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Dear readers,

Before you is the newest issue of Sport Science, published by the Faculty of Education of the University of Travnik. Sport Science has been published regularly and for the past seven years fourteen issues have been published.

The first issue of Sport Science was published in June 2008 with the first scientific papers in the field of kinesiology. The journal was well accepted among Bosnian and Herzegovinian readers, as well as international readers. Sport Science has almost immediately become one of the most esteemed journals. What is significant is that every new issue published scientific papers of greater quality; it expanded scientific research in the field of kinesiology and has made a great contribution in the fields of sport theory, sports anthropology, sports management, sports systems, methodology of sport and so forth.

In retrospect, if the journal Sport Science hadn't been released kinesiological research at this University and in this region would not be possible. Hence, the release of this journal has, first of all, encouraged scientific research in the field of kinesiology and its multidisciplinary fields; brought together scientists and experts from Bosnia and Herzegovina and neighboring countries, Europe and the world; it has accelerated the flow of scientific information; placed research at a higher level; opened up new possibilities for references, scientific research, scientific questioning and confirmation of research results with a higher number of other scientific publications and journals.

Today, however, most of the goals which were set at the beginning have been accomplished. The journal Sport Science has become one of the most prestigious journals in Bosnia and Herzegovina. It has also made an affirmation in Europe and the world.

That is precisely why we know that it is our obligation to continue publishing Sport Science and to make it an even better and more recognized journal. Fourteen issues of Sport Science obligate us to do that.

The issue before you has been published after the first international conference in the field of sports, science, education and development - InSEED 2015 which took place in February this year and after which we have launched the third cycle of studies – doctoral studies at the Faculty of Education. In that regard, and tying together the conference, journal and doctoral studies, we have created the preconditions for scientific research and scientific work at the highest level. On the other hand, when speaking about the quality of scientific papers, we believe that the issue before you has created new standards when it comes to publishing scientific research results and results of scientific papers.

*Dr. Nihad Selimović, MSc
Editor in chief*

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EFFECTS OF DIFFERENTLY DIMENSIONED PERIODIZATION ON IMPROVING BALANCES AND COORDINATION IN STUDENT POPULATION

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Original scientific paper

Abstract

The aim of this study was to determine effects of differently dimensioned periodization on improving balances and coordination in student population. A prospective randomised study with repeated measures design was conducted at the Faculty of Sport and Physical Education of the University of Sarajevo and consisted 39 units of training during a 15-week period. The study included a total of 44 male students aged 19-23 years, categorized in two groups. Group 1 (n=22) were students who had a program for improvement of a non-dominant side of the body which consists skills training and proprioceptive training (15 weeks, 3 times per week); Group 2 (n=22) were students who had a program that was primarily focused on the strength training (15 weeks, 3 times per week). Outcome measures were: Stability Index, left and right hand dribbling, left and right foot dribbling and slalom with three balls and they were assessed baseline and after 15-week exercise program. The paired-samples t-test is used to determine whether the mean difference between paired observations is statistically significantly different from zero. Significance of intergroup differences was tested for the left or right limbs, using separate multivariate models (MANOVA) and univariate analysis of variance (ANOVA). Program for development of absolute muscle power in group 2 elicited an decrease of $\Delta M = -1.21 \pm 2.03$ seconds in the left foot dribbling ($p = 0.011$) and program for improvement of non-dominant side of body in group 1 elicited an decrease of $\Delta M = -0.67 \pm 1.08$ seconds in the right foot dribbling after 15-week exercise program compared to a baseline measurement ($p = 0.008$). There was a statistically significant difference in mean of time for slalom with three balls measured baseline and after 15-week exercise program in group 1 ($p = 0.001$) and group 2 ($p < 0.001$). Program for improvement of non-dominant side of the body including a proprioceptive training is very important instrument for improving of physical performances.

Keywords: proprioceptive training, strength training, coordination, balances, multivariate analysis

Introduction

Motor coordination is fast execution of complex, very complex and various motor tasks. It is assumed that the basis of coordination high degree of plasticity of the nervous system, which is characterized by a great ability to adapt, reconstruction and development of body movements (Malacko & Rađo, 2004). There is a relative strong correlation between motor coordination and intelligence (g factor or general intelligence) and sports technique. For these reasons, there is a need to use a wider repertoire of different structures of movement in the initial stages of training, which can contribute to the formation of more complex coordination skills (Čolakhodžić & Rađo, 2011). Balance is the ability of keeping of the body in equilibrium position and correcting movements of gravity which makes it difficult to maintain the equilibrium position by external factors (active disruptive factors) (Malacko & Rađo 2004). The coefficient of the inherent balance is large and depends on a lot of factors and most important factors are the quality of the vestibular, kinesthetic, tactile and optical systems and the size of support surface, the height of gravity center of the body and the position of the free parts of the body for complexity and severity of the equilibrium position (Čolakhodžić & Rađo, 2011). Proprioception encompasses two aspects of position sense mechanoreceptors, static and dynamic. Static sense is thought to provide conscious orientation of one body part to another, while dynamic sense facilitates a neuromuscular feedback system related to the rate and direction of movement (Laskowski

et al., 1997; Stillman, 2002; Olsson et al., 2004). Dynamic balance is believed to be more challenging because it requires the ability to maintain equilibrium during a transition from a dynamic to a static state (Ross & Guskiewicz, 2004). Proprioception can therefore be considered a complex neuromuscular process that involves both afferent and efferent signals to maintain stability and orientation during activities (Laskowski et al., 1997; Stillman, 2002). In basic of the proprioceptive training are training operators of distortions and rebalancing, which have their roots in rehabilitation process (Šebić - Zuhric, L., 2008). In this study, we evaluated effects of differently dimensioned periodization on improving balances and coordination.

Materials and methods

A prospective randomised study with repeated measures design was conducted at the Faculty of Sport and Physical Education of the University of Sarajevo and consisted 39 units of training during a 15-week period. The study included a total of 44 male students aged 19-23 years, categorized in two groups. Group 1 (n=22) were students who had a program for improvement of a non-dominant side of the body which consists skills training and proprioceptive training (15 weeks, 3 times per week); Group 2 (n=22) were students who had a program that was primarily focused on the development of absolute muscle power (15 weeks, 3 times per week). However, an

increase in the number of exercises and the number of series, reducing of the number of repetitions and an increase in some time to pause between sets are the main tools of training development of absolute muscle power. Variables for assessment balances and coordination were assessed baseline and after 15-week exercise program. Biodex balance system used for the assessment of the balance and the Stability Index (SI) was calculated. SI represents displacement from a level platform position. Coordination was assessed with following variables: left and right hand dribbling, left and right foot dribbling and slalom with three balls.

Results are expressed as mean value and standard deviation incase of normal distributed continue variables, as median and IQR in case of non-normal distributed continue variables. The Kolmogorov-Smirnov statistic with a Lilliefors significance level was used for testing normality. The paired-samples t-test is used to determine whether the mean difference between paired observations is statistically significantly different from zero. Significance of intergroup differences was tested for the left or right limbs, using separate multivariate models (MANOVA) and univariate analysis of variance (ANOVA) for slalom with three balls. A p-value <0.05 was considered as significant and Bonferroni correction was applied. Statistical analysis was performed by using the Statistical Package for the Social Sciences (SPSS Release 16.0; SPSS Inc., Chicago, Illinois, United States of America) software.

Results

There was not a statistically significant difference in mean of Stability Index measured baseline ($M=7.71\pm2.69$) and after 15-week exercise program ($M=7.73\pm3.03$), $t(21) = -0.037$, $p>0.05$, $d=0.008$ in group 1 and baseline ($M=7.01\pm2.95$) and after 15-week exercise program ($M=8.15\pm4.25$), $t(21) = -1.447$, $p>0.05$, $d=0.309$ in group 2 (Fig. 1). There was not a statistically significant difference in Stability Index between two groups ($F(1,42)=1.252$; $p=0.270$; $\eta^2=0.029$).

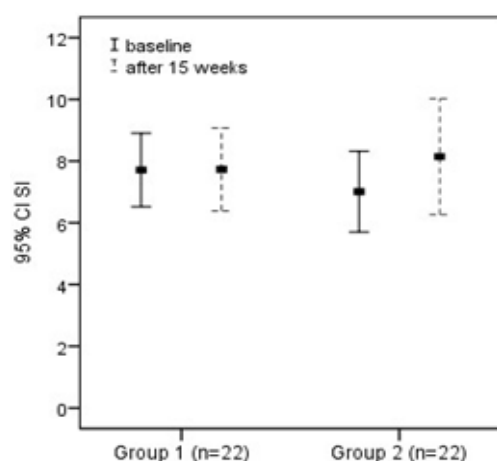


Figure 1. The Stability Index (SI) measured baseline and after 15-week exercise program in group 1 (improvement of non-dominant side of the body) and group 2 (development of absolute muscle power).

Program for development of absolute muscle power in group 2 elicited a decrease of $\Delta M = -1.21 \pm 2.03$ seconds in the left foot dribbling after 15-week exercise program compared to a baseline measure-

ment $t(21) = 2.795$, $p = 0.011$, $d = 0.596$. The other tested changes of time for hand and foot dribbling were not statistically significant (Fig. 2). There was not a statistically significant difference in coordination of left limbs between two groups ($\Delta Wilk = 0.948$; $F(2,41)=1.124$; $p = 0.335$; $\eta^2=0.052$).

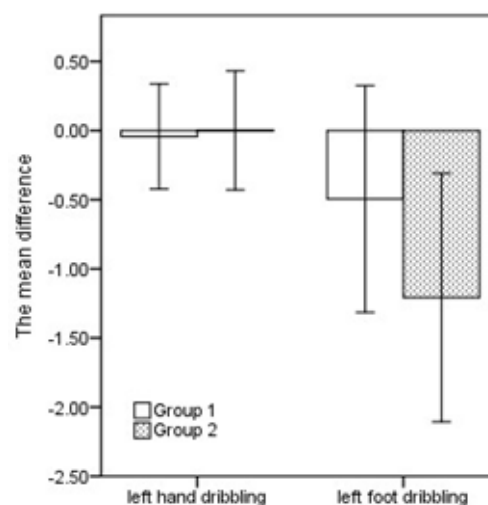


Figure 2. The mean difference of time for left hand and foot dribbling measured baseline and after 15-week exercise program in group 1 (improvement of non-dominant side of the body) and group 2 (development of absolute muscle power).

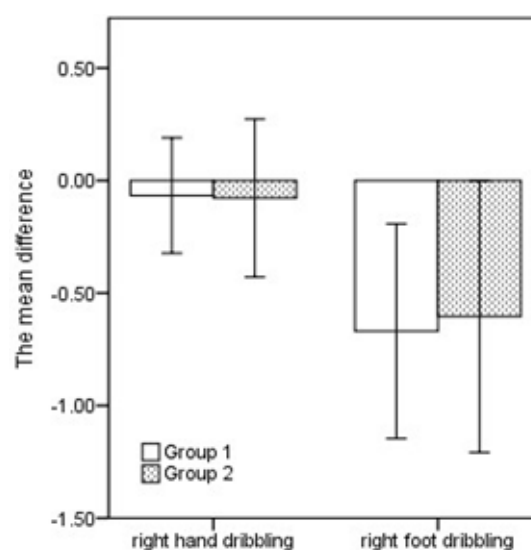


Figure 3. The mean difference of time for right hand and foot dribbling measured baseline and after 15-week exercise program in group 1 (improvement of non-dominant side of the body) and group 2 (development of absolute muscle power).

Program for improvement of non-dominant side of body in group 1 elicited a decrease of $\Delta M = -0.67 \pm 1.08$ seconds in the right foot dribbling after 15-week exercise program compared to a baseline measurement $t(21) = 2.916$, $p = 0.008$, $d = 0.622$. In group with the program for the development of absolute muscle power there was a small reduction of time, but it is not reached the value of statistical significance. The other tested changes of time for hand dribbling were not statistically significant (Fig. 3). There was not a statistically significant difference in coordination of right limbs between two groups ($\Delta Wilk = 0.999$; $F(2,41) = 0.017$; $p = 0.983$; $\eta^2=0.001$).

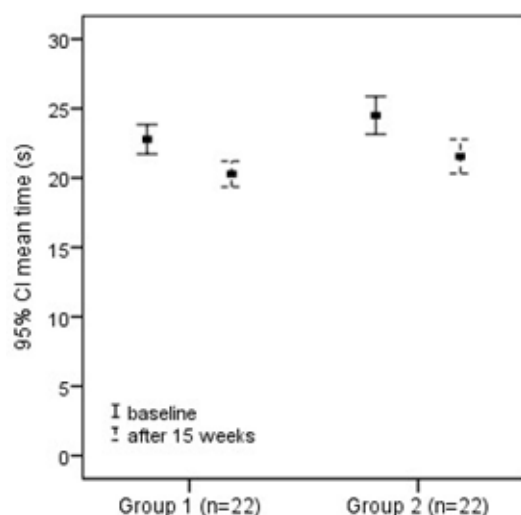


Figure 4. The Stability Index (SI) measured baseline and after 15-week exercise program in group 1 (improvement of non-dominant side of the body) and group 2 (development of absolute muscle power).

There was a statistically significant difference in mean of time for slalom with three balls measured baseline ($M = 22.78 \pm 2.38$) and after 15-week exercise program ($M = 20.28 \pm 2.08$), $t(21) = 3.798$, $p = 0.001$, $d = 0.810$ in group 1 and baseline ($M = 24.51 \pm 3.08$) and after 15-week exercise program ($M = 21.55 \pm 2.75$), $t(21) = 6.751$, $p < 0.001$, $d = 1.439$ in group 2 (Fig. 4). There was not a statistically significant difference in time for this test between two groups ($F(1,42) = 0.332$; $p = 0.568$; $\eta^2 = 0.008$).

Discussion

In this prospective study we found that both programs, strength training and training for improvement of non-dominant side of the body, were effective in improving performances of lower limbs. Program for improvement of non-dominant side of the body was effective in improving balances, but it is not reached the value of statistical significance. In the study of Kollmitzer et al. (Kollmitzer et al., 2000), there were investigated effects of 1) regular back extensor strength training as opposed to balance training, and 2) the influence of the sequence

of both training types on postural control, force, and muscle efficiency. After 1 month, back extensor strengthening led to decreased postural stability on hard surface, whereas there were no change after balance skill training. In the study of Chong et al. (Chong et al., 2001) a balance program was applied on healthy people using balance board (4 weeks, 3 times per week). The program was carried out and participants improved their balance ability. The study of (Blackburn et al., 2000) questioned whether proprioception or muscular strength is the dominant factor in balance and joint stability. They found that an enhancement of proprioception and muscular strength are equally effective in promoting joint stability and balance maintenance. In our study, there were not a statistically significant differences in Stability Index, coordination of left and right limbs and slalom with three balls between two groups. Rozzi et al. suggests that balance training is an effective means of improving joint proprioception and single-leg standing ability in subjects with unstable and nonimpaired ankles (Rozzi et al., 1999).

Conclusion

Strength program elicited an decrease of needed time in the left foot dribbling and program for improvement of non-dominant side including proprioceptive training elicited an decrease time in the right foot dribbling after 15-week exercise program compared to a baseline measurement. There was a statistically significant difference in mean of time for slalom with three balls in both groups. Program for improvement of non-dominant side of the body including a proprioceptive training is very important instrument for improving of physical performances. Andae magna vid ulpa consequi uidit, te porem hictem venis voluptatur sum dist que omnium aut optatate sed et omnium dolupta pelignia dolor seque prae. Cus none ex estrume vitinustist volectat. As qui dit auditiberum ate cone cum quam idis el ident omnis sentet volupta ersperr oviducimod magnis dolorpo reptas et audias evelentet molupta tintenis aut eos dolorporeped eat rehende libusdae natur, odipsap eritiorem sed ut quate re et volest, cuptusa assumt, quiant. Ut pa dolor alit est utem rerumquo blaboritatur solutae coriore peribus rerio magnatum inullor ehenimin

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EFEKTI RAZLIČITO DIMENZIONIRANIH PERIODIZACIJA NA POBOLJŠANJE BALANSA I KOORDINACIJE U STUDENTSKOJ POPULACIJI

Sažetak

Cilj ovog istraživanja bio je determinisati efekte različito dimenzioniranih periodizacija na poboljšanje balansa i koordinacije u studentskoj populaciji. Potencijalno nasumično istraživanje, izvedeno korištenjem ponavljanih mjera sprovedeno je na Fakultetu sporta i fizičkog obrazovanja Univerziteta u Sarajevu, i sastojalo se od 39 trening jedinica u periodu od 15 sedmica. Istraživanje je provedeno na ukupno 44 studenta (muškarca) od 19 do 23 godine, podijeljenih u dvije grupe. Grupu 1 su činili studenti koji su provodili program za poboljšanje nedominatne strane tijela, a koji se sastojao od treninga vještina i proprioceptivnog treninga (15 sedmica, 3 puta sedmično). Grupu 2 su činili studenti koji su provodili program koji se primarno fokusirao na trening jačine (15 sedmica, 3 puta sedmično). Korištene mjere: indeks stabilnosti, dribling lijevom i desnom rukom, dribling lijevom i desnom nogom i slalom sa tri lopte, što je ocijenjeno nakon 15-osedmičnog programa vježbanja. Parni uzorak t-testa korišten je da pokaže da li je razlika između obzervacija (proučavanja) u paru statistički značajnija od nule. Značaj međugrupnih razlika je testiran na lijevom i desnim udovima, odvojeno koristeći multivarijantni model (MANOVA) i jednovarijantnu analizu varijacije (varijanse) (ANOVA). Program za razvoj apsolutne mišićne snage u grupi 2 umanjen je za $\Delta M = -1.21 \pm 2.03$ sekundi u driblingu lijevom nogom, i program za poboljšanje nedominantne strane tijela grupe 1 umanjen je za $\Delta M = -0.67 \pm 1.08$ sekundi u driblingu desnom nogom nakon 15-osedmičnog programa vježbanja u odnosu na početni instrument mjerenja. Pokazana je statistički značajna razlika u mjerenja vremena potrebnog za slalom sa tri lopte s početnog (inicijalnog) vremena mjerenja i nakon 15-osedmičnog programa vježbanja u grupi 1 i grupi 2. Program za poboljšanje nedominatne strane tijela putem proprioceptivnog treninga je vrlo značajan instrument za poboljšanje fizičkih performansi.

Ključne riječi: proprioceptivni trening, trening snage, koordinacija, balans, multivarijantna analiza

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TRANSFORMATIONAL PROCESSES OF SITUATIONAL-MOTOR ABILITIES OF YOUNG BASKETBALL PLAYERS UNDER THE INFLUENCE OF TEN MONTHS BASKETBALL PROGRAMS

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Abstract

The purpose of this study is establishing the influence of programmed training process on development of situational motor abilities in young basketball players. Transformational processes were researched on a sample of 40 subjects age 12-14 of Youth Basketball Club "Sloboda" Tuzla. Variables that were used for the assessment of situation motor abilities were: variables for the assessment of coordination of arms & legs with a ball, variable for the assessment of a ball control, variable for the assessment of movement in defense in 30 second period, variable for the assessment of movement in defense, variable for the assessment of a shoot from 5 positions, variable for the assessment of a fast shoot in 60 second period, variable for the assessment of a shoot in a ball in 30 second period, variable for the assessment of 20 m dribbling, variable for the assessment of dribbling control & variable for the assessment of agility run with a ball. On the basis of gathered and analyzed results & through factor analysis, canonic discriminative analysis & analysis of partial both quantitative & qualitative changes in a domain of situation motor abilities of young basketball players of the Youth Basketball Club "Sloboda" Tuzla. Applied trainings during the period of 10 months gave both positive results and progress and improvement of basketball players' abilities.

Keywords: transformational processes, situational motor abilities, young basketball players, training program

Introduction

Basically the structure of the game of basketball is very important for players (basketball players) have certain anthropological characteristics and motor skills, particularly situational-motor (Tocić, 1998). In the twenty-first century, basketball has become an integral part of the lives of many people, especially children and youth. Attractiveness and magic games, with a spectacular presentation to the audience, are currently the main causes of popularity that basketball enjoys in all meridians.

How to stand out Karalejić and Jakovljević (1998) by collecting data on motor and energy manifestations, medical, psychological and social status of basketball players engaged in a number of researchers relatively new discipline of the science of physical culture – metrology. In this sense, in basketball is the main goal of metrology to the basketball coach provide exact information on the status, potential and perspective basketball players, especially young people. Testing can be registered to a certain state of players in some abilities or characteristics on the one hand, and on the other hand, quantitative evaluation of the results we are able to compare with previously established criteria.

Evaluation is very important. Just to identify the condition without its evaluation has little benefit and does not provide the necessary information. The criteria which to compare the results are, in general, the results of top individuals-basketball players.

The essence of the development of specific motor abilities of the players in the development of technical and tactical skills based on individual motor of a player (Trunić, 2007).

By Trninić (2006) development of technical and tactical quality (situational- motor skills) players, implies the realization of the following tasks :

- The continuing changes in the reactions of the

game and anthropological characteristics,

- Fostering and maintaining a conscious, deep and problematic rather than the surface approach to learning and training aimed at the selection of reactions in the game, distinguishing important from unimportant, linking technical and tactical knowledge of the game with situational experience at matches as well as the encouragement of understanding of the game,

- Application of knowledge, skills and habits in the game, which is the ultimate goal of the basketball education.

The technique is the primary means of games and a rational, rhythmically and efficiently perform certain movements with and without the ball and which are in the domain rules of the game, all in order to solve certain tasks (situation) in the game (Karalejić & Jakovljević, 2001). The transformation process in a general sense means change, transformation (Malacko, 2000 ; Malacko & Rađo , 2004).

The main purpose of the process of sports training is to provoke change (transformation) from the initial (initial state) in transit (new state) and that when athletes achieve a higher level of skills in certain time intervals. The technology of sports training is primarily related to problem management during the transformation process of sports training and is based on the fact, that when bringing athletes from the initial (initial, current) state of the newly formed (transit, final) state, which is usually at a higher level, achieves customization athletes conditions consisting in continuous changing and guidance towards achieving the best possible performance at certain time intervals (Malacko & Rađo, 2004).

Basketball requires optimal development of motor and functional abilities and morphological characteristics. It is manifesting in situation-related efficien-

cy, particularly in high-intensity training and competition loads (Trninić, et al., 2012). Improvement of the state of training it could be influenced on parameters of situation efficacy (Sporiš, et al., 2010).

Method

The sample

Testing and measuring situational- motor skills was carried out by tests Karalejić and Jakovljević (1998). The study was conducted on a sample of 40 basketball players, male, aged 12-14 years, the Youth basketball team Freedom Tuzla.

The sample of variables and a description of research And comprised anthropological space situational-motor skills with selected ten variables :

1. "Double leg - Single Leg" (DLSL)
2. Two second bounce drill (2BD30)
3. Movement on the defensive for 30 seconds (KOS30)
4. Movement on the defensive in the paint (DEFM)
5. Shoot, with five positions for 50 seconds (SPSP50)
6. Fast shooting for 60 seconds (SSH60)
7. Lay up in the basket in 30 seconds (X30)
8. Dribbling 20 meters (D20M)
9. Control of dribbling (KD)
10. Kamikaze Ball (KAMSL)
11. Double leg - single leg (DLSL) (Ballhandling)

Procedure: Respondent holding the ball in his right hand on his hip. At the sign of timekeepers turning the ball around both legs (in advance). When the ball comes back in the right hand, make step forward right foot and turn the ball around the right leg, then draw legs and again turned the ball around both legs. Afterwards real step forward left foot and turning the ball around the left leg. After that compiles feet and turning the ball around both legs, still step forward right and continue the same way. It is important that the ball always goes around the leg and in the same direction. Every time the ball touches the left hand is counted 1,2,3 ... The test takes 30 seconds

Two bounce drill (2BD30) (ball control)

Procedure: The subject starts with the ball in his right hand: running dribbling one side (on the side), then towards the goal, but towards the goal from behind. Each hit the ball counts. The test takes 30 seconds.

The movement on the defensive for the 30s (KOS30)

Procedure: The subject stands in a defensive basketball stance, on the edge of the circle, so that both his legs outside the edge and facing towards the basket. At the sign of timekeepers moving creep on the defensive while with both feet has traveled outside the half circle (behind the free-throw line or center), and it represents one cycle of movement that counts. The respondent has to perform as many cycles of movement for 30 seconds.

The movement on the defensive in the paint (DEFM)

Procedure: The subject stands on the defensive with his back to the basket at one end of the free throw line. At the signal timekeepers respondent moving creep in attitude on the left towards the other end of the same line, crosses the line with both feet, makes a turn toward the center of the racket continues moving towards one end of the base line, turn to the other end, again towards the middle of the

paint and terminates at the the same place where it started.

Fast shooting for 60s (SSH60)

Procedure: A respondent can start the task from any position behind the label which is at a distance for his age. At the signal timekeepers respondent shoots, wins the ball and dribbling goes to another point from which a shot again. Respondent must be the mark. Must shooting technique jump shot and four times laying of which can not be two consecutive terms. Respondent is trying to achieve as many points in 60 seconds.

Kamikaze Ball (KAMSL)

Procedure: The subject behind the baseline basketball court, in primary offensive stance. At the sign of timekeepers dribbling full sprint to the opposite baseline and back and still by scheme (the free throw line and back to the base, the center line of the field and back to the base line and other free throws and back to the base). At each point in the change of direction has to step on the line. When the respondent last step on the base line during stops.

X - Out (X30) (Lay up in the basket in 30 sec.)

Procedure: The subject starts with the right angle of the racket (" elbow "), where there is one stand establishes a dribble and penetrate to the basket right two-steps and shoots laying. Wins the ball, established as quickly as possible dribbling left hand and moving towards the left corner of the racket where there is a second rack, touring rack and penetrate to the basket and shoots left two-step laying his left hand. It works interchangeably with the aim to achieve as many goals within 30 seconds.

Control dribbling (KD)

Procedure: The subject starts with " weaker party " in a rack in the middle of the basketball racket. At the signal timekeepers respondent will dribble weaker arm around racks which are placed on the edge of the basketball racket. The respondent completes the job once it exceeds all stands (finish line) with both feet and then timekeeper stops the time. Respondent must always dribbling further arm of the stand. If you drop out of the movement, the test is interrupted and running again. Respondent performed the task three times, of which the first trial, and the other two measures.

Dribbling 20m (D20m)

Procedure: The subject stands in basic offensive position behind the starting line. The command is " attention " and shot. Respondent dribbling towards the finishing line. Go while two respondents. Copies of the two attempts (one by one), and is calculated better. Starter standing in the extension of the starting line, a timekeeper 5-7 his line extended goal. Every respondent has marked trails. Warn patients to run at full power through the finish .

Shoot, with five external position (the half) for 50 seconds (S5SP50)

Procedure: Respondent starts with kicks, jump shot technique, the wing position and shoots at each position by three balls, a total of 15 shots. The nearest position is away from the cage is 2.7 m, the mean position 3.65m 4.55m farthest. The task is to obtain as many hits (all 15) within 50 seconds.

Methods of data processing

The data in this study were processed using the program system for multivariate data analysis. Analyses were made in statistical program SPSS 12.0 .

Factor analysis was applied in order to on the basis of a number of manifest variables, among which confirmed the connection, make reductions and establishes a small number of latent dimensions that explain the interconnectedness manifested intercorrelation matrix.

Canonical discriminational analysis was applied in order to determine the global quantitative changes, as well as the participation of individual variables in discrimination between the initial and final states transformed into a system of independent canonical variables with maximum separation.

In order to determine the statistical significance of quantitative changes in the univariate level of certain anthropological dimensions of the studied group of patients that have been tested in two time points, ie. The initial and final measurements was used t - test for paired samples.

Results and Discussion

Size of characteristic roots caused the four main components isolated from a total of ten variables in the initial measurement (Table 1), which explains 77.755 % of the total variance isolated. It may be noted that the first principal component tests dominate the mechanisms responsible for the speed of movement and physical fitness, as well as control dribbling (KD) and ballhandling (DLSL), and explain 27.349 % common variance, which represents exceptional elements predisposition to create a great basketball player. Five variables that make this latent dimension of the rapidity of the ball 20 meters

from the start of places (D20M), kamikaze run with the ball (KAMSL), movement on the defensive in the paint (DEFM), control dribbling (KD) and ballhandling, double leg-single leg (DLSL).

As a comparison with the results of research Maric et al (2013) who in his research as results of correlation analysis showed that dribble has the biggest influence on the players and on its quality at cadets, accompanied also with precision passing and shooting with precision.

In the second principal component is dominated by tests responsible for the direct precision of shooting the ball to the basket and taking the ball to the basket as decisive factors realizing the benefits and win, also with the defense of one team, consisting of three variables and shoot with five positions for 50 seconds (SPSP50), fast shooting for 60 seconds (SSH60) and lay up in the basket for 30 seconds (X30), and explains 18.819 % of the variance. In the third latent dimension we find a variable control of the ball leading towards the goal of 30 seconds (2BD30) that determines the ability to manipulate the ball and so more offensive ability in relation to other players and defense, and explains 15.812 % of the variance. The fourth major component also clearly crystallized and define the movement of players on the defensive for 30 seconds (KOS30). This variable reflects and represents defensive abilities as a dominant factor in basketball who achieves success of a team and gives self confidence and safety for the attack, and is also a willing moment and character of players and teams, and explains 15.775 % of the total variance.

Table 1.

Total isolated variance									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Var.	Cumul. %	Total	% of Var.	Cumul. %	Total	% of Var.	Cumul. %
1	4.395	39.955	39.955	4.395	39.955	39.955	3.008	27.349	27.349
2	1.666	15.148	55.103	1.666	15.148	55.103	2.070	18.819	46.168
3	1.482	13.475	68.578	1.482	13.475	68.578	1.739	15.812	61.980
4	1.009	9.177	77.755	1.009	9.177	77.755	1.735	15.775	77.755

In the final state (Table 2) manifested space situational-motor skills was reduced to three main components that explain 66.840 % of the total variance isolated.

It may be noted that the first principal component as well as in the initial state tests dominate the mechanisms responsible for the speed of movement and physical fitness, as well as control dribbling and ballhandling and precision shooting and passing the ball to the basket, and explain 37.396 % common variance .

Six variables that make this latent dimension of the movement on the defensive in the paint (DEFM), kamikaze run with the ball (KAMSL), movement on the defensive for 30 seconds (KOS30), control dribbling (KD) and ballhandling, double leg-single leg (DLSL), fast shooting for 60 seconds (SSH60).

In the second principal component found two vari-

ables control of the ball of 30 seconds (2BD30) and speed dribbling, dribbling 20 meters (D20M), which determines the ability to manipulate the ball and so more offensive ability in relation to other players and defense, and explains 14.980 %.

In the third dimension we find two variables capabilities shooting and passing the ball to the basket through the variable effort from shoot with five positions for 50 seconds (SPSP50) and lay up to the basket for 30 seconds (X30), and explains 14.464 %. Kocic et al (2009) in their research findings define how an experimental training program implemented in young basketball players contributing to improvement primarily the result of the shot for goal from the deposit and shot for a goal at an angle of 45 degrees from the right side with respect to the basket.

Table 2.

Total isolated variance									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Var.	Cumul. %	Total	% of Var.	Cumul. %	Total	% of Var.	Cumul. %
1	4.442	40.383	40.383	4.442	40.383	40.383	4.114	37.396	37.396
2	1.666	15.150	55.533	1.666	15.150	55.533	1.648	14.980	52.376
3	1.244	11.307	66.840	1.244	11.307	66.840	1.591	14.464	66.840

With great statistical significance of differences from 0.00 (sig.), canonical correlation .852, Wilks Lambda (0.275) and Bartlett Chi-square test (41.986) we can talk about important strength of discrimination. Observation of canonical discriminant analysis (Table 3) we see that the biggest partial influence on global change has variable control of the ball (2BD30), slightly less variable dribbling 20 meters (D20), the movement on the defensive for 30 seconds (KOS30), ballhandling (DLSL), movement on the defensive in the paint (DEFM), lay up to the basket for 30 seconds (X30) and only a slight effect of the variable control dribbling (KD) and fast shooting for 60 seconds (SSH60) and shoot with the five position for 50 seconds (SPSP50).

Also, other mechanisms responsible for dribbling and movement on the defensive through variables have dribbling 20 meters, control dribbling and movement on the defensive in the paint who are negatively focused on the other, which means that the decline in nominal value in the final state. However, since these tests reflect the spatial-temporal instances, it is clear that with lower nominal values achieved the better result, and as the other showed a positive trend of transformation

Table 3.

Basic parameters				
Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	2.640 ^a	100.0	100.0	.852

Table 4.

Wilks Lambda					
Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.	
1	.275	41.986	10	.000	

Table 5. The matrix structure

Function	
2BD30	.601
D20M	-.396
KOS30	.373
DLSL	.352
DEFM	-.348
X30	.301
KD	-.171
SSH60	.141
SPSP50	.127
KAMSL	.008

Centroids

Grupa (1inic-2fin)	Function
	1
1	-1.584
2	1.584

The explication of partial quantitative changes analyzed situational-motor abilities of basketball club "Freedom" from Tuzla was made based either on the results presented in Table 5. The evaluation of the above statistical indicators, taking into account the numerical values qualitatively better results come to the conclusion that in all test subjects in significantly positive progress during the ten-month training process. In a test shoot with the five positions for 50 seconds (SPSP50) is evident slight improvement while in the test kamikaze ball (KAMSL) recorded a slight declination of results achieved on the final measurement.

Table 6.

T-test									
Paired Differences									
		95% Confidence Inter- val of the Difference					t	df	Sig.
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	DLSL-I - DLSL-F	-6.35000	5.37318	1.20148	-8.86473	-3.8352	-5.285	19	.000
Pair 2	2BD30-I - 2BD30-F	-18.7500	8.34061	1.86502	-22.6535	-14.844	-10.05	19	.000
Pair 3	KOS30-I - KOS30-F	-3.90000	4.11544	.92024	-5.82608	-1.9739	-4.238	19	.000
Pair 4	DEFM-I - DEFM-F	.90700	.33468	.07484	.75036	1.06364	12.120	19	.000
Pair 5	SPSP50-I - SPSP50-F	-.75000	2.02290	.45233	-1.69674	.19674	-1.658	19	.114

Pair 6	SSH60-I - SSH60-F	-1.45000	1.27630	.28539	-2.04733	-.85267	-5.081	19	.000
Pair 7	X30-I X30-F	-1.25000	1.77334	.39653	-2.07995	-.42005	-3.152	19	.005
Pair 8	D20M-I - D20M-F	.44300	.33902	.07581	.28433	.60167	5.844	19	.000
Pair 9	KD-I KD-F	.36950	.14409	.03222	.30206	.43694	11.468	19	.000
Pair 10	KAMSL-I - KAMSL-F	-.13050	6.37595	1.42571	-3.11454	2.85354	-.092	19	.928

Conclusion

Applied training operators in training have given positive results and led to the advancement and improvement of basketball players in this segment, which is understandable because during the long months of training work more emphasis subordinated situational basketball elements and exercises. Applying the operators are generally changed the initial state to a higher level, and which is characterized by a high level of physical fitness to the defensive willing momentum through movement on the defensive and in addition extremely handling the ball and a good percentage of accuracy through the shot in specific conditions.

It is very important to define for all coaches work-

ing with this age categories in that phase of training technical elements of basketball particular attention to dribble, control and maneuvering of accuracy added as priorities for the successful functioning of the games and later capacity to meet tactical tasks. These tests are very useful for all coaches of young basketball players according to the aspects of checking level of practising basic technical elements and can be used in training process.

Finally we can say that physical education operators within ten months of training programs at the population basketball MCO "Freedom" from Tuzla for the most part treated situational- motor skills produced positive partial effects.

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TRANSFORMACIONI PROCESI SITUACIONO-MOTORIČKIH SPOSOBNOSTI MLADIH KOŠARKAŠA POD UTICAJEM DESETOMJESEČNOG KOŠARKAŠKOG PROGRAMA

Sažetak

Cilj ovog istraživanja je utvrđivanje uticaja programiranog trenažnog procesa na razvoj situaciono-motoričkih sposobnosti kod mladih košarkaša. Transformacioni procesi su istraživani na uzorku od 40 ispitanika uzrasta od 12 do 14 godina OKK "Sloboda" Tuzla. Uzorak varijabli za procjenu situaciono-motoričkih sposobnosti bile su: varijable za procjenu manipulacije sa loptom, varijable za procjenu kontrole lopte, varijable za procjenu kretanja u odbrambenom stavu za 30 sekundi, varijable za procjenu kretanja u odbrambenom stavu u reketu, varijable za procjenu šutiranja sa pet pozicija, varijable za procjenu brzog šutiranja za 60 sekundi, varijable za procjenu šuta polaganjem lopte na koš za 30 sekundi, varijable za procjenu driblinga 20 metara, varijable za procjenu kontrole driblinga i varijable za procjenu kamikaze sa loptom.

Na osnovu urađenih i analiziranih rezultata kroz faktorsku analizu, kanoničku diskriminativnu analizu i analizu parcijalnih kvantitativnih promjena (t-test) možemo konstatovati da je došlo do značajnih kvalitativnih i kvantitativnih promjena u prostoru situaciono-motoričkih sposobnosti mladih košarkaša OKK Sloboda Tuzla. Primjenjeni trenažni operateri na treningu tokom perioda od deset mjeseci su dali pozitivne rezultate i doveli do napretka i poboljšanja košarkaša u ovom segmentu.

Ključne riječi: transformacioni procesi, situaciono-motoričke sposobnosti, mladi košarkaši, trenažni program.

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CONTRIBUTION OF DYNAMIC RUNNING PARAMETERS ON MAXIMUM ACHIEVED RUNNING SPEED IN 50M DASH RUN AMONG BOYS.

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Abstract

Sprint is characterized as movement of highest running velocity and it is highly genetically conditioned. Early detection of genetic resources can help create a superior sprinter. Maximum running velocity is expressed through the structure of kinematic and dynamic parameters. Prediction of maximum gained speed (KVmax) using dynamic running parameters measured on 50m dash run was conducted on a sample of boys ($n = 81$, age: 10-12 yrs.). Measurement of dynamic parameters was performed using a software system named BRZ with photo-cells technology. Dynamic running parameters results are presented as mean $\pm$ SD in sets of variables: achieved velocity (V), time results at measuring points (T) and time results on split running intervals (TI). Sets of variables V ($\beta = 14.201$, $p = 0.000$, Adjusted $R^2 = 0.939$), T ($\beta = 14.009$, $p = 0.000$, Adjusted $R^2 = 0.925$) and TI ($\beta = 14.063$, $p = 0.000$, Adjusted $R^2 = 0.929$) showed highest significant statistical predictive value. The highest partial contribution ($p < 0.05$) for prediction of KVmax from the V set are the measured speeds at 15, 20, 25 and 30m, from the T set time results achieved on the 15 and 30m point measurement and in the TI set running time results between 15-20m, 20- 25m and 25-30m. By measuring the basic dynamic parameters of running, it is possible to accurately determine the level of maximal running speed. Boys before puberty, on tested sample, reach maximal running velocities between 15 and 30m. According to the results of research as a part of conclusion, a modified 30m running test was presented suitable when selecting talented boys in the sprint running events.

Keywords: sprint, selection, running speed, time result success

Introduction

Sprint does not represent a fast running, but the ultimate human natural speed movement. Sprint represents a monostructural athletic movement, with highly emphasized technical demands (Bellot, 1991; Mero, 1987; Muller, 1991.), specifically difficult elements to learn and extraordinary high level of demonstrated strength and possibility to manifest as greater force in a short period of time (Mero, 1986.). Sprint speed is a result of the optimal ratio of length and frequency of steps. Structure of the sprint race distinguishes three phases, of which running at maximal speed – is a key to the result outcome (Mann, 1983; Wood, 1987.). Both parameters are interdependent and related to processes of central movement's regulation, morphological characteristics, motor abilities and energy production and consumption (Komi, 1987; Mero, 1992; Young, 1992.). Maximal running speed, it's early achievement and ability to maintain running speed for high amount of time, represents a combination of factors for achieving top results in sprint disciplines (Dintiman, 1997.). Selection in sprint is very important, because speed is a complex motor ability, with great amount of latent dimensions and it's highly conditioned by genetics structure. Speed ability is usually measured through assessment of time results achieved by running characteristic distances like: 30m, 20m or 60m. Running velocity is measured using radars technology based on Doppler's effect and laser beam. Indirect measure and assessment is mostly applied technique to determine running velocity. It is gained by dividing distance and time results achieved for the same distance.

Reasons for researching this topic lies in the fact that, according to the author's knowledge, there are

several studies on the selection in sprint by measuring basic dynamic parameters. Possibility of early detection of great straight-line speed capacity, indicatively can map speed capacities, because speed is dominant in many sports and it is possible to intensively develop it in a younger age (Williams, 2011.). We hypothesized that highest running speed is achieved between 20 and 30m. Results of this study can be applied in practice. Main goal of research is to detect characteristic field test of straight-line sprint, which could be used in further screening of talented boys and their selection for sprint disciplines.

Methods and materials

Sample

Sample represents 81 male subjects (mean $\pm$ SD: age 11 ± 0.9 ; weight 47 ± 2.5 ; height 158 ± 6.8). All subjects were healthy, with no previous experience in sprint events. For all respondents, their physical education teacher signed a written agreement for testing. All procedures were conducted according to the Declaration of Helsinki and Ethic committee of Faculty of Sport approved research.

Experimental approach

The study was designed as prospective section study. Boys from elementary public schools were assessed for time trial on 50 m dash run. The testing procedure was conducted on track area 100m in length. The temperature was optimal 22°C. Track surface was hard rubber – tartan surface. Study was conducted on the same day for all 81 subject. Water

intake was "ad-hoc". All participants run the metric distance of 50m two times, wearing sport equipment and track shoes. Spikes were not allowed. Distance was sectioned for each 5 meters. Ten pairs of time measuring cells were set on each 5m mark. Time was measured and recorded on time sheet. Time results were used to calculate all the others dynamic parameters.

Dynamic parameters assessment

Each participant went through the procedure of warming up for at least 15 minutes. Dynamic parameters were determined using a software system "BRZ", by running at 50 m from standing start, on timekeeper's sign. Achieved maximum running speed (KVmax) represents the number of overrun meters per time unit (m / s), and it's calculated by the velocity formula $v = s/t$. Value of the maximum speed was obtained by inspection of achieved average speed results, in all time intervals (stages) of share, for each subject. Dynamic parameters: for a set of generated speed (V) variables were: V5m, V10m, V15m, V20m, V25m, V30m, V35m, V40m and V50m; for a set of generated times (T) variables were: T5m, T10m, T15m, T20m, T25m, T30m, T35m, T40m and T50m; and for generated time while running certain length share intervals (TI) variables were: TI0-5m, TI5-10m, TI10-15m; TI15-20m; TI20-25m; TI25-30m; TI30-35m; TI35-40m and TI40-50m. Due to a technical fault on the electronic cell, mounted on a 45 m, data were not used and included in the assessment of the study outcome.

Statistical analysis

Data analysis was carried out using the software package for data processing SPSS 22.0 (IBM Corp.). Kolmogorov - Smirnov test was used for testing the normality of data distribution. Multivariate linear re-

gression analysis was used to determine values of prediction sets for dynamic parameters of running on KVmax variable. Statistical significance was set at $p < 0.05$.

