the purpose of the study and were unaware of the other team's participation in the study. Consent was obtained from the team leader and from the main technique-tactics coach.

Statistical analyses

SPSS (v22.0; SPSS, Inc., Chicago, IL, USA) was used for statistical analysis. The standard statistical parameters (mean, SD, and range) were calculated for each trial of the mentioned agility tests. The Kolmogorov-Smirnov test was used for testing the normality of distribution. To determine the factor validity of agility tests used in soccer an intercorrelation matrix of 6 agility tests was factorized using a principal component factor analysis. The number of significant factors was determined by the Kaiser-Guttman criterion (Nunnaly et al., 1994), which retains the principal components with eigenvalues of 1.0 or greater. The structure matrix was used to determine the factor validity. The factorial validity is 1 from construct validity and was identified in the test showing the highest correlation with the extracted factor (Nunnaly et al., 1994).

Results

All the variables had normally distributed data. From the kurtosis values, it can be seen that most of the motor tests demonstrate a platykurtosis distribution. Mesokurtosis distribution is shown through the test of zig-zag running with a ball and the Illinois test with a ball. The skewness values for most of the tests is in the range of the recommened values between -1 and +1, which leads to the conclusion that the distribution of the results is somewhat symmetrical. The negative asymmetry (hypokurtosis) is visible only with the test of zig-zag running with a ball, while positive asymmetry or epikurtosis (a larger number of the results are in the range of the best results) is visible only with the Illinois test with a ball.

Table 1. Intercorrelation matrix of all the agility tests

	1	2	3	4	5	6
Zig-zag running without a ball	1,00					
Zig-zag running with a ball	,63	1,00				
Ajax test 5x10 meters without a ball	,40	,34	1,00			
Ajax test 5x10 meters with a ball	,29	,47	,25	1,00		
Illinois test without a ball	,58	,63	,58	,59	1,00	
Illinois test with a ball	,34	,55	,41	,45	,62	1,00

By reviewing Table 1, it can be noted that the highest coefficients of correlation are connected to the tests of zig-zag running without a ball and zig-zag running with a ball (r,=63) and to zig-zag running with a ball and the Illinois test without a ball (r,=63). There have also been determined statistically significant coefficients of correlation among the test of zig-zag running without a ball and the Ajax test 5x10 meters without a ball (r,=40), zig-zag running without a ball and the Illinois test without a ball (r,=58), zig-zag running with a ball and the Ajax test 5x10 meters with a ball (r,=47), zig-zag running with a ball and the Illinois test without a ball (r,=55), the Ajax test 5x10 meters without a ball and the Illinois test without a ball (r,=58), the Ajax test 5x10 meters without a ball and the Illinois test with a ball (r,=41), the Ajax test 5x10 meters with a ball and the Illinois tests with and without a ball (r,=59; r,=45), and the Illinois test without a ball and the Illinois test with a ball (r,=62).

The principal component factor analysis of the 6 agility tests resulted in the extraction of 1 significant component. The first component explained the 56,85% of the total variance of the system. All the tests for evaluation of agility have a high projection of the first main component and were between ,645 and ,896. The highest projection of the first main component, and with it the factorial validity, was shown through the Illinois test without a ball (r,=896). It can be said that the size of the communalities mainly satisfied the demands for thoughtful interpretation of the extricated latent dimensions since it is similar to that which is normally gained in the research of motor abilities.

Table 2. Eigenvalues (λ) and percentage of explained variance for all principal components

Component	Total (λ)	Percentage of variance	Cumulative percentage
1	**3,411**	**56,852**	**56,852**
2	0,802	13,361	70,213
3	0,722	12,037	82,250
4	0,531	8,854	91,105
5	0,295	4,920	96,025
6	0,238	3,975	100,000

Table 3. Correlation coefficients of all the agility tests with the extracted principal components, eigenvalues (λ), and the percentage of explained variance (λ%)

	H1	h^2
Zig-zag running without a ball	,721	,519
Zig-zag running with a ball	,812	,659
Ajax test 5x10 meters without a ball	,645	,416
Ajax test 5x10 meters with a ball	,671	,450
Illinios test without a ball	,896	,803
Illinois test with a ball	,751	,564

Discussion

The factor analysis resulted in the extraction of 1 significant principal component, which extracted 56,85% of the total variance of all 6 agility tests (Table 2). All 6 tests have high projections of the first main component (r = 0.64–0.90). The first factor can be interpreted as a general agility factor. The Illinois test without a ball showed the highest projection of the first main component. Because of the correlation between the test and the extracted agility factor, it is evident that the Illinois test without a ball (r = 0.90) has the best factorial validity among all the analyzed agility tests. In addition, high factorial validity was also shown through the test of zig-zag running with a ball (r=0.81) and the Illinois test with a ball (r=0.75).

When using tests to evaluate athletes' agility, it is important to be aware of the complexity of this motor ability. Metikos et al. (2003) conducted a component analysis on 32 agility tests in their study and were able to extract 7 statistically significant principal components (eigenvalues greater than 1, by the Kaiser- Guttman criterion). Of the 7 principal components, only 5 were interpretable. This finding speaks in favor of agility as a complex motor ability.

It can be concluded that of the 6 agility tests used in this study, the Illinois test without a ball and the zig-zag running with a ball are the most valid tests for estimating the agility of soccer players. When constructing a test with this aim, it is wise to take into consideration the game specifics and the positional tasks of soccer players.

Agility is one of the main determinants of performance in soccer. It can be successfully developed if the training is based on the changes of direction, which are done quickly and easily. By working on agility and improving the balance and coordination, soccer players will be able to move faster and change directions more quickly while maintaining control. Some objectives of agility training are enhanced power, balance, speed, and coordination. The results of this study have the following implications for the assessment of agility in soccer: (a) all agility tests used in this study have an acceptable between- and within-subject reliability and they can be used to estimate the agility of soccer players; (b) the Illinois test without a ball and the test of zig-zag running with a ball are the most valid agility tests for the estimation of agility of professional soccer payers.

Conclusion

On the basis of the gained results, after applying all the statistic methods, it can be concluded that the tests have a single subject of measure, i.e. a latent dimension has been isolated, which can be defined as agility. All the tests have high projections, and with that a diagnostic validity of the first main component. The highest projection and diagnostic validity of all the applied 6 tests for evaluation of agility is shown through the Illinois test without a ball.

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SOME PHYSICAL FITNESS INDICATORS OF YOUNG ACADEMY FOOTBALL PLAYERS ACCORDING TO PLAYING POSITIONS IN UNITED ARAB EMIRATES

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Abstract
Talent identification and early selection into a professional football academy have been reported to be very important for the long-term development of footballing expertise. Through football-specific research, a number of anthropometric and physical parameters have been linked to successful performance in football. The objective of the research study was to explore speed and agility tests of U15 and U16 academy football players according to playing positions, which can be used to predict their future success in football. The sample of research were 60 football players from academy in UAE (31 players age U15 and 29 players age U16), conferred by the position in the football field (playing positions) at the 4 subsamples: Goalkeepers (8), defenders (16), midfielders (20) and forwards (16).The study found out that of all the speed and agility tests assessed, the most discriminatory ones were: sprint speed 20-meter sprints. Results obtained in the testing can also contribute to control of the training process and the proper directing and selection of football players. Finally, this study allowed some normative data for football players to be established and provided a complete speed and agility picture than in earlier studies.

Keywords: *speed and agility tests, academy football players, playing positions*

Introduction

Football is one of the most widely played and complex sports in the world, where players need technical, tactical, and physical skills to succeed (Joksimović et al., 2009). Talent identification and early selection into a professional football academy have been reported to be very important for the long-term development of footballing expertise (Le Gall *et al*., 2010). Several researchers in football have tried to evaluate factors that optimally contribute to successful football performance (Svensson and Durst, 2005; Wisløff *et al*., 1998; Tumilty, 1993). Through football-specific research, a number of anthropometric and physical parameters have been linked to successful performance in football (Le Gall *et al*., 2010). Ostojic (2002) indicated that a relationship exists between an athlete's body composition and functional fitness characteristics and pointed out that body composition and somatotype variables can greatly influence the attainment of functional characteristics such as strength, speed, power, and flexibility by an athlete. These variables are thus used by exercise physiologists and coaches during talent scouting. They measure both anthropometric characteristics and functional fitness in an effort to determine factors that indicate future talent. This was substantiated by Le Gall *et al*. (2010) who studied players at France's elite football academy (Clairefontaine) and found that youth players with significantly greater height, weight, jumping ability and maximal anaerobic power, were more likely to be selected for France's senior men national team

game.

Gambetta (1996) defined speed as the ability to move the body or body segments in the shortest possible amount of time. Studies comparing sprint performances of junior and senior players, elite and non-elite, professional versus amateurs and premier league versus lower leagues, all reported better speed performances for higher level players (Wisloff *et al*., 2004; Cometti *et al.,* 2001; Diallo *et al.,*

2001; Helgerud *et al*., 2001; Kollath and Quade, 1993; Tumilty and Darby, 1992). This variation could be attributed to the level of training and competition demands for each category, the effect ofage and maturity as well as the ability of the body to accommodate higher training loads and strength in leg muscles in the case of juniors versus seniors. attributes namely; acceleration, velocity, and speed endurance. Nesser *et al.* (1996) propound that sprint tests are commonly used to predict athletic potential during talent identification and to reliably monitor changes in sprinting ability as it develops with maturation and changes in the level of competition. According to Malina *et al*. (2004) speed improves

greatly between the ages of 5-8 years in both boys and girls, and that gender variations only become apparent during the adolescence growth spurt (14-18 years in boys and 11-14 years in girls). Thereafter speed increases steadily until early adulthood (22 years)

The game of football is characterized by low-intensity patterns inter-paced with short high intensity sprinting episodes which comprise high-speed movements, accelerations, decelerations and recovery periods (Helgerud *et al.*, 2001) and includes walking, jogging, and sprinting (Reilly, 1996; Bangsbo *et al*., 1991). Wisløff *et al.*, (2004) estimated that the sprinting phase is performed every 90 seconds of play and last between 2-5 seconds, and constitute about 11% of the total distance covered during a 90 minutes match. Although the percentage seems to be insignificant, these periods of play directly contribute to winning of ball possession and creation of scoring chances and are therefore decisive in the final result of a football match (Duthie *et al.*, 2005). In any match, the attacking and counter-attacking phase demands high speed and acceleration from both strikers and defenders. These actions (attacking and counter-attacking) require a combination of high speed and agility (Little and Williams, 2005). Therefore it is of paramount importance for attackers and defenders to possess high- speed abilities. Single sprint effort tests over distances ranging from 5 - 60m are regularly used to assess running speed in both junior and senior football players (Young *et al.*, 2008; Veale *et al.*, 2008; Duthie *et al.*, 2006a; Pyne *et al.*, 2005). The most frequently used sprint tests are over 10m, 20m, 30m and 40m (Chamari *et al.,* 2004; Wisloff *et al*., 2004; Hoff and Helgerud, 2003; Cometti *et al,*. 2001; Kollath and Quade, 1993) with less frequent use of 5m, 15m and 60m, (Dupont *et al.,* 2005; Helgerud *et al.,* 2001). This tendency is in line with the argument of Valquer *et al*. (1998) who reported that

96% of sprint bouts in a football match are of less than 30m and at least 49% of these are less than 10m. Cometti *et al*. (2001) measured ninety-five (95) French elite and sub-elite football players with the aim of finding the appropriate test that could discriminate between players' performances. Elite players had shorter 10m sprint time compared to sub-elite players (1.79 sec versus 1.90 sec; $p < 0.05$), but there was no difference in 30m sprint times for the two groups. These results imply that a 30m sprint test is not a good test to distinguish between different levels of players. Similarly, Stolen *et al*. (2005) reported that speed over 10m and 20m are good indicators of on-the-field performance and that these results can distinguish good performers from lesser performers. These observations concur with Valquer *et al*. (1998) who noted that 5m, 10m, and 20m sprint tests better resemble the actual short sprint bouts in the real game of football. Young *et al.* (2005) compared starters and non-starters of elite Australia club players using 10m and 40m sprint tests. The aim of the study was to determine whether speed can be used to select players who enter as starters or substitutes in a match. They reported a significant difference between the two groups ($p = 0.02$). Starters scored 1.86±0.06 seconds in 10m sprint and 3.46±0.06 in a 40m sprint against 1.94±0.09 and 3.57±0.13 seconds for non-starters. Pyne *et al.* (2005) measured sprint speed (5, 10 and 20m) of junior players selected for the final end of season draft camp in Australia and who were successfully selected into the elite senior team and those who were not selected. They found that those who were selected performed better compared to the non-selected. However, Veale *et al.,* (2008) used 10, 20 and 40m sprint and noted that there was no difference ($p = 0.16$) between sprinting performance of players selected into the senior team and those who were not selected. This could be that the group studied was more homogeneous that they performed at a similar level.

Agility is the ability of a moving body to accelerate and quickly change direction (Draper and Lancaster, 1985). It is the product of the interaction between speed, balance, strength, andcoordination (Sheppard and Young, 2006; Farrow *et al.*, 2005). Running patterns of team sports athletes are characterized by rapid changes in direction, as compared to linear running in track and field athletes (Dawson *et al.*, 2004b; Young *et al.*, 2002; Gambetta, 1996). Agility can be categorized as planned agility and reactive agility, where the latter is actually similar to quickness. Planned agility describes the deliberate quick change in direction in a straight line along a designed agility course, while reactive agility is when a player moves the whole body rapidly with change of velocity or direction in response to a stimulus (e.g. the movement of an opponent or the ball) (Oliver and Meyers,

2009; Sheppard and Young, 2006; Farrow *et al.*, 2005; Reilly 2000). Reactive agility is a necessity in the game of football as the player is required to run with the ball at a fast pace and at the same time avoids being tackled, as well as reacting quickly to the unexpected bounce of the ball and movements of the opponent. Therefore reactive agility can be said to be sport-specific and therefore a number of tests have been designed to test team sports players with a protocol that is functional to their specific sport. It

has been documented that agility can successfully differentiate between athletes of different playing standards in rugby (Farrow *et al.,* 2005), netball (Sporis *et al*., 2011) and football (Sheppard *et al.,* 2006). Young *et al*. (1996) examined elite and non-elite football players using the straight line sprint test and Illinois agility test. The results were similar between the two groups for straight line running, however, elite players showed better results in the Illinois test compared to non-elite players (15.3±0.11 and 17.1±2.01), (p = 0.05). These results substantiate the assertion of Reilly et al. (2000b) that agility can be used to differentiate between athletes of varying playing abilities. Malina *et al*. (2004) assert that agility increases sharply during the growth spurt in both boys and girls up to the age of 14 years for girls and 18 years for boys. Hastad and Lacy (1994) compared the agility status of young (13-15 years) and late adolescent football players (16-19 years) using the Illinois test. They found that young players were between 3%-27% slower compared to older players. The findings reflect a correlation between agility performance and increased age (maturity). They attributed the difference to the ability of older players to accommodate higher training loads and intensities that comes with an increase in age. However, the other factors such as playing experience, decision- making ability, and anticipatory skills cannot be ruled out as possible causes of a performance difference.

The majority of studies, therefore, indicated that sprint speed tests can successfully discriminate between players from a heterogeneous group and can be used to distinguish between talented and less talented football players. The objective of the research study was to explore agility and speed of U15 and U16 academy football players according to playing positions, which can be used to predict their future success in football. It is assumed that by realizing this objective, this study could subsequently add value to talent identification and in monitoring players' physical performance.

Materials and Methods

The sample of research were 60 football players from academy in UAE (31 players age U15 and 29 players age U16), conferred by the position in the football field (playing positions) at the 4 subsamples: Goalkeepers (8), defenders (16), midfielders (20) and forwards (16). Each participant will have to meet pre-defined conditions, to enter the sample: to regularly attend training sessions, that the respondents voluntarily attended training in the football academy. All the players had more than 3 years of experience that the participants are healthy, participants do not have physical defects, morphological aberrations damaged locomotor apparatus, and they do not possess greater pathophysiological abnormalities. The players were fully-informed of all the experimental procedures. All tests were performed on an indoor artificial grass pitch. It was assumed that players will not consume either excessive or very minimal amounts of water at least two hours before the tests. It was also assumed that the players will not train or partake in any vigorous exercises at least 24 hours before the testing day. The testing process started early in the morning until midday and were conducted at the academy's training fields. According to the recommendations of Gore (2000), the following testing order was observed: Body mass, Height and Body mass index. Mass is the quantity of matter in a body and is calculated through the measurement of weight. Body mass was measured using a digital scale. Body mass was recorded to the nearest 0.1kg. Values for height and weight measurements were used to compute Body mass index (BMI): BMI = BM/height^2. Field tests were conducted on day two of testing in the following order speed tests (sprint speed 10, 20 and 40-meter sprints) and agility test. Procedure for each of the three speed tests, the subjects covered the required distance from a static position in the shortest possible time. From a 'go' command the subject started running from a stationary position. Two cones were placed a meter before the first timing gate to mark the starting point and another one 1 meter after the last timing gate. The timing gates were adjusted accordingly for 10m, 20m and 40m and maximum encouragement was given to them so that they run up to the last timing gate. Trials: The fastest time from two attempts was recorded as the individual's score. Agility test. Agility is an important component of many team sports, which involve rapid changes of direction and speed of play. It is a vital component in the game of football which involves quick short runs with the ball, combined with dribbling and turning in various unanticipated directions. The length of the course was 10 meters and the width (distance between the start and finish points) was 5 meters. Four cones were used to mark the start, finish and the two turning points. Another four cones were placed down the center an equal distance apart. Each of the center cones was spaced 3.3 meters apart (Fig 1). Procedure: Players assumed a prone position a meter behind the timing gates and hands by their shoulders. On the 'Go'

command the player got up as quickly as possible and ran around the course in the direction indicated, without knocking the cones over, to the finish line, at which the time taken to complete the course was recorded on the timing gate. Trials: The best time score from two trials was taken as the final score.

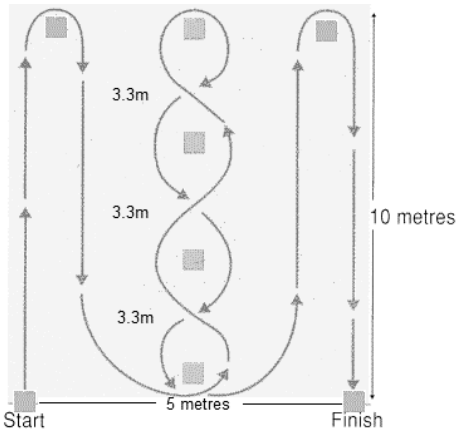

Figure 1 Illinois test course *(Adapted from Semenick, 1979)*

All results have been analyzed in the statistical program Statistics 7.0 for Windows. For all variables basic parameters of the descriptive statistics were calculated: the minimum score (Min), maximum score (Max), mean (Mean), standard deviation (Std. deviation). To determine a statistically significant difference between the groups for each variable was used a T-test, where for the statistically significant difference the value of the significance level to $P < 0.05$ was taken.

Results

Anthropometry of U15 according to positions of play. A statistically significant difference was observed in height of the players across playing positions ($P < 0.05$), with a greater difference existing between forwards and defenders. Defenders and forwards were of similar height, while goalkeepers and midfielders were slightly taller. No significant differences were observed in all other variables across playing positions (Table 1). Goalkeepers were the heaviest of all the other groups, also goalkeepers were the tallest and forwards were the lightest and shortest. Speed and agility U15 according to positions of play. There were no statistically significant differences across playing positions in terms of agility and sprint performance ($P > 0.05$) (Table 1). Table 1 shows that defenders, midfielders and forwards had highest and similar scores in 10m sprints while goalkeepers had the least scores. In 20m sprints, defenders were the fastest groups followed by forwards, while goalkeepers and midfielders were the slowest among the group. In Table 1 forwards recorded the best sprint performance in 40m, followed by defenders and goalkeepers who had similar scores (5.8 seconds), while midfielders were the slowest. Midfielders were agiler than others were players in the U15 team, followed by defenders and forwards, while goalkeepers were the least agile among the group.

Table 1. Speed and agility performance of U15 players according to playing positions (values are mean + SD)

	Goalkeepers (n=4)	Defenders (n=7)	Midfielders (n=9)	Forwards (n=9)	P - value
Age (years)	15.2±.065	15.1±0.71	14.8±0.73	14.8±0.67	> 0.05
Height (cm)	169.1±5.78	164.6±5.97	166.8±6.98	164.2±4.78	< 0.05
Body mass (kg)	62.4±7.07	57.3±12.9	57.4±9.19	53.9±6.9	> 0.05
Body mass index	21.1± 2.92	20.7± 3.21	20.5± 1.81	20.8± 1.99	> 0.05
10m sprint (sec)	1.82±0.06	1.77±0.09	1.78±0.81	1.76±0.16	> 0.05
20m sprint (sec)	3.23±0.28	3.08±0.16	3.21±0.14	3.18±0.16	> 0.05
40m sprint (sec)	5.93±0.17	5.83±0.28	5.95±0.19	5.73±0.22	> 0.05
Agility (sec)	16.91±0.84	16.75±0.46	16.37±0.41	16.87±0.33	> 0.05

Anthropometry of U16 according to positions of play. There was no significant difference between playing positions for any anthropometric variables (P > 0.05). Defenders, midfielders and forwards were of similar height, while goalkeepers were slightly taller. No significant differences were observed in all other variables across playing positions (Table 1). Goalkeepers were the heaviest of all the other groups, also goalkeepers were the tallest and forwards and defenders were the lightest and shortest. Speed and agility U16 according to positions of play. There were no significant statistically significant differences according to positions of play (P > 0.05) for the U16 team in terms of agility and all sprint performance tests. Defenders and goalkeepers were the fastest in the 10m sprint, while midfielders and forwards were the slowest (with similar score). Midfielders were the fastest in 20m sprints followed by goalkeepers and defenders, while forwards were the least of all the playing positions. Table 2 shows that forwards were the fastest over 40m, while all the other positions had similar times. From Table 2, in agility, midfielders were the quickest followed by defenders while goalkeepers and forwards were the slowest.

Table 2. Speed and agility performance of U16 according to playing positions (values are mean + SD)

	Goalkeepers (n=4)	Defenders (n=9)	Midfielders (n=10)	Forwards (n=8)	P- value
Age (years)	15.7±1.38	15.7±0.93	16.2±0.85	16.1±0.71	> 0.05
Height (cm)	175.3±4.73	168.3±3.36	170.5±6.39	168.9±3.21	> 0.05
Body mass (kg)	64.8±5.33	60.8±4.23	62.2±4.79	60.8±5.39	> 0.05
Body mass index	21.7±0.52	21.1±0.89	21.8±1.55	21.9±1.69	> 0.05
10m sprint (sec)	1.71±0.22	1.74±0.24	1.75±0.20	1.75±0.12	> 0.05
20m sprint (sec)	2.98±0.25	3.01±0.41	2.97± 0.22	3.07±0.35	> 0.05
40m sprint (sec)	5.82±0.34	5.74±0.43	5.77±0.23	5.64±0.38	> 0.05
Agility (sec)	16.65±0.97	16.43±0.75	16.34±0.81	16.68±0.93	> 0.05

U16 players performed statistically had significantly better in the 10m sprint test, 40m sprint test, and agility test, compared to the U15. Table 3 shows that there was no statistically significant difference in 20m sprint test among the two groups (P > 0.05). When U16 and U15 players were combined into one group according to playing positions, there were no significant differences observed in agility or sprint performance (P > 0.05) (Table 4). Table 4 shows that goalkeepers and forwards had similar scores in 10 and 20m sprint test and agility test (1.76 and 16.78 seconds). In the40m sprint test, defenders and forwards scored better than goalkeepers and midfielders. However, midfielders were the agilest group while goalkeepers and forwards were the slowest in terms of agility.

Table 3 Speed and agility performance of U16 (n=41) and U15 (n=33) players (values are mean + SD)

	Total	U16	U15	P-value
10m Sprint (sec)	1.76±0.11	1.73±0.12	1.78±0.23	< 0.05
20m Sprint (sec)	3.09±0.28	3.01±0.23	3.17±0.11	> 0.05
40m Sprint (sec)	5.74±0.32	5.68±0.33	5.78±0.21	< 0.05
Agility (sec)	16.62±0.57	16.52±0.79	16.72±0.42	< 0.05

Table 4 Speed and agility performance of the total group according to playing positions (values are mean + SD)

	Goalkeepers (n=8)	Defenders (n=16)	Midfielders (n=19)	Forwards (n=17)	P-value
10m sprint (sec)	1.76±0.11	1.75±0.18	1.76±0.12	1.75±0.11	> 0.05
20m sprint (sec)	3.11±0.21	3.04±0.27	3.09±0.18	3.12±0.21	> 0.05
40m sprint (sec)	5.83±0.24	5.78±0.37	5.86±0.21	5.68±0.19	> 0.05
Agility (sec)	16.78±0.52	16.56±0.68	16.35±0.72	16.77±0.64	> 0.05

Discussion

Height and weight are reportedly determined more by heredity (Malina *et al*., 2004; Bouchard *et al*., 1997) and to some extent by environmental factors and lifestyle. The use of height and weight in talent selection in football is limited, as football players are known to have varying heights and weights, however, it was reported that height and weight of players have a positional advantage (Reilly *et al*., 2000a). Tall and heavy players were noted to feature as goalkeepers and central defenders, while short and light players play as midfielders and forwards (Reilly *et al*., 2000a; Bangsbo, 1994a). When mean height and weight scores found in this study is compared to data of young football players of similar age groups from the literature in other studies, they reflect that players from U15 and U16 compared well with players from China elite under 17 football team studied by Wong and Wong (2009); the Brazilian under 16 football team reported by Pittoli *et al*. (2010) and the Canadian under 16 team reported by Leatt *et al*. (1987). However, it was noted that the height and weight results of young football players in this study are significantly lower to those of young football players from Tunisia and Senegal studied by Chamari (2004) and those of young players from Finland reported by Rahkila and Luthanen (1989), as well as those from Europe reported by Hegerud *et al*. (2001). It was noted that young players from these countries are taller and heavier than those in the current study. In the current study 10m, 20m and 40m sprints were used to assess sprinting abilities of young players. There were statistically significant differences between the U16 and U15 teams in 10m sprints ($P < 0.05$) and 40m sprint ($P < 0.05$) but no significant difference was observed for 20m sprint performance tests ($P > 0.05$).

The results show that U16 players were better performers compared to U15 players. Lack of differences in 20m speed test scores between the U15 and U16 teams is inconsistent with the findings of Valquer *et al*. (1998) who noted that short sprint bouts of less than 30m can best distinguish performance in football because they resemble the actual sprints in a football match. When comparing different playing positions, the current study found that there were no significant differences between players in all positions of play. Strikers and midfielders were noted to be the fastest, whilst defenders and goalkeepers were the slowest in the 10m and 40m sprints - similar observation to Sporis *et al*. (2011). However, in 20m sprint goalkeepers had similar top scores with strikers. Sporis *et al*. (2011) reported that playing positions do not differ significantly in straight-line sprint tests. However, they noted that attackers displayed better speed, while goalkeepers were the slowest. Speed tests were found to discriminate good performers from lesser performers (Stolen *et al*., 2005; Valquer *et al*., 1998) and speed scores were reported to be good indicators of on-the-field performance for heterogeneous groups (Young *et al*., 2005). The 10m and 40m sprint tests successfully discriminated between U16 and U15 young football players. The findings are consistent with those of Wong *et al*. (2005) who studied Australian junior football players and found differences in sprint time ($P< 0.05$ in 10m; $P< 0.05$ in 40m) between starters and substitutes, Commetti *et al*. (2001) who studied elite and sub-elite French players and Pyne *et al*. (2005) who studied selected and non-selected (from an academy to upper levels of play) Australian junior football players. There are various studies which used different instruments to measure agility (Chaleh-Chaleh *et al*., 2012; Sporis *et al*., 2011; Svensson and Drust, 2005; Buttifant *et al*., 1999; Moreno, 1995). The current study used the Illinois agility test. The test incorporates both the aspect of acceleration and change of direction that characterize the actual running during a football match. U16 players scored statistically significantly better on the agility test compared to the U15 ($P< 0.05$). This shows a difference in performance capabilities between the two groups. When comparing different playing positions, the current study found that there were no statistically significant differences between players in all positions of play ($P > 0.05$). Midfielders were noted to be the agilest group, whilst goalkeepers and forwards were the least agile group. Sporis *et al*. (2011) reported similar findings in a group of elite Serbian under 16 National team football players that they analyzed according to playing positions. They similarly reported no significant differences between players in different playing positions.

Conclusion

The study found out that of all the speed and agility tests assessed, the most discriminatory ones were: sprint speed 20-meter sprints. Height and weight are important in allocating positional roles, but cannot discriminate successfully from less successful performers. The mean weight and height for youth

football players (14-19 years) as reported by various authors range from 49.9±0.4 - 71.3±6.8 kg and 163.9±0.3 - 178.6±6.3 cm, respectively and for adult players range from 72.1±8.0 – 78.4±7.4kg and 177.2±4.5 – 190±6.0 (Joksimović, A. (2017; Pittoli *et al*., 2010; Stolen *et al*., 2005; Chamari *et al.*, 2004; Rahkila and Luthanen, 1989; Leatt, *et al*., 1987). According to Malina *et al*. (2004), the weight and height of a football player are important contributors to functional test performance such as speed, vertical jump, and to football-specific skill performance such as heading, shooting, passing and goalkeeping. Coaches, demonstrators, and experts involved in football should consider the speed and agility tests in the development of football players and that these characteristics can vary according to playing positions, which can be used to predict their future success in football. Results obtained in the testing can also contribute to control of the training process and the proper directing and selection of football players. Finally, this study allowed some normative data for football players to be established and provided a complete speed and agility picture than in earlier studies.

