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The Influence of Anthropometric Characteristics on Kinematic Parameters of Children's Sprinter's Running

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A B S T R A C T

Children's sprinters running differs from the adults' one primarily in their motoric abilities, anthropometric characteristics, physiological and biochemical characteristics, as well as psychological and sociological characteristics. This research's aim was to examine the influence of anthropometric characteristics on kinematic parameters of children's sprinter's running. The sample of variables consisted of variables which determine anthropometric characteristics (14 anthropometric characteristics) and of 5 kinematic parameters' variables of sprinter's running. Kinematic parameters of sprinter's running in the phase of maximal speed have been collected by applying the Optojump technology (Microgate, Italy) and the sprinter's running times were measured every 5 meters on a 50 m lap. The results obtained from the multiple regression analysis between the group of anthropometric characteristics and the 50 m running results indicate that the percentage of fatty tissue is a statistically significant variable with boys, while the same variable with girls is near the limit of statistical significance. In the factor structure of anthropometric characteristics two factors have been set apart with boys and three with girls. The first factor set apart with both boys and girls is the factor of body voluminosity, the second factor with boys is the factor of longitudinal dimensionality, while with girls it is the factor of fatty tissue quantity. The factor of longitudinal dimensionality is the third girls' factor. For most variables a negative correlation has been determined with a higher percentage of fat or a higher quantity of subcutaneous fatty tissue with both boys and girls. Boys having a lower quantity of subcutaneous fatty tissue achieve better results in 50 m running, they have a shorter duration of contact with the pad, a longer duration of the flight phase and a longer step length when compared to boys with a higher quantity of subcutaneous fatty tissue. Boys with a bigger body muscular mass achieve a shorter duration of the contact, a longer duration of the flight and a longer step length. Girls who have a lower quantity of subcutaneous fatty tissue achieve a better 50 m running time, have a shorter duration of contact with the pad and a longer step length. It has been established that taller boys have a longer step length, and longer feet significantly influence the longer duration of contact with the pad and the lowering of the step frequency.

Key words: *sprinter's running, anthropometric characteristics, kinematic parameters, maximal running speed, girls, boys*

Introduction

Sprinter's running is the quickest form of human motion, and in the sense of motoric performances, sprinting is a very demanding motoric ability when it comes to coordination and it is actually not very easy to master it. The sprinting or sprinter's running main aim is to achieve the maximal running speed in an as short time as possible and keep it for the longer possible time.

Sprinting is a cyclic motoric activity which consists of repeating racing steps and is determined by acceleration, achieving the maximal speed and the ability to keep the maximal speed on the track as long as possible. These factors are strongly influenced by metabolic and anthropometric components[1].

The running speed primarily depends on the length and frequency of steps, and the increase in the length of steps is in connection with the decrease in the frequency of steps. The frequency of steps increases with the increase of running speed while the duration of the step's

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contact with the pad decreases with the increase in running speed. The placement of the step on the pad should be as close as possible to the vertical projection of the body's centre of gravity. Children's sprinter's running differs from the adults' one primarily due to the difference in motoric abilities, anthropometric characteristics, physiological and biochemical characteristics, as well as psychological and sociological characteristics.

In former researches of children and young people's sprinter's running in the phase of maximal speed, it has been determined that the maximal running speed increases with the examinees' age and that boys and girls, in consideration of their age, differ in biochemical parameters of running. Boys and girls of an earlier school age show a statistically significant difference in the frequency and length of steps during maximal speed running. Boys achieve a higher step frequency, while girls achieve a longer step length. There are no significant differences in the maximal running speed of the aforementioned examinees[2–7].

In former researches of relations among anthropometric characteristics, motoric abilities and sprinter's running efficiency, the authors have suggested the application of different tests for the selection and assessment in practice. The structure of anthropometric characteristics is dominated by the longitudinal component and the body's voluminosity, while factors of explosive power of the jump type and explosive power of the throw type have been set apart as significant for sprinter's running[8–12].

In former researches of relations among anthropometric characteristics, motoric abilities and children's running speed, the authors have determined some conceptions according to which the subcutaneous fatty tissue has a negative prediction on the sprinter's running result[13–17].