Results

K - S test was statistically insignificant and indicate that data were within normal distribution values. Table 1 shows results for criterion variable KVmax. Measurement has revealed that the average maximum achieved running speed was 6.02 m / s, and the greatest single achieved running speed was 7.04 m / s.

Table 1. Measured values of KVmax

	n	Mean $\pm$ SD	Min	Max
KVmax (m/s)	81	6.02 $\pm$ 0.43	4.9	7.04

All sets of predictor variables show the highest statistical significance ($p = 0.00$) for predicting manifest variable KVmax (Table 2). The largest partial predictor values on KVmax from V set of dynamic parameters show V15m ($p = 0.028$), V20m ($p > 0.00$), V25m ($p > 0.00$) and V30m ($p > 0.00$). From the T set of dynamic parameters variables, the greatest partial contributions showed variables T15m ($p = 0.054$) and T30m ($p = 0.024$). From the TI set of dynamic parameters variables, the greatest partial contribution showed variables TI15-20m ($p > 0.00$), TI20-25m ($p = 0.003$) and TI25-30m ($p > 0.00$).

World record holder in 100 m sprint (Usain Bolt's) segmental values of achieved speed and respondent's sample were showed in graph of mean values (Graph 1), with 9 measuring points.

Table 2. Multivariate regression analysis of KVmax in the area of dynamic parameters of running

		KVmax (n = 81)			
		Mean $\pm$ SD	β	p - value	Adjusted R ²
V set results		4.98 $\pm$ 0.373	14,201	0.00	0.939
T set results		5.56 $\pm$ 0.352	14,009	0.00	0.925
TI set results		1.007 $\pm$ 0.074	14,063	0.00	0.929
Variables in the Equation					
V (m/s)	V15m	5.70 $\pm$ 0.420	0.150	0.028	
	V20m	5.82 $\pm$ 0.413	0.280	< 0.00	
	V25m	5.81 $\pm$ 0.450	0.214	< 0.00	
	V30m	5.84 $\pm$ 0.464	0.274	< 0.00	
T (s)	T15m	3.74 $\pm$ 0.223	0.620	0.054	
	T30m	6.32 $\pm$ 0.392	-1.280	0.024	
TI (s)	TI15-20m	0.86 $\pm$ 0.62	-0.310	< 0.00	
	TI20-25m	0.86 $\pm$ 0.67	-0.260	0.003	
	TI25-30m	0.86 $\pm$ 0.67	-0.290	< 0.00	

β - coefficient of regression correlation, p - value - statistical significance, R² - total variation explained

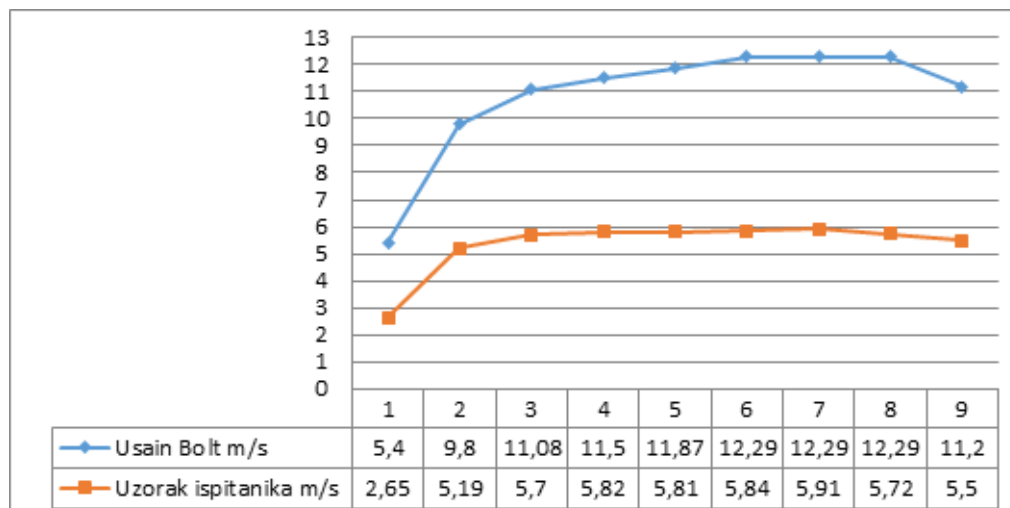


Figure 1. Graph of speed generated by world record holder and boys of younger school age

Discussion

Based on the results, it can be concluded that the dynamic parameters of running have great contribution to achieving maximum running speed. Speeds generated within 15 and 30 meters are fine indicator when assessing achieved maximum running speed. For assessment of maximum running speed, time achieved on 30th meter can be used. Also, time achieved on the 15th meter – T15m variable has a high level of predictive value, on the border of statistical significance ($p = 0.54$), related to the maximum running speed. All longitudinal intervals of 15 – 20 m, 20 – 25 m and 25 – 30 m, had the same result value (0.86 s) and were valid for predicting maximum running speed. It is important to emphasize that the values of dynamic parameters for achieved times on measuring intervals were in reversed proportion with running speed, the lower the values of time achieved, the higher the maximum running speed. This confirms the importance of assessing maximum running speed, in order to gain better result values in sprint disciplines. The results confirm working hypothesis.

Generally speaking, based on the results of boys tested in the sample, maximum speed were achieved within 15 – 30 m. Average speed values, generated in this length interval, were 5.70 – 5.84 m / s. The highest average maximum running speed, of almost all respondents, was recorded at the 30th meter of 50 m running distance. Čoh (2001.) showed in his research that this age group achieved it's maximum speed between 15 and 30 m, with the highest speed average at 30th m, which confirms our results.

Senior's 100 m sprint has a specific structure, where start progression, reaching maximum speed, running at distance and deceleration phases were clearly revealed. Result values of ran distance of 50 m for boys were analysed, where a race structure with characteristic race phases, similar to those senior's 100 m race phases, was found. At the phase of start progression, speed level drastically rises to 15th m. In the area between 15 and 30 meters, phase of reaching maximum speed appears. After 40 meters speed decreases, just like in the phase of deceleration. It can be concluded that the boy's 50 m race has a similar structure with phases characteristic for senior's 100 m race.

Great number of authors, according to the research

results for assessing maximum running speed, propose tests: 20 m flying (Mero, 1987; Racev, 1985.), 30 m standing (Balsevich, 1986.) and 30 m flying (Ae, 1992; Aemstrong, 1984; Dick, 1989.). These test are not adequate for assessing sprinter qualities of those aged under 14 years (Hoare, 1994.). Based on the research results, authors suggest a modified 30 m running test, as a good indicator of talent level of boys in early school ages. This research 30 m running test standing, modified and scientifically verified, as the proposal for assessment test of sprint qualities, can be used for purposes of selection of children at younger age.

Research limitation could be the number of respondents. Although it was, while planing research, found that the sample could not be less than 13 respondents, authors believe that the larger sample would certainly contribute and add weight when generalizing conclusion. This statement is seen through the prism of data presented as mean values. Although the sample was, according to the age and experience in sprint homogeneous, the study didn't found homogeneity in terms of participating in other sports, time experience in sports, morphological characteristics, functional characteristics and etc., which could modify the pattern of results. Differences in biological and chronological age of respondents could also significantly affect the results, which represents a specific limitation. Due to the technical fault on 45th m, results weren't recorded, which could further show the precise moment of deceleration phase. Further research should determine the percentage contribution of each of the characteristic phases on the result outcome, which could be indicative for a specific development of speed abilities in the sensitive period, in order to adulthood dedicated training.

Conclusion

Observing the whole system of predictor variables for all 3 sets of dynamic running parameters, it can be concluded that a good test for assessing maximum running speed for this sample of respondents – boys at younger school ages, could be 30 m stand running, high start, where time is measured at 15, 20, 25 and 30 meters. Research on this sample of boys, who had no knowledge of sprint running tech-

niques, shows us that children achieve maximum speed between 15 and 30 meters. Previous studies mostly tell us about the value of test 20 m flying for prediction of maximal running speed. Length of approach for this test is not standardized, so this test can have various result values, conditioned by changing the length of approach. Results of the study (Table 3) based on the mean values and standard deviation, as well as the statistical correlation, formulate direct time and speed indicators when selecting talented boys into sprint disciplines. When applying this test, individual quality of sprint abilities could be compared, such as: a) ability to gain

maximum speed as soon as possible; b) to retain maximum speed. If the respondent achieves extreme values at 15 m, and average at 30 m, the premise is that he has great ability of early reaching maximum speed, but not the capacity for it maintenance, while it does not involve only energetic and functional possibilities, but also latent dimensions which make sprint one of the most attractive disciplines in the world of sports.

Test limitation is presented by the use of an electronic measuring device with photo – cells, which is not available to all experts.

Table 3. Relative values of the 30 m running test

	ET	T	Avg.		ET	T	Avg.
t (s)	< 3.31	3.31-3.52	3.53-3.74	15-20m	< 0.736	0.736-0.798	0.799-0.86
v (m/s)	> 6.54	6.12-6.54	5.70-6.11	15-20m	< 0.726	0.726-0.793	0.794-0.86
t (s)	< 4.06	4.06-4.33	4.34-4.6	20-25m	< 0.726	0.726-0.793	0.794-0.86
v (m/s)	> 6.64	6.12-6.64	5.82-6.22	20-25m	< 0.726	0.726-0.793	0.794-0.86
t (s)	< 4.8	4.8-5.13	5.14-5.46	25-30m	< 2.2	2.2-2.42	2.43-2.59
v (m/s)	> 6.71	6.26-6.71	5.81-6.25	25-30m	> 6.66	6.32-6.66	5.79-6.33
t (s)	< 5.55	5.55-5.94	5.94-6.33	Last 15m			
v (m/s)	> 6.76	6.76-6.3	5.84-6.29	Last 15m			

ET – extremely talented, T – talented, Avg. – average, t – time, v – speed

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DOPRINOS PARAMETARA DINAMIČKOG TRČANJA NA MAKSIMALNU OSTVARENU BRZINU TRČANJA NA 50 M MEĐU DJEČACIMA

Sažetak

Sprint predstavlja kretanje najvećom maksimalnom brzinom i visoko je genetski uslovljen. Rano otkrivanje genetskog potencijala može pomoći stvaranju vrhunskog sprintera. Visok nivo maksimalane brzine izražen je tipičnom strukturom kinematičkih i dinamičkih parametara. Prediktivni doprinos dinamičkih parametara trčanja na maksimalnu ostvarenu brzinu (KVmax) pri pretrčavanju distance od 50m utvrđen je na uzorku dječaka (n = 81, dob: 10-12 god.). Mjerenje dinamičkih parametara izvršeno je upotrebom softverskog sistema BRZ sa foto - ćelijama. Rezultati dinamičkih parametara trčanja iskazani su kao srednje vrijednosti $\pm$ SD setovima varijabli: ostvarena brzina (V) i ostvareno vrijeme (T) na mjernim mjestima i ostvarenim vremenima pretrčavanja dužinskih intervala (TI). Setovi varijabli V ($\beta = 14.201$, $p = 0.000$, Adjusted $R^2 = 0.939$), T ($\beta = 14.009$, $p = 0.000$, Adjusted $R^2 = 0.925$) i TI ($\beta = 14.063$, $p = 0.000$, Adjusted $R^2 = 0.929$) pokazuju maksimalni statistički nivo prediktivne vrijednosti. Najveće parcijalne doprinose ($p < 0.05$) za predikciju KVmax iz seta V pokazuju rezultati ostvarene brzine na 15, 20, 25 i 30m, iz seta T ostvareno vrijeme na 15 i 30m te iz seta TI vremenski intervali trčanja između 15-20m, 20-25m te 25-30m. Mjerenjem osnovnih dinamičkih parametara trčanja moguće je precizno utvrditi nivo maksimalne brzine trčanja. Dječaci predpubertetskog uzrasta ispitanog uzorka maksimalnu brzinu trčanja dostižu između 15 i 30m. Rezultati istraživanja omogućuju objektivniji pristup u modeliranju seta testova pogodnih za selekciju dječaka nadarenih za sprinterske discipline.

Ključne riječi: sprint, selekcija, maksimalna brzina trčanja.

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CHANGES IN BODY COMPOSITION AND AEROBIC CAPACITY OF FOOTBALL PLAYERS DURING THE HALF SEASON OF BOSNIA AND HERZEGOVINA PREMIER LEAGUE

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Abstract

The goal of the research was to determine changes in body composition and aerobic capacity of senior football players generated in semi-annual cycle of Bosnia and Herzegovina's Premiership League. Regarding the time aspect, this research has a longitudinal character aiming to determine changes in body composition and aerobic capacity on the sample of 23 senior football players (25.45 ± 5.74 years of age; 182.9 ± 5.94 cm height; 76.9 ± 6.39 kg weight) of the F.C. Velež, Mostar, that originated between two points in time. Body composition is determined by BIA method (Bioelectrical Impedance Analysis), using the electronicscales TANITA TBF- 300 (Tanita corporation of America Inc.), while the aerobic capacity was determined indirectly by BEEP test. Measurements were made at the beginning of the preparation period of the 2013/14 spring half season of Bosnia and Herzegovina's Premiership League and seven days after the official end of the half season. The changes induced by controlled programmed activities have made, in terms of statistics, significant impact on the fat tissue quantity in kilograms (FATMAS $t=3.44$; $sig.=.002$), fat tissue percentage (FAT% $t=3.84$; $sig.=.001$) and tissue impedance (IMPEDANCE $t=3.44$; $sig.=.002$) of the football players at the statistic relevancy $p=.05$. There were no statistically significant changes regarding other body composition variables, or the value of aerobic capacity in L/kg/min-1 (VO2MAX $t=1.234$; $sig.=.230$). It is evident that the football half season which includes 45 days preparation period and 15 games during the League competition has not induced statistically significant changes in height, mass, accumulated energy, muscular mass quantity and fluids quantity in the body. The changes were statistically insignificant in the aerobic capacity as well. After the winter break, which is very long in the Bosnia and Herzegovina's Premiership League, lasting approximately two months, the training program of the team in the preparation period was focused on the reduction of the fat tissue and achieving and maintaining a certain level of aerobic capacities – conditional readiness of the team.

Keywords: football, body composition, aerobic capacity, half season

Introduction

Diagnostics and evaluation of the results are very important in sports. Since most of the clubs and individuals in Bosnia and Herzegovina are not in a position to conduct extensive laboratory tests, they use tests that are simple to use and available to most sportsmen and trainers. Determining body composition and quantity of fat component of overall mass, as well as determining aerobic functional capacity in comparison with the values found in model values of the specific sport has a great significance in diagnostics and training process evaluation. Besides determining the fat component, there are reasonable grounds for determining of content of other components of body composition (muscle tissue, bones, fluids...etc.) as well. Various methods are used for determining body composition, and there is increased interest in more sophisticated techniques and methods as a result of growing demands in sports. There are many methods for assessment and determining of body composition (Ostojić 2007; Mišigoj-Duraković 2008), and one of the most used methods in practice is Bioelectric Impedance Analysis (BIA). It is fast, less intrusive and cheap method for body composition evaluation that is performed by conducting a safe dosage of 800 μ A power and 50 KHz frequency current through the body. The current flows freely through the lean tissue of the body, but encounters resistance when it passes through fat tissue. The scales software computes body composition using the data of the specific individual (height,

weight, age, status). The fat component of the body consists of so called essential and non-essential fat. Essential fat constitutes 2%-5% of lean body mass as lipid components of the cells, while non-essential fat constitutes subcutaneous fat tissue. Relation between fat and lean component of athletes changes considerably depending on gender, training activity level, periodisation and age. Females have significantly higher percentage of fat, and the highest ratio of lean component to fat component of the body is reached by approximately twenty years of age, subsequently decreasing in individuals not involved in sports. A normal increase of body fat of 1% for each decade is expected after twenty years of age. The upper limits of body fat percentage are 25% for men and 30% for women, while minimal values range between 5%-10% for men and 5%-17% for women (Wilmore & Costill, 2004). The factors to be considered when evaluating body composition are training activity level at the time of the measuring, period of the competition season and nutrition quality. In any case, the changes in body composition represent a significant indicator of the training process' intensity and extensity correlation, football player's nutrition, momentary status of preparedness and provide clear directions for programming of subsequent cycles and training units. Aerobic abilities are defined as a system for transport and use of oxygen and muscle system's capability to deliver and through biochemical processes use oxygen for

energy production serving the purpose of muscular activity (Sekulić & Metikoš, 2007). Aerobic capacity is defined as capability of physical activity through longer time period in aerobic metabolism conditions (Vučetić & Šentija, 2004). Maximum oxygen uptake (VO_2max) is the most used physiological indicator of aerobic functional capabilities of football players. Maximum oxygen uptake is the maximal quantity of oxygen that body can use in one minute (Matković & Ružić, 2009) and represents a measure of aerobic capabilities of athletes expressed as absolute (l/min) or relative rate (ml/kg/min). The absolute values of VO_2max are increasing during childhood year after year, while relative values of maximal uptake of oxygen are stable among men (Rowland, 1990). Jackson & associates research (1995) showed that the relative uptake of oxygen is decreasing with age. Average annual decrease among men was $0,46 \text{ ml/kg/min}$ (1,2%), and among women $0,54 \text{ ml/kg/min}$ (1,7%). Some of the reasons for this decrease are decrease in maximal heart rate and stroke volume. The factors limiting maximal uptake are defined as internal and external factors. Internal factors are: pulmonary ventilation, diffusing capacity of the lungs, cardiac output, oxygen carrying capacity of blood, peripheral use of oxygen, as well as muscular tissue composition, while external factors are: the amount of workload, amount of used muscular mass, body position, partial pressure of oxygen and climate (Rado & associates, 2000). Maximal uptake of oxygen among healthy adults varies between 40 and 80 ml/kg/min . The highest medium values of VO_2max among players in Serbian and Monte Negro Premier League had midfielders ($53,3 \pm 1,9 \text{ ml.kg}^{-1}.\text{min}^{-1}$), followed by forwards ($52,9 \pm 4,4 \text{ ml.kg}^{-1}.\text{min}^{-1}$), defensive players ($51,8 \pm 3,3 \text{ ml.kg}^{-1}.\text{min}^{-1}$) while the goalkeepers had the lowest values ($50,5 \pm 1,8 \text{ ml.kg}^{-1}.\text{min}^{-1}$) (Suzić & associates, 2004). The elite players' model values of maximal oxygen uptake are $60\text{--}67 \text{ ml/kg/min}$. Full-backs and midfielders have the highest relative oxygen uptake, followed by forwards, center-backs and goalkeepers (Marković & Bradić, 2008). These authors say that aerobic endurance interval training of high intensity, lasting 6-8 weeks, can increase VO_2max of the trained football players by 10-15%. Compared to untrained men and athletes in other sports, football players have higher maximal uptake of oxygen, but those values are still considerably lower than those among elite endurance athletes. On several occasions, a positive relation was established between players' maximal uptake of oxygen and the total of distance run in the game, which points out to the way that aerobic capabilities represent an important component of success in football. Poor aerobic capability can disable maintenance of the high quality aerobic work during the whole game and lead to progressive exhaustion particularly evident during the last 15 minutes of the game. Maximal uptake of oxygen can be estimated by various diagnostic techniques. The most used field test is the Beep test (Leger & Lambert, 1982) and its variations (Bangsbo, Iai, Krstrup, 2008; Vučetić, 2004) belonging to the group of continuous progressive load tests, which implies that the load, defined by the speed of running, is progressively increasing and starts with very low running speed. The other characteristic is that the test is performed to exhaustion, which means, as long as the increase in load can be endured.

Research Problem And Purpose

The primary problem of this research is quantitative changes in body composition and aerobic capacity of the senior football players during one half-season. The purpose of the research was to determine the changes in body composition and aerobic capacity of senior football players caused by half-year's cycle in Bosnia and Herzegovina Premier League.

Methods

The research had longitudinal character aiming to determine the quantitative changes originated between two points in time on the specific sample of subjects. The measurements were performed at the beginning of the preparation period of the 2013/14 spring half season of Bosnia and Herzegovina Premier League and seven days after the official end of the half season.

Sample

The research was conducted on sample of 23 senior players F.C. Velež Mostar. For the final interpretation the only the results of the subjects who participated in initial and final measuring were taken and they were the team members who played 2013/14 winter half season of Bosnia and Herzegovina Premier League.

Variable Samples

Ten variables were used for the estimation of subjects' treated anthropological spaces. Nine variables determined by Bioelectrical Impedance Analysis (BIA) method were used for the estimation of the body composition of the subjects. TANITA TBF-300 (Tanita Corporation of America Inc.) electronic scales with a level achieved in the test, the same was calculated into maximal relative oxygen uptake (VO_2MAX) of the individual in ml/kg/min^{-1} .

Data Analysis Methods

Data analysis was carried out by SPSS 12.0 for Windows software. Descriptive parameters were determined for all the variables and both measurements, and a paired sample T-test was used for determining of the quantitative changes.

Results and Discussion

The state of specific anthropological spaces was determined at the beginning of the preparations for 2013/14 half season of F.C. Velež Mostar, for the purpose of determining the state of momentary preparedness of the team. Body composition and aerobic capacity of the players was measured and determined by the Beep test. Values obtained were calculated into maximal relative oxygen uptake. Descriptive variable parameters of the initial and final measuring are shown in Tables 1 and 2. Comparison of these values show that subjects were on average $25,45 \pm 5,74$ years old; $182,9 \pm 5,94 \text{ cm}$ high and had an average mass of $76,9 \pm 6,39 \text{ kg}$. World's elite football players are 25 to 27 years old with a standard deviation of approximately 2 years (Ekblom, 1994; Shephard, 1999). In Croatia and Serbia that average is approximately 23 years ± 3 years (Jerković, Jerković, Sporiš 2006; Ostojić 2000). In

comparison with data presented above, our subjects are of the similar average age. According to Bloomfield & associates research (2005), the average height and mass of the European football players shows that Bundesliga players are the highest 1.83 ± 0.06 m and the heaviest 77.5 ± 6.4 kg of the four European top leagues players, the Spanish BBVA La Liga players are the shortest 1.80 ± 0.06 m and the Serie A players were the lightest with body mass of 74.3 ± 5.4 kg. Elite players in Croatia are on average 178.73 ± 5.81 cm high and weigh 78.01 ± 5.73 kg (Jerković, Jerković, Sporiš 2006), and in Serbia 181.9 ± 5.7 cm high, weigh 77.4 ± 5.9 kg with body fat percentage of 10.8 ± 2.1 %. Body fat percentage of both elite and young players ranges from 7 to 19% (Casajus & Aragones, 1997; Rico-Sanz, 1997; Witlich & associates, 2001), which matches the sample of our study with somewhat lowered values in final measuring. As tables 1 and 2 show, football players in Bosnia and Herzegovina have approximately the same values as elite players in Europe. Table 3 representing comparative values of values' arithmetic mean in initial and final measuring; show that there were changes in most of the variables concerning the central and dispersive parameters. There were changes in all variables concerning the values of arithmetic means of higher or lower intensity and different direction. The only variable that remained the same was the height variable (HEIGHT), which was expected since the measuring was conducted on seniors whose growth and development is completed, resulting in minimal variation.

Table 1. Basic parameters of distribution-initial measuring

Variable	N	Min	Max	Mean	Std.
HEIGHTI	23	173	198	182.91	5.93
MASSI	23	62.0	88.8	76.90	6.39
BMII	23	20.5	24.7	22.961	1.05
BMRI	23	1650	2116	1873.52	120.79
IMPEDANCEI	23	412	562	480.52	35.51
FAT%I	23	4.6	11.7	8.62	1.95
FAT.MASI	23	2.9	10.1	6.71	1.86
FFMI	23	59.1	80.1	70.18	5.03
TBWI	23	43.3	58.6	51.37	3.66
VO2MAXI	23	45.20	59.10	52.82	3.57

Table 2. Basic parameters of distribution-final measuring

Variable	N	Min	Max	Mean	Std.
HEIGHTF	23	173.00	198.00	183.08	6.73
MASSF	23	64.80	87.00	76.03	6.30
BMIF	23	20.70	24.00	22.54	1.00
BMRF	23	1717	2085	1864.13	111.86
IMPEDANCEF	23	357.00	542.00	440.69	41.20
FAT%F	23	3.30	10.10	6.23	1.89
FAT.MASF	23	2.50	7.80	4.74	1.63
FFMF	23	61.60	79.80	70.85	5.11
TBWF	23	45.10	58.40	51.87	3.74
VO2MAXF	23	43.40	55.70	51.45	3.58

Quantitative changes were analyzed by T-test for the dependent samples (table 3). The differences between two measuring are statistically significant on level $p < .05$ in variables defining the quantity of fat tissue in kilograms (FATMAS $t = 3.44$; $sig. = .002$), fat mass percentage (FAT% $t = 3.84$; $sig. = .001$) and impedance (IMPEDANCE $t = 3.44$; $sig. = .002$). There were no statistically significant changes in other variables of body composition, or in the aerobic capacity values in ml/kg/min-1 (VOMAX $t = 1.234$; $sig. = .230$). The results show that players have, on average, lost weight – 86 kg, there was a decrease in BMI as a ratio between player's mass and product of his height, and in the quantity of other fat free mass (FFM) of the body on average (-.67 kg). A decrease in fat tissue led to decrease in impedance, which is explained by increase in quantity of fluids in body composition (on average, hydration was -.500 g) and decrease of impedance automatically results in increase of the electric current flow speed through the body. The final measuring showed 2.38 % decrease in subjects' fat percentage which complies with model values of the world's elite football players (7 – 12 %) (Wilmore & Costill, 2004), but they correspond to the lower limit of these values. The fat percentage in body composition is also a significant indicator of the connection between training unit's intensity and elite players' nutrition.

Table 3. Paired-Samples T-test

Variable Mean		Paired Differences					t	df	Sig. (2-tal.)
		Std. Dev.	S t d . Error Mean	95% Confidence Inter- val of the Difference					
				Lower	Upper				
Pair 1	HEIGHTI - HEIGHTF	.173	8.33	1.73735	-3.7769	3.4291	-.100	22	.921
Pair 2	MASSI - MASSF	.860	8.55	1.78319	-2.8372	4.5589	.483	22	.634
Pair 3	BMII - BMIF	.413	1.66	.34626	-.3050	1.1311	1.193	22	.246
Pair 4	BMRI - BMRF	9.391	154.89	32.29868	-57.5920	76.3746	.291	22	.774
Pair 5	IMPEDANCEI - IMPEDANCEF	39.826	59.26	12.35695	14.1993	65.4528	3.223	22	.004
Pair 6	FAT%I - FAT%F	2.386	2.97	.62124	1.0985	3.6753	3.842	22	.001
Pair 7	FAT.MASI - FAT.MASF	1.969	2.74	.57251	.7822	3.1568	3.440	22	.002
Pair 8	FFMI - FFMF	-.673	6.67	1.39266	-3.5621	2.2142	-.484	22	.633
Pair 9	TBWI - TBWF	-.504	4.88	1.01799	-2.6155	1.6068	-.495	22	.625
Pair 10	VO _{2MAX} I - VO _{2MAX} F	1.372	5.33	1.11271	-.9350	3.6802	1.234	22	.230

Conclusion

Significance of the changes in body composition and aerobic capacity of the football players originated in half season of Bosnia and Herzegovina's Premier League was analyzed on sample of 23 football players that are members of the team participating in Premier League. The results were obtained by measuring the variables at the beginning of the preparation period for the half season, and seven days after half season's end. The problem of this research was set to determine a level of partial quantitative changes in body composition and aerobic capacity during one half season. Based on the results of the T-test for dependent samples, we found that the preparation period lasting 45 days and league championship of 15 games resulted in statistically significant changes concerning fat tissue quantity in kilograms (FATMAS $t=3.44$; $sig.=.002$), fat mass percentage (FAT% $t=3.84$; $sig.=.001$) and tissue impedance (IMPEDANCE $t=3.44$; $sig.=.002$) of the players on the level of statistic significance $p=.05$. There were no statistically significant changes in other variables of body composition or aerobic capacity values in ml/kg/min-1 (VOMAX $t=1.234$; $sig.=.230$). It is also evident that half season of Bosnia and Herzegovina

Premier League which includes preparation period of 45 days and league championship of 15 games did not result in statistically significant changes in height, mass, accumulated energy, muscular mass quantity, fluids quantity in the body, or aerobic capacity of the football players. After the winter break, which is very long in Bosnia and Herzegovina's Premier League, lasting approximately two months, the training program of the team in the preparation period was focused on the reduction of the fat tissue and achieving and maintaining a certain level of aerobic capacities – conditional readiness of the team. It can be concluded that preparation period structured in this manner has a statistically significant effect on the transformations of the variables that define the fat component of the football players' body composition. The players on average lost 86 kg of mass, and increased fluids in the body (500 g), electrical impedance of the body was decreased (from 480, 52 Ω to 440, 69 Ω). There was a decrease in both energy potential and body fat percentage (2.38 %). A decrease in fat tissue and increase of fluids in body composition automatically leads to impedance decrease caused by faster electricity flow through the player's body.

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PROMJENE U TJELESNOM SASTAVU I AEROBNOM KAPACITETU NOGOMETAŠA TOKOM POLUSEZONE U PREMIJER LIGI BIH

Sažetak

Istraživanje je imalo za cilj da se utvrde promjene u tjelesnom sastavu i aerobnom kapacitetu kod nogometaša seniora prouzrokovane polugodišnjim ciklusom u Premijer ligi BiH. Sa vremenskog aspekta ovo istraživanje ima longitudinalni karakter sa ciljem da se na uzorku od 23 nogometaša seniora (starosti 25.45 ± 5.74 godina; visine 182.9 ± 5.94 cm; mase 76.9 ± 6.39 kg) koji čine kadar F.K. „Velež“ Mostar, utvrde promjene u sastavu tijela i aerobnom kapacitetu nastale između dvije vremenske tačke. Sastav tijela utvrđen je metodom mjerenja bioelektrične impedance (Bioelectrical Impedance Analysis) - BIA. U tu svrhu korištena je električna vaga TANITATBF- 300 (Tanita corporation of America Inc.) dok je aerobni kapacitet utvrđen indirektno pomoću BEEP testa. Mjerenja su izvršena na početku pripremnog perioda proljetne polusezone 2013/14 Premijer lige BiH i sedam dana nakon zvaničnog završetka polusezone. Promjene izazvane kontrolisanim programiranim radom statistički značajno su se odrazile na količinu masnog tkiva u kilogramima (FATMAS $t=3.44$; sig. = .002), procent masnog tkiva (FAT% $t=3.84$; sig. = .001) i otporu tkivu (OTPOR $t=3.44$; sig. = .002) nogometaša na nivou statističke značajnosti $p=.05$. Kod ostalih varijabli sastava tijela nijedno do statistički značajnih promjena, kao i u vrijednosti aerobnog kapaciteta u $L/kg/min-1$ (VO2MAX $t=1.234$; sig. = .230). Evidentno je da nogometna polusezona koja obuhvata pripremni period od 45 dana i ligaško takmičenje od 15 utakmica, nije prouzrokovao statistički značajne promjene u visini, masi, akumuliranoj energiji, količini mišićne mase i količini tečnosti u tijelu. Promjene nisu statistički značajne ni u aerobnom kapacitetu nogometaša. Nakon zimске pauze, koja je u Premijer ligi BiH veoma duga i traje oko dva mjeseca, trenažni program ekipe u pripremnom periodu bio je usmjeren na smanjenje masnog tkiva i postizanja i održavanja određenog nivoa aerobnih kapaciteta, odnosno kondicione spremnosti ekipe.

Ključne riječi: nogomet, sastav tijela, aerobni kapacitet, polusezona

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SEMI-ORTHOGONAL TRANSFORMATION OF PRINCIPAL COMPONENTS OF COGNITIVE DIMENSIONS OF ATHLETES AND UNIFIED PARTNERS

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Original scientific paper

Abstract

Let Z be a matrix of the standardized data obtained by describing a set E of n entities on a set V of m quantitative, normally or at least elliptically distributed variables. Let R be a matrix of intercorrelations of these variables. Assume that R is surely a regular matrix and it is possible to reject the hypothesis that the variables in V have a spherical distribution, that is, eigenvalues of the correlation matrix in the P population from which the E sample was drawn are equal.

Let $U_2 = (\text{diag } R - I) - I$,

be Guttman's estimate of unique variances of variables from V and let $\lambda_p, p = 1, \dots, m$

be eigenvalues of matrix R . Let $c = \text{trag } (I - U_2)$.

Define a scalar k such that $\lambda_{pk} \lambda_p > c, \lambda_{pk-1} \lambda_p < c$.

k is now a number of principal components of matrix Z defined on the basis of Štalec and Momirović PB criterion. Let $\Lambda = (\lambda_p)$; $p = 1, \dots, k$ be a diagonal matrix of the first k eigenvalues of matrix R and let $X = (x_p)$; $p = 1, \dots, k$ be a matrix of the associated with them eigenvectors scaled so that $X^t X = I$. Let T be an orthogonal matrix such as to optimize the function $X^t T = Q = (q_p)$; $p(Q) = \text{extremum}, T^t T = I$ where $p(Q)$ is a parsimonious function, for example, an ordinary varimax function

$$\sum_{j,m} \lambda_{pk} q_{jp} q_{jp}^4 - \sum_{j,m} \lambda_{pk} (\sum_{j,m} q_{jp} q_{jp}^2)^2 = \text{maximum}$$

where coefficients q_{jp} are elements of matrix Q (Kaiser, 1958). It is now a transformation of the principal components defined by the vectors in the matrix $K = ZX$ into semi-orthogonal latent dimensions determined by the type II orthoblique procedure (Harris & Kaiser, 1964).

Keywords: transformation, matrix, eigen, orthogonal, vectors, variance

Introduction

World Health Organization classification of mental and behavioral disorders (ICD-10, 1992) gives the classification and diagnostic guidelines on MR: „Mental retardation is a condition of arrested or incomplete development of the mind, which is especially characterized by impairment of skills manifested during the developmental period, which contribute to the overall level of intelligence, i.e. cognitive, language, motor, and social abilities. Retardation can occur with or without any other mental or physical disorder. However, mentally retarded individuals can experience the full range of mental disorders, and the prevalence of other mental disorders is at least three to four times greater in this population than in the general population. In addition, mentally retarded individuals are at greater risk of exploitation and physical/sexual abuse. Adaptive behavior is always impaired, but in protected social environments where support is available this impairment may not be at all obvious in subjects with mild mental retardation. Intelligence is not a unitary characteristic but is assessed on the basis of a large number of different, more or less specific skills. Although the general tendency is for all these skills to develop to a similar level in each individual, there can be large discrepancies, especially in persons who are mentally retarded. Such people may show severe impair-

ment in on particular area (e.g. language), or may have a particular area of higher skill (e.g. in simple visuo-spatial tasks) against a background of severe mental retardation.

This presents problems when determining the diagnostic category in which a retarded person should be classified. The assessment of intellectual level should be based on whatever information is available, including clinical findings, adaptive behavior (judged in relation to the individual's cultural background), and psychometric test performance. For a definite diagnosis of mental retardation, there should be reduced level of intellectual functioning resulting in diminished ability to adapt to the daily demands of the normal social environment.

Associated mental or physical disorders have a major influence on the clinical picture and the use made of any skills. The diagnostic category chosen should therefore be based on global assessments of ability. The IQ levels given are provided as a guide and should not be applied rigidly. The IQ should be determined from standardized, individually administered intelligence tests appropriate to the individual's level of functioning and additional specific handicapping conditions, e.g. language problems, hearing impairment, physical involvement. Scales of social maturity and adaptation, again locally standardized,

should be completed if at all possible by interviewing a parent or care-provider who is familiar with the individual's skills in everyday life. Without the use of standardized procedures, the diagnosis must be regarded as provisional. (Geneva, 1992, FCD-10).

Methods

Sample of respondents

The selection of a sample of respondents was conditioned by organizational and financial capabilities necessary for the implementation of the research process. It was necessary to ensure a sufficient number of qualified and fully trained measurers, certain instrumentation and standardized conditions under which the planned research was to be conducted. The measurement was conducted on a sample that was representative of the central part of Serbia.

The measurement was carried out in the organizations and schools that bring together children with special needs.

In order to do the research correctly and get results stable enough in terms of sampling error, it was necessary to include a sufficient number of respondents in the sample. The sample size for such type of research is conditioned by the objectives and tasks of the research, by the population size and degree of variability of the applied system of parameters.

Based on the chosen statistical-mathematical model and program, objectives and hypotheses, we opted for a sample of 40 respondents, a total of 80 for each subsample (40 Special Olympics athletes and 40 partners). The size of such a sample should meet the following criteria:

the size of the sample effective should permit as many degrees of freedom as to make it possible for any coefficient in the pattern matrix or any correlation coefficient equal to or greater than .30 to be considered different from zero with an inference error less than .01.

to apply adequate statistical methods successfully, according to the latest beliefs, the number of subjects in the sample should be five times larger than the number of the variables applied.

In addition, respondents were to meet the following specific requirements:

respondents were required to be male, the age of respondents was defined on the basis of chronological age, so the research covered respondents aged 15 to 18 years plus-minus 0.5 years, respondents were required to be members of a society that brings together Special Olympics athletes, respondents were required to attend training classes regularly, what was determined on the basis of records kept by the coaches.

In defining the population from which the sample was drawn, except the above, no other restrictions or stratification variables were applied.

Sample of cognitive variables

For the assessment of cognitive abilities, Raven's colored matrices were used.

The aforementioned instrument determines an overall IQ.

However, the test allows assessment of perceptual PP, symbolic reasoning SR and identification of relations and correlates RK.

A 1-12 concrete thinking, AB 1-3 concrete thinking,

4-11 functional thinking, 12 abstract thinking, B 1-3 concrete thinking, 4-7 functional thinking, 8-12 abstract thinking.

Data processing methods

Except for the Mulaik's known textbook on factor analysis, which has something about the assessment of reliability of principal components (Mulaik, 1972), and Kaiser and Caffrey's work in which their method of Alpha factor analysis was derived on the basis of maximizing the reliability of latent dimensions (Kaiser & Caffrey, 1965), it seems that the producers of various methods of component and factor analyses, as well as writers of books about this class of methods for latent structures analysis were not too worried about how much the real existence of the latent dimensions obtained by these methods could be trusted. It also refers to the latent dimensions obtained by orthoblique transformation of principal components, the method that has become a standard procedure for latent structure analysis among all those who did not acquire their information on factor analysis reading seriously written articles on this scientific field with their fingers, or those who do not analyze their findings with the help of some sadly conceived and even worse written commercial statistical software packages, such as, but not limited to, SPSS, CSS, Statistica, Statgraphics and BMDP, not to mention other products whose popularity is much lower, but not necessarily because they are much weaker than those applied today by only ignorant scientists and a special kind of human beings called a strain of processors.

All the data in this study were analyzed at the Multidisciplinary Research Center, Faculty of Sport and Physical Education, University of Pristina by the system of data processing programs DRSOFT developed by Popović, D. (1980, 1993) and Momirović, K. & Popović, D. (2003).

Semi-orthogonal transformation of principal components

Let Z be a matrix of the standardized data obtained by describing set E of n entities on a V set of m quantitative, normally or at least elliptically distributed variables. Let R be an intercorrelation matrix of these variables. Assume that R is surely a regular matrix and it is possible to reject the hypothesis that variables in V have a spherical distribution, that is, eigenvalues of the correlation matrix in population P from which the E sample was drawn are equal. Let $U_2 = (\text{diag } R^{-1})^{-1}$ is Guttman's estimate of unique variances of variables from V and let $\square_p$, $p = 1, \dots, m$ be eigenvalues of matrix R . Let $c = \text{trag } (I - U_2)$. Define a scalar k such that $\square_{pk} \square_p > c$, $\square_{p-k-1} \square_p < c$. k is now a number of principal components of matrix Z defined on the basis of Štalc and Momirović's PB criterion. Let $\square = (\square_p)$; $p = 1, \dots, k$ be a diagonal matrix of the first k eigenvalues of matrix R and let $X = (x_p)$; $p = 1, \dots, k$ be a matrix of the associated with them eigenvectors scaled so that $XtX = I$. Let T be an orthogonal matrix such as to optimize the function $XT = Q = (q_p)$; $p(Q) = \text{extremum}$, $TtT = I$, where $p(Q)$ is a parsimonious function, for example, an ordinary varimax function $\square_{jm} \square_{pk} q_{jp}^4 - \square_{pk} (\square_{jm} q_{jp}^2)^2 = \text{maximum}$, where coefficients q_{jp} are elements of matrix Q (Kaiser, 1958). Now the

transformation of the principal components defined by the vectors in the matrix $K = ZX$ into semi-orthogonal latent dimensions determined by the type II orthoblique procedure (Harris & Kaiser, 1964) is defined by the operation $L = KT = ZXT$. The covariance matrix of these dimensions is $C = LtLn^{-1} = QtRQ = Tt\Box T$. Denote the matrix of their variances with $S^2 = (sp^2) = \text{diag } C$. If we standardize the latent dimensions by the operation $D = LS^{-1}$, in the matrix $M = DtDn^{-1} = S^{-1}Tt\Box TS^{-1}$, there will be their intercorrelations. Notice that C , and therefore M , cannot be diagonal matrices, so thus formed latent dimensions are not orthogonal in the space of entities from E .

The matrix of correlations between variables from V and latent variables, which is commonly referred to as a factor structure matrix, will be $F = ZtDn^{-1} = RXTS^{-1} = X\Box TS^{-1}$; and as the elements of matrix F are orthogonal projections of vectors from Z over vectors from D , the coordinates of these vectors in the space spread by vectors from D are elements of the matrix $A = FM^{-1} = XTS$. But since $AtA = S^2$, the latent dimensions obtained by this method are orthogonal in the space spread by the vectors of variables from Z ; the squared norms of the vectors of those dimensions in the space of variables are equal to the variances of the dimensions.

Results

The factor structure of intellectual abilities was analyzed on the basis of all the information provided by the matrix of significant principal components (Table 1). Based on Momirović's B6 criterion, two latent dimensions that delimit the entire space of three cognitive tests with about 76.12% of the common variance were isolated. It can be accepted as satisfactory for this type of research. The communalities of variables, except for the tasks by which the effectiveness of parallel processor RK, or the ability to identify relations and correlates was assessed, are relatively high and can be considered satisfactory. The variable for assessing perceptual abilities PP has the highest correlation with the isolated cognitive dimension. A large number of authors have determined a positive correlation between perceptual abilities and motor abilities. Although perceptual measurement instruments are considerably saturated by cognitive factors (in the literature it is often written about cognitive functioning at the perceptual level), it would be too free to declare them cognitive measurement instruments, though in a certain sense they are. Positive correlation between perceptual and motor abilities, usually of medium height, was determined by Horne, Fitts, Harrison, Fleishman, Neeman, Hempel, et al. The authors also found that motor activity had a positive effect on the development of perceptual abilities. The isolated cognitive dimension is also clearly defined by the tasks which assessed symbolic reasoning SR with relatively high projection for the assessment of the efficiency of the serial processor that corresponds to Cattell's factor of crystallized intelligence. Only the test for evaluation of parallel processor, or identification of relations and correlates RK, is projected on the second principal component. It explains 16.34% of the total variability and can be considered as a factor responsible for parallel processing of information.

