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THE INFLUENCE OF TENNIS MOTOR ABILITIES AND BASIC ANTHROPOMETRIC CHARACTERISTICS ON THE COMPETITION SUCCESSFULNESS OF YOUNG TENNIS PLAYERS

VPLIV TENIŠKO MOTORIČNIH SPOSOBNOSTI IN TEMELJNIH ANTROPOMETRIČNIH ZNAČILNOSTI NA TEKMOVALNO USPEŠNOST MLADIH TENIŠKIH IGRALK IN IGRALCEV

Abstract

The aim of the present research is to find out how selected variables (explosive power of the arms, elastic power of the legs, repetitive strength of the trunk, movement speed, speed of alternative arm movements, agility, dynamic balance, flexibility of the shoulder girdle, running endurance, body height and body weight) can be used to explain the variance of criterion variable, represented by competition successfulness. The tests of tennis motor abilities and anthropometric measurements were carried out on a sample of 51 female and 52 male tennis players, aged 13. A regression analysis of female and male tennis players was carried out. It showed that the system of tennis motor variables explains 49% of the variance of criterion variable in female tennis players, and 54% in male tennis players. For female tennis players three variables were extracted that seem statistically significant for explaining the variance of criterion variable: the tests of elastic leg power, balance and running endurance; in the case of male tennis players two variables seem statistically significant. These two variables are the test of agility (fandrill) and body height. The findings indicate that the results of tennis motor tests and anthropometric measurements should be valued differently for female and male tennis players of the same age.

Key words: tennis, success, tennis motor tests, anthropometric measurements

Izvleček

Namen raziskave je ugotoviti, kako izbrane spremenljivke, ki predstavljajo eksplozivno in elastično moč nog in rok, repetitivno moč trupa, hitrost, hitrost alternativnih gibanj z roko, agilnost, ravnotežje, gibljivost ramenskega obroča, tekaško vzdržljivost, telesno težo in višino, pojasnjujejo varianco kriterijske spremenljivke. V ta namen je 51 teniških igralk in 52 teniških igralcev, starih 13 let, opravilo meritve teniško motoričnih sposobnosti in morfoloških značilnosti. Kriterijska spremenljivka je bila določena s tekmovalno uspešnostjo. Regresijsko analizo smo opravili ločeno za teniške igralke in igralce. Pri teniških igralkah smo s teniško motoričnimi in antropometričnimi spremenljivkami uspeli pojasniti 49 % variance kriterijske spremenljivke, pri teniških igralcih pa 54 %. Pri teniških igralkah med izbranimi spremenljivkami tri statistično značilno pojasnjujejo varianco kriterijske spremenljivke. Predstavljajo teste elastične moči nog, ravnotežja in tekaške vzdržljivosti. Pri teniških igralcih med izbranimi spremenljivkami dve statistično značilno pojasnjujeta varianco kriterijske spremenljivke. To sta spremenljivki, ki merita agilnost (pahljača) in telesno višino. Vsekakor dobljeni rezultati kažejo, da je potrebno rezultate teniško motoričnih in antropometričnih meritev enako starih teniških igralcev in igralk vrednotiti različno glede na spol.

Ključne besede: tenis, uspešnost, teniško-motorični testi, antropometrične mere

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Introduction

Tennis is a dynamic sports game played with a racquet and a ball. Success in tennis is defined by several factors, which can be divided into social (e.g., sport infrastructure, sport popularity), external (e.g., competitor, coach, parents, training conditions) and internal factors (e.g., potential capacity, realisation – mobility capacity and competition experience).

In the present research, the competition successfulness of young female and male tennis players, aged 13, is explained on the basis of selected tennis motor tests, anthropometric measurements, and the test of running endurance. The selected tests measure muscular power of the arms, elastic power of the legs and repetitive strength of the trunk, speed of movement, speed of alternative arm movements, agility, dynamic balance, flexibility of the shoulder girdle, running endurance, body height and body weight. Muscular strength is defined as the ability of a muscle or a group of muscles to exert maximal force during contraction. Muscular power is a combination of strength and speed. The test measures how quickly muscular strength is applied. The research was carried out with the aim of answering the following two questions: a) To what extent can the selected variables explain the variance of criterion variable in female and male tennis players?, b) Which variables have the highest prediction value for female and which for male tennis players?