This research's aim is to examine the influence of anthropometric characteristics on kinematic parameters of sprinter's running at maximal speed running and the 50 m running time. In line with this aim, two hypotheses have been set:

- H1 – there is a statistically significant influence of anthropometric characteristics on the 50 m running time with boys and girls,
- H2 – there is a statistically significant influence of anthropometric characteristics on kinematic parameters of sprinter's running at maximal speed running with boys and girls.

Materials and Methods

Sample of examinees

The sample of examinees has been made of 150 boys and girls from the first and second grade of a Pula's primary school (70 boys and 80 girls). The average boys` age was 8.12±0.63, their height 133.56±7.66 centimeters, and their body mass 31.42±8.05 kilograms. The average girls` age was 8.08±0.61, their height 132.05±6.44 centimeters, and their body mass 29.91±7.25 kilograms.

Sample of variables

The sample of variables is made by variables used to determine the anthropometric characteristics and kinematic parameters of sprinter's running.

A standardized measuring procedure which included 14 anthropometric measures has been used to measure the anthropometric characteristics. The sample of anthropometric measures has been chosen so to include all latent dimensions in the morphological space and is in line with former researches of sprinter's running dynamics[8,9].

The longitudinal dimensionality of the skeleton is defined by the body's height (ALVT), by the leg length (ALDN) and the foot length (ALDST). The transversal dimensionality of the skeleton is defined by the elbow diameter (ATDLZ), the knee diameter (ATDKZ) and the diameter of the ankle (ATDSZ). The voluminosity and mass of the body are defined by the body mass (AVTM), the perimeter of the upper arm (AVONAD), the perimeter of the forearm (AVOPOD), the perimeter of the upper leg (AVONAT) and the perimeter of the lower leg (AVOPOT).

The subcutaneous fatty tissue is defined by the skin-fold of the upper arm (ANNAD) and the skin-fold of the lower leg (ANPOTK). The percentage of fat has been worked out from the aforementioned skin-folds (%MASTI) using the equation for the evaluation of the body fat share in the total body mass of the school children population in line with Slaughter et al.'s equation (1988).

The sprinter's running kinematic parameters in the phase of maximal speed have been collected applying the technology Optojump (Microgate, Italy). Optojump is an optical measuring system consisting of a bar (rod) which emits and another one which receives signals. The optical sensors (lighting diodes) placed in the bars are located on a distance of 2 cm. The lighting diodes of the emitting bar constantly receive a signal from the opposite rod. The system detects any kind of obstruction to the signal and works out its duration. This enables the measurement of the duration of the flight phase and the contact with the pad with the precision of 1/1,000 s. During the examinee's running over the track along the installed optical sensors in the Optojump technology, the computer program »Sprint« notes down: time – the 20 m running speed, the duration of the contact for each step and the duration of the flight for each step. From the parameters of the 20 m running results the computer program has worked out the average running speed (the number of meters covered by running in a unit of time; v=s/t), while the average step frequency (k/s) and the average step length (v/fk) have been obtained from the measured parameters of the contact and flight duration. The test has been carried out on an athletic track of 50 m distance. At the starter's order examinees took the starting position (high start) and after the sound signal they started running the 50 m lap. The task was repeated twice so that the length between the first and second registration of results was 15 minutes. The best result achieved on the lap was considered of merit for the research's needs. During the 50 m lap run, in the maximal speed phase (from 15 to 35 m), the Optojump technology of 20 m length was set on one side of the track. During the examinee's running along the installed optical sensors of the Optojump technology, the carrier of measuring was sitting and, using the computer program »Sprint«, monitored the recording of examinees' results.

The kinematic parameters sample of variables includes the 50 m running time (KT50), the duration of the contact of the foot with the pad (KTK), the frequency of steps (KFK), the duration of flight (KTL) and the length of steps (KDK).

Methods of data processing

The program package Statistica ver. 7.1. (Statsoft, Inc., TULSA, USA) has been used for the processing of collected data.

In line with this research's aim, the appropriate methods of data processing have been applied. For all anthropometric characteristics variables, in the preliminary part the basic descriptive parameters have been worked out regarding the examinee's sex, while the normality of distribution of anthropometric characteristics variables was tested by the Kolmogorov-Smirnovljev test.