The factor structure of cognitive abilities was analyzed in parallel on the basis of the information provided by oblimin transformation of significant principal components, i.e. based on the parallel projections of variables over the factors (Table 2) of the correlation matrix of variables and factors (Table 3) of intercorrelations of the factor matrix (Table 4). Judging by the variance value, the first factor is the most important of the isolated dimensions. It is defined by the tasks for assessing the input processor and by the tasks for assessing the serial processor. The second latent dimension is defined by the variable for the assessment of the parallel processor. Correlation between cognitive abilities and success in a football game has been proved in numerous studies. It is assumed that better adaptation of cognitive abilities to specific living conditions to which players of all levels, especially those of the top level, are exposed, is also responsible for the relationship between cognitive abilities and success in a football game. For this reason, understanding the cognitive structure of players is of particular importance for the planning and reorganization of work and prediction of success in every sport including football. Obtaining such a result is understandable when taking into consideration the fact that football is characterized by diversity and a wide range of technical elements, movements of the whole body and limbs in different directions at variable speed. During a football game, dynamic situations are constantly changing depending on the movement of the ball on the ground and the players are forced to apply various movement techniques as well as different tactical options.

Principal components of cognitive variables of athletes and partners

Table 1. Pattern of oblimin factors of cognitive variables of athletes and partners

	FAC1	FAC2	h ²
PP	(.80)	-.08	.66
SR	-.22	(.93)	.92
RK	(.74)	.38	.70
Lambda	1.26	1.02	
%	41.99	34.12	
Cum. %	41.99	76.12	

Table 2. Structure of oblimin factors of cognitive variables of athletes and partners

	FAC1	FAC2
PP	.76	-.24
SR	.00	.96
RK	.81	.22

Table 3. Intercorrelations of oblimin factors of cognitive variables of athletes and partners

	OBL1	OBL2
PP	.77	-.28
SR	-.03	.96
RK	.80	.19

Table 4. Intercorrelations of oblimin factors of cognitive variables of athletes and partners

	OBL1	OBL2
OBL1	1.00	-.04
OBL2	-.04	1.00

Based on the above, it may be concluded that the basic cognitive processes can be reduced to the functions of perceptual, parallel and serial processors which are probably under control of the central processor responsible for coordinating all cognitive functions

Conclusion

The research was conducted in order to determine the structure of cognitive abilities in Special Olympics athletes and partners in football.

For this purpose, 80 athletes and partners engaged in football were tested. For the assessment of cognitive abilities, Raven's Colored Progressive Matrices which measure IQ were selected.

All the data in this research were analyzed at the Multidisciplinary Research Center, Faculty of Sport and Physical Education, University of Pristina by the system of data processing programs DRSOFT developed by Popović, D. (1980, 1993), and Momirović, K. & Popović, D. (2003).

The algorithms and programs implemented in this research have been fully presented and the results of these programs have been analyzed.

The factor structure of cognitive abilities was an-

alyzed in parallel on the basis of the information provided by oblimin transformation of significant principal components, i.e. based on the parallel projection of variables over the factors (Table 2) of the correlation matrix of variables and factors (Table 3) of the factor intercorrelation matrix (Table 4).

Judging by the variance value, the first factor is the most important of the isolated dimensions. It is defined by the tasks for assessment of the input processor and by the tasks for assessing the serial processor. The second latent dimension is defined by the variable for assessing the parallel processor. Correlation between cognitive abilities and success in a football game has been proved in numerous studies. It is assumed that better adaptation of cognitive skills to specific living conditions to which players of all levels, especially those of the top level, are exposed, is also responsible for the relationship between cognitive abilities and success in a football game. For this reason, understanding the cognitive structure of players is of particular importance for the planning and reorganization of work and prediction of success in every sport including football.

Obtaining such a result is understandable when taking into account the fact that football is characterized by a variety and a wide range of technical elements, movements of the whole body and limbs in different directions at variable speed. During a football match, dynamic situations are constantly changing, depending on the movement of the ball on the ground, and the players are forced to apply various movement techniques as well as different tactical approaches.

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SEMIORTOGONALNA TRANSFORMACIJA GLAVNIH KOMPONENATA KOGNITIVNIH DIMENZIJA ATLETA I SARADNIKA

Sažetak

Istraživanje je sprovedeno sa ciljem da se utvrdi struktura kognitivnih sposobnosti, kod atleta i saradnika Specijalne Olimpijade u fudbalu. U tu svrhu ispitano je 80 atleta i saradnika koji se bave fudbalom. Za procenu kognitivnih sposobnosti izabrane su RAVENOVE progresivne matrice u boji koje procenjuju IQ. Svi podaci u ovom istraživanju, obrađeni su u Centru za multidisciplinarna istraživanja Fakulteta za sport i fizičko vaspitanje Univerziteta u Prištini pomoću sistema programa za obradu podataka DRSOFT koji je razvio Popović, D. (1980 i 1993) i Momirović, K. i Popović, D. (2003). Algoritmi i programi koji su realizovani u okviru ovog rada u potpunosti su prikazani a rezultati tih programa analizirani. Faktorska struktura kognitivnih sposobnosti analizirana je paralelno na osnovu informacija koje pruža oblimim transformacija značajnih glavnih komponentata tj. na osnovu paralelnih projekcija varijabli na faktore (tab. 2.) matrice korelacija varijabli i faktora (tab. 3.) interkorelacije matrice faktora (tab. 4.). Sudeći prema veličini varijanse prvi faktor je najznačajniji od izolovanih dimenzija, definisan je zadacima za procenu input procesora i zadacima za procenu serijalnog procesora. Druga latentna dimenzija definisana je sa varijablom za procenu paralelnog procesora. Povezanost kognitivnih sposobnosti i uspeha u fudbalskoj igri dokazana je u brojnim istraživanjima. Predpostavlja se da je za vezu kognitivnih sposobnosti i uspeha u fudbalskoj igri odgovorna i bolja adaptacija kognitivnih sposobnosti na specifične uslove života kojima su izloženi igrači svih nivoa a posebno vrhunskog nivoa. Iz tog razloga poznavanje kognitivne strukture igrača od posebne je važnosti za planiranje i reorganizaciju rada i prognozu uspeha u svakom sportu pa tako i u fudbalu. Dobijanje ovakvog rezultata je razumljivo kada se uzme u obzir da je za fudbal karakteristična raznolikost i mnoštvo tehničkih elemenata, pokreta celog tela i ekstremiteta u različitim pravcima sa promenljivim tempom. U toku fudbalskog meča neprestalno se menjaju dinamičke situacije u zavisnosti od kretanja lopte na terenu i igrači su prinuđeni da primenjuju raznovrsne tehnike kretanja kao i različite taktičke varijante.

Ključne riječi: transformacija, matrica, svojstva, ortogonalan, vektor, varijansa

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PROGRAMMED EFFECTS OF PHYSICAL ACTIVITY ON BMI AND PULSE AT PERIPHERAL ARTERIAL DISEASE OF THE LOWER LIMBS

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Abstract

The aim of the research is to examine the degree of improvement of BMI and pulse in peripheral arterial disease of the lower limbs on the respondents using medical treatment and respondents using medical treatment and programmed physical activity.

Analysis included 100 respondents from clinic of vascular diseases KCUS divided two equal groups: control (n=50) and test group (n=50). Average age of respondents of control group was 48.60±3.82, and in test group 47.56±3.62. At the beginning of the research, basic anamnestic data revealed that 56% respondents of the control group and 54% respondents of the test group consumed cigarettes. There were no statistically significant difference in the percentage proportion of smokers in relation to the test group. After included in the study, all respondents stopped using cigarettes. At the beginning of the research it was not established statistically significant difference between the value of the body mass index (BMI) of respondents. The values of body mass index of the respondents at the end of the research are significantly reduced.

The analysis of paired variables on the value of BMI of respondents of control group, before and after treatment, didn't reveal statistically significant change in the average value of BMI, while the value of BMI of the respondents of the test group was significantly reduced ($p = 0.001$). The analysis of the average value of the pulse of the respondents of the control group and the test group at the end of the research revealed that the average values were not significantly different in relation to the test group and that they were within the reference values. The analysis of paired variables on the value of the pulse before and after treatment at the respondents of the both control and test group revealed statistically significant changes in average values in the both groups.

Keywords: BMI, arterial, limb, treatment, physical activity

Introduction

Cardiovascular diseases in the 2nd half of the last century and 1st ten years of this century are the leading cause of death and labor disability in developed countries of Europe and the world. This presents great burden to the economic and social aspects of society (Criqui et al., 1992). Prevalence of arterial occlusive disease varies depending on age, length of disease, type of disease, and diabetes, if present. General prevalence of arterial occlusive disease is from 1-1.5%. In great European studies (Kröger et al., 2006; Norgren et al., 2007) general prevalence of arterial occlusive disease varies from 0.9-6.9%, especially at the age from 50-60. Transformational process, in general sense, presents change and transformation. Every change of condition of entrance and exit in system is happening in that way that entrance, during certain amount of time, changes into exit i.e. initial state and transforms into new (transitive, final) state (Malacko, 2004). Risk factors for peripheral arterial disease are similar to ones important in etiology of coroner arterial disease. Those are: smoking, dyslipidemia, diabetes, and hypertension. Also, specific risk factors can be more significant on a certain body parts (Fawkes et al., 1992,; Mathiesen Joakimsen & Bonna, 2000; Shadman et al., 2004

Methods

The aim of the research is to examine the degree of improvement of BMI and pulse in peripheral arterial disease of the lower limbs on the respondents using medical treatment and respondents using medical treatment and programmed physical activity.

Analysis which was performed on respondents of Clinical center of University of Sarajevo was retrospectively prospective; clinically descriptive and controlled. Clinic for vascular diseases presents third level of health care. With this study we evaluated period of 4 months. Written consent of the respondents was not needed because data we used do not include elements that can violate ethical code of this paper.

Retrospectively prospective analysis included 100 respondents from clinic of vascular diseases KCUS divided two equal groups: control (n=50) and test group (n=50). Instruments that were used in research are:

Anamnesis data: age, smoking status, history of illnesses;

Clinical data : Body mass index (BMI) (malnutrition up to 19kg/m²; Normal body weight 19-24 kg/m²; overweight 24.30 kg/m²; obesity over 30 kg/m²)

Pulse value – reference values from 60-90/min.in

everyday program of vasoactive walk- walk on flat path until pain appears, after which respondent rests for 5-10 minutes. The aim of walk is that respondent crosses at least 10% of aimed path.

Ethical aspect of research: research is performed according to ethical principles of Declaration of Helsinki. Personal data of respondents are protected by initials and passwords. After inserting data in data base, it is locked and only researchers have access to it. Research data won't be presented nor published until public presentation. This research was public, with the consent of Ethical committee and according to procedure of Clinical centre of University of Sarajevo. Research was conducted ethically and humanly. Research was conducted according to principles of good clinical practice and according to Declaration of Helsinki from June 1964. which enables references for doctors who conduct biomedical researches on people (audit of Declaration on 52nd assembly SZO in Edinburgh, Scotland- October 2000).

Results

Analysis of gender structure of respondents shows that the largest number of respondents of both groups were males; 66% in control group and 62% in test group while number of females was 34% in control group and 38% in test group. There is no statistically significant difference in gender structure in relation to test group. Male respondents were more dominant. Average age of respondents of control group was 48.60 ± 3.82 , and in test group 47.56 ± 3.62 . There was no statistically significant difference between average age of respondents in relation to gender of respondents within both control and test group. ANOVA test on values of BMI at the beginning of research didn't reveal any statistically significant difference. Average value of BMI of the respondents of control group was 29 ± 2.13 kg/m², while average value of BMI of the respondents of test group was 28.54 ± 2.13 kg/m², ($p=0.291$).

Table 1. average values of BMI compared to the test group at the beginning of research

	N	X	SD	SEM	95% CI for Mean		Minimum	Maximum
					Lower	Upper		
Control group	50	29.00	2.13	0.30	28.39	29.60	25.00	33.00
Test group	50	28.54	2.19	0.31	27.91	29.16	24.00	34.00
total	100	28.77	2.16	0.21	28.33	29.20	24.00	34.00

F=1.126; p=0.291

Analysis of average values of pulse of the respondents of the control group at the beginning of the research reveals that average values weren't significantly different in relation to test group and that they were within reference values, which was confirmed by ANOVA test.

cantly different in relation to test group and that they were within reference values, which was confirmed by ANOVA test.

Table 2. average values of pulse in relation to test group at the beginning of research

	N	X	SD	SEM	95% CI for Mean		Minimum	Maximum
					Lower	Upper		
Control group	50	89.64	12.11	1.71	86.19	93.08	68.00	125.00
Test group	50	86.36	11.17	1.57	83.18	89.53	60.00	115.00
Total	100	88.00	11.71	1.17	85.67	90.32	60.00	125.00

F=1.980; p=0.163

ANOVA test on values of BMI at the end of research reveals statistically significant difference. The average value of BMI of the respondents of control group

was 28.86 ± 1.77 kg/m² while the average value of BMI of the respondents of test group was 27.14 ± 2.08 kg/m² ($p<0.05$)

Table 3. Average values BMI in relation to test group at the end of research

	N	X	SD	SEM	95% CI for Mean		Minimum	Maximum
					Lower	Upper		
Control group	50	28.86	1.77	0.25	28.35	29.36	25.00	33.00
Test group	50	27.14	2.08	0.29	26.54	27.73	24.00	33.00
Total	100	28.00	2.11	0.21	27.58	28.41	24.00	33.00

F=19.694; p<0.05

Wilcoxon test of paired variables on values of BMI before and after treatment of the respondents of control group didn't reveal any statistically significant changes of average value of BMI, while in values of BMI of the respondents of the test group were significantly reduced ($p=0.001$).

Table 4. difference between average values of BMI in relation to test group at the beginning of research

Group		N	X	SD	Minimum	Maximum
Control group	BMI – before research	50	29.00	2.13	25.00	33.00
	BMI – after research	50	28.86	1.77	25.00	33.00
	Z=-0.800; p=0.424					
Test group	BMI – before research	50	28.54	2.19	24.00	34.00
	BMI – after research	50	27.14	2.08	24.00	33.00
	Z=-5.733; p=0.001					

Analysis of average values of pulse of respondents of control and test group at the end of research revealed that average values weren't significantly dif-

ferent in relation to test group and they were within reference values, which was confirmed by ANOVA test (p=0.163).

Table 5. Average values of BMI in relation to test group at the end of research

	N	X	SD	SEM	95% CI for Mean		Minimum	Maximum
					Lower	Upper		
Control group	50	79.10	7.10	1.00	77.08	81.11	65.00	100.00
Test group	50	77.24	8.86	1.25	74.72	79.75	60.00	100.00
Total	100	78.17	8.04	0.80	76.57	79.76	60.00	100.00
F=1.341; p=0.250								

Wilcox test of paired variables on values of BMI before and after treatment of the respondents of control and test group revealed statistically significant

changes in average values. Average value in both groups was significantly reduced (p<0.05).

Table 6. difference in average values of pulse compared to test group at the beginning and at the end of research

Group		N	X	SD	Minimum	Maximum
Control group	Pulse – before research	50	89.64	12.11	68.00	125.00
	Pulse- after research	50	79.10	7.10	65.00	100.00
	Z=-6.060; p=0.001					
Test group	Puls – before research	50	86.36	11.17	60.00	115.00
	Puls – after research	50	77.24	8.86	60.00	100.00
	Z=-6.068; p=0.001					

Discussion

Atherosclerosis is a specific form of arteriosclerosis in which an artery wall thickens as a result of invasion and accumulation of white blood cells. The wall stiffening may eventually increase pulse pressure; widened pulse pressure is one possible result of advanced disease within the major arteries. Atherosclerosis is therefore a syndrome affecting arterial blood vessels due to a chronic inflammatory response of WBCs in the walls of arteries. This is promoted by low-density lipoproteins (LDL, plasma proteins that carry cholesterol and triglycerides) without adequate removal of fats and cholesterol from the macrophages by functional high-density lipoproteins (HDL). It is commonly referred to as a "hardening" or furring of the arteries. It is caused by the formation of multiple atheromatous plaques within the arteries. The most common consequences of atherosclerosis are ischemic heart disease, cerebrovascular disease and gangrenous changes on limbs.

In western countries peripheral arterial disease affects 5 % of population at the age from 55-74 (Stoffers, Rinkens, Kester, Kaiser & Knottnerus, 1996). Disease usually starts at the age of 40 and progresses as the person becomes older. Prevalence of peripheral arterial disease affects around 20% of pop-

ulation over 65. Risk factors for peripheral arterial disease are: age (persons over 50), arterial hypertension, dyslipidemia and diabetes and nicotine use. Reviewing all available literature we concluded that our results do not statistically deviate and that peripheral arterial disease is more common with men. However, (Higgins & Higgins, 2003) in their " Epidemiology of peripheral arterial disease in women" state that as the women's life extends, in developed countries, the prevalence of peripheral arterial disease will increase. Their research shows that prevalence of peripheral arterial disease in women is in the range from 3% to 29% and that, despite of earlier beliefs, prevalence of the mentioned disease is the same with both men and women, because in a great percentage it is asymptomatic therefore more difficult to detect. Statistical analysis of BMI of the respondents at the beginning of research didn't reveal any statistically significant difference. The average value of BMI of the respondents in the control group was 29 ± 2.13 kg/m², while value of BMI of the respondents in the test group was 28.54 ± 2.13 kg/m². It was found, at the end of the research, statistically significant difference in relation to value of body mass index. The average value of BMI of the respondent of control group was 28.86 ± 1.77 kg / m², while value of body mass index of the respon-

dents of test group was 27.14 ± 2.08 kg/m². It wasn't found statistically significant change of average value of BMI on the respondents of the of control group before and after treatment, while the average value of BMI at the respondents of test group was significantly reduced. One of the risk factors for peripheral arterial disease is certainly increased value of BMI (Althouse et al., 2014). Our research shows that, with the proper treatment, patient's value of BMI is reduced. Progressive physical activity is effective treatment for improving patient's movement. It also reduces mortality and cardiovascular manifestations on a patient with peripheral arterial disease. However, patients' ability to participate in physical activities reduces as they become older. Maintenance and increasing reserves of functional capacity are important factors for older population. The aim of physical participation of healthy older population is maintenance and development of physical reserves. Therefore, for individuals that suffer from peripheral arterial disease, adequate and controlled physical activities can be used as primary way of therapy (Schiattarella et al., 2014). Analysis of average values of pulse of the respondents of the control group at the beginning of the research shows that average values weren't significantly different in relation to test group and that they were within reference values. Analysis of average values of pulse of respondents of control and test group at the end of research shows that average values weren't significantly different in relation to test group and they were within reference values. Average value of pulse in both groups was significantly reduced.

Conclusion

Analysis of gender structure of respondents, 100 of them, revealed that the largest number of re-

spondents of both groups were males; 66% in control group and 62% in test group while number of females was 34% in control group and 38% in test group. The average age of respondents of control group was 48.60 ± 3.82 , and in test group 47.56 ± 3.62 . There was no statistically significant difference between average age of respondents in relation to gender of respondents within both control and test group. Average value of BMI of the respondents of control group at the beginning of research was 29 ± 2.13 kg/m², while value of BMI of the respondents of test group was 28.54 ± 2.13 kg/m². The average value of BMI of respondents of control group at the end of the research was 28.86 ± 1.77 kg/m², while the value of BMI of the respondents of test group was 27.14 ± 2.08 . Based on analysis of value of BMI of respondents of control group before and after treatment, we can conclude that there weren't statistically significant changes in average values of BMI, while value of BMI of respondents of test group was significantly reduced. At the beginning of the research, basic anamnestic data revealed that 56% respondents of the control group and 54% respondents of the test group consumed cigarettes. This data is very important because all respondents stopped using cigarettes when included in study. The analysis of the average value of the pulse of the respondents of the control group and the test group at the beginning of research revealed that the average values were not significantly different in relation to the test group and that they were within the reference values, which was revealed at the end of research. However, analysis of the value of pulse of the respondents of both control and test group before and after treatment revealed statistically significant change of average value. Therefore we can conclude that average value of pulse in both groups was significantly reduced.

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EFEKTI PROGRAMIRANE TJELESNE AKTIVNOSTI NA BMI I PULS KOD PERIFERNE ARTERIJSKE BOLESTI DONJIH EKSTREMITETA

Sažetak

Cilj rada je ispitati stepen poboljšanja BMI i pulsa kod periferne arterijske bolesti donjih ekstremiteta kod ispitanika na medikamentoznoj terapiji i ispitanika koji uz medikamentoznu terapiju obavljaju programirane tjelesne aktivnosti. Istraživanjem je obuhvaćeno 100 ispitanika koji su prema kriterijumima za uključivanje u studiju podjeljeni u dvije podjednake skupine: kontrolnu (n=50) i ispitivanu (n=50) klinike za vaskularne bolesti KCUS. Prosječna starosna dob ispitanika kontrolne skupine je iznosila 48.60 ± 3.82 godina, dok je ispitanika ispitivane skupine iznosila 47.56 ± 3.62 godina. Na početku istraživanja je na osnovu anamnestičkih podataka ustanovljeno da je 56% ispitanika kontrolne i 54% ispitanika ispitivane skupine konzumiralo cigarete. Nije ustanovljena statistički značajna razlika u procentualnom udjelu pušača u odnosu na ispitivane skupine. Nakon uključivanja u studiju svi ispitanici su prestali konzumirati cigarete. Ustanovljeno je da na početku istraživanja nije ustanovljena statistički značajna razlika vrijednosti indeksa tjelesne mase ispitanika (BMI). Vrijednosti indeksa tjelesne mase ispitanika na kraju istraživanja su se statistički značajno smanjile. Prosječna vrijednost BMI ispitanika kontrolne skupine je iznosila 28.86 ± 1.77 kg/m², dok je kod ispitanika ispitivane skupine iznosila 27.14 ± 2.08 kg/m², ($p < 0,05$). Analizom uparenih varijabli na vrijednost BMI prije i nakon tretmana kod ispitanika kontrolne skupine nije ustanovljeno statistički značajna promjena prosječne vrijednosti BMI, dok je kod ispitanika ispitivane skupine ustanovljen statistički značajan pad vrijednosti BMI ($p = 0.001$). Analizom prosječnih vrijednosti pulsa ispitanika kontrolne i ispitivane skupine na kraju istraživanja ustanovljeno je da se prosječne vrijednosti nisu statistički značajno razlikovale u odnosu na ispitivanu skupinu te da su se nalazile u referentnim vrijednostima. Analizom uparenih varijabli na vrijednost pulsa prije i nakon tretmana kod ispitanika kontrolne i ispitivane skupine ustanovljena je statistički značajna promjena prosječne vrijednosti kod obje ispitivane skupine.

Ključne riječi: BMI, arterija, ud, tretman, fizička aktivnost

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LATENT STRUCTURE OF STANDARD INDICATORS OF COMPETITIVE EFFICIENCY OF TEAMS ON THE WORLD BASKETBALL CHAMPIONSHIP OF PLAYERS UP TO 20 YEARS

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Original scientific paper

Abstract

The aim of this paper is defining the latent space of standard indicators of competitive effectivity in order to get the exact indicators which have great influence on the world championship success of the basketball teams up to 20 years. This research is conducted using data collected from 48 games of eight best qualified basketball teams on the U-19 world basketball championship in Serbia. The latent structure of basketball game is examined using factor analysis based on standard indicators of competitive efficiency of the game with the goal of determining their functional dependance and to obtain complete vision of their interaction. Characteristic roots which explained 69,42% of mutual variance are obtained. The isolated factors are defined as: factor of situational precision in attack, factor of situational lucidity of players in defence as well in the offense, factor of situational unprecision and anticipation of shoot in offense, factor of situational efficiency in jumps and in free throws, and the last, factor of situational aggressivity and precision of shoot for three points.

Keywords: *standard indicators of efficiency, latent structure, the absolute and relative performance of teams, functional dependency and mutual interaction.*

Introduction

Scientific research basketball games are focused on discovering pop and hidden aspects of success (Slavko Trninić & Dizdar, 2001). In this paper, the research moved on the latent structure of situational space basketball games. Basketball game can be seen as a regulated system that is based on the cohesion of the team, which tries to answer the expected and unexpected situations games using their own resources of toys within a specific concept and strategy games. In modern basketball are of special interest site indicators that solve the most important and essential problems of basketball games, since they are the closest to reality and originally. Development of science that deals with basketball issues depends on the used state of the accumulation of acquired knowledge, intellectual and creative potentials (Separovic & Nuhanovic, 2008). The research was conducted with teams participants of World Basketball Championship, players up to 20 years in the area of standard indicators of competitive efficiency. The collection, processing and analysis of statistical data are the only valid way by which we can explain the causes of success or failure of the team (Simovic & Komić, 2008). The aim of this research is the determination of the latent structure of the standard indicators of situational effectiveness in eight best ranked team on the world basketball championship, players up to 20 years.

Methods

The population from which the sample was obtained by participants are basketball teams participating in the world championship, basketball U-19, which was attended by 16 participants team world championship teams: Serbia, USA, France, Brazil, Australia, Argentina, Turkey, Spain, Lithuania Canada, Korea,

China, Nigeria, Lebanon, Mali, and Puerto Rico. To analyze the data you use eight highest scoring team at the World Basketball Championship, a sample of 48 games played. The eight best-placed team played after 9 games, of which 24 played between eight highest scoring team in the competition. Data collection is based on the expert judgment of official statisticians, who maintain statistics on the World Cup matches. Based on the official FIBA statistics, results were obtained for the standard indicators of competition efficiency on which the analysis was conducted. The sample includes 14 variables FIBA variables, as follows: steals, turnovers, rebound defensive rebound, personal fouls, blocking debris, assists, number of inserted balls from the game in the basket for two points, the number of unsuccessful attempts of putting the ball in the game the basket for two points, the number of inserted balls from the game in the basket for the three points, the number of unsuccessful attempts of putting the ball in the basket of the game for three points, the number of inserted balls in the basket behind the free throw line, the number of unsuccessful attempts of putting the ball in the basket behind the free throw line , overall jumping team in defense and attack.

Results

Applying Bartlettov test, tested the possibility of being subjected to this set of standard indicators FIBA any type of factorization. Data from (Table 1), confirming to us that this matrix data can be subjected to factorization

Tabele 1.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.607
Bartlett's Test of Sphericity	Approx. Square	Chi- 886.339
	Df	91
	Sig.	.000

Communality values have high and uniform values ranging from .36 to .92. which contributes to the definition of the main components. On the basis of the calculated characteristic equation (Table 2), using the Guttman-Kaiser criterion, obtained five characteristic roots that explain 69.42% of the variance, which is quite the same study (Separovic & Nuhanovic, 2008) which are 69.21% explanation of common variance.

Tabele 2.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.962	21.160	21.160	2.962	21.160	21.160
2	2.214	15.815	36.976	2.214	15.815	36.976
3	1.747	12.480	49.456	1.747	12.480	49.456
4	1.510	10.785	60.241	1.510	10.785	60.241
5	1.285	9.178	69.420	1.285	9.178	69.420

The analysis matrix slop (Table 3), the first isolated latent dimension highest projections have standard indicators assists, shot two-point-successful and three-point shot-fail, the other steals and turnovers, the third jump, rebound and shot two-point-unsuccessful, the fourth leaps in defending free throws-and unsuccessful free throws-successful, the fifth personal fouls, blocking debris and three-point shot-successful.

Tabele 3.

	1	2	3	4	5
FIBAOL	.178	-.765	.151	.004	.113
FIBAIL	-.234	-.526	-.170	-.521	-.228
FIBAS	.368	.224	.657	-.436	-.136
FIBASO	.482	.374	.049	-.500	-.212
FIBASN	-.076	-.036	.932	-.055	-.006
FIBAOG	-.074	-.281	-.037	-.033	.751
FIBABŠ	.366	.010	.130	-.013	-.377
FIBAA	.861	.045	-.024	.004	.354
FIBAŠ2US	.729	-.209	.174	.240	-.246
FIBAŠ2NE	-.040	-.470	.643	.278	-.059
FIBAŠ3US	.212	.205	.004	-.101	.792
FIBAŠ3NE	-.589	.464	.260	.087	.241
FIBASBUS	.126	.054	-.128	-.668	.117
FIBASBNE	-.223	-.104	.245	-.749	.105

Discussion

Results show that in the space of standard indicators of competitive efficiency distinguishes five factors. The first factor can be defined as a situational factor of precision in the attack, the second as a factor of situational clarity players in defense and attack, the third factor as a situational inaccuracies and anticipation of rubble in the attack, the fourth factor as a situational efficiency in rebounding and free throws and fifth as a factor of situational aggressiveness and precision field goal for three points. Following

standard situational indicators on the best European teams at the European Championship in Sweden in 2003, were isolated three latent dimensions: effectiveness of debris (by one and two points), and winning the ball in play, efficiency rubble for three points and third is not possible to meaningfully interpret (Golubovic ., D, Jovanovic 2005). In determining the latent structure of situational efficiency of elite junior basketball players (Jeličić Trninic & Jelaska, 2010), it was concluded that neither the use of standard indicators of situational efficiency, nor the use of them derived latent dimensions are not sufficient to explain the structure of the game of basketball. One of the important prerequisites of situational precision in attack is the size of the visual field of players, identification and forecasting of the open positions of players and a timely timing and precision passing the football performance for easy and open implementation of the attacks, which significantly improves the precision of basketball shooting (Separovic & Nuhanovic , 2008). Research Croatian top senior basketball players to sample nine senior teams from the A-1 Croatian Basketball League in the championship 2006/2007. It was determined the existence of three main components (Sindik Jukic & Adžija, 2012). Slightly lower average assistance in this study can be explained by the fact that the average entered all the results eight best ranked team not only winning team as the XII World Basketball Championship in 1994 where the winning team had on average a higher number of assists 14,73 of the losers of 10.56 which indicates a higher level of collective bidding during the game (S Trninic Viskić-Štalec, Štalec, Dizdar & Birkić, 1995). Assistance is the factor that indicates a higher percentage of realization of rubble highest scoring team. Analyzing shot two-point-successful, there is the information that the average two-point field goal for-success at the World Cup players up to 20 years was 23.15, and that all the teams who have had more than 28 shots for two points-successful (15 games) achieved victory in the game. Most shots on the basketball world championship to 20 years for the two-point-successful had runners-up 256, or 28.44 per game, and at least team on sixth place 177 or

19.67 shots for two points-successful, a game in the World Cup players up to 20 years. The resulting seven results that favored the minimum result obtained from 9 to 14 shots for the two-point-successful. The teams that have had those results that favored the minimum result obtained, lost their matches, except for the best placed teams which achieved two wins with 14 successfully infiltrated the ball for two points. In both games the best team in the championship had a worse shot two-point-successful, or more successful three-point shot and shot from the free throw line, which indicates that he fired the two-point-successful, important but not decisive for the final the outcome of the match. The second dimension to define variables (steals and turnovers) and are characteristic of situational effectiveness of players in the phase of transition and set the defense, pressure on the player with the ball at the stage of shooting, passing and keeping the ball in the area around the field of play, and the efficiency of the player with Ball in the attack. The third dimension is defined variables (jumping, rebound and shot two-point-unsuccessful) describing his shooting imprecision and jumping anticipation of players. The correlation between the jump in defense phase and stage attacks on the final score in basketball investigated by many authors and the results showed that the jump in defense and rebound have no significant association with the final result at the basketball game. The fourth dimension by defining variables (leaps to defense, free throws and unsuccessful free throws-successful) describe the variables specific to players who have an affinity high jump in the paint and situational performance when shooting free throws. The fifth dimension defined variables (personal fouls, blocking debris and three-point shot-successful) and are characteristic for situational agility and aggressiveness of players in the phase transition and set defense, remote precision, agility on the player with the ball and the players without the ball, especially in the zone rubble two and three-point and near the basket. The defense was successful and with much less personal faults if the players are capable of explosive change directions without losing balance and distortion of the spatial structure of the movement. (Brdic J., Bradic A. Pasalic E. 2007) found that the winning men's team at the European Championship in Sweden in 2003, the greatest differences between the effective free throws, assists, shots failed two-and three-point. A three-pointer-unsuccessful, the world championship has averaged 17.78 to 11 per game, and overall shooting percentage in the champion-

ship ranged from 40.3 (četvoroplasirana team) to 50.4 (runners-up), which is explained by the fact that slight differences in the percentage of debris and steals is not enough to win the world championship. On the 19th Junior Basketball Championship in Zadar in 2000 he was the main objective of determining the latent structure of situational efficiency of elite junior basketball players. The authors concluded that neither the use of standard indicators of situational efficiency, nor the use of them derived latent dimensions are not dosatni for explanation of the structure of basketball game (Jelacic M. Trninić M. Jelaska I. 2005).

Conclusion

The aim is to determine the success of the basketball team in the area of standard indicators of competitive efficiency in the world U-19 Basketball Championship in Novi Sad in Serbia. For this purpose, a survey was conducted on a sample of eight best-placed team (national team), the world championship of Serbia, USA, France, Brazil, Australia, Argentina, Turkey and Spain. The paper used variable 14 standard (FIBA) indicators of competitive efficiency. The data processing was used factor analysis. The study tried to get to the explanation of latent dimensions in the area of standard indicators of competitive efficiency. Based on the analysis of the intercorrelation matrix of isolated factors can be seen connections isolated factors within the space of standard situational indicators. Based on the results obtained within this matrix, we can see that they are not achieved statistically significant correlation coefficients between the factors obtained FIBA standard performance indicators in basketball. The five basic latent dimensions that enlighten space situational efficiency competition team, which point to structural diversity and specific situacin success in basketball. Basketball game in competitive conditions is too complex a collective game that used a standard variable situational indicators of efficiency, as well as derived from them latent dimensions, are not enough to fully explain the structure of basketball game, so to look for additional standard and derived indicators that we approached and defined structure games and success in today's basketball team. Situational characteristics are only one segment of monitoring the success in basketball, and should not zanemaritii other segments that have an impact on situational efficiency, especially morphology, motor skills, functional, and cognitive and cognitive space.

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LATENTNA STRUKTURA STANDARDNIH POKAZATELJA EFIKASNOSTI KOŠARKAŠKIH TIMOVA NA U-20 SVJETSKOM PRVENSTVU U KOŠARCI

Sažetak

Cilj istraživanja jeste definisati latentni prostor standardnih pokazatelja takmičarske efikasnosti kako bismo dobili tačne podatke koji su važni za uspjeh tima na U-20 Svjetskom košarkaškom prvenstvu. Istraživanje je provedeno na uzorku od 48 igara osam najbolje rangiranih košarkaških reprezentacija na U-20 Svjetskom košarkaškom prvenstvu u Srbiji. Latentna struktura u košarci je istražena pomoću faktorske analize na temelju standardnih pokazatelja efikasnosti u konkurentnoj košarkaškoj utakmici, s ciljem kako bi se utvrdila njihova funkcionalna ovisnost i dobio cjelovit uvid u interakciju među njima. Istraživanjem se došlo do pet karakterističnih korijena koji objašnjavaju 69,42% zajedničke varijance. Izolirane faktore smo definisali kao: situacioni faktor u preciznom napadu, situacioni faktor uspješnosti u odbrani i napadu, situacioni faktor nepreciznosti i očekivanju rušenja u napadu, situacioni faktor učinkovitosti u skokovima i slobodnom bacanju i faktor situacione agresivnosti i preciznost šuta za tri poena.

Ključne riječi: standardni indikatori učinkovitosti, latentna struktura, apsolutne i relativne izvedbe timova, funkcionalne zavisnosti i uzajamne interakcije.

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THE DIFFERENCES IN YOUNG ATHLETES' QUALITY OF LIFE WITH REGARD TO GENDER

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Original scientific paper

Abstract:

The purpose of this study was to investigate the differences in the quality of life among young athletes with regard to gender. The study was conducted on a sample of 339 young athletes (both gender) average age 15.1 years in Zagreb. The quality of life of the participants in this study was estimated using the Croatian version of the Questionnaire of quality of life for children and adolescents The Kidscreen Questionnaire which includes monitoring the quality of life through elements of physical, emotional, social and behavioural well-being. Descriptive statistics were used to calculate the basic descriptive parameters, while the differences in the perception of the quality of life for young athletes were tested by discriminant analysis. Discriminant analysis confirmed the differences in the perception of the quality of life on the basis of gender for the following variables: leisure, self-concept and physical well-being. Discriminant factor was interpreted as pleasure and life concern.

Keywords: sport, discriminant analysis, the questionnaire The Kidscreen-52

Introduction

Sport as a human activity has, over a very long period of time, been integrated into the culture and lifestyle of the majority of communities, as well as our culture and social environment. During the moments of success, promotion of the society/state, but also their own individual promotion, is an accompanying factor in the popularity of some sports stars. Therefore, it is not surprising that a great number of children and young people join different sports organizations, and thus become integrated in the system of organized training process. Parents are probably most deserving for the initial involvement in organized sports and are often the first sports role models to their children. The influence of the immediate social environment in which the child grows up, the choice and availability of sports facilities, the expertise of the coaches and the parents' financial situation (especially nowadays when the parents have become an important source of financing) are also very important. The phenomenon of youth sport also involves the segment of human growth and development, in which an athlete at a young age and through a relatively short period of life (from 6 to 12 years) demonstrates his/her sports creative abilities (Malacko, 1991). Sport is characterized by voluntary access and choice, hence the enthusiasm typical of athletes. However, in sport one cannot aspire to mediocre values. Regardless of age and fitness level, there is a strong orientation towards sport victory. In sport, the element of competition, the desire to achieve results better than those of the rivals, as well as constantly seeking ways towards higher results is important (Enciklopedija fizičke kulture, 1977:32). Today the concept of sport includes different but basically very similar definitions. For instance, Malacko (1991) defines sport as physical activity, i.e. physical exercise, as a pleasant, lively and dynamic activity in which a person aspires to present his/her maximum capabilities in order to achieve success, in other words good sports results. Milanović (1997) describes sport as a set of motor activities of variable and dynamic character where the ability of athletes, their characteristics and skills during the training process and com-

petition are expressed. In the study of young Europeans' quality of life with regard to gender, we can see differences in some dimensions of the quality of life. Bisegger, Cloetta, Rueden, Abel, Ravens-Sieberger (2005); The Kidscreen Group Europe (2006) hypothesized that the expected difference in the quality of life among young people with regard to gender in the dimensions of physical well-being, psychological well-being and self-concept would be in favour of boys. It was also hypothesized that males would express worse mood, and higher levels of unpleasant emotions. On the basis of the same study it was hypothesized that girls would have better peer support, but that they may at the same time be more exposed to potential peer violence. The results of this study confirmed the hypotheses pertaining to better quality of life in favour of boys regarding their physical well-being and higher levels of stress, low mood and unpleasant emotions. It was also confirmed that boys had more positive self-image than girls. The hypothesized existence of differences between girls and boys was not confirmed within the dimension of psychological well-being, nor within the dimension of violence among young people. The other dimensions of the quality of life also showed no significant difference. The hypothesis of better social acceptability of women by peers (Bisegger et al., 2005) was also not confirmed. The differences in the quality of life with regard to gender and economic status were observed in the research conducted by Ravens – Sieberger et al., (2007). They applied the shorter version of the questionnaire The Kidscreen-27 (The Kidscreen Group Europe, 2006), which contains 27 items. Minor differences with regard to gender were confirmed for social support and peer relationships. Young men's results for the quality of life were better than the girls' on the dimensions of physical well-being, psychological well-being, relationships with parents and in the use of leisure time. It is interesting to observe that the differences in the use of leisure time and the relationship with parents were not found in childhood, but in the period of adolescence were certain gender differences were observed. This may

indicate the formation of different interests during adolescence based on gender differences. Girls between 12 and 18 years of age reported a slightly better quality of life in relationships with peers than boys, while girls aged 8-11 reported a better quality of life in the dimension of school environment (Ravens-Sieberer et al., 2007). This suggests that different aspects of monitoring the quality of life give different results in certain groups of research participants. While the quality of life of children and young people can in some way be observed separately from the quality of life of adults, it is very difficult to completely separate these two interconnected categories. It is very likely that a child will definitely feel all the positive and negative phenomena and events in the society reflecting on the family life. This paper observes the quality of life of the young people in terms of their sports activities, i.e. one small part of life that significantly changes the structure of the living habits and family routine. Depending on the level of sports competence of young athletes, as well as the type of sport, doing sports can affect the general quality of life of a young athlete. Today, as well as over the recent years, the age limit for athletes who achieve superior results has increasingly been reducing (e.g. N. Comaneci won an Olympic gold medal at the age of 14, M. Phelps became the world record holder in 200-meter butterfly swimming at the age of 15 years and 9 months, and Cameroonian swimmer A.J.G. Mouafo performed at the Olympic Games in Beijing, aged only 12 (Wikipedia, 17 November 2010)). In other words, the ultimate competitive sport is very much present in adolescence. Top sport can be defined as an activity that requires the youth to invest a significant amount of leisure time in learning and presenting the prescribed skills. It involves encouragement and cheering from adults who are separated from the players and the selection of winners at the state, regional or national level (Berryman, 1978). The connection between youth sport (the level of sports activity) and the quality of life may depend on the level of training. Top sport, recreational sport and school sport include sporting activities at different levels, both according to sports development and towards targets that have or have not been realized (Urli & Sikić, 1993). Engaging in professional sports can have positive and negative effect on young athletes' quality of life. Positive effects can be seen in the improvement of the degree of motor and functional abilities (Hraste, Lozovina, Radmilo, 2009), and can affect the reduction of ballast tissue (Borer, 2008). Sport can contribute to a person's psychological well-being (Horga, 1993), introduce young athletes to proper nutrition and prepare them to cope with stressful situations (Pešut, 2007). In addition, research confirms the active role of sport in the prevention of addiction (Đonlić, 2011), and the positive effects in the areas of education, revention, rehabilitation and socialization (Milanović, Jukić, Čustonja, Šimek, 2004). On the contrary, a negative impact on the quality of life can be manifested through a variety of eating disorders in some sports due to insufficient calorie intake which can adversely affect bone density (Júrimäe, J. & Júrimäe, T., 2009), or may be reflected as injury and overtraining (Borić, Ivelj, Leko, Bojanić, Roić, 2007). Therefore, for a young athlete's quality of life to be satisfactory, the obligations that accompany any organized sports training must be incorporated into the process of his/her

growing up and maturation. In the process, besides sports, there are also other very important obligations (school, family, friends...). In other words, young athletes have many needs that can be satisfied through sport, but also outside sport. Whether and how the success of these needs will be met depends on a number of factors in young athletes' lives and their living conditions.

Methods

Aim and research hypotheses

Based on the previously mentioned, it can be concluded that participation in sports activities for a variety of positive effects on health, physical and mental well-being can contribute to someone's quality of life. Therefore, the main objective of this paper was to examine the differences in the experience of the quality of life of young athletes with regard to gender. Based on the research objectives the following hypothesis was tested: There is no difference in young athletes' quality of life with regard to gender. Although during sexual maturation differences in the characteristics, structure and composition of the body as well as functional and physiological characteristics important for athletic success (Mišigoj - Duraković, 2008) become evident, no significant differences in the experience of young athletes' quality of life with regard to gender were expected, as young people during adolescence have similar interests and are prone to forming similar interest groups (Bastašić, 1995). Since both boys and girls undergo similar training which requires maximum fitness of athletes for the purpose of achieving the best results, and we also witnesses a slow disappearance of the differences between the so-called "male" and "female" sports, which have in the past been the source of polemics (Medved, 1980; Schack, 2005) no significant differences were expected to be obtained in the experience of young athletes' quality of life on the basis of gender. In other words, it was assumed that sports activity has equally positive impact on the quality of life of young people, regardless of their gender.