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STRUCTURE OF BOXERS' MORPHOLOGICAL CHARACTERISTICS

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Abstract

Boxing training is essentially a transformation process through which the boxer, as a system, translates from one state to another, in accordance with the requirements needed from the athlete. The subject of research is the structure of boxers' morphological characteristics. From aforementioned subject and problem comes out the aim of this research: to determine the structure of boxers' morphological dimensions. In the field of morphological characteristics, it is expected to obtain four latent dimensions: the longitudinal dimensionality of the skeleton, the transversal dimensionality of the skeleton, the volume and mass of the body, and the subcutaneous fat tissue. The sample of respondents consisted of 100 boxers, aged 15 -18 years, from boxing clubs in Serbia. To assess the morphological characteristics of the respondents, 20 anthropometric variables, selected according to the International Biological Program (IBP), have been applied to cover the four-dimensional space. A canonical correlation analysis was used to process the results of testing boxers' morphological characteristics. The results obtained support the hypothesis (H) that in the area of morphological characteristics, four latent dimensions are expected to be obtained: the longitudinal dimensionality of the skeleton, the transversal dimensionality of the skeleton, the volume and mass of the body, and the subcutaneous fat tissue, which ultimately confirmed the hypothesis.

Keywords*: morphological characteristics, boxers*

Introduction

Boxing is a martial sport discipline in which two participants (boxers), equal in weight, hit one another with the impact surface of their fists during the interval of time called rounds. The competitor, in this discipline, aims to strike the opponent and in this way points, while avoiding the opponent's hits (Kahrović, Muric, 2017).

Success in all sports activities depends on psychosomatic dimensions of personality. For this reason, in order to achieve top sporting results, it is necessary to implement as precise the orientation as possible and then selecting the persons whose structure of psychosomatic characteristics is most suitable for a certain sport orientation.

It is known that high-end sporting results today require a large volume and intensity of exercise. With the aim of optimizing sports training, tests are continually being carried out that contribute to changing this process. This is understandable since the achievements of a man are limited to his genetic potentials. That is why knowledge of psychosomatic dimensions is the most important in boxing.

The achievement of top results in modern sports is increasingly conditioned by applying the latest scientific knowledge in the processes of selecting and directing athletes, programming training controls, program recovery and planning and programming in competitions. Therefore, efficient and cost-effective work on achieving top results depends to a large extent on the systematic collection and use of information and training programs, determining the content, scope and intensity of the activities consisting of training programs, recovery methods, sporting design planning, and planning of appearances in the competition. Therefore, it is up to the experts to find out, among other things, new methods that enable the identification of personality dimensions and their connection, which are responsible for achieving success in sports. This complex activity of the boxer during the fight requires the boxers to be versatile, and in their repertoire they must have adequate combat positions (left-handed, right-handed and frontal) and different tactics for each technique. Also in the fight with different opponents (high, low, opposite attitude - "gard") (Ćirković, 1978; Kuznjecov, 1980; Savić, 1986; Savić, 1996; Chatzilelekas, 1999; Filimonov, 2000; Ćirković, Jovanović , Kasum. (2010)). The training processes last long enough to allow for adaptive changes in the individual functions of the organism (Zahorjević, 1976; Zulić I Milošević, 1987; Popović, 1988; Malacko I Rađo, 2004, Malacko and Popović, 2001). Naturally, before determining the specificity of a particular sport, the general relations of anthropological dimensions should be determined previously (Hošek-Momirović, 1975; Blašković, 1977; Doder, 1998). Boxing

training is essentially a transformation process through which the boxer, as a system, translates from one state to another, and in accordance with the requirements presented to the athlete.The subject of research is the structure of the morphological characteristics of the boxer.From the above subject and problem, the aim of this research is the following: to determine the structure of the anthropometric dimensions of the boxer.

H- In the space of morphological characteristics it is expected to obtain four latent dimensions: longitudinal dimension of the skeleton, transferal dimensionality of the skeleton, volume and mass of the body and subcutaneous fat tissue.

Methods of Research

The population from which the sample was taken for this research can be defined as a boxer population from boxing clubs of Serbia aged 15-18 years. The only sample of respondents consisted of 100 boxers. To assess the morphological characteristics of the subjects, 20 anthropometric variables, selected according to the International Biological Program (IBP), were used to cover the four-dimensional space defined as the longitudinal dimension of the skeleton, the transferal dimensionality of the skeleton, the volume and mass of the body and the subcutaneous fat tissue.

Results of Research with Discussion

Under the morphological characteristics of the anthropological status of a man, a certain system of basic anthropometric latent dimensions is usually understood. Today it is impossible to imagine any more serious planning of any movable activity without knowing the morphological structure, its impact on the given activity, and the impact of this activity on the development of morphological characteristics.

Tab 1. Matrix of main anthropometric variables' components

	FAC1	FAC2	FAC3	FAC4	h^2
AVIS	,845	-,364	,247	,001	.90
ASV	,815	-,291	,152	,014	.77
ADR	,748	-,390	,268	,035	.78
ADN	,774	-,393	,330	,019	.86
ARR	,868	-,381	,170	,007	.92
AŠR	,816	-,088	-,084	,113	.69
AŠK	,811	-,082	,059	,085	.67
ADRZ	,750	-,331	-,199	-.109	.72
AŠŠ	,663	-,302	-,194	-,307	.66
ATDGK	,845	,152	-,213	-,073	.78
AMAS	,189	,013	-,517	,491	.54
ASOGK	,867	,127	-,303	,043	.86
AONADL	,857	,243	-,285	,025	.87
AOPODL	,864	,112	-,351	,006	.88
AONATK	,571	,358	,005	,113	.46
AKNN	,561	,630	,173	-,165	.76
AKNL	,672	,599	,004	-,038	.81
AKNT	-,015	-,022	,217	,766	.63
AKNPAZ	,500	,470	,361	,191	.63
AKNPOT	,500	,630	,340	-,124	.77
Characteristic roots	10.18	2.49	1.31	1.05	
%	50.94	12.48	6.56	5.28	
Cumulative %	50.94	63.43	69.99	75.28	

Morphological characteristics and somatotypic characteristics have long attracted the attention of many researchers from the need to determine the principles of development in general, and especially the organism of the athlete, and also to determine the contribution of these characteristics in the realization of certain motor skills. The starting matrix for determining the structure for component analysis is a complete intercorelation matrix. From the obtained intercorella matrix obtained using the component analysis, 75.28% of the variability of the applied system of variables was explained. With the use of the GK criteria, four main components were obtained whose characteristic roots fulfill the set criteria (Table 1).

The first major component with the characteristic root 10.18 and a 50.94% variant is explained by all variables of longitudinal, transversal and circular dimensionality, as well as two variables for assessing adiposity of the back and armpit of boxers (AKNL and AKNPAZ). Based on the high correlations that the mentioned variables have with the first major component, it can be safely assumed that it acts as a general factor for the growth and development of small boxers.

The other main component explains a total of 12.48% of the total variance. It represents a dual factor of the measure of the subcutaneous fat tissue of the upper arm (ANN) and the subcutaneous fat tissue of the lower leg (AKNPOT), which can be concluded that this ballast tissue represents a significant but not the dominant characteristic of young selected boxers.

The third major component also represents a single body weight factor (AMAS) and the fourth is also a single factor of the abdominal skin complex (AKNT).

Tab. 2. Matrix of anthropometric variables' set

	OBL1	OBL2	OBL3	OBL4
AVIS	,978	,020	,087	,047
ASV	,856	,054	-,007	,017
ADR	,944	-,038	,110	,097
ADN	,991	-,012	,171	,108
ARR	,974	-,011	,011	,016
AŠR	,585	,181	-,293	-,004
AŠK	,639	,230	-,148	,036
ADRZ	,691	-,106	-,244	-,249
AŠŠ	,610	-,096	-,121	-,419
ATDGK	,348	,405	-,341	-,237
AMAS	-,109	-,097	-,767	,192
ASOGK	,344	,355	-,486	-,175
AONADL	,249	,474	-,468	-,183
AOPODL	,334	,328	-,507	-,230
AONATK	,089	,562	-,204	,051
AKNN	-,071	,896	,071	-,127
AKNL	-,043	,849	-,169	-,098
AKNT	,108	-,009	-,199	,794
AKNPAZ	,105	,748	,083	,289
AKNPOT	-,038	,919	,213	-,007

The size of the utility for all variables is satisfactory. In order to obtain the parsimony structure, in order to simplify this clear structure even further, the obtained initial coordinate system was transformed into a cosugial oblimin position, after which the same number of factors remained. Because the applied transformation method yields a total of three matrices, a matrix of parallel projections of factors to factors (Table 2), a matrix of orthogonal projections of factor variables (Table 3), and a matrix of intercorelation of the obtained factors (Table 4), all three matrices are interpreted simultaneously.

The first oblimin factor of the largest projection has variants of longitudinal and transversal dimensionality. It can be undoubtedly interpreted as a general factor for the growth of skeletons of young selected boxers.

The other oblimin factor is defined by variables for assessing adipose tissue of young boxers. The largest saturation of this factor is provided by the variables of the skin kit of the lower leg (AKNPOT), the skin set of the upper arm (AKNN), the leather backbone (AKNL), the skin armpit (AKNPAZ) and the one variable for assessing the circular dimensionality of the skeleton circumference circumference (AONAT). This is a factor that is not generated by the multi-year training process, because the sample of respondents is young boxers but is the result of endogenous impact. This factor can be defined as a factor of subcutaneous fat tissue or endomorphism.

The third oblimin factor represents the factor of volume and body weight, i.e. variables that play a significant role in the percentage of the total body mass.

The fourth oblimin factor is the single factor of the skin of the abdomen, and this is certainly a product of hyperfactorization.

Tab. 3. Matrix of anthropometric variables' structure

	OBL1	OBL2	OBL3	OBL4
AVIS	,948	,398	-,251	-,124
ASV	,877	,407	-,314	-,145
ADR	,873	,315	-,198	-,060
ADN	,907	,345	-,159	-,053
ARR	,963	,386	-,321	-,158
AŠR	,762	,492	-,539	-,159
AŠK	,779	,524	-,420	-,119
ADRZ	,777	,263	-,483	-,387
AŠŠ	,688	,229	-,351	-,531
ATDGK	,676	,654	-,580	-,378
AMAS	,082	,019	-,687	,146
ASOGK	,691	,630	-,706	-,324
AONADL	,640	,707	-,685	-,326
AOPODL	,687	,610	-,723	-,376
AONATK	,383	,642	-,362	-,045
AKNN	,297	,863	-,128	-,203
AKNL	,383	,882	-,364	-,198
AKNT	,029	-,003	-,155	,756
AKNPAZ	,332	,741	-,101	,198
AKNPOT	,268	,854	,009	-,078

Statistically significant correlations between isolated factors exist between the first three factors, which is logical, because young selected boxers have a somewhat higher accumulation of subcutaneous fat tissue and volumes that are correlated with the general growth factor.

Tab.4 Oblimin factor inter-correlations

Component	OBL1	OBL2	OBL3	OBL4
OBL1	1,000	,413	-,346	-,181
OBL2	,413	1,000	-,236	-,107
OBL3	-,346	-,236	1,000	,099
OBL4	-,181	-,107	,099	1,000

Some morphological characteristics of boxers have a significant degree of connection with success in combat. In a series of research it has been found that high boxers and boxers with longer arms and legs have a certain advantage over lower boxers or boxers with short extremities, that boxers with a large amount of fat tissue are inferior to those of the same weight, but without this unnecessary ballast, boxers wider fist easier to hit the target and apply hard shots (due to the return forces and glove depreciation), boxers with larger bands are usually stronger and easier to hit the body. The magnitude of the impact of specific morphological material on the success of combat should be determined by determining the degree of interconnection of the complete battery of anthropometric tests with success in combat. It can be expected that the length of the arm, the legs, the feet, the bicameral range, the weight, the circumference of the chest, upper arms, forearms and thighs, the width of the fist and the feet, the diameter of the wrist, and the skin folds on the stomach and back in significant relationships with the success in combat than other measures. It follows from all that follows that a structure corresponding to the boxer's structure is obtained in the morphological space.

Conclusion

The research was conducted with the aim of determining the structure of anthropometric dimensions in active boxing competitors. The results of the study have shown that some morphological characteristics of the boxers have a considerable degree of connection with success in the box. High boxers and boxers with longer arms and legs have a particular advantage over lower boxers, and boxers with a large amount of fat tissue are inferior to those of the same weight. On the basis of the obtained results we conclude that the length of the arm, legs, feet, bi-chromium range, weight, volume of the chest, upper arms, forearms and thighs, the width of the fist and feet, the diameter of the wrist, and the skin folds on the stomach and back in significant relationships with success in the fight.

Statistically significant correlations between isolated factors exist between the first three factors, which is logical, because young selected boxers have a somewhat higher accumulation of subcutaneous fat tissue and volumes that are correlated with the general growth factor.

It follows from all that a structure corresponding to the boxer's structure is obtained in the morphological space. The results thus obtained support the hypothesis (H) that in the space of morphological characteristics it is expected to obtain four latent dimensions: the longitudinal dimension of the skeleton, the transferal dimensionality of the skeleton, the volume and mass of the body and the subcutaneous fat tissue. Well, on the basis of all this, the hypothesis is confirmed.

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SELF-CONFIDENCE ASPECTS OF YOUNG PEOPLE ENGAGED IN SPORTS ACTIVITIES

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Abstract

Physical and sports activities play an important role in the young people's lives as they represent a good way to reduce negative phenomena and possible psychological problems. On the one hand, bearing in mind the importance of sports activities, and on the other, today's preoccupation of young people with numerous contents that do not have physical activity, it was important to look at the differences in the self-esteem aspects (self-esteem and self-efficacy) of young people engaged in sports activities as well as those who are not. Thus, the aim of this paper was to examine the level of self-confidence of young people involved in sports activities. Furthermore, based on the aspects of self-esteem and self-efficacy, to identify the differences between youth who are engaged in sports and those who do not practice sports activities in order to raise awareness of the importance of sports activities for self-confidence and their life quality. The research included 155 youngsters ages 16 to 19, where 72 were athletes and 83 were non - sportsters. The results showed that young people engaged in sports activities have a higher level of self-confidence; there are no significant differences in this pattern between athletes and non - sportsters, although those engaged in sports activities achieve higher results. There is an important link between self-esteem and self-efficacy in athletes, and there is no significant difference in aspects of self-confidence with regard to the age of young people engaged in sports activities.

Keywords: *self-confidence, self-esteem, self-efficacy, sports activities, young people*

Introduction

In adolescence, most young people build respect around their physical appearance, where girls tend to lose weight and boys strive for muscularity (Lacković - Grgin, 2000). Physical activity and sports can improve strength and endurance, beautify the body, reduce body weight, take control of one's own life, which brings self-confidence, changes attitude about yourself and your own appearance. If they practice sport and other forms of physical activity, young people will be able to achieve many advantages. You can enhance moderate exercise by cognitive and conative characteristics that determine the values of youth behavior, and the ability to adapt to today's pace of life. According to Galić (2003), organized sports and other physical activities enable young people: gaining self-confidence, getting acquainted and getting closer with their peers, confirming their abilities, achieving social recognition, etc. Despite the fact that a physically active lifestyle is desirable, because it reduces the risk of developing multiple diseases, and on the other hand relieves stress and depression, improves mood, self-esteem and life satisfaction, the inadequate number of high school students are involved in sports activities (Majurec and Brlas, 2001, according to Prskalo, 2007). Namely, the emphasis of successful mastering of sports knowledge and skills is that it further contributes to the acquisition of perseverance habits, acceptance of the sport activity and function in the group. Young people's sports activities can still enable satisfaction of a range of social and emotional needs.

Aforementioned indicates the importance of self-confidence among young people as an aspect of self-image that contains cognitive and affective components (Tubić, 2005). It helps in the formation of positive emotions, maintaining concentration, setting goals, overcoming efforts, structuring the game strategy, decisive psychological moments. Sports psychologists define self-confidence as a belief that the desired action can be successfully accomplished (Bajraktarević, 2004). Self-confidence is a security in itself and its capabilities, an assessment of its ability to be successful in carrying out tasks. The experience of young athletes should be positive in order to develop self-confidence. "Sports programs should emphasize the development of the experience of one's own values, self-esteem and independence and place victory second" (Cox, 2005: 29).

As stated, self-confidence encompasses the cognitive and affective personality component. Allegedly, self-esteem is more concerned with the aspect of evaluating the image of oneself, that is, its affective component, and trust in one's own abilities / self-efficacy expands the cognitive component. A positive attitude about yourself is the first step in developing all other psychological skills. There are many definitions of self-esteem, so Rosenberg (1965) defines self-esteem as a positive or negative attitude about self while self-efficacy is a person's conviction in his own ability to perform certain behavior (Bandura, 1977, according to Tubić, 2005). Self-confidence greatly contributes to sporting success. Research shows that it is the most important factor of distinguishing a successful from a less successful athlete. Athletes can have the talent and all the necessary abilities maximally developed, but if they do not believe in them, they will not be able to use them. One of the reasons is that psychological skills, among which the most important is the security in their ability and the ability to use them at a critical moment, are inadequately developed. The results of Klomsten and associates (2004) indicate that physical exercise and sports can contribute to the development of self. Relationships with physical activity and psychological functioning indicate that these are reciprocal interactive processes.

Participation in physical activities improves mental health. Participation in sports activities involves many processes and can have a strong impact on the formation and changes in the adolescents' self-esteem. Athletic performance and self-efficacy support one another (Gašić-Pavišić et al., 2006). Research (Tubić, 2010) shows that athletes differ from non-sportsters in emotional stability, self-confidence, persistence, responsibility, the need for domination. The research (DuBoisetal, 2000) points to the difference between the overall self-assessment and self-evaluation in the characteristic areas.

There are papers that suggest (Biddle, 2000; Fox, 2000) dealing with moderate physical activity improves emotional functioning, improves self-esteem and physical self-concept, and increases self-satisfaction. In the research Gašić-Pavišić et al. (2006), found that dealing with sports affects the general self-esteem and locus control of adolescents through social feedback and social evaluation of sports achievements and physical fitness. A useful conceptual model of self-esteem was formulated by Albert Bandura (1977, 1986), and he combined the concept of trust and expectation. Self-confidence refers to the perception of one's ability to complete a task related to a given situation. When it comes to sports and motor control Bandurin theory is mostly used. According to his theory, self-confidence derives from four main sources of information: successes, model observation, verbal engagement and induced emotions. Successes provides the best basis for self-confidence, if the experience is successful it will raise the level of self-confidence. It is necessary to know that the expectation of failure leads to a real failure, which then aggravates the image of itself and its abilities, and increases the expectations of future failures. Lack of self-confidence often raises concern about how to play or how others will think that he is playing. Preoccupation by avoiding disagreements will weaken concentration and make it easier to draw attention. Confidence also affects the goals. People who are not trustworthy set their own easy goals and do not go to their extreme boundaries. Trusting yourself and your abilities helps dealing with errors effectively and continue to strive for success.

Methodological framework of research

Sample and population

The research included young people engaged in sports activities and young people who are not. The sample consisted of 155 boys, divided into two sub-sections of athletes (72) and non-sportsmen (83). The age ranges from 16 to 19.

Instruments and statistical methods

The questionnaires used are self-assessment (Rosenberg, 1965) and self-efficacy (Ivanov, Penezić, 1998), and a sociodemographic questionnaire adapted for this research. Descriptive statistical methods, T-test, F-test, Pirson correlation coefficient were statistical methods used in the study.

Problem, goals and hypotheses

The main problem of the research is to examine the level of self-confidence of young people engaged in sports as well as differences in relation to involvement in sports activities. The following goals were derived from the problem:

1. Examine the level of self-confidence (self-esteem and self-efficacy) of young people involved in sports activities;\2. Determine whether there is a statistically significant difference between those involved in sports activities and young people who are not involved;
3. To determine the connection of self-esteem and self-efficacy among young people practicing sports activities;
4. Explore the differences in self-esteem and self-efficacy with regard to the age of young people involved in sports activities.

The following hypotheses are set in accordance with the objectives:

There is an assumption that young people have a higher level of self-esteem and self-efficacy as an aspect of self-confidence.

A significant difference exists between those who are and who are not engaged in sports activities.

There is a statistically significant link between self-esteem and self-efficacy among young people involved in sports activities.

A difference in self-esteem and self - efficiency with respect to the age of young people who are engaged in sports exists.

Results

Self-esteem and self-efficacy

The first task was to examine the level of self-esteem and self-efficacy among young people that form important aspects of self-confidence of young people involved in sports activities. Therefore, it was necessary to gain insight into the descriptive statistical parameters of the aspects of self-confidence shown in Table 1.

Table 1: Descriptive statistical parameters for self-confidence aspects

	N	Minim	Maxim	Mean	SD	Skewness	Kurtosis
Self.esteem	72	9.00	40.00	282.169	603.455	-.605	-.059
Self-efficacy	72	16.00	50.00	393.333	755.077	-.971	.760

The arithmetic mean of the self-assessment is (M = 28.21, SD = 6.03) on self-esteem questionnaire while on the self-efficacy (M = 39.33 SD = 7.55), the results confirm that young people show higher values on questionnaires that can move up to 40 and 50 on the self-efficacy scale. Asymmetric data (SK = - .605; SK = -. 971) indicate a negative asymmetry, indicating that most of the results are in the larger scores zone. The above shows that young people who play sports show a higher level of self-confidence.

Self-esteem and self-efficacy differences among young people engaged in sports activities and also non athletes

The second goal is to determine the differences between youngsters who are engaged in sports activities and those who are not. Table 2 shows the results.

Table 2: Testing the results significance

	Sport activities	N	Mean	SD	T	p
Self-esteem	No	83	278.056	710.215	0.390	0.692
	Yes	72	282.169	603.455		
Self-efficacy	No	83	386.988	633.753	-0.569	0.57
	Yes	72	393.333	755.077		

The results show that young people engaged in sports activities have higher average scores on the self-esteem and self-efficacy scale than those who do not practice sports, but this difference has not been statistically significant (t = .390; p> .005; t = -.569, p> .005;).

Self-esteem and self-efficacy connection among young people engaged in sports activities
In order to understand the connection between self-esteem and self-efficacy, table 3 shows Pearsin's correlation coefficient.

Table 3: Self-esteem and self-efficacy connection

		Self-esteem	Self-efficacy
Self-esteem	Pearson Correlation	1	.372**
	Sig. (2-tailed)		.000
	N	72	72
Self-efficacy	Pearson Correlation	.372**	1
	Sig. (2-tailed)	.000	
	N	72	72

**. Correlation is significant at the 0.01 level (2-tailed).

The results show that there is a significant link between self-esteem and self-efficacy among young people engaged in sports ($r = .372$, $p < .01$)

Self-esteem and self-efficacy age differences of young people engaged in sports activities
The fourth goal relates to the examination of respect and self-efficacy regarding the age of athletes. In order to review the results it was necessary to display the descriptive parameters and to test the significance of the results.

Table 4: Descriptive parameters on the self-esteem scale and significance testing

Age	N	Mean	SD	F	p
16 years	14	261.429	649.175	1.297	.288
17 years	18	275,00	582.237		
18 years	21	263.333	815.621		
19 years	19	306.316	676.766		

In the following table, the results show the self-efficacy of young people engaged in sports.

Table 5: Descriptive parameters on the scale of self-efficacy and significance testing

Age	N	Mean	SD	F	p
16 years	14	365.714	63.471	.674	.573
17 years	18	42.5	568.331		
18 years	21	40.2	808.173		
19 years	19	397.895	821.637		

The results show that age self-esteem rises with age and the older have somewhat greater efficacy. The data in the tables show that no statistically significant differences have been found in regard to the age of young people engaged in sports on a scale of frustration ($F = 1.297$, $p > .05$) as well as on the scale of self-efficacy ($F = .674$, $p > .05$).

Conclusion and discussion

Quality sports programs are needed in order to engage as many young people as possible in sports activities, , which will enable young people to grow and develop properly, strengthen their self-esteem, engage them in the active sporting system. Based on the results obtained, young people involved in sports activities achieve higher results in the aspects of self-confidence, which other results indicate (Biddle, 2000; Fox, 2000, Gašić-Pavišić et al., 2006). There is no difference in the aspects of self-confidence, and one of the reasons is a smaller sample in the research of those engaged in sports activities. Regarding the

difference in confidence between athletes and non-sportsmen, the results are not in accordance with other studies (Tubić, 2010, DuBoisetal., 2000), because the majority indicates a significant difference in the athletes benefit. Other possible causes of the results and non-standard difference in confidence between athletes and non-sportsters are that there are certain conflicts in adolescence, and therefore descriptions are more unstable. These conflicts constitute the most important source of identity crisis, due to the need to find a balanced image of themselves and the demands of the social environment. The level and variability of self-esteem and self-efficacy can provide result causes. Researchers say that self-esteem changes from day to day or even hour to hour (Larsen-Buss, 2008). According to Ivanov (2007), since the assessment of self-efficacy refers to an assessment of what one can do regardless of the real skills that he possesses, it is possible that the very ambition of young people in this period has contributed to the degree of self-efficacy shown in this research. There was a significant correlation between self-esteem and self-efficacy among young people engaged in sports activities and thus confirmed the third hypothesis. The results obtained in this study on the connection between self-esteem and self-efficacy is in accordance with other research. There was no difference in self-esteem and self-efficacy with regard to age. It can be stated that the tendency of young people of all ages to be positive about themselves and a have better appreciation of themselves is a vindication.

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INFLUENCE OF SOCIO-DEMOGRAPHIC CHARACTERISTICS ON THE DEVIANT BEHAVIOR OF THE GIRLS FROM MACEDONIAN AND ALBANIAN NATIONALITY FROM THE REGION OF KUMANOVO-LIPKOVO

Isni Aliji

Abstract

The survey was conducted on a sample of 84 female respondents from different ethnic backgrounds in order to be determined the influence of nationality and the socio-demographic characteristics of the deviant behavior of the girls from the Macedonian and Albanian nationalities from the Kumanovo-Lipkovo region. Besides the basic goal, the following specific goals arise: to determine which is the motive for deviant behavior among the girls from the Macedonian and Albanian nationality; to determine the influence of the family on the deviant behavior of the girls from the Macedonian and Albanian nationalities; To determine in which areas (rural or urban areas) there are more deviant behaviors among girls from Macedonian and Albanian national backgrounds. In order to determine the set goals, a questionnaire with 21 questions was applied, which give answers of the socio-demographic and individual characteristics of the respondents. Based on the obtained results, it is noted that the relations among family members, the way they solve family problems, and the opinion of other ethnic communities by family members, have a significant impact on the behavior of girls from Macedonian and Albanian nationality. In the families where there is a relaxed atmosphere, there are warm relationships with mutual respect and acception for each member's opinion. Macedonian girls from towns go out to different places (restaurants, cafes, parks, etc.), while Albanian girls prefer to go out to restaurants. Consuming alcohol is only present to the Macedonian girls, which certainly restricts one of the prerequisites for their deviant behavior, if it is taken in larger quantities. Unlike them, alcohol consumption among Albanian girls is not present at all. When it comes to influence, in the opinion of the friends, it can be concluded that young people at this time period of life can easily fall under the influence and opinion of others. Teachers of physical education have the major impact on deviant behavior among young girls from both nationalities.

Key words: *multiethnic, deviant, behavior, environment*

Introduction

In the past period, in the world and in our country, there were happened numerous incidents on the sports fields, in which were involved many young people. This is especially evident in multiethnic environments such as in the municipalities of Kumanovo and Lipkovo.

Deviant behavior can be manifested through verbal insults or through excessive use of physical force in order to inflict mental or physical injuries on the opponent or rival. During the matches, the deviant behavior of athletes is manifested through disrespecting of the referee's rules of the game or disrespecting the personality of each actor on the terrain. The most common causes of deviant behavior among young people are the prejudices that exist for the other community, club, minority, religion, etc. Frustration dates from childhood of the individual, from inadequate home education, from the negative influence of the environment, and so on. This issue has been studied by several authors, such as:

Stojanoski N., Kozarev A., Banachikj Lj., Petrovic N., Manojlovic N., Sebastian M., Anastasovski I., Nanev L. etc.

Subject and objective of the research

Subject of study in our research is the deviant behavior of the girls from the Macedonian and Albanian ethnicity from the Kumanovo-Lipkovo region, depending on the nationality.

On the basis of the assigned subject, arises the main goal of the research, which is aimed at determining the influence of the nationality and the socio-demographic characteristics on the deviant behavior among the girls from the Macedonian and Albanian nationalities from the Kumanovo-Lipkovo region.

On the basis of the basic goal, there arise the following specific goals: to be determined which is the motive for the deviant behavior among the girls from the Macedonian and Albanian nationalities; to be determined the influence of the families on the deviant behavior of the girls from the Macedonian and Albanian nationalities; to be determined in which environments (rural or urban areas) is more predominantly deviant behavior of girls from Macedonian and Albanian nationality.