The following pieces of research covering these issues have been consulted: Bunc, Dlouha, Hoehm and Safarik (1990) have conducted research on 80 boys and girls aged 13 and 14 with a test battery which was composed of eight tennis motor tests and anthropometric measures. Based on comparison between tests and competition successfulness in tennis they established that the speed of young tennis players was of high importance. Filipčič (1993) compared competition successfulness with the results of basic motor and tennis tests on 43 tennis players aged between 15 and 23. The results of regression analysis show a statistically significant connection between the system of predictor variables and the criterion variable. By applying the system of used predictor variables approximately 40% of the criterion variance can be explained.

Filipčič (1996) also compared competitive and potential successfulness to regression analysis and expert modelling on 87 young tennis players, aged between 12 and 14. Regression analysis was initially performed separately on motor, morphologic and functional parts of the expert tree. Using morphologic predictor variables, 50% of the criterion variable was explained, 63% of the criterion variable was accounted for using tennis motor predictor variables, and 53% of the criterion variable was explained by functional predictor variables. Regression analysis was furthermore performed on the highest level of the three dimensions that helped justify 66% of the criterion variable. Congruity of the results obtained through expert modelling and regression analysis with the morphologic dimensions turned out to be 0.40, with the motor dimensions 0.65 and with the functional dimensions 0.58. On the highest level, i.e. the level of potential successfulness of young tennis players, the congruity of the results was 0.71. The congruity of the results obtained through expert modelling and regression analysis on the one hand and the criterion variable on the other hand were established to be 0.53 and 0.81 respectively.

Šerjak (2000) determined a connection between tennis motor tests and competition successfulness of 51 female tennis players, aged between 11 and 14. The results of regression analyses showed that the system of tennis motor variables had a statistically significant connection with the criterion variable. Variables of muscular strength, speed of movement, flexibility and coordination have the highest prediction value. Stare (2002) used regression analysis to determine correlations of anthropometric and tennis motor dimensions with competition successfulness of

tennis players. 75 young tennis players, aged between 12 and 14, participated in the research. The calculated values were statistically significant. Using anthropometric variables, 32% of the criterion variable was explained, while tennis motor predictor variables accounted for 41% of the criterion. Within anthropometric variables, three were correlated with the criterion with statistic significance. Of the tennis motor variables, stamina and speed of movement were statistically significant as well.

Method

Participants

The sample of participants consisted of 51 female and 52 male tennis players, all aged thirteen. The study covered only the players satisfying the following conditions: female and male tennis players were ranked among the first 60 players in Slovenia; they participated in the process of regular training and completed all the tests relevant to the research.

Instruments

Several tennis motor tests were used in the present study:

Medicine ball put (MBP)

The subject stands behind a line (a right-hander with his/her left side towards the direction of the throw), holding the ball in his/her dominant hand, the left hand supporting the ball from the bottom. After a slight arch backward, the ball is thrown straight ahead with a move similar to a serve. The distance from the line to the point where the ball landed is measured.

Quarter jump (QJ)

The subject, from a sideways stance with his/her feet apart behind the line, takes four alternate jump steps, landing on both feet. The distance from the line to the last set of footprints (heel) is measured.

Sit-ups 60 s (SU60)

The subject lies back down with legs bent and the soles of the feet resting on the ground about 30 cm apart, hands behind the head, fingers interlocked. On the signal, the subject sits up, twisting the trunk and touching one elbow with the opposite knee, then lies back flat again. The sit-up is repeated, the other elbow touching the other knee; the task is repeated without interruption as many times as possible for a period of 60 seconds or as long as the subject is able continue.