Participants

The sample of participants consisted of 339 young athletes participating in team and individual sports (girls = 187, boys = 152), who trained in sports clubs outside of school. The characteristic of these clubs is their focus on achieving high results in a particular sport. The participants were divided on the basis of gender. The average age of young athletes was 15 years and all were secondary schools students in Zagreb. Since the participants in the study were minors, proper consent and approval from schools and parents was obtained and the study was conducted in accordance with the code of ethics for research involving children (Ajduković, Kolesarić, 2003).

Instruments and variables

Young athletes quality of life was estimated using the Croatian version of the Questionnaire of the quality of life for children and adolescents The Kidscreen Questionnaire (The Kidscreen Group Europe, 2006; Lorger, 2011). The quality of life construct, which is estimated by this questionnaire, involves observing the quality of life through elements of

physical, emotional, social, and behavioural benefits. The questionnaire contains a total of 10 dimensions on the basis of which the perceived quality of life is assessed. When filling out the questionnaire, the participants responded to the statements on the five point Likert scale (from not at all (never) = 1 point to extremely (always) = 5 points).

Data analysis

Analysis and processing of the results was conducted using STATISTICA 8.0 on two levels. Initially, ba-

sic descriptive parameters of the arithmetic mean (M) and standard deviation (SD) were calculated. The second level of the analysis included discriminant analysis with the aim to determine significant differences in the variables of the quality of life between the two groups of athletes according to gender. Based on the obtained results, conclusions were made about the differences in the perception of young athletes' quality of life with regard to gender.

Results and discussion

Table 1: Descriptive parameters for the distribution of results in the sample of young female and male athletes

Number	Content of items	N	M	SD	N	M	SD
		Girls	Girls	Girls	Boys	Boys	Boys
1	In general. how would you say your health is?	187	4.21	0.84	152	4.48	0.72
2	Have you felt fit and well?	187	3.64	0.86	152	3.85	0.85
3	Have you been physically active (e.g. running...)?	187	3.73	1.02	152	4.00	1.05
4	Have you been able to run well?	187	3.64	0.96	152	4.07	0.92
5	Have you felt full of energy?	187	3.51	1.02	152	3.80	0.96
6	Has your life been enjoyable?	187	3.81	0.95	152	3.96	0.97
7	Have you felt pleased that you are alive?	187	4.07	1.05	152	4.19	1.05
8	Have you felt satisfied with your life?	187	4.02	0.86	152	4.13	0.92
9	Have you been in a good mood?	187	3.67	0.94	152	3.75	0.84
10	Have you felt cheerful?	187	3.70	0.97	152	3.77	0.90
11	Have you had fun?	187	3.95	0.95	152	3.99	0.98
12	Have you felt that you do everything badly?	187	2.29	0.89	152	2.13	0.76
13	Have you felt sad?	187	2.28	0.80	152	2.03	0.75
14	Have you felt so bad that you didn't want to do anything?	187	2.28	0.95	152	2.07	1.03
15	Have you felt that everything in your life goes wrong?	187	2.12	0.91	152	1.88	0.98
16	Have you felt fed up?	187	2.44	1.05	152	2.27	0.98
17	Have you felt lonely?	187	1.85	0.93	152	1.57	0.84
18	Have you felt under pressure?	187	3.06	1.09	152	2.34	1.08
19	Have you been happy with the way you are?	187	3.48	0.90	152	3.90	0.96
20	Have you been happy with your clothes?	187	3.88	0.87	152	4.26	0.88
21	Have you been worried about the way you look?	187	2.47	1.23	152	1.86	1.05
22	Have you felt jealous of the way other girls and boys look?	187	1.90	0.91	152	1.61	0.92
23	Would you like to change something about your body?	187	2.69	1.29	152	2.26	1.23
24	Have you had enough time for yourself?	187	2.63	1.01	152	3.30	0.99
25	Have you been able to do the things that you want to do in your free time?	187	2.77	1.06	152	3.38	1.08
26	Have you had enough opportunity to be outside?	187	2.77	1.06	152	3.45	1.15
27	Have you had enough time to meet friends?	187	2.99	1.08	152	3.51	1.19
28	Have you been able to choose what to do in your free time?	187	3.54	1.25	152	3.84	1.15
29	Have your parent(s) understood you?	187	3.64	1.17	152	3.67	1.07
30	Have you felt loved by your parent(s)?	187	4.28	0.98	152	4.24	0.94
31	Have you been happy at home?	187	3.98	0.99	152	4.05	1.04
32	Have your parent(s) had enough time for you?	187	3.83	1.14	152	3.84	1.11
33	Have your parent(s) treated you fairly?	187	3.89	1.06	152	4.01	1.11
34	Have you been able to talk to your parent(s) when you wanted to?	187	3.98	1.19	152	4.17	1.07
35	Have you had enough money to do the same things as your friends?	187	3.93	1.16	152	4.00	1.10
36	Have you had enough money for your expenses?	187	3.97	1.14	152	4.20	1.01

37	Do you have enough money to do things with your friends?	187	4.09	0.93	152	4.21	0.99
38	Have you spent time with your friends?	187	3.83	0.98	152	4.01	0.94
39	Have you done things with other girls and boys?	187	3.54	1.06	152	3.84	1.09
40	Have you had fun with your friends?	187	4.17	1.02	152	4.32	0.87
41	Have you and your friends helped each other?	187	4.22	0.84	152	4.15	0.85
42	Have you been able to talk about everything with your friends?	187	4.28	0.92	152	4.01	1.02
43	Have you been able to rely on your friends?	187	4.33	0.90	152	4.04	1.06
44	Have you been happy at school?	187	2.84	1.05	152	2.96	1.23
45	Have you got on well at school?	187	3.13	0.93	152	3.05	1.15
46	Have you been satisfied with your teachers?	187	2.59	0.95	152	2.90	1.14
47	Have you been able to pay attention?	187	3.26	1.01	152	3.49	1.10
48	Have you enjoyed going to school?	187	2.45	1.11	152	2.49	1.25
49	Have you got along well with your teachers?	187	3.48	1.02	152	3.37	1.14
50	Have you been afraid of other girls and boys?	187	1.16	0.46	152	1.38	0.94
51	Have other girls and boys made fun of you?	187	1.25	0.55	152	1.45	0.85
52	Have other girls and boys bullied you?	187	1.17	0.58	152	1.29	0.87

Note: The Croatian version of The Kidscreen-52 questionnaire cannot be used without the consent of the author. i.e. the rights holder for the Republic of Croatia.

Table 1 shows the basic descriptive parameters for the distribution of the results in the sample of female and male young athletes. This analysis shows that the vast majority of answers had a negative distribution. i.e. that the results were grouped in the areas of higher values. Hence it may be said that the majority of young male and female athletes expressed their agreement with the questionnaire items. According to the obtained higher values, it may be concluded that young athletes were satisfied with the quality of life. Average values were obtained for the assessment of the moods and emotions, and free time and school environment dimensions. On the items related to the feelings of happiness in school, satisfaction with teachers' work and enjoyment in school. Higher values were obtained for the estimate of these dimensions: physical well-being,

psychological well-being, family relationships, relationships with friends, self - perception and financial matters. Relatively low values were given as estimates for bullying experience in this group of young athletes. Friendships among athletes are very important because it can be one of the reasons children and young people decide to engage in sport (Barić & Horga. 2006). The role of peers in the socialization process is important, and the group which young athletes belong to can directly affect their social development (Bungić & Barić. 2009; Urli & Šikić. 1993). In conclusion, it can be said that young athletes expressed a high satisfaction with the quality of life. which is in accordance with the research results given by Snyder et al., (2010) where young athletes' assessment of the quality of life was higher than non-athletes' on the dimensions of mental, emotional and physical well-being.

Table 2: Descriptive parameters for the dimension quality of life of young female and male athletes

Gender	Dimension quality of life	M (Athletes G)	M (Athletes B)	SD (Athletes G)	SD (Athletes B)
Young female and male athletes	Family and home life	3.93	4.11	.93	.86
	Psychological well -being	3.85	3.97	.75	.74
	Friends	4.27	4.07	.76	.83
	Bullying	1.19	1.37	.44	.78
	Free time	2.94	3.49	.87	.93
	School environment	2.96	3.04	.69	.87
	Physical well-being	3.74	4.03	.66	.61
	Self - perception	2.38	1.96	.69	.62
	Money	4.01	4.13	.99	.95
	Moods and emotions	2.28	2.09	.68	.65
	Hanging out with friends	3.84	4.06	.86	.75
Average quality of life: Young female athletes:		M =3.56	(SD = 0.49)		
Young male athletes:		M =3.70	(SD = 0.40)		

Table 2 gives the basic descriptive results for the sample of male and female young athletes. A detailed analysis shows that male young athletes' values of arithmetic means were somewhat higher than female young athletes' in almost all variables. The

most marked differences in favour of male young athletes can be seen in the dimensions of free time, self - perception and physical well-being. The values of standard deviations were very similar in both samples, except in the dimensions which describe

bullying, school environment and hanging out with friends. Average value for the total quality of life of young male and female athletes shows only slight differences in favour of male athletes. The significance of differences between female and male young athletes was tested by discriminant analysis.

Considering the similarity of the training process for young female and male athletes which is aimed towards achieving the best possible results. According to the set hypothesis, the differences in the experience of the quality of life for female and male young athletes were not expected.

Table 3: Differences in the dimensions quality of life of young female and male athletes

Function	Eigenvalue	Coefficient of discrimination	Wilks' L	Chi - square	Degrees of freedom	p
1	.32	.49	.76	93.40	11	.00

The results of the discriminant analysis presented in table 3 confirmed statistical significance of the discriminant function. The coefficient of discrimination was not particularly high. Significance of the Wilks' lambda was tested by Chi - square test which showed the differences between the two groups at a significance level of $p = 0.01$. The obtained discriminant function showed a statistically significant difference between female and male young athletes in the quality of life variables. Eigenvalue of 0.32 indicated a moderate difference between the groups where 24.01% of the variance obtained by discriminant function can be explained by young athletes' belonging to a particular gender. Wilks' lambda of 0.76 shows a relatively high overlap of the two groups in discriminant area. i.e. the similarity between the groups. This indicates that the differences in the quality of life between female and male young athletes, although statistically significant, were not great.

Table 4: Differences in the dimension quality of life of female and male young athletes

Variables	c	r
Family and home life	.02	.03
Psychological well -being	-.37	.12
Friends	-.48	-.22
Bullying	.38	.25
Free time	.62	.54
School environment	-.14	.10
Physical well-being	.42	.41
Self - perception	-.51	-.46
Money	-.05	.11
Moods and emotions	-.28	-.26
Hanging out with friends	.15	.22
Group centroids: female athletes:	- 0.50	
male athletes:	0.69	

Legend: Discriminant coefficients (c), correlation component of the quality of life with discriminant function (r) and the group centroids

The obtained results show that the dimensions describing free time, self-perception, physical well-being, friends and bullying had the greatest contribution to the forming of the result on this discriminant function. The correlations of discriminant variables with the discriminant function show that the two groups most differed in the following dimensions: free time, self - perception and physical well-being. Considering that on the one side of the factor there was pastime, entertainment and pleasure, and on the other side worry, this discriminant function can be interpreted as satisfaction and concern with life.

The structure of the discriminant function and group centroids showed the dominance of free time and physical well-being in the sample of young male athletes, while the variable of self - perception was associated with the group of young female athletes. It can be said that in this sample the following contributed to the quality of life of young female and male athletes: the freedom in the choice of content and way of spending free time.

The experience of physical well-being expressed through high level of sports activity, health and fitness, which can have an impact on the general self-perception and the perception of one's own appearance. This means that a more favourable experience of physical well-being expressed through high level of health, sports activity, high level of energy and aerobic skills combined with satisfactory ways of spending free time and entertainment. May decrease feelings of concern for one's own appearance and thus favourably affect athletes' self- perception. According to the values of group centroids, it can be concluded that female athletes gave higher estimates for the questions comprising the dimension of self-perception, and lower to the issues presented in the dimensions of physical well-being and leisure, while male athletes' estimates were completely opposite. Female athletes were more concerned with their own appearance, the desire to change their own appearance, and jealousy of their peers' physical appearance. Male athletes were directed towards a more pleasant experience of life expressed through a greater enjoyment in their free time. The choice of the content of their free time with the possibility of entertainment and socializing with friends, and greater satisfaction with their physical well-being, expressed through a high level of sports fitness and health. Several factors could contribute to these results, such as the differences in sports performance (Bompa, 2000). Differences in sports experiences during the early years of maturation, which may be of crucial importance in shaping the positive personality traits, especially in the domain of self-confidence and independence (Cox, 2005). It seems that young male athletes perceive their fitness and competence to be at a higher level than female athletes, which can greatly depend on the type of sport as well as the intensity of the training. Young male athletes are expected to be more aggressive and competitive, while female athletes are more ready to cooperate and seek more attention (Tandarić, 2008). Likewise, female athletes may experience someone's success as their own defeat (Tandarić, 2008) which can also contribute to certain dissatisfaction, and reflect on their self- perception. They are more prone to injuries than male athletes (Granito, 2002; Henry & Kaeding. 2001; University of Alberta. 2010; University of Michigan. 2007), which can have an adverse effect on their

perception of fitness (physical well-being). Finally, the differences in the perception of the quality of life between young male and female athletes were evident in the experience of satisfaction in the use and the contents of their free time, as well as the assessment of physical well-being and the overall level of self-perception. Accordingly, the hypothesized lack of differences between the young male and female athletes was not confirmed.

Conclusion

The primary aim of this research was to examine the differences in the perceived quality of life between young athletes with respect to gender. The differences in the quality of life were determined by discriminant function of the satisfaction and life concerns. Young female athletes were more focused on the concern for their own appearance and the desire to change their physical appearance, while young male athletes were more focused on pleasant and careless way of life expressed through freedom and satisfaction in the use of free time and a high level of physical well-being.

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RAZLIKE U KVALITETI ŽIVOTA MLADIH SPORTAŠA S OBZIROM NA SPOL

Sažetak

Svrha istraživanja bila je istražiti razlike u kvaliteti života mladih sportaša s obzirom na spol. Istraživanje je provedeno na uzorku od 339 mladih sportaša oba spola u gradu Zagrebu prosječne dobi 15.1 godina. Kvaliteta života procijenjena je pomoću hrvatske verzije Upitnika kvalitete života za djecu i adolescente The Kidscreen Questionnaire koji uključuje promatranje kvalitete života kroz elemente tjelesne, emocionalne, socijalne i bihevioralne dobrobiti. Deskriptivnim statističkim metodama izračunati su osnovni deskriptivni parametri, dok su razlike u doživljaju kvalitete života mladih sportašica i sportaša bile provjerene diskriminacijskom analizom. Diskriminacijskom analizom potvrđena je razlika u doživljaju kvalitete života na temelju spola u varijabama slobodnog vremena, samopoimanja i tjelesne dobrobiti, a diskriminacijski faktor interpretiran je kao zadovoljstvo i zabrinutost životom.

Ključne riječi: sport, diskriminacijska analiza, upitnik The Kidscreen-52.

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THE RELATION BETWEEN TIME MANAGEMENT AND JOB STRESS IN PHYSICAL EDUCATION LECTURERS AND FACULTY MEMBERS OF HAMEDAN UNIVERSITIES

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Original scientific paper

Abstract

The goal of this research is to study the level of job stress and time management of physical education teachers in Hamedan universities; it also investigates the effect of time management as an efficient component on job stress controlling process. The data collected by field study method through Spielberg job stress questionnaire (Cronbach alpha coefficient 0.83) and modified questionnaire of time management (Cronbach alpha coefficient 0.84). Research population consisted of physical education teachers of Hamedan universities; and research statistical sample also included all physical education faculty members of Hamedan universities and also, teachers of non- faculty members that to be PhD student and or had 5 years of experiences. Finally, 61 physical education teachers participated in this research. The age mean age of physical education teachers measured 38.92 ± 8.8 years and job stress and time management estimated 4.09 ± 1.6 and 105 ± 9.07 , respectively. Moreover, there was a significant relation seen between job stress and time management variables and dimensions (goal setting, planning, and performance evaluation). Independent t-test showed no significant difference between men and women as well as education level in job stress level and time management of physical education teachers. According to research findings, it can be stated that improved time management leads to reduced job stress level in physical education teachers that significantly influences their quality of life.

Keywords: Time management, job stress, physical education teachers and faculty members

Introduction

Human life, self-esteem, and the pride of any individual and society depend on the level of job that attracted scholars' attention in the present decade. Job embraces many aspects including satisfying human needs, independence, social integration, esteem, mental relaxation, and convenience of community members; however, it may be the main source of mental pressure, too. Stress exists among all individuals working in a society. Evidences demonstrate that personnel jobs play a critical role in stress suffering. Jobs deal with time pressures (time is important in these jobs), those encounter physical risks and injuries, high-responsible and accountable jobs to human or financial issues, etc are more sensitive to stress. However, it worth notifying that some balanced organizational stresses may be constructive that leads to higher motivation and effort among employees (Alvani, 2008).

Job stress is a typical implementation worrying that causes reduced self-confidence and poor performance. In other words, it refers individual's general attitude toward its job; the one with high stress job has a negative attitude; hence, unsatisfied individual never succeeds. Job dissatisfaction causes disappointment and adverse effects including anxiety, absence, delays in work, desertion, early retirement (Nakhaei Niyazi, 2008).

In the present world, only capital and knowledge are not sufficient for job success. One effective factor for success is proper use of time referred as time management (Moghimi, 2006). Time management means controlling and planning the person's time (Mancini, 2003). Of the variables related to job stress dealing with it is time management that contains goal setting, prioritizing, planning, and performance evaluation components (Javaheri zade, 2005; Ghaed Mohammadi, 2010).

However, any job has its particular stresses, university professors incur specific pressures less observed in other professions. Planning curriculum,

large workload and time pressure, assessment, educational environment, job vague future, class discipline, peers conflicts, unfavorable working condition, as well as promotion pressures are some of professors' stress sources along with personal, family, and social pressures lead to stress. Moreover, it adversely influences teachers and students' relations, the quality of teaching, and commitment leading to escaping from work, frequent absence, uneasiness, and job insecurity. Studies conducted on university teachers stress level reveal that prevalence of job stress among university teachers around the world is widespread and seriously increasing (Winfield, 2000).

Regarding that teaching at university is a crucial job in society, and university teachers critically contribution in educational system due to their responsibility in developing educational objectives as well as education, if time cannot properly managed, it not only influences itself, but also universities' function and performance; on the other hand, teachers' mental health is particularly prioritized. One of the current discussions is time management and its role in efficiency and reducing job stresses. Time management is the requirement of managers. Regarding that there has been no studies conducted on the relation between these two variables among university teachers; thus, it is necessary to study the relation between time management and job stress in physical education teachers.

The goal of this research is to study physical education teachers' job stress in Hamedan universities; it also investigates whether time management plays any role in controlling job stress process as an effective component?

Research specialized objectives include:

1. Determining the relation between physical education teacher's job stress in Hamedan universities and time management components
2. Describing individual characteristics (sex, age,

years of experience, education level) of physical education teachers in Hamedan universities

3. Determining the relation between individual characteristics with time management and job stress variables

4. Determining job stress level of physical education teachers in Hamedan universities

5. Determining time management level of physical education teachers in Hamedan universities

Therefore, in general, it tries to analyze the relation between time management with job stress level of physical education university teachers of Hamedan.

Materials and methods:

The present descriptive-correlation research is an applied study. The information gathered through field study method. The statistical population consisted of physical education professors in Hamedan and research sample was also all physical education faculty members of Hamedan universities as well as on tuition teachers studying PhD and or M.A with five years of experiences in Hamedan universities. Data collected through using two questionnaires. The first was time management questionnaire involving two parts: the first part, page 1, measures individual characteristics (sex, age, years of experience, education level) of physical education professors stated in objective 2. The second part, consisting of 28 items, estimates goal setting, prioritization, planning, and performance evaluation components (objective 2), respectively; contains 7 items.

Job stress of questionnaire contains 30 items measuring physical education professors' job stress in goal 4. The questionnaires distributed to the professors in person.

Objectives (1 and 3) and the relation between individual characteristics and time management components with job stress studied and determined using inferential statistics.

This research used Javaheri zade (2009) (Time management; Concepts, Basics, and unctions) reliable time management questionnaire in a five-point Lykert scale . The researcher verified the validity (according to physical education professors' attitudes) and reliability (using Cronbach alpha coefficient) of the questioners. Job stress level assessed through using Spielberg standard job stress questionnaire including 30 nine-option questions, in a Lykert scale, applied in several studies with a high validity and reliability (Cronbach alpha coefficient 0.84 in Esandiyari et al (2012) study and the reliability of 0.89 in Karami (2011)).

Data analyzed using descriptive statistics; then, data curve normality examined by Kolmogorov-Smirnov test (Sig=0.2, Z=0.076). Variables' relations determined through using independent t-test and Spearman correlation test. Statistical computations conducted in SPSS 16 software.

Results:

As Table 1 shows, physical education professors' mean age attained 38.92 ± 8.8 years; job stress level in a nine-point scale estimated 4.09 ± 1.6 ; further, time management scored 105 ± 9.07 of the total 140. According to figure 1 and Table 2, there is an inverse significant relation seen between job stress and time management ($R = -0.35$, $Sig = 0.006$). Furthermore, as Table 3 represents, there is no significant difference between time management and job stress of different groups in terms of sex and education level.

Table 1: Descriptive characteristics of physical education Lecturers and faculty members

Variables	SEM	SD	Mean
AGE	1.12	8.8	38.92
Work experience	0.94	7.34	10.65
job stress	0.2	1.6	4.09
time management	1.16	9.07	105
goal setting	0.43	3.35	30.4
Prioritization	0.31	2.4	24.87
planning	0.44	3.47	25.6
performance evaluation	0.37	2.93	23.97

Table 2: Correlation between job stress with time management and its components

Variables	R	SIG
Job stress		
time management	- 0.35	0.006
goal setting	-0.33	0.009
Prioritization	-0.1	0.42
planning	-0.37	0.004
performance evaluation	-0.35	0.004
age	-0.34	0.007
Time management		
Work experience	-0.27	0.03
age	0.05	0.71
Work experience	0.04	0.7

Table 3: Independent t-test for studying variables' differences

Variables	sig	Mean $\pm$ SD	T
The amount of time management in both men and women	0.61	Male: 104 ± 8.4 Female: 108 ± 9.9	-0.51
The Time Management in both groups PhD and Masters	0.08	PHD: 104 ± 9 MSC: 106 ± 9.2	-1.74
The amount of Job stress in both men and women	0.98	Male: 4.09 ± 1.34 Female: 4.1 ± 1.9	-0.02
The Job stress in both groups PhD and Masters	0.79	PHD: 4.01 ± 1.3 MSC: 4.13 ± 1.7	-0.27

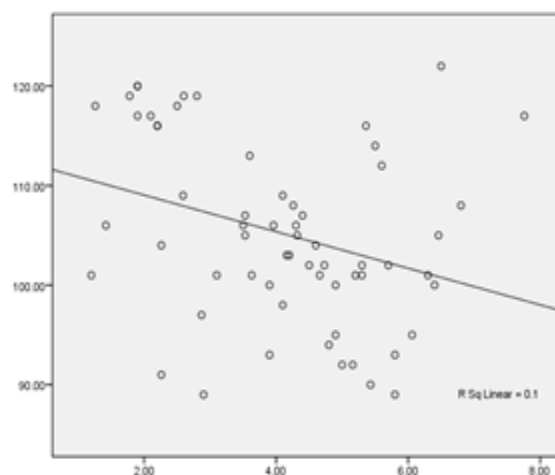


Figure 1: Scatter plot of time management and job stress

Discussion and conclusion:

According to research obtained results, it can be stated that physical education professors' mean age was 38.92 ± 8.8 years; job stress level was 4.09 ± 1.6 of the total score of 9 indicating average job stress level. Further, time management scored 105 ± 9.07 of the total score of 140; thus, it expressed that physical education professors had a relatively good time management. There was a significant, inverse relation seen between job stress and time management ($\text{Sig}=0.006$, $R=-0.35$) as well as its aspects and components (goal setting, planning, and performance evaluation); while, no significant relation seen with prioritization component using Spearman correlation coefficient ($R=-0.1$, $\text{Sig}=0.42$). Independent t-test showed no significant difference between time management and job stress among men and women. Moreover, job stress level and time management had no significant difference in term of education level. Regarding obtained averages for men time management (104) and women (108), it can be indicated that time management level of female professors is a little larger than male professors; however, it is not significant. Further, there is a significant, inverse relation between job stress with age and years of experience; whereas, the relation of time management and age and years of experience was not significant. No studies conducted investigating these variables in physical education professors; however, some similar studies mentioned as follows:

Abbas Nejad (2010) studied the relation of time management with job stress in physical education and non-physical education teachers in Mashhad city and concluded that: 1. There is no significant difference seen in time management of physical education and non-physical education teachers; 2. The difference of physical education and non-physical education teachers' job stress is not significant ($0.05 < 0.312$). Physical education teachers have higher stress comparing non-physical education teachers. 3. There is an inverse and significant relation seen between time management and job stress, which are consistent with the results of the present research. 4. No significant relation seen among age, sex, years of experience, education level with physical education and non-physical education teachers' job stress, this result is inconsistent with the results of this study. 5. There is a direct, significant relation between age and years of experience with time management of physical education and non-physical education teachers, which is inconsistent with the present research findings. 6. Sex and education level of physical education and non-physical education teachers had no significant relation.

Javaheri zade (2005), in a research named studying time management skills and features in Tehran city guidance schools comparing with desired condition, concluded that time management characteristics confirmed in other researches approved in guidance schools' management by some adjustments. In addition, desired condition and time management of

guidance schools' principals showed significant difference.

Ghaed Mohammadi (2010), in a study named time management and its components among Islamic Azad University students, found that mean score of goal setting, prioritizing, and performance evaluation as time management components lacks significant difference; while, mean of planning and time allocation as time management components was significantly different.

Chitsaz (2010), in a study named the relation between job stress and organizational commitment of faculty members of Vali Asr University and Islamic Azad University of Rafsanjan, concluded that job stress of faculty members is average, which is consistent with the results of the present research.

Individual factors (education level and sex) lack any direct, significant relation with job stress and organizational commitment of faculty members, which is inconsistent with our findings. Individual factors (major and years of experience) had no significant relation with job stress and organizational commitment of faculty members.

Isfahani (2011), in his study named the relation between time management and creativity of the staff of physical education organizations, found out that time management influences staff creativity. Moreover, Miranda (2005) studied the interaction between time management and elementary schools' teachers' occupational requirements and concluded that time management and emotional exhaustion and burnout are significantly correlated.

Abangah (2011), in a study named the relation of roughness factor and job stress with occupational performance of Islamic Azad University staff and faculty members, Gachsaran branch, found out that all aspects of job stress negatively and significantly predict job performance.

Brigitte (2007), reviewing time management, expressed that time management significantly correlated with time, job satisfaction, and health; the less the time management the higher job stress. Furthermore, Hosseini (2013) also studied the relation of time management and job stress among physical education organization staff and found out that time management has a significant, inverse relation with job stress so that the poorer the time management the higher the job stress. This result is consistent with the results of our study.

Ahsan et al (2009) in a paper naming the effect of job stress on job satisfaction of Malaysia University staff concluded that there is a significant, inverse relation between job stress and job satisfaction. Considering these studies, it can be stated that job stress considerably influences working and occupational quality in different organizations. According to research findings and conducted studies, it concluded that better time management leads to reducing job stress level of physical education professors. This not only improves the quality of teaching, but also enhances the quality of life of physical education teachers.

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ODNOS UPRAVLJANJA VREMENOM I POSLOVNOG STRESA U NASTAVI TJELESNOG ODGOJA I KOD ČLANOVA FAKULTETA HAMEDAN UNIVERZITETA

Sažetak

Cilj ovog istraživanja je bio proučiti odnos razine stresa na poslu i upravljanja vremenom tjelesnog odgoja nastavnika u Hamedan sveučilištima. Također je istraživana uticaj upravljanja vremenom kao učinkovite komponente na proces koji kontrolira stres u poslu. Podaci su prikupljeni metodom terenskog istraživanja kroz Spielberg upitnik poslovnog stresa (Cronbach alfa koeficijent = 0,83) i modificiranog upitnika za upravljanje vremenom (Cronbach alfa koeficijent = 0,84). Uzorak se sastoji od učitelja tjelesnog odgoja ali statistički uzorak također uključuje svo edukacijsko osoblje Hamedan Univerziteta kao i ne-nastavno osoblje koje ima doktorat ili 5 godina iskustva. Konačno, 61 nastavnik tjelesnog odgoja su sudjelovali u ovom istraživanju. Prosječna dob nastavnika tjelesnog odgoja bila je $38,92 \pm 8,8$ godina a stres posla i upravljanje vremenom procjenjuje se na $4,09 \pm 1,6$ i $105 \pm 9,07$, respektivno. Osim toga, tu je značajna povezanost između varijabli poslovni stres i upravljanje vremenom (postavljanje ciljeva, planiranje i ocjenjivanje). Nezavisni t-test je pokazao da nema značajne razlike između muškaraca i žena, kao i po razini obrazovanja u razini stresa i upravljanja vremenom nastavnika tjelesnog odgoja. Prema rezultatima istraživanja, može se reći da bolje upravljanje vremenom dovodi do smanjene radne razine stresa kod nastavnika tjelesnog odgoja koji znatno utječe na njihovu kvalitetu života.

Ključne riječi: upravljanje vremenom, poslovni stres, učitelji tjelesnog odgoja, osoblje fakulteta

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METHODS FOR CONFRONTING FOOTBALL PLAY GROUNDS HOOLIGANISM IN JORDAN FROM THE VIEW POINT OF THE TEACHING STAFF MEMBERS AT THE FACULTIES OF PHYSICAL EDUCATION IN THE JORDANIAN UNIVERSITY

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Original scientific paper

Abstract:

This study aimed to know the method for encountering the football stadiums' hooliganism in Jordan from the view point of the teaching staff members at the physical education faculties in the Jordanian Universities.

The researchers have used the descriptive method, a special scale has been prepared in the methods for confronting the football stadiums hooliganism.

Study sample consisted the teaching staff at the faculties of physical education in the Jordanian Universities, the number was (94) members, and after using the appropriate statistical treatments the study reached that the methods of confronting the football hooliganism were greatly relevant and correspond to the current stage condition that the region is going through, since there were no differences with statistical significance between the study sample categories and in all the variables of the football stadiums hooliganism scale.

The most prominent study recommendations were, the care not to evolve the football game in the narrow political world, and considering the loss as a defeat of the nation's dignity and reputation, directing those in charge of the football game in Jordan towards the necessity to limit the achievements of regional racial or sectarian gains, and to rapidly work to place those methods within applicable strategies on the real ground for prevention or remedy.

Keywords: *Methods, Hooliganism, Universities, Football*

Introduction

Sport activities are still attracting money of the practitioners and the viewers at the normal personal level or at the formal level. Football game considers the popular game at the global level regarding the practice and the viewing and the real and intense competition to achieve a result, or the championship.

The sport activities regardless of the number and type or color, especially the football have the prominent role in curing happiness and sadness, raising and falling, the cup and the medals, so the activities including the football activities produce a lot of hooliganism phenomenon's (Spaaij, 2005).

There is no doubt that the hooliganism acts consider the most uglier forms that cause the harm to the society's security and stability, in addition that it contribute to the loss of the football value and characteristics, also the presence of the irresponsible acts as a result of hoppyness and sadness, loss or gain that led to some of the repeated deaths and incidences.

Football stadiums hooliganism became a widespread phenomenon at the sport fields and became threatening the future of a competitive sport, many researchers have pointed that the small world that reflects the reality of the large community (Dunning, 2000 ; Spaaij, 2007).

The evolution of this phenomenon at the football stadiums in Jordan, and its spread abnormally may be because of the intering professionalism in the football game and achieving the win at any cost, or because of the desire to achieve the champion with the accompanied reward and media and may be as a result of the Arab spring movement in the region that most of the middle East countries affected

by it including Jordan, since hooliganism became a semi-daily phenomenon appears in the relationship between the individuals and in the life at the groups at the nations level.

Sport social. scientists affirm that the individual has the ability and the readiness to practice hooliganism especially if the reasons are available and apparent in the form and content, what accompany the sport completion in football as causes for the hooliganism could be for the economic difficulties, denying the civil rights, feeling unjust are factors that generate hooliganism (Urry, 2000).

Confronting football stadiums hooliganism in Jordan at the individual and the collective levels is a very difficult process and with multi dimension, since deterring or forgiveness are not always sufficient, rather that they become the source for new forms of hooliganism, and anti-violence in the sport activities and specifically in the football needs making a lot of arrangement and strategies and methods that correspond with the current situation in the region (Spaaij, 2005; Bairner, (2006).

Study Importance:

Study importance stems from that the Jordanian football stadiums have lived for a long period of time for from the football hooliganism phenomenon, but lately this phenomenon has began to appear in a distinct form because of the frequent aggressive behaviors from the players, trainers, administratives, arbitrators the public, the media and even the security men toward each others.

This study contributes to the establishment of new methods in confronting the football stadiums hooliganism in Jordan that fit with the current conditions in the region.

Also, the researchers through their experience in the field football training and administration that the study results will be helpful for those in charge of sport whether in the football field or in other sport activities in finding the solutions for this phenomenon.

Research Problem

The researchers through their presence in the football arena as a player, trainer, administrator and arpeator sees that the hooliganism phenomenon in the football studiums has began to invade the Jordanain playgrounds that has led to the occuracne of harm and damage at the individual and groups levels, also in the private and facilities.

Also the researchers see that the currant political condition which we means the youth's movement that calls for change and modification, accompanied by poor economic conditions also the entrance of the football game in the preffision world and the search of everyone for contesting and competing to achieve the champion and the cup, and the reward, all this led to the intense struggle and conflict, increased fraction between all the game's elements to reach the first rank.

The researchers see that those in charge of football in Jordan still attempting to stop this phenomenon by the old classical methods without any benefit from the experiment of the global and the regional countries, even there were no creative attempts by the Jordanian officials in the sport field to bring new methods to confront the football hoodlumism in Jordan that tit the condition surrounding us.

The study aim to know the methods for confronting the football hooliganism in Jordan from the view point at the teaching stuff members at the physical education faculties in the Jordanian Universities.

Also, to know the presence of differences with statistical significance in the methods for confronting the football hooliganism in Jordan from the view point of the teaching staff members at the physical education acuities in the Jordanian Universities attribute to the gender variable.

Moreover, to know the presence of differences with statistical hooliganism in the methods for confronting the football hooliganism in Jordan from the view point of the teaching staff members at the physical education faculties attribute to the academic rank.

This study is distinguish from other studies in the Arabic environment:

the scarcity of previous study studies in the methods for confronting the football hooliganism in the 21th century.

Considers the first study in the Arabic environment that investigates the methods for confronting the football hooliganism in Jordan in the shadow of the current economic and political conditions in the Middle East region.

Study Questions

What are the methods for confronting the football hooliganism in Jordan from the study sample's view point?

Are there differences with statistical significant in the methods for confronting the football hooliganism in Jordan from the study sample's view point attribute to the gender variable?

Are there any differences with statistical significance in the methods for confronting the football hooligan-

ism in Jordan from the view point of the study sample attribute to the academic rank variable?

Terms Identification

Football stadumes hooliganism – is the process causing the harm, damage & Buring, also the irresponsible and the unethical acts taken by the game's element directly or indirectly, violating the laws and the regulations, or moving around ghe laws and the regulations in order to achieve the illegal goals before, during and after the competition in the game.

Study Implementation Steps

The items of the scale for the methods of confronting the football hoolligance were determined through referring to the previous studies and surveying the experts opinions in the game field.

The items of the scale for the methods to confront the football hooliganism in Jordan were introduced to the experts in the field the football training and management sport psychologists, sport social scientists, to know the extent of the variables , and their linguistic wording.

The scale of football hooliganism was distributed to the study sample, within time line scheduling.

The relevant statistical treatments were applied with the studies nature (the Means, standard deviations & ANOVA, Grounbach Alpha.

Materials and methods

Participants and Procedure

Study population consists of all the teaching staff members at the faculties of physical education in the Jordanian Universities (Jordan).

The spatial field – faculties of physical education in the Jordanian Universities (Jordan). The temporal field 2013/2014.

Table 1. Study Sample Distribution

	University	Number	Percentage
	Yarmook	29	30.9%
	Mut'a	19	20.2%
	Jordan	22	23.4%
	Hashemite	24	25.5%
	Male	80	85.11%
	Female	14	14.9%
	Assistant Prof	32	34%
Rank	Associate Prof	25	56.6%
N - 94	professor	16	17.0%

Instrument

Procedures and Research Instrument

Instrument Consistency:

The scale's consistency affirmation was made by using the internal consistency coefficients by using Grounbah-Alpah equation, the consistency values reached (0.935) which is accepted for the scientific research purposes.

Instrument validity – the instrument validity was at-

tested through content validity, by introducing the scale to a set of experts to affirm the soundness of the used language, and the extent of the items relevance to the used axis, in addition to know the extent of the belengness of each item to the axis in which it locates, the relevant were made in the light of the arbitors directions and suggestions.

Results

In the light of the study goals and questions the researches has conducted the needed statistical analysis in order to achieve the study goals, and the results were introduced according to the questions order.

To answer the first question that points to "the extent of the study sample agreement about the use of the methods to confront the football playgrounds hooliganism in Jordan".

The means and standard deviations were used, table (2) shows that.

Table 2. Arithmetic means, standards deviation and the scale axis order N = 94

Number	Field	Mean	S.D	Order
1	The public	4.083	0.316	1
2	Educational institutions	4.067	0.492	2
3	The players	4.053	0.255	3
4	Media	4.038	0.224	4
5	Union Management	4.023	0.294	5
6	Security	4.005	0.347	6
7	Arbitors	3.949	0.211	7
8	Trainors	3.920	0.271	8
9	Administrators	3.880	0.243	9

It is clear from table (2) the mean responses of the study sample individuals teaching staff members at the faculties of physical education in the Jordanian universities, to the items the axis confronting the football playgrounds hooliganism in Jordan ranged between (3.880-4.083) with S.D ranged between (0.711-0.492) it expresses according to the used classification in this study that there the methods for confronting the football playgrounds hooliganism in Jordan from the view point of the study sample.

Table 3.

Number	The field	Gender	Number	Mean	S.D	T-Value
1	Union management	Male	80	40.281	0.305	0.393
		Female	14	39.940	0.265	
2	Media	Male	80	40.365	0.221	0.174
		Female	14	40.476	0.251	
3	The public	Male	80	40.760	0.35	0.468
		Female	14	41.190	0.920	
4	Educational institutions	Male	80	40.438	0.570	0.468
		Female	14	41.964	0.990	

5	The players	Male	80	40.692	0.280	1.453
		Female	14	39.619	0.750	
6	The trainer's	Male	80	39.113	0.304	0.695
		Female	14	39.500	0.724	
7	Administration	Male	80	38.642	0.280	0.865
		Female	14	39.524	0.534	
8	Arbitors	Male	80	39.625	0.230	0.287
		Female	14	38.690	0.630	
9	Security	Male	80	40.182	0.395	0.287
		Female	14	39.286	0.830	

To answer the second question that points are there differences with statistic significance in the methods of confronting the football playgrounds hooliganism in Jordan from the view point of the study sample attribute to the gender variable?

The means, S.D, T-Test were used for the dependent variables to compare the mean for the males with the mean for the females. It is clear from table (3) that there are no differences with statistical significance attribute to gender variable.

Illustration of the third question results:

To answer question three that points "are there differences with statistical significance in the methods for confronting the football playgrounds hooliganism in Jordan from the view point of the study sample attribute to the academic rank?

Univariat analysis was used, and table (4) illustrates that.

Table 4. results of Univariate regression analysis according to the Academic rank variable

Number	Field	Total squares	Freedom degree	Mean	F	Sig
1	Union management	Between the sets 0.340 inside the sets 8.875 Total 9.215	3 90 93	0.156 0.091	1.672	0.181
2	Media	0.64 4.612 4.676	3 90 93	0.21 0.51	0.417	0.741
3	Public	0.485 8.785 9.271	3 90 93	0.162 0.098	1.658	0.182
4	Educational institutions	0.710 21.812 22.522	3 90 93	0.337 0.242	0.977	0.407
5	Players	0.708 8.402 8.112	3 90 93	0.25 0.084	0.871	0.614
6	Trainors	0.73 6.740 6.813	3 90 93	0.24 0.75	0.326	0.807
7	Administrators	0.63 9.406 5.469	3 90 93	0.21 0.61	0.349	0.790
8	Arbitors	0.68 4.072 4.140	3 90 93	0.23 0.45	0.502	0.682
9	Security	0.350 10.846 11.196	3 90 93	0.117 0.171	0.968	0.411

It is clear from table (4) the absence of differences with statistical significance attribute to the rank variable.

Discussion

After conducting the needed statistical processes to answer the study questions and in the light of the reached results, and after illustrating the previous tables, the researchers have discussed and analyzed the results pertain to the study according to their order.

Firstly: discussing the results relating to the first question.

The first question was: what are the methods for confronting the football playground hooliganism in Jordan from the view point of the study sample.

Referring to the results in table (2), we notice the mean of the study sample responses to the items axis the methods confronting the football playground in Jordan ranged between (3.88-4.083) with S.D ranged between (0.211-0.492).

This indicates to the study sample agreement on the methods to confront the football playground hooliganism in Jordan.

The researchers explain that through the study sample individuals, view point that the nine axis in the study consider the basic and secondary reasons for the football playgrounds hooliganism and methods for confronting the playgrounds for the reasons of the football playgrounds hooliganism.

The axis the public, the educational institutions, the players & media occupied the first rank regarding the study sample interest in confronting the hooliganism in the football playgrounds in Jordan considering that the educational initiations (we mean the family, the school, the mosque & the church, and the society are basic foundations in educating the current and future generations, and the public considers the basic part of the educational insitiutions since its influencing and influenced by all the practices and behaviors that the society is subject to. (Back, 2001 and Frec & Hughson, 2003) agree that that playars have the prominent role since they are the actual ring for the reasons of the football playgrounds hooligans, it preserved its rank as an important role in its control and raising the level of its literacy & controlling itt's reactions and emotions for the benefit of the game educational and technical.

Also, the sport media and its funds have the great impact on the hooliganism in the football playgrounds from the public anger and the recurrent action, so the study sample has interested in the methods for confronting the playgrounds hooliganism from the view point of the sport media with the interest in other factors.

The study in its results and in its axis did not agree with results from other studies in the Arabic literature, that the main results it is possible to confront the playgrounds hooliganism through caring about the players, trainors, and administrators and considering them the basic elements of hooliganism, followed by the educational insitiutions and the public, the union administration and security as secondary factors.

The researchers explain this that because of the political social and economic conditions, and of what the middle East region is going through from the heat of the youth and political movement, and because the educational experts in Jordan have began

trying to find relevant solutions for the hooliganism from its roots according to the stage requirement in which we live in Jordan.

Secondly, Discussing the results relating to the second and third questions.

The second question is: are there differences with statistical significances in the methods for confronting the football playgrounds hooliganism in Jordan from the view point of the study sample attribute to the gender variable/ while the third question was, are there differences with statistical significance in the methods for confronting the football playgrounds hooliganism In Jordan attribute to the academic rank variable?