Method of Work

Sample of respondents and variables

The survey was conducted on a sample of 84 respondents of which 40 of them
are with Macedonian and 44 with Albanian nationality. In the survey were applied in total 21 variables, which are listed in details in the questionnaire.

SURVEY QUESTIONNAIRE

SOCIO-DEMOGRAPHIC DATA FOR THE RESPONDENT

1. Gender? 2. Age? 3. The current status of the respondent? 4. Ethnicity?
5. Place of residence (specify the exact place of residence)?

INDIVIDUAL CHARACTERISTICS OF THE RESPONDENT

1. How many members have you in your family?
2. How many members of your family are employed?
3. What is the total monthly income in your family ?
4. Do you live in?
5. What are the relationship between family members?
6. In a dispute between you and your family members you react?
7. Do you have a circle of friends?
8. How often do you go out and hang out with your comrades / friends?
9. At what age are your comrades / friends?
10. Whether the opinion and behavior of your comrades / friends affects you?
11. Where do you get out mostly?
12. When you go out, do you consume alcohol?
13. If you consume alcohol, how often do you do that?
14. Does your teacher have a negative attitude towards other nationalities in your school?
15. Does the physical education teacher schedule sports competitions with teams of other nationalities?
16. Are the sports teams from your school with a mixed up character, with players of different nationalities?
17. Does your family speak, with an hatred speech for any other nationality?
18. Have you had a conflicting situation with someone of another nationality?
19. Do your friends have a negative attitude towards members of other nationalities?
20. Do you think that the knowledge of a language of another nationality will reduce?
21. With which members of other nationalities you have the best relationships?

Methods for data processing

For all applied variables are calculated: Percentage representation (%); Frequency of responses; The significance of differences in responses is determined by applying the nonparametric h^2- test.

Results and Discussion

The interpretation of the results for all studied variables will be presented in the text below.

From the inspection of Table 1, it can be noticed that among the majority of families of Macedonian girls, there are 4 members (36.6%) and 5 members (36.6%). Families with 7 members, there are only 7.3%, and families over 7 members have not been identified at all. From the table it can be noticed that among the Albanian girls most families have 5 members (33.3%), but there are families with 11 members (1,2%).

From the inspection of Table 2, the percentage answers for the number of employed family members are presented. It can be noticed that there are families in which no one of the members is employed. For

Macedonian families, this percentage number is 4.9%, and for Albanian families, it is 23.3%. To the 58.1% of Macedonian families only one person is employed, while in the Albanian families the percentage of one person who is employed is 42.9%.

From the inspection of Table 3, are presented the answers of the question about the amount of monthly income in the family. It can be noticed that there are families that are without regular monthly incomes, in the Macedonian families the percentage is 2.4%, while in Albanian families the percentage is 11.6%. Most families have monthly incomes over 30 000 denars, for Macedonian families this percentage is 43.9%, while for Albanian families it is 18.6%. None of the Macedonian families receives social assistance while in Albanian families the percentage is 14%

From the answers to the question 4, it can be noticed that 95% of the Macedonian respondents live with their parents, while 97.7% of the Albanian respondents are living with their parents. Such high percentages are expected, taking into account the age of the respondents. 2.4% or 2.3% of Macedonian and Albanian girls live in their own home

From the answers to the question, the responses of the respondents on the relations of family members were presented. It can be noticed that 73% of the Macedonian girls have a relaxed relationship in the family, while for Albanians this percentage is higher and amounts to 88%. In both groups of respondents, we do not notice tense relations between members of the family. From the value of the h^2-test it can be seen that there are no statistically significant differences (h^2=3.816; sig=.148) between the Macedonians and the Albanians in this variable.

From the answers to question 6, it can be noticed that 61% of the Macedonian respondents calmly say their opinion, while 93% of the Albanian respondents say calmly their opinion. 14. 6% of the Macedonian respondents react impulsively, while from the Albanians 0%, and 24% from the Macedonians react with offensive words. 7% of the Albanian respondents react with insulting words in a dispute with family members.

From the value of h^2-test it can be noticed that, there are statistically significant differences (h^2=13,191; sig=.oo1) between the Macedonians and the Albanians regarding in the disputes among the members of the family. It can be noticed that the Macedonians are more impulsive and more responsive in situations where there is a misunderstanding between family members.

From the inspection of Table 7, it can be noticed that 100% of the Macedonian and Albanian respondents have a wide circle of friends. From the value of h^2-test it can be seen that there are no statistical differences between the Macedonians and the Albanians regarding the relation of this variable.

From the answers to the question 8, it can be noticed that regarding at going out, 7,3% of the Macedonians responded, that they go out rarely, almost never, and that they hang out rarely responded 7,3% that they go out from time to time responded 14, 6%, that go out often responded 26%, and that they go out constantly responded 43%. The Albanian respondents who go out rarely is 14%, and those who go out very rarely is 18%. The percentage of respondants who hang out from time to time is 39%, 18.6% of Albanians say that they go out very often and only 9.3% say that they go out constantly. From the obtained results it can be concluded that the percentage of going out to Macedonians is higher than to Albanians, which is confirmed with the value of the h2- test which shows that there is a statistically significant difference (h^2=17,589; sig=.oo1) between the Macedonians and the Albanians in this variable.

From the answers to question 9, the results of the variable related to the age of friends are presented. It can be noticed that 58% of the Macedonians have friends of the same age, only 2.4% responded that their friends are younger, and that their friends are older than them responded 7.3%, that their friends are from different ages responded 31,7% of the respondents, while to the Albanians 88.4% of the respondents said that their friends are at the same age, while the friends that are younger than them responded 2.3%, that the friends are older than them responded 2.3%, that they have friends from all ages responded 19% of the Albanian respondents. From the value of the h2- test, it can be seen that there are statistically significant differences (h^2=10,370; sig=.016) between the Macedonians and the Albanians in relation to the age of the friends

From the answers to the question 10, it can be noticed that among 14.6% of Macedonian respondents, the opinion of the others do not influence at all, 29% stated that there is not any particular influence, and that there is influence, but 41% of the respondents say it is not a prejuridical, and 2.4% of them stated that there is a strong influence on them, while 12.2% of the Macedonian respondents said that they fully accept the opinion and behavior of their comrades / friends. Among the Albanian respondents, 9.3% of

the respondents say that the opinion of the other people did not have any influence at all, 25.6% of the respondents say that there were not any particular influences, 32% of the Albanian respondents say that there is an influence but it is not prejuridical, and that the opinion and behavior of my comrades I accept completely said 6% of the Albanian respondents. From the value of the h2- test it can be seen that there is a statistically significant difference in the responses (h^2=22,473; sig=.000),the Macedonians are more influenced by opinion of their comrades / friends.

From the answers to question 11, the answers to the question about where the respondents usually go out are presented. It can be noticed that 56.1% of the Macedonian respondents go out everywhere, 17.1% go out in the park, and 14.6% say that they go out to the restaurant. 60.5% of the Albanian respondents, said that they go out in a restaurant, and 18.6% in the park and in a smaller percentage in other places in cafes, cultural institutions. From the obtained results we can conclude that there are statistically significant differences between the respondents Macedonians and Albanians in which they most often go out, which is confirmed with the value of the h2 -test (h^2=32,463; sig=.000). The Macedonian respondents are more likely to appear in all places, and most of the Albanians say that they usually go out to restaurants.

From the responses to question 12, it can be noticed that 41.5% of the Macedonian respondents when they go out they consume alcohol, and 58.5% of the Macedonian respondents say that when they go out they do not consume alcohol. 100% of the Albanians responders say that when they go out they do not consume alcohol. The reason for this behavior of the Albanian respondents is from religious motives. From the value of the h2 -test it can be seen that there are statistically significant differences (h^2=22,353; sig=.000) between the Macedonians and the Albanians, while the Macedonians consume alcohol, and the Albanians do not consume alcohol at all.

From the answers to Question 13, it can be noticed that 41.5% of the Macedonian respondents say that they do not consume alcohol, 22% say that when they go out only on special occasions they consume alcohol, 22% say that they rarely consume alcohol, 2,4% once a month, 9.8% of the Macedonian respondents reported that they consume alcohol once a week, and 2.4% of the Macedonian respondents declared that they daily consume alcohol. 100% of the Albanian respondents said that they do not drink alcohol at any times. The reason for this, in addition of religious beliefs, should be sought in the environment in which they live, most of them originate from a rural environment. From the value of the h2- test it can be seen that there are statistically significant differences (h^2=35,239; sig=.000) between the Macedonians and the Albanians, because among the Albanians they all stated that they do not consume alcohol, and among the Macedonians 58, 5% consume alcohol on different occasions.

From the responses to question 14, it can be noticed that the value of the h2- test (h^2=2.427; sig=.119) shows that there are no statistically significant differences in this variable between the Macedonians and the Albanians

From the responses to question 15, the results for the variable referring to physical education teachers are presented. From the value of the h2-test (h^2=1.147; sig=.284), it can be seen that there are no statistically significant differences in this variable between the Macedonians and the Albanians.

From the answers to question 16, it can be noticed that 46.3% of the Macedonian respondents stated that the teams from their schools are with mixed compositions, and 53.7% say that their sports teams are not with mixed compositions. Among the Albanians respondents, 29.8% say that the sports teams in their school are with mixed compositions, and 59% of the Albanian respondents say that the sports teams in their schools are not with mixed composition. It should be noticed that in those schools where more nationalities are teaching together, teams are mixed in compositions. Our research was carried out also in schools where the students are from one ethnic community. From the value of the h2-test it can be noticed that there are statistically significant differences (h^2=10,532 ; sig=.001) between the Macedonians and the Albanians, at the same time the Macedonians responded in a greater percentage, that the sports teams in their schools are in a mixed composition.

From the answers to question 17, it can be noticed that the majority of the Macedonian respondents in 80.5% declared that in their family is not spoken with an hatred speech for another nationality, and 19.5% claimed that they speak with an hatred speech for another nationality. 11.6% of the Albanian respondents stated that their families do not speak with an hatred speech for another nationality, and 86% of the Albanian respondents state that it is spoken but very rarely. From the value of the h2- test it can be seen that there is a statistically significant difference in the given answers (h^2=40, 296; sig=.000), It can

be noticed that hatred speech towards other nationalities is created under the influence of the family.

From the inspection of Table 18, it can be noticed that 56.1% of the Macedonians stated that they have never had a conflicting situation with persons of another nationality, that 39% of the respondents had a say in their life, and 4.9% of them say that they have had just once. 88% of the Albanians stated that they have never had a conflicting situation with persons of another nationality, that they once had such a situation declared 7.0%, and that they had more than once conflicting situations with another nationality, declare 4.8%. From the value of the h2 -test it can be seen that there are statistically significant differences (h^2=12,543; sig=.002) between Macedonian and Albanian girls.

From the answers to question 19, it can be seen that 65.9% of the Macedonian respondents say that, their friends with whom they have friendship do not have any negative attitude towards other nationalities, that they have a negative attitude towards a nationality 22.0% of the respondents have declared, that they have a negative attitude towards some nationalities 22.0% of the respondents have declared. To the Albanian girls, 7% of the respondents declared that their partners have not any negative attitude towards the members of other ethnic communities, 62.8% said that their friends have a negative attitude towards a nationality, that their friends have a negative attitude towards some of the other nationalities declared 30% of the respondents of the Albanian nationality. From the value of the h2- test it can be seen that there are statistically significant differences (h^2=31,726; sig=.000) between Macedonian and Albanian girls, while Albanians have a negative attitude towards other nationalities.

From the answers to question 20, it can be noticed that 17.1% of the Macedonian respondents think that the knowledge of the language of another nationality would reduce impatience on international basis, that impatience will not be reduced on an international basis if the language of another nationality is known reported 26.8%, while 56.1% said that they did not know. 60.5% of the Albanian girls say that the knowledge of a language of another nationality reduces the impatience on a national basis, 25.6% of respondents say that it can not reduce it, and 14% of the respondents said that they did not know. From the value of the h2- test it can be seen that there are statistically significant differences (h^2=2o.869; sig=.000), also Albanian girls say in a larger percentage that the knowledge of the language of another nationality would reduce impatience on an international basis. Such thinking is based on the fact that most Albanians know yet another language of the other nationalities that live in macedonia, the most common languages are Macedonian and Turkish.

From the responses to question 21, it can be noticed that, in the question of which other nationality you have the best relations, 80.5% of the girls of Macedonian nationality said that with the Serbs, they have the best relations with the Albanians, 2.4% with the Roma 2.4 %, with Turks 2.4%. Girls from Albanian nationality stated that the best relations with another nationality that they have, are those with the Macedonians in percentage of 87.3%, and the Albanians girls have declared that in 8.7% they have the best relations with Turkish nationality. From the value of the h2-test it can be seen that there are statistically significant differences (h^2=60.226; sig=.000), in the given answers between the Macedonians and the Albanians.

Conclusion

Based on the obtained results and the interpretation of the same, the following conclusions arise.

Relations between family members, the way they solve family problems, and the opinion of other ethnic communities by family members, have a significant impact on the behavior of the girls of Macedonian and Albanian nationality. In families where there is a relaxed atmosphere, there are warm relationships with mutual respect and respect for each member's opinion. There is no hate speech to other nationalities, and these individuals do not manifest deviant behavior towards girls of other ethnicity.

The place of living has a great influence on the deviant behavior of young girls of Macedonian and Albanian nationality. Macedonian girls from urban environments go out to different places (restaurants, cafes, parks, etc.), while Albanian girls mostly prefer to go out to restaurants. Consuming alcohol is only present to the Macedonian girls, which certainly restricts one of the prerequisites for deviant behavior, if it is taken in larger quantities. Unlike them, alcohol consumption among Albanian girls is not present at all. This is certainly due to religious beliefs and religion that prohibits the consumption of alcoholic drinks.

When it comes to the influence of the opinion of the friends, it can be concluded that young people at this time of life can easily fall under the influence and opinion of others.

Physical education teachers have a major impact on deviant behavior among young girls from both nationalities. With their behavior, opinion and approach, they can greatly contribute to the positive opinion about the members of other ethnic communities. This can be achieved by scheduling matches with other ethnic groups, sports teams which have to be mixed up without any favor of an ethnic community.

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TANDEM TEACHING IN PHYSICAL AND HEALTH EDUCATION CLASSES FROM TEACHER`S PERSPECTIVE

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Abstract

Physical education is integrated part of educational system in Macedonia. Its effectivnes and realization are determined by many factors and teachers are one of those factors. This paper analyses the possibility to influence the effectives of PE teaching process by implementing tandem teaching of generalist teachers and physical education specialist at PE classes. In this process, the opinions of the main involved actors are the most relevant for the effectiveness of suggested model. Therfore, the aim of this study was to investigate the opinions of generalist teachers and PE specialist for implementation of tandem teaching. The research was realized on a sample of 118 teachers, 83 generalist teachers and 35 PE specialist from 15 primary schools in Republic of Macedonia. Specialy designed questioner was applied. The results suggest that both group of teachers supports the idea of tandem teaching but also that additional workshop, seminars and other forms of education are required. The paper emphasizes the benefits from implementation of tandem teaching and also suggest the future steps in the implementation process.

KeyWords*: physical education, teachers, tandem.*

Introduction

Education is one of the most important segments in human lives providing knowledge and experiences that determine the future of each human and each country worldwide. As one of the segments of everyday life, education is closely related and influenced by changes in other segments in everyday life and existence – economical, social and political. These changes results with many educational reforms in different segments of education that should make it more reliable to needs and requirements of the society and everyday living. As integrated part of the educational system, physical education is not exception from this process of reforms and constant changes.

The values and importance of quality physical education are recognized by many international institutions such as UNESCO, United Nations, European Commission. UNESCO recognize physical education as "the most effective means of providing all children and youth with skills, attitude, values, knowledge and understanding for lifelong participation in society" (Quality PE report, 2013: pp 6). Values of physical education that are not only related with physical and motor development but also referring to good health, personal development and social inclusion are recognized and emphasized by the European commission (Euridyce report, 2013). In the White paper of sport (European Commission, 2007a) it is underlined that "time spent in sport, whether in school physical education lessons or extracurricular activities, could result in substantial education and health benefits". These values of physical education are recognized on the national level as well. As underlined in national conception for education of Republic of Macedonia (2007), physical and health education curriculum is realized with different physical education contents and fundamental motor activities that activates the locomotor system and have a positive impact and influence on symmetric growth and proper holistic development of the children, improving their physical and motor abilities, promoting health and active lifestyle. Other specific goals of PHE are determined as: acquisition of system of motor knowledge and skills, efficient and creative functioning, development of social conscience, national and cultural identity, development of conscience for care and protection of health and importance of maintaining healthy environment. These specific aims of PHE are in accordance with the main educational goal: holistic and harmonies development of children according their individual abilities and development characteristics (Conception

for nine-year compulsory education, 2007). More important than only theoretical determinations of the goals of PHE education curriculum is its realization, implementation in practice and effects that this implementation has on children. Regarded this issues, teachers particularly their education, competences and motivation are the key factors for successful implementation of PHE curriculum and realization of PHE process. As emphasized in the report of the Expert Group on Health-Enhancing Physical Activity, (2015) "physical education teachers are key agents for putting physical and sport policies into practice". Putting teachers work in the spotlight as an agents for effectiveness of PHE teaching process, indicates on importance of their work and effects from that work. In these regard, and related with previously indicated processes of constant reforms in the educational system aiming to make it more reliable to the needs of contemporary society, are the last reforms in educational system in Macedonia.

Namely, the current situation in Macedonia related to PHE teaching process and its effectiveness indicates a decrease of quality of its realization. Although there is an evident luck of research data that will justify this decrease of quality of PHE realization, yet is notable and evident in everyday work and practice. Apart from common problems and obstacles that exist in everyday work related with PHE process such as luck of equipment and material facilities, improper designed of certain unions in current curriculum (Popeska, Klincarov, Mitevski & Nikovski, 2017) some of noted problems are also related with teachers education, competences and possibility for constant learning and improvement. In this regard, teachers reported luck of instructions for work for specific thematic unions within the regular curriculum, problems with practical realization and demonstration of certain contents as well lack of opportunities for professional development (Popeska et all, 2017). These results indicate that certain changes are needed in the segment of teachers work and delivery of physical education. In this regard, using the positive experience from some European countries in the first line the experience from Slovenia, one of the suggested reforms in education in Macedonia is implementation of Tandem of generalist teacher and PHE specialist in PHE teaching process in primary education.

Currently, in primary school education system in Republic of Macedonia, general primary school teachers (classroom teachers) up to 5 grade and specialized PE teachers that teaches only PE at 6th, 7th, 8th and 9th grade deliver the subject physical and health education. Considering the educational work that they should deliver as well as different age group that they are working with, the university education of these two group of teachers is quite different. Generalist teachers are educated at Teaching Faculties and Faculty of Philosophy, particularly Institute for Pedagogy. PE specialists are educated at Faculty of Physical education, sport and health. The education of both groups of teacher as well as within the group of generalist teachers is different regarded the knowledge for bases of physical education, methodical and didactical aspects of realization of PHE teaching process, knowledge for development characteristics of children in different age periods, PHE contents and level of practical preparation (Malcev & Popeska, 2017). The suggested reforms for implementation of tandems should integrate the qualifications of both group of teachers and consequently is expected to improve the effectives of realization of PHE teaching process and effects on children.

The tandem by itself means common work of generalist teachers and PHE subject teachers as partners in teaching process. This means equal participation in planning and preparation of PHE classes, equal participation in practical realization, equal obligations and responsibilities as well.

Tandem teaching is not unknown form of work in primary education, aldo is not very common practice in Europe and worldwide. Based on results presented in UNESCO worldwide study for physical education, primary education PE is delivered 79% by generalist teachers and 31% by specialized PE teachers. For example, in Malta, each class has both type of teachers. Specialist teacher in charge for one-lesson and generalist teachers in charge for the remaining lessons. Based on analyses in Eurydice report from 2013, in some European countries such as Germany, France and Ireland, classroom teachers are supported by sport coaches or advisers for some PE lessons. The tandem teaching as suggested in reforms in Republic of Macedonia already exist as a positive practice in Slovenia. In this country, both generalist teachers and PE specialist work together at PE classes at elementary primary education. This concept is evaluated very positive from both group of teachers.

Considering that the reform for implementation of tandem teaching in PHE is oriented toward teachers that deliver PHE in primary education, we were interested in their opinions for this issue. In this regard, we designed this study with aim to identify the opinions of generalist teachers and PHE subject teachers related with implementation of tandem teaching at PHE classes in elementary stage of primary education.

Material & methods

The study was realized on total sample of 118 teachers, from 15 primary schools in four different cities in Republic of Macedonia. From the total sample of participants, 70% or 83 participants were generalist teachers, while 30% or 35 teachers were specialized PE teachers. The study was realized in May, 2017. Descriptive analytical and descriptive explicative analyses were used as method of research. Teachers opinions for their competences, initial educational preparation for delivering PE in primary education as well as the possibility for implementation of tandem teaching, were identified using specially designed questioner. The validity and reliability of the questioner were previously determined an published in separate study. The questioner was composed from four different questions with four suggested answers. The obtained data were analyzed using frequencies (f) and percents (%). Results are also presented graphically.

Results

The first question refers to teachers opinions for possibility for tandem or co - operational teaching in physical education from first to fifth grade. Following options were suggested: it is possible working together with generalist teachers as tandem; possible as cooperators and professional advisers to generalist teachers; possible as cooperators and tandem teachers to classroom teachers for certain specific units and it`s not possible, there is no need for such organization. The obtained results from both groups of teachers are presented at Figure 1.

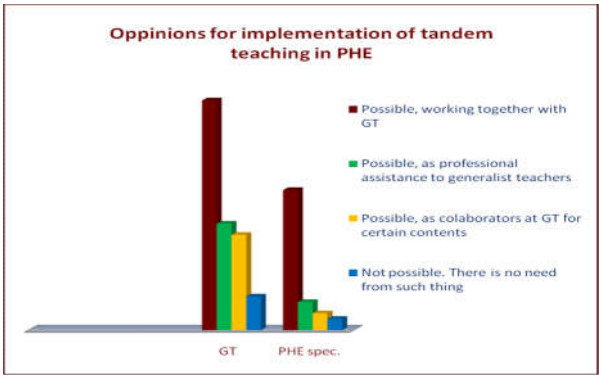

Figure 1: Tandem teaching

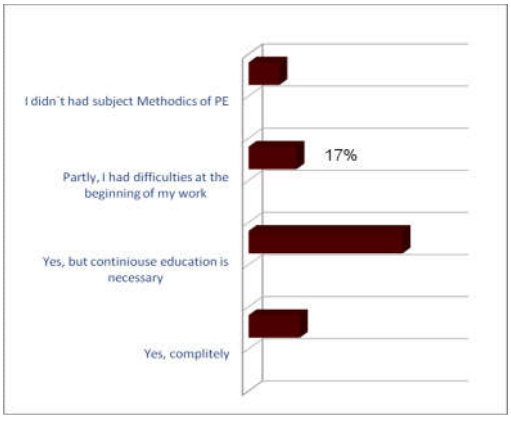

Figure 2: Satisfaction from aquired knowledge for PE didactics during university studies – Generalist teachers

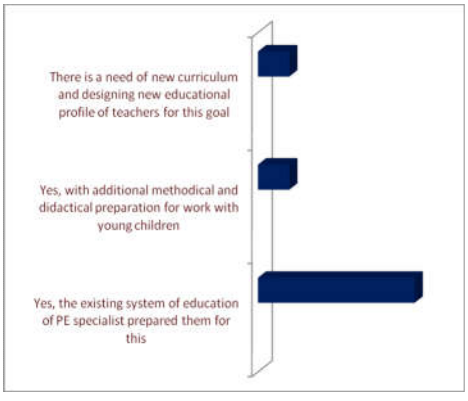

Figure 3: Satisfaction from aquired knowledge for PE didactics during university studies – PE specialists

Realization of physical education process requires teachers to have certain knowledge from kinesiology related with motor development of children, children motor abilities and skills, basic principles of physical exercises, theoretical and practical knowledge for fundamental movements, elements from certain sport disciplines etc. Teachers should also have specific pedagogical and

psychological knowledge for work with children in different age periods as well as specific knowledge from methodic and didactics of physical education. All these aspects integrated together are one of the important factors for successful realization of PE teaching process. Therefore, the following two questions are related with satisfaction from the level of acquired knowledge during initial studies at faculty for both, generalist teachers (Figure 2) and PE specialists (Figure 3) and need of additional education and continuous development in this segment (Figure 4).

The realization of curriculum should be related with children needs and possibilities in certain age period, but the success of its implementation is mainly related with teachers knowledge and abilities to deliver the curriculum contents at best possible way and most efficient manner. Therefore, the issue of curriculum delivery is closely related with teacher's education, which was previously mentioned. The responsibility that teachers has on effectiveness of curriculum realization, as well as their everyday work and experiences, suggest on great competences that teachers has in evaluation of current PE curriculum. This also put teachers in position to suggest changes and improvements in this segment. Regarded this, the last question refers to teachers opinions for current PHE curriculum for primary education and possible needs for changes. The obtained results are presented in Figure 5.

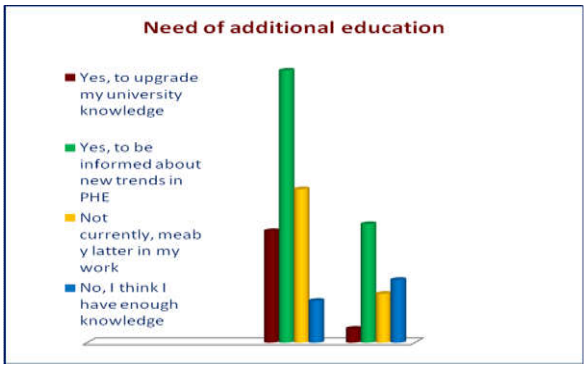

Figure 4: Additional education and continuous development in PE teaching

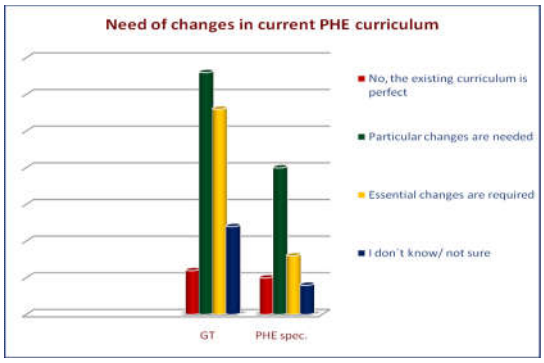

Figure 5: Possible changes and improvements in current PHE curriculum

Discussion

According the results for the first questions that investigate teacher's opinions for possibility for tandem or co - operational teaching in physical education from first to fifth grade, the highest percent of interviewed teachers in both group, particularly 49% of generalist teachers and high 71% of PE specialists agree that to work together as tandem teachers. The next highest percent of choices or 23% of generalist teachers and 14% of PE specialist consider that PE specialist can be professional advisers to generalist teachers. These form means that responsibilities and realization are mainly to generalist teacher but PE specialists can be included as support, help and advice in process of planning, selection of content and if needed demonstration in certain part. For 20% of generalist teachers and 9% of PE specialists, this role of PE specialist is needed only for some specific thematic unions. The smallest percent of interviewed teachers, particularly 7% of generalist and 6% of PE specialist consider that operational and tandem work between both groups of teachers is not needed, it`s impossible to be implemented, suggesting that current organization is acceptable and should not be changed. Based on obtained results on this question, it`s notable that both, generalist teachers and PE specialist recognized the need of co -operational and tandem work at PE teaching process in elementary level of primary education. This means a green light for latest suggested educational reforms. Considering that both group of teachers are aware of benefits from this process, next steps should be oriented toward precise determination of the tandem model, clear distinction of tasks, requirements of both group of teachers and professional training for how this process should be implemented and realized most effectively.

Following two questions are closely related to implementation of tandem teaching. They are investigating the level of knowledge of teachers for didactics of PE and their need for continuous future professional development, considering that the university education of both group of teachers is realized in different institutions and different study programs. From the sample of generalist teachers 54% are satisfied from the level of knowledge that they had during university education related to PE, but also

emphasize the thing that is essential for teachers – continuous learning following the changes in educational requirements. From all interviewed generalist teachers, 15% are very confident and completely satisfied with current level of education, while 14% reported that they had difficulties at the beginning of their work. These answers could be result of several factors. Some of them could be different personal level of activity of teachers during their initial education, manner of education or whether they were full – time or part time students or suggest on different quality of delivery of didactics of PE at different universities that also, in some points is closely related with different maintains of hours for practical work (Jovanova – Mitkovska, Poepska & Smilkov, 2014). One group, particularly 11% of generalist teachers reported that they never had subject Methodic of PE. This is not surprising, considering the fact that in Macedonian educational system, generalist teachers could be teachers educated at Teaching faculties having diploma "graduated generalist teachers" and teachers that had diploma qualification "graduated pedagogues" and were educated at Faculties of Philosophy, studies for pedagogy (Conception for primary education, 2007). The structure of study programs of both groups of studies is completely different especially in terms of methodic of certain subject, mainly physical education, music education and art education. This difference and possible consequences from it are also emphasized in other studies (Popeska, Klincarov, Mitevski & Nikovski, 2017; Malcev & Popeska, 2017) alerting that all generalist teachers at state level should have proper and equal education for PE. Related with the sample of PE specialist, the level, their satisfaction for acquired knowledge from methodic of PE and competences to deliver it in elementary phase of primary education, 72% are satisfied with the existing system of education required for effective delivery of PE teaching process in primary education. From total sample of PE specialists, 14% consider that additional methodic and didactic preparation is needed, while 14% consider that essential changes in this process are needed in order to be fully competent to deliver PE at all levels of primary education. The explanation of this result could be given with analyses of study program at Faculty of physical education, sport and health where 97% of interviewed participants were educated. Namely, this study program offers variety of subjects from different sports, sport disciplines, methodical, psychological, social aspects of work but particular subjects related with educational work with small children are missing. These answers indicate the future actions that should be oriented to need of continuous education of both group of teachers and development of specific qualification required in the work with children in early and middle childhood.