20-m run (R20)

The result is the time of the subject's running a 20 m distance, starting from standing position at the start.

Tapping 20 s (TAP20)

For twenty seconds the subject has to tap alternately two plates on the tapping board with his dominant hand, while holding the other hand in between the two plates. The result is the number of alternate double hits.

Fandrill (FAN)

The subject runs with a racquet in his/her dominant hand, along a marked-out course of five directions of four meters. The subject must always step on the central marker and the other bases, or at least touch them with one foot. In addition, the racquet must touch the ground in front of the player at each of the outside bases. Leg number three must always be run backward, while the other legs in any manner desired, as quickly as possible.

Turns on low beam (TLB)

The subject stands on low beam and on command performs alternating turns of 180 degrees to the left and then to the right for 60 s. If the subject falls from the beam, he/she again steps on it and continues the task. The turn to one direction and back represents one repetition.

Twist with the stick (TS)

The subject stands and holds a stick forward with arms extended. The left hand must be on the stick all the time while the right one can move. The subject moves the stick over his/her head so that the distance between the left and the right hand is minimum. The elbows of both arms must be extended. The result is the distance between the left and the right hand on the stick.

2400-m run (R2400)

The result is the time of the subject's running a 2400 m distance (6 laps on an athletics stadium) from standing position at the start. Subjects are divided into groups, with a maximum of 8 subjects.

Predictor variables are shown in table 1.

Table 1: Predictor variables

Code	*Name of the test*	*Ability*
MBP	Medicine ball put (cm)	Explosive power of arms
QJ	Quarter jump (cm)	Elastic power of the legs
SU60	Sit-ups in 60 s (freq.)	Repetitive strength of the trunk
R20	20-m run (.1 s)	Speed of movement
TAP20	Tapping in 20 s (freq.)	Speed of alternative movements with the arm
FAN	Fandrill (.1 s)	Agility
TLB	Turns on low beam (freq.)	Dynamic balance
TS	Twist with the stick (cm)	Flexibility in the shoulder girdle
R2400	2400-m run (s)	Running endurance
BH	Body height (cm)	Longitudinal dimensionality of the body
BW	Body weight (.1 kg)	Body mass

Procedure

The measurements were carried out at the Faculty of Sport in Ljubljana within regular annual measurements organised for the Slovenian national team candidates. Apart from these candidates, the best tennis players from different tennis clubs were invited to take part in the project. The

measurements were carried out within one day. The tests of speed of movement and speed of alternative movements with the arm were conducted immediately after the warming up, while the tests of repetitive strength of the trunk and of running endurance were carried out last.

In defining the criterion variable, all the competitions for female and male tennis players aged up to 13 which had been organised in the period of the last competitive season were taken into account. Since the players competed in a different number of tournaments, we selected the most suitable criterion variable (competition successfulness), which is the ratio between the number of points collected by an individual player in tournaments and the number of entered tournaments.

The number of collected points represents all the points received for ranking in a competition (depending on the competition rank; from 1st to 3rd rank), while the points received for winning depend on the opponent's ranking – bonus points. Points received collectively are divided by the number of tournaments entered. On this basis the coefficient of competition successfulness is calculated.

Regression analysis was used to establish a relation between tennis motor variables and anthropometric variables on the one hand and competition successfulness of female and male tennis players on the other.

Results

Basic statistical parameters of female and male tennis players are shown in Tables 2 and 3. A high coefficient of variation (the ratio between standard deviation and arithmetic mean) appears only in the variable Turns on low beam (TLB), in both female and male tennis players. The variable Turns on low beam (TLB) represents the test that measures dynamic balance on the low beam. The high coefficient can be explained with the duration of the test (60 s). It needs to be emphasised that the task was very difficult with regard to the participant's balance, and it distinguished those with good from those with poor balance. In other variables variation coefficients are much lower, indicating a relatively homogeneous sample of young tennis players.