Referring to the results in tables (3 and 4), we notice the absence of differences with statistical significance attribute to the gender and the academic rank variables in the methods for confronting the football playgrounds hooliganism in Jordan.

The researchers explain that the study sample regardless of the gender and the academic rank considers a sample representing the educated sport society and is able to solve the problems it is encountering in a logical and scientific way also, most of the sample individuals practiced in the sport field, as players, trainors, administrator media representatives and have their contacts with the sport security men, even the public, so the study sample considers valid in its feeling about the methods through which it is possible to confront the football playgrounds hooliganism and the mass public that love the game from a sport side, and from the political side and economic side, Jordan considers a safe region with social pressure because of the political condition with the neighboring countries which made the study sample agree at a high degree upon the methods for confronting the football playgrounds hooliganism presented in this study, this came in agreement with many studies (king, 2001, Urry, 2000, Dunning, 2000).

Conclusion

The majority of the study sample agree that the methods for confronting the football playgrounds hooliganism in Jordan are relevant at a high degree that corresponds with the current condition that the middle east is going through.

The order of the axis of the methods for confronting the football playgrounds hooliganism in Jordan was as follow top- down: the public , the educational institutions, the players, information, union administration, public security, arbitors, trainers, and administration.

Their were no differences with statistical significance attribute to the gender and the academic rank in the methods for confronting the football playgrounds hooliganism in Jordan.

Raising the public's sport awareness level considering football as a sport in which there is a winner and a loses, and the care not to involve football in the narrow political world, and considering loss as a defeat to the nations dignity and reputation.

The educational sport leaderships should use the media (printed audio, visual) that promote condemning the football playgrounds hooliganism, and the media should focus on the positive sport events. Directing those incharge of the football game in Jordan to attempt to limit the phenomenon achieving the regional, racial, sectarian gains, and directing the

social security towards that.

The work to set the methods to confront the football playgrounds hooliganism in Jordan within a strategy and implementing them on the real ground either for prevention or remedy.

Those in charge of the football game in Jordan

should conduct investigative studies after the application of such methods to find out the presence or the absence of any differences.

reference to the presence or the absence of any differences. such methods/ ion or remedy/tball in the narrow political world.

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METODE ZA SUČELJAVANJE HULIGANIZMA NOGOMETNIH IGRALIŠTA U JORDANU S TAČKE GLEDIŠTA ČLANOVA NASTAVNOG OSOBLJA NA FAKULTETIMA ZA FIZIČKU KULTURU NA JORDANSKIM UNIVERZITETIMA

Sažetak

Ova studija usmjerena je na saznanja metoda za sučeljavanje s nailazećim huliganstvom na nogometnim stadionima u Jordanu s gledišta članova nastavnog osoblja na fakultetima tjelesnog odgoja na jordanskim univerzitetima. Istraživači su koristili opisni način, a posebna skala je pripremljena u postupcima za procjenu suočavanja nogometnih stadiona s huliganstvom. Uzorak se sastojao od nastavnog osoblja na fakultetima tjelesnog odgoja u jordanskim univerzitetima, ukupno njih 94. Nakon korištenja odgovarajućih statističkih postupaka dobiveno je da su metode suočavanja s nogometnim huliganstvom jako važne i odgovaraju tekućem stanju uz uvjet da regija prolazi kroz sve te procese, jer nije bilo razlike u statističke značajnosti između kategorija studija uzorka i svih varijabli nogometnog huliganstva na stadionima. Najistaknutije preporuke studije su, skrb za razvijati nogometne igre u užem političkom svijetu, te s obzirom na gubitak kao poraz u smislu dostojanstva i ugleda nacije, usmjeravanje zaduženih za nogometnu igru u Jordanu prema potrebi ograničenih dostignuća regionalnih dobitaka. Zaključak je da treba brzo raditi upotrijebiti te metode unutar primjenjivih strategija na stvarnom terenu za sprječavanje ili prevenciju.

Ključne riječi: metode, huliganizam, sveučilišta, nogomet

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THE EFFECT OF BRAND CREDIBILITY ON CONSUMERS' PERCEPTION ABOUT BRANDS AND THEIR PURCHASING BEHAVIORS IN SPORT GOODS

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Original scientific paper

Abstract

The present study was an attempt to explore the effect of brand credibility on consumers' satisfaction, continuance loyalty and loyalty to a brand. The main sample of this descriptive -correctional research comprised Nike-sport-products consumers (N=171), selected through convenience sampling procedures. The outputs related to the relationship among the variables obtained by means of the EQS 6.1 and the Structural Equation Modeling statistics indicated that the proposed diagrammed model was appropriate. In other words, the obtained data fitted well with the proposed model. Results indicated that brand credibility significantly affects consumers' perception about the brand and their purchasing behaviors. Accordingly, it is recommended that the sports-products companies should attempt to create positive images about their goods in the minds of their customers.

Keywords: Brand credibility, satisfaction, continuous commitment, loyalty, switching propensity, word of mouth.

Introduction

Mullin, Hardy, and Sutton (2007) define sport marketing as all the activities planned to meet the needs and demands of sport consumers through a series of exchanging processes. One of the significant issues of sport marketing that warrants investigation is Branding Management. Nowadays, with the increased competition among traders, creating prominent brands can be considered as an appropriate path to overcome some of the problems (Heding, Knudtzen, & Bjerre, 2008). Brand, according to Tafreshi Motlagh and Khandani (2010) is known as a name, phrase, items, sign, plan or a mixture of these used by the companies to make their products and services known to everyone. However, as Takali (2012) maintains brands do not just signify the name, rather it represents exactly what an organization/company is attempting to have and maintain in the long run. A brand communicates with the consumers not only through its literal meaning, but also more importantly by means of its long term effect and nature identified by its users. Generally speaking, brands help the consumers to permanently consider the products and services. They can also affect one's image of the product, the services and even the company that provides them. Heding et al. (2008) propose that In the intelligible marketing, nowadays, rather than competing on the prices, companies main priority is to find out ways to stabilize the value of their products among the consumers. This is possible only when a company, through effective management, tries to produce powerful brands that fit well with the environmental conditions. Consumers prefer to spend more money on the products with good trademarks, not on those products that do not have any established trade mark/s. Thus, consumers, for many reasons, can popularize a brand. One of the most important reasons is that they trust the brands as their own friends (Jafaripishe, 2012). As Takali (2012) believes brands help consumers to keep in their minds the products and the services and the company in for a long time.

Developing Hypotheses

Brands are valid marks, otherwise stated, they are credible and trustworthy; they cause companies to be honest about their products and services and to attend to complaints made about them (Heidarzadeh, Ghaffari, & Farzaneh, 2011). According to Erdem and Swait's (2004) study, the credibility of a brand encompasses two main types: (1) trustworthiness, that is, believing that the company is willing to act its promises; and, (2) expertise, that is, believing that the company is capable to fulfill its promises. Keller (2008) also states that it is possible that consumers have some judgments about 'the company behind the brand'. The credibility of a brand of an organization and its acceptability is evaluated based on the three dimensions of the individuals' understanding of the expertise of the organization, the reliability of the organization, and its desirability. If the brand has the following qualities from the consumer's viewpoint: (1) Being suitable and innovative (the expertise of the organization), (2) Being reliable and able to attract consumers in the long-term (reliability), and (3) Being attractive and entertaining and being worthy of the expenses (the desirability of the brand), then, it will enjoy the required credibility on the part of the consumers. Put another way, credibility is a yardstick which evaluates the degree of the enthusiasm of the consumer toward the organization to which the brand belongs. The importance of credibility stems from the fact that incomplete and unparallel expressions lead in the lack of the consumer's trust about the qualities of the product, and this ends in the perceived risk of the consumer. The credibility of the brand reduces the perceived risk because it increases the consumers' trust about the promises of a product of a company. Also, credibility reduces the expenses for information because consumers may use the credible brands as a database to economize the expenses of gathering data and processing those (Erdem &

Swait, 2004). In addition, the credibility of a brand and its expertise has a great role in bringing about loyalty in the consumers, which in turn, leads to three kinds of emotions in them: satisfaction, loyalty commitment, and continuous commitment. A kind of commitment to loyalty and satisfaction emerges among the consumers if the company and the brand are able to bring about a sense of loyalty in the consumers. This helps the consumers feel committed to the brand continuously.

With the advances in technology and the market becoming more competitive in different sections of production and services, a loyal consumer is considered as the main asset of any corporation. If the consumers are loyal to the brand, they will spend a lot of money on the products, marketing programs will be more effective, and this will cause the company to achieve the privilege of a firm competition (Dunne & Moulden, 2009). Loyalty is traditionally used to commonly describe adherence and a big, strong interest to a country, individual or an ideal (Hoseini, Nasr, Javani, & Salimi, 2011). In the same vein, Oliver (1997) has described loyalty to a brand as "making a big commitment to purchase again or supporting a product or preferred service continuously in the future, and repeating purchasing the brand regularly against the situational impact and the existing marketing attempts, which may cause a change in behavior". Kressmann et al. (2006) measured two groups of theoretical scale for loyalty to brand, namely, 'Behavioral scale' and 'Theoretical scale'. Behavioral Loyalty is described as loyalty to a trade mark through observable purchase within a period of time. Indeed, Behavioral Loyalty relates to the number and the amount of purchase; Theoretical Loyalty, on the other hand, is described based on statement of one's preferences, his commitment or the aim to purchase (Taylor, Celuch, & Goodwin, 2004). Morgan (2000) maintains that the word 'loyal' can be interpreted in different ways ranging from emotional loyalty (How do I feel?) to behavioral loyalty (Why am I loyal?). The American Marketing Association (AMA) defines loyalty to a brand as: "A privilege that a customer buys a product repetitively from the same producer instead of buying it from different producers" (p. XX). Consumers' loyalty is beneficial to a company in many different ways. Among these advantages, decrease in the expense of attracting customers, increase in payments made by a loyal consumer for a good or service, benefits gained from having a customer for a long time, positive performance through increasing the power of predicting, and increasing obstacles for the competitors can be enumerated. Loyal consumers are referred to as sort marketing agencies acting for the company (Heding et al., 2008). SEYED, AMINI, and AMINI (2010) found a positive correlation between behavioral and theoretical loyalty, and satisfaction and trusting a brand. Similarly, Singh and Sirdeshmukh (2000) proposed a model in which trust is a preliminary step for satisfaction and loyalty. Swait, Erdem, Louviere, and Dubelaar (1993), in a study on sports shoes, concluded that the expense which a consumer is willing to pay for purchasing a trademark is a tool for measuring the degree of credibility the brand has for the customer. A similar trend was observed in Sweeney and Swait's (2008) investigation which indicated that the credibility of a brand has a positive effect on loyalty. However, Amirkhani, amani, Taab, and Arjo-

madi (2012) showed contradictory results: that the credibility of a brand has no effect on loyalty. Many studies including Ghorban and Tahernejad (2012), Alam, Arshad, and Shabbir (2012), Heidarzadeh et al. (2011) and Ghorban (2012) conclude that the credibility of a brand has a positive effect on loyalty. In line with these theoretical frameworks and findings, the first hypothesis is proposed as follows: H1: The credibility of a brand significantly affects consumers' loyalty to sports products.

Nowadays, it is totally accepted that the satisfied customers are less sensitive to the price and are less affected by the competitors' attack. They also stay more loyal to the product of the company for a longer time in comparison with the unsatisfied customers. Customer satisfaction has been the strategic center of many organizations in the last two decades. Satisfaction has been described as measuring the perceived difference between the previous expectations and the real performance of the product (Heidarzadeh et al., 2011). Oliver (1997) defines satisfaction as a pleasant realization, (i.e., the consumer feels as if consumption has fulfilled a need, desire, or a goal). The high levels of general satisfaction reflect a positive reaction with regard to fulfilling the needs of the consumers through time, which ends in loyal consumers. The satisfaction of the consumer can create long-term benefits such as positive recommendation through word of mouth (WOM; reference?), mutual purchase, and the loyalty of the consumer for the company. The satisfaction of a consumer has been defined as a plausibility completion response toward the good, service, profit, or reward (Yoshida & James, 2010). Comparing expectations with perceptions leads to positive or negative disconfirmation if perceptions decrease or increase the short-term expectations, respectively. The outcome of perceptions being in line with the expectations is confirmation, and as a positive disconfirmation, it most probably will lead to satisfaction (Westerbeek & Shilbury, 2003). Studies of Sweeney and Swait (2008), Ghorban and Tahernejad (2012), Heidarzadeh et al. (2011) and Ghorban (2012) have all reported that the credibility of a brand has a positive effect on satisfaction. Similarly, Singh and Sirdeshmukh (2000) proposed a model in which reliability is an introduction to satisfaction and loyalty. In their study, Amirkhani et al. (2012), however, concluded that the credibility of a brand has no effect on satisfaction. Accordingly, the second hypothesis is proposed as follows:

H2: The credibility of the brand significantly affects customers' satisfaction with sports products.

Commitment has been conceptualized differently in sports marketing and, in general, in marketing studies, in particular. One of the triaxial models developed by Kim and Alen (1991) is continuance commitment, which relates to the sense of 'being locked' in a specific organization (J. W. Kim, James, & Kim, 2013). In many definitions, it is common that commitment is a stable or necessary factor which directs one's behavior (Engelberg, Skinner, & Zakus, 2011). Customer relationship commitment has been considered important as far as decreasing rearrangements (R. M. Morgan & Hunt, 1994), increase in one's purchase and in causing favorable tendencies such as loyalty in the future in a marketing concept are concerned. Commitment has usually been considered as a relationship booster (Heidarzadeh et al., 2011). Continuance commitment reflects a knowledgeable

assessment of the expenses when one intends to quit an organization and the recognition of the need to preserve a relationship, which includes the perceived expenses of rearrangements or the lack of an appropriate option (Sweeney & Swait, 2008). It is expected that a continuous commitment decreases switching propensity when: (a) the company is able to act its promises, and (b) when the company is able to be trusted for acting its promises. It must be mentioned that when the other conditions are stable, a brand with high credibility enjoys a higher continuous commitment compared to a brand with lower credibility (Heidarzadeh et al., 2011). Based on the outcomes of Sweeney and Swait's (2008), and Amirkhani's et al. (2012) studies, the credibility of a brand has a positive effect on continuous commitment. The third hypothesis is, thus, is formulates as follows:

Hypothesis 3: Brand credibility significantly affects consumers' continued commitment.

Cox (1967) has defined verbal advertisements in a very simple way, in which they are not more than a dialogue about products. The key factors influencing word of mouth advertisement are: (1) Personal factors including reliable resources, credibility, opinion leadership, experience, previous perceptions of the institute, (2) Interpersonal factors encompassing power requirements, (3) Message characteristics such as clarity of the message, message delivery power, nonverbal communication, and (4) Situational characteristics that comprise low risk of product/situation, low complexity of the service/multiple separate sources, receiver without information, etc. Arndt (1967) stated that verbal advertisement is a face to face across-sender-receiver communication. In this communication, the receiver receives information about a brand or a service through non-commercial channels. Three main parts of verbal communication are as follows: (1) Interpersonal communication, person to person recommendation, no use of mass communication (2) Transformation of information based on a product, brand, or service, and (3) Impartial connector or the person in touch. Word of mouth recommendation indicates a kind of behavior in which the consumer informally shares his/her experience, evaluation and recommendation of the product or service with other potential consumers. Word of mouth communication is a very influential factor affecting decision-making of consumers in terms of purchasing the goods, and usually is stronger than other methods of promoting, which can be used by marketers extensively since the personal communication is perceived as a more reliable method of impersonal information. While consumers' awareness of the product is usually enhanced by mass media, in many cases WOM is more effective in real purchase decision (Kim & Trail, 2011). The main components of WOM marketing according to the statement of the International Institution of Verbal Advertisement Marketing Association are as follows: (a) providing people with needed training regarding the products and services, (b) identifying people who we doubt to share their points of view more than other people, (c) providing mechanisms which facilitate sharing information among people, (d) Investigation and the necessary study in this field that how, where, and when people's attitudes are shared, (e) hearing the statements and points of view of supporters, slanderers, and impartial people (Jafarpishe, 2012). Sweeney and Swait (2008)

found that brand credibility has a key role in increasing word of mouth activity. A somehow similar trend was observed in the study conducted by Ghorban and Tahernejad (2012) who concluded that brand credibility has an indirect role on word of mouth. The fourth hypothesis is accordingly formulated as follows:

H4: Brand credibility significantly affects consumers' word of mouth of sports products.

In general, advertisement can have a significant effect on purchasing tendencies of consumers and their satisfaction of the products and services. Switching propensity and to suggest others to purchase stems from the theory of Social Exchange (reference). Purchasing certain brands happens due to two incentives: (1) Evaluating the benefits the customer perceives to get from this relationship, and (2) queries done by the customer about other benefits to maintain relationship in the future (reference). Marketers believe that most of the satisfied customers, if they are satisfied, may switch to a competitor brand for many different reasons. This issue depends on factors such as: sense of variety seeking, presentation of brands with higher qualities by the competitors and the customers' tastes, etc. (Amirkhani et al., 2012). Aaker (1991) considers three levels for loyalty to a brand: in the highest level, that is, level 5 the customer has a commitment to the brand; in level 4 the customer has an interest in the brand; in level 3 the behavior of the customer is satisfactory with the change in costs; in level 2 the customer has a habit of continual purchase but there is a possibility of switching propensity without any reason; and in the first level the customer is not loyal. Thus, in the first two levels of the five levels of loyalty, there is a switching propensity. Sweeney and Swait (2008) found that brand credibility has a key role in decreasing the consumers' switching propensity. Based on the theoretical frameworks states above, therefore, the fifth hypothesis predicts that:

H5: Brand credibility has a negative role on consumers' switching propensity of sports products.

To sum up, then, the proposed model for research is illustrated in Figure. 1

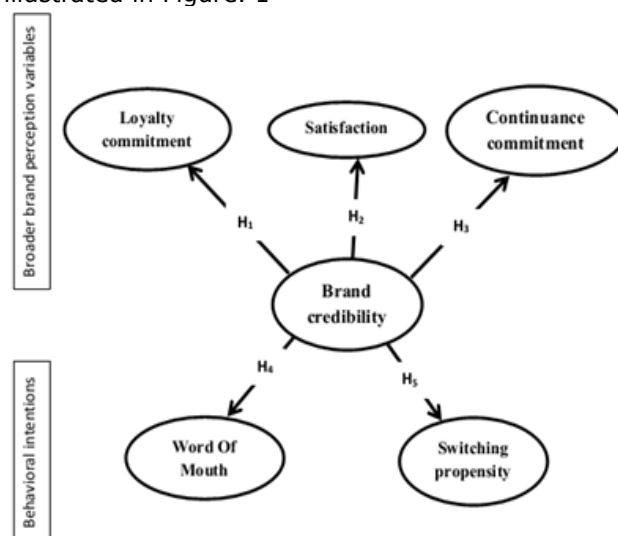


Figure 1. The Proposed Model of Study

Method

Sample

The participants of this research were the Nike sport products consumers. Since the number of the Nike brand consumers are uncertain, infinite population size was considered. To determine the sample size, the following formula was used (Johnson & Bhat-tacharyya, 1977):

$$n = \frac{(z)^2 \cdot \sigma^2}{d^2}$$

In the above formula, Z with a confidence interval of 95% is equal to 1.96 and "d" is error rate that equals .07 was considered. A pilot study (n=30 Nike sport products consumers) was executed to evaluate the sample variance and instrument reliability. Sample variance (.194) was obtained that ended in a number of 153 participants as the final sample. The 180 questionnaires distributed among consumers yielded 171 complete and appropriately responded questionnaires (i.e., 95% overall response rate). A convenience sample (N = 171) of NIKE consumers were, therefore, recruited from both men (51.5%) and women (48.5%). The participants' average age was 24.23 ($\pm$ 5.06 years). 32.2% of those over five times, 20.5% twice, 19.9% at least once, and 15.2% three times and 12.3% four times had been using the Nike sport products.

Instrument and measurements

This section describes the measurement tools used to measure each variable involved in the proposed model of the study. Loyalty commitment in this study reflects the underlying affective notion of commitment, including the desire to maintain a relationship in the future. Loyalty commitment was measured by a 6-item scale extracted from Meyer and Allen (1984). Brand credibility, representing the belief that the brand is capable and willing to act on its promises, and comprising aspects of expertise and trustworthiness, was measured based on scale used by Erdem and Swait (1998). The 5-item satisfaction measures were taken from Oliver (1997). Items for the switching propensity and word of mouth recommendations were taken from Zeithaml, Berry, and Parasuraman (1996) and Sweeney and Swait (2008) scales of behavioral intentions. All items were measured on 7-point Likert scales. The 3-item continuance commitment measures were taken from Sweeney and Swait (2008).

Data analyses

For testing the hypothesized model, a two-step approach was used. First, a confirmatory factor analysis (CFA) was performed to assess the measurement model using the EQS 6.1 statistical package. After the CFA was conducted, a general Structural Equation Modeling (SEM) technique was used to examine the structural relationships among loyalty commitment, satisfaction, switching propensity and word

of mouth constructs. For each scale, internal consistency measures (Cronbach's alpha and composite reliability) were calculated to indicate reliabilities. In addition, the average variance extracted (AVE) value was measured, which demonstrated whether each of the items contributed to the scale's underlying theoretical construct.

Results

Confirmatory Factor Analysis

Table 1 summarizes descriptive statistics, reliability estimate and CFA item statistics of the scales. The descriptive statistics showed that the skewness and kurtosis values of the 21 items were all within ± 1.00 , meeting the criteria suggested by Kline (2005): Brand credibility item skewness values ranged from -.36 to -.08 and item kurtosis ranged from -1.06 to -.49. Continuance commitment item skewness values ranged from -.16 to -.05 and item kurtosis ranged from -1.04 to -.67. Loyalty commitment item skewness values ranged from -.24 to -.11 and item kurtosis ranged from -1.04 to -.71. Satisfaction item skewness values ranged from -.50 to -.23 and item kurtosis ranged from -1.09 to -.12. Switching propensity item skewness values ranged from .08 to .37 and item kurtosis ranged from -.97 to -.88. Word of mouth item skewness values ranged from -.37 to -.26 and item kurtosis ranged from -.92 to -.90 (Table 1). For multivariate normality, Mardia's coefficient was examined in both CFA and SEM models, and its normalized estimate was higher (CFA & SEM Mardia = 50.75) than the required range of values for this indicator (-3 to +3 Bentler, 1989)). To address this departure from multivariate normality, robust analysis methods were requested through EQS, and indicators such as the Satorra Bentler χ^2 and robust statistics were examined which correct for such departures. First, CFA results indicated an adequate fit for the four factor model: Satorra Bentler χ^2 = 125.41, df = 98, $p < .05$, NFI = .96, NNFI = .99, CFI = .99, RMSEA = .041, with a 90% confidence interval between .013 and .060, satisfying the scientific criteria (Hair, 2006; Hu & Bentler, 1999; Kline, 2005). Second, reliability of the measures was evaluated by computing the average variance extracted (AVE), Cronbach's alpha and composite reliability for each construct. Internal consistency levels were acceptable, ranging from 0.75 to 0.96 ($\alpha \geq .7$; Nunnally (1978)). The results indicated acceptable levels of composite reliability for all constructs, ranging from .65 to .89. Since values exceeded the .60 cut-off point ($CR \geq .6$; Aubert, Rivard, & Patry, 1996; Bagozzi & Yi, 1988). The AVE values were all above .50, which also implied that the scales had good construct reliability, ranging from .59 to .75 (Fornell & Larcker, 1981). In this study, factor loadings of the construct indicators are all above 0.50 and representing good convergent validity for each of the construct items, ranging from .74 to .91 (Anderson & Gerbing, 1988; Bagozzi & Yi, 1988). Thus, convergent validity of the measures was achieved.

Table 1 Descriptive statistics, reliability estimate and CFA item statistics of the scales

Variables	M	SD	α	CR*	AVE	SKEWNESS	KURTOSIS	FACTOR LOADING
Brand credibility	4.25	1.21	.96	.89	.71			
Bc1	4.29	1.28				-.36	-.49	.81
Bc2	4.17	1.36				-.08	-.83	.82
Bc3	4.30	1.48				-.11	-1.06	.88
Bc4	4.33	1.47				-.30	-.84	.87
Bc5	4.12	1.34				-.13	-.77	.81
Bc6	4.29	1.42				-.33	-.84	.86
Continuance commitment	3.80	1.40	.87	.82	.75			
Cc1	3.84	1.53				-.16	-.67	.87
Cc2	3.81	1.51				-.12	-1.04	.87
Cc3	3.75	1.59				-.05	-.86	.86
Loyalty commitment	4.14	1.35	.96	.88	.72			
LC1	4.37	1.31				-.18	-.72	.83
LC2	4.30	1.38				-.14	-1.02	.82
LC3	4.00	1.58				-.11	-.83	.88
LC4	4.03	1.74				-.15	-1.04	.89
LC5	4.05	1.64				-.19	-.85	.86
LC6	4.08	1.60				-.24	-.79	.81
Satisfaction	4.03	1.43	.92	.88	.75			
Sa1	4.09	1.65				-.50	-.95	.89
Sa2	3.96	1.59				-.29	-.85	.90
Sa3	4.09	1.70				-.42	-1.09	.89
Sa4	4.23	1.62				-.49	-1.01	.91
Sa5	3.77	1.41				-.23	-.12	.74
Switching propensity	3.90	1.27	.75	.65	.59			
Sp1	3.87	1.54				.37	-.97	.76
Sp2	3.93	1.29				.08	-.88	.78
Word of mouth	4.12	1.49	.90	.82	.75			
Wm1	4.30	1.69				-.32	-.92	.84
Wm2	4.04	1.54				-.37	-.91	.89
Wm3	4.03	1.68				-.26	-.90	.86

Note: * composite reliability

Structural Equation Modeling

The results of the proposed model revealed an excellent fit of the model to the data. The fit indices were as follows: Satorra Bentler $\chi^2 = 536.07$, $df = 270$, $p < .05$, $NFI = .89$, $NNFI = .93$, $CFI = .94$, $RMSEA = .076$ (with the 90% confidence interval .066 to .085). As can be observed in Figure 2, the model results support all of the five hypotheses. Brand credibility was found to significantly influence loyalty commitment ($\beta = .90$, $p < .05$; H1 supported), satisfaction ($\beta = .77$, $p < .05$; H2 supported), continuance commitment ($\beta = .74$, $p < .05$; H3 supported), word of mouth ($\beta = .92$, $p < .05$; H4 supported) and switching propensity ($\beta = -.77$, $p < .05$; H5 supported).



Figure 2. Standardized Weights for the Structural Model

Discussion and conclusion

Nowadays, most of the companies come to believe that brands of the products and their services are their most valuable assets. In today's complex and challenging world, all of us, either individually or as business managers, face an increase in options and decrease in time for making decisions and choices. Accordingly, the role of brands in simplifying customer decisions, reducing risk and defining their expectations is invaluable. One of the duties of senior management of each organization is to build strong and powerful brands that not only act their promises and commitments, but also improve and enhance their capabilities over time (Keller, 2008). Brands are like floating icebergs that the small and visible part of them which is above the water represents things that are linked with brands over time. However, the invisible massive and important part which is under water implies the power of brand. The purpose of this study was to investigate the effect of brand credibility on brand perception variables including, satisfaction, continuous commitment, and brand loyalty.

According to results of the study, brand credibility had a significantly direct effect on loyalty. The outcomes are in line with Sweeney and Swait (2008), Ghorban and Tahernejad (2012), Ghorban (2012), and Heidarzadeh et al. (2011) who reported the same findings. However, these findings are in contrast with the findings of Amirkhani et al. (2012) who suggested that brand credibility did not have a significant effect on consumer loyalty. Levin, Beasley, and Gamble (2004) believed that brand loyalty is not just continuous purchasing of products, but a deep commitment to repurchase. In other words, if customers are loyal to a brand, they are likely to pay higher prices for it and the effect of marketing programs on them will be stronger; accordingly, companies will achieve a sustainable competitive advantage. Therefore, building and maintaining the value of a reputable brand name is one of the ways of increasing customer loyalty.

In addition, results indicated that brand credibility had significantly positive effect on continuous commitment, this, corroborates with the findings of Sweeney and Swait (2008), Ghorban (2012), (Amirkhani et al., 2012), and Heidarzadeh et al. (2011) who considered commitment as a necessity in strengthening the relationship and as a marketing concept. It is thought that commitment increases favorable behaviors like loyalty in future. Thus, based on the findings, brands with high reputation encompass higher levels of commitment.

Given the high levels of satisfaction, a positive reaction is reflected towards meeting customer needs over time, which in turn, leads to customer loyalty. Findings of the current study also verified that consumers' satisfaction had a positive effect on brand loyalty. These findings are in accordance with the study of SEYED et al. (2010) who reported that attitudinal and behavioral loyalty affect satisfaction. Consumer loyalty leads to satisfaction and the motivation that have been the strategic focus of many companies in the last two decades.

Oliver (1997) defined satisfaction as a pleasurable fulfillment. That is, the customer senses that consumption fulfills some need, desire, goal, or so forth and that this fulfillment is pleasurable. Customer's support of marketing processes by means of author-

ity that they have in giving a high credit to a brand can be helpful. Findings of some studies also confirm this and mention that brand credibility has a significant positive effect on customer satisfaction. These findings are in agreement with Sweeney and Swait (2008), Ghorban and Tahernejad (2012), Ghorban (2012), Heidarzadeh et al. (2011), however they do not confirm the findings of Amirkhani et al. (2012). Findings, furthermore, showed brand credibility had a significant positive effect on verbal advice; this positive effect is in accordance with findings of Sweeney and Swait (2008). This effect is also observed in findings of Ghorban and Tahernejad (2012), although Ghorban and Tahernejad (2012) reported that credibility had an indirect effect on verbal advice and its effect was the result of certain other variables, such as But, the current study investigated the effect of brand credibility on word-of-mouth. Credibility of a brand refers to the perceived trust in the capabilities and desire to continuously deliver what has been promised. So, it is expected that based on brand credibility and customer's trust in this continuity, customers will verbally advise brands to others – a point that the findings of this study confirm.

Brand credibility, moreover, turned out to have a significant negative effect on switching propensity. This finding supports Sweeney and Swait (2008) who found that brand credibility had a crucial role in reducing consumers' switching propensity. Brand credibility represents the summary of brand-to-consumer and consumer-to-brand communication over time because consumers can have a relationship with the brand; in the meantime, brands create a close relationship with the consumer. For companies, a credible brand means that marketing efforts would be more economical as a result of the increase in the acceptability of the messages. As a consequence, company sales increase due to the growth in customer's visit and repurchasing of the products. Desire to change the brand unlike desire to repurchase – which is another perception variable – does not have a direct effect on priorities and indicators of decision making. According to the marketers, most of the satisfied consumers, in spite of their satisfaction, can switch to the rival brands for no reason.

Brand credibility consists of two main components: trustworthiness and expertise. Trustworthiness refers to the willingness of companies in acting what they have promised. Expertise refers to a company's ability in acting what they have promised. This concept indicates consumer-to-brand and brand-to-consumer communication. As mentioned before, brand credibility represents the summary of brand-to-consumer and consumer-to-brand communication over time. Based on these findings, therefore, sporting goods manufacturers should attempt to build and stabilize a proper understanding of trademarks in consumers' minds. In this regard, factors that strengthen loyalty, continuous commitment and satisfaction of consumers should be improved and the facts that undermine them should be avoided. The proposed research model illustrated through Figure 1 illustrates all these factors.

Sporting goods marketers, by using brand credibility, thus, should focus on strengthening the brand perception. Behavior of a consumer who is looking for brand credibility is affected by social motives and self-expression. Although the potential impact of

verbal advertisement /WOM and its value for a company is of utmost importance, it is difficult to manage verbal advertisement and to identify the signs and opportunities for companies or organizations in a non-official channel. Managers should seek the ways to stimulate positive verbal advice and expand or develop the steps that reduce negative verbal advice and its effect.

In order to build brand credibility among consumers, the following recommendations are suggested to managers and sport marketers: (1) Make sure that their organization's (company's) products and services are good and are beneficial for the consum-

ers, (2) make sure that consumers' experience of the products or services over time is positive, (3) make sure of the regular and continuous satisfaction of the consumer, (4) Make sure that they do not just rely on previous experiences, (5) make sure that their brand acts the promises made to consumers, (6) provide evidence of the benefits delivered in the form of facts or figures, so as to develop trust in consumers, prompt word of mouth marketing (verbal advice) where satisfied consumers talk appropriately about you (organization/company) officially or non-officially

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UTJECAJ KREDIBILITETA BRENDU NA PREDODŽBU POTROŠAČA O BRENDU I NJIHOVOG KUPOVNOG PONAŠANJA U SPORTSKIM DOBRIMA

Sažetak

Ova studija je pokušaj istraživanja učinka brand kredibiliteta na zadovoljstvo, odanost kontinuiranih potrošača i lojalnosti brandu. Glavni uzorak ovog opisnog istraživanja sastoji se od potrošača Nike-Sportproizvoda (N = 171), odabranih kroz postupke praktičnog uzorkovanja. Izlazi se odnose na odnos između varijabli dobivenih pomoću standarda kakvoće 6.1 i statistike Structural Equation Modeling pokazuju da je predloženi dijagram model bio pravilno zamišljen. Drugim riječima, dobiveni podaci dobro opisuju predloženi modela. Rezultati su pokazali da brand kredibilitet značajno utječe na percepciju potrošača o brandu i njihovo kupovno ponašanje. U skladu s tim, preporučuje se da se stvaraju pozitivne slike o sportskim proizvodima tvrtke u svijesti njihovih kasnijih kupaca.

Ključne riječi: brand, kredibilitet, zadovoljstvo, posvećenost, odanost

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EFFECTS OF TRAINING OF ISOKINETIC POTENTIALS OF DYNAMIC KNEE STABILIZERS OF FOOTBALL PLAYERS

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Abstract

Abilities of strong and coordinated performance are important and necessary for function of all football activities. Verhejn (1997) states that footballers need strength for everything they do. Modern football demands of a player proportional development of all muscle body areas through integration of training of strength into one complete training. Problem of the research is determining the effect of programmed training of isokinetic potentials of dynamic stabilizers in footballers, with the goal of integrating training contents into complete sport preparation of a footballer. Sample subjects used in research are junior footballers (U-18) of quality junior league of B&H in competition; season 2010/ 2011. There were 20 subjects altogether. Criteria was: 15 played games in the last season, participation in training of at least 80% in the last season and at least 4 years of experience in playing football. Biodex Isokinetic System is used for testing strong potentials of footballers (speed 60 °/s). Initial and final testing was performed. Between tests there was programmed training process of strength of dynamic knee stabilizers (12 weeks). 36 training programmed stimulus (3 training stimulus a week) were performed in the introductory preparation part of training. Structure of programmed exercises was consisted of: squats, lunge, duels, pushing, jumps, short sprints and endurance. Functional exercises of strength were used and as they developed, they progressed into exercises for specific situations. Determining quantity differences between initial and final measurement was performed by T-test for dependent samples. Treated variables which include muscle potential of knee extensor and knee flexor: EXTLEF60 - max. torque of knee extensor of the left leg; EXTRIG60 - max. Torque of knee extensor of the right leg; EXTWLF60 - complete work of knee extensors of left leg; EXTWRG60 - complete work of knee extensors of right leg; AVGPFLF60 - average strength of knee extensor of left leg; AVGPERG60 - average strength of knee extensor of right leg; FLXLEF60 - max. Torque of knee flexor of left leg; FLXRIG60 - max. Torque of knee flexor of right leg; FLXTWLF60 - complete work of knee flexor of left leg; FXTWRG60 - complete movement of knee flexor of right leg; AVGPFLF60 - average strength of knee flexor of left leg; AVGPFRG60 - average strength of knee flexor of right leg. Research results have shown statistically significant differences between initial and final measurement ($p < 0.05$) in favour of final measurement. Research shows that using exercises and movements based on your own body weight (squats, lunge, duels, sprints, jumps, pushing, endurance) which are specific for football, led by adequate distribution of physical burden and certain periods of time, improve strength performance without disturbing football performance. We need to look for reasons in adequate functional exercises, which in progress, turned into exercises for specific situations. Generally saying, it is necessary to find compatibility in exercise and situational performance and to try to accomplish multiple effects with one exercise.

Key words: effects, isokinetics, football, knee stabilizers, training

Introduction

Football contains different forms of movement of cyclic and acyclic type like: running, stopping, rotation, jumps, falls, quick stand up, throwing, shooting, pushing (Rađo i Talović, 2003). Poly structural football movements are performed depending on situation in the game and in the different intensity, rhythm and duration on the purpose of offence and defense actions. Abilities of strong and coordinated performance are important and necessary for function of all football activities. Modern football demands of a player proportional development of all muscle body areas through integration of training of strength into one complete training. Verhejn (1997) states that footballers need strength for everything they do. Footballer is always on the move. He runs 10km during the game and needs to carry his body weight from one part of the field to another. Many sprints he performs ask for special consumption of energy. What makes football tiring are all kinds of activities that consume a lot of energy that come one after another quickly or they sometimes overlap. Sprint can follow after jump, and it can finish with sliding start, shooting or passing.

Problem and aim

Problem of the research is determining the effect of programmed training of isokinetic potentials of dynamic stabilizers in footballers, with the goal of integrating training contents into complete sport preparation of a footballer.

Methods

Sample subjects used in research are junior footballers (U-18) of quality junior league of B&H in competition; season 2010/ 2011. There were 20 subjects altogether. Criteria was: 15 played games in the last season, participation in training of at least 80% in the last season and at least 4 years of experience in playing football. Biodex Isokinetic System is used for testing strong potentials of footballers (speed 60 °/s). Initial and final testing was performed. Between tests there was programmed training process of strength of dynamic knee stabilizers (12 weeks). 36 training programmed stimulus (3 training stimulus a week) were performed in the introductory preparation part of training. Determining quantity

differences between initial and final measurement was performed by T-test for dependent samples. Treated variables which include muscle potential of knee extensor and knee flexor: EXTLEF60 - max. torque of knee extensor of the left leg ; EXTRIG60 - max. Torque of knee extensor of the right leg; EXTWLF60 – complete work of knee extensors of left leg; EXTWRG60 – complete work of knee extensors of right leg ; AVGPFLF60 – average strength of knee extensor of left leg; AVGPERG60 - average strength of knee extensor of right leg; FLXLEF60 - max. Torque of knee flexor of left leg; FLXRIG60 - max. Torque of knee flexor of right leg; FLXTWLF60 – complete work of knee flexor of left leg; FLXTWRG60 – complete movement of knee flexor of right leg; AVGPFLF60 - average strength of knee flexor of left leg; AVGPFRG60 – average strength of knee flexor of right leg.

Description of training programmed contents 36 training stimulus of training program in period of competition were carried out. Structure of programmed exercises was consisted of: squats, lunge, duels, pushing, jumps, short sprints and endurance. Complete program is carried out on a football field without disturbing context of football training. Functional exercises of strength were used and as they developed, they progressed into exercises for specific situations. Program is carried out along with warm-up in introductory part of training. Training program was conceptualized so that it doesn't disturb coach's plans and it fits in the schedule. Distribution of physical burden was adequate within the training and within weekly micro cycles. Performance of training program of strength of dynamic knee stabilizers was carried out with a constant feedback from players and coach. Program contents were functional, stimulant, motivational and the distribution of physical burden was adjusted to the upcoming games.

Table 1. General information about program

Content	Numeric means
Program duration	12 weeks
Part of training in which program was carried out	Introductory part of training
Frequency of weekly trainings	3
Duration of program content within training	20 – 30 min.

Table 3. Results of T-test for dependent samples

TABLE OF RESULTS OF T-TEST FOR DEPENDENT SAMPLES										
Variables	Paired Differences					95% Confidence Interval of the Difference	t	df	S i g . (2-tailed)	
	Mean	Std. tion	Devia- tion	Std. Mean	Error					
										Lower
EXTLEF60	-970.476	1.199.773		261.812		-1.516.606	-424.346	-3.707	20	.001
EXTRIG60	-1.330.952	1.825.930		398.451		-2.162.106	-499.799	-3.340	20	.003
EXTWLF60	-1.480.476	5.476.334		1.195.034		-3.973.274	1.012.321	-1.239	20	.230
EXTWRG60	-3.134.286	5.965.861		1.301.858		-5.849.913	-418.658	-2.408	20	.026
AVGPFLF60	-987.143	1.386.388		302.535		-1.618.219	-356.067	-3.263	20	.004
AVGPERG60	-1.383.333	1.932.145		421.629		-2.262.835	-503.832	-3.281	20	.004
FLXLEF60	-935.238	1.281.740		279.698		-1.518.679	-351.797	-3.344	20	.003
FLXRIG60	-773.333	1.841.386		401.823		-1.611.522	.64856	-1.925	20	.069
FLXTWLF60	-4.128.095	5.511.324		1.202.670		-6.636.820	-1.619.370	-3.432	20	.003

Table 2. program content

Content of implemented program
Deep squat
Half squat endurance
Lunge and return in initial position
Endurance in lunge
lunge position and return into outstretched position of stepped out leg
lunge upfront from half squat, movement in that position 8 to 10 m.
Step back in position of split legs, sit on one leg
Endurance in position of split legs
Step forward with a squat
Endurance in step back
Half squat on one leg
Half squat endurance D/L (arms upfront in the chest range, lower back tight)
Half squat endurance, maksimum running 10 m
Pair work , 1 against 1, pushing in movement
Long jump, rotating, running 10 m
Pair work, 1 against 1, possession, holding the ball with blocking the ball

Results

Research results have shown statistically significant differences between initial and final measurement ($p < 0.05$) in favour of final measurement. Quantity statistically significant changes in univariate level occurred at variables of maximum torque of extensor of right and left leg (EXTLEF60_F), (EXTRIG60_F), then in complete work in strength of extensor of right leg (EXTWRG60_F), and maximum torque of flexors of left leg (FLXLEF60_F). Significant training effects manifested through statistically significant changes are present in abilities of complete work, strength of flexors of right and left leg (FLXTWRG60_F), (FLXTWLF60_F). Also the average strength of both flexors and extensors of both legs (AVGPFRG60_F), (AVGPFLF60_F), AVGPFLF60_F, (AVGPERG60_F) has changed.

FLXTWRG60	-4.326.190	7.142.308	1.558.579	-7.577.330	-1.075.051	-2.776	20	.012
AVGPFLF60	-1.382.857	1.135.659	247.821	-1.899.803	-865.911	-5.580	20	.000
AVGPFRG60	-1.438.095	1.782.071	388.880	-2.249.284	-626.906	-3.698	20	.001

Discussion

Significance of strength in football is unquestionable. It is manifested in all football movements, to smaller or bigger extend, and it is connected with other abilities. Footballer needs to possess strength and endurance in shooting, jump and technical performance. Komes, (2004) notes that in a typical game, professional footballer spends : 17% standing, 47% in offence, 16% slowly running, 23% running with mid intensity and 2% in minimum sprint of total time. Continued action between two half-terms lasts for 7 sec. In average game, player possesses the ball for about 2 min. Despite the fact that, during the game, almost 50% of the time player spends by walking or standing, he crosses over 10km. If the game, in which speed, explosiveness and skills of performing complex actions dominate, is analyzed from biomechanical point of view, we can single out around 300 movements. Because of everything mentioned above functional work on strength is very important. Strength, coordinated with precise movements, is very important for the footballer and it helps him in his performance. Every football activity is connected to making appropriate decisions which goal is to have performance according to situation and the result at the end. This fact is a condition and a base for improvement of all football performances, as well as strength of dynamic knee stabilizers. It stimulates, develops and maintains integral performance in specific situations. Mihačić, Ujević, Sporiš and Kubla (2005) note that trainings of speed strength are performed with and without the ball, in order to be as similar as possible to the real football situation. Rak and Čustonja (2006) note that training of strength is powerful instrument only if it is applied in the right way.