Preparedness for continuous learning, improvement of competences and knowledge is investigated in the third question in the interview. Based on results, the highest percent of teachers, particularly 47% of generalist teachers and 49% of PE specialist have need of additional education, workshop and seminars in order to be informed for new trends in PE education and manners how to improve their work. The need of additional education in order to upgrade university knowledge is reported by 19% of generalists and only 6% of PE specialist with is in line with results from previous question. Nearly half of PE specialists (45%) and 34% from generalist teachers are not so interested for improvement of personal knowledge, reporting that currently they don`t need any form of additional education or improvement (26% GT and 20% PE specialist). Surprisingly, almost 25% of PE specialists and 8% of generalist teachers are very confident in their knowledge and don`t need additional professional improvement at all. The explanation in the results for final two groups can be found in several reasons such as age of the participants and years of working experience, motivation for personal development, satisfaction from work, working conditions, lack of offers possibilities for development (lack of professional seminars, workshops) etc. All suggested aspects should be specifically investigated in future studies.

This question was also followed with open question: What are the topics that you are most interested to be included in future possible seminars and workshops? Based on qualitative analyses on obtained results, we did the ranking of mentioned answers. From most to less mentioned, they are following: creative approaches in teaching work that not require use of standard sport equipment and alternative forms of realization of PE teaching process; new trends in PE; use of technology in PE teaching process; work with children with special educational needs; creating an effective network for practice exchange between generalist teachers and PE specialists etc. Similar results for suggested topics for additional improvement via workshop and seminars are obtained in study of Popeska, Jovanova & Sivevska (2017) referring to implementation of technology in PE teaching process. The study of Popeska, Klincarov, Mitevski & Nikovski (2017), referring to common obstacles in realization of PE teaching process, where teachers included in realization of PE teaching process reported lack of seminars and workshops for their

topic of interests.

Considering teachers working experience and the impact of their work upon effectiveness of PE teaching process, the last question refers to their opinion for current PE curriculum in primary education at the level that they teach and possibilities for improvement or change. According the results, 42% from generalist teachers and 54% from PE specialist consider that particular changes are needed. Essential changes are required by 35% of generalist teachers and 22% of PE specialist, while completely satisfied with existing one are 8% of generalists and 13% of PE specialist. Asked about segments that should be changed or improved, different aspects were emphasized. For generalist teachers changes are needed in certain thematic unions; more hours for corrective gymnastics, compatibility between suggested contents, age and development characteristics of the children. PE specialists suggested following issues for improvement or change: contents in the curriculum with emphasis on selection of sport in 8th and 9th grade, implementation of new interesting sport, greater compatibility between theoretical contents suggested in books for each grade from 6th –to 9th and curriculum for respective grade; greater compatibility of the contents and requirements in the curriculum with material facilities and available equipment as well as suggestion of alternative forms of realization of PE teaching process.

Conclusions

Summarizing the results from all previous analyzed questions, the same vision could be noted. Changes are needed in several segments of realization of PE teaching process in elementary education. Uniting the knowledge and working forces of both group of teachers, generalist teachers and PE specialist many of challenges and noted problems could be overcome and will lead to greater effectiveness of PE teaching process and greater benefits for the children. In this regard, implementation of tandem teaching between generalist teachers and PE specialist could be one of possible effective manners.

What could be the possible benefits from implementing the tandem teaching in PE in elementary primary education? Following we present some of them for which we consider important:

- Increased level of physical activity of children at PHE classes
- Equal and successful realization of all suggested contents
- Better holistic learning through PHE
- More effective realization of PHE classes
- Possibility to follow and assess children motor development at regular bases
- Increased level of PA during school day
- More time for educational component
- Possibility for better realization of health component
- Better support between generalist teachers and physical education specialists

The concept of tandem teaching should be beneficial and successful only if it is created with joint actions of all relevant and included parties. In this regard, following future actions should be taken:

- Creating an expert group that will work on concept and implementation of tandem teaching. This expert group should be consisted of university professors from Faculty of physical education, sport and health and Teaching faculties from all state universities that work in the field of methodic of PE; representatives of generalist teachers and PE specialists, representative from Bureau of Education, representative from Ministry of Education, experts from countries that already implemented such concept. This group should work on all aspects of implementation of tandem teaching.
- Implementation of positive experiences of other countries considering and adapting the national context.
- Organization of meetings, seminars, workshops for promotion of the concept.
- Organization of workshops, seminars, lectures for preparation of generalist teachers and PE specialist for tandem teaching.
- Designing text books and guidelines for tandem teaching for the teachers.
- Development of network of teachers included in TT
- Designing a common study programs for educating tandems.

All suggested actions require teamwork from generalist teachers, PE specialists, university professors from Faculty of PE, sport and health and Teaching faculties and governmental institutions. Each one of them should contribute in their field of expertise. Each one of them is equally important and the

implementation could be successful only if teamwork and benefits for the children are focused as priority. At the and the focus and main goal are the children and their wellbeing and only common actions could lead to this common goal.

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MOTOR TRANSFORMATION AND DEVELOPMENT OF YOUNG ATHLETES DURING ASCHOOL YEAR

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Abstract

The purposes of the present study are: 1.Evaluate technical differences in running, evaluate anthropometric and motor transformation in young athletes in 10-12 and 12-14 year. Analyses the specific different skill, control the evaluation some motor skill. This experiment was carried out with young athletes a sample of 75 young athletes of regular first year; we will analyze and compare two batteries of tests and the analysis of standard tests and analysis euro fit tests. The study in this motors area athlets , will be done by analyzing the initial state and final state results. Athletes checked in early October and the end of the school year in May. This paper it processed with advanced statistical methodologies SPSS version 15.0 to control the number of athletes is 70 aged 10-12 end 12-14 ., the study will be conducted on the basis of comparative analysis, correlation, regressive analysis, and analyzing tests curriculum control, the impact of physical activity . It proved a statistics factory development as an increased static end repetition force and, spinets also have motors that control tests and agility explosive force, to enhance sustainability is not significant. On the basis of comparison of the battery of tests we will have a closer analysis and interpretation.This research will be conducted with a sample of 70 athlets . They actively paticipate in sport activities. The sample is selected rendomly on the basis of the best performance. They are 10-14 years old with a perfect physical and health conditions, with no problems in the psychosomatic status. The motor space is controlled by 8 motor tests as well as a functional 'bip test' 20m run which has been considered as the criterion test.

Key words*: strength, static strength, repetitive strength, cooreltion*

Introduction

Sports and motor activity developent are based on research with cybernetic approach. The organization of motor transfer is possible only with a well organized training process. This approach towards the scientific research is applied with all the activities within the sports in general. Group of athletes with physiological loads of defferent levels. Due to functional and physiological maturity they usually perform with high level of physiological load. The study of motor space and the regresive analysis on the basis of functional criteria with the multiple regresive analysis is done with the aim of analyzing the reports of aerobic opportunities with 8 basic motor tests. The issues related between the motor skills and functional skills have been topics in many scientific and professional studies oriented towards many goals. On the other hand, as studies with the exclusion of funksional test as a predicitve variable are rarely found, this study will aim to detect the relations of this variable with eight other varibles and results shown with the selected population of tudents.

This study aims to present tests which study the motor space and their coorealtion with functional skills with the second year students. It also aims to prove relations between the basic motor tests and functional Bip test with this unique selected population. The objectives of the study are to:

- Determine the state of motor skills of this sample
- Determine the level of positive and negative coorelation of functional skills with eight basic motor skills.

Research Methods

The study sample are male end female athlets in Teovo end Struga who mainly come from the region of Western Macedonia.

Motor variable and control variable

The variables thet will determine the motor space are:

Pull-ups, exercises for stomach and back muscles, pull-ups in paralells, lifting with back muscles, 100 metres running, 1500 metres running, balance test, 5x10 m running, independent control variable (Bip test).

Research Methodology

It has been calculated the regresive relation between motor variable and criteria variable in the level of single variations and multivariations. The regresive analysis is consisted of the following coefficients:

1. Multiple correlation coefficient vector (R)
2. Vector of square coefficient of multiple determining correlation (R^2)
3. Adjusted vector of multiple coefficient determinant
4. Estimated standard errors
5. Estimated dependent sum, sum of Square Regres
6. Independent sum (residual) square sum
7. Total square sum
8. Degrees of freedom (df) m-number of independent variables, n-number of entities
9. The dependent mean square divided by the number of degrees of freedom
10. The independent mean square divided by the number of degrees of freedom
11. Results of F-tests F=Mean square (regresion)/ Mean squares (residual)
12. The degre of level of multiple correlation, or the reliability of hypothesis that the coefficient of multiple correlation is equal to zero.
13. Unstandardized coefficient of regression
14. Standard errors of unstandardized coefficient of regression
15. Standardized coefficient of regression (partial) (BETA)
16. Degrees of freedom in the process of validation of regresive coefficients
17. The levels of freedom during the process of validation of the regressive coefficientt(89)-value for df=n-m-1=89
18. The level regressive coefficient value.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,675(a)	,456	,379	6,26541

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1872,360	8	234,045	5,962	,000(a)
	Residual	2237,555	57	39,255		
	Total	4109,914	65			

Interpretation of results

The results as shown in the first table of the controlled variable of the Bip test have 67,5% common information (multiple correlation R =.675). The determining square of the multiple correlation with a value R^2 = .456, and adjusted square with a value R^2 = .379, and the percentage of error Std=6.26541. Controlled variable is constant.

In the second table accordng to Anova, the square sum 1872,360, with the degree of freedom df-t as well as the residual average and the residual limit 234,045, the value of multiple correlation test F=5.962 and the correlation of the value of the zero hypothesis with Sig=.000. The sum of the residual square 2237,555 and with average square 39,255. The controlled variables are constant and the independent variable is the variable of the Bip test.

In the third table there are shown results that prove the reliability of our hypothesis that according to coefficient (a) with the independent variable in the first part of the results with the standard coefficient. By lloking at the results of variables it can be concluded that variable 6 =-3.002 vr. 1500m and the 8th =-2.482 running 5x10 get close to the value +2 and the 5th variable = -1.707 100m running. With these three variables there is proven standard deviation with values near zero.

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta	B	Std. Error
1	(Constant)	103,744	17,797		5,829	,000
	VAR00001	,309	,291	,166	1,060	,294
	VAR00002	-,099	,076	-,170	-1,289	,202
	VAR00003	-,096	,274	-,056	-,350	,728
	VAR00004	-,031	,068	-,059	-,464	,644
	VAR00005	-1,878	1,100	-,258	-1,707	,093
	VAR00006	1,207	,402	,329	3,002	,004
	VAR00007	-,396	,277	-,164	-1,431	,158
	VAR00008	-1,428	,575	-,278	-2,482	,016

Conclusions

This research concluded an average state of the motor space over the comparison of results with the previous studies. We aimed to identify the importance of VO2 within this group of tests which are basis for evaluating students in motor control. Our predictions were verified and they show that VO2 max has an impact and a better correlation the variables that detect the speed of running.

The results gathered in this research have a theoretical value and also a practical one which helps coaches to plan a well programmed training process. The redults gathered with the testing of motor and functional variables can be analyzed during the teaching and training process. The students who achieved better results of VO2 showed better results in running .

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STIDENTS' FEAR AND BEHAVIOR IN THE BEGINNING OF SKI TRAINING

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Abstract

Learning skiing technique can happen quickly or can take longer, and the thinking of a beginner skier may be in a great range of learning speeds.In this article we will observe the behavior of beginner skiers and their fears through:the reasons that lead to fear while learning to ski;creating a model for bringing the beginner skier back to an effective learning state. In the analysis of the results, using the "Discussion in Focus Group - Poll Discussion" method, three types of fear of initial ski education were identified. Exploring the fear of falling, we conclude that this fear is provoked by the sense of collision with the earth, not the actual activity itself. The second one is the fear of the unknown. We often waste time worrying about what can happen to us, and this fear has a lasting impact on how we act and what our behavior is on the ski track. Fear of failure is an attitude that leads to stiff and tense movements and a low probability of dealing with the element studied. This fear also causes great mental tension - thoughts are changing in uncertainty in well familiar movements and doubts in one`s abilities. Summing up, we can note that with a sense of security on the ground, with confidence built by the ski teacher, with emotional comfort in interpersonal relationships that exists in the lesson, each fear can be overcome and the beginner skier returns to an effective state of learning skiing technique.

Key words: *ski, fear, student*

Introduction

Those people who enjoy the advantage of living among nature in clean air and keep their physical condition by skiing abound of emotions and health. And it is a well-known fact that doing sport means being healthy!

One may ask "Is it easy to learn to ski?" Mastering skiing techniques can be either quick or it may take longer time, and the thinking of a beginner skier may greatly influence the rate of learning and mastering such skiing techniques.

Hypothesis: Someone who has been living following the same stereotype "home-school/work-home"for years may be afraid of starting a new activity because in general such a person is fully aware of the danger and risk involved (picturing the steep ski slopes with skiers and snowboard riders shuttling on it or the dreary images of falling and resulting traumas), and that poses quite a serious obstacle to that person's ability to learn skiing.

What is fear? Fear is a natural reaction caused by environmental factors. It tampers with the pursuit of a dream and the striving for success, holds back one's actions and suppresses one's determination. In this context, the ability to overcome arising fear is a very important life ability. How to master this skill while learning to ski?

We suppose that the application of a model, consisting of the creation of a mental picture of skiing-related skills and movements, shall chase away the fearful thoughts of the unknown, the unfamiliar or failure and shall make skiing a favorite outdoor activity in natural environment.

Purpose and objectives:

This article studies the behavior of beginner skiers and their fear notions in terms of:

- the reasons that arouse fear while they are learning to ski;
- designing a model intended to bring back the beginner skier to a condition effective for learning.

Study methods: The study is conducted on 125 first year students (the contingent) (105 men and 20 women) (62 full-time students and 63 part-time students) attending the specialty of Pedagogy in Physical Education Teaching (PPET) of Saint Cyril and St. Methodius University of Veliko Tarnovo in Bulgaria. All of them are required by the academic program to train in the winter sports course in the town of Bansko.

The subject of this study is the students' attitude toward fear and how they overcome such fear in the beginning of their training in alpine skiing. This requires the use of the following methods:

1. Theoretical and logical analysis of literary sources.

In order to gather knowledge about the current state of the problem, in particular to get an idea of the extent to which the different aspects of that problem have been studied by Bulgarian and foreign authors, we made a review of existing literature.

2. Structural observation

Targeted observations were made during the training course along the ski slopes near the town of Bansko and the town of Dobrinishte.

3. Polling method – discussion in the focus group.

We investigated the problems subject to this study by conducting discussions with the students of the specialty of Pedagogy in Physical Education Teaching (48) – part-time attendance.

4. Method of inquiry

We made inquiries with the purpose to outline the main problem underlying the mastering of skiing techniques, which is fear and the emanations of fear. We obtained the opinion of all 125 students who participated in our study. The questionnaire used to investigate the fear and the behavior of students in the beginning of their ski training (Appendix 1) is attached hereto.

5. Mathematical and statistical analysis by benchmarking.

6. Simulation

This method was used to create a model enabling them to attain effective condition for learning the movements that are typical of alpine skiing techniques.

Results

The analysis of the results obtained from the questionnaire used to investigate the fear and behavior showed that men defined themselves most of all as athletes and said to have self-confidence – "I know what my strengths are" (68.7%). "I have my own concerns" and "I am aware of my shortcomings" was expressed by almost 19.5%, and 11.8% had no opinion. That is how students answered to questions 1. "Who am I?" and 4. "Do I have self-confidence?" (fig. 1).

In the group of women-students prevailed average self-confidence based on the answers of "I am aware of my shortcomings"and the self-definition as "a young person with his/her own concerns"(about 57%) – almost three times more than men. Those who demonstrated high self-confidence were 36.2% of the women-students whereas 7.8% of the women-students had no opinion.

To our opinion the awareness of the inner need to do well, as well as the believing in one's self, can be achieved by identifying the students' desires and needs for targets achievable within one lesson. Needless to say, the role of the coach for creating an environment that promotes self-confidence is paramount. The self-confidence to keep going, to make a step further, or to attain a target can enable students to evaluate and manage his/her needs, which results in a productive and exciting training. Students who perform on such level are often on active communications while being in learning environment.

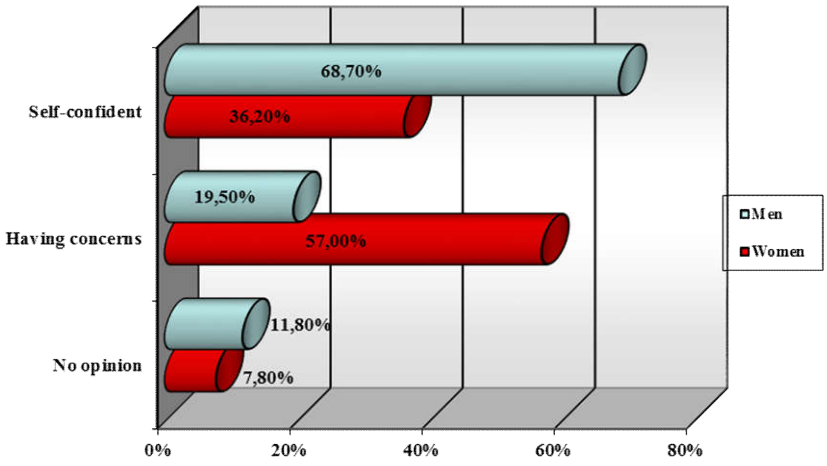

Fig.1. Students' opinion on the questions: "Who am I?" and "Do I have self-confidence?"

Grouping the questions about the feeling of fear (questions 6, 7 and 11) all participants (100%) answered that they were afraid because skiing is "a very different type of sport and something quite new". 45.8% - men and women together both part-time and full-time students showed high level of personal anxiety fearing falling, 36.6% of them feared failure, and the remaining 22 students (17.6%) – feared the unknown (fig.2).

Most diverse are the shapes that young people give to fear. Here are some of them: a monster, ice, frost, myself, something that looks like me, a bird of prey, etc.

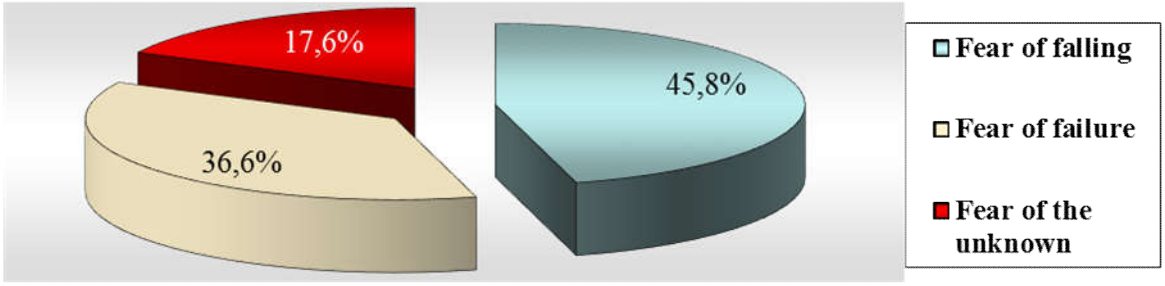

Fig.2. What fears do we face in the beginning of our ski training?

To our opinion the established fear notions determine students' behavior during their skiing training. It is perfectly normal for a beginner skier to fear falling. It is also normal to feel fear while sloping down for the first time or making his/her first parallel turn on skis. Fear starts to subside with each next exposure to the fearful situation. The same principle applies to the fear of falling. As soon as a student begins to fall he/she gains experience and gets used to the process, which in its turn results in attenuation of the feeling of fear and the building of fear-resistance.

To eliminate the imaginary fear of falling the right thing to do from a methodical point of view is to train falling – a series of controlled falls. The idea is to train several falls in the course of a lesson in order to develop a stable mental state that would not yield to any unreasonable fears. For instance, let us imagine that you want to learn to ski. The first time you stand up on your skis you would almost inevitably fall but your body gets a bit more accustomed. The second time you are able to stand up in starting position and you move a little, then you fall. The third time you fall again but before that you have been able to move a little further. The hundredth time you slope down from the top of the slope and the thousandth time ... well, you easily slope down from the steepest slope "without batting an eyelid".

Let us analyze the second most common type of fear for skiers – the fear of failure. Ironically, the fear of failure sets the pattern for failure because one is distracted from the thoughts on possible outcomes and loses focus, which renders skiing ineffective.

The fear of failure is a mental attitude that manifest itself in stiff and tense movements and offers little chances of mastering the trained element of skiing technique. This fear causes enormous mental tension – thoughts are diverted into being insecure in already mastered movements and into doubting one's capabilities.

The fear of failure springs from a result-oriented attitude where the effects in case of success are constantly judged against the effects in case of failure. Therefore, this fear can be overcome by directing the focus at 100% on the process of skiing (the stance, the inclination, the eyes, etc.) and one's awareness should not fluctuate to and from possible results. When attention is focused like this the worrying skier will have no opportunity to think of any failure or success.

The fear of "what will others thing of me" can be trained by creating a situation where students would feel uncomfortable. The things to do in such cases are as follows:

- listening to the critics of others – to train the fear of being criticized;
- making the movement (the element) in a way that other would not expect to see – to train the fear of inconformity with the opinion of others;

By every instance of overcoming the fear of failure, fear-resistance increases. It says: "This fear is not real, it is nothing but an illusion, and it exists only in my mind". When dozens of such fear are overcome, fear disappears. Our body and mind have the congenial capacity to adapt! Adaptation forms the basis of survival.

It is important to note that unlike the fear of falling, which may sometimes be even useful, the fear of failure has no other purpose but to safeguard one's ego. The fear of failure is entirely based on auto-suggestion, which means that the elimination of this fear is entirely in the hands of oneself.

What will happen on the ski slope or in the cableway? This is the fear of the unknown. It exists only in one's mind and exuberant imagination. Since this fear is groundless, unreal, it often arouses for no reason or ooccasion and drives one to do things that are often ridiculous. The fear of the unknown has one more peculiarity worth mentioning – it may win a victory in case one delays the making of a decision or the taking of an action under its influence. This fear has the tendency to grow bugger when dealing with it is postponed. And one more thing that is typical of the fear of the unknown – it will immediately disappear when action starts. Needless to say, this is much easier said than done.

Ignoring the fear of the unknown may be achieved by making a conscientious differentiation between one's personal observation and the imaginary image. The first time you fear to death and it seem to you that if you dare do it your life will end. But yet, you dare do it and your life does not end and you understand that it is not that frightful. The second time it is something like half-fear and once again it seems like it is way beyond your powers to do it. But still you keep doing it and it's not that frightful after all. Each next time you try you understand that your action is not that frightful as your mind may be depicting it.

Many risks originate from the inexperienced skier's imagination. The fear that either something of the outfit may be defective or the cableway may stop and leave you hanging in the air or tha the ski slope is very steep, are very common imaginary fears that worry many beginner skiers. In such situations negative thoughts should be put to questioning and one should try to overcome them by reasoning. Naturally, the outfit has been tested and guaranteed as strong, furthermore you can trust your skiing coach counting on his/her knowledge and experience. Thoughts should be directed towards the movements performed on the ski slope by repeating in one's mind phrases like "relax", "you are doing great, "don't stop".

Once provoked, the negative emotions may lead to the occurrence of stronger doubts, the level of self-confidence drops, and self-esteem inevitably falls down. Stop! Your determination is your guarantee that you will overcome every fear. What is the main difference between fear and determination? Fear activates negative emotions and directs them to thought of failure. Determination, on the contrary, provokes positive emotions and directs them to favorable concurrence of circumstance. The fear-instigated negative though begins to "multiply" in an increased rate but this is nothing for people who are used saying: „eyes fear but hands are doing it".

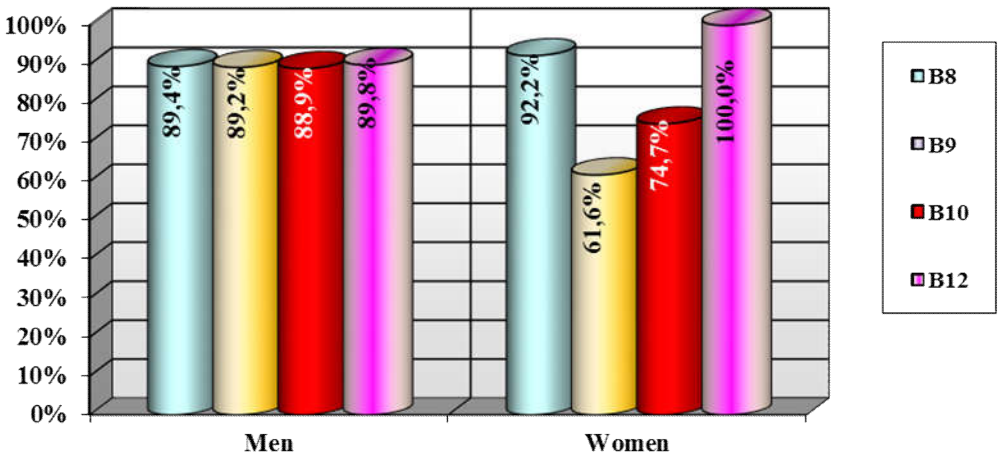

Fig. 3. Average values of the methods to manage fear

One of the most important steps in fighting fear is the preparation to fight. So far we defined what types of fear prevail in students and that is a great advantage for our study.
The average values for men when asked about the methods they use to manage their fears (question 8, 9, 10 and 12) are within the "tenths" range in the upper percentage scale (89.4%, 89.2%, 88.9% and 89.8%,), which is directly related to the better and more successful coping with tasks, namely: „I forget about fear" by playing a game; by using the trick of „I can do it" which motivates them; they are convinced that by stepping on the skis „everything will be fine", and the answers to question 12 "Let me make one more step" – "I'm doing it on my own" show their approach to reality by saying "this is a great opportunity for me" (fig. 3).

We asked the same questions also the twenty female students in an informal conversation (discussion). Here are the results: 92.2% of them would not think about their fears when the elements of skiing technique are mastered "by playing a game", for 38.4% of them fear was still there even after they were repeating "I can do it" but the encouraging thing was that the remaining 61.6% of them were "ready to win". The most preferred answer to the question "What will happen when you step on your skis?" (question 10) was "I am entirely focused on the skiing I am about to do but I am still worried" – 74.7% whereas 25.3% of them answered "I am very concerned about the skiing I am about to do". Unanimously all women (100% of them) answered that they were willing to make "one more step" in order to be successful and to overcome their fears.

Ski schools have been integrated into the service provision section of winter tourism. Whether or not a guest to the resort is going to return and become a regular visitor of the resort greatly depends on the effective performance of the skiing coach (instructor) because the time spent on the ski slope is the most time-consuming part of the guest's stay in the resort. This is important for our students – the future sport specialists should have the passion to sport and mountains as good skiing coaches.

Comparison of the opinions of students from the two forms of attendance – full-time and part-time - regarding any "noticed concerns/worries of the skiing coach"showed that 12.2% and 17.6% of them (part-time and full-time accordingly) thought that the coach had some concerns/worries with respect to the "environmental and weather conditions", "he/she was afraid of failure" was the preferred answer for 5.1% of the full-time and 2.9% of the part-time students. The students of both forms of attendance who answered that "everybody is afraid sometimes, it is only normal" were about 10%. The other 44.9% of the part-time and 67.3% of the full-time students were convinced that the skiing coach showed no signs of being afraid of anything.

We are convinced that the skiing coach has accepted the responsibility to influence the student's behavior. The mastering of mobile skills and movements such as the ones associated with skiing bears a clear and structural information about the direction and time of practicing but also some concerns about the safety and discipline of students. The skiing coach should be able to play different roles in order to ensure a successful lesson.

The preferred "strategies used by the students in order to be able to overcome their worries and fears when learning to ski" were almost equally proportioned in percentage rating – about 25% each. Four groups of 25 students chose to manage their fear: by paying games, by training, by the feeling that "I am not alone" (the skiing coach, my friends are next to me), by"having the others understand my problem"and the remaining 25% of them had their own management strategy – by sharing, by saying that things can always get worse, by dividing the problem into pieces, etc.

Based on the result analysis we created a model of the strategies for managing the fear falling, the fear of failure and the fear of the unknown during the ski training (fig. 4). Although it is not always possible to do a lot in order to change the way people see things that could be changed, still an attempt can be made to build a better mental frame.

Fig. 4 Model of fear management strategies

Inferences

1. The feeling of touching the ground is what causes the fear of falling and not the particular movement or action taken alone.
2. The safe practicing of trained falls contribute to the gaining of confidence in one's mobility skills.
3. The fear of failure is a mental attitude that manifest itself in stiff and tense movements and offers little chances of mastering the trained element of skiing technique.
4. Coping with the fear of the unknown starts by identifying the problem and by taking appropriate action to reduce the risk in a given situation.