The relations of 50 m running results and the group of anthropometric characteristics have been determined by the standardized procedure of the multiple regression analysis.

The relations of kinematic parameters at maximal speed running and the anthropometric characteristics have been determined by the application of the forward stepwise regression analysis.

Results and Discussion

In the scope of anthropometric characteristics and kinematic parameters values analysis the following descriptive values have been worked out: the arithmetic mean (X), minimal result (Min), maximal result (Max), standard deviation (SD), the coefficient of asymmetry (Skewness), the coefficient of distortion (Kurtosis) and the maximal deviation between the relative cumulative empirical frequency and the relative theoretical frequency (maxD).

The descriptive analysis of variables has been worked out for all examinees, while the results are shown separately for boys and girls (Table 1).

The results of the descriptive analysis of anthropometric characteristics variables and the K-S test have shown that with boys all the analyzed variables are normally distributed, except for the variables diameter of the knee joint (ATDKZ) and the percentage of fat (%MASTI). The average body height for boys is 133.56±7.66 cm, while the body mass is 31.42±8.05 cm (Table 2).

The anthropometric characteristics values obtained by the analysis of descriptive parameters and the value of the K-S test with girls have shown that most variables are normally distributed, except the variables diameter of the knee joint (ATDKZ), upper arm skin-fold (ANNAD) and lower leg skin-fold (ANPOTK). The average body height for girls is 132.05±6.44 cm, and the body mass is 29.91±7.25 cm.

The variables diameter of the knee joint (ATDKZ) for boys and girls, the percentage of fat (%MASTI) for boys, as well as the upper arm skin-fold (ANNAD) and lower leg skin-fold (ANPOT) for girls show a deviation from the normal distribution, although with most anthropometric characteristics variables a mild negative asymmetry has been noticed. In earlier researches of sprinter's running

TABLE 1
DESCRIPTIVE PARAMETERS OF ANTHROPOMETRIC CHARACTERISTICS VARIABLES WITH BOYS (N=70)

Variables	$\overline{X}$	Min	Max	SD	Skewness	Kurtosis	maxD
ALVT	133.565	116.0	155.50	7.666	0.617	0.345	0.12
AVTM	31.428	19.0	64.20	8.055	1.527	3.129	0.15
ALDN	74.051	64.0	86.00	4.367	0.501	0.167	0.11
ALDST	20.986	18.0	25.00	1.442	0.450	0.271	0.11
ATDLZ	5.374	4.50	7.00	0.495	0.716	0.409	0.13
ATDKZ	8.129	7.10	10.00	0.671	0.912	0.253	0.17
ATDSZ	6.326	5.50	7.50	0.411	0.664	0.836	0.10
AVONAD	21.464	16.50	32.00	3.196	0.922	0.563	0.15
AVOPOD	19.725	16.00	25.50	1.945	0.539	–0.062	0.12
AVONAT	40.020	18.50	54.00	6.267	–0.554	1.453	0.10
AVOPOT	28.164	21.50	38.50	3.034	0.993	1.452	0.13
ANNAD	14.024	6.00	26.20	5.113	0.702	–0.222	0.12
ANPOT	14.997	6.00	26.60	5.704	0.410	–0.829	0.11
% Fat	21.536	9.82	49.36	8.874	1.080	0.386	0.19

Test 0.05=0.16

TABLE 2
DESCRIPTIVE PARAMETERS OF ANTHROPOMETRIC CHARACTERISTICS VARIABLES WITH GIRLS (N=80)

Variables	$\overline{X}$	Min	Max	SD	Skewness	Kurtosis	maxD
ALVT	132.051	117	147.5	6.444	0.032	–0.203	0.08
AVTM	29.915	17.8	59.1	7.257	1.581	3.438	0.15
ALDN	74.418	64	84	3.885	0.023	0.204	0.09
ALDST	20.686	17.5	23	1.148	–0.154	–0.264	0.11
ATDLZ	5.155	4.2	6.5	0.432	0.615	0.524	0.11
ATDKZ	7.722	6.5	10	0.674	1.092	1.431	0.17
ATDSZ	6.042	5.2	7.5	0.389	0.858	1.699	0.10
AVONAD	21.449	17	31	3.022	1.104	1.214	0.13
AVOPOD	19.032	15.5	25	1.815	0.915	1.625	0.15
AVONAT	41.019	32.5	61	5.616	1.005	1.450	0.11
AVOPOT	28.006	22.5	40	3.228	1.159	1.989	0.13
ANNAD	13.133	7	36	6.374	1.883	3.316	0.22
ANPOT	14.539	7.2	38	7.396	1.524	1.600	0.22
% Fat	22.675	13.784	49.042	7.624	1.452	2.182	0.20