It is obvious that training process of strength of dynamic knee stabilizers has produced the results, effects and made quality changes .

According to conclusions of authors Jukić, Milanović, Šimek, Bašić (2005) leading questions in theory and method of modeling training operators and individual trainings are connected to the duration of breaks and its work regime. The need for determining optimal duration of the break is connected to the need for ensuring enough time for energy recovery and recovery of neural and muscle function, which are responsible for repetition of certain training and competition activity, and for removing metabolites, which are results of distribution of physical burden which lead to stormy functional and biochemical reactions.

Exercises are conceptualized through basic static and dynamic exercises and through specific and pre-

tending exercises. It was always intended to make a line from basic exercises to football movement, or to try to „sneak“ strength exercises into football performance and tasks which would be motivating and functional. The goal was to conceive programs that would be functional and from which brain and the muscle would benefit. Everything was carried out on the field in accordance to period and schedule of competition and other training factors. Simply, functional strength in football is necessary because we need to be able to manipulate our body, in time and space, controlling the ball, opponents and situations on the field. Analysis of the competition leads to the need for strength. Functional strength of footballer can be seen through movement, sprint, jump, stopping, sliding, shooting, throwing, blocking, change of direction etc. Here we can see different types of strength, but they have one thing in common; they are subordinate to functional performance. That shows combination of all other abilities and leads to integrate approach to training. And that was the goal of this program. Although title of the program relates to dynamic knee stabilizers, exercises presented here are created in such manner that they affect other parts of the body, because that is necessary for competition. Sporiš, Mihačić i Kubla (2008) point out that muscle strength within the leg also needs to be balanced. As a general rule, strength of the back of the leg needs to be equal to quadriceps at least 70%. Strength of stomach and strength of back need to be in correlation . Having in mind that such imbalance can occur, prevention needs to be done. Footballers have tendency to use their „stronger“ side. They turn to that side, or jump on the same leg.

We need to have in mind that football is a sport of timing and collaboration and that success is a result of team work. Many contents of strength exercises are performed with the ball at the end, thanks to collaboration.

Conclusion

Research shows that using exercises and movements based on your own body weight (squats, lunge, duels, sprints, jumps, pushing, endurance) which are specific for football, led by adequate distribution of physical burden and certain periods of time , improve strength performance without disturbing football performance. We need to look for reasons in adequate functional exercises, which in progress, turned into exercises for specific situations. Generally saying, it is necessary to find compatibility in exercise and situational performance and to try to accomplish multiple effects with one exercise.

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EFEKTI TRENINGA IZOKINETIČKIH POTENCIJALA DINAMIČKIH STABILIZATORA KOLJENA NOGOMETAŠA

Sažetak

Sposobnosti snažne i koordinirane izvedbe su neophodne i važne u funkciji svih nogometnih aktivnosti. Verheijn (1997) navodi da je fudbalerima snaga potrebna za sve što rade. Moderni nogomet zahtjeva od igrača proporcionalnu razvijenost svih mišićnih regija tijela kroz integraciju treninga snage u jedan kompletan trening. Problem istraživanja je utvrđivanje efekata programiranog treninga izokinetičkih potencijala dinamičkih stabilizatora koljena nogometaša, s ciljem integracije tretiranih sadržaja u ukupnu sportsku pripremu nogometaša. Uzorak ispitanika su nogometaši juniorskog uzrasta (U-18) kvalitene juniorske lige BiH u takmičarskom dijelu sezone 2010/2011, ukupno 20 ispitanika. Kriteriji su bili najmanje 15 odigranih utakmica u protekloj sezoni, učešće na barem 80% treninga u prethodnoj sezoni, najmanje 4 godina nogometnog iskustva. Za testiranje snažnih potencijala nogometaša korišten je Biodex Isokinetic Sistem (brzina 60 %/s). Vršeno je inicijalno i finalno testiranje. Između testiranja sproveden je programirani trenažni proces snage dinamičkih stabilizatora koljena (12 sedmica). Realiziralo se 36 trenažnih programskih podražaja (3 trenažna podražaja semično) u uvodno-pripremnom dijelu treninga. Struktura programiranih vježbi su činili: čučnjevi, iskoraci, dueli, guranja, skokovi, kratki sprintevi, izdržaji. Koristile su se funkcionalne vježbe snage nogometaša koje su se u progresiji pretvarale specifično situacijske vježbe. Utvrđivanje kvantitativnih razlika između inicijalnog i finalnog mjerenja vršeno je T- testom za zavisne uzorke. Varijable koje tretirane obuhvataju mišićni potencijal ekstenzora i fleksora koljena: EXTLEF60 - max. moment sile ekstenzora koljena lijeve noge; EXTRIG60 - max. moment sile ekstenzora koljena desne noge; EXTWLF60 - ukupan rad ekstenzora koljena lijeve noge; EXTWRG60 - ukupan rad ekstenzora koljena desne noge; AVGPFLF60 - prosječna snaga ekstenzora koljena lijeve noge; AVGPFRG60 - prosječna snaga ekstenzora koljena desne noge; FLXLEF60 - max. moment sile fleksora koljena lijeve noge; FLXRIG60 - max. moment sile fleksora koljena desne noge; FLXTWLF60 - ukupan rad fleksora koljena lijeve noge; FXTWRG60 - ukupan rad fleksora koljena desne noge; AVGPFLF60 - prosječna snaga fleksora koljena lijeve noge; AVGPFRG60 - prosječna snaga fleksora koljena desne noge. Rezultati istraživanja su pokazali statistički značajne razlike između inicijalnog i finalnog mjerenja ($p < 0.05$) u korist finalnog mjerenja. Istraživanje pokazuje da korištenje vježbi i kretnji s vlastitom težinom (čučnjevi, iskoraci, dueli, guranja, skokovi, sprintevi, izdržaji) specifičnih za nogomet, vođeni adekvatnom distribucijom opterećenja i periodizacijom, učinkovito unapređuju performanse snage ne remeteći nogometnu izvedbu. Razloge trebamo tražiti u primjerenim funkcionalnim vježbama koje su se u progresiji pretvarale u specifično situacijske vježbe. U osnovi neophodno je nastojati pronaći kompatibilnost vježbe i situacijske izvedbe, jednom vježbom nastojati ostvarivati višestruke efekte.

Cljučne riječi: efekti, izokinetika, nogomet, stabilizatori koljena, trening

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DIFFERENCES IN FUNCTIONAL AND MOTOR POTENTIAL OF YOUNG FOOTBALL PLAYERS IN DIFFERENT LEVELS OF COMPETITION

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Abstract

Football contains all forms of movement like running, stopping, rotation, jumps, falls, throwing, pushing, which develop in different intensity, rhythm, and duration, for the purpose of defense and offense (Alić & Rado, 2009). During the game, football players perform different movements without the ball and the intervals of high and low intensity rotate (Verheijen, 1997). It is perfectly understandable that professional and amateur football are not on the same level of performance and quality. It is expected that there are differences between young competitors in different levels of competition. The aim of the research is to determine and analyze differences in functional and motor potential of young football players on different levels of competition. Sample subjects used in research are junior football players (U-19), three (3) clubs of Quality junior league of Bosnia and Herzegovina, N=60 respondents; and football players (U-19) N=60, three (3) clubs of Entity junior league. That is 120 respondents altogether for the first and the second part of the competition. Sample of variables that are used contain area of agility MA93639 - agility 93639, MAILINO - Illinois test, MACC - slalom running (zigzag). Tests : MBRZ5 - Sprint 5 m, MBRZ10 - Sprint 10 m, MBRZ20 - Sprint 20 m are used for assessment of explosive endurance of type of sprint. Variables for assessment of explosive endurance of type of jump: MSD - Long jumping, MSV - High jump, MSS - high jumping after drop jumps. Tests for assessment of flexibility : MFLZL - Adduction while lying in prone position, MFLPL - Abduction while lying in supine position, MFLOL - abduction while lying on the side and test for indirect assessment of relative VO2 max. BEEP - beep test, FMAXVO2 max - ml/kg/min. Instrumentarium for photo cells is used for variables treated for time measurement. Determination of differences between levels of competition was performed by univariate analysis of variance. (ANOVA). Research results have shown statistically significant differences between the first and the second level of competition ($p < 0.05$), where the young football players of the first level have shown higher level of functional and motor potential. Analyzing results and having insight in all levels and conditions of young players of the first and second level of the competition, there is a conclusion that the first level, as expected, has higher functional and motor potential. Quality selection, higher demands of the competition and more organized technology of training process are assumingly reasons for domination of the first level of competition.

Key words: differences, football, functional and motor potential, levels

Introduction

Football contains all forms of movement like running, stopping, rotation, jumps, falls, throwing, pushing, which develop in different intensity, rhythm, and duration, for the purpose of defense and offense (Alić & Rado, 2009).

During the game, football players perform different movements without the ball and the intervals of high and low intensity rotate (Verheijen, 1997). It is perfectly understandable that professional and amateur football are not on the same level of performance and quality. There are differences in leagues based on level and gradation of competition. It is expected that there are differences between young competitors in different levels of competition. Player's quality and training condition is determined by diagnostic procedures, through testing. Sporiš & others. (2007) point out that tests are the base of planning of training process. Program is created according to current condition of players and desired condition of their training. Diagnostic procedures are precisely used to determine differences between levels of competition.

Problem and aim

The aim of the research is to determine and analyze differences in functional and motor potential of young football players on different levels of competition.

Methods

Sample subjects used in research are junior football players (U-19), three (3) clubs of Quality junior league of Bosnia and Herzegovina, N=60 respondents; and football players (U-19) N=60, three (3) clubs of Entity junior league. That is 120 respondents altogether for the first and the second part of the competition.

Sample of variables that are used contain area of agility MA93639 - agility 93639, MAILINO - Illinois test, MACC - slalom running (zigzag). Tests : MBRZ5 - Sprint 5 m, MBRZ10 - Sprint 10 m, MBRZ20 - Sprint 20 m are used for assessment of explosive endurance of type of sprint. Variables for assessment of explosive endurance of type of jump: MSD - Long jumping, MSV - High jump, MSS - high jumping after drop jumps. Tests for assessment of flexibility : MFLZL - Adduction while lying in prone position, MFLPL - Abduction while lying in supine position, MFLOL - abduction while lying on the side, and test for indirect assessment of relative VO2 max. BEEP - beep test, FMAXVO2 max - ml/kg/min. Instrumentarium for photo cells is used for variables treated for time measurement. Determination of differences between levels of competition was performed by univariate analysis of variance. (ANOVA).

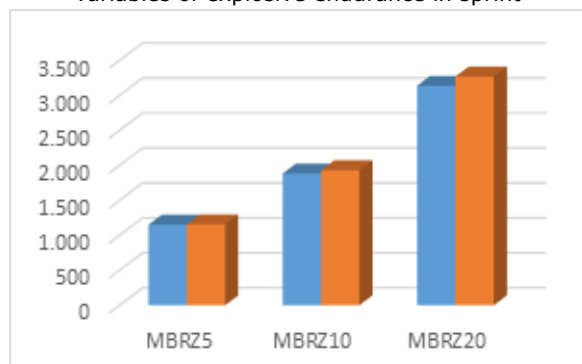
Results

Table 1 shows quantity differences of univariate analysis of variance between the first and the second level of competition in the area of motor and functional potentials. Results show obvious superiority of the first level of the competition. Almost all variables of motor and functional potential show the significance in favour of the first level of competition. The only variable which doesn't show statistically significant differences is speed at 5 meters (MBRZ5).

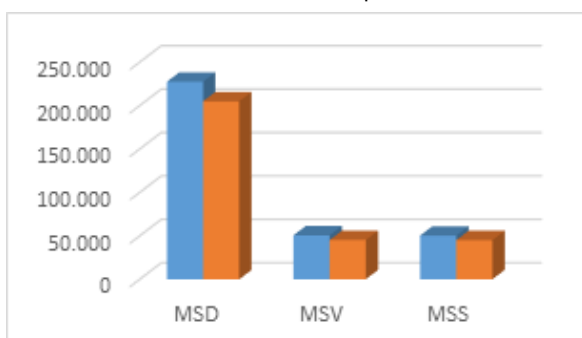
Table 1. Quantity difference in univariate level of variables of motor and functional abilities of the first and the second level of competition

Tests of Equality of Group Means					
Variables	Wilks' Lambda	F	df1	df2	Sig.
MBRZ5	.996	.598	1	153	.440
MBRZ10	.869	23.138	1	153	.000
MBRZ20	.633	88.710	1	153	.000
MSD	.562	119.417	1	153	.000
MSV	.737	54.723	1	153	.000
MSS	.747	51.697	1	153	.000
MFLZL	.854	26.106	1	153	.000
MFLPL	.842	28.664	1	153	.000
MFLLOL	.950	8.005	1	153	.005
MA93639	.706	63.634	1	153	.000
MAILINO	.615	95.752	1	153	.000
MACC	.595	104.315	1	153	.000
FMAXVO2	.878	21.179	1	153	.000

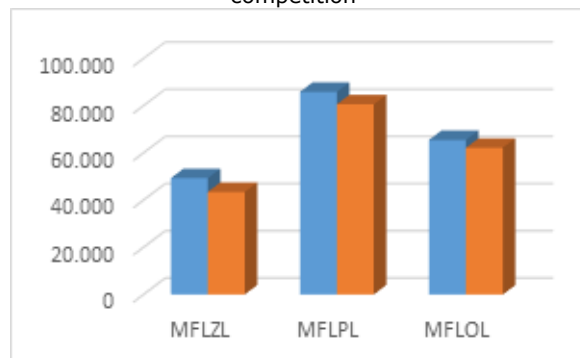
Graphs 1. Quantity differences in arithmetic means of variables of explosive endurance in sprint



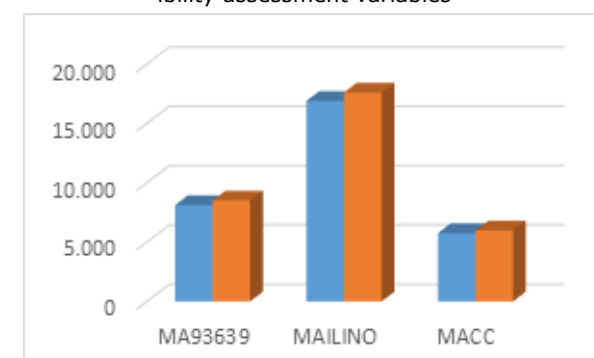
Graphs 2. Variables of endurance in jump of the first and second level of competition



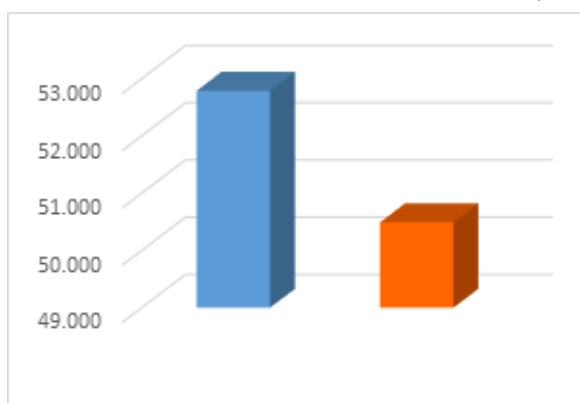
Graph 3. Agility of the first and the second level of competition



Graph 4. Quantity differences in arithmetic means of flexibility assessment variables



Graph 5. quantity differences in arithmetic means of variables for assessment of maximum oxygen uptake VO2 max. of the first and the second level of comp



Discussion

Analyzing results, obtained from determining differences in area of motor and functional potentials, in sense of quantity, it is noticed that the first level of competition is more superior to the second level. Hierarchy logic of different levels of competition is always directed in favour of higher level of competition because higher level of competition demands higher quality. Research results have shown statistically significant differences between the first and the second level of competition ($p < 0.05$), where the young football players of the first level have shown higher level of functional and motor potential. Results have shown domination in almost every included variable. Generally saying, the first and the second level of the competition are not the same in terms of performance demands, which continuously reflects

treated abilities in this research. Differences in different levels of competition are confirmed (Verheijen, 1997;20 08) in dutch league where the games of all different levels of competition (professional, amateur, advanced juniors) have been monitored. Football players in lower levels have less running, more walking and stops. In lower levels intensity drops and the game tempo is slower. The first level of the competition is the most demanding level of the competition in Bosnia and Herzegovina, which requires organized and structured training activity. It is clear that analysis of structure of movement in football, from biomechanics, structural and anatomic point of view is the same whether it is amateur or professional football. But the tempo, speed and intensity of performance of those acyclic movements are not the same. If total number of movement structure of players on a field is divided then 55-60% goes on running and walking, 20-25% passing the ball and goal shots 12-14% receiving the ball, 8-10% dribbling, 4-6% stealing the ball. When analyzing running, 10%, goes on start running, around 20% on fast running, around 40% on slow running and around 30% on walking (Dujmović, 2000). Physical demands of football increase as the level of competition increases. On higher levels of the game, distance is crossed by running and sprints. Verheijen (1997) displays and notes that difference between professional and amateur football is in the amount of high intense actions. Football of lower levels is performed with less high intense actions. Regardless of game levels there is visible drop of sprints in the second half-time. However that drop is the lowest with the professional players because of their higher level of trainings, while in others drop decreases in gradation, sprint drops are bigger and bigger. If we compare running and sprints of young players (age 17-18) and professional players we would notice that there aren't visible differences in running but the difference in number of sprints is evident. Young players sprint less. This also applies to short and long sprints, especially in the second half-time. It can be concluded that difference between levels isn't in the amount of running but in the number of sprints. Sprints alone, without understanding the

game and reacting according to game situation, don't have complete efficiency. Apart from speed of the sprint, things that influence on sprint, during the football actions, are place of performance, moment and direction of the sprint. Otherwise, the player who trains faster and more frequent sprint performance would automatically play in higher level. (Verheijen, 2008).

The important segments for the football performance are functional potentials. Football is dominant aerobic- anaerobic sport (Bangsbo, 1994). In this research, differences have been monitored in that segment too (FMAXVO2). Differences were displayed in favour of the first level. Alić (2008), researching differences among 5 leagues/levels of competition of seniors in Bosnia and Herzegovina, notes statistically significant differences in the area of functional abilities in favour of level according to gradation of the competition.

Monitoring profiles of 16 young elite players, authors Wong del P and Wong SH (2009) found height : 173+/-5.2 cm, weight : 64.2+/-8.1 kg and age : 16.2+/-0.6. They tested maximal vertical jump, isokinetic performance of knee cap on corner speed from 60, 120, 180, and 300 degrees, maximum oxygen consumption (VO2max), 1 maximum repetition (1RM), endurance test and 30min sprint. Compared to European and African players Asian players have lower jump height and lower body height. They also have lower efficiency effect in isokinetic potential of endurance of quadriceps and legs (especially in great speed), VO2max, 1RM endurance test and sprint.

Conclusion

Analyzing results and having insight in all levels and conditions of young players of the first and second level of the competition, there is a conclusion that the first level, as expected, has higher functional and motor potential. Quality selection, higher demands of the competition and more organized technology of training process are assumingly reasons for domination of the first level of competition.

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RAZLIKE U FUNKCIONALNOM I MOTORIČKOM POTENCIJALU MLADIH NOGOMETAŠA RAZLIČITOG NIVOA TAKMIČENJA

Sažetak

Nogomet sadži sve oblike kretanja poput trčanja, zaustavljanja, okreta, skokova, padova, bacanja, guranja, koji se odvijaju u različitom intenzitetu, ritmu i trajanju, u svrhu odbrambenih i napadačkih akcija (Alić i Rađo, 2009). Za vrijeme nogometne utakmice nogometaši izvode različite kretnje sa i bez lopte, te se pri tome izmjenjuju intervali rada visokog i niskog intenziteta (Verheijen, 1997). Razumljivo je da vrhunski i amaterski nogomet nisu istog nivoa izvedbe i kvaliteta. Za očekivat je da razlike postoje i kod mladih nogometaša različitih nivoa takmičenja. Cilj istraživanja je utvrditi i analizirati razlike u funkcionalnom i motoričkom potencijalu mladih nogometaša različitog nivoa takmičenja. Uzorak ispitanika su nogometaši juniorskog uzrasta (U-19) tri (3) kluba Kvalitene juniorske lige Bosne i Hercegovine, N= 60 ispitanika, te nogometaši (U-19) N=60, tri (3) kluba Entitetske juniorske lige. Ukupno 120 ispitanika za prvi i drugi nivo takmičenja. Uzorak varijabli koje su tretirane obuhvataju prostor agilnosti: MA93639 - Agilnost 93639, MAILINO - Illinois test, MACC - slalom trčanje (cik-cak). Za procjenu eksplozivne snage tipa sprinta korišteni su testovi: MBRZ5 - Sprint 5 m iz mjesta, MBRZ10 - Sprint 10 m iz mjesta, MBRZ20 - Sprint 20 m iz mjesta. Varijable za procjenu eksplozivne snage tipa skoka: MSD - Skok u dalj iz mjesta, MSV - Skok u vis iz mjesta, MSS - Skok u vis nakon saskoka. Testovi za procjenu fleksibilnosti: MFLZL - Zanoženje iz ležanja na prsima, MFLPL - Prednoženje iz ležanja na leđima, MFLOL - Odnnoženje ležeći bočno, te test za indirektnu procjenu relativnog VO2 max. BEEP - beep test, FMAXVO2 max - ml/kg/min. Za varijable tretirane vremenskim mjerenjem korišten je instrumentarij foto čelija. Utvrđivanje razlika između nivoa takmičenja vršeno je univarijantnom analizom varijanse (ANOVA). Rezultati istraživanja su pokazali statistički značajne razlike između prvog i drugog nivoa takmičenja ($p < 0.05$) gdje su veći nivoi funkcionalnog i motoričkog potencijala pokazali mladi nogometaši prvog nivoa. Analizom rezultata i uvidom u nivoe i stanja mladih nogometaša prvog i drugog nivoa takmičenja, nameće se konstatacija da prvi nivo očekivano ima veći funkcionalni i motorički potencijal. Kvalitetna selekcija, veći zahtjevi takmičenja, te organizovanja tehnologija trenažnog procesa za predspotaviti su razlozi dominacije prvog nivoa takmičenja.

Ključne riječi: razlike, nogomet, funkcionalni i motorički potencijal, nivoi

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EVALUATION OF PREVALENCE OF COMPETENCES NECESSARY IN SPORT PRACTICE AND EDUCATION

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Abstract:

The objective of the research has been to look into the applied knowledge and competences given in the curricula, in a systematic way and in cooperation with managers of sports organizations, as well as the students Faculty of Sports and Physical Education of the University of Sarajevo and users of the services offered by the Faculty. The research focuses on the overview of the competences needed for collecting, processing and transferring information, as well as the competences for communication. It was implemented in Bosnia and Herzegovina and included several groups of respondents. The first part of the research is based on the results of a poll completed in 2005 that included 66 respondents, representatives of clubs and sport organizations on the quality of collecting and distribution of information. The second part of the evaluation included 213 questionnaires completed by students in the period 2008-2013 on the commonness of competences in the curricula on the Faculty of Sports. Careful processing of the results of this research lead to the conclusion that the insufficiency of information springs out of the insufficiency of necessary competences for communication. Moreover, it indicated that there is space for improvement of the education process and providing necessary competences in relation to communication.

Keywords: Competences, evaluation, communication, information, practical work

Introduction

The new technologies and accelerated frequency of information exchange, as well as the increased quantity of new knowledge available to all, bring upon the need for the knowledge and skills that enable collection, processing and distribution of information. The development of sports in relation with the development of new technologies applied in sports, development of sport disciplines, expansion of sport industry and implementation of new forms of work increase the need for the skills that make it possible for the sport managers, coaches and educators to respond to the new trends in an adequate way. Today, the development and application of information systems and technologies open access to information platforms that help us get new information on technologies, ideas, activities, development projects and scientific achievements. Access to, processing and distribution of, information is made easier and better assuming that the competences that enable faster, better and more efficient communications exist and are adopted.

In their paper, Bagarić & Mihaljević-Djigunović (2007) divide communication competences in several segments based on the ways in which they are used. Strategic competence is described as a range of meta-cognitive components that enable a user of language to participate in the setting of the communication objective, evaluate communication sources and plan. Discourse competence is described as the skill of connecting and interpretation of forms and meanings in order to achieve meaningful unity of spoken or written texts of different genres. Grammatical competence is related to the skill of (verbal or non verbal) linguistic code, i.e. the knowledge of morphological and syntax rules, vocabulary, semantic rules, as well as the knowledge of phonological and orthographical rules. Sociolinguistic compe-

tence is defined as the knowledge of social norms and conventions that are the essence of appropriate understanding and use of language in different socio-linguistic and socio-cultural contexts.

As a response to the labor market needs and social trends in general, one of the tasks of the higher education institutions is to define necessary competences and knowledge that the students need to possess after graduation to be able to respond to the demands of both their prospective employers and the society in general. Learning outcomes met based on the adopted competences are a basis for the necessary qualifications.

Competences are adopted through the learning process. Bloom, an American psychologist (Bloom & assoc., 1956) observed learning as a process in which we build upon the previous knowledge, to eventually reach more complex levels of understanding. According to the Bloom's taxonomy, teaching results are categorized into three connected domains: cognitive domain of knowledge and understanding, affective domain of attitudes and psychomotor domain of skills. Key words of defining the learning outcomes are: to define, to list, to name, to refer to, to analyze, to calculate, to plan, etc. that are used to demonstrate the students' achievements (Lončar-Vicković & Dolaček-Alduk, 2009).

The main objective of this research is to define competences that will be transferred to students through the education process in order to improve the processes of communication, dissemination and exchange of information, which are among the basic tools to manage the processes within organizations, clubs, sports associations, events and other segments of sports.

Defining competences and their application in the teaching process lead to the changed attitude the

students have towards their future occupations. and increases their chances on the labor market.

One of the conclusions of the research completed by Rađo & assoc. (2010) was that the students have limited access in selection of their future professions as they see their jobs exclusively as gym teachers or coaches. which might be caused to limited information or lack of interest in changes.

Methods of work

The research was planned and implemented in two parts. and based on several target groups completing the poll. with instructions. contacting respondents. classification of questionnaires. data analysis. valorization. analysis and interpretation of results and statistics. The results interpretation was an opportunity for giving recommendation. promotion of needs and establishing adequate approach to the information exchange. as well as upgrading curricula through introduction of new competences needed for adequate management of sport organizations and other forms of sports activities.

The first part of the research was completed on the level of clubs and associations in Bosnia and Herzegovina (Mujkić. 2005). It was necessary to balance the sample. but at the same time to keep focus on the directors and managers as the key leaders of the process in sports management.

Sport management anticipates sport development. plans general activities in the field of sports. organizes resources. processes and functions. meets the human resource development. organizes sport and business function. provides communication and coordination. controls the processes and eliminates destructive conflicts (Malacko & Rađo. 2004. p. 70). Out of the 127 clubs that were contacted. 90 questionnaires were received. and 66 are considered valid. In this part of the research. the sample of variables was a set of 40 variables (items) given in the unified questionnaire. classified and divided into basic groups that present general data and data on application of modern methods in management. necessary for good functioning of a sport organization. in line with the standards implemented in the developed European countries. The responses were graded according to the five point and two point Likert-type scale with multiple choice answers.

Table 1.

1	AOPOS	Respondent's occupation
2	AOSTS	Respondent's education background
3	AORIS	Respondent's work experience
4	AORST	Total respondent's years of service
5	AMESEM	Participation in seminars
6	AMEMPR	Participation in international projects
7	AMETSE	Duration of seminars
8	AMEOSE	Organization of seminars
9	AMESTL	Use of literature
10	AMEPOP	Support at work
11	AMESTLO	The need to use literature
12	AMEKOZ	Education so far
13	AMEČŽU	Life-long learning

14	AMENTE	Information on scientific achievements
15	AMEPOK	Use of information technologies (IT)
16	AMEZOIT	Knowledge of IT
17	AMEPKI	IT needs
18	AMEJEZ	Need to speak languages
19	AMEJST	Information on languages spoken
20	AMEMOP	Opinion on international projects
21	AMEMP	Information on participation in international projects
22	AMESMS	Sport managers and sport
23	AMEŠM	Schooling of managers
24	AMEŠOR	Form of schooling of managers
25	AMEMOŠ	Opinion on attending lectures on sports
26	AMEŠUL	Role in sports
27	AMEINF	Information flow
28	AMEMIN	Contacts with ministries
29	AMEINM	Information received from the ministries
30	AMEBIH	Opinion on BH sports
31	AMESAR	View of cooperation among sport organizations
32	AMEZAK	Law on sports
33	AMESTR	Strategy of sports
34	AMEFMI	Financing by ministry
35	AMEFSP	Financing by sponsors
36	AMEFDO	Financing by donors
37	AMEFVL	Financing from their own income
38	AMEFOI	Financing from other sources
39	AMESOR	Organization strategy
40	AMEBPL	Business plan

The aim of the second part is to identify the state and quality of different segments of the curricula and see if they are in line with the necessary competences. A successful research implies including as many students of different courses as possible. year 2007-2013. as well as their prospective employers. The variable sample is a set of a total of 68 variables given in different questionnaires specific for different types of respondents. Variables rating competences are set in a seven point Likert scale. numbered 1-7 rating prevalence of competences. containing 34 variables. focused on how possible it is to gain knowledge and competences on the Faculty of Sports and Physical Education. This is in relation to the general and specific defined competences. as follows (Table2):

Table 2.

1	ANAZ	Analytical thinking ability
2	SINZ	Ability to synthesize knowledge from different fields
3	PRMZ	Ability to apply knowledge in practice
4	PLAZ	Ability to plan and manage time
5	OPCZ	General knowledge in the field of sport
6	PRAZ	Practical skills

7	USMZ	Oral communication
8	PISZ	Written communication
9	PREZ	Presentation skills
10	STJZ	Speaking foreign languages
11	RACZ	Basic computer skills
12	ISTZ	Research skills
13	MJEZ	Use of measuring methods and techniques
14	NOVZ	Base and ability to acquire new knowledge
15	PINZ	Ability to find information from different sources
16	TEHZ	Use of technologies in sports and physical education
17	KRIZ	Ability of critical thinking and self-reflexion
18	PRIZ	Ability to adjust to new situations
19	KREZ	Creativity (creating new ideas)
20	SAMZ	Ability to work independently
21	PROZ	Designing and managing projects
22	INIZ	Initiative and entrepreneurship
23	STEZ	Using acquired knowledge to solve problems
24	ODLZ	Making decisions
25	KVAZ	Aiming for quality
26	USPZ	Desire to succeed
27	TIMZ	Team spirit
28	INTZ	Interpersonal skills (communication, cooperation)
29	VODZ	Leadership skills
30	IDSZ	Ability to work on an interdisciplinary team
31	RAZZ	Appreciating differences (different cultures)
32	IKOZ	Ability to work in an international context
33	KULZ	Understanding cultures and customs of other countries
34	ETIZ	Appreciating ethical principles in sports

In both parts of the research the classification of the returned questionnaires included digitalization of the results gained. The results gained were processed through non-parameter based and parameter based approach. From the aspect of processing, the data was analyzed on univariate and multivariate level.

Latent structure of the research was defined by factor analysis.

Results and discussion

The research completed showed that an adequate information system customary for developed countries did not exist. The research showed which methods and forms of dissemination of information through information technologies as the most prevalent information channel in the world. There is no information related to the most recent results and scientific achievements in the field of sport in Bosnia and Herzegovina. 59.09% respondents re-

plied that they do not have permanent information on new technologies, scientific achievements, new forms of marketing, quality control, training, and all other segments in the field of sport. Almost all respondents, 92.42% of them are of the opinion that it is necessary to use computers at work. Most respondents, 74.85% have no information related to international project, while almost all respondents consider it a good way to improve work.

This is supported by the fact that 71.83% respondents think that the information on sport projects in Bosnia and Herzegovina, and the world is on a poor level; 84.51% have no regular contacts with different ministries in Bosnia and Herzegovina, while the same number of respondents receive no information from the ministries in charge.

Given that the research was done on a representative sample and that the results are linked to the basic sports management and application of modern management in Bosnia and Herzegovina, the first part of the research leaned on methods that responded to the needs of this research. Regardless of the fact that the respondents are relatively inferior in many segments in relation to the general organization forms in the world and in Europe, it seems that the general behavior rules are similar and that it resulted in the model with six latent model characteristics described as: communication skills, learning, planning, expertise, knowledge and having information.

Table 3.

	F1	F2	F3	F4	F5	F6
AOPOS	0.11	0.14	0.09	0.27	0.32	0.18
AOSTS	0.28	0.07	0.31	0.26	0.11	0.08
AORIS	0.20	0.10	0.11	0.29	0.35	0.08
AORST	0.29	-0.01	0.00	0.17	0.74	-0.16
AMESEM	0.22	0.55	0.05	0.11	0.11	0.07
AMEMPR	0.34	0.38	-0.06	0.31	-0.14	0.25
AMETSE	-0.07	0.85	0.08	0.05	0.00	0.07
AMEOSE	0.02	0.99	0.04	-0.08	0.06	-0.08
AMESTL	0.27	0.25	0.07	0.11	0.34	0.09
AMEPOP	0.19	0.10	0.13	0.02	0.39	0.27
AMESTLO	0.19	0.25	0.12	0.16	0.28	0.17
AMEKOZ	-0.08	0.24	-0.03	0.15	0.50	0.26
AMECZU	0.17	0.17	0.18	0.20	0.28	0.17
AMENTE	0.04	0.26	0.25	0.22	0.26	0.08
AMEPOK	0.19	0.18	0.14	0.25	0.18	0.20
AMEZOIT	0.75	-0.01	0.06	0.16	0.07	0.02
AMEPKI	0.18	0.14	0.18	0.20	0.29	0.18
AMEJEZ	0.16	0.11	0.15	0.28	0.21	0.25
AMEJST	0.75	0.09	0.04	0.16	-0.05	0.06
AMEMOP	0.15	0.13	0.28	0.23	0.19	0.19
AMEMP	0.14	0.13	0.02	0.31	0.09	0.41
AMESMS	0.17	0.15	0.17	0.27	0.24	0.16
AMESHM	0.21	0.12	0.21	0.20	0.18	0.22
AMESHOR	0.75	-0.08	0.08	-0.17	0.31	0.11
AMEMOSH	0.03	0.15	0.27	0.25	0.13	0.30
AMESHUL	0.15	0.21	0.18	0.15	0.26	0.21
AMEINF	0.09	0.10	0.06	0.09	0.33	0.42

AMEMIN	0.17	0.05	0.12	0.19	0.19	0.40
AMEINM	0.15	0.06	0.12	0.15	0.17	0.47
AMEBIH	0.15	0.17	0.06	0.25	0.31	0.19
AMESAR	0.12	0.26	0.21	-0.04	0.53	0.04
AMEZAK	0.00	0.21	0.27	0.14	0.25	0.22
AMESTR	0.05	0.11	0.31	0.23	0.21	0.21
AMEFMI	0.14	0.01	0.25	-0.12	-0.09	0.80
AMEFSP	0.28	0.13	0.49	0.02	0.18	-0.03
AMEFDO	-0.04	-0.03	0.67	0.22	0.04	0.17
AMEFVL	0.10	0.05	0.16	0.63	0.17	-0.07
AMEFOI	0.02	-0.04	0.14	0.87	0.05	-0.06
AMESOR	0.19	0.05	0.57	0.13	0.01	0.15
AMEBPL	0.18	0.20	0.61	0.06	0.00	0.06

The research set aside spaces related to having information and communication skills, as a foundation for the second part of the research and comparing influence of education to gaining necessary competences.

Having analyzed a group of respondents who are students who worked according to the new curricula from 2008 to 2013, it resulted in the structure of latent space of variables that represent the opinion of students on the prevalence of spaces that give certain competences. The results of the factor analysis is separation of six latent dimensions marked F1, F2, F3, F4, F5 and F6 (table 5.) among which the first, dimension F1 is best defined in relation to the other five. The first dimension with the total variability (Cumulative %) with 47.13 % of the common variance in its structure can be defined as F1 that marks management.

Practical work defined as F2 denotes prevalence of practical skills. The practical work usually stands out as a necessary dimension. The students show interest in practical work and the desire to introduce more practical and less theoretical learning (Bečić, Vojinić, & Stojčić, 2013). F3 is aimed at knowledge and skills necessary for research, while F4 in essence denotes the space of competences as a precondition for advancing career, which includes the need for life-long learning. It is evident that, in the context of ever-changing society, it is impossible to manage processes and jobs without permanent personal development. For example, managers of large organizations meet globalization, technological development, cultural reorganization and competition based on competences (Kalz & assoc. 2010). Ever since the Prague Declaration 2001, great attention is paid to life-long learning, which implies permanent interest and development of new knowledge and skills, conditioned by fast development of new technologies and their practical application. A condition that a graduate student needs to meet in order to continue their education is to grasp the need for additional education. Such competences that a student gains during the course of studying are applicable after the education process is completed.

The strategy of the development of sports in Bosnia and Herzegovina 2010-2014 points out that professional training and additional education has to be treated as the most important means of the development of sports in Bosnia and Herzegovina and the introduction of the life-long learning one of requirements for all sport professionals. Higher education

institutions need to be the leaders of this process. The new information within the curricula is the essence of the life-long learning matter.

Along with the accelerated development of the new technologies in science, education and sport, it is necessary to apply new forms of learning and education of all segments of the society. Besides regular curricula of the higher-education institutions, sport managers, as well as all other sport professionals, need to upgrade and enrich their knowledge through the system that would provide conditions for good quality life-long learning. In the world today, life-long learning is an essential element of not only higher education, but education in general, as it springs out of the need of the society to apply new technologies. (Mujkić & Kovačević, 2006; p.67.)

Using new technologies in sports, F5, is closely linked to the previous F4, and this link is seen through their mutual relation based on the correlation gained (table). "Occurrence, development and fast changes in the sport, technological and business function of modern sport organizations undoubtedly represent one of the most important incentive of the changed sport and business function and philosophy, and turning towards knowledge and creative potentials as the most important production and natural resources." (Malacko & Rađo, 2004, p. 3).

Sport medicine, sport psychology, sport sociology, training and tourism, sport organizations, clubs, associations, events and competitions, sport facilities, sport education on all levels of the education process, as well as all other groups and subgroups of sport branches make up a large number of necessary competences related to the application of new technologies in sports. These competences are a confirmation of the claim of inalienability of general and specific competences, but also that there is a need to define those specific competences that are applicable in practice and give a clear picture on the future profile in all fields, thus being able to define sector qualifications, as e.g. sport sociologist. F6 is specific for communication competences.

Table 4.

OPCZ	General knowledge in the field of sports
USMZ	Oral communication
PISZ	Written communication
PREZ	Presentation skills

Today, communication skills are inevitable competences necessary for all forms of work. The development of new technologies contributes to a faster communications: "Having analyzed the origin of communications in sport, and following their development ever since 19th century, we can conclude that the modern trends have contributed to the endless possibilities in all aspects of communication in sports, primarily in printed media, then in electronic media, public relations, marketing, advertizing, inter-personal communication, research and new technologies." (Popović & Krivokapić, 2011; p. 7).

Table 5.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.936
	Approx. Chi-Square	4292.222
Bartlett's Test of Sphericity	Df	561
	Sig.	0

Table 6.

Total Variance Explained						
Initial Eigenvalues			Extraction	Sums	of	Rotation
			Squared	Loadings		Sums of
						Squared
						Loadings
Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
16.027	47.139	47.139	16.027	47.139	47.139	12.172
2.008	5.905	53.044	2.008	5.905	53.044	6.034
1.351	3.974	57.018	1.351	3.974	57.018	6.275
1.146	3.372	60.39	1.146	3.372	60.39	7.433
1.097	3.226	63.616	1.097	3.226	63.616	8.049
1.079	3.172	66.789	1.079	3.172	66.789	6.701

Table 7.

Structure Matrix						
Component	1	2	3	4	5	6
ANAZ	0.454	0.605	0.136	-0.48	-0.506	-0.384
SINZ	0.475	0.753	0.263	-0.333	-0.534	-0.431
PRMZ	0.442	0.79	0.38	-0.384	-0.26	-0.338
PLAZ	0.533	0.655	0.375	-0.292	-0.477	-0.591
OPCZ	0.404	0.608	0.164	-0.342	-0.217	-0.665
PRAZ	0.363	0.745	0.384	-0.16	-0.172	-0.378
USMZ	0.399	0.479	0.231	-0.408	-0.296	-0.764
PISZ	0.318	0.493	0.081	-0.093	-0.477	-0.522
PREZ	0.348	0.331	0.295	-0.169	-0.3	-0.834
STJZ	0.38	0.323	0.816	-0.252	-0.235	-0.18
RACZ	0.355	0.33	0.663	-0.406	-0.462	-0.324
ISTZ	0.544	0.231	0.598	-0.358	-0.588	-0.5
MJEZ	0.529	0.241	0.674	-0.196	-0.366	-0.51
NOVZ	0.464	0.17	0.347	-0.604	-0.481	-0.596
PINZ	0.454	0.176	0.319	-0.483	-0.784	-0.331
TEHZ	0.529	0.34	0.405	-0.31	-0.735	-0.398
KRIZ	0.61	0.321	0.41	-0.238	-0.746	-0.29
PRIZ	0.589	0.306	0.569	-0.562	-0.53	-0.501
KREZ	0.722	0.344	0.446	-0.599	-0.536	-0.457
SAMZ	0.657	0.297	0.409	-0.606	-0.528	-0.477
PROZ	0.722	0.151	0.543	-0.397	-0.559	-0.424
INIZ	0.686	0.249	0.648	-0.487	-0.421	-0.371
STEZ	0.652	0.443	0.387	-0.627	-0.624	-0.359
ODLZ	0.608	0.385	0.431	-0.511	-0.691	-0.232
KVAZ	0.653	0.319	0.551	-0.709	-0.537	-0.337
USPZ	0.502	0.262	0.331	-0.858	-0.358	-0.286
TIMZ	0.627	0.448	0.281	-0.785	-0.303	-0.281
INTV	0.738	0.366	0.271	-0.571	-0.319	-0.496
VODZ	0.832	0.316	0.419	-0.515	-0.431	-0.424
IDSZ	0.849	0.417	0.386	-0.439	-0.432	-0.392
RAZZ	0.732	0.276	0.246	-0.428	-0.574	-0.263
IKOZ	0.815	0.345	0.467	-0.36	-0.406	-0.246
KULZ	0.815	0.33	0.341	-0.404	-0.464	-0.208
ETIZ	0.828	0.354	0.291	-0.401	-0.377	-0.448

Table 8.