To summarize, let us mention that every fear can be overcome by feeling secure on the slope thanks to the trust built by the skiing coach and the emotional comfort of one's relationships with others that prevail in the lesson so that the beginner skier could restore his/her effective condition for learning to ski.

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Appendix

QUESTIONNAIRE
THE FEAR AND BEHAVIOR WE EXPERIENCE
IN THE BEGINNING OF OUR SKI TRAINING

1. "Who am I?"
a) I am a young person ready to face challenges.
b) I am an athlete and I always strive to win.
c) I have my own concerns.
2. "How well do I know myself?"
a) rather Yes; b) rather No; c) I can't tell.
3. "Am I able to adjust, to adapt?"
a) Yes; b) rather Yes; c) rather No; d) No; e) I can't tell.
4. "Do I have self-confidence?"
a) I love myself; b) I know what my strengths are; c) I am aware of my shortcomings;
d) I am sleeping through my life; e) I don't know.
5. "What is my attitude to real life?"
a) It is a great opportunity for me; b) A fear that I will not be successful;
c) It is a challenge/jump into the unknown; d) .....
6. "Why am I afraid in the beginning of my skiing training?"
a) because it is only human; b) the unusual outfit bothers me;
c) because it is done outdoors; d) because it is a quite different sport for me;
e) .....
7."What are my fears?"
a) falling; b) trauma;
c) failure; d) the unknown
e) .....
8."How can I forget about fear?"
a) When I take a deep breath, time after time, I feel my body truly relaxed.
b) While playing I can't think about fear.
c) I feel do difference – fear is still there.
d) .....
9. Repeating "I can do it!"
a) If I repeat it 10 times using increasing voice strength, I forget about fear.
b) This trick is used in other sports too and this motivates me to win.
c) I feel do difference – fear is still there;
10."What will happen when you step on your skis?"
a) I am very concerned about the skiing I am about to do.
b) I am entirely focused on the skiing I am about to do but I am still worried.
c) I redirect the focus of my thoughts because I know that everything will be fine.

11."If you were able to give your fear a specific shape or face, for instance a despiteful person, a monster, etc., what would it look like?" The better you describe it the easier you will overcome it**.**

.....

.....

12."Let me make one more step!"

a) If you are afraid, for instance, to climb a Christmas tree up to a marked level, would you make one more step to overcome your fears.

b) I'm not afraid to try and I will go to the end because the ski coach is right next to me.

c) I'm doing it on my own.

13. "The ski coach is also afraid/worried sometimes. Have you noticed?"

a) Everybody is afraid sometimes, it is only normal. b) He/she is afraid of failure.

c) He/she is afraid of the environmental and weather conditions.

d) He/she shows no signs of being afraid.

14."How would you describe your problem if it had not been yours?"

a) I would try to judge how serious the problem is by imagining that it was mine.

b) I would show my friend that it is only normal to feel fear sometimes.

c) Looking at it from a distance I would judge if it is worth worrying about or not.

15. "Which strategy of fear management would you like to use at this time?"

a) by playing a game; b) by sharing;

c) by the feeling that I am not alone (the coach, my friends are next to me);

d) by having the others understand my problem;

e) .....

Sex: a) M b) F

Age: a) younger than 25 years b) younger than 30 years c) older than 30 years

THANK YOU FOR YOUR TIME!

THE CONCEPT OF INTERACTIVE MODELS IN UNIVERSITY TEACHING

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Abstract

The issue of improving the quality of the teaching in higher education presents an open and contemporary problem, which can and should be studied from several scientific aspects. With the introduction of the credit transfer system in higher education in the Republic of Macedonia, which entails a higher level of students' participation in the realization of the teaching, constant monitoring and a contemporary means of evaluation, the efficiency and quality of the teaching have significantly improved, but it seems that the process of realization still comes second, at least from the aspect of its interest to be improved.The subject of this research is designing interactive models for learning in the academic teaching as well as developing didactic competences for future teachers.Studying the problem is done by action research of a participative, interpretative and descriptive character. The essence of such a way of research is that it consists of a sequence of action steps, with the help of which action is immediately put into practice, and simultaneous monitoring of the action itself (participation), the activities of the subjects included in the process, as well as revision in stages after each action, ending in the final reconstruction, is being done. The relevant data in the research are received through formative and summative examination of the views and opinions of the students regarding the interactive models of realization of the teaching, and through examining the abilities and skills of the students regarding the application of interactive models in practical teaching.The conclusions point to the need for increased participation of the separate didactics in the study programs, as the most applicable subject programs that are mostly connected to the students' practical work. From the received results of the research, it can be stated that the students' views regarding the interactive work are visibly positive, since the teaching is dynamic and interesting, while the acquired knowledge and developed skills complement the development of their competences for practical work.Due to the universality of the basic didactic concept, which is applied in this research, one of its main aims is for them to become generators, i.e. original examples (samples) for support of the interaction in higher education when developing a variety of profiles. It firstly refers to the category of students who in the future will choose to work as teachers in different levels of education.

Key words: *interactive models, higher education, didactics of higher education, students*

Introduction

Interaction as a modern educational strategy

"... The industrial revolution, neoliberal economic reforms and the movement of behavioral objectivism, in their mutual time and theoretical interweaving, form an education aimed at the development of competences, which in contemporary theory and practice have more general meaning ..." (Despotović, 2008: 35-49). The genesis of the development of the goals and tasks of university teaching and learning is always in the context of the educational tradition of specific educational systems. They can be placed between two different conceptual solutions: traditional teaching or progressive teaching. Thus goals and tasks are oriented either towards content and knowledge or towards the student. The first option directs the teaching towards learning the content, which leads to the creation of a general profile of an expert, the second option puts the emphasis on the individual, on individual qualities and social behavior. This creates an expert who is able to do research, i.e. he/she knows how to think methodologically, he/she has developed communication skills and is capable of teamwork. These are the capabilities that are necessary for life in a civil society. The second model of learning is generally accepted today. In the broadest sense, education focused on the development of competences can be defined as an educational theory or concept, which explains the interdependence of education and economic development, or, more precisely, the promotion of economic development through education. According to this, "competency-based education is an instrument of economic reform or micro-technology of human capital theory" (Anderson, 2008: 24).

Regardless of which model is applied, different definitions and categories can be found in the theoretical and research learning studies to determine the diversity of the learning process. What this refers to, above all, is the learning styles, the approach to learning and the different types of intelligence. For example, Howard Gardner develops the theory of multiple intelligence and, accordingly, on the different bases of the learning process. According to Gardner, "there are seven types of intelligence: verbal (linguistic), logical-mathematical, visual (spatial), music, interpersonal (social), intrapersonal (personal), and bodily-kinesthetic" (Gardner, 1991: 28). The way of thinking, priorities and needs are different for different types of intelligence. Kolb starts from the "differences in approach to the learning process: practical experience, reflective observation, active experimentation, abstract conceptualization" (Kolb, 1985: 95).

Therefore, the use of the interactive concept in higher education should correspond to the different needs and predispositions of the students. The implications of this approach of interactive teaching are: use of different interactive models that correspond to different learning styles, development of the same topic through the use of different methods, and individualization of the learning process which takes into account the learning capacities.

For adults, the process of learning involves multiple activities, and an integral, conceptual and phased process. The multiplicity of learning means that learning is a process that integrates the emotional, social, cognitive and affective dimensions. The phased process of learning involves procedurality and passing through certain stages that do not have to be successive, which are: motivation, acquiring information and knowledge, perceiving their meaning, practicing and applying the learned, and its planning and implementation.

The process of integrated learning is based on and it complements the past, the current and the future experience. Contextuality of the learning process involves learning through interaction in a certain physical and social context and through exchange and collaboration. The benefits of the understanding of this learning are activities with different functions that: motivate, stimulate, relax, let the students get to know each other, create an atmosphere of trust, and so on. They are integral parts of the interaction, the procedurality in the development of sub-topics, the content and methods that provide a phased formation and application of knowledge; technical and organizational support of the process of interactive teaching with which contextual variables, such as physical space and social context, are specified according to the initial basics of interactive teaching; enabling and encouraging various forms of group work, exchange between stakeholders and cooperative activities, as well as development of monitoring and support strategies.

When presenting the basic characteristics of these two opposing models, we begging from the analysis of the indicators: the placement of the two models, the types of activities used in them, and the articulation components of the teaching. The traditional model is based on the understanding of the learning as a transmission i.e. one - way transfer of knowledge in the direction of teacher - student, without obtaining feedback on the level of acquired knowledge and developed skills. Within this model, the learning is same for all students. It is a uniform process that does not respect individual differences and does not meet the different needs of the one who is being taught. At the same time, the learning process is understood as a "pure and isolated" cognitive process and as an individual activity – "everyone learns for themselves" and "is responsible" for the results of their own learning.

Discussions

The basics of interactive teaching, according to Kolb, are grounded in the notions that "learning is an active construction of knowledge, which is constantly being upgraded through an active two-way mode" (Kolb, 1985: 25). Yet, the different styles of learning and individual differences and learning abilities are appreciated, and learning is a "multiple activity" (Gardner, 1991: 34), an integral and contextual process. Cooperative forms of learning are used and partnership relations are developed.

And the different types of activities used in both models are diametrically different in nature. Thus, while the traditional model uses uniform types of activities according to their function and a limited number of methods, interactive classes develop activities that differ in their function and with a number of different methods. And the articulation sections of the teaching - preparation, realization and monitoring - are different in both models.

In the traditional model of teaching in the preparatory part, the attention is directed towards the teacher, the teaching programs set goals that are primarily related to the teaching contents, and efforts are not made to develop a learning environment. In interactive teaching, the attention is focused on the students, the context of the content, the procedures and the teacher. Objectives are set to be achieved by the students, the teaching process and the teaching content. The existence of material and technical logistics is obvious. During the realization of the traditional model, the attention is focused on the results, and in the interactive model the attention is focused on the process, the relations between the subjects and the results. In the first model, linear interaction is used, and in the second multiple interaction.

The role of the teacher is visibly different, instead of a mediator he is a facilitator in the traditional model. In the interactive teaching, there is a diagnostic, formative and summative evaluation. Evaluation in the traditional model is usually not planned and does not come down to examination of the acquired knowledge. The analysis of the last articulation element shows the absence of *monitoring* in the traditional model, while in the second model there are developed monitoring strategies as a support process.

The initial teacher education is a basic requirement for practical introduction in the teaching profession. For K. Kamberski, initial education of teachers is "a system of knowledge, abilities and expertise (skills) that future teachers acquire during their studies, which enable the professional execution of the teaching activity. These are basic (initial) competences, abilities and skills without which the teaching profession cannot be imagined, and with which it is further upgraded through the system of continuous education (professional development)" (Kamberski, 2000: 114). According to the same author, "initial teacher education is an initial certified education for acquiring the right to work in a particular subsystem" (Kamberski, 2000: 115). Initial education as an initial professional preparation of teachers in primary and secondary education in the Republic of Macedonia is conducted with a different approach, depending on whether it comes down to a class or subject teacher in general, arts or vocational subjects or practical classes.

So, the teacher needs to perform very specific tasks. In addition to the common functions and roles that define the term - teacher, the teaching work in the first three cycles of primary education has specificities that arise, primarily, from the developmental characteristics of the students. They are manifested through the professional obligations, requirements and tasks that are placed before the teacher. The first three cycles of primary education are the basic level i.e. a kind of entry into education. Teaching in the early grades is the first contact with an organized educational activity.

"Their characteristics can be identified in the documents of the Bologna Declaration and other documents relating to the Bologna Process, which are the basis of the reforms in higher education in Europe" (Miovska-Spaseva, Achkovska-Leshkovska, 2010: 10-15). On the other hand, when speaking more specifically about the initial education of teachers, the analyzes made in many European countries of the OECD distinguish two basic models that form the teaching (and any other) profession. All this puts forward the issue of the effectiveness of the academic production of teachers and the involvement in the contemporary requirements of the "Bologna Process", in regards to the issue of the quality of the initiation in the education of teachers, as well as the quality of the realization itself, which is partially selective, especially in our case.

In this way the issue which is only one part of the theoretical elaboration will be absolved, as far as possible, at the level of a paper of this kind, and will briefly draw on the analysis of the policy of educational reforms and their reflection on education, primarily on the initial education of teachers in the first and second education cycle in the nine-year primary education.

Speaking about the educational policy in higher education in general, the full acceptance of a more comprehensive European model is evident. Our country is one of the signatories of the Bologna Declaration, and is in the process of developing the realization of the goals arising from the Bologna Process.

The transition from the traditional to the contemporary is a feature of the time of work of the higher education institutions in our country, including the faculties that educate future teachers. The recommendations of the Bologna Declaration, which are the initiators of most of the changes in higher education, are incorporated as basic components for the development of education in the Republic of Macedonia by 2015. The full results of the integration of the Bologna requirements into our education, which can be defined in the most general way as a process, changing and opening up education towards

European practices, can be measured at the end of this educational transition, i.e. within the time limit provided for it (2015).

From the modernization of teaching and traditional learning models, in which a large number of students studied in one group, the lack of informational-communication technology and its poor application in the teaching process, the weak didactic competencies of some teachers, the failure to apply the concept of learning outcomes and to make the students competent for independent work, arose the need for a system of new measures. This system consists of the following elements: implementation of the concept of educational output, introduction of informational-communication technologies and training of the teaching staff.

Results

The weak didactical competencies of some teachers impose the need to improve the teaching staff, from which, in the context of the research, the following would be emphasized: introduction of interactive models in teaching and use of educational modern technology in teaching, which, as present weaknesses, can be overcome in many ways, but above all as an examination of the educational needs of the staff in higher education, who according to previous personal experiences, will point out the need for finding a form for developing high-academy didactic competences.

"The change of the principles and recommendations of the Bologna Process, besides among the teaching, collaborative and administrative staff, caused changes and stirred up the students too" (National Program for the Development of Education in the Republic of Macedonia 2005-2015: 290).

Current issues and problems associated with initial teacher education relate to the need for higher education institutions to promote standards that will apply not only to studies in basic subjects, but also to pedagogical, psychological and methodical skills of teachers for more efficient work in schools. Among other things, there is a need for conceptualization and application of modern programs for permanent professional and pedagogical improvement of the teaching staff in the elementary education. The need for the development of study programs at the faculties of teachers and their revision supported by empirical indicators should also integrate the representation of subjects in the education studies and teaching methodology. The analyzes indicate that with the European standards in the initial teacher education for pedagogical and methodical preparation of future teachers, 25 to 35% of the total number of hours are allocated.

According to the above, in the next revisions of the study programs, as one of the solutions for overcoming the situation, the number of hours within the specific didactic (methodic) has to increase, also subject programs for integrated pedagogical practices need to be introduced. Regarding the permanent training of teachers, the relevant institutions show different level of initiative for improvement. Different forms of professional development are offered by the various relevant institutions.

Conclusions: Determinants of interaction in higher education

The most significant conclusions are the ones regarding the importance of the general educational didactics for possible successful realization of the special didactics, as well as the fact that during the development of the study program with general pedagogical subjects, modern contemporary tendencies of higher education had been taken into consideration. Following the modern trends in higher education indicate the need for a high percentage of representation of practical instruction.

The use of modern teaching methods, in which students are included as equal partners, requires a high level of activity from their side, that positively reflects on the quality of knowledge, regular attendance, and at the same time it may also be a way to overcome some of the problems which occur when studying under the European Credit Transfer System – which is visualized as a very effective way of studying.

These statements point to the conclusion that interactive teaching significantly influences the quality of the learning process and the obtained results.

The highly active working methods in their fragmented use or in their continuous and complete didactically meaningful use, in the form of ready-made interactive models, which is the case with this research, positively influence the quality of knowledge, especially in a multiplied form, as in this case.

The second reasoning suggests that the proactive way of working, through the use of appropriate interactive models, positively influences the durability of knowledge, the possibility for its application and the development of strong didactic competences.

If one starts from these two considerations as premisses, the conclusion that proactivity in teaching appears as a significant factor in improving the quality of knowledge and the development of skills is inevitably imposed, all the more so that this whole "educational scenario" largely takes place in the sphere of the immediate practical activity. So, contemporary academic teaching should increasingly be developed in the direction of using proactivity in conditions of immediate practice (everywhere and always).

The question of how much and what kind of knowledge will the future pedagogues and teachers need, and where is the boundary between what is considered a productive need and what is really needed to those who "tomorrow" will compete in the market of labor, remains open.

This prompts another question as to how the interactive way of work actually represents a kind of burden for teachers and how much they avoid additional (i.e. only seemingly additional because they are essential) burdens that occur during the interactive teaching. Namely, it is quite clear that teaching ex catedra is the easiest for every teacher (but also least productive for every teacher).

The development of interactive models, which ultimately do not have to be programmed at the level of those used in this research, the production of additional materials, continuous monitoring and the creation of conditions for a positive transfer of the theory in the form of its applicability, require greater engagement from the teachers, more time, more energy and effort, and material logistics. This is certainly not due to pedagogical indolence of the teachers, nor to their ignorance of the modes of interaction, but to several actual factors, such as working with large groups of students, performing teaching on many subjects, certain personnel problems, and above all lack of new educational and scientific cadres.

However, the issue on the level of pedagogical competence of teachers in higher education and the development of their didactic abilities, without which, no matter how highly educated they are, effective teaching at this level of education is not possible, still remains open at the university-level. Therefore, one of the outcomes of this research is the establishment of a new concept for the development of high school didactics, which can be developed on two levels, both formally and informally. On the first level, as a systemic solution, a program for didactic training for future teachers in higher education should be made. On the second level, a systematic and programmatic solution should be offerd for the professional development of teachers in higher education, which will improve and strengthen their pedagogical and didactic competences.

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SIGNIFICANCE OF THE DIFFERENCES AND THE DEVELOPMENT TREND OF SYSTOLE AND DIASTOLE PRESSURE AND HEART RATE AMONG STUDENTS OF AGE 6-14 FROM ELEMENTARY SCHOOLS IN MUNICIPALITY OF KISELA VODA

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Abstract

On a sample of 4013 subjects (2025 male and 1988 female), at the age of 6-14, a research has been conducted in order to determine some functional characteristics of students of both gender from first to eight grade at the territory of municipality of Kisela Voda. In order to establish the functional characteristics, three measures were used: systole pressure, diastole pressure and resting hearth rate. Apart from the basic descriptive parameters, in order to determine the statistically significant differences on multivariate and univariate level, MANOVA and ANOVA were used. Based on the results from this research we can conclude that most of the functional measures among boys and girls demonstrate significant statistical differences on multivariate level in the entire area of functional characteristics. The results from the univariate analysis ANOVA, it has been found that most functional measures both among girls and boys show statistically significant differences between different age groups, defined on one year at the level of significance of Q<.05.

Key words: systole, diastole pressure, heart rate

Introduction

It is generally known that the world and healthcare are facing isses caused by human inactiveness. The larger part of the population including elementary school children in most industrialized countries have a sedentary lifestyle, which gradually affects human health even in early ages. Given that inactivenesss is one of the causes for increased body weight thus causing increased blood pressure, we recognised the necessity to analyze some of the functional measures at school aged students of both sexes. Information on the condition of the blood pressure of children and youth will be useful for the subjects themselves as well as public healthcare institutions, clinical planning and prevention of high blood pressure among population, as well as determining normatives for keeping track of trends in the future. In Republic of Macedonia there is scarcely any research, especially on a large scale number of subjects which deal with this topic.

Topic and Aim of the Research

The topic of this research is determining the blood pressure of students from both sexes at the age of 6-14 from elementary schools in municipality of Kisela Voda.

The aim of this research is to establish the laws of the development trend of the systole and diastole blood pressure, as well as the resting heart rate among students of both sexes at the age 6-14 from elementary schools on the territory of municipality of Kisela Voda.

Research Methods

The sample population for this research has been defined as students from eight elementary schools located in municipality of Kisela Voda, at the age of 6-14 who are part of the educational process. The age is defined as chronological age, with a variation of 6 months in the number of years of age of the subject. The research was conducted on sample of 4013 subjects (2025 male and 1988 female) students aged 6-14 from eight elementary schools in municipality of Kisela Voda, who voluntarily participated in the research. In order to determine the blood pressure and resting heart rate, "Beuer" digital measuring devices have been used. For determining the functional measures, three variables were used: systole pressure, diastole pressure, resting hearth rate of subjects from both sexes The following statistical indicators were used during the processing of the data obtained: Arithmetic mean (X); Standard deviation (SD); Minimum value (Min); Maximum value (Max); Variability coefficient (KV); Analyses MANOVA

and ANOVA were used to determine the statistically significant differences on multivariate and univariate level.

Results and Discussion

The values from the multivariate analysis MANOVA show that there statistically significant differences among males and females in the entire set of functional measures (systole, diastole pressure and resting heart rate). The univariate analysis ANOVA determined that in most functional measures both males and females show statistically significant differences between difference age groups, defined on one year with a level of significance Q< .05. Statistically significant differences have not been found only in the functional measure diastole pressure of females aged 6-14.

Table1. Basic statistical parameters and statistically significant differences between age categories in terms of the functional measure systole pressure of males aged 6-14

Age	Min	Max	Mean	Std.Err	SD	KV%	F	Q
6	80,00	146,00	100,41	0,84	8,48	8,45		
7	84,00	142,00	101,70	0,54	7,97	7,84		
8	88,00	141,00	103,77	0,54	8,49	8,18		
9	80,00	130,00	103,37	0,45	7,06	6,83		
10	84,00	148,00	104,79	0,48	7,70	7,35	21,94	**,00**
11	84,00	126,00	105,75	0,38	5,90	5,58		
12	90,00	128,00	106,69	0,41	6,14	5,75		
13	92,00	161,00	106,89	0,51	7,53	7,04		
14	92,00	171,00	108,69	0,58	8,29	7,63		

Statistically significant differences between different age categories (Post-hoc LSD test)

Age	6	7	8	9	10	11	12	13	14
6		.15	.00	.00	.00	.00	.00	.00	.00
7	.15		.00	.02	.00	.00	.00	.00	.00
8	.00	**.00**		.55	.12	.00	.00	.00	.00
9	.00	.02	.55		.03	.00	.00	.00	.00
10	.00	.00	.12	**.03**		.16	.01	.00	.00
11	.00	.00	.00	.00	.16		.18	.10	.00
12	.00	.00	.00	.00	.01	.18		.78	.01
13	.00	.00	.00	.00	.00	.10	.78		.01
14	.00	.00	.00	.00	.00	.00	.01	**.01**	

Table 2. Basic statistical parameters and statistically significant differences among senior categories of the functional measure systole pressure of females aged 6-14

Age	Min	Max	Mean	Std.Err	SD	KV%	F	Q
6	81,00	120,00	99,71	0,71	7,41	7,44		
7	76,00	141,00	101,14	0,58	9,14	9,03		
8	83,00	136,00	101,25	0,50	7,72	7,62		
9	90,00	161,00	103,57	0,54	8,14	7,86		
10	77,00	163,00	104,35	0,65	9,95	9,53	19,33	**,00**
11	86,00	128,00	105,21	0,42	6,48	6,16		
12	75,00	136,00	106,05	0,51	7,27	6,86		
13	87,00	149,00	106,01	0,45	6,87	6,48		
14	84,00	138,00	106,70	0,45	6,10	5,72		

Statistically significant differences among age categories (Post-hoc LSD test)

Age	6	7	8	9	10	11	12	13	14
6		.11	.09	.00	.00	.00	.00	.00	.00
7	.11		.87	.00	.00	.00	.00	.00	.00
8	.09	.87		**.00**	.00	.00	.00	.00	.00
9	.00	.00	**.00**		.28	.02	.00	.00	.00
10	.00	.00	.00	.28		.23	.02	.02	.00
11	.00	.00	.00	.02	.23		.26	.26	.05
12	.00	.00	.00	.00	.02	.26		.96	.41
13	.00	.00	.00	.00	.02	.26	.96		.37
14	.00	.00	.00	.00	.00	.05	.41	.37	

Tables 1 and 2 demonstrate basic descriptive statistical parameters of the functional measures systole, diastole pressure and resting heart rate of subjects from both sexes. From reviewing the tables it is evident that the change of systole pressure on annual basis is insignificant and shows a certain irregularity in the developmental tendency of both sexes. A more accentuated acceleration of the systole pressure is observed among males aged 7-8 and 13-14, whereas among females this is observed at the age 8-9 and 13-14. Based on the variability coefficient it can be seen that the biggest variation of the systole pressure is found among males at the age of 6 and among females at the age of 7. Lowest variations of the systole pressure are seen among males at the age of 11 and females at the age of 14.

The LSD test value shows that statistically significant differences in the systole pressure exist at the age of 7-8, 9-10 and 13-14 among males, or 8-9 neighbouring age group among females. Among the remaining neighbouring age groups of both sexes there aren't any statistically significant differences in the systole pressure.

Table 3. Basic statistical parameters and statistically significant differences among age categories in terms of the functional measure diastole pressure of males aged 6-14

Age	**Min**	**Max**	**Mean**	**Std.Err**	**SD**	**KV%**	**F**	**Q**
6	42,00	97,00	58,84	1,08	10,90	18,53		
7	45,00	97,00	60,56	0,68	10,06	16,61		
8	45,00	97,00	61.29	0,67	10,69	17,44		
9	42,00	88,00	60,26	0,56	8,76	14,54		
10	47,00	112,00	62,09	0,58	9,40	15,13	2,17	**,03**
11	48,00	98,00	61,08	0,58	8,90	14,57		
12	48,00	111,00	61.90	0,68	10,16	16,41		
13	48,00	99,00	61,96	0,64	9,36	15,11		
14	48,00	110,00	62,43	0,61	8,84	14,16		

Statistically significant differences among age categories (Post-hoc LSD test)

Age	6	7	8	9	10	11	12	13	14
6		.14	.03	.21	.00	.05	.01	.01	.00
7	.14		.41	.73	.08	.57	.14	.13	.05
8	.03	.41		.23	.35	.80	.49	.45	.21
9	.21	.73	.23		**.03**	.35	.07	.06	.02
10	.00	.08	.35	**.03**		.24	.83	.89	.70
11	.05	.57	.80	.35	.24		.36	.33	.14
12	.01	.14	.49	.07	.83	.36		.95	.57
13	.01	.13	.45	.06	.89	.33	.95		.62
14	.00	.05	.21	.02	.70	.14	.57	.62	

Table 4. Basic statistical parameters and statistically significant differences among age categories in terms of the functional measure diastole pressure of females aged 6-14

Age	Min	Max	Mean	Std.Err	SD	KV%	F	Q
6	44,00	97,00	58,95	0,88	9,24	15,67		
7	40,00	96,00	61,42	0,73	11,45	18,65		
8	42,00	87,00	60.49	0,61	9,46	15,64		
9	45,00	96,00	60,71	0,60	9,02	14,85		
10	46,00	113,00	62,62	0,74	11,29	18,03	1,85	,07
11	48,00	93,00	61,44	0,59	9,26	15,07		
12	45,00	110,00	61.79	0,74	10,49	16,97		
13	48,00	115,00	62,15	0,68	10,36	16,67		
14	48,00	115,00	61,92	0,74	10,09	16,29		

Statistically significant differences among age categories (Post-hoc LSD test)

Age	6	7	8	9	10	11	12	13	14
6		**.03**	.19	.14	.00	.03	.02	.01	.02
7	**.03**		.31	.45	.19	.98	.70	.43	.61
8	.19	.31		.82	.02	.31	.18	.08	.15
9	.14	.45	.82		**.04**	.44	.27	.13	.23
10	.00	.19	.02	**.04**		.20	.39	.62	.48
11	.03	.98	.31	.44	.20		.72	.45	.63
12	.02	.70	.18	.27	.39	.72		.71	.90
13	.01	.43	.08	.13	.62	.45	.71		.82
14	.02	.61	.15	.23	.48	.63	.90	.82	

Table 3 and 4 show that the change of diastole pressure with the increasing of age is insignificant and there is a certain irregularity in the development tendency of both sexes. A more accentuated acceleration of the diastole pressure is seen at the age of 6-7 and 9-10 among both sexes. The variability coefficient value indicates that the biggest variations of the diastole pressure are noted at the age of 6 among males and age 7 among females. The lowest variation of the diastole pressure is seen at the age of 14 among males and age 11 among females. The LSD test value indicates that statistically significant differences of the diastole pressure are found at the age of 9-10 neighbouring age group among males and age 6-7 and 9-10 as a neighbouring groups among females. Among the remaining neighbouring age groups of both sexes there aren't any statistically significant differences in the diastole pressure.