Test 0.05=0.15

the analyzed anthropometric variables showed a similar quality[14,22]. It is thus possible that entities of more observable diameters, skin-folds and percentages of fat occur in the population.

The relations between 50 m running results and the set of anthropometric characteristics have been determined by the standard procedure of the multiple regression analysis (Table 3).

TABLE 3
RESULTS OF THE REGRESSION ANALYSIS IN THE MANIFEST AREA OF BOYS ANTHROPOMETRIC CHARACTERISTICS

R= 0.59; R^2=0.35; F(14.54)=2.1201 p<0.02493; SEE=0.72

KT50	β	r_p	r	β_e	B	B_e	t(54)	p
Intercept					16.49	4.57	3.61	0.00
ALVT	–0.76	–0.20	–0.17	0.50	–0.08	0.05	–1.52	0.13
AVTM	–0.09	–0.02	–0.01	0.76	–0.01	0.08	–0.11	0.91
ALDN	0.27	0.11	0.09	0.35	0.05	0.06	0.78	0.44
ALDST	0.32	0.16	0.13	0.27	0.18	0.15	1.17	0.25
ATDLZ	0.23	0.16	0.13	0.19	0.37	0.30	1.22	0.23
ATDKZ	–0.10	–0.04	–0.04	0.31	–0.12	0.37	–0.32	0.75
ATDSZ	–0.01	–0.01	–0.01	0.19	–0.02	0.38	–0.06	0.95
AVONAD	–0.10	–0.02	–0.02	0.72	–0.03	0.18	–0.14	0.89
AVOPOD	–0.57	–0.15	–0.12	0.52	–0.24	0.21	–1.11	0.27
AVONAT	0.04	0.03	0.02	0.20	0.01	0.03	0.22	0.83
AVOPOT	–0.06	–0.02	–0.02	0.40	–0.02	0.10	–0.15	0.88
ANNAD	0.01	0.00	0.00	0.31	0.00	0.05	0.02	0.98
ANPOT	–0.11	–0.05	–0.04	0.29	–0.02	0.04	–0.38	0.70
% Fat	0.98	0.34	0.29	0.37	0.09	0.03	2.66	0.01

Multiple correlation (R), coefficient of determination (R^2), F-value by which the statistical significance of the multiple correlation is tested (F), standard error prediction (SEE), the value of the independent variable for the zero values of the independent ones (Intercept), standardized regression coefficient (β), partial correlations (rp), correlations of dependent and independent variables (r), standard errors of standardized regression coefficients (βe), non-standardized regression coefficients (B), standard errors of non-standardized regression coefficients (Be), t-value by which the significance of regression coefficients is tested (t), level of significance (p)

The multiple correlation (R=0.59) is statistically significant with a conclusion error of 0.02, while 35 per cent of the criterion variable variance can be explained by the applied set of anthropometric variables. Of the 14 variables, only the variable percentage of fat (%MASTI) has a statistically significant negative influence on the criterion variable, with a conclusion error of 0.01.

The criterion variable (KT50 – the 50 m running result) is reversely scaled, while all predictor variables are normally scaled. Thus, the positive sign of the standardized regression coefficient shows a negative influence of certain predictors on the criterion variable.

The method of main components has been applied on the manifest group of anthropometric variables to determine the latent structure (Table 4).

The application of the GK criterion offered two main components explaining 72 per cent of manifest variables common variance. The variables body mass (AVTM), perimeter of the upper arm (AVONAD), perimeter of the forearm (AVOPOD), perimeter of the upper leg (AVONAT), perimeter of the lower leg (AVOPOT) and the percentage of fat (%MASTI) show the largest projections on the first factor. Considering the structure of the obtained factor, it can be called the factor of body voluminosity.