Component Correlation Matrix						
	1	2	3	4	5	6
1	1	0.356	0.412	-0.469	-0.479	-0.374
2	0.356	1	0.195	-0.232	-0.249	-0.355
3	0.412	0.195	1	-0.261	-0.307	-0.245
4	-0.469	-0.232	-0.261	1	0.327	0.259
5	-0.479	-0.249	-0.307	0.327	1	0.319
6	-0.374	-0.355	-0.245	0.259	0.319	1

Conclusion

Considering the fact that the research was completed in two parts with different target groups, time frames, processing data on management quality and information flow quality, as well as the prevalence of competences in the curricula on the Faculty of Sports and Physical Education of the University of Sarajevo, the conclusions are given in the respective order.

The first part of the research concluded that there is no adequate information exchange, what certainly influences the quality of daily processes and the development of sports. As it is done on a representative sample, this kind of research is aimed at learning lessons from experiences that can serve as a foundation for further advancement and upgrading of the development of sports and sport management. This is primarily related to the formulation, implementation and management of the development programs and projects, and implementation of other development activities, such as regular communication between sports professionals and ministries in charge, exchange of information on possible joint projects, and communication with prospective international partners.

The second part of the research pointed to the need for further education, upgrading of the teaching processes and definition of subject-related and specific competences.

"Put more precisely, this denotes the implementation of certain concrete skills and knowledge. It denotes a combination of knowledge and its application (skills), attitudes and responsibilities described in the learning outcomes of the education process." (Lončar-Vicković & Dolaček-Alduk, 2009; p.24), while subject-related competences are identified for each profession or subject, and in this sense they are more narrow. The defining and valuation of subject-related competences, even more so than in the case of general competences, should involve graduated students, young experts and employers (Kleut, 2006; p.10).

The research pointed to the need to connect practice and education and introduce new methodological approaches, both in terms of upgrading the practical processes and educational processes as well. Such approach is especially prevalent in the applied science faculties, where the information flows faster, where the market needs are evaluated on a regular basis, enabling a link between practice and education. This research is a foundation for the continuation of the research that would result in clear definition of the communication competences needed for a regular flow of information between organizations, international initiatives, and cooperation with ministries, clubs and associations, therefore leading to the improvement of processes within organizations.

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EVALUACIJA ZASTUPLJENOSTI KOMPETENCIJA POTREBNIH U SPORTSKOJ PRAKSI I EDUKACIJI

Sažetak:

Cilj istraživanja je da se na sistematski način, uz sudjelovanje menadžera sportskih organizacija, studenata, korisnika usluga Fakulteta sporta i tjelesnog odgoja Univerziteta u Sarajevu, ispituju znanja u praksi i generičke kompetencije koje trebaju biti usvojene u okviru nastavnog procesa. Istraživanje je fokusirano na pregled kompetencija potrebnih za prikupljanje, obradu i prenos informacija, kao i kompetencije za komunikacije. Isto je sprovedeno u Bosni i Hercegovini, obuhvatajući više grupa ispitanika. Prvi dio istraživanja se odnosi na rezultate dobijene 2005. godine nakon obrade podataka sakupljenim kreiranim anketama. Ankete su popunjene od strane 66 ispitanika, predstavnika klubova i sportskih organizacija. Drugi dio evaluacije se odnosi na te 213 upitnika popunjenih od strane studenata u periodu 2008- 2013. godine, koji su dali svoje mišljenje o zastupljenosti kompetencija u okviru novog nastavnog plana i programa na Fakultetu sporta. Na osnovu dobijenih rezultata istraživanih prostora i njihovom pažljivom obradom ustanovljeno je da nedostatak definisanih informacija proizilazi iz nedostatka potrebnih kompetencija za komunikacije, te da u budućnosti postoji veliki prostor za poboljšanje procesa u edukaciji kao preduslov za obezbjeđivanje potrebnih kompetencija koje su vezane za komunikacije.

Ključne riječi: Kompetencije, evaluacija, komunikacija, informisanost, praksa

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DIFFERENCE IN MANIFESTATION OF MOTOR ABILITIES OF FOOTBALLERS IN TWO LEVELS OF COMPETITION

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Original scientific paper

Abstract:

The purpose of this research is to determine difference of manifestation parameters of football players' motor abilities at two levels of competition. For research purposes, a sample of respondents was population represented by junior football players (U-19) 8 clubs (4 clubs- 80 football players- Quality Junior League of BiH and 4 clubs- 80 football players of Entity Junior League), total of 160 respondents. Sample of variables used in this research consisted of 12 variables of basal motor abilities. The analysis was conducted between differences of arithmetic means at univariate level, by using univariate analysis variance (ANOVA) and discriminative differences between I and II level of competition, in the level of motor abilities at multivariate level. 64 At univariate level (central and dispersion parameters) we got information of which variables carry significant differences between groups. Results of ANOVA are pointing to differences and define variables of explosive power, agility and flexibility, which in the highest degree contribute to the differences of two levels of competition. By discriminative analysis in manifest space of motor abilities at multivariate level, we got one isolated discriminative function, which is statistically significant at level $p < .01$, (sig..00). These differences probably occurred as a result of application of different training technologies, and planned and programmed work on higher level of competition.

Keywords: Differences, level of competition, motor abilities, football.

Introduction

The aim of the paper is to determine level of differences of manifest parameters of motor abilities of footballers in two levels of competition. Sample subjects used in this research were junior footballers (U-19), 8 clubs (4 clubs -80 footballers of Quality junior league of B&H and 4 clubs - 80 footballers of Entity junior league).160 subjects in total. Sample of variables used in this research was consisted of 12 variables of basic motor abilities.

Differences in arithmetic means in univariate level of univariate analysis (ANOVA) and discriminatory differences between the first the second level of the competition based on motor abilities on multivariate level were also analyzed. On univariate level (central and dispersive parameters) we received data in which variables show significant changes between groups, but we didn't receive data to which degree these changes occur. Also data shows which variables contributed to those differences on multivariate level in favour of higher level of competition. ANOVA results point to differences and define variables of explosive strength ,agility, and flexibility, which contribute to differences in two levels of competition. Discriminative analysis in manifest area of motor abilities provides us information that one discriminative function, which is statistically important in level $p < .01$.(sig00) was isolated. These differences appeared as a result of usage of training technologies and planned and programmed work on a higher level of competition.

Problem and the aim of the research

Problem and the aim of the research are the differences in motor abilities on two levels of competition. The levels of statistical differences of basic motor abilities of two levels of competition were also defined as a problem. The aim of the paper is to determine level of differences in manifest parameters of motor abilities of footballers in two levels of competition.

Methods

Sample subjects used in this research were junior footballers (U-19), 8 clubs (4 clubs -80 footballers of Quality junior league of B&H and 4 clubs - 80 footballers of Entity junior league). 160 subjects in total. Sample of variables used in this research was consisted of 12 variables of basic motor abilities. Differences in arithmetic means in univariate level of univariate analysis (ANOVA) and discriminatory differences between the first and the second level of the competition on level of motor abilities on multivariate level were also analyzed.

Table 1. shows visible differences on univariate level in area of basic motor abilities between two levels of competition. Differences occurred in area of explosive strength and flexibility and variables which determine basic motor ability, agility. Variables, in which levels on univariate level do not differ are variables of speed and one of the three variables of flexibility.

Table 1.

Test of differences of arithmetic means between groups					
	Wilks' Lambda	F	df1	df2	Sig.
MSB5M	.994	.882	1	146	.349
MSB10M	.996	.552	1	146	.459
MSB20M	.978	3.226	1	146	.075
MSSDM	.958	6.432	1	146	.012
MSST	.958	6.382	1	146	.013
MSDJ	.943	8.762	1	146	.004
MSFZL	.915	13.500	1	146	.000
MSFPL	.973	4.025	1	146	.047
MSFOLB	.990	1.479	1	146	.226

MSA936	.927	11.436	1	146	.001
MSAILL	.948	8.001	1	146	.005
MSZIG	.962	5.735	1	146	.018

Analyzing Box test (table 2.), which was used to test differences of matrices of covariance between subjects in the first and the second level of competition can confirm the existence of statistically significant difference in covariance of analyzed matrices ($p < .01$).

Box M-test was used to test similarities in matrices of covariance between two subjects (Rađo and Wolf 2002), i.e. between subjects of first and second level of competition. It is shown that difference in matrices of covariance is statistically significant ($p < .01$), and it allows access to further procedure of discriminative analysis.

Table 2. Box test results

		Test Results	
Box's M	150.386		
F	Approx.	1.761	
	df1	78	
	df2	64838.326	
	Sig.	.000	

On univariate level (central and dispersive parameters) we received data in which variables show significant changes between groups, but we didn't receive data to which degree these changes occur. Also data shows which variables contributed to those differences on multivariate level in favour of higher level of competition. Discriminative analysis in manifest area of motor abilities provides us information that one discriminative function, which is statistically important in level $p < .01$ (sig00) was isolated. Table 3. shows results of discriminative analysis in area of motor abilities. Significant discriminative function, with medium high value (CanonicalCorrelation = .47) was obtained, while Wilk's Lambda table which was used as a criteria for discriminative analysis of applied sistem of variables (table 4.) shows high values (.77), which points to discriminative differences between groups. Isolated function explains a 100% of total variance.

Table 3. Significance of isolated discriminative function

Eigenvalues				
Function	E i -	% of	Cumu-	Canonical
	gen-	Variance	lative	Correla-
	value		%	tion
dimension0 1	.291 ^a	100.0	100.0	.475

Table 4. Wilks Lambda

Wilks' Lambda				
Test of Function(s)	Wilks' Lambda	Chi-square	Df	Sig.
dimension0 1	.775	35.759	12	.000

Observing the matrice of structure of discriminative function (table 5), we can see which variables contributed the most to the quantity differences between treated levels on multivariate level. It is visible that, in quantity sense on multiunivariate level, the highest and the most important discrimination between groups in isolated function in fa-

vour of the second level create variables of flexibility (MSFZL – adduction while lying). High coefficient of variables (MSA936 – test 93639 and MSAILL – Illinois test, MSZIG-zigzag) with positive prefix point to discrimination of these groups and variables which determine agility. The specific characteristic of these variables is that they are scaled in an opposite way (lower result is better result) and that these parameters indicate that difference in parameters are in favor of the first level. Based on numerical summaries with lower and negative prefix (MSDJ -.461, MSST -.395 I MSSDM -.393) variables of explosive strength, type- jump, occurred which point to discrimination or differences favor of the first level of the competition.

Table 5. Structure of discriminative function

Structure of dicriminative function	
	Funnnction
	1
MSFZL	.572
MSA936	.526
MSDJ	-.461
MSAILL	.440
MSSDM	-.395
MSST	-.393
MSZIG	.373
MSFPL	.312
MSB20M	.279
MSFOLB	.189
MSB5M	.146
MSB10M	.116

Position of centroids (table 6) shows clearly differences of motor parameters between two levels of the competition, wich was confirmed by discriminative analysis.

Table 6. group centroids

Functions at Group Centroids	
LEVEL	Function
	1
I levelof competition	-.501
II nivo of competition	.573

Discussion

Results of discriminative analysis point to domination of the first level of competition in relation to the second level of the competition in almost all variables of motor area except for variables of speed, which don't show significant coefficients of discrimination.

Analyzing motor abilities it can be concluded that speed is very important for footballers and sometimes even crucial for the result in the game (Rienzi & associates, 2000). During the game, from the total movement in the game, 11% is sprint, which appears in every 90 sec.and lasts for 2 or 4 minutes in average, or 15 metres. The speed is ability which, along with agility makes the greatest discrimination between successful and unsuccessful footballer.

Analyzing values of arithmetic means of variable MSB10M which were obtained during this research,

we can say that footballers, used as sample subjects in this research, do not differ from their peers (Sporiš, & associates, 2008). It is noticed that treated sample has better results in relation to results of the mentioned paper, but still, they have lower values from the top footballers, which can be found in literature and those are: 1.79 and 1.90 seconds. (Table 7) We can say that sample subjects have high speed and it is on the same level as the one in top footballers. What is specific for the speed on the higher level is the presence of higher number of short sprints.

Regarding the tactics it is very important for the players of higher level to use their speed abilities at the right time and place. Therefore the efficiency of sprint is very important. The best players are not only fast, but they have the capability to think fast and act fast in the game in relation to their own cognitive, technically tactic abilities and training condition. (Rađo, I., Talović, M, Dogan, M., Bradić, A. 2002.).

Regarding the fact that in training process there is very little content which can influence on development of flexibility, at the beginning and at the end of training, variable of flexibility, with the highest coefficient of discrimination, can be explained that the second level of competition has less training efforts in relation to the first level. Analyzing data it is noticed that all variables which discriminate the first level from the second one have prefix „fast, explosive“, which means that, in training process, from the anatomic point of view, the muscles of the back quadriceps were pressured¹. Each training causes contractions, especially intense trainings. (Sporiš, G. and associates, 2008.) If exercises of flexibility aren't used before, after and during the training, then the muscle is decreased acutely, and if it isn't done in a longer period of time than it's decreased chronically. (Alić, H., 2012.) That state of muscle demands additional and compensatory movements in performing football actions, which demands extra energy from a player. Although speed isn't part of variables which discriminate these groups of subjects, ability that is perhaps, more important and more present in football game and which includes speed, is agility. Agility has all three variables which determinate this ability and it contributes to the difference of these two groups of subjects.

Table 7.

Variables	Croatian footballers, Sporiš, 2007.	Jelešković, E. 2011.	
		Level 1	Level 2
MSB5M	1.42 ± 0.6	1.14±0.5	1.15±0.4
MSB10M	2.17 ± 0.5	1.91±0.9	1.93±0.9

It is known that agility is ability which consists of speed, strength, and coordination² (Bangsbo, J. 1994). Footballer sprints every 90sec, and every sprint lasts from 2 to 4 seconds.

He also makes 1000-1400 changes of direction during the game (Mohr, Krstrup i Bangsbo 2003; Bangsbo, Norregaard & Thorso, 1991; Rienzi et al., 2000; Reilly & Thomas, 1976). The ability, which is most frequently manifested in those conditions is agility (greek agilis – agile, smart, speedy). Differences that were occurred and confirmed by discriminative analysis show us that footballers of the first level of the competition have higher level of abilities, which enable them to react faster, move faster, and deal with the 1:1 situations more easily (Fonseca, S. I sar. (2007)). They also react fast in situations when they need to create space for themselves which require fast decision and fast and effective change of direction of movement in order to get to the final goal, and that is to score a goal.

Three variables which contributed to discrimination of the first and the second level of the competition in basic motor abilities are variables of explosive strength, which are the most dynamic actions in football and they are connected to explosive movements like sprints, jumps and shots. While doing this actions the aim of footballer is to move his whole body (sprint, jump) part of his body (feet while shooting) and external object (ball), as fast as possible (Marković, Bradić, 2008.) which shows quality of the first level of competition, when we talk about motor abilities. These differences occurred as a result of different training technologies or serious work on higher level of competition (Cometti and associates 2001). These suspicions can be confirmed by the fact that clubs on the first level of competition had organized preparations, which made good preconditions for serious work, which produced better results in developing certain abilities.

Conclusion

ANOVA results and results of discriminatory analysis point to domination of the first level of the competition in almost all variables of motor area except for variables which don't have significant coefficient of discrimination. Defined structure of two levels of the competition point to differences: differences in techniques of training and differences which point to directions in creating training strategies. They give us solutions in modeling training units and methods of developing certain abilities which are important for successful game. It is symptomatic that performance techniques require certain training techniques. Therefore the only solution for complete adaption anthropologic status of the individual is situational training, which, at the same time tests all abilities of the individual when solving complex tasks, which include efforts, high concentration, commitment and creativity.

Given results dictate different approach to training operators, acceptance of new technology in sport, constant learning and improvement, and creates the need for quality selection in every sense of the word. This research enabled great amount of information about characteristics of Bosnian and Herzegovinian young people who are great potentials.

Path to success demands a lot of sacrifice and work. But with the hard work, all obstacles can be removed. Improvement of quality requires constant practice of education and teaching. In order to understand contemporary processes in sport one needs to be trained for quality, creativity and innovation.

This process is not possible with partial knowledge of

¹ Dervišević, E. (2010) Predavanje na kolegiju Kineziometrija, Postdiplomski studij, Fakultet sporta i tjelesnog odgoja, Sarajevo.

² Rađo, I. (2011) Predavanje na redovnoj nastavi III godine, Predmet „Tehnologija sporta i sportskog treninga“

anthropologic characteristics. It requires knowledge of multiple interactions and relations in the process of adaptation of body to the high level of training efforts. The only constant diagnostics of current con-

dition of abilities and characteristics, contained in equation of specification of football game or sport in general, enables optimization of training process and reaching top results.

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RAZLIČITOST MANIFESTACIJE MOTORIČKIH SPOSOBNOSTI NOGOMETAŠA DVA NIVOA TAKMIČENJA

Sažetak

Cilj rada je utvrditi nivo razlika manifestnih parametara motoričkih sposobnosti nogometaša dva nivoa takmičenja. Za potrebe ovog istraživanja uzorak ispitanika bila je populacija koju predstavljaju nogometaši juniorskog uzrasta (U-19) 8 klubova (4 kluba – 80 nogometaša - Kvalitene juniorske lige BiH i 4 kluba – 80 nogometaša Entitetske juniorske lige), ukupno 160 ispitanika. Uzorak varijabli koji je korišten u ovom istraživanju sačinjavalo je 12varijabli bazično motoričkih sposobnosti. Analizirane su razlike aritmetičkih sredina na univarijantnom nivou univarijantnom analizom varijance (ANOVA) i diskriminativne razlike između I i II nivoa takmičenja u nivou motoričkih sposobnosti na multivarijantnom nivou. Na univarijantnom nivou (centralni i disperzioni parametri) dobili smo podatke u kojim varijablama postoje značajne razlike između grupa. Rezultati ANOVA-e nam ukazuju na razlike i definišu varijable eksplozivne snage, agilnosti i fleksibilnosti, koje u najvišoj mjeri doprinose razlikama dva nivoa takmičenja. Diskriminativnom analizom u manifestnom prostoru motoričkih sposobnosti na multivarijantnom nivou dobili smo jednu izolovanu diskriminativnu funkciju koja je statistički značajne na nivou $p < .01$, (sig..00). Ove razlike vjerovatno su nastale kao rezultat primjena različitih trenažnih tehnologija, te planiranog i programiranog rada na većem nivou takmičenja.

Ključne riječi: Razlike, nivo takmičenja, motoričke sposobnosti, nogomet.

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TECHNICAL AND TACTICAL ANALYSIS OF KICKBOXING FIGHTERS K1-B CLASS

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Original scientific paper

Abstract:

The objective of the research refers to technically-tactical fighting characteristics in kickboxing. The sample for analysis consisted of 10 final fights, i.e. 20 K1 fighters of B-class. This study evaluated the frequency of hand punches (jab, hook, uppercut, uraken) as well as five kicks (low kick, mae geri, mawashi geri, mawashi pivot, knee). According to statistical analysis, by calculating the frequency of the applied techniques which is expressed in terms of relative and absolute value followed by trend analysis, it was concluded there is a difference in quantitative representation of fighting technical elements between winners and defeated. The most common attack techniques are jab (41.56%) and Low kick (21.89%). By comparing monitored occurrence it is possible determine that the tend line per rounds recorded fall and rise. There is also a difference between fighters K1 B- class and fighters K1 A-class in the number of punches in favour of A class.

Key words: Technique, kickboxing, competitive activity, round, jab, low kick

Introduction

Without complex and comprehensive approach to the problems encountered in kickboxing and without proper methodology, it is not possible to achieve the best result which is the final goal for each fighter, team and coach (Pelević, 1997, Stefanovic & Jakovljevic, 2004; Pelević, 2012, Milosevic & Milosevic, 2013). The basis for rational approach to the problem of planning, programming, implementation and evaluation of the training process effects, lies in analysis of the activities of the fighter during the match (Kapo, S., Rađo., I. Kajmović, H. 2004a, 2004b; Kapo, S., Kajmović, H. Ramadanović, M. 2006a; Blažević, 2007; Ljubisavljevic, Blažević, Amanović, 2011; Blažević, Kacar, Ljubisavljevic, Amanović, Crnjac, 2012a; Blažević, Kacar, Ljubisavljevic, Amanović, Crnjac, 2012b). Martial activity can be conditionally observed in two mutually relative independent domains; motor and technically-tactical domain. Technique is a dominant part of kickboxing and it has a direct impact on the result. In the analysis of the technical and tactical activities the focus is given to technical elements used during the match, their frequency during the match and their efficiency. Practice has shown that there are differences in the quantity and quality of certain technically-tactical fighter skill manifestation (Mudrić Milosevic, Jovanovic, 2005; Kacar, Blažević, Ljubisavljevic, Crnjac, Gavrilovic, 2012; Ljubisavljevic, Čokorilo, Kostovski, Smajić, Amanovic, Blažević, 2014).

In kickboxing, so far, hasn't been set serious consistently integrated system for monitoring and analysis of the fight, which would allow overview of technically-tactical fighter characteristics. The reasons for this may be found in the objective fight complexity, technically-tactical element identification and methods of their usage for analyzing competitive activities etc. Kickboxing belongs to a group of polystructural acyclic sports where acyclic unpredictable movements dominate, where the result is usually a binary variable (won-lost) and the movement is per-

formed and limited in direct conflict with the enemy in order to avoid the opponent's kick and destruction (Milosevic, Gavrilovic, Ivancevic, 1988. Milosevic, Zulic, Božić, 1989; Blažević, 2007; Ljubisavljevic 2010 Milosevic & Milosevic, 2014). Competitive activity requires from a fighter to perform the fight very rapidly and that the fight abounds with a large number of technically – tactical activities. This complex activity of kickboxing during the match requires that the fighters are versatile, and in their repertoire they have to include adequate combat techniques and different tactics for each technique. It is particularly important that the fighter carries out as many hits in the body and the head of his opponent as possible, because if the fight doesn't end before the time expires; the winner is the one who gave more punches and kicks. The objective of this study was to determine the dominance and frequency of technical and tactical elements in K-1 B-class fighters.

Methods

The study was conducted by analyzing the fight of official competition Serbian Championship held from 22nd to 23rd of March 2014 in Novi Sad SRC "Spens" in K1 discipline of B class. The sample of respondents consisted of 20 senior kick boxers of B class, 16 men and 4 women. Ten matches were analyzed in total. The competition was held in the following categories: up to 64 kg, 67 kg, 71 kg, up to 81 kg, 86 kg, 91 kg and +91 kg. In women's competition, two matches were held in categories 60 kg and 70 kg.

During this study we used a technique of video monitoring. In order to obtain more precise data about techniques used during the match, videos are processed in a special program Premiere Pro CC. Upon completed processing of video data in specially prepared tables, designed in Excel for this research, frequency and the type of performed arm and leg techniques were noted. In this study we followed nine

technical elements which are four arm techniques: jab, uppercut, hook, uraken and five leg techniques lowkick, mae geri, mawashi geri, mawashi geri pivot and knee kick.

All data collected during the study were processed using descriptive and causal statistics (Peric, 2006). For mathematical processing of original data and their graphic illustration, we used Microsoft Excel. After complete analysis of all 10 matches and entering the number of implemented hitting techniques (for each match and each fighter) we also designed special table where we entered complete data about total number of hits performed in all 10 matches and two more tables (one for winners and defeated each), in order to have a complete overview and precisely reach the relevant data. Further, results obtained for B class were compared with results of previous research (Ljubisavljevic, Cokorilo, Kostovski, Smajic, Amanovic, Blazevic. 2014) which analyzed fights of K1 A class, i.e. a trend of totally implemented techniques per round of A and B class were presented.

Results and discussion

All the data collected during the study were processed. The study was based on the analysis of K 1 B class kickboxer's matches. Totally 10 fights were analyzed. Regarding work objectives set, we observed the frequency of applied punches and kicks techniques. The paper observed nine technical elements which is four arm techniques (jab, uppercut, hook, uraken) and five leg techniques (low kick, mae geri, mawashi geri, mawashi geri pivot and knee kick). Based on the registered data, numerical and percentage indicators of observed elements were calculated and then comparative analysis of their representation in winners and defeated was conducted. In tables 1, 2 and 3 was presented a total number of performed arm and leg techniques in each round separately. In the first round (table 1), was totally 680 hits performed (arms and legs), out of which the jabs were dominating (283 or 41.62%), and the least (regarding arm and legs hits) uraken was performed (3 or 0.44%). Out of leg techniques mostly performed was low kick (140 or 20.59%) and the least mawashi geri pivot (8 or 1.18%).

Table 1. Total number of techniques performed – I round

Technique	I round number of tech-niq.	Abso-lute frequency %	% Of all tech-niq. in round	A l l rounds total	% Of all tech-niq. in round
jab	283	35.91	41.62	788	41.56
hook	102	34.93	15.00	277	14.61
uppercut	5	45.45	0.74	11	0.58
uraken	3	50.00	0.44	6	0.32
low kick	140	33.73	20.59	415	21.89
mae geri	26	29.54	3.82	88	4.64
m a w a s h i geri	61	43.88	8.97	139	7.33
m a w a s h i piv.	8	34.78	1.18	23	1.21
knee	52	34.89	7.65	149	7.86
Total	680		100	1899	100

In the second round, the number of totally performed hits (arms and legs) is 597 and it is significantly reduced (by 83 compared to the first round). Out of that the majority (as in the first round) refers to arm punch – jab (266 or 44.56%) and the least of performed punches was uraken (2 or 0.34%). The mostly performed kick was low kick (122 or 20.44%) and the least mawashi geri pivot (7 or 1.17%).

Table 2. Total number of techniques performed – I I round

Technique	I round number of tech-niq.	A b s o - l u t e frequency %	% Of all tech-niques in the round	A l l rounds total	% Of all tech-niq.
jab	266	33.76	44.56	788	41.56
hook	82	29.60	13.74	277	14.61
uppercut	3	27.27	0.50	11	0.58
uraken	2	33.33	0.34	6	0.32
low kick	122	29.40	20.44	415	21.89
mae geri	27	30.68	4.52	88	4.64
mawashi	35	25.18	5.86	139	7.33
Mawashi piv.	7	30.43	1.17	23	1.21
knee	53	35.57	8.88	149	7.86
Total	597		100	1899	100

In the third round (compared with the second round) total number of punches and kicks increased (22) which presents slightly increased activity of fighters, probably because the number of total hits in the second round is significantly reduced compared to the first round (for 83). As well as in previous rounds jabs were mostly performed (293 or 38.61%) and the least (out of punches) uraken (1 or 0.16%). Out of kicks was mostly performed low kick (153 or 24.72%) and the least mawashi geri pivot (8 or 1.29%).

Table 3. Total number of techniques performed – I I I round

T e c h - nique	I I I round number of tech-niq.	Abso-lute frequency %	% Of all tech-niq. in the round	A l l rounds total	% Of all tech-niq.
jab	239	30.33	38.61	788	41.56
hook	93	33.57	15.02	277	14.61
uppercut	3	27.27	0.48	11	0.58
uraken	1	16.67	0.16	6	0.32
low kick	153	36.87	24.72	415	21.89
mae geri	35	39.77	5.65	88	4.64
mawashi geri	43	30.94	6.95	139	7.33
Mawashi piv.	8	34.78	1.29	23	1.21
knee	44	29.53	7.11	149	7.86
Total	619		100	1896	100

Observed according to techniques, the mostly used was jab. Namely, this technique scored 788 points. Low kick totally scored 415 points (21.89%). Punch hook was applied 277 times (14.61%). Knee kick was applied 149 times or 7.86%, mawashi geri 139 times or 7.33% and mae geri 88 times or 4.64%. Other techniques were applied rarely as follows: uraken 0.32%, uppercut 0.58%, mawashi geri piv-

ot 1.21%. Hence, in most cases scoring was accomplished with punches (57.07%), while kicks scored 42.93%.

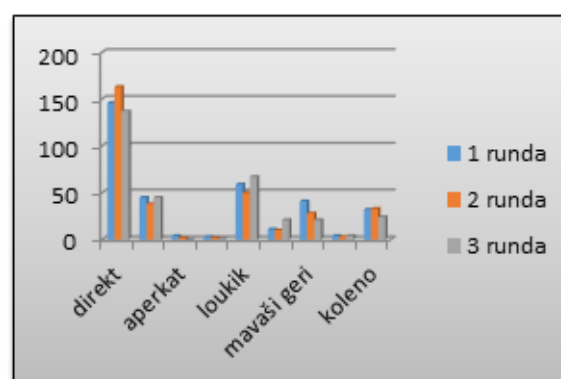
In tables 4, 5 and 6 and graph 1, 2 and 3 was presented the number of implemented techniques per rounds of winners and defeated, what will answer the question whether the activity increases in both fighters in the match or only in one (the winner).

Table 4. Number of techniques implemented by rounds – WINNERS

	jab	hook	uppercut	uraken	low kick	maegeri	m a w a s h i geri	mawa-piv	knee	Σ
1 st round	146	45	4	3	59	11	41	4	32	345
2 nd round	163	38	2	2	50	10	28	3	33	329
3 rd round	137	45	0	1	67	21	21	4	24	325
Σ	446	128	6	6	176	42	90	11	89	999
%	44.64	12.81	0.60	0.60	17.61	4.20	9.00	1.10	8.90	

The number of implemented jabs in "the winners" increased in the second round and then noticeably decreased in the third round compared to defeated, where the number of implemented jabs from round to round decreases. (table 5). Out of total performed hits in all three rounds, at winners the percentage of implemented jabs is 44.64%, and at defeated 38%, which is difference of 6.64% in favor of the winners. Out of punches hook is in the second place (at winners 12.81% and defeated 16.55%) in favor of the defeated 3.74%. With low kick, defeated had the advantage (239 or 26.55%) as well as with hook compared to the winners (176 or 17.61%), but it wasn't enough to win. In punches, the least implemented punch in winners (6 or 0.60 %) and defeated (0) was uraken. Out of kicks that is mawashi pivot (winners 11 or 1.10%, defeated 14 or 1.55%), same as in our previous research (Ljubisavljevic et

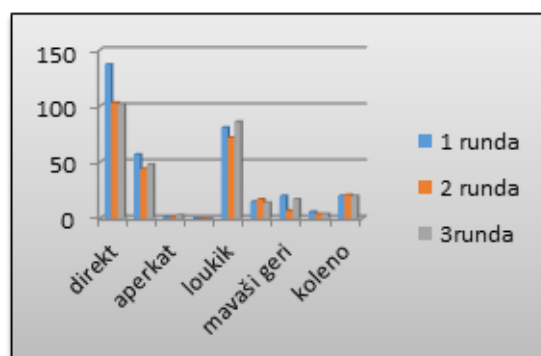
al. 2014)



Graph 1. Overview of implemented techniques per rounds – WINNERS

Table 5. Number of implemented techniques per round – DEFEATED

	jab	hook	uppercut	uraken	low kick	mae geri	mwashi	Mawa pivot	knee	Σ
1 st round	137	57	1	0	81	15	20	6	20	337
2 nd round	103	44	1	0	72	17	7	4	21	269
3 rd round	102	48	3	0	86	14	17	4	20	294
Σ	342	149	5	0	239	46	44	14	61	900
%	38	16.55	0.55	0	26.55	5.11	4.88	1.55	6.77	

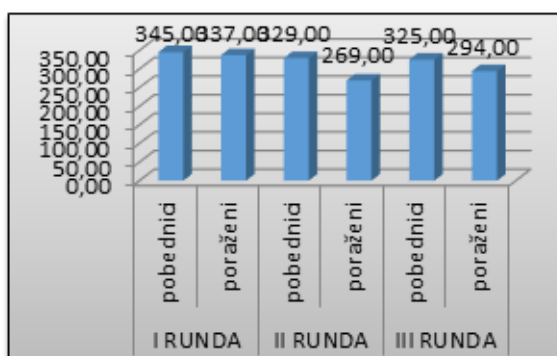


Graph 2. Overview of implemented techniques per rounds – DEFEATED

The results proved that in this rank of the competition, as well as in competition of class A (Ljubisavljevic et al. 2014) jabs dominate in all three rounds (in relation with punches and kicks) while in kicks low kick is dominant. By the number of the total hits per rounds winners are in constant dominant advantage in all three rounds compared with the "defeated" (table 6 and graph 3).

Table 6. Descriptive parameters

	I ROUND		II ROUND		III ROUND	
	winners	defeated	winners	defeated	winners	defeated
SUM - ROUND	345.00	337.00	329.00	269.00	325.00	294.00
AVERAGE	38.33	37.44	36.56	29.89	36.11	32.67
STDEV	45.37	46.13	50.59	36.20	43.67	37.77
MIN	3.00	0.00	2.00	0.00	0.00	0.00
MAX	146.00	137.00	163.00	103.00	137.00	102.00



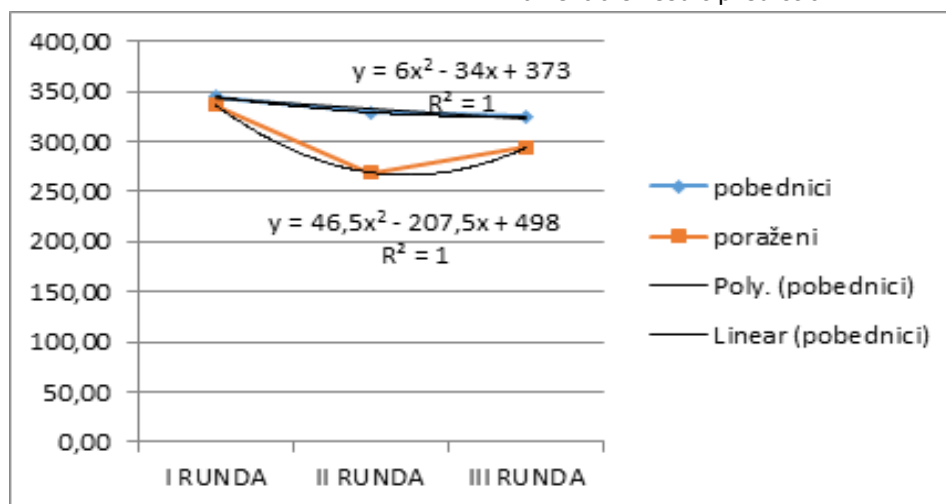
Graph 3. Descriptive parameters

Comparing the obtained results (table 7) of class A (Ljubisavljevic et al. 2014) with the results of B class, there is an obvious dissonance in the number of hits performed in B class compared to an A class. It is very important that "the defeated" are "dominant" in A class by the number of hits compared with "winners and defeated" of B class.

Table 7. Comparing the obtained results

	I ROUND	II ROUND	III ROUND	Σ	Σ winners defeated
winners A-class	377.00	449.00	505.00	1331	2515
defeated A-class	415.00	381.00	388.00	1184	
winners B-class	345.00	329.00	325.00	999	1899
defeated B-class	337.00	269.00	294.00	900	

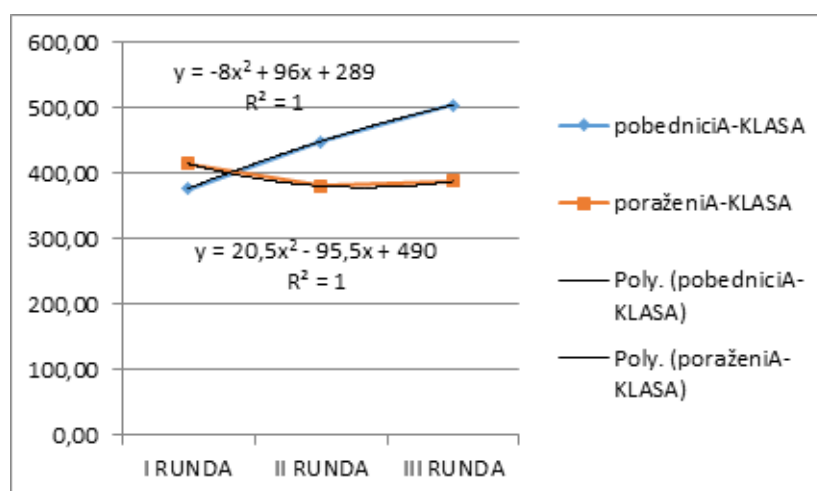
By comparing the monitored events it is possible to determine that the trend line recorded decline and rising (graph 4.) A slight decline is noted in the second and third round in winners and decline in second and rise in the third round in defeated. The coefficient of determination for monitored events ($R^2=1$) is very high, which leads to the conclusion that the described variability is high and the model is clearly reflecting empirical data and provides possibility for a reliable result prediction.



Graph 4. Trend of totally implemented techniques per rounds K1 – B Class

The results achieved by A class fighters, per round (Ljubisavljevic et al. 2014), the trend line recorded distinct increase in the second and the third round in winners, and at defeated decrease in the second and mild dissonant rise in the third round (graph 5). The coefficient of determination for monitored events ($R^2=1$), as well as in A class is very high, which leads to a conclusion that the explained variability is high and the given model reflects empirical data extremely well and provides opportunity for reliable result prediction. We can conclude that

the winners of A class recorded constant distinct increase in all three rounds compared with B class, while at "defeated" of A class, there has been a slight decline in the second round, which is less severe compared to the "defeated" of B class where the significant decrease and then rapid increase was noted but not enough for victory.



Graph 5. Trend of totally implemented techniques per round K1 A Class

Previous conclusions indicate reliable prediction and suggest that during the fight the fighter must not let his activity to drop extremely and then suddenly "wake up" in order to compensate for the lost points for victory (even though the practice has shown that sometimes the "stray hit" of the fighter who is close to defeat (knockout) can reverse the outcome). The results obtained are similar to previous research of A class (Ljubisavljevic et al. 2014) indicating that out of total number of punches and kicks (1899) mostly implemented was jab (788 or 41.56% total) and out of kicks mostly applied was low kick (415 times or 21.89%), while the number of other implemented techniques (punches and kicks) throughout entire match is far below the number of these two elements (hook 277 times or 14.61% and knee 149 times or 7.86%). Out of punches as well as in previous research of A class (Ljubisavljevic et al. 2014) the least was used uraken (6 times or 0.32%) while out of kicks the least used was mawashi pivot (23 times or 1.21%). Practically, this proves it is dangerous to turn the back on the opponent, although in practice, implemented at the right moment (during the match), these two hits can decide the match result (knockout the opponent).

Conclusion

In the study of technically-tactical activity of kickboxers of K1 B class, on the sample of 10 matches which were held in the national Championship of Serbia from 22nd to 23rd of March 2014 in Novi Sad, SRC "Spens" nine variables were followed; four arm

techniques, jab, uppercut, hook, uraken and five leg techniques low kick, mae geri, mawashi geri, mawashi geri pivot and knee kick. The main objective of the study was to determine the frequency of certain technique (punches and kicks) during kickboxing match and their contribution to the final score.

The results showed that even in this rank of competition, jabs dominate, in all three rounds total, and with this technique was scored 788 times or 41.56% (regarding punches and kicks), while in leg technique low kick dominates and with this technique was scored 415 times or 21.89% regarding all techniques. By the number of the total hits per rounds the winners are in the constant dominant advantage in all three rounds compared to the "defeated".

The trend line per round recorded increase and decrease. A slight decrease was noted in the second and the third round in winners and in defeated decrease was noted in the second and increase in the third round.

If we compare obtained results of B class with the results of A class (Ljubisavljevic et al. 2014), there is a noticeable dissonance in the number of hits of B compared to an A class. It is very important that the "defeated" of A class according to the number of hits performed are "dominant" compared to the "winners and defeated" of B class. The obvious is a distinct rise of winner's and defeated activity of an A class during all three rounds compared to B class. The results obtained, undoubtedly confirm that the primary arm technique, but in combination with kicks, increase the chance for victory.

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TEHNIČKA I TAKTIČKA ANALIZA KIKBOKSERA I K1 BORACA

Sažetak:

Cilj ovog istraživanja odnosi se na tehničko-taktičke karakteristike borbe u kickboxingu. Istraživanje je provedeno na uzorku od 10 finalnih borbi, odnosno 20 K1 boraca B-klase. Putem ove studije istražila se učestalost ručnih udaraca (jab, hook, uppercut, uraken) kao i pet udaraca (low kick, mae geri, mawashi geri, mawashi pivot, knee). Prema statističkim analizama, izračunavanjem učestalosti primijenjenih tehnika koje su izražene u terminima relativne i apsolutne vrijednosti, a dobivene putem trend analize, zaključeno je da postoji razlika u kvantitativnoj zastupljenosti borbe tehničkih elemenata između pobjednika i poraženog. Najčešće tehnike napada su jab (41.56%) i low kick (21.89%). Usporedbom posmatranih pojava moguće je utvrditi da trend linija po rundi bilježi pad i uspon. Također, postoji razlika između boraca K1 B-klase i boraca K1 A-klase u broju udaraca gdje prednost imaju borci A-klase.

Ključne riječi: Tehnika, kickboxing, takmičarska aktivnost, runda, jab, low kick

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ANALYSIS OF POSTURE STATUS DIVERSITY BETWEEN GIRLS AND BOYS, AGED 7 - 9 YEARS, RECORDED IN THREE DIMENSIONS

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Original scientific paper

Abstract:

Postural deformities are increasingly common in children and adolescents. In the preschool and early school age functional disorders posture are most frequently occur, while the adolescence characterized by the appearance of structural deformities of the spinal column. It is very important to establish postural disorders as early as possible, in order to provide a means of positive influence and keep them under control. Good posture is one of the basic requirements of good health, normal growth and development as a whole. An increasing number of children due to bad habits and hypokinesia faced with the problems of poor posture status. The aim of this study is that by using "Contemplas" measuring instrument and "3D posture compact" testing protocol, determine the degree of postural deformities and differences between boys and girls. The study included 280 respondents of the school population from 1st to 4th grade elementary school, 140 girls and 140 boys. Significant statistical differences between girls and boys (Sig. .001) were obtained from the variables Distance thoracic spine - sacrum, lumbar spine Distance - sacrum, Varus / Valgus left, Varus / Valgus right. Based on the obtained results it can be said that girls have more often than boys problems related to these four variables. Also, twice as many girls than boys has pronounced deformity relating to the valgus knee. Results of the thoracic part of the spinal column status - viewed frontally (girls AS. -0.31 / Boys AS. - 0.46), a parameter suggests a potential scoliosis, indicating that there is no significant difference between boys and girls (Sig., .062). In terms of the variable "thoracic spine" it can be concluded that the test group of children doesn't have big scoliotic deviations and there is no significant difference between boys and girls for this potentially very dangerous physical deformity.

Key words: body alignment, scoliosis, deformity, 3D analysis

Introduction

In recent years, among children and young people who in the future will be the holders of the society and the community, there is a growing global problem hypokinesia. The disturbing fact is that a growing number of children tends to be sedentary lifestyle and a growing lack of habit of regular exercise. With the advent of the Internet and modern technology, the lifestyle of the human race is completely changed. One of the biggest problems are long-hour irregular positions where children are during the day, which ultimately lead to different postural deformities (Le Roux, 2013).

Body posture is a reflection of the physical and psychological state of the individual, as well as an indicator of the mechanical efficiency of kinetic sense, muscle balance and nerve-muscle coordination (Wojna, Anwajler, Hawrylak, & Barczyk, 2010). It is well known that good posture is one of the basic requirements of good health, normal growth and development as a whole (Torlaković, Muftić, & Kovač, 2013). Poor posture can cause various diseases of locomotor system, nervous system, cardiovascular and respiratory systems (Łubkowski, Szarka-Eckardt, Zukowski, Bendik, & Pavlović, 2015), and a timely reviews of experts are necessary to eliminate or minimize the possible postural deformities. The age of childhood is recognized as a sensitive period for the adoption and retention of habits to physical exercise (Huddleston et al., 2002). It is therefore

necessary to take advantage of the period of early childhood and encourage children to engage in physical activity, which is one of the key methods of fighting against bad posture (Łubkowski et al., 2015).