Table 5. Basic statistical parameters and statistically significant differences among age categories in terms of the functional measure resting heart rate among males aged 6-14

Age	Min	Max	Mean	Std.Err	SD	KV%	F	Q
6	53,00	123,00	98,25	1,37	13,80	14,05		
7	60,00	127,00	96,72	0,92	13,52	13,98		
8	61,00	126,00	96,51	0,89	14,07	14,57		
9	62,00	129,00	95,43	0,88	13,70	14,35		
10	57,00	126,00	91,72	0,87	13,92	15,18	7,08	**,00**
11	61,00	138,00	93,06	0,90	13,81	14,84		
12	56,00	137,00	93,44	1,04	15,48	16,57		
13	56,00	129,00	92,33	1,01	14,94	16,18		
14	55,00	132,00	89,68	1,06	15,26	17,02		

Statistically significant differences among age categories (Post-hoc LSD test)

Age	6	7	8	9	10	11	12	13	14
6		.37	.30	.10	.00	.00	.01	.00	.00
7	.37		.87	.33	.00	.01	.02	.00	.00
8	.30	.87		.40	.00	.01	.02	.00	.00
9	.10	.33	.40		**.00**	.07	.13	.02	.00
10	.00	.00	.00	**.00**		.30	.19	.64	.13
11	.00	.01	.01	.07	.30		.78	.59	.01
12	.01	.02	.02	.13	.19	.78		.42	.01
13	.00	.00	.00	.02	.64	.59	.42		.06
14	.00	.00	.00	.00	.13	.01	.01	.06	

Table 6. Basic statistical parameters and statistically significant differences among age categories in terms of the functional measure resting heart rate of females aged 6-14

Age	**Min**	**Max**	**Mean**	**Std.Err**	**SD**	**KV%**	**F**	**Q**
6	55,00	126,00	96,11	1,41	14,84	15,44		
7	50,00	128,00	99,89	0,83	13,04	13,06		
8	50,00	125,00	97,32	0,85	13,20	13,56		
9	62,00	124,00	96,38	0,93	13,97	14,50		
10	65,00	128,00	96,35	0,88	13,53	14,04	3,11	**,00**
11	60,00	128,00	98,52	0,93	14,45	14,66		
12	58,00	130,00	100,26	1,12	15,86	15,82		
13	58,00	128,00	95,25	1,03	15,63	16,41		
14	58,00	130,00	97,62	1,22	16,61	17,01		

Statistically significant differences among age categories (Post-hoc LSD test)

Age	6	7	8	9	10	11	12	13	14
6		**.02**	.47	.87	.88	.15	.02	.61	.39
7	**.02**		**.05**	.01	.01	.30	.79	.00	.11
8	.47	**.05**		.48	.47	.36	.03	.12	.83
9	.87	.01	.48		.98	.11	.01	.41	.39
10	.88	.01	.47	.98		.10	.01	.41	.37
11	.15	.30	.36	.11	.10		.21	.01	.52
12	.02	.79	.03	.01	.01	.21		**.00**	.07
13	.61	.00	.12	.41	.41	.01	**.00**		.10
14	.39	.11	.83	.39	.37	.52	.07	.10	

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THE INFLUENCE OF EXTERNAL FACTORS ON ANTHROPOLOGICAL CHARACTERISTICS OF STUDENTS AGED FROM 10 TO 18 IN THE CENTRAL BANAT DISTRICT

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Abstract

The aim of this study was to evaluate the anthropometric characteristics that have the greatest significance for the growth and development of pupils in primary schools from the 5th to the 8th grade and pupils from the 1st to the 4th grade of secondary schools on the territory of the Central Banat district. The author has defined the hypothesis: There is an influence of external factors on somatic characteristics and body composition. Based on the conducted research, it is determined that the largest percentage of students come from workers' families with secondary vocational education. The body height and mass of the pupil increases with age. The largest percentage of the pupils is normally fed with normal percentage of body fat. The results of the research indicate that there is an association and influence of external factors on anthropological characteristics, differently in boys and girls.

Key Words: *obesity, socio-economic factors, body mass index, anthropological characteristics, pupils*

Introduction

Growth and development are the basic biological features of childhood and youth. An important prerequisite for normal growth and development is the good health of the child. Growth is a complex process and is defined as a change in body weight, shape and proportion, as well as physiological functions during organogenesis. Development implies qualitative changes during biological maturation, i.e. cell functioning, tissue differentiation, organs and organ systems. Growth is regulated by the effects of various influences that can be divided into endogenous and exogenous. Endogenous effects are those that include genetic factors, hormone factors and sex. Exogenous are socio-economic factors, nutrition, climate and disease. They are essential for the proper growth and development of a personality, because they can be influenced, can be changed, improved and their actions can be guided. Socio-economic opportunities have a significant impact on the lives of individuals. Another important factor is a proper diet. Good and bad habits acquired during childhood remain for the rest of their lives and irregular nutrition can have significant consequences (Vranjašević, 2001). Physical activity of children and youth is nowadays considered a desirable and useful factor of growth and development. (Simić, 2002). The age of growth and development is considered suitable for the organism to accept the development of functional and morphological abilities. External factors are numerous and particularly important because they can be worked on successfully. The most important external factors are: nutrition, climatic factors, socio-economic factors, psychological factors, diseases. Socio-economic factors significantly affect the conditions of life and growth of children. Families, peers, schools and the media have a significant impact on the socialization of children. The social community and organizations significantly influence the socialization of children and their development.

The Purpose of This Work

The aim of this research is to evaluate the anthropometric characteristics of students, which have the greatest significance for the growth and development, of pupils from the 1st to the 8th grade of primary schools and pupils from the 1st to the 4th grade of secondary schools; to determine the influence of external factors on somatic characteristics and body composition as well as their interconnectedness.

Methodology of Research

Sample

The survey examined pupils, from 5th to 8th grades of primary schools, and pupils from the 1st to the 4th grade of secondary schools. The research was conducted in schools that were deployed on the entire territory of the Central Bank District.

Table 1.

Gender	Primary schools	Secondary schools	Total
Male	184	105	289
Female	178	89	267

Examinees were selected by type of random sample. The sample included 556 persons of both sexes, 289 boys and 267 girls (Table 1). The method of survey and measurement of anthropological characteristics was applied. Prior to the completion of the questionnaires, biology professors introduced the aim and purpose of the research to students. The average filling lasted 15 minutes. All the answers and all the anthropological measurements obtained during the survey were included in the statistical processing.

Examined characteristics

The survey includes demographic and social indicators, habits and biological characteristics of pupils. The following features were taken: sex, age, class, school, diet, socio-economic status of parents, parents' education, body height, body weight, percentage (%) of body fat, body fat in kg.

Instruments and examining techniques

The survey is composed of 18 questions. The questions relate to the basic biographical data of the examinees, their diet, the most consumed foods, how much they are physically active. The questions are close-type, where the examinees decide on one or more offered answers.
The age of the examinees was presented as a decimal age, calculated as the difference between the year of the survey and their year of birth. The height of the body was determined using the Martin anthropometer, with a measuring range of up to 210 cm and a measurement accuracy of 0.01 cm. It represents the distance from the basic to the vertex, where the subject is standing on a flat surface, with his heels joined together so that the back and the heels are in the same vertical position. The head is placed in such a position so that the "Frankfurt Horizontal" is in a vertical position. The examiner stands behind the back of the examinee and the horizontal arm of the anthropometer descends until it touches the subject (vertex). The body mass is determined using a digital portable scales, the accuracy of which is 0.01 kg. Prior to every measurement, the scale is calibrated and leveled. The percentage the body fat is measured by Bioelectric Analyzer (BF 306). It is a device in the form of a controller, which determines the percentage of body fat that appears on the display in percentages and kilograms for the entered height, weight and age of the examinees.

Methods for data analysis

The obtained anthropological and socio-demographic data is arranged in the database, separately for boys and girls, in EXCEL for Windows. Statistical analysis was done using EXCEL and SPSS 10.0 for Windows. The basic statistical indicators, separately for each gender, were calculated using descriptive statistical method. The significance of the differences between the average values was tested by the Student's t-test (at the significance level of $p = 0.05$ and 0.01. ($t < 1.96$ no difference; $t > 1.96$ some differences $t > 2.58$ very significant differences). The mutual correlation between anthropometric and socio-demographic parameters is determined by Pearson's correlation coefficient (r). The linear regression analysis determined the influence of socio-demographic factors and students' habits on anthropometric characteristics and nutritional status. The multiple-regression analysis determined the influence of external factors on the anthropological characteristics of the examinees, thus determining which factor is greater and which has a lesser impact on the observed characteristic. The age of the examinee is given by a decimal age, calculated from the date of birth and the date of the survey. The body mass index (BMI) is an indication of nutrition. The prevalence of undernourished, overweight and obese children is estimated

based on the BMI reference values given by Cole (2000, 2007) - International Obesity Task Force (IOTF) for each age and gender.

Results

Table 2. shows the distribution of the examinees parents' education. There is a very similar percentage share of education categories in both parents. Most parents, both sexes, are with secondary education, then with primary school, while the smallest number of parents is with higher education. Observing the results for the overall sample, it is noted that secondary education is represented in 89.27% of parents, primary education in 8.46%, and higher in 2.25%.

Table 2. Parents' education

Parent	1		2		3	
	N	%	N	%	N	%
Father	48	8,63	501	90,10	7	1,25
Mother	46	8,30	490	88,45	18	3,25
Total	94	8,46	991	89,27	25	2,25

1-primary school 2 – secondary school 3 – higher education

Table 3. shows parents' occupations. A similar percentage of occupations is observed in both parents. Most of the parents of both sexes are workers and farmers, while clerks are lower in percentage. In the overall sample, the largest number of examinees come from working families (48.52%), followed by examinees from agricultural (31.90%), then clerical (10.89%) and families where parents are engaged in other occupations (8.69%) .

Table 3. Parents' occupations

	1		2		3		4		5	
	N	%	N	%	N	%	N	%	N	%
M	240	49,38	145	29,83	56	11,52	45	9,25	486	100
F	201	47,51	145	34,27	43	10,16	34	8,03	423	100
TOTAL		48,52		31,90		10,89		8,69		

1 – workers, 2 – agriculture workers, 3 – clerks, 4 – other, 5 – total

Distribution of habits related to physical activity among the students surveyed is given in Table 4. In the surveyed youth population, a small number of them do not engage in sports, fewer boys (0.69%) than girls (5.24%) ($p < 0.01$). Recreational activities 2 to 3 times a week are done by 91.69% of boys and 89.88% of girls, and 7.61% of boys and 4.86% of girls actively trains a sport. In terms of gender, more male examinees are engaged in sport and training, but the difference is not significant.

Table 4. Physical activity

	Doesn't do sport		Recreationally 2 to 3 times a week		Trains a sport		Total	
	N	%	N	%	N	%	N	%
Male	2	0,69	265	91,69	22	7,61	289	100
Female	14	5,24	240	89,88	13	4,86	267	100

By analyzing the representation of physical activities in individual birth years, it was noticed that the majority of examinees, of both sexes, are engaged in sports from the 13th and 18th years.

Results of statistical analysis of anthropological characteristics

The results of the analysis of anthropological characteristics indicate that the mean height of the body in the examined boys from 11 to 19 years old is 166.35 ± 5.77 cm, and in the girls 161.53 ± 5.22 cm. Among the boys, significant differences in height of the body were observed from 12 to 15 years ($p < 0.01$), and between 18 and 19 years ($p < 0.05$). In girls, a significant increase is between 12 and 14 years ($p < 0.01$), and between 14 and 15 years ($p < 0.05$). In all ages, boys have higher body height, but significant differences have been recorded since the age of 13 ($p < 0.01$). The average body weight in boys from 11 to 19 years is 60.46 ± 7.69 kg, and in girls 52.29 ± 6.35 kg. For this characteristic, an increase that goes with the age is also observed, but as in the case of a previous characteristic, it is not straightforward and deviates from the usual trend in the movement of this characteristic in individual ages. The highest increase in body mass in boys is from the age of 13 to 15, and among girls between 13 and 14. A gender difference was found for the benefit of boys in all ages, but significant differences were observed from the age of 14 ($p < 0.01$).

Results of statistical analysis of nutritive status

In all ages, the majority of boys are physiologically normally fed. The lowest number of malnourished boys is at the age of 14 (2.70%) and the highest at the age of 19 (23.80%). The distribution of excessive nutrition ranges from 4.38% at the age of 13 to 16.67% at the age of 17. Obesity is at the lowest level at the age of 18 (3.22%), and at the highest at the age of 14th (8.10%). Results of nutritional status in the total sample indicate that physiologically normal nutrition is present in 79.93% of boys. 5.53% are infants, while 14.53% of boys are overweight and obese. The nutritional status categories in girls indicate that girls in all ages are normally fed. Malnutrition is, as with boys, most represented at the age of 19, and 12 and 17, and no girls belonged to this category. The prevalence of excessive nutrition ranges from 2.78% at the age of 14 to 24.13% at the age of 12. The most obese students are at the age of 13 to 16, which is in line with the hormonal changes that accompany this stage of development. The nutritional status categories in the total sample of girls show that the highest percentage of girls is normally fed (73.03%). Overweight is 13.25%, obesity is 8.61% and there is the lowest percentage of those who are malnourished (4.50%). The total prevalence of overweight and obese girls (22.46%) is significantly higher ($p < 0.05$) than in boys (14.53%). Based on the results of the percentage of fat measurement in males, the majority of students have normal value of body fat for their age. At all ages, a small percentage of boys with a low percentage of fat in the body was registered, except at the age of 19, where a greater percentage of such students was registered. In the overall sample, it is noted that a an average of 64.35% of pupils have normal percentage of body fat. The percentage of boys with high and very high fat values in the body is 31.14%, which indicates that a certain percentage of boys has high body fat values, in normal body weight. Based on the results of fat percentage measurements in females, it is noted that most of the students in all ages are with normal body fat values. In most ages, girls are slightly more represented in the categories of high and very high percentage of fat compared to boys. In the overall sample, a very similar percentile representation of certain categories as in the male gender is observed. Most girls have normal values of fat percentage in the body of 59.93%. The lowest number of girls has low (4.43%), and high and very high values have a total of 35.57% of girls.

Regression analysis of the correlation between anthropological characteristics and external factors

The following tables show the results of the regression analysis in the overall sample, between anthropological characteristics and some external factors such as: parents' education, consumption of certain foods, age and habits of students. It is noted that of all the examined factors, only the age of the examinees influences significantly the height of the boys (Table 5). In girls (Table 6), a height correlation with the age of examinees was observed, and for other factors, no significant association with body height was noticed.

The body weight of the boys is significantly influenced by the age of examinees and fruit intake ($p < 0.01$), and to a lesser extent the habit of smoking ($p < 0.05$). Doing sport also significantly influences the decrease in the body mass of the boys (Table 7).

Table 5. Analysis of the correlation between body height and external factors in boys

Constants	β	t	P
father's education	. 010	1 . 091	. 276
mother's education	. 008	.892	.373
age	. 036	2.360	**. 019**
fruit	. 009	. 896	. 371
milk	. 002	. 205	. 838
meat	- . 001	- . 160	. 873
alcohol	. 006	. 624	. 533
smoking	. 012	1 . 184	. 237
sport	- . 010	- 1 . 141	. 255

Table 6. Analysis of the correlation between body height and external factors in girls

Constants	B	t	P
father's education	- .003	-.3.35	. 738
mother's education	. 006	.649	.517
age	. 022	1.782	**. 036**
fruit	. 004	. 433	. 665
milk	. 013	1.554	. 121
meat	- . 016	- . 1.815	. 071
sport	. 015	- 1 . 819	. 070

Table 7. Analysis of the correlation between body height and external factors in boys

Constants	β	t	P
father's education	-.028	- 1.256	. 210
mother's education	. 020	.893	.372
age	.378	12.916	**. 000**
fruit	.115	4.792	**. 000**
milk	-.024	-1.052	. 294
meat	.029	1.273	. 204
sport	- .044	- 2.005	**. 046**

In the case of girls (Table 8), a significant positive correlation with the age of the examinees was found, i.e. increase of body weight with age. The weight of girls is also significantly influenced by the consumption of milk, while the use of meat in the diet is significantly negatively related to the body mass of the girls.

Table 8. Analysis of the correlation between body height and external factors in girls

Constants	B	t	P
father's education	.041	1.305	. 193
mother's education	. 001	.017	.986
age	.452	13.572	**. 000**
fruit	.046	1.464	. 145
milk	.109	3.664	**.000**
meat	-.128	-4.075	**. 000**
sport	- .014	.471	. 638

Regression analysis of association of BMI and external factors

The body mass index (BMI) increases significantly with the boys' age and, to a lesser extent, with higher consumption of meat. In girls, no significant correlation between the factors examined and the nutrition index was found. A significant negative association in percentage of body fat with their age was

observed in girls, which indicates that the percentage of body fat decreases to a certain extent in the older girls. Increased intake of milk and meat also significantly influences the increase in fat in the body of the girls.

Correlation analysis of external factors and anthropological characteristics

The results of the correlation analysis between the anthropological characteristics and some external factors determine the interconnectedness of all the above factors. It is noted that parents' education is in a high positive correlation, indicating that parents in most cases choose a spouse with the same level of education. Father's education significantly influences the values of the index of nutrition and consumption of fruits and meat in boys. Mother's education affects the consumption of meat and fruit and to some extent the habit of smoking. Drinking alcohol is affected by the age of the examinees, father's education and the habit of smoking. The age of the examinees is significantly related to the body height and weight, the index of nutrition and consumption of fruits, milk and meat products, and also significantly affects the physical activity of boys and the habit of smoking. The height and weight of the examinees are in significant positive correlation with each other and are also associated with the index of nutrition and consumption of fruit and milk. The percentage of body fat and its amount in kilograms are significantly related to the age, the index of nutrition and consumption of milk and meat, while the relative amount of fatty tissue is related to physical activity to a certain extent.

Discussion

The paper presents the results of the research on the influence of external factors on the growth and development of children on the territory of the Central Banat District. The survey was conducted in primary and secondary schools and included a total of 556 children. In some age groups, a small number of children was surveyed, resulted by a small number of children in certain classes. The children examined, in most cases come from families of parents with secondary education, while the smallest number of parents are with higher education. Children's parents are mostly workers and farmers, while clerks and other occupations are represented in a lower percentage. Distribution of habits related to physical activity among the students surveyed indicates that young people are mainly engaged in some physical activity. A very small percentage of young people said that they did not engage in sports, and that is less with boys (0.69%) than girls (5.24%) ($p < 0.01$). Recreational activities 2 to 3 times a week are employed by 91.69% of boys and 89.88% of girls, and 7.61% boys and 4.86% girls actively trains a sport. The research of anthropological characteristics included the height and weight of the body, since these characteristics are most often used to estimate growth, health, and nutrition. The average height of the body, as one of the most reliable growth indicators, was in the boys 11 to 19 years of age being 166.35 ± 5.77 cm, and in girls 161.53 ± 5.22 cm. In all ages, boys have higher body height, but significant differences have been recorded since the age 13 ($p < 0.01$). Regression analysis has shown that of all the factors tested, only the age of the subjects significantly influences the value of this characteristic, i.e. its increase with age. However, correlation analysis has established a significant correlation of body height with consumption of milk, meat and fruits, and in girls and with the education of a father. The average body weight in boys from the age of 11 to 19 is 60.46 ± 7.69 kg, and in girls 52.29 ± 6.35 kg. For this characteristic, an increase with age is also observed, but as in the case of the previous characteristic, it is not straightforward and deviates from the usual trend in the movement of this characteristic in individual ages. The body mass in the boys is positively influenced by the consumption of fruit, while physical activity affects it negatively, ie. body weight decreases with increased physical activity. The body weight of the girls is affected by the use of milk and meat in their diet. This characteristic is significantly correlated with height and nutritional index in both genders, and in girls with absolute and relative fat content in the body, as well. The results of nutritive status in the total sample indicate that physiologically normal nutrition is present in 79.93% of boys. Malnutrition is present in 5.53%, while 14.53% of boys are overweight and obese. The nutritional status categories in girls indicate that girls in all ages are normally fed. However, the overall prevalence of over-nourished and obese girls (22.46%) is significantly higher ($p < 0.05$) than in boys (14.53%). By analyzing the correlation of the body mass index with external factors, it was found that in boys, its values are influenced by the age of the examinees and the use of meat in the diet, that is, it increases with aging and increased intake of meat in the diet. The body mass index in both genders is significantly correlated with body height and weight and relative and absolute fat content.

Based on the results of the fat percentage, it has been observed that the highest number of students of both genders have normal body fat values for their age. In most ages, girls are slightly more represented in the categories of high and very high percentage of fat compared to boys.

Conclusion

The significance of the research is that similar research had not been done on this territory and therefore it provides useful information in terms of proper growth and development of children in school age, guidance and improvement of health. Schools represent a significant factor in the lives of young people because they can take preventive measures in order to improve the health of the youth (Rakić, 2009). School health promotion should provide: healthy and safe school environment and good health centers in school, which can be achieved by doing such research. It has been found that children and youth exercise some kind of physical activity, however, the percentage of children who actively train a sport is relatively small. Only 7.61% of boys and 4.86% of girls are actively training a sport. In all ages, boys have higher body height values, but significant differences are recorded at the age of 13. Correlation analysis has established a significant correlation of body height with consumption of milk, meat and fruits, and in girls and with the education of a father. In earlier research it was found that children whose fathers and mothers have secondary and higher education are of major anthropometric characteristics (Božić - Krstić, 1983, Rakić, 2009). In this study, however, there was no significant correlation between parents' education and anthropological characteristics, and similar result was found in recent studies of children from Novi Sad (Herubel, 2013). The highest increase in body mass in boys is from the age of 13 to 15, and among girls between 13 and 14. The body mass in boys is positively influenced by the consumption of fruit, while physical activity affects it negatively, i.e. body weight decreases with increased physical activity. The highest percentage of boys and girls is physiologically normally fed. In boys, the body mass index increases with aging and with increased intake of meat in the diet. In both genders, it is significantly correlated with body height and weight and relative and absolute fat content. Most students of both genders have normal values of body fat for their age. At most ages, girls are slightly more represented in the categories of high and very high percentage of fat compared to boys. The results of the research indicate a certain influence of the investigated factors on the anthropometric characteristics and parameters of the body composition. However, the individual factors examined differ in their effect in boys and girls.

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MULTIVARIATE SPACE OF JUDO SPORTSMEN AT THE AGE OF 13 TO 15 YEARS OLD AND THE COMPARISON OF THE ANTHROPOLOGICAL DIMENSIONS

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Abstract

The research was conducted on a sample of 92 participants, at the age of 13-15 years old, which have been training at least one year. The participants' sample was conducted from 2 judo sportsmen groups from Macedonia 50 and BIH 42. The aim of this research was to compare the anthropological dimensions from the two groups. For the purpose of this research, there were applied 28 variables from which: 9 anthropometrics variables, 14 variables for assessment of motor dimensions and 5 variables for assessment of situational movement structure of judo sportsmen. With applying invariant and multivariate statistical methods, there have been established differences in some anthropometrical measurements, in some motor abilities and in situational movement structures in judo sportsmen, between groups.

Key words: *groups, judo sportsmen, univariate, multivariate, situational movement structures*

Introduction

Because of the specificity of this sport, and it is characterized by explosive and very complex movements, which because of their movement structure counts in the group of poly structural acyclic activities, imposes the need for constant implementations of researches which will be related to the improvement of the motor and specific motor abilities, especially with the younger age categories. The significant correlation between the functional abilities and the performance of technical elements in judo, indicate that the improvement of some functional variables can have positive influence on the performance of the same elements during the combat (Bratik 2011). The aim of the training process in judo sport is to improve the techniques' that are used in the competitions with the opponent. Judo sport belongs to the sport groups that have significant influence on the transformation of human personality in complete. In judo dominant part have some of the next motor abilities: coordination, balance, velocity, strength, durability (Lolič D, Nurkič M, 2011). With its regular practice during long time period, influences on the optimal growth of the young sportsmen, on improving the structure of psychosomatic status, influence on the anthropometric and motor dimensions of sportsmen, provides guidance and control of the innate reflex movements or it has significant influence on all spaces (conation, cognitive, sociological, psychological etc. Ibri, L., 2011). The relation between basic motor abilities, morphological characteristics and motor knowledge (skill), is a multidimensional and complex space for adequate analyses. It is considered that the higher level of basic motor abilities is based on a prerequisite for successful learning of new motor structure, their improving and applying (Bratič, 2003). Analyzing the previous researches, we can conclude that there is a need of a bigger number of information's which will provide the practice secure grip for successful work.

METHODES

The research was conducted on a stratified sample of participants, judo sportsmen, and males. In total it was conducted on 92 competitors at the age of 13-15 years old, members of several clubs from R. Macedonia and BiH. For the purpose of this research, there were conducted measurements of anthropological dimensions in three spaces:

- Assessment of morphological characteristics (9 variables)
- Assessment of motor abilities (14 variables)
- Assessment of situational movement structure of judo sportsmen (5 variables)

1. Variables for assessment of morphological characteristics

1. body height (ATLVIS)
2. leg lenght (ADUENO)
3. arm lenght (ADUŽRU)
4. body mass (ATLMAS)
5. chest volume (AOBGRU)
6. femur size (AOBNAT)
7. humerus size (AOBNAD)
8. back skin fold (ANABLE)
9. stomach skin fold (ANABTR)

2. Variables for assessment of motor abilities
   1. Tap with arm (MBFTAP)
   2. Tap with leg (MBFTAN)
   3. Deep bent on bench (MFLPRK)
   4. Twisting with stick on shoulders (MELISK)
   5. Jump in distance from place (MFESDM)
   6. Jump in height from place (MFESVM)
   7. Trowing medicine from lying (MFEBML)
   8. Lifting the body fom lying (MREPTL)
   9. Lifting the body-back bent (MRCZTL)
   10. Balance on hemisphere-inner static (MBAPLU)
   11. Balance on hemisphere-external dinamic (MBAPLV)
   12. Movement in air (MTKOZR)
   13. Movement with stick (MTKOSP)
   14. Movement on the ground (MAGONT)
3. Variables for assessment of situational movement structure of judo sportsmen
   a) for assessment of arm tehniques

- ipon-seoi-nage SMISN

b) for assessment of side tehniques

- Uki-goshi SMUGŠ

c) for assessment of leg tehniques

- o-soto-gari SMOSG

d) for assessment of sacrificial tehniques

– tomoe-nage SMTNG

e) for assessment of fixing tehniques (osa-e-komi 4 positions)

- Kesa-gatame, kata gatame, kami shiho gatame, jokoshiho gatame SMKKG

The data obtained from this research according to the characteristics and the size of the chosen sample, are processed in various programs. The original data from the measurements at first were placed in data matrix in Excel, and afterwards statistical parameters were calculated with the program Statistic for Windows 6.0. Also and the statistical package SPSS. For the needs of this research, there were calculated this next measures: arithmetic's mean (MEAN), standard deviation (Std. Dev) which needs to be at least 1/3 from the value of the mean, minimal (MIN) and maximal (MAX) score, Skew-symmetry of the result distribution, Kurt – curvature of result distribution, K-S- Kolmogorov-Smirnov's procedure to establish the distributive normality of the results.

Results and Discussion

On table 1 and 2 are shown basic descriptive statistic parameters of the two groups of participants or the participants from R. Macedonia (table 1) and participants from BiH (table 2). Analyzing the data given from table 1 and 2, we can conclude that the distribution of the anthropometric variables, motor variables and situational movement structure variables of judo sportsmen, are moving in the boundaries of normal distribution of the results. On the first participants sample, values of the Gaus curve (Skewness)

are in span of moderate symmetry (+1-1), with the exception of the variables ABNABTR=1.81 and MBAPLU=2.313, which indicates to concentration of the results towards smaller values.

Table 1. Basic central and dispersion parameters- participants from Macedonia

	Valid N	Mean	Minimum	Maximum	Std.Dev.	Skew	Kurt	max D	p
ATLMAS	50	58,854	40,000	89,000	12,534	,743	-,130	.127	p> .20
ATLVIS	50	167,914	150,000	193,000	9,419	,437	-,125	,093	p> .20
ADUZNO	50	98,246	90,000	113,000	5,229	,814	,228	,134	p> .20
ADUZRU	50	70,926	61,000	82,500	5,127	,047	-,545	,091	p> .20
ANABLE	50	,944	,600	1,600	,256	,620	,185	,113	p> .20
ANABTR	50	1,286	,800	3,000	,427	1,811	4,421	**,206**	**p< ,05**
AOBGRU	50	84,620	67,500	102,000	8,428	,534	,136	,142	p> .20
AOBNAD	50	25,880	21,000	33,000	2,887	,520	,128	,115	p> .20
AOBNAT	50	49,311	40,000	66,000	5,402	1,017	1,408	,112	p> .20
MBFTAP	50	32,160	22,000	39,000	4,022	-,423	-,678	,156	p< ,20
MBFTAN	50	20,880	14,000	28,000	3,600	-,026	-1,013	,142	p> .20
MRCZTL	50	27,440	6,000	60,000	14,452	,553	-,706	,146	p> .20
MREPTL	50	26,840	10,000	60,000	12,129	,586	-,203	,111	p> .20
MBAPLV	50	7,340	1,000	22,000	5,101	,881	-,018	**,223**	**p< ,05**
MBAPLU	50	5,340	1,000	20,000	3,520	2,313	7,088	**,225**	**p< ,05**
MBEBML	50	6,487	4,000	8,920	1,408	-,122	-1,261	,101	p> .20
MKTOZR	50	4,404	3,250	5,780	,564	,419	,458	,112	p> .20
MKTOSP	50	7,190	4,740	11,470	1,850	,690	-,790	,153	p< ,20
MAGONT	50	12,572	9,600	17,200	1,958	,535	-,401	,095	p> .20
MFESDM	50	194,360	148,000	250,000	25,830	-,105	-,649	,094	p> .20
MFESVM	50	35,360	24,000	50,000	6,868	,469	-,870	,158	p< ,20
MFLPRK	50	29,180	15,000	40,000	5,871	-,363	-,610	,122	p> .20
MFLISK	50	75,280	50,000	109,000	13,561	,481	-,060	,151	p< ,20
SMISN	50	3,697	2,000	5,000	,815	-,145	-,984	,157	p< ,20
SMUGS	50	3,680	2,000	5,000	,752	-,161	-,519	,105	p> .20
SMTNG	50	3,462	2,000	4,830	,718	-,148	-,621	,120	p> .20
SMOSG	50	3,297	1,160	4,660	,739	-,792	1,125	,143	p> .20
SMKKG	50	3,784	2,100	4,800	,758	-,495	-,661	,111	p> .20

The values of the Gaus curve (Kurtosis) is platicurtic which indicates on bigger discrimination of the results, while exceptions are variables ANABTR=4.421, MBAPLU=7.088, where we can notice leptokurtic curve, or bigger concentration of the results around theirs means. The result distribution of the variables given with the method Kolmogorov-Smirnof, shows that values of the tested variables deviates from the normal result distribution only with three variables (ANABTR, MBAPLV, MBAPLU) on level of p<.05. Similar analysis can be noticed with the second group of participants, the values of Gaus curve (Skewness) are in span of moderate symmetry (+1-1), with the exception of the variables ABNABTR=1.066, MBAPLU=1.398 and MKTOSP=1.809, which indicates to concentration of the results towards smaller values.