The second factor is determined by the variables body height (ALVT), leg length (ALDN) and foot length (ALDST), so this factor may be considered the factor of longitudinal skeleton dimensionality (Table 5).

TABLE 4
THE FACTOR STRUCTURE OF BOYS' ANTHROPOMETRIC CHARACTERISTICS

Variables	Factor 1	Factor 2
ALVT	0.46	0.88
AVTM	0.85	0.50
ALDN	0.34	0.86
ALDST	0.48	0.76
ATDLZ	0.51	0.50
ATDKZ	0.69	0.56
ATDSZ	0.42	0.53
AVONAD	0.96	0.25
AVOPOD	0.91	0.33
AVONAT	0.75	0.27
AVOPOT	0.88	0.36
ANNAD	–0.20	0.40
ANPOTK	–0.16	0.34
% Fat	0.92	0.16
l	8.59	1.47
λ%	61.35	10.49
Cum λ	8.59	10.06
Cum %	61.35	71.84

Characteristic values (λ), percentage of variance explanation (λ%), cumulative size of characteristic values (cumλ), cumulative percentage of variance explanation (cum%)

TABLE 5
THE MATRIX OF ANTHROPOMETRIC FACTORS CORRELATION WITH BOYS

Factor	1	2
1	1.00	0.69
2	0.69	1.00

Table 5 shows the correlation of anthropometric factors, and according to obtained correlations, it can be determined that there are average correlations between the factor of voluminosity and body mass and the factor of longitudinal skeleton dimensionality.

The relations of 50 m running results and the set of anthropometric characteristics for girls have been determined by the standard procedure of the multiple regression analysis (Table 6).

The multiple correlation (R=0.41) is statistically significant with a conclusion error of 0.05, but only 17 per cent of the criterion variable variance could be explained by the applied set of anthropometric characteristics. Of the 14 variables, not one could be set apart with a statistically significant influence on the criterion variable.

The method of main components has been applied on the manifest group to determine the latent structure (Table 7).

The application of the GK criterion offered two main components explaining 82 per cent of manifest variables common variance. The variables body mass (AVTM), diameter of the knee joint (ATDKZ), perimeter of the upper arm (AVONAD), perimeter of the forearm (AVOPOD), perimeter of the upper leg (AVONAT), perimeter of the lower leg (AVOPOT) and the percentage of fat (%MASTI) show the largest projections on the first factor. Considering the structure of the obtained factor, it can be called the factor of body voluminosity. The second factor is determined by the variables skin-fold of the upper arm (ANNAD) and skin-fold of the lower leg (ANPOTK) so this factor may be considered the factor of fatty tissue quantity. The variables body height (ALVT), leg length (ALDN) and foot length (ALDST) have the largest projections on the third factor, so this factor may be considered the factor of longitudinal skeleton dimensionality (Table 8).

Table 8 shows the correlation of girls' anthropometric characteristics. The correlation values indicate that there is a high correlation between the factor body voluminosity and the factor longitudinal dimensionality of the skeleton.

The obtained results of the multiple regression analysis between the group of anthropometric characteristics and the 50 m running result indicate that for boys the variable percentage of fat (%MASTI) could be set apart as statistically significant, while the same variable is near the limit of statistical relevance for girls. For boys, 35 per cent of the criterion variable variance has been explained by the group of anthropometric characteristics, while the same applies for 17 per cent of girls. The values of the obtained regression coefficients and partial correlations