Table 2: Basic statistical parameters of female tennis players

Variable	*M*	*SD*	*CV*
MBP	758.18	147.34	0.19
SU60	51.84	7.91	0.15
QJ	755.22	70.19	0.09
R20	3.7116	.2098	0.05
TAP20	44.59	3.68	0.08
FAN	15.447	1.452	0.09
TLB	**26.04**	**14.57**	**0.55**
TS	66.80	18.34	0.27
R2400	636.53	66.80	0.10
BH	163.225	6.660	0.04
BW	51.225	7.557	0.14

Legend:

CV – ratio between Std. dev and Mean (coefficient of variation)

Table 3: Basic statistical parameters of male tennis players

Variable	*M*	*SD*	*CV*
MBP	898.65	222.50	0.24
SU60	55.13	8.32	0.15
QJ	820.29	77.94	0.09
R20	3.6079	.2306	0.06
TAP20	44.12	4.68	0.10
FAN	14.894	1.540	0.10
TLB	**25.52**	**11.61**	**0.45**
TS	75.44	19.80	0.26
R2400	639.54	51.69	0.08
BH	162.681	9.090	0.05
BW	51.727	9.616	0.18

Legend:
CV – relation between Std. dev and Mean

Table 4: Correlation between tennis motor and morphological variables of female tennis players

	MBP	*SU60*	*QJ*	*R20*	*TAP20*	*FAN*	*TLB*	*TS*	*R2400*	*BH*	*BW*
MBP	1.000	.154	**.326**	**-.344**	**.288**	-.172	.006	-.085	**-.315**	**.341**	.215
SU60	.154	1.000	.025	-.120	.158	-.114	.098	-.106	**-.352**	.003	-.146
QJ	**.326**	.025	1.000	**-.738**	**.322**	**-.551**	**.365**	-.114	-.055	**.281**	.115
R20	**-.344**	-.120	**-.738**	1.000	**-.385**	**.405**	-.156	.109	.211	-.196	-.092
TAP20	**.288**	.158	**.322**	**-.385**	1.000	**-.334**	.113	-.031	-.021	**.270**	**.301**
FAN	-.172	-.114	**-.551**	**.405**	**-.334**	1.000	**-.515**	**.314**	.082	**-.361**	-.172
TLB	.006	.098	**.365**	-.156	.113	**-.515**	1.000	**-.309**	-.088	.072	-.034
TS	-.085	-.106	-.114	.109	-.031	**.314**	**-.309**	1.000	-.082	.170	.206
R2400	**-.315**	**-.352**	-.055	.211	-.021	.082	-.088	-.082	1.000	-.130	.064
BH	**.341**	.003	**.281**	-.196	**.270**	**-.361**	.072	.170	-.130	1.000	**.687**
BW	.215	-.146	.115	-.092	**.301**	-.172	-.034	.206	.064	**.687**	1.000

The intercorrelation between predictor variables in the male category is shown in Table 4. Body weight (BW) and body height (BH) have very significant and positive correlation. Medicine ball put (MBP) is significantly correlated with Quarter jump (QJ), 20-m run (R20), Tapping in 20 s (TAP20), 2400-m run (R2400) and body height (BH). Sit-ups in 60 s and 2400-m run have significant correlation. Significant correlation was established also between Quarter jump (QJ) and all other variables except Sit-ups in 60 s (SU), Twist with the stick (TS), 2400-m run (R2400) and body weight (BW). The variable 20-m run is related to Tapping in 20 s (TAP20) and Fandrill (FAN). Tapping in 20 s (TAP20) has significant correlation with Fandrill (FAN), body height (BH) and body weight (BW). Fandrill (FAN) is significantly related to Turns on low beam (TLB), Twist with the stick (TS), and body height (BH). A significant correlation was found between Turns on low beam and Twist with the stick (TS). The final conclusion is that motor variables which represent speed, agility and muscular power are significantly interrelated.