The values of the Gaus curve (Kurtosis) is platicurtic which indicates on bigger discrimination of the results, while exception is variable MKTOSO=4.214. The result distribution of the variables given with the method Kolmogorov-Smirnof, shows that values of the tested variables deviates from the normal result distribution only with the variable MBAPLV, on level of p<.05. to display the differences in antropometric characteristics, motor abilities and situational movement structure of young judo sportsmen on table 3 are shown: arithmetic's mean (MEAN), standard deviation (Std. Dev)T-test (t), degrees of freedom (df) and the probability of error in rejection of hypotheses that the difference statistically is not significant (p). The results from the t-test, indicates on the fact that on univariate level there is statistical significant difference between the tests of the three anthropological spaces. The difference is expressed in anthropometric dimensions in the test arm length (ADUZRU) in favor of the participants from BiH which it is been shown that they have bigger extremities, and with the variable femur size (AOBNAT) in favor of the participants from Macedonia which have bigger size of femur.

Table 1. Basic central and dispersion parameters- participants from BiH

	Valid N	Mean	Minim	Maxim	Std.Dev.	Skew	Kurt	max D	p
ATLMAS	42	58,564	32,000	92,000	14,242	,342	-,290	,073	p > .20
ATLVIS	42	168,476	147,300	183,600	9,406	-,438	-,607	,098	p > .20
ADUZNO	42	98,359	84,300	108,300	6,525	-,279	-,726	,115	p > .20
ADUZRU	42	73,702	62,000	86,600	4,932	,063	,263	,111	p > .20
ANABLE	42	,945	,600	1,300	,158	-,102	-,027	,135	p > .20
ANABTR	42	1,285	,900	2,100	,259	1,066	1,211	,144	p > .20
AOBGRU	42	84,078	68,000	100,000	8,18	,176	-,555	,136	p > .20
AOBNAD	42	25,457	19,000	34,500	3,498	,329	-,219	,076	p > .20
AOBNAT	42	46,145	33,000	57,000	4,311	-,284	1,465	,087	p > .20
MBFTAP	42	32,464	24,000	38,000	3,485	-,227	-,724	,123	p > .20
MBFTAN	42	20,833	15,000	26,000	2,507	,003	-,061	,106	p > .20
MRCZTL	42	55,785	9,000	110,000	28,937	,242	-1,089	,126	p > .20
MREPTL	42	41,904	10,000	70,000	15,803	-,266	-,682	,100	p > .20
MBAPLV	42	6,428	1,000	17,000	4,037	,920	-,087	**,226**	**p < ,05**
MBAPLU	42	6,142	1,000	20,000	3,948	1,398	2,436	,185	p < ,15
MBEBML	42	6,483	4,200	9,200	1,247	,311	-,756	,098	p > .20
MKTOZR	42	4,312	3,200	5,560	,582	,128	-,249	,089	p > .20
MKTOSP	42	6,207	4,850	11,400	1,364	1,809	4,214	,172	p < ,20
MAGONT	42	12,153	9,100	17,440	2,210	,954	,250	,139	p > .20
MFESDM	42	199,166	135,000	252,000	31,574	-,324	-,799	,134	p > .20
MFESVM	42	34,452	25,000	45,000	5,504	,421	-,931	,172	p < ,20
MFLPRK	42	28,190	10,000	45,000	6,641	-,127	,771	,077	p > .20
MFLISK	42	71,047	35,000	100,000	15,405	,257	-,368	,152	p > .20
SMISN	42	4,118	3,000	5,000	,524	,102	-,900	,160	p > .20
SMUGS	42	4,057	2,300	5,000	,651	-,452	-,080	, 108	p < .20
SMTNG	42	3,540	1,000	5,000	,981	-,436	-,399	,090	p > .20
SMOSG	42	3,680	2,000	4,800	,673	-,223	-,037	,108	p > .20
SMKKG	42	3,744	1,000	4,900	,892	-,826	,620	,120	p > .20

Table 3. t-test of the means of the two groups

	Mean	Mean				Valid N	Valid N	Std.De	Std.De	F-ratio	p
	G_1:1	G_2:2	t-value	df	p	G_1:1	G_2:2	G_1:1	G_2:2	varia	varia
ATLAS	58,854	58,564	,103	90	,917	50	42	12,534	14,242	1,291	,390
ATLVIS	167,914	168,476	-,285	90	,776	50	42	9,419	9,406	1,002	,999
ADUZNO	98,246	98,359	-,092	90	,926	50	42	5,229	6,525	1,557	,137
ADUZRU	70,926	73,702	-2,632	90	**,009**	50	42	5,127	4,932	1,080	,046
ANABLE	,944	,945	-,027	90	,978	50	42	,256	,158	2,633	,001
ANABTR	1,2860	1,285	,003	90	,996	50	42	,427	,259	2,724	,001
AOBGRU	84,620	84,126	,282	90	,778	50	42	8,428	8,282	1,035	,914
AOBNAD	25,880	25,457	,635	90	,526	50	42	2,887	3,498	1,468	,973
AOBNAT	49,311	46,145	3,064	90	**,002**	50	42	5,402	4,311	1,570	,140
MBFTAP	32,160	32,464	-,383	90	,701	50	42	4,022	3,485	1,331	,349
MBFTAN	20,880	20,833	,070	90	,943	50	42	3,600	2,507	2,061	,019
MRCZTL	27,440	55,785	-6,085	90	**,000**	50	42	14,452	28,937	4,009	,000
MREPTL	26,840	41,904	-5,169	90	**,000**	50	42	12,129	15,803	1,697	,076
MBAPLV	7,340	6,428	,937	90	,351	50	42	5,101	4,037	1,596	,126
MBAPLU	5,340	6,142	-1,030	90	,305	50	42	3,520	3,948	1,257	,439
MBEBML	6,487	6,483	,014	90	,988	50	42	1,408	1,247	1,275	,425
MKTOZR	4,404	4,312	,760	90	,448	50	42	,564	,582	1,066	,823
MKTOSP	7,190	6,207	2,850	90	**,005**	50	42	1,850	1,364	1,839	,047
MAGONT	12,572	12,153	,962	90	,338	50	42	1,958	2,210	1,273	,415
MFESDM	194,360	199,166	-,803	90	,423	50	42	25,830	31,574	1,494	,178
MFESVM	35,360	34,452	,690	90	,491	50	42	6,868	5,504	1,556	,148
MFLPRK	29,180	28,190	,758	90	,450	50	42	5,871	6,641	1,279	,406
MFLISK	75,280	71,047	1,401	90	,164	50	42	13,561	15,405	1,290	,391
SMISN	3,697	4,118	-2,882	90	**,004**	50	42	,815	,524	2,419	,004
SMUGS	3,680	4,056	-2,538	90	**,012**	50	42	,752	,652	1,330	,349
SMTNG	3,462	3,540	-,434	90	,664	50	42	,718	,981	1,863	,037
SMOSG	3,297	3,680	-2,577	90	**,011**	50	42	,739	,673	1,202	,546
SMKKG	3,784	3,744	,232	90	,816	50	42	,758	,892	1,384	,274

With the tests from the motor space, statically significant difference was established with the variables lifting the body- back bent (MRCZTL), and also with the variable twisting with stick on shoulders (MELISK). The differences of the results in situational movement structure of young judo sportsmen were evidenced in three variables: for assessment of arm techniques -ipon-seoi-nage (SMISN) and for assessment of leg techniques -o-soto-gari (SMOSG). It is evident that better results in the three variables belongs to the first group of participants or that they have better technical characteristics. According to the results from table 4, in which are shown variance analysis (ANOVA) and Multivariate analysis of variance (MANOVA) between the two examples of judo participants, in three anthropological spaces, statically significant difference has been established with the variables: arm length (ADUZRU) on level p=.009, femur size (AOBNAT) on level p=.002, lifting the body- back bent (MRCZTL) and lifting the body from lying (MREPTL) on level p=.000, also with the variable twisting with stick on shoulders (MELOSP) on level p=.005. With situational movement structure of young judo sportsmen were evidenced in three variables: -ipon-seoi-nage (SMISN) on level p=.004, uki goshi (SMUGS) on level p=.012 and with the variable osoto gari (SMOSG) on level p=.011. With the overall system of 28 (twenty eight) applied variables there was established statistical significant difference between the tested groups of judo sportsmen according to Wilks' Lambda (0.364), Rao's R approximation (Rao's R=3.537) and according to the values for df1=30 and df2=61 and p-level=0.000.

Table 4. Variance analysis (ANOVA) and Multivariate analysis of variance (MANOVA).

	Mean sqr	Mean sqr	F(df1,2)	
	Effect	Error	1,90	p-level
ATLAS	1,92	177,957	,010	,917
ATLVIS	7,21	88,613	,081	,776
ADUZNO	,29	34,284	,008	,926
ADUZRU	175,95	25,396	6,928	**,009**
ANABLE	,00	,047	,000	,978
ANABTR	,00	,130	,000	,996
AOBGRU	5,57	69,936	,079	,778
AOBNAD	4,08	10,114	,403	,526
AOBNAT	228,76	24,359	9,391	**,002**
MBFTAP	2,11	14,343	,147	,701
MBFTAN	,05	9,923	,005	,943
MRCZTL	18340,29	495,193	37,036	**,000**
MREPTL	5180,31	193,870	26,720	**,000**
MBAPLV	18,96	21,594	,878	,351
MBAPLU	14,71	13,848	1,062	,305
MBEBML	,00	1,788	,000	,988
MKTOZR	,19	,327	,578	,448
MKTOSP	22,03	2,711	8,123	**,005**
MAGONT	4,00	4,314	,927	,338
MFESDM	527,37	817,415	,645	,423
MFESVM	18,80	39,488	,476	,491
MFLPRK	22,35	38,865	,575	,450
MFLISK	408,88	208,244	1,963	,164
SMISN	4,05	,486	8,310	**,004**
SMUGS	3,23	,502	6,443	**,012**
SMTNG	,14	,720	,188	,664
SMOSG	3,35	,504	6,642	**,011**
SMKKG	,04	,675	,053	,816

Wilks'				
Lambda	Rao's R	df 1	df 2	p-level
,364995	3,537515	30	61	**,000014**

Conclusion

Based on the obtained results for assessment of morphological characteristics and situational movement structure of young judo sportsmen from 13 to 15 years old, members from judo clubs in R. Macedonia and BiH, we can conclude next: with the variables for assessment of anthropometrical characteristics from total 9 variables, the differences were established only in two variables, with the motor space from total 14 variables the differences were established only in two variables, and the biggest number of differences from total 5 variables the differences were established in three situational movement structure of young judo sportsmen.

Generally we can say that although we are testing two groups of participants which are geographical apart, in anthropometric characteristics and motor abilities we have with minimal differences, or we can say that they are participants with similar growth which is probably the result from constant training process. According to the differences of the situational movement structure of young judo sportsmen, probably on the training process in Macedonia they are paying more attention on the situational movement structure. Only with regular following of the effects of planned training technology, we can asses on the growth of the anthropological dimensions and situational movement structure on young judo sportsmen (Findek, 1997).

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DIFFERENCES BETWEEN SITUATION MOTOR STEREOTIPS OF KARATE COMPETITORS AND KARATE REPRESENTATIVES

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Abstract

This survey was conducted on a deliberate sample of 32 respondents, 16 karate competitors and 16 karate representatives, male, junior and senior (according to WKF) from the Republic of Macedonia. The main goal of this research was to determine the differences between situational motor stereotypes (situational karate tests) between karate competitors and karate representatives in a sports fight. In the study, a total of 15 variables of karate elements applied in a sports karate combat divided into 5 spaces were used: three variables of attack with one hand strike, three variables of attack with two hands techniques, three variables of attack with three hands techniques , three variables of attack with one stroke with leg and three variables of attack with combined techniques of hands and legs. To determine the differences in the arithmetic means of karate techniques in attack, a T-test for small independent samples is applied. The results of the T - test obtained in the survey show statistically significant differences in only three variables.

***Key words**: situational karate tests, karate elements, sports fights, competitors and representatives, T-test*

Introduction

The value of these researches in the field of karate sports consists in finding and determining the differences according to which the competitors are separated and which are important for achieving the top results. In order to achieve the desired goal, as many information as possible, which will be properly incorporated and used in the process of building the personality of the karate athlete, is required. Therefore, determining the differences between the examined groups and referring to situational motoric stereotypes (situational karate tests) is of great importance in karate sports. Modern karate competitions consist of two individually important karate disciplines kumite and kata. Due to the fact that they are based on different selections of motion techniques, their kinematic and kinetic parameters, they differ in their anthropometric and physical performance. Kumite competitions are characterized by the complex technical structure and specific abilities of the competitors in the area of combined attack techniques (Chaabène, H., et all. 2014).

Methods of Work

Sample of respondents

This survey was conducted with a deliberate sample of 32 participants, 16 karate competitors and 16 karate male and female juniors and seniors (according to WKF) from the Republic of Macedonia. Respondents were recorded in simulated fighting in a training match where, during a 3-minute combat, they were supposed to perform as many attacks with karate techniques as the subject of the research: a one-handed attack, an attack with two hand techniques , an attack with three hands techniques, an attack with one stroke with leg and an attack with combined techniques of hands and leg (techniques that are commonly used in a sports fight). Each of the respondents individually produced five fights (with breaks between each fight), which included all five groups of attacks with karate techniques. Also, it was necessary to meet certain criteria on the day of carrying out the measurements: to be psycho-physically healthy on the day of the check, to regularly attend training in their clubs, to be competitors in the respective categories and during the measurement to maximally and conscientiously they carry out the tasks set, which would give a realistic picture of the examined state.

A sample of variables

In the research, a total of 15 variables of situational motor tests were applied (according to Kostovski, Ž. et all. 2014 and Zaborski, B. 2012), divided into 5 spaces, of which:

- three variables of attack with one hand strike (kizame cuki, kizame cuki back step and dzako cuki),

- three variables of attack with two hands techniques (kizame cuki-đako cuki đodan, kizame cuki-čako cuki čudan and čako cuki-čako čuki đodan),
- three variables of attack with three hands techniques (kizame cuki-đako cuki-step đako cuki, đako cuki-kizame cuki-đako cuki and kizame cuki-step đako cuki-đako cuki other hand)
- three variables of attack with one leg stroke (mawashi geri, uramawashi geri and mawashi geri with a back leg) and
- three variables of attack with combined techniques of hand and leg (kizame cuki-đako cuki-mawashi geri back leg, đako čuki čudan-mawashi geri čudan-mawashi geri đodan and kizame cuki-đako čuki-mawashi geri đodan)

Statistical Methods for Data Processing

The data obtained from this research according to the characteristics and size of the selected sample are processed in several programs. For the purposes of this research, the following were calculated: Mean - arithmetic mean, SD - standard deviation, Min., Max., Skew - symmetry of distribution, Kurt - according to the roundness of the distribution of the results, the homogeneity of the results in a certain biomotor test, KS - Kolmogorov-Smirnov, which determines the normal distribution of results and T-test for small independent samples for analyzing differences between arithmetic means of two groups of respondents.

Results and Discussion

Table no. 1 Descriptive statistical parameters of specific motor skills in the participants - competitors and representatives

	COMPETITORS								REPRESENTATIVES							
	Mean	Std. Dev.	Min.	Max.	Skew.	Kurt.	K-S	Sig	Mean	Std. Dev.	Min.	Max.	Skew.	Kurt.	K-S	Sig
KC	15.13	3.95	10.00	22.00	0.12	-1.06	0.66	0.78	15.31	1.85	11.00	19.00	-0.45	1.25	0.83	0.50
KCZS	11.25	1.81	8.00	14.00	-0.12	-0.87	0.64	0.80	13.19	2.46	9.00	19.00	0.53	0.92	0.48	0.97
ĐC	14.94	3.97	8.00	22.00	0.41	-0.28	0.87	0.43	14.75	2.79	10.00	21.00	0.55	0.68	0.86	0.45
KCĐCĐ	11.63	1.75	8.00	14.00	-0.54	-0.36	0.64	0.81	11.31	1.78	8.00	14.00	-0.13	-0.86	0.85	0.46
KCĐCČ	11.38	1.41	9.00	13.00	-0.28	-1.02	0.75	0.62	10.94	1.57	8.00	13.00	-0.83	-0.53	1.25	0.09
ĐCĐCĐ	11.56	1.71	8.00	14.00	**1.03***	0.72	0.90	0.39	11.13	1.41	9.00	13.00	0.08	-1.23	0.65	0.79
KCĐCIĐC	7.94	1.77	5.00	12.00	0.60	0.53	0.69	0.72	8.88	0.89	7.00	10.00	-0.39	-0.28	0.97	0.30
ĐCKCĐC	7.44	1.36	5.00	10.00	0.51	0.21	1.00	0.27	8.63	1.41	7.00	11.00	0.44	-1.10	0.94	0.35
KCI2ĐC	7.13	1.36	5.00	10.00	0.47	-0.40	0.93	0.35	7.56	1.21	6.00	9.00	-0.04	-1.58	0.78	0.58
AWMG	13.06	2.14	10.00	17.00	-0.05	-0.95	0.68	0.75	13.19	1.64	11.00	16.00	0.17	-1.23	0.71	0.69
UMWG	9.63	1.75	6.00	13.00	-0.20	0.54	0.69	0.73	10.75	1.13	9.00	13.00	0.24	-0.40	0.74	0.64
MWGZN	13.13	2.36	9.00	18.00	0.35	-0.23	0.51	0.95	13.06	2.35	10.00	17.00	0.20	-1.20	0.58	0.89
KCĐCMG	8.19	1.56	5.00	12.00	0.61	2.07	1.19	0.12	7.88	0.96	7.00	10.00	0.80	-0.23	1.03	0.24
ĐCMGĐCĐ	6.19	1.11	4.00	8.00	-0.42	-0.76	1.07	0.20	6.81	1.05	5.00	9.00	0.42	-0.20	0.87	0.43
KCĐCMGČ	8.06	1.53	6.00	10.00	-0.25	-1.49	0.92	0.36	7.44	0.96	6.00	9.00	0.46	-0.59	1.20	0.11

The basic descriptive statistical parameters (competitors) of the specific - motor skills are shown in table no. 1 from which it can be concluded that the standard deviation (Std.Dev) in the applied variables is with normal values, ie, is less than 1/3 of the arithmetic mean. Minimum and maximum values are logical and expected and do not indicate the existence of extreme values that indicate that the grouping of results mainly moves around its own arithmetic mean.

From the analysis of the projection of the Gaussian curve (Skew.), which determines the symmetry of the distribution of the result, it can be concluded that the displayed coefficients range within the limits of the recommended values (-1 + 1), with the exception of the variable direct attack đako cuki - đako cuki đodan (ĐCĐCĐ = -1.03), which suggests that in this variable, most of the respondents show slightly higher values.

From the values of the curvature of the Gaussian curve (Kurt.), a platicurtic distribution is observed, that is, all the variables show consistency and none of them can be seen deviation.

The distribution of the results of the variables obtained by the Kolmogorov-Smirnov method shows that the values of all the examined variables do not depart from the normal distribution of the results.

The values of the variables based on the standard deviation (Table no. 1), clearly show that this is a homogeneous group of representatives, since there is no deviation greater than one third of the arithmetic mean of the examined variables. The minimum and maximum results obtained are characteristic for the selected sample. Also, from the values of the distribution of the results of the skewnis (Skew.), it is evident that it is a normal distribution of them, that is, in the range of moderate symmetry (-1 + 1). The degree of curvature at the top of the curve (Kurt.) is platicurtic, indicating that all the values obtained are less than 3. The homogeneity and distribution of the results in these variables (K-S) is in the range of the normal values and shows no deviation.

Table no. 2. T-tests of the specific - motor skills of the respondents - competitors and representatives

Варијабли	Група	N	Mean	Std. Dev.	t	df	Sig. (2-tailed)
KC	1,00	16	15.13	3.95	-0.17	30.00	0.86
	2,00	16	15.31	1.85			
KCZS	1,00	16	11.25	1.81	-2.54	30.00	**0.02**
	2,00	16	**13.19**	2.46			
ĐC	1,00	16	14.94	3.97	0.15	30.00	0.88
	2,00	16	14.75	2.79			
KCĐCĐ	1,00	16	11.63	1.75	0.50	30.00	0.62
	2,00	16	11.31	1.78			
KCĐCČ	1,00	16	11.38	1.41	0.83	30.00	0.41
	2,00	16	10.94	1.57			
ĐCĐCĐ	1,00	16	11.56	1.71	0.79	30.00	0.44
	2,00	16	11.13	1.41			
KCĐCIĐC	1,00	16	7.94	1.77	-1.90	30.00	0.07
	2,00	16	8.88	0.89			
ĐCKCĐC	1,00	16	7.44	1.36	-2.42	30.00	**0.02**
	2,00	16	**8.63**	1.41			
KCI2ĐC	1,00	16	7.13	1.36	-0.96	30.00	0.34
	2,00	16	7.56	1.21			
AMWG	1,00	16	13.06	2.14	-0.19	30.00	0.85
	2,00	16	13.19	1.64			
UMWG	1,00	16	9.63	1.75	-2.17	30.00	**0.04**
	2,00	16	**10.75**	1.13			
MWGZN	1,00	16	13.13	2.36	0.07	30.00	0.94
	2,00	16	13.06	2.35			
KCĐCMG	1,00	16	8.19	1.56	0.68	30.00	0.50
	2,00	16	7.88	0.96			
ĐČMČMĐ	1,00	16	6.19	1.11	-1.64	30.00	0.11
	2,00	16	6.81	1.05			
KCĐCMGČ	1,00	16	8.06	1.53	1.38	30.00	0.18
	2,00	16	7.44	0.96			

In table no. 2, the data obtained by testing the two - dimensional t - test for small independent samples are presented. The obtained data indicate that the comparative arithmetic means of the variables that represent the specific - motor skills of the participants - competitors and representatives, statistically significant differ only in three variables. In the variable kizame cuki with the last step (KCZS) the two groups statistically differ significantly at the level p = 0.02. The T-value that measures the size of the difference in relation to variations in the sample data is t = -2.54. It can also be noted that the standard deviation (Std.Dev) in the applied variable is normal, ie it is less than 1/3 of arithmetic means. Regarding the second variable đako cuki - kizame cuki - đako cuki (ĐCKCĐC), in which there is a statistically significant difference at the level p = 0.02, it can be seen that here the standard deviation (Std.Dev) is normal, and t- the test is -2.42. The results of the conducted researches indicate that direct hand strikes are

the most effective techniques of attack, which, as blows, have an advantage over impacts with legs. These types of attacks can be used as: one attack, a counter attack, or in a combination of both (Vidranski, T. 2011). Similar is the situation in the third variable ura mawashi geri (UMWG), in which both groups differ significantly at the level of 0.04, with a t-test value of -2.17 and normal values of the standard deviation which is also less than 1/3 of this arithmetic means.

The differences that occur with these three variables in favor of the group of respondents - representatives, in our opinion, is a consequence of some other factors and conditions that affect them. This can include: the greater number of repetitions in the unit time, which leads to the advantage of their performance, and is perceived by the values of the arithmetic environments that show greater value in the group of respondents - representatives in relation to the group of participants - competitors, (while the other variables are approximately the same values of the arithmetic means), then using these techniques as special techniques of the examinees and paying more attention to the exercise trail estimates. Regarding the variables in which no significant difference has been obtained, we can conclude that it is about a similarly similar population that is actively represented in competitions in domestic and international competitions that devote approximately the same time to trainings using the same or similar pointers techniques, but from each other stand out because of the influence of some other factors. In the context of the above, we will follow up on some of the previous studies according to which karate competitions are characterized by a complex technical structure and specific competitive abilities in the area of combined attack techniques Jovanović S, et all. (1995).

Conclusion

The survey was conducted on a deliberate sample of 32 respondents, 16 karate players and 16 karate competitors, male, junior and senior (according to WKF) from the Republic of Macedonia. Macedonia. For the realization of this research, a total of 15 variables of situational motor tests were applied (Kostovski, Ž., Et all.2014 and Zaborski, B. 2012), divided in 5 spaces. The research yields results that lead to the following conclusions:

- In the variable kizame cuki with the back step (KCZS) the two groups statistically differ significantly on level p = 0.02
- In the variable đako cuki - kizame cuki - đako cuki (ĐCKCĐC) there is a statistically significant difference on the level p = 0.02
- In the ura mawashi geri variable (UMWG) the two groups differ significantly at the level of p = 0.04

The analysis of the obtained differences from this research leads to the conclusion that it is logical and expected. The obtained number of differences in specific karate tests among the respondents representatives and competitors points to the fact that they practice a number of techniques and combinations in their training process, using these techniques as special techniques, which on the other hand lead to the adoption of a larger number of points in karate battles. This would be one of the conditions under which the second group of respondents (representatories) stand out from the first (contestants).

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PREVALENCE OF OVERWEIGHT, OBESITY AND THE LEVEL OF PHYSICAL ACTIVITY AMONG THE CHILDREN OF PRISHTINA 12 YEARS OLD

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Abstract

Every year, around 2.8 million people die as a result of being overweight or obese. First overweight and obesity was associated with high-income countries, but now obesity is also prevalent in low-and middle-income countries.This cross-sectional study was focused in the prevalence of overweight and obesity in the primary school children's of Prishtina in sixth grade. Two hundred and seventy seven (277) children's have participated in this study. One hundred forty (140) of them were boys and one hundred thirty seven (137) were girls, aged 11.85±0.45. The children were selected from three different public schools in different regions of the city.

Key word: *obesity, physical activity, children*

Introduction

Overweight and obesity during last three decades has increased rapidly and reached epidemic proportions in most countries of the world (WHO, 2013, Ogden and Carroll, 2012). Every year, around 2.8 million people die as a result of being overweight or obese. First overweight and obesity was associated with high-income countries, but now obesity is also prevalent in low-and middle-income countries. Due to the rapid increases in overweight, obesity prevalence and the serious public health consequences, now overweight and obesity are considered one of the most serious public health challenges of the early 21st century (WHO, 2012). According the National Health and Nutrition Examination Survey (NHANES), in United States of America, the prevalence of overweight and obesity increment has occurred since 1976–1980. Among preschool children aged 2–5, obesity increased from 5.0% to 10.4% between 1976–1980 and 2007–2008 and from 6.5% to 19.6% among those aged 6–11. Among adolescents aged 12–19, obesity increased from 5.0% to 18.1% during the same frame (Ogden and Carroll, 2012). Data of World Health Organization (WHO), collected from the 36 European countries in 2005/2006, shows that the prevalence of overweight including obesity in 11 and 13 years old children ranges from 5% to more than 25% in some countries (WHO,2009). Boys at all ages have a higher prevalence of overweight and obesity than girls, except in some countries: in 11-year-olds in Denmark, France, Netherlands and the United Kingdom (Wales) and in 13-year-olds in Ireland, where girls are more frequently overweight and obese than boys (WHO, 2009). These trends of increasing childhood overweight and obesity seems to be a problem also in countries that are near Kosovo as well. In Macedonia the prevalence of overweight and obesity in children aged 11 is 13% in girls while 21% in boys; In Croatia 14% in girls and 20% in boys; Bulgaria 10% in girls respectively 20% in boys and Slovenia 12% in girls; 20% in boys (Currie C et al.2009) .

The only data we were able to find in Kosovo were those of Tishukaj, 2011 and Rexhepi, et.al.2011. The mean of BMI that he found was; boys aged nine 16.85; girls of same age 16.4, while the BMI for the children aged fifteen was: 20.5 at boys and 20.8 at girls.

Methods and materials

This cross-sectional study was focused in the prevalence of overweight and obesity in the primary school children's of Prishtina in sixth grade. Two hundred and seventy seven (277) children's have participated in this study. One hundred forty (140) of them were boys and one hundred thirty seven (137) were girls, aged 11.85±0.45. The children were selected from three different public schools in different regions of the city. Based on the data form Ministry of education science and technology, the total number of sixth grade schoolchildren in the municipality of Prishtina is three thousand six hundred and fifty two (3652). Body mass and body height measurement were made with stadiometer, where the flat digital beam balance scale was connected through the adapter with stadiometer. Physical activity of the

children was assessed with validated (Crocker, 1997) Physical Activity Questionnaire for Older Children (PAQ-C).