TABLE 6
THE RESULTS OF THE REGRESSION ANALYSIS IN THE MANIFEST AREA OF GIRLS' ANTHROPOMETRIC CHARACTERISTICS

R= 0.41; R^2=0.17; F(14.62)=0.94 p<0.05; SEE=0.91								
KT50	β	r_p	r	$β_e$	B	B_e	t(62)	p
Intercept					9.53	4.62	2.06	0.04
ALVT	–0.08	–0.03	–0.03	0.32	–0.01	0.04	–0.24	0.81
AVTM	–0.67	–0.13	–0.12	0.64	–0.08	0.08	–1.06	0.29
ALDN	–0.08	–0.04	–0.04	0.24	–0.02	0.06	–0.34	0.73
ALDST	0.23	0.11	0.10	0.28	0.18	0.22	0.83	0.41
ATDLZ	–0.14	–0.08	–0.08	0.21	–0.28	0.43	–0.66	0.51
ATDKZ	0.22	0.11	0.10	0.26	0.30	0.35	0.86	0.39
ATDSZ	–0.03	–0.02	–0.02	0.16	–0.07	0.38	–0.19	0.85
AVONAD	0.50	0.13	0.12	0.48	0.15	0.14	1.04	0.30
AVOPOD	0.18	0.05	0.05	0.42	0.09	0.21	0.42	0.67
AVONAT	–0.07	–0.02	–0.02	0.40	–0.01	0.06	–0.17	0.86
AVOPOT	–0.49	–0.21	–0.19	0.29	–0.13	0.08	–1.68	0.10
ANNAD	0.40	0.13	0.11	0.41	0.06	0.06	0.99	0.32
ANPOT	–0.43	–0.13	–0.12	0.40	–0.05	0.05	–1.07	0.29
% Fat	0.63	0.21	0.20	0.37	0.07	0.04	1.70	0.09

Multiple correlation (R), coefficient of determination (R^2), F-value by which the statistical significance of the multiple correlation is tested (F), standard error prediction (SEE), the value of the independent variable for the zero values of the independent ones (Intercept), standardised regression coefficient (β), partial correlations (rp), correlations of dependent and independent variables (r), standard errors of standardised regression coefficients (βe), non-standardised regression coefficients (B), standard errors of non-standardised regression coefficients (Be), t-value by which the significance of regression coefficients is tested (t), level of significance (p)

TABLE 7
THE FACTOR STRUCTURE OF GIRLS' ANTHROPOMETRIC CHARACTERISTICS

Variables	Factor 1	Factor 2	Factor 3
ALVT	0.41	0.07	0.85
AVTM	0.88	0.11	0.44
ALDN	0.25	0.06	0.88
ALDST	0.33	–0.15	0.87
ATDLZ	0.64	0.08	0.50
ATDKZ	0.72	0.08	0.50
ATDSZ	0.39	–0.12	0.52
AVONAD	0.91	0.09	0.29
AVOPOD	0.88	0.11	0.37
AVONAT	0.90	0.10	0.31
AVOPOT	0.86	0.13	0.31
ANNAD	0.12	0.97	–0.03
ANPOTK	0.16	0.97	–0.02
% Fat	0.92	0.13	0.20
l	8.49	1.15	1.83
λ%	60.62	8.24	13.06
Cum λ	8.49	9.64	11.47
Cum %	60.62	68.86	81.92

Characteristic values (λ), percentage of variance explanation (λ%), cumulative size of characteristic values (cumλ), cumulative percentage of variance explanation (cum%)

TABLE 8
THE MATRIX OF CORRELATION OF GIRLS' ANTHROPOMETRIC CHARACTERISTICS

Factor	1	2	3
1	1.00		
2	0.25	1.00	
3	0.75	0.03	1.00

have a positive sign, but since the criterion variable is negatively scaled, it can be concluded that the variable fat percentage (%MASTI) has a negative influence on the achieved 50 m running time. In former researches of sprinter's running success it has also been confirmed that fatty tissue has a negative influence on the prediction of sprinting results[8,14].

In the factor structure of anthropometric characteristics two factors have been set apart for boys and three for girls. The first factor which appeared with boys and girls is the factor of body voluminosity, the second boy's factor is the factor of longitudinal dimensionality, while for girls it is the factor of fatty tissue quantity. The third girls' factor is the same as the second boys', namely, the factor of longitudinal dimensionality. Šnajder determined in 1982[8] that measures of the subcutaneous fatty tissue and the circular skeleton dimensionality have a significant influence on the sprinter's running result. The measures of the subcutaneous fatty tissue and the circular skeleton dimensionality could be defined in this research by the factor of body voluminosity. That is why this research's obtained results have confirmed the proved fact that a higher quantity of ballast mass means poorer results in sprinter's running.