Table 5: Correlation between tennis motor and morphological variables of male tennis players

	MBP	*SU60*	*QJ*	*R20*	*TAP20*	*FAN*	*TLB*	*TS*	*R2400*	*BH*	*BW*
MBP	1.000	**.268**	**.531**	**-.356**	**.409**	-.009	**-.261**	.088	-.045	**.595**	**.658**
SU60	**.268**	1.000	**.445**	**-.509**	**.454**	**-.428**	.215	-.020	**-.324**	**.250**	.198
QJ	**.531**	**.445**	1.000	**-.728**	**.560**	**-.460**	.173	.164	**-.512**	**.547**	**.407**
R20	**-.356**	**-.509**	**-.728**	1.000	**-.403**	**.395**	-.191	-.120	**.570**	**-.316**	**-.270**
TAP20	**.409**	**.454**	**.560**	**-.403**	1.000	**-.238**	-.172	.220	**-.382**	**.497**	**.398**
FAN	-.009	**-.428**	**-.460**	**.395**	**-.238**	1.000	**-.647**	-.005	**.334**	-.204	**-.287**
TLB	**-.261**	.215	.173	-.191	-.172	**-.647**	1.000	.105	**-.234**	-.063	-.044
TS	.088	-.020	.164	-.120	.220	-.005	.105	1.000	**-.260**	.185	.037
R2400	-.045	**-.324**	**-.512**	**.570**	**-.382**	**.334**	**-.234**	**-.260**	1.000	-.218	-.084
BH	**.595**	**.250**	**.547**	**-.316**	**.497**	-.204	-.063	.185	-.218	1.000	**.820**
BW	**.658**	.198	**.407**	**-.270**	**.398**	**-.287**	-.044	.037	-.084	**.820**	1.000

The intercorrelation between predictor variables in the male category is shown in Table 5. Body weight (BW) and body height (BH) have very significant and positive correlation. Medicine ball put (BMP) has strong correlation with body weight (BW), body height (BH) and Quarter jump (QJ). The variable Sit-ups in 60 s (SU60) is significantly correlated with Quarter jump (QJ),

Table 6: Regression analysis of female tennis players

R	***R^2***	***F***	***Sig. F***
.700	.49	3.414	.00

Variable	***Beta***	***Correl***	***Part Cor***	***T***	***Sig. T***
MBP	-.130	.136	-.107	-.934	.356
SU60	-.066	.019	-.059	-.519	.606
QJ	.419	.377	.236	2.064	.046
R20	.245	-.173	.150	1.309	.198
TAP20	.045	.167	.037	.327	.745
FAN	.123	-.327	.083	.730	.470
TLB	.365	.459	.291	2.543	.015
TS	-.025	.006	-.021	-.188	.852
R2400	-.358	-.296	-.297	-2.602	.013
BH	.188	.411	.119	1.044	.303
BW	.235	.324	.158	1.385	.174

Legend:
R – coefficient of multiple correlation
R^2 – coefficient of determination
F – F test of H0: R^2=0
Sig. F – significance of F test
Beta – standardized beta coefficient
Correl – Pearson correlation coefficient
Part Cor – Partial Correlation coefficient
T – t value for H0: Beta=0
Sig T – two-tailed significance level of T

20-m run (R20), Tapping in 20 s (TAP20) and Fandrill (FAN). It is obvious that Quarter jump (QJ), 20-m run (R20), and Tapping in 20 s (TAP20) have significant correlation with all other variables except Turns on low beam (TLB) and Twist with the stick (TS). Significant correlation was established between Fandrill (FAN) and all other variables except Medicine ball put (MBP), Twist with the stick (TS) and body height (BH). Turns on low beam (TLB) is significantly related with Fandrill (FAN), Medicine ball put (MBP) and 2400-m run (R2400). Twist with the stick is significantly correlated only with 2400-m run (R2400). The final conclusion is that significant correlation was recorded in almost all motor variables except Turns on low beam (TLB) and Twist with the stick (TS).