The aim of this study is to evaluate and determine the diversity of posture status in boys and girls aged 7 to 9 years old.

Methods

The sample of respondents

A random study included 280 subjects (140 girls and 140 boys) from 1st to 4th grade (ages 7-9 years) in six primary schools of the Sarajevo Canton. The condition for participation in the study of each subject was written parental consent.

The sample of variables

A sample of 17 variables are obtained via "3D posture compact" testing protocol on Contemplas measuring instrument (Table 1). The parameters indicate the eventual deviations from zero (normal) values of postural status at all three planes, where shifts in the observed plains has been shown in centimeters and degrees. Higher values of deviation (positive or negative) and imply a higher level of deformity (Kovač, Kajmović, Rado, & Manić, 2014).

Table 1. Description of variables

Shoulder displacement	Variable expressed in centimetres indicates elevation/depression of the left/right frontal plane. Results with the positive values are in regard to the right shoulder elevation, while the negative values indicate a left shoulder elevation.
Pelvic obliquity	Variable expressed in centimetres displays elevated/lowered left/right pelvic side in frontal plane. Results with positive values indicate the elevation of right pelvic side, and results with negative value indicate the elevation of left pelvic side.
Shoulder rotation	Variable expressed in degrees indicates the rotation in longitudinal axis (transversal plane) of the left/right shoulder. If the results are positive it indicates a rotation of the upper body in which case the right shoulder is placed forward, while negative results indicate a rotation of the upper body in which case the left shoulder is placed forward.
Pelvic rotation	Variable expressed in degrees indicates rotation in longitudinal axis (transversal plane) of the left/right pelvic side. If the results are positive it indicates the rotation in which case the right side of the pelvis is placed forward, while in negative results the rotation of the left side of the pelvis is placed forward.
Trochanter rotation	Variable expressed in degrees indicates rotation of the left/right trochanter in longitudinal axis (transversal plane). If the result is positive it indicates the rotation of the lower body in which case the right side of pelvis is rotated towards front, while the negative results indicate the front rotation of the left side of pelvis.
Condylus rotation	Variable expressed in degrees indicates the knee rotation in longitudinal axis (transversal plane). If the results are positive, it indicates the front rotation of lateral condylus of the right leg, while the negative results indicate the front rotation of the left lateral condylus.
Malleolus rotation	Variable expressed in degrees indicates the rotation of the axis which runs through malleolus of ankle joint. If the result is positive it indicates the front rotation of the lateral malleolus of the right foot, while the negative result indicates the opposite rotation.
Sag. Distance cervical spine – sacrum*	Variable expressed in centimetres indicates the distance of the most protruded cervical (neck) vertebra in regards to the vertical line projection of the sacrum (bone at the bottom of the spine) in the sagittal plane. Positive result indicates the increased flexion of the cervical spine, while the negative results indicate the increased extension of the cervical spine.
Sag. Distance thoracic spine – sacrum*	Variable expressed in centimetres indicates the distance of the thoracic spine in regards to vertical line projections of the sacrum (bone at the bottom of the spine) in sagittal plane. Positive results indicate an increase of flexion in thoracic spine, while the negative results indicate an increase in other extension of the thoracic spine . *Higher values in the positive and negative offset do not apply for the variables "Sag. distance cervical, thoracic, lumbar – sacrum"
Sag. Distance lumbar spine – sacrum*	Variable expressed in centimetres indicates the distance of the lumbar (lower) spine in regards to the vertical line projection of sacrum (bone at the bottom of the spine) in sagittal plane. Positive result indicates an increase in lumbar spine flexion, while negative results indicate increase in the lumbar spine extension.
Varus/Valgus left	Variable expressed in degrees indicates the Varus-Valgus alignment angle of the left leg (medial/lateral) at the knee joint.
Varus/Valgus right	Variable expressed in degrees indicates the Varus/Valgus alignment angle of the right leg (medial/lateral) at the knee joint.
Flexion/Extension left	Variable expressed in degrees indicates the hyperextension and flexion of the left leg at the knee joint (sagittal plane). Positive result indicates the left leg flexion, while negative result indicates hyperextension of the left leg.
Flexion/Extension right	Variable expressed in degrees indicates the hyperextension or the flexion of the right leg at knee joint (sagittal plane). Positive result indicates the right leg flexion, while the negative result indicates the hyperextension of the right leg.
Frontal Cervical spine	Variable expressed in centimetres indicates the distance of the cervical spine in frontal plane in relation to the vertical line projection of the sacrum. If the result is positive it indicates the right displacement of the cervical spine, and the negative result indicates the left side displacement.
Frontal Thoracic spine	Variable expressed in centimetres indicates the distance of the thoracic spine in frontal plane in relations to vertical line projection of the sacrum. If the result is positive it indicates the right displacement of the thoracic spine, while the negative result indicates the left side displacement.
Frontal Lumbar spine	Variable expressed in centimetres indicates the distance of the lumbar spine in frontal plane in relation to vertical line projection of sacrum. If the result is positive it indicates the right displacement of the lumbar spine, but if the result is negative it indicates the left side displacement.

Testing protocol

To begin the testing and evaluation of posture on the measuring instrument Contemplas, it is necessary to have a perfect flat surface in order to set up Contemplas measurement panel (Figure 1). Gluing me

tering plate to the substrate is required to prevent shifted while children standing on it, which would, if it was a shift, leading to repeat the calibration process.

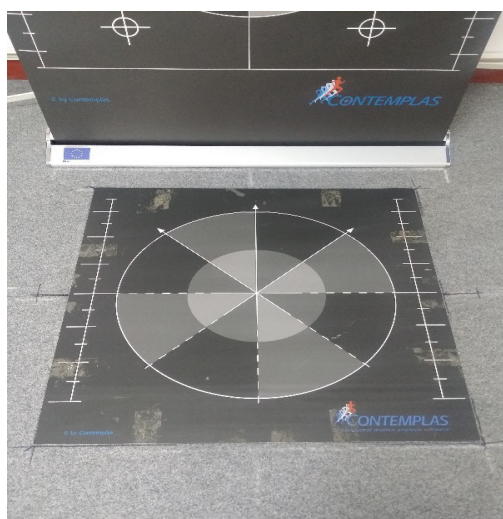


Figure 1. Contemplas panel

After proper installation of plate, follows placing a 3D calibration frame on which are placed reflective markers (Figure 2).

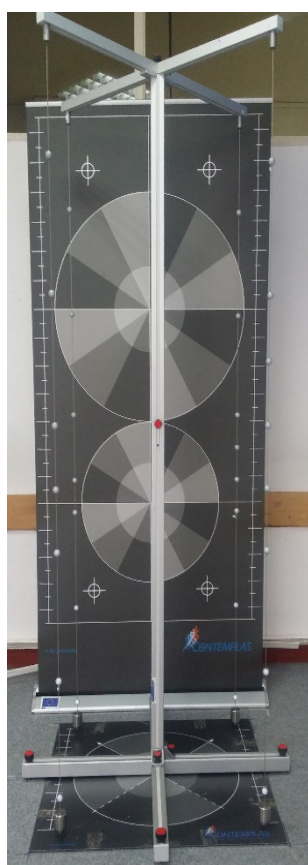


Figure 2.

The calibration frame has to be positioned in the middle of Contemplas plate. All parts of the calibration frame is required ideally aligned, which is checked by using a spirit level. After a calibration frame installation, follows setting up the "V" frame on which there are 3 cameras that enable three-dimensional analysis (Figure 3).



Figure 3. „V“ Camera Frame

The cameras are set to a minimum of 2 meters and 15 centimeters from the center of the measuring board. Then in the software, check the image quality camera and begins with the space calibration. On the basis of the calibration frame, the process of calibrating gain width, depth and height. The next step involves preparing and placing reflective markers on specific points (depending on the test protocol) of a subject body. "3D Posture Compact" protocol provided for placing 14 markers on the body of each subject on the following specific places: the acromion (left and right), cervical spine, thoracic spine (kyphosis), lumbar spine (lordosis), crista iliaca posterior superior (left and right), sacrum, trochanter major (left and right), condylus laterallis (left and right), malleolus laterallis (left and right). Once the markers are placed, the respondent stands on the board with his back toward the camera, with a hip-width apart parallel feet, divorces, where axis passing through the center malleolus must be parallel with the horizontal line on the measuring board (frontal plane). Respondent should stand still, with parallel feet hip-width apart and looking straight ahead, after which the recording (between the 12 and 18-and-second). After recording, markers are removed from the subjects and put on the next and repeats the process pasting markers and paint. Protocol testing is used according to Kovač et al. (2014).

Data processing method

The results are processed in IBM SPSS 22 software package. All results are expressed by the mean and standard deviation. T-test for independent samples was used to establish the postural status differences between pupils of different genders.

Results

Through the realization of the research it was found that with 3D analysis can be collected very good data on physical deformities. Transversal analysis that combines data from the sagittal and frontal planes allows for more relevant indicators than just the analysis in the sagittal plane (Steffen et al., 2010). In view of the spine, a statistically significant difference between boys and girls was obtained with two variables (Sag. Distance thoracic spine - sacrum; Sag. Distance lumbar spine - sacrum) which provide information of the spinal column state in the

sagittal plane ($p < .001$) (Table 2). The values in the sagittal plane were caused by physiological curves of the spine at the cervical, thoracic and lumbar region, and based on the distance from the outermost part of the sacrum (Kovač et al., 2014). Next to spinal deformities, a statistically significant difference ($p < .001$) was obtained in two variables related to the legs deformity (varus and valgus) (Table 2). The reason for zero values in the variables "malleolus rotation" is that according to the protocol of testing, each participant had the same initial parallel position, where the axis which running through the center of the lateral malleolus should be parallel to the center line on the measuring board.

Table 2. Differences between boys and girls

Variables	Boys		Girls		T- test
	Mean	St. deviation	AS	SD	
Shoulder displacement	0.34	0.78	0.41	0.97	.498
Pelvic obliquity	0.08	0.34	0.10	0.36	.646
Shoulder obliquity	-0.83	5.70	-1.06	4.64	.710
Pelvic rotation	-0.81	5.59	-0.75	4.83	.915
<i>Trochanter rotation</i>	-2.20	5.40	-1.34	4.85	.163
Condylus rotation	-2.36	3.95	-2.21	3.83	.747
Malleolus rotation	0.00	0.00	0.00	0.00	-
Sag. Distance cervical spine - sacrum	2.40	1.83	2.55	1.87	.061
Sag. Distance thoracic spine - sacrum	-1.03	1.49	-0.26	1.59	.000
Sag. Distance lumbar spine - sacrum	2.14	1.00	2.69	0.90	.000
Varus/Valgus left	-0.09	2.62	1.50	2.66	.000
Varus/Valgus right	-0.48	2.85	1.40	2.36	.000
Flexion/Ext left	-1.72	6.20	-1.80	6.02	.912
Flexion/Ext right	-0.32	6.67	-0.69	5.10	.604
Cervical spine	-0.19	0.94	-0.12	0.90	.500
Thoracic spine	-0.46	0.73	-0.31	0.66	.062
Lumbar spine	-0.18	0.36	-0.19	0.34	.786

Discussion

The spine has a central role in the correct and proper posture. The assumption of normal posture, at which comes the minimum muscle tension and energy consumption are optimal ratio of spinal structures and joints (Muyor, López-Miñarro, & Alacid, 2013). Our results indicate that girls than boys have a greater tendency to lumbar lordosis, kyphosis, genu varum and genu valgus deformities (64 girls, or 45.71% of them have expressed lordosis, while 42 girls or 30% of them have expressed kyphosis). Kifotic bad posture is characterized by increasing physiological curvature of thoracic spine toward backwards (Simov, Milinić, & Stojanović, 2011). Survey results indicate that one of the causes of kifotic poor posture is probably bad posture while sitting (bending head towards sternum) (Simov et al., 2011) and one of the growing problems of our time is excessive computer work. Some research suggests that the increased sitting time at a computer in girls leads to a rise in cases of lumbar lordosis, and the reason is stated lower body height than boys, which leads to stretched trunk in order to view toward the monitor lead in the straight (Straker, O'Sullivan, Smith, & Perry, 2007). Inactivity leads to a weakening and mus-

cle tone decline, and thus the strength of the back muscles, causing improper seating that can lead to spinal deformity, or the appearance of bad posture. Regarding the relationship between the angle of the upper leg and lower leg (Valguma / Varum knee), it is evident through the results of this study that girls incline towards valgus position (81 girls, or 57.85% of them have expressed valgus position). As possible causes of the frequent cases of increased valgus in girls according to specific structure (width of the pelvis, pelvic inclination, the weakness of certain pelvis muscle groups, lowered foot, and increased dorsiflexion of the foot) (McLean, Huang, & van den Bogert, 2005; Paušić, 2007). Genu valgum is very common physical deformity, affects the stability and mobility of the lower extremities, and if there is no preventive work, it can lead to a limitation in range of motion, and affect the overall function of the locomotor system. The reasons for this situation can be sought in the fact that children are less play and engage in physical activity during leisure time, and an increasing part of their time spent in a passive position, sitting or lying down (Cvetkovic & Peric, 2009).

Conclusion

This research led to the conclusion that girls ages 7 to 9 years are significantly more likely to postural problems in relation to their peers males regarding to the four variables (Distance lumbar spine - sacrum, Distance thoracic spine - sacrum, Varus / Valgus left, Varus / valgus right). Increasingly frequent occurrence of inactive children and youth, or hypokinesia and sedentary lifestyle, are an ideal platform

for the development of various diseases and deformities. The results indicate that it is necessary to include younger school age children in organized systematic work, as well as the need for active use of free time. Also of great significance is the educated and informed parents whose children suffer from certain aspects of postural deformities, about the role of the timely inclusion in kinesitherapy programs that may ultimately lead to improved posture.

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ANALIZA RAZLIČITOSTI STATUSA POSTURE IZMEĐU DJEVOJČICA I DJEČAKA UZRASTA OD 7 DO 9 GODINA SNIMLJENIH U TRI DIMENZIJE

Sažetak

Posturalni deformiteti su neminovno učestali u dječijem i adolescentnom uzrastu. U predškolskom i ranom školskom uzrastu najčešće se javljaju funkcionalni poremećaji posture, dok je za adolescentni uzrast karakteristična pojava strukturalnih deformiteta kičmenog stuba. Zato je jako bitno ustanoviti posturalne poremećaje u što ranijoj dobi, kako bi se na njih moglo pozitivno utjecati i držati ih pod kontrolom. Dobro držanje tijela predstavlja jedan od osnovnih preduslova dobrog zdravlja, normalnog rasta i razvoja u cijelini. Sve veći broj djece zbog loših navika i hipokinezije susreće se sa problemima lošeg statusa posture. Cilj ovog rada je da se pomoću „Contemplas 3D posture compact“ protokola testiranja, utvrdi stupanj posturalnih deformiteta te razlike između dječaka i djevojčica. Istraživanje je obuhvatilo 280 ispitanika školske populacije od 1 do 4 razreda Osnovne škole, 140 djevojčica i 140 dječaka. Značajne statističke razlike između djevojčica i dječaka (Sig. .001) dobivene su kod varijabli Distance thoracic spine – sacrum, Distance lumbar spine – sacrum, Varus/Valgus left, Varus/Valgus right. Na osnovu dobivenih rezultata može se konstatirati da se kod djevojčica češće pojavljuju problemi vezani za ove četiri varijable. Utvrđeno je da dvostruko veći broj djevojčica u odnosu na dječake, ima izraženiji deformitet koji se odnosi na valgus koljena. Rezultati statusa torakalnog dijela kičmenog stuba - gledano frontalno (djevojčice AS. -0.31 / dječaci AS. - 0.46), parametra koji ukazuje na potencijalni deformitet skoliotičnog tipa, govore da ne postoji signifikantna razlika između dječaka i djevojčica (Sig. .073). Na osnovu predloženih rezultata, može se zaključiti da ispitivana grupa djece nema velika skoliotična odstupanja, odnosno da ne postoji značajna razlika između dječaka i djevojčica za ovaj potencijalno vrlo opasan tjelesni deformitet.

Gljučne riječi: Deformiteti tijela, 3D Contemplas, SpineLab.

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LEISURE TIME OF PRIMARY SCHOOL STUDENTS AS AN IMPORTANT FACTOR OF EDUCATION AND PERSONAL DEVELOPMENT

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Original scientific paper

Abstract

Leisure (free) time, as a space for relaxation, rest, positive personal development, humanization, socialization and creative personal development becomes an important factor of upbringing and education. The way young people spend their free time depends of their exposure to the appropriate educational influence during their growing up period. The aim of the research is to examine the way of how primary school children spend their leisure time, considering their sex, success, school grade, and connectivity of the students' age (grade) and success with the free time utilization. A sample of respondents consists of 505 younger age students from the primary school „turbe.“ The results showed that students spend their free time well, and that there is statisticly relevant difference among students in spending free time, considering their sex, success and the school grade. Based on research results, we can conclude that there is a connection between success, grade (age) and the way of spending free time. So, the students who spend their free time well are more successfull in school, but with age there is a slight decrease of well and useful free time spending. The final results will be used in practice what will help students in free time organizing and planning.

Key words: free time, students, primary school, education.

Introduction

Leisure, or free time, is a widespread phenomena of contemporary society. The easiest way to define free time is to claim that it is a space of freedom for every individual and satisfying his/her own needs. Previsic (2000) defines free time as the „time of active relaxation, rest, positive development, socialization, humanization, and creative confirmation of personality with its important characteristics such as: freedom, will, meaningfulness, creativity, individuality, amateurism, inculturation, self-actualization, self-activity.“ The same author further claims that free time is a space and possibility of interaction within the process of individualization, socialization, and personality realization. Important characteristic of such free time is not wasting it, but creative planning of time which is disposed to an individual after completion regular duties. Considering that free time is a universal phenomena of modern society, its meaningful spending is a pedagogical category and important domain of upbringing and education (Previsic 2000). Arbunic (2004) connects free time with the absence of duties and determines it as „time shortcut released from every necessity, which is disposed to an individual for satisfying his/her own personal, intimate needs in self uniqueness realization.“ Free time activities are diverse, and can consist of physical activity, tourism, media, art, interaction with people, implementation of family obligations“ (Ilsin, 2000). Free time with its implications and the content becomes an important factor of upbringing and education. Contemporary society carries with itself a variety of contents which enter our freedom space, but what are those that we are going to choose depend on many factors; first of all, from our free time education. „The choice of free time activities is especially important for young people who are exposed to different educational influences. For them, free time activities can be the source of progress but also unfavorable influences“ (Mlinarevic, 2006). During growing up period, young people should be educated in a way that they can control their free time and utilize if following their

own interes. For a healthy development of youth, the important role have their family and the school. The school and family tasks are to help in organizing free time, to reinforce positivity and to stop negativity, to direct children to ideal society offering interesting and different sport or cultural activities. A well spent free time allows young people to satisfy some of their needs (socializing, affirmation, belonging) and develop many competences (interpersonal, communicational, motivational) (Center for healthy growth, 2013). Particularly because of importance that a free time has on youth, the main element of the work wants to examine the question: Do primary school students spend their free time well and in a useful way? To find out the way students spend their free time, we purposefully examined the attitudes of students about their spending time way. We assumed that there is a connection between the success of the students and the grade (age of students) with the way of spending free time.

Methodology of the work

Exsperimental facing the problem

According to the questionnaire consisted of 21 question, we examined the way primary school students spend their free time. Interviewing was done by the people who are responsible and familiar with the way of answering. Interviewing in the lower grades was done by the classroom teachers and in the upper grades, by the subject teachers. The students had 10 minutes to answer the questionnaire, so they did not have time to think too much of the answers. The students filled the questionnaire on a voluntary basis. The research is done with the approval of the Board of Trustees of primary school „Turbe.“

Sample of respondents:

The sample of respondents consisted of 505 students of primary school „Turbe.“ Therefrom 101 students from the 4th grade, 101 students from the 5th grade, 101 from 6th, 101 from 7th, and 101 from 8th grade. From the total number of respondents

242 (47.90%) are boys, and 263 (52.10%) are girls. According to success, 11 (2.10%) are satisfactory, 110 (21.80%) are average, 176 (34.90%) are very good, and 208 (41.20%) are great students.

Instruments:

In the research is used a questionnaire. The first group of questions, total 3, which are at the top of the questionnaire are related to gathering the principal sociodemographic information about the students who are involved in the research. Those are: sex, grade, school success by the end of the first term. Afterwards, there are 18 questions answered through the Likert's type scale: 1 (I strongly disagree); 2 (I disagree); 3 (neutral); 4 (I agree); and 5 (I strongly agree).

Statistical analysis:

Gathered information are operationalized through the further statistical analysis:

Review of reliability we examined with Alpha Cronbach method, and later on, we calculated principal descriptive parameters. With Chi-square test (2x2) we examined the difference between boys and girls in spending free time. Kruskal-Wallis's test was used for examining the differences between students according to their success when spending free time and for examining the differences between school grades when spending free time. Through the logistic regression we confirmed the connection between success and the school grade (age) with free time spending. With the factor analysis we performed factorization. The level of relevance is $p < 0.05$.

Results and discussion

Research titled „Free time of students as an important factor of education and development“ was done in primary school „Turbe“ in Turbe.

Calculated Cronbach coefficient alpha for 8 indicators of profitable free time spending (Table 1) is 0.74.

Table 1. Measure of central tendency, variability and distribution of frequency characteristics
Profitable free time spending

Rb.	Variables	N	Md	1 %	2 %	3 %	4 %	5 %
1.	I spend free time socializing with friends	505	4.00	3.20	5.10	7.70	40.60	43.40
2.	In my free time, I read some book or a newspaper.	505	3.00	22.80	12.90	18.40	24.60	21.40
3.	In my free time, I help my family members to do the housework.	505	4.00	5.70	8.50	12.90	34.10	38.80
4.	I spend my free time walking or having picnic with friends.	505	4.00	10.50	12.70	17.40	34.30	25.10
5.	I spend free time driving bicycle or rolls.	505	4.00	11.90	9.50	11.70	29.50	37.40
6.	I spend free time playing outside with friends.	505	4.00	5.30	6.90	9.70	35.20	42.80
7.	In my free time I play some sport or hobbies.	505	4.00	10.30	10.90	10.30	25.90	42.60
8.	I am involved in one or more out of class activities in my school.	505	3.00	32.70	9.90	10.50	19.40	27.50

Reminder: N-total number of respondents; Md-Median

Analyzing table 1 we can see that majority of students spend their free time socializing with friends, playing outside, walking or having picnic with friends, doing some sport or hobby, driving bicycle or rolls, and also some of them like to read some book or a newspaper (even though it is a high percentage of

those who are not fond of it). From the Table 1 we can see a high percentage of students who are not involved in some extra activities in school.

Calculated Cronbach coefficient alpha for 5 indicators of unprofitable free time spending (Table 2) is 0.57.

Table 2. Measure of central tendency, variability, and distribution of frequency characteristics.

Rb.	Variables	N	Md	1 %	2 %	3 %	4 %	5 %
1.	I spend free time playing computer games.	505	2.00	24.00	28.10	15.40	20.00	12.50
2.	I spend free time on Internet	505	3.00	26.90	21.00	13.50	21.40	17.20
3.	I have too much of my free time and I am bored.	505	2.00	42.80	20.00	14.50	11.00	11.70
4.	In my free time I sleep or just loafing.	505	2.00	49.70	20.40	10.10	10.90	8.90
5.	In free time I watch soap operas.	505	3.00	34.20	14.90	18.00	19.60	13.30

The results of the research, (Table 2) show that majority of students does not spend their free time playing computer games, even though it is a high percentage of respondents who do. Majority of respondents claimed that they do not spend free time „surfing“ the Internet, even though it is a high percentage of those who do. Today, Internet can be understood as a gift, and if students use it in a useful way, it's acceptable, but otherwise, it is not. Majority

of students claimed that they are not bored in their free time, they do not sleep or loaf, and majority of them does not watch the soap operas.

Calculated Cronbach coefficient alpha for 5 indicators of directing students about free time spending (Table 3) is 0.71.

Table 3. Measure of central tendency, variability and distribution of frequency characteristics
Directing students about free time spending

Rb.	Variables	N	Md	1 %	2 %	3 %	4 %	5 %
1.	In free time, I would like to involve in some activities of afforestation or landscaping.	505	4.00	16.80	7.10	17.60	24.00	34.50
2.	Teachers direct us to spend our free time in a profitable way.	505	4.00	9.90	5.70	12.90	24.20	47.30
3.	Parents direct me to spend my free time in a profitable way.	505	5.00	7.30	4.40	6.90	23.00	58.40
4.	I like to spend my free time with family.	505	5.00	3.10	3.00	9.90	24.60	59.40
5.	Free time is important for me and I like to spend it in a useful way.	505	5.00	5.90	1.80	3.40	17.40	71.50

Analyzing results, (Table 3) we see that majority of students are willing to involve in some activities of afforestation or landscaping. Majority of them claimed that teachers and parents direct them to profitable free time spending. Also, a majority primary school students like to spend time with their families, free time is important to them and they want to spend it in a useful way. Considering that majority of parents have a job, and that Internet is completely available to children, we assumed that they do not spend their free time well. On the contrary, the results showed completely opposite, and we can say that our assumption, free time of primary school students is not filled with useful activities is not true.

We suppose that their homeplace or suburban area influenced such results.

Table 4. Free time – comparing relevance according to sex (male/female) (CHI-square test 2x2)

Parameters	N	Chi-Square	df	Sig.
Well spent free time	505	47.861	32	0.035
Bad spent free time	505	26.506	20	0.150
Directing students	505	49.087	17	0.000

Reminder: N-total number of respondents; Chi-Square-value of CHI-square test; df- freedom percentage; Sig.- statistical relevance.

Chi-square test showed that there are statisticly relevant differences between boys and girls when it comes to well spent free time spending and directing. Differences are not confirmed in analyzing bad free time spending, and therefore we get a strong confirmation of our assumption that there is a statisticly relevant difference in attitudes of students about free time when considering their sex, success, and the school grade. We got results we expected when analyzing differences based on sex, because we assume that boys are fond of bad and unuseful free time spending, what is quite different in girls' case.

Table 5. Kruskal-Volis's test (KVSL)

Test Statistic ^{a,b}	
	KVSL
Chi-Square	46.466
df	3
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: success	

Reminder: KVSL- profitable free time; Chi-Square- value of CHI-square test; df- freedom percentage; Sig.- statistical relevance

Table 6. Median (KVSL)

Report		
KVSL	Median	N
success		
"satisfactory"	3.1250	11
"average"	3.5000	110
"very good"	3.6250	176
"great"	4.1250	208
Total	3.7500	505

Reminder: KVSL- well spent free time; N- total number of respondents

Kruskal-Volis's test discovered statisticly relevant difference in well free time spending based on success, $\chi^2(3, n=505) = 46.47, p=0.000$. Great students have higher median results (Md=4.13) in a difference of students with verygood, average and satisfactory success. We expected these results based on success, because we suppose that the success is better if the free time is spent well.

Table 7. Kruskal-Volis's test (NKVSL)

Test Statistics ^{a,b}	
	NKVSL
Chi-Square	14.548
df	3
Asymp. Sig.	.002
a. Kruskal Wallis Test	
b. Grouping Variable: success	

Reminder: NKVSL- bad spent free time; Chi-Square- value of CHI-square test; df- freedom percentage; Sig.- statistical relevance.

Table 8. Median (NKVSL)

Report		
NKVSL	Median	N
success		
"satisfactory"	2.2000	11
"average"	2.6000	110
"very good"	2.4000	176
"great"	2.2000	208
Total	2.4000	505

Reminder: NKVSL- bad spent free time; N- total number of respondents

Kruskal-Volis's test discovered also statisticly relevant difference in bad free time spending based on success $\chi^2(3, n=505) = 14.55, p=0.002$. Students with average success have higher median results (Md=2.60) in bad free time spending, what is different in case of other students. Based on the results, we can conclude, that the second part of our assumption is also confirmed *there is a statisticly*

relevant difference in attitudes of students about free time spending, according to their sex, success and the grade students attend.

Table 9. Kruskal – Volis's test (KVSL)

Test Statistics ^{a,b}	
KVSL	
Chi-Square	69.691
df	4
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: grade	

Reminder: KVSL- well spent free time; Chi-Square- value of CHI-square test; df- freedom percentage; Sig.- statistical relevance.

Table 10. Median (KVSL)

Report		
KVSL grade	Median	N
"IV"	4.2500	101
"V"	4.0000	101
"VI"	3.7500	101
"VII"	3.5000	101
"VIII"	3.3750	101
Total	3.7500	505

Reminder: KVSL- well spent free time; N- total number of respondents

Kruskal-Volis's test discovered statisticly relevant difference between boys and girls in well free time spending based the school grade. $\chi^2(4, n=505) = 69.69, p=0.000$. The students of the 4th grade have a higher median results (Md=4,25) from the other students in well free time spending. Therefore, younger students spend their free time more usefully and profitably.

Table 11. Kruskal – Volis's test (NKVSL)

Test Statistics ^{a,b}	
NKVSL	
Chi-Square	23.108
df	4
Asymp. Sig.	.000
a. Kruskal Wallis Test	
b. Grouping Variable: grade	

Reminder: NKVSL- bad spent free time; Chi-Square- value of CHI-square test; df- freedom percentage; Sig.- statistical relevance.

Table 12. Median (NKVSL)

Report		
NKVSL grade	Median	N
"IV"	2.4000	101
"V"	2.4000	101
"VI"	2.4000	101
"VII"	2.4000	101
"VIII"	2.8000	101
Total	2.4000	505

Reminder: NKVSL- bad spent free time; N- total number of respondents

Kruskal-Volis's test discovered statisticly relevant difference in bad free time spending based on the school grade. $\chi^2(4, n=505) = 23.11, p=0.000$. The students of the 8th grade have a higher median results (Md=2.80) from the other students. We expected such results we supposed that the older primary school students spend less useful their free time in a difference of younger students. Analyzing research results we conclude that the third part of our assumption is also confirmed *there is a statisticly relevant difference in attitudes of primary school students about free time spending based on the sex, success and the school grade*. With this our assumption is completely confirmed.

Logistical regression was done in order to confirm connection of the students' success and profitable free time spending (Table 13). The whole model (with all predictors) was statisticly relevant, $\chi^2(8, n=505) = 47.73, p<0.01$, what confirms the connection between the success and well spent free time. If the students spend their free time well, than the school success is also better. The complete model explains between 9.0% (r^2 Koks and Snel) and 13.5% (r^2 Nagelkerk) the variaties of the success and correctly classifies 75.6% of cases. As showed in Table 13, just one variable gave a unique statisticly relevant contribution to the model (involving in one or more extraactivities in school). The strongest predictor of well spent time was socializing with friends, whose probability quotient is 1.39.

Table 13. Predicting connectivity of the success with the well spent time.

Rb.	Variables	B	SE	Wald	df	Sig.	Exp(B)	95%C.I.for Exp (B)	
								Lower	Upper
1.	I spend free time socilizing with friends.	.33	.34	.95	1	.33	1.39	.72	2.67
2.	In my free time. I like to read some book or a newspaper.	-.30	.25	1.53	1	.22	.74	.46	1.19
3.	In my free time. I like to help my family members to do the housework.	-.11	.25	.18	1	.67	.90	.55	1.47
4.	In my free time. i like to walk or have picnic with friends.	.08	.25	.11	1	.74	1.09	.66	1.79
5.	I spend free time driving bicycle or rolls.	.06	.26	.05	1	.82	1.06	.64	1.74
6.	I spend free time playing with friends outside.	-.35	.29	1.50	1	.22	.70	.40	1.24
7.	In my free time. I like to play some sport or hobby.	-.39	.25	2.47	1	.12	.68	.42	1.10
8.	I am involved in one or more extra activities in school.	-1.29	.26	24.62	1	.00	.28	.17	.46
9.	Constant	2.28	.24	89.22	1	.00	9.80		

Reminder: B-unstandardized coefficient; SE-standard mistake; df-freedom percentage; Sig.-relevance; Exp(B)-probability quotient; 95%C.I.for Exp (B)- Interval of 95% of accuracy for probability quotient.

Through logistic regression, we examined connection of the success with the bad spent free time (Table 14). The whole model (with all predictors) is not statistically relevant $\chi^2(5, n=505) = 10.23, p > 0.05$, what shows that there is no relevant connection between students' success and bad spent free time. Complete model explains between 2.0% (r^2 Koks and Snel) and 3.0% (r^2 Nagelkerk) the varieties of

the success and correctly classifies 76.0% of cases. As showed in Table 14, just one variable gave a unique, statistically relevant contribution to the model (spending free time „surfing“ the Internet). The strongest predictor of bad free time spending was „surfing“ the Internet, whose probability quotient is 1.62.

Table 14. Predicting connectivity of the success with bad spent free time

Rb.	Variables	B	SE	Wald	df	Sig.	Exp(B)	95% C.I. for Exp (B)	
								Lower	Upper
1.	I spend free time playing computer games	.07	.24	.09	1	.76	1.08	.67	1.72
2.	I spend free time „surfing“ the Internet	.49	.24	4.26	1	.04	1.62	1.03	2.57
3.	I have too much of my free time and I am bored.	.14	.25	.32	1	.57	1.15	.71	1.88
4.	I n my free time I sleep or just loafing.	.09	.27	.12	1	.73	1.10	.65	1.85
5.	In my free time I watch soap operas.	.27	.22	1.40	1	.24	1.30	.84	2.02
6.	Constant	.48	.30	2.54	1	.11	1.61		

Reminder: B-unstandardized coefficient; SE-standard mistake; df-freedom percentage; Sig.-relevance; Exp(B)-probability quotient; 95%C.I.for Exp (B)- Interval of 95% of accuracy for probability quotient;

Logistic regression was done in order to confirm connectivity of the school grade (age) with the well spent free time (Table 15). The whole model (with all predictors) was statistically relevant $\chi^2(8, n=505) = 57.38, p < 0.01$, what shows that there is a relevant connectivity of the students' age with the well spent free time. The complete model explains between 10.7% (r^2 Koks and Snel) and 14.5% (r^2 Nagelk-

erk) the varieties of the age and correctly classifies 64.0% cases. As showed in Table 15, just three variables gave a unique, statistically relevant contribution to the model (reading books in free time, driving bicycle or rolls, and involving in one or more extra activities in school). The strongest predictor of well spent free time was reading books or a newspaper, whose probability quotient is 2.28.

Table 15. Predicting connectivity of the students' age (school grade) with the well spent free time.

Rb.	Variables	B	SE	Wald	df	Sig.	Exp(B)	95%C.I. for Exp (B)	
								Lower	Upper
1.	I spend free time socializing with friends.	.03	.30	.01	1	.93	1.03	.57	1.85
2.	In my free time I read some book or a newspaper.	.82	.21	14.93	1	.00	2.28	1.50	3.46
3.	In my free time I help my family members to do the housework.	-.15	.23	.41	1	.52	.86	.55	1.35
4.	I spend my free time walking or having picnic with friends.	.09	.22	.16	1	.69	1.09	.71	1.69
5.	I spend my free time driving bicycle or rolls.	.76	.23	11.28	1	.00	2.13	1.37	3.31
6.	I spend free time playing with friends outside.	.22	.26	.69	1	.41	1.24	.75	2.07
7.	In my free time, i play some sport or hobby.	.03	.23	.02	1	.89	1.03	.66	1.61
8.	I am involved in one or more extra activities in school.	.47	.21	5.07	1	.02	1.61	1.06	2.43
9.	Constant	-1.46	.19	60.05	1	.00	.23		

Reminder: B-unstandardized coefficient; SE-standard mistake; df-freedom percentage; Sig.- relevance; Exp(B)-probability quotient; 95%C.I.for Exp (B)- Interval of 95% of accuracy for probability quotient;

Logistic regression was done in order to confirm connectivity of the grade (age) with bad spent free time (Table 16). The whole model (with all predictors) was statistically relevant $\chi^2(5, n=505) = 28.44, p < 0.01$, what shows that there is a relevant connectivity between the students' age (grade) and bad spent free time. The complete model explains between 5.5% (r^2 Koks and Snel) and 7.4% (r^2 Nagelk-

erk) the varieties of the age and correctly classifies 64.6% cases. As showed in Table 16, four variables influenced a unique statistically relevant contribution to the model (spending free time „surfing“ the Internet, too much of free time, sleeping or loafing or watching soap operas in free time). The strongest predictor of bad spent free time was „surfing“ the Internet, whose probability quotient is 2.02.

Table 16. Predicting connectivity between the students' age (school grade) and bad spent free time.

Rb.	Variables	B	SE	Wald	df	Sig.	Exp(B)	95% C.I. for Exp (B)	
								Lower	Upper
1.	I spend free time playing computer games.	-.09	.22	.16	1	.69	.92	.60	1.41
2.	I spend free time „surfing“ the Internet.	.70	.21	10.75	1	.00	2.02	1.33	3.07
3.	I have too much of free time and I am bored.	-.67	.24	7.85	1	.01	.51	.32	.82
4.	In my free time I sleep or loafing.	.62	.24	6.56	1	.01	1.87	1.16	3.01
5.	In my free time, I watch soap operas.	-.43	.21	4.14	1	.04	.65	.43	.98
6.	Constant	-.50	.14	13.05	1	.00	.61		

Reminder: B-unstandardized coefficient; SE-standard mistake; df-freedom percentage; Sig.-relevance; Exp(B)-probability quotient; 95%C.I.for Exp (B)- Interval of 95% of accuracy for probability quotient;

Based on the research results we conclude that our assumption: „there is a relevant connectivity between the success and the students' age (grade) with the free time spending“ is completely accurate and confirmed.

Free time factor structure of primary school students

Considering the number of respondents and variables, we supposed that it is possible to confirm students' free time factor structure. The value of Kaiser-Meyer-Olkin measure of adequacy is 0.790, what is above the offered value, 0.60, while Bartlett's test of sphericity achieved statistical relevance (0.000), what indicates that factor analysis is justified.

Applied factor analysis confirmed the latent structure of students' free time spending, calculating the matrix of intercorrelation, characteristic rates of matrix intercorrelation, the number of relevant characteristic rates defined with Gutman-Kajzer criteria, and calculating the main components of matrix intercorrelation and their communalities after extraction of factors, set of matrix, matrix structure after oblimin transformation, and calculating of correlation coefficients of latent dimensions defined as oblimin fac-

tors on this sample of primary school respondents.

Applied Gutman – Kajzer's criteria for stopping extraction of latent dimensions (with characteristic values LAMBDA-characteristic rate more than 1.) or defining the number of relevant correlation-matrix components of manifestive indicators (Table 17), allows pretty understandably, considering methodological intention, a reduction to „five latent dimensions“ which explain around 56% of unique representation of subject measuring, (free time of primary school students) and the rest 44% is about specific aspects or mistakes.

Table 17. Characteristic rates (LAMBDA) of matrix intercorrelation free time of primary school students

	LAMBDA	%	% KUMULAT.
1	4.001	22.228	22.23
2	2.239	12.437	34.67
3	1.531	8.507	43.17
4	1.212	6.733	49.91
5	1.089	6.053	55.96

Reminder: LAMBDA-characteristic rate more than 1; %KUMULAT.-cumulative percentage

Table 18. Matrix structure

Rb.	Parameters	1	2	3	4	5
1.	I spend free time socializing with friends.	.766				
2.	I spend free time playing computer games.		.704			
3.	I spend free time „surfing“ the Internet.		.725			
4.	In free time I read some book or a newspaper.		-.632			
5.	In my free time. I help my family members to do the housework.					.637
6.	I spend free time walking or having picnic with friends.	.667				
7.	I spend free time driving bicycle or rolls.	.644				
8.	I spend free time playing outside with friends.	.762				
9.	In free time I like to play some sport or hobby.	.655				
10.	I have too much of free time and I am bored.			.691		
11.	In free time I like sleeping or loafing.			.694		
12.	In free time I watch soap operas.					.659
13.	I am involved in one or more extra activities in school.		-.525			
14.	In my free time. i would like to involve in some activities of afforestation or landscaping.				-.600	
15.	Teachers direct us to spend our free time well and useful.				-.775	
16.	Parents direct me how to spend well my free time.				-.782	
17.	I like to spend my free time with family.				-.575	
18.	Free time is important to me and I like to spend it well.				-.552	

Reminder: In the Matrix structure chart are not listed values less than 0.30.

In Chart 18 are shown the correlations between manifestive indicators and oblimin factors.

In the first factor indicators define free time socializing with friends, playing some sport or hobby, driv-

ing bicycle or rolls, and walking or having picnic with friends. In the second factor indicators define free time playing computer games, „surfing“ the Internet, reading books or a newspaper, and involvement in extra activities out of school classes.

Third factor are defined by parameters which emphasize that students have too much of their free time and they are bored, they like sleeping and loafing. The fourth factor is defined by indicators in which parents and teachers direct children to the way of spending time, importance of free time for students, involving in different activities, and free time with family. In the fifth factor, parameters define free time through watching soap operas, and help family members to do the housework.

Table 19. Matrix of intercorelation between factors

Factors	1	2	3	4	5
1	1.000	-.091	.087	-.302	.094
2	-.091	1.000	.099	.258	-.077
3	.087	.099	1.000	-.038	.093
4	-.302	.258	-.038	1.000	-.105
5	.094	-.077	.093	-.105	1.000

Based on the Table 19 we see that there is a connection between factors, but the correlation is little. According to results we conclude that our assumption: „it is possible to confirm factorial structure of the primary school students' free time“ is confirmed.

Conclusion

Based on the research results we concluded that primary school students spend their free time well. The

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SLOBODNO VRIJEME UČENIKA OSNOVNE ŠKOLE KAO VAŽAN FAKTOR ODGOJA I RAZVOJA

Sažetak

Slobodno vrijeme kao prostor odmora, razonode, pozitivnog razvoja ličnosti, humanizacije, socijalizacije i stvaralačkog razvoja ličnosti postaje važan faktor odgoja i obrazovanja. Na koji način će mlade osobe iskoristiti svoje slobodno vrijeme zavisi i od toga je li na njih bio usmjeren odgovarajući odgojni utjecaj u razdoblju njihovog odrastanja. Cilj istraživanja je ispitati na koji način učenici osnovne škole provode svoje slobodno vrijeme s obzirom na spol, uspjeh i razred, te povezanost uspjeha i uzrasta učenika sa korištenjem slobodnog vremena. Uzorak ispitanika čine učenici Osnovne škole „Turbe“ i to 505 učenika mlađeg školskog uzrasta. Rezultati su pokazali da učenici kvalitetno koriste svoje slobodno vrijeme, da postoji statistički značajna razlika između učenika u provođenju slobodnog vremena obzirom na spol, uspjeh i razred. Na osnovu rezultata istraživanja zaključili smo da postoji povezanost uspjeha i razreda koji učenici pohađaju (uzrast učenika) sa provođenjem slobodnog vremena. Dakle, učenici koji korisno provode slobodno vrijeme imaju bolji uspjeh u školi, ali da sa uzrastom opada kvalitetno provođenje slobodnog vremena. Rezultati do kojih se došlo imaće svoju praktičnu primjenu pomoći učenicima u organizaciji i planiranju slobodnog vremena.

Ključne riječi: slobodno vrijeme, učenici, osnovna škola, odgoj.

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