Results

In table 1. are presented basic statistical parameters for the anthropometric variables and other parameters as BMI and physical activity levels. The sample of this research has had mean body mass 44.30 kg, with a high difference between the minimal result 26.5 kg and maximal result 87.2 kg. The mean body height was 150.7 cm, with a high difference between minimal 132.4 cm and maximal result 170 cm as well. The physical activity levels were collected from the PAQ-C and mean score of physical activity was 3.12. Tables 2&3 present the same parameters but separately by gender.

Table 1. Subject characteristics - all group

Variable	Obs	Mean	Std. Dev.	Min.	Max
Body mass (kg)	277	44.30	11.05	26.50	87.20
Body height (cm)	277	150.75	6.97	132.40	170.00
BMI	277	19.31	3.74	12.83	32.98
Age	277	11.85	0.45	10.82	13.15
Sum. PA	277	3.12	0.587	1.77	4.67

Table 2. Characteristics by gender - boys

Variable	Obs	Mean	Std. Dev.	Min.	Max
Body mass (kg)	140	44.51	10.38	26.50	80.60
Body height (cm)	140	150.48	6.55	133.00	166.00
BMI	140	19.50	3.55	13.96	29.75
Age	140	11.84	0.43	10.98	13.15
Sum. PA	140	3.23	0.580	1.77	4.67

Table 3. Characteristics by gender – girls

Variable	Obs	Mean	Std. Dev.	Min.	Max
Body mass (kg)	137	44.08	11.653	28.00	87.20
Body height (cm)	137	151.02	7.341	132.40	170.00
BMI	137	19.11	3.886	12.83	32.98
Age	137	11.87	0.459	10.82	13.08
Sum. PA	137	3.02	0.574	1.96	4.56

In table 4. is shown separation of subjects on the basis of BMI parameters by Cole, et.al.2000. In the category as a normal body mass were classified 202 subjects or 72.92 % .In the category of overweight were classified 58 or 20.94 %. While in the obese category have been classified 17 subjects or 6.14 %.

Table 4. Classification as normal body mass, overweight and obese

Fat	Freq. (n)	Percent. (%)	Cum.
Normal body mass (kg)	202	72.92	72.92
Overweight	58	20.94	93.86
Obese	17	6.14	100
Total	277	100	

Table 5. Differences between girls and boys in physical activity

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
Males	140	3.23	0.05	0.58	3.13	3.32
Females	137	3.03	0.05	0.58	2.93	3.12
	T test	2.88		Prob. (T test)	0.004	

Differences between boys and girls for physical activity are given in Table 5. These differences are made by the method of T-test and if we check the table, we can see that boys have shown significant difference in comparison with girls. The difference can be seen even in the arithmetic mean of the subjects where the boys have more physical activity than girls. Value of T-test was 2.88, which is valid with the probability 0.004.

Discusion

In our study we have explored the prevalence of overweight and obesity, report levels of physical activity among children in Prishtina aged 12 years. The sample size of this study was 277 children (140 boys and 137 girls), recruited from three different public schools of Prishtina. Classification of children as normal body mass, overweight or obese was made using Cole, et.al cut-off points. Based on the results that we acquired 202 children or 72.92 % have normal body mass; 58 children or 20.94% have overweight and 17 children or 6.14 % are obese. With T-test analyze we have compared two genders and we found significant difference, boys have an inclination in overweight where 25% of them were overweight compared to girls 16.79% (t-test= 2.88, p=0.004). Our data about gender differences are in agreement with data from Pizaro, et.al.2012, Berg, et.al.2001 and data from HBSC study 2005/06 where almost all countries have higher prevalence of overweight including obesity among boys than girls in 11 and 13 years old children. Using T-test analyses, I have compared the levels of physical activity among boys and girls. I have found significant differences between boys and girls, where the boys were more active (T-test = 2.88 and p=0.004). To classify the subjects based on physical activity level proportions I divide them in three groups and by gender as well as “least active”, “moderate active” and “most active”. With Pearson’s chi-square² analyzes we found significant gender differences were boys were more active than girls **(p = 0.04).** Results obtained from T-test are consistent with similar studies by different authors (Baquet, et.al.2014, Ortlieb, et.al.2013), and Verloigne, et.al.2012 in a research across 5 European countries among children 10-12 years old found that girls in all the levels of activities spent less time than boys.

Conclusions

Prevalence of overweight and obesity found in our research give us to understand that in comparison with other countries has shown high values particularly in boys. Physical activity questionnaire did not show expected reliability to measure the level of physical activity. We recommend in the future to use objective and accurate tools when measuring physical activity. More research on the prevalence of obesity among the children in Kosovo would be great value considering the consequences of this disease. Obtained data from this study suggests that the institutions as Institute of Public Health and other should pay attention to this phenomenon and be taken seriously. Longitudinal studies will be much more efficient to follow the direction of overweight as well as factors that affect increase or reduction of overweight and obesity.

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THE SYSTEM OF LEGAL ASPECTS THROUGH AN INSTITUTIONAL FRAMEWORK FOR SPORTS IN BOSNIA AND HERZEGOVINA

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Abstract

The Ministry of Civil Affairs addresses the Sports Development Strategy, which is a part of the Law on Sport. The goal is to determine the extent to which the stated law, as well as the Strategy are implemented, and how much attention the Ministry itself pays to the problems in sports, development of entity strategies and activities related to sports. The public sector distributes financial resources generated through tax obligations that are collected from the citizens through a public fund (the budget). It also provides the rights and social benefits to all citizens, especially those who need them the most. In this way, support is provided to all aspects of sports activities that represent the public (social) need for sports.

Keywords: *law, sports, system.*

Introduction

As opposed to other transition economies, the organisation of sports activities in Bosnia and Herzegovina is significantly conditioned by the administrative and political organisation of the country. As such, the function of sports in BiH is partly inherited, and partly represents an expression of objective needs sports organisations have so as to efficiently reorganise in line with the transition processes. The fact is that Bosnia and Herzegovina has a highly complex system of political and state organisation consisting of two entities (The Federation of Bosnia and Herzegovina comprised of ten organisational units - cantons and Republika Srpska), as well as Brčko District. The organisation of the area related to sports activities is significantly tied to the constitutional and legal regulations, i.e. legislation. In order to develop the sports system in BiH, it is necessary to continually work on raising the level of awareness in society on social and economic functions of sports on the basis of which it is possible to create a systemic and sustainable development of sports activities. Prior to discussing the institutional framework for sports in BiH, we will briefly address the institutional framework for sports in Europe. When it comes to the institutional framework and organisation of the sports system in Western Europe, we can say that it encompasses: the public, voluntary and commercial sectors.

Sports organisations should not exclusively rely on these funds, but they should strive towards financial stability accomplished through their own results. However, sport is also important for the state because, whether directly or indirectly, from the boys who run around after the ball on deserted grass fields, to 40,000 viewers crammed into a stadium watching the national football team play, most BiH citizens are involved in it.

The voluntary sector provides services to the citizens who are members of sports organisations (self-interest groups - associations of citizens), as well as to those who are not members of organisations (humanitarian and philanthropic groups). The voluntary sector functions on the principle of membership fees, participation fees and fundraising.

Non-profit sports organisations have a very important role in the overall model of sports activities and it is often pointed out that their importance in the community should not be underestimated. Their management is usually voluntary and they have a large share of participation. They can vary in organisational size, from a local darts club with limited resources, to the bigger, financially secure, Olympic clubs.

The problem and research subject

The countries in the region have recognised the importance of sports, and they are trying to promote their states through sports in every possible way. Unfortunately, Bosnia and Herzegovina is still far away

from doing this. The main responsibility of the country should be to provide an organised sports system so as to enable the citizens of Bosnia and Herzegovina to have an unimpeded approach to sports activities, regardless of their abilities. The support mechanisms for sporting talents, as well as failure to maintain a sports infrastructure represent one of the most significant problems in BiH.

Research goals

The goal of this research is to, based on the results, provide specific suggestions for improving the level of autonomy in sports, and point out specific limitations and difficulties in implementing the existing regulations in the area of sports. It is particularly important to examine the cause of failure in implementing the existing regulations in the area of sports, and to provide a comparative overview of institutional and normative solutions in the domain of sports activities.

Research methods

Several different methods such as the dogmatic method, comparative-historical methods, the method of analysis, inductive and deductive methods, as well as statistical methods will be used in the paper.

Sports activities in the profit and non-profit organisations

In the emerging global changes, sports organisations increasingly resemble "small" and "medium" businesses with characteristics of a profit-oriented organised unit that, due to its mission and legal status (non-government organisation) has an obligation to invest the surplus of the generated capital into developing its own activity.

When we mention sports in this context, we have to keep in mind that this is not a classical business, but an approach similar to it, and thereby it is necessary to make an important distinctive and competitive difference between profit and non-profit organisations. A good example of this is a quote of P. Drucker (2005.) who states: "Non-profit organisations start with their mission, while the profit ones start with profit. That is the first lesson that businesses can learn from successful non-profits."

However, what can be considered as a joint connection of both is the needs of the clients, consumers, fans, the public, etc., that can be satisfied by using their services, i.e. products. In fact, both struggle at their own unique markets, but sports organisations do not necessarily have to accomplish a business success if they have one in sports and vice versa, which cannot be said for profit organisations. Such a competitive difference has to be kept in mind if we talk about non-commercial sports or sports that do not have a high marketing and entrepreneurship potential, i.e. publicity.

The fundamental characteristics of top sports is specialisation. Top results in sports can only be achieved through long-term and systemic work, but not all sports branches can achieve it simultaneously. It is limited to only one branch of sports or even one sports discipline.

The structure of sports in BiH and its systemic organisation

We can say that the sports system in Bosnia and Herzegovina, which clearly has a great impact on society, possesses the characteristics of a European sports system. The differences are, of course, present in the amount of financing, but its structure is completely compatible with the European model. Nevertheless, sports in BiH has, together with the European sports, gone through a turbulent period at the beginning of the 1990s. As an integral part of the South-Eastern European countries, BiH has, apart from the events of war happening during these years, and by entry into force of the Dayton Agreement on 14th December 1995, managed to recover the sports system that today, together with the countries in the region, journeys through transition. Having in mind that the BiH sports system is partly inherited on the one hand, and, on the other, conditioned by the needs and interests of sports organisations so as to efficiently reorganise in line with the transition processes, sports in BiH has a significant progression.

Government organisations - Public Sector Institutions for Sports in BiH

Institutional activities of government institutions is, in everyday life, usually replaced by phrases like "activities of the public authorities" or "public sector activities" in one of the previously stated areas. In that regard, focus is placed on institutional activities of government institutions for sports in Bosnia and Herzegovina whose function and purpose is to create an environment for the development of sports organisations and sports in Bosnia and Herzegovina as a whole.

Considering the jurisdiction of state authorities (public authorities) in BiH, it can be noted that they are regulated by the Constitution, and thus, sports institutions in BiH are defined by legal frameworks in the form of ministries in charge, i.e. their sectors and departments for sports, namely, the municipal, city, cantonal, entity and state levels. Taking into consideration the statutory jurisdictions, the Public Sector Institutions perform administrative, professional and other tasks related to the jurisdiction in the area of sports.

In order to easily understand the organisation of BiH, it is necessary to point out that there are two territorial units (entities) within Bosnia and Herzegovina, namely, the Federation of Bosnia and Herzegovina (FBiH) entity and Republika Srpska (RS) entity, which are constitutionally determined as integral parts of Bosnia and Herzegovina. Within its jurisdiction, Republika Srpska has, through its Law on Sports, specifically defined and regulated a series of issues from the domain of sports activities, and in a systemic and highly organised manner approached the organisation of this area. On the contrary, FBiH regulates and supports sports organisations within the limits of its constitutional jurisdictions, but the question of the constitutional jurisdiction of FBiH entity, when compared to the Constitution of Bosnia and Herzegovina, has not been explicitly prescribed, being regulated by Cantonal Laws on Sports instead.

Apart from these levels, there is also Brčko District whose position is defined through a specific arbitral decision made by the international community which designates that this territorial unit should be treated separately, not belonging to either entity or other levels of authority.

Ministry of Civil Affairs - the competent authority for affairs related to sports on the level of Bosnia and Herzegovina is the Ministry of Civil Affairs BiH within which there is a Sector for Sports.

The Law on Sports in Bosnia and Herzegovina defines the jurisdictions of the Sector for Sports.

Federal Ministry of Culture and Sports - the sector for sports performs administrative, professional and other tasks related to coordination in the area of sports in the Federation. Its activities are tied to the material support and development programmes, and it participates in creating the general and specific conditions for sports activities, sports advancement and improvement, material and social stimulation with the goal of accomplishing top results.

Ministry of Family, Youth and Sports of Republika Srpska - within the Department for Sport, performs administrative and other professional tasks. Around 950 sports organisations (sports federations, sports associations, sports societies, professional associations) with the right to perform sports activities from the sports domain are registered in the area of the Republika Srpska entity. Out of the total number of sports organisations, 34 sports federations of Republika Srpska and 6 sports federations of individuals with disabilities exist and compete within their sports branches.

The *Department for Economic Development, Sport and Culture of Brčko District* - the separately treated territorial unit Brčko District cares for the development of mass and top sports, using sports facilities, professional staff, etc., allocating funds for sports in their domain.

Cantonal levels of authority

Even though cantons within the Federation of BiH entity are indeed separate units with their jurisdiction regulated by the Constitution, the question of sports development is greatly determined by the specificities that are culturally, politically, environmentally and organisationally conditioned. It should be pointed out that only Sarajevo Canton has an individual Ministry of Culture and Sports regulating this area, while other cantons regulate this issue in a different way, mostly through their sectors, offices or departments within ministries in charge of this area. Cantonal ministries:

a) Ministry of Culture and Sports of the Sarajevo Canton
b) Ministry of Education, Science, Culture and Sports of the Zenica - Doboj Canton
c) Ministry of Education, Science, Culture and Sports of the Tuzla Canton
d) Ministry of Education, Science, Culture and Sports of the Una - Sana Canton
e) Ministry of Education, Science, Culture and Sports of the Herzegovina - Neretva Canton
f) Ministry of Education, Science, Culture and Sports of the Central Bosnia Canton
g) Ministry of Education, Science, Culture and Sports of the Posavina Canton
h) Ministry of Education, Science, Culture and Sports of the Bosnian - Podrinje Canton
i) Ministry of Education, Science, Culture and Sports of the West Herzegovina Canton
j) Ministry of Education, Science, Culture and Sports ofthe Herzeg - Bosnia Canton

Local levels of authority - city administrations, municipalities, public institutions

When it comes to BiH, the local level of authority is fairly specific and regulations related to sports are adjusted to the environmental specificities represented by the city departments for social affairs and municipal departments for education, culture, sports and information, public institutions and public enterprises, which, according to the Law on Cantonal Administration 20/01, make the local level of organisation for sports and, as such, provide direct support to athletes and sports organisations.

In this regard, the common factor for all institutions is greater attention towards sports shown by athletes and sports teams from these areas, certain care for sports facilities, the criteria of financing sports organisations, professional staff and civil registry in sports, etc.

The local level of authority represents the level of city administrations or the level or municipal administrations in both the Federation of BiH and Republika Srpska. The jurisdictions of the local level of authority are regulated by the cantonal and entity constitutions, laws on local self-government and municipal statutes. In rare cases where there is a city level of authority, the jurisdictions given to the municipal level are shared. In cases where there is no city authority, the most significant jurisdictions in the municipality related to issues regarding sports are mostly tied with activities associated with culture, education, health protection, tourism and sports.

City administrations - Municipalities within Cantons are units of local self-government. Through departments for education, culture, sports and information (social affairs) they fulfil the function of local governments and self-governments by implementing laws, other regulations and general acts in the area for which they are founded, they propose and implement the determined policy and create the conditions for the development of physical culture and sports, solve administrative issues form the area of sports and provide cooperation with the bodies from other city municipalities and Cantonal bodies in order to improve sports.

Public institutions - are formed at the cantonal and municipal levels, and they are mostly issued through decisions of their legislative bodies. Through the decisions on forming public institutions, the sportive and cultural functions of facilities are unified and tied with the economic function, because the revenues of such institutions are not turned into profit, but completely spent on accomplishing sportive and cultural contents with the goal to create a self-sustaining organism in the form of a public institution in the public (state) ownership. These institutions are governed by the Board of Directors named by the executive body of the founder, and managed by directors who are named by the Board of Directors upon agreement by the same executive body (the cantonal government, mayor or municipal mayor).

Public enterprises - are formed in the area of sports in case of an object or objects where there is balance or economic dominance of an economic over the sportive function in a way that profit is enough to support the function of sports. The goal of public enterprises is to obtain a profit that will dominate all costs, and to invest it in further trade of the economic function and satisfaction of the object's sportive role.

Non-government organisations for sports in BiH

Table 2. Non-government sector - professional federations

NON-GOVERNMENT SECTOR
Olympic Committee of BiH
Paralympic Committee of BiH
Special Olympics of BiH

The following table shows all the important umbrella sports organisations in BiH representing the activities performed by athletes, teams, i.e. national teams in the context of BiH's representative performances at international competitions, whether it relates to Olympic, Paralympic or Non-Olympic sports. Sports organisations at the level of BiH are the Olympic Committee, the Paralympic Committee,

Special Olympics, the Agency for Anti-Doping Control and sports federations operating at the level of BiH. Entity sports federations, cantonal sports federations, sports associations and clubs will, for the needs of this book, be presented in the domain of statistical information for their legally defined form. Table 2, Non-government sector - umbrella sports organisations in BiH

Olympic Committee of BiH

Through its activities, the Olympic Committee of Bosnia and Herzegovina (hereafter referred to as OC BiH) contributes to strengthening the reputation of Bosnia and Herzegovina in the world, and, through sports, sports bodies and sports organisations, cooperates with other countries.

OC BiH was founded on 4th June 1992. Its founding and the first appearance of athletes form our country at the Olympic Games in Barcelona in 1992 was followed by an official recognition from the International Olympic Committee (hereafter referred to as IOC), which made its Decision at the Executive Committee session in Monaco on 24th September 1993. Upon its establishment and the international recognition, OC BiH has, on 8th December 2002, been entered into the registry of the Ministry of Justice as a first sports organisation that joins national sports federations. By entering into the registry and signing the Lausanne Declaration on 28th July 1999, OC BiH has been constituted as the umbrella sports body of Bosnia and Herzegovina.

Paralympic Committee of BiH

The Paralympic Committee of BiH was founded in 1995 with the goal to, through sports, provide its contribution to resocialising a large number of people with disabilities and through the training process achieve sports results that will worthily represent our county at international sports competitions. Based upon the expressed desires and created opportunities, activities on developing athletics, sitting volleyball, swimming, archery, wheelchair basketball, winter sports, table tennis, etc. have been set in motion. During the first participation at the greatest sports manifestation for people with disabilities, exceptional results have been accomplished. Our athletes have won fourth and eighth place in athletics. This was followed by the establishment of sports federations for certain sports, as well as participation on the most significant international sports competitions. The number of participants at local competitions has been growing each year, and admirable results have been accomplished at international competitions. Our national sitting volleyball team is a two-time Paralympic gold medallist at the Paralympic Games in Athens 2000 and London 2012, as well as a silver medallist in Sidney 2004 and Beijing 2008. They are multiple World and European medallists. Swimmers, table tennis players, athletes and wheelchair basketball players have worthily represented our country at the greatest international sports competitions for athletes with disabilities. The Strategic goal of the Paralympic Committee for the following period is to resocialise athletes with disabilities, educate and qualify them to adapt and integrate into society.

Special Olympics of BiH

The Special Olympics of BiH is a member of the Special Olympics International, organised in line with the Accreditation Rules. The Special Olympics of BiH is the umbrella body dealing with the implementation of specific sports and recreational activities for people with disabilities / people with intellectual disabilities / according to the principles and rules of the Special Olympics International / and laws governing the issues of sports in Bosnia and Herzegovina.

Special Olympics of BiH is the only sports organisation at the state level that organises training sessions and competitions for people with intellectual disabilities, with participation of special schools, day centres, institutes and sports clubs working with people with intellectual disabilities. Special Olympics of BiH is, in achieving its goals and tasks, an independent sports organisation.

Special Olympics of BiH has its symbol - emblem whose form and sign have been determined by the International Rules of the Special Olympics, with the right to emblem in national and international appearances.

Mission - assembling people with intellectual disabilities who will, through sports and sports activities, become and participate as productive and honoured members of society in the broadest sense of the word. ***Vision*** - a society in which people with intellectual disabilities and their families equally participate in all aspects of life, have a choice, opportunity and respect. SO BiH accomplishes goals and performs tasks that are of equal interest and use for the members, and especially to people of both

genders with intellectual disabilities so as to become and participate as productive members of society in the broadest sense of the word.

Agency for Anti-Doping Control

Applying the World Anti-Doping Code in the local legal system is an obligation with an international and legal character founded on the fact that Bosnia and Herzegovina is a signatory of the International Convention against Doping in Sport from 2005, which is a basis, among others, for the obligation to implement anti-doping rules from this Code. Failure to fulfil this obligation in the designated period (until 1st January 2015 for the new Code) would present a breach of an internationally accepted obligation, and thus the international law, which would generate immense consequences for sports and its development in Bosnia and Herzegovina. The Agency is governed by the director, and the internal organisation consists of two sectors: The Sector for Administration, International Cooperation and Public Relations and the Sector for Anti-Doping Control, Prevention, Education, Research and Development governed by assistant directors. The Agency has, in 2016, been trusted with organising and implementing 16 doping controls in total at international competitions organised in Bosnia and Herzegovina, namely: ICF Canoe Kayak Wildwater World Championships Banja Luka, INBA Balkan Natural Championships in Čapljina, the International Athletic Event "Vidovdan Road Race" in Brčko under the patronage of the International Association of Athletics Federations (IAAF), as well as many other controls.

Generally speaking, the condition in the area of anti-doping correlates with the general state of anti-doping in the region, Europe and the world, i.e., much like the rest of the wold, Bosnia and Herzegovina is faced with equal challenges. When drafting the laws and bylaws, the compatibility assessment with the stated WADA World Anti-Doping Code is provided by WADA - Wold Anti-Doping Agency.

We would especially like to point out that the Agency has, through quality work in line with the highest international standards, managed to assert itself as an essential partner of the World Anti-Doping Agency (WADA) and international sports federations. The Wold Anti-Doping Agency (WADA) has awarded the Agency with a Code compliance with the highest rules and procedures, international standards prescribed by the new 2015 World Anti-Doping Code. The existence of the Agency for Anti-Doping Control of Bosnia and Herzegovina, as well as the stated Code compliance removed the possibility of a ban on participation for athletes from Bosnia and Herzegovina at international competitions, and a ban on organising international competitions in BiH.

Conclusion

The commercial sector in BiH is almost at its inception due to the fact that the potential it is generating is not understood as seriously as it should. However, the future of the sports system in BiH is inevitably directed towards the path where the pioneering steps towards implementing the sustainable development management model (for example FC Sarajevo) based on a market concept are evident. In order to better explain the system in which sports functions in BiH, and the way it operates, it is best to say that the sports system in BiH functions on the principle of government institutions (public sector) and non-government organisations (voluntary sector) based on the concept of Olympic, Paralympic and Non-Olympic sports. OC BiH, as a member of IOC is obligated to, during its operations, respect the rules of the Olympic Charter, IOC Statutes, IOC Code of Ethics, Wold Anti-Doping Code, the Lausanne Declaration, Law on Associations and Foundations of BiH, as well as the Law on Sports in Bosnia and Herzegovina. The Administrative and Professional Services of OC BiH has 7 permanent employees divided into departments: The department of sports, department of international relations, administrative department, financial department, marketing department, department of arts and culture. The analysis of Law implementation in the part related to anti-doping has shown that this Agency is one of the few institutions on the state level which has completely accomplished its statutory jurisdictions and has, outside the borders of BiH, become a significant subject at the international scheme.

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A Report on the Implementation of the Agency for Anti-Doping Control Work Programme for 2016

HEALTH KINESIOLOGY STUDY

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Abstract

One of the basic public health problems in developed countries, and more and more in developing countries, is related to chronic non-contagious diseases whose incidence and prevalence in the entire population is constantly growing. In the background of these diseases are so called health risk factors and most of them are depending on person's behaviour and health habits. Behaviour change of the population and promotion of healthy lifestyle is the basis of risk factors prevalence reduction in the entire population as well as in its targeted stratums. To gain such a goal, political decisions, include the problem into the national strategy, set out the appropriate acts and regulations and ensure the needed means. In these countries special professional and university health studies are introduced, in the most cases related to health kinesiology. Accordingly, we propose the foundation of health kinesiology study that should cover the needs of South-Eastern European countries.

***Key Words**: Chronic non-contagious diseases, physical activity, health kinesiology*

Introduction

One of the basic public health problems in developed countries, and more and more in developing countries, is related to chronic non-contagious diseases (NCD) whose incidence and prevalence in the entire population is constantly growing. Their morbidity and mortality threatens the health of our populations and our economies. In the background of these diseases are so called health risk factors and most of them are depending on person's behaveiour and health habits. New and innovative thinking is essential to foster new creative approaches that leverage and integrate evidence through the support of big data, technology and design thinking.

Appropriate regular daily physical activity is a major component in preventing chronic disease, along with a healthy diet and not smoking. For individuals, it is a powerful means of preventing chronic diseases; for nations, it can provide a cost-effective way of improving public health across the population. Available experience and scientific evidence show that regular physical activity provides people, both male and female, of all ages and conditions - including disabilities - with a wide range of physical, social and mental health benefits. Physical activity interacts positively with strategies to improve diet, discourage the use of tobacco, alcohol and drugs, helps reduce violence, enhances functional capacity and promotes social interaction and integration.

HEPA - Health Enhancing Physical Activity

In 2005 the European Network for the Promotion of Health-Enhancing Physical Activity (HEPA Europe) was founded. The aim was to respond to the noticeable lack of a platform for sharing the development and implementation of evidence-based policies and strategies in the field of physical activity and health.

Activities of the network support cooperation, partnerships and collaboration with other related sectors, activities and approaches.

The term "health-enhancing physical activity" is frequently used across the European Region. It emphasizes the connection with health by focusing on "any form of physical activity that benefits health and functional capacity with undue harm of risk.

Health kinesiology

In 2006, a new professional organization was created in the United States. The National Society of Physical Activity Practitioners in Public Health (NSPAPPH) is a dedicated group of professionals interested in advancing the capacity of professionals in physical activity and public health in the United States. People with training in this area, particularly at the university level, are employed in state and local health departments working on public health programming for physical activity promotion.

The actual situation in Europe is that medical studies are, as a rule, oriented onto treatment of clinical diseases, while the epidemiological and public health issues in the population are only informatively

covered. So, physicians have limited knowledge about chronic diseases epidemiology and epidemiology of risk factors responsible for their development. That is the reason why it is difficult to expect from primary care physicians and from health service in general, to have a view into the problem, and even less to undertake planning and implementation of appropriate contemporary measures of primary and secondary chronic diseases prevention.

On the other hand, personnel in kinesiology are not enough, if at all, educated for cooperation with health system. They mast become aware on the need of that, regarding regular PA as a health factor and fulfill quality criteria in their education, sites and programs.

Healthy lifestyle promotion and behaviour change in this direction are the basis of risk factors prevalence decreasing in the population and in its strata. To attain this goal, a political decision and inclusion the problem in the national strategy, adopt the appropriate acts and regulations and ensure sufficient fund and professional personnel are needed.

According to experiences from some countries, for making and adopting the strategy, participation of experts from different fields as well as of several government sectors and NGO-s is essential. Countries that already the established guidelines and recommendations have successfully implemented, have special scientific research and operative institutions to explore and implement measures to remove the risk factors and the development of chronic diseases. In these countries a specialized professional and academic study of health were introduced, usually associated with so-called health kinesiology. In the region of south-eastern Europe such a study does not exist, resulting in no any collaboration between the Health and Kinesiology. This is one of the reasons for the lack of effective national strategies to promote physical activity as an irreplaceable health factor in the fight against the most common chronic non-communicable diseases.

Graduates of health kinesiology acquire competency in public health work in kinesiology specific sub-fields of primary and secondary prevention of chronic non-communicable diseases and sports injuries. They are also trained to work in the bodies of the city and regional administration as well as in national government in health care and sports sectors with the task of coordinating these two areas in order to promote HEPA. Their theoretical and practical knowledge and experience in promoting health, physical activity, healthy diet and avoiding or giving up bad habits of health, focuses on the implementation and evaluation of necessary measures to improve national health.

The degree in health kinesiology should give a competence to work in research-educational and research institutions related to research and education areas that connect the physical activity and health. In the recreational and rehabilitation centres and federations they are competent to plan, program and implement specific measures of primary and secondary prevention of certain chronic non-communicable diseases and sports injuries as well as of appropriate kinesitherapeutic procedures.

Conclusion

In the region of South-eastern Europe (SEE) such a study does not exist and there is no appropriate collaboration between the Health system and Kinesiology. This is one of the reasons for the lack of effective national strategies to promote physical activity as an irreplaceable health factor in the fight against the most common chronic non-communicable diseases. These diseases with their incidence, prevalence and mortality dominate in developed countries, and increasingly in developing countries.

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