Table 6 shows that the predictor system and the criterion variable are correlated with statistical significance ($p < .005$). The coefficient of determination ($R^2 = .49$) shows that the association of the system of prediction variables with the criterion variable is statistically significant. Among the selected variables three beta coefficients (Quarter jump - QJ, Turns on low beam - TLB, 2400-m run - R2400) have statistical significance. Additionally, all three variables also have a high beta coefficient, correlation and partial correlation.

Table 7: Regression analysis of male tennis players

R	*R^2*	*F*	*Sig. F*
.739	.54	4.382	.00

Variable	*Beta*	*Correl*	*Part Cor*	*T*	*Sig. T*
MBP	.155	.275	.086	.812	.421
SU60	.030	.304	.022	.206	.838
QJ	-.293	.408	-.138	-1.300	.201
R20	-.131	-.384	-.078	-.737	.466
TAP20	-.240	.220	-.158	-1.486	.145
FAN	-.463	-.481	-.263	-2.468	.018
TLB	-.046	.265	-.029	-.273	.787
TS	.052	.164	.046	.436	.665
R2400	-.257	-.397	-.189	-1.771	.084
BH	.681	.558	.319	2.993	.005
BW	-.180	.465	-.078	-.734	.467

Legend:
R – coefficient of multiple correlation
R^2 – coefficient of determination
F – F change
Sig. F – significance of F change
Beta – standardized coefficient beta
Correl – correlation coefficient
Part Cor – Partial Correlation coefficient
T – T value for B
Sig T – two-tailed significance level of T

Table 7 shows that the predictor system and the criterion variable are correlated with statistical significance ($p < .005$). The coefficient of determination ($R^2 = .54$) shows that the predictor system of tennis motor variables explains 54% of the variance of criterion variable. The coefficient of multiple correlation ($R = .739$) shows that the relation of the system of predictor variables with the criterion variable is .74. Among the selected variables two variables, namely Fandrill (FAN) and

body height (BH), significantly explain the variance of criterion variable. Additionally, both variables have a higher Beta coefficient, correlation and partial correlation. A comparison between correlation and partial correlation in male players shows a lower coefficient value in Sit-ups in 60 s (SU60), Quarter jump (QJ), 20-m run (R20), Turns on low beam (TLB), body weight (BW).

Discussion

The results of regression in female and male tennis players show relatively high values of explained variance of criterion variable (49% in female and 54% in male players). Filipčič (1996) made a regression analysis of male tennis players (aged 14) on different abilities and characteristics. The following values of explained variance were obtained: in 15 morphological variables the explained variance was 51%, in 22 tennis motor variables 63%, while in 6 functional variables the explained variance was 53%. The criterion variable in the present research also included competition successfulness, estimated based on a coefficient of successfulness.

Female tennis players

The most significant predictor of the criterion variable is Quarter jump (QJ), which measures the elastic power of the legs. The variable belongs to the field of energy component of movement (mechanisms for regulation of excitation intensity). It should be mentioned that a high level of correlation between the variables Quarter jump (QJ) and 20-m run (R20) (0.72) was found, which may indicate specific common mechanisms. Čoh and Šturm (1987) proved a high reliability of the jump test. Their research included 124 categorized sport athletes in six different sport disciplines and confirmed the hypothesis of the multidimensional field of jump power where latent structure is determined by three factors: the factor of elastic power, the short sprint factor, and the factor of muscular power. Later Čoh (1988) discovered that elastic power was the ability characteristic of good athletes. Filipčič (1993) established that the variable 20-m run (R20) is the only individual predictor that can explain successfulness in tennis with statistical significance. He also established that the speed of movement and start speed were very important in tennis. Namely, variables influence the movement of tennis players, since the start and the first meters of the run are crucial in the preparation and realisation of the stroke. In a tennis game many short sprints are no longer than 11 metres. Usually they are five metres long (Schonborn, 2000).