Correlations of boys' and girls' anthropometric characteristics have shown that there are high correlations between the factor of voluminosity and the factor of the skeleton longitudinal dimensionality. Such results were expected with examinees of a younger school-age, since the child's growth implies the growth of body mass as a characteristic of body voluminosity[4].

According to this research's obtained results, the H1 hypothesis, which tells us that there is a statistically significant influence of anthropometric characteristics on the boys' and girls' 50 meters running time, can be accepted.

Relations of kinematic parameters at maximal speed running and the anthropometric characteristics have been defined by the application of the forward stepwise regression analysis. This method primarily analyses the independent variable which has the largest autonomous contribution to the explanation of the dependent variable, followed by the second and on for variables which have significant values of the beta coefficient and partial regression.

In relation to the kinematic parameters of sprinter's running at maximal speed running, the following variables have been considered as criteria variables: 50 m running time (KT50), duration of contact of the foot with the pad (KTK), step frequency (KFK), flight duration (KTL) and step length (KDK). (Table 9)The results obtained by the forward stepwise regression analysis for boys (Table 9.) indicate a high correlation of the predictive set of variables and the 5 independent variables.

The first criterion variable is the 50 m running time (KT50), and the first results have shown a statistically significant correlation between the predictive set and the independent variable (R=0.55). The predictive set has explained 31 per cent of variance. A significant contribution in explaining the correlation of the predictive set with the criterion has been determined for variables percentage of fat (%MASTI; r=0.46) and body mass (AVTM; r=–0.25). The criterion variable is reversely scaled, so the variable percentage of fat (%MASTI) has a negative influence on the criterion variable, while the variable body mass (AVTM) has a positive influence on the same variable.

The second criterion variable is the duration of contact (KTK), and the correlation between the predictive set and the independent variable is statistically significant (R=0.64). The predictive set has explained 41 per cent of the variance. A significant correlation with the criterion variable has been determined for variables percentage of fat (%MASTI; r=0.53), perimeter of the lower leg (AVOPOT; r=0.27), length of foot (ALDST; r=0.34) and perimeter of the upper leg (AVONAT; r=0.19).

The third criterion variable is the duration of flight (KTL). The analysis of results has shown a statistically significant correlation between the predictive set of variables and the independent variable (R=0.58), while the predictive set has explained 34 per cent of variance. The significant correlation of predictive variables with the criterion variable has been determined for variables percentage of fat (%MASTI; r=0.40), perimeter of the upper leg (AVONAT; r=0.23) and perimeter of the lower leg (AVOPOT; r=0.21).

The fourth criterion variable is the step frequency (KFK), and the correlation between the predictive set and the independent variable is R=0.34, thus not being statistically significant. The predictive set has explained only 12 per cent of variance. A significant correlation with the criterion variable has been determined only for the variable foot length (ALDST; r=–0.25), while the variable percentage of fat (%MASTI; r=–0.22) found itself near the limit of statistical relevance.

The fifth criterion variable is the step length (KDK). The obtained results indicate a statistically significant correlation between the predictive set and the independent variable (R=0.65). At the same time, this represents the highest correlation between the predictive set and all independent variables.

The predictive set has explained 42 per cent of variance, while a statistically significant correlation with the criterion variable has been determined for the variable body height (ALVT; r=0.41), percentage of fat (%MASTI; r=–0.21) and perimeter of the forearm (AVOPOD; r=0.20) (Table 10).

Results obtained by the forward stepwise regression analysis for girls (Table 10) indicate a significant correlation between the predictive set of variables with 4 out of 5 independent variables.

The first criterion variable is the 50 m running time (KT50). The obtained results have shown a statistically significant correlation between the predictive set and the independent variable (R=0.37). The predictive set has explained 14 per cent of variance. A significant contribution in explaining the correlation of the predictive set with the criterion has been determined for variables percentage of fat (%MASTI; r=0.37) and perimeter of the forearm (AVOPOD; r=0.26). The criterion variable is reversely scaled, so the variable percentage of fat (%MASTI) has a negative influence on the criterion variable.

The second criterion variable is the duration of contact (KTK). The correlation between the predictive set and the independent variable is statistically significant (R=0.64). The predictive set has explained 41 per cent of the variance. A significant correlation with the criterion variable has been determined for variables perimeter of the upper arm (AVONAD; r=0.37) and perimeter of the lower leg (AVOPOT; r=0.32).