The second variable with a statistically significant influence on the criteria is Turns on low beam (TLB), which measures the balance and belongs to the field of informational component of movement. In previous research on male and female tennis players (Filipčič, 1993, 1996), no importance of the variables that represent balance was proven. However, the results obtained by the present research are not surprising because the importance of balance is high in tennis. Balance exerts a major influence on most strokes performed in a tennis game, particularly on those that are performed during the non-supporting phase, that is, in a jump. Because of a faster and more dynamic style of playing, these strokes are now more frequent. The last predictor variable which explains the competition successfulness of female tennis players with statistical significance is 2400-m run (R2400). This variable belongs to the field of energy component of movement, or, more precisely, to the field of running endurance. The test is frequently used and known as the Cooper test of aerobic endurance. In the research on tennis game (Filipčič, 1993), a similar variable was used (R2000), which was also found to function as an individual predictor explaining competition successfulness with statistical significance. For successful performance in the test

2400-m run (R2400) the following factors are important: functional ability of organic systems for O_2 transport (respiratory and cardiovascular system and the capacity of the blood), morphological and functional characteristics of the muscles, and mechanism for the regulation and excitation of the nerve–muscular system. The importance of the mentioned mechanisms for tennis is reflected particularly in time-consuming matches where the player must retain a high level of abilities throughout the entire match or perform at her best at the very end of the match.

Male tennis players

The most significant tennis motor predictor of the criterion variable is Fandrill (FAN). The variable belongs to the field of information component of movement, or, more precisely, to the field of regulation of movement. Fandrill (FAN) is one of the best representatives of the tests that measure agility (the speed of specific tennis movements on a marked tennis court). The movement is performed with a tennis racquet which links the testing task to actual movements in a tennis game. The test lasts for about 10 seconds, which comes very close to the average duration of the point played on the court. As for the playing situation, Fandrill (FAN) imitates the contents of the game (way of movement) and also to the duration and intensity of movement. The field of agility has been mentioned several times as a very important predictor of competition successfulness of male tennis players (Bunc, Dlouha, Hoehm, Safarik, 1990; Filipčič, 1993, 1996; Muller, 1989). Agility is an ability that belongs to the field of regulation of movement. The most decisive mechanisms, however, are those that make up the structure of movement. It has been established that agility as the ability to structure and accomplish complex movements plays an important role in tennis. In tennis terms, agility stands for footing, which is in positive correlation with space orientation (body orientation in the field), leg coordination and the speed of performing complex motor tasks. Also, it has a high correlation with the reorganisation of stereotypes of movement, and, finally, with tennis technique and the technique of movement.

Body height (BH) stands out as an individual predictor that can explain the variance of criterion variable with statistical significance. This is not surprising since body height is an advantage in most motor skills, including tennis. Body height offers a possibility of higher contact points (the point where the racquet hits the ball) in serve, forehand, backhand, volley, and smash. It also allows the player to hit a distant ball. As far as competition successfulness is concerned, body height represents one of the most important morphological characteristics. Body height is highly correlated to the length of individual body parts. A recent trend shows that players of 185 cm and higher top the world tennis ranking list. It also needs to be mentioned that a greater body height might indicate accelerated physical and biological development in individual athletes. Two athletes of the same age may have completely different morphological (body) characteristics. Usually, a faster body development could also mean a faster psychological development of the athlete. Therefore, where body height (BH) is concerned, the possibility of a faster or slower growth of a tennis player during puberty has to be taken into account.

To conclude, the analyses of regressions in female and male tennis players show a relatively high value of explained variance of criterion variable. This indicates the importance of motor and morphological variables. For female tennis players, three variables: Quarter jump (QJ), Turns on low beam (TLB), 2400-m run (R2400) were found to be statistically significant. For male tennis players, only two variables were found to be statistically important: Fandrill (FAN) and body height (BH). This points to a certain difference between male and female tennis players. The findings indicate that the results of tennis motor tests and morphological measures of athletes of the same age should be valued differently for female and male tennis players. The results obtained

could explain the different demands of tennis playing for female and male tennis players. Namely, male tennis players tend to show more variety, dynamics and speed in the tennis game.

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