The third criterion variable is the duration of flight (KTL). The correlation between the predictive set of variables and the independent variable is statistically significant (R=0.58), while the predictive set has explained 34 per cent of variance. A significant correlation of predictive variables with the criterion variable has been determined for variables diameter of the knee joint (ATDKZ; r=0.23) and skin-fold of the lower leg (ANPOTK; r=–0.21).

TABLE 9
RESULTS OF THE FORWARD STEPWISE REGRESSION ANALYSIS IN THE MANIFEST AREA BETWEEN THE KINEMATIC PARAMETERS OF SPRINTER'S RUNNING AT MAXIMAL SPEED RUNNING AND THE BOYS' ANTHROPOMETRIC CHARACTERISTICS

R= 0.55; R^2=0.31; F(5.62)=5.52 p<0.000; SEE=0.695

KT50	β	r_p	r	$β_e$	B	B_e	t(54)	p
Intercept					12.13	2.05	5.93	0.00
ATDSZ	–0.03	–0.02	–0.02	0.16	–0.05	0.32	–0.17	0.87
% Fat	1.15	0.48	0.46	0.26	0.11	0.02	4.36	0.00
AVTM	–0.80	–0.29	–0.25	0.34	–0.08	0.03	–2.34	0.02
ATDLZ	0.19	0.16	0.14	0.15	0.31	0.24	1.29	0.20
AVOPOD	–0.38	–0.14	–0.12	0.34	–0.16	0.14	–1.12	0.27

R= 0.64; R^2=0.41; F(5.62)=8.75 p<0.000; SEE=0.01

KTK	β	r_p	r	$β_e$	B	B_e	t(54)	p
Intercept					0.16	0.03	5.59	0.00
% Fat	1.11	0.57	0.53	0.20	0.00	0.00	5.47	0.00
AVOPOT	–0.71	–0.34	–0.27	0.25	0.00	0.00	–2.81	0.01
ALDST	0.55	0.40	0.34	0.16	0.01	0.00	3.46	0.00
AVONAT	–0.32	–0.24	–0.19	0.16	0.00	0.00	–1.97	0.05
ATDLZ	–0.19	–0.17	–0.13	0.14	–0.01	0.00	–1.33	0.19

R= 0.58; R^2=0.34; F(5.62)=6.44 p<0.000; SEE=0.01

KTL	β	r_p	r	$β_e$	B	B_e	t(54)	p
Intercept					0.02	0.03	0.55	0.59
% Fat	–0.85	–0.44	–0.40	0.22	0.00	0.00	–3.85	0.00
AVONAT	0.38	0.27	0.23	0.17	0.00	0.00	2.23	0.03
AVOPOT	0.67	0.25	0.21	0.34	0.00	0.00	2.00	0.05
AVTM	–0.62	–0.22	–0.18	0.35	0.00	0.00	–1.78	0.08
ATDLZ	0.19	0.17	0.14	0.14	0.00	0.00	1.32	0.19

R= 0.34; R^2=0.12; F(4.63)=2.16 p<0.08; SEE=0.248

KFK	β	r_p	r	$β_e$	B	B_e	t(54)	p
Intercept					4.81	0.84	5.70	0.00
ALDST	–0.45	–0.26	–0.25	0.21	–0.08	0.04	–2.13	0.04
AVTM	0.26	0.07	0.06	0.49	0.01	0.02	0.53	0.60
% Fat	–0.62	–0.23	–0.22	0.33	–0.02	0.01	–1.88	0.06
AVONAD	0.56	0.14	0.13	0.51	0.04	0.04	1.09	0.28

R= 0.65; R^2=0.42; F(4.63)=11.76 p<0.000; SEE=0.820

KDK	β	r_p	r	$β_e$	B	B_e	t(54)	p
Intercept					0.14	20.84	0.01	0.99
ALVT	0.60	0.48	0.41	0.14	0.81	0.19	4.32	0.00
% Fat	–0.61	–0.27	–0.21	0.27	–0.72	0.33	–2.22	0.03
AVOPOD	0.77	0.25	0.20	0.37	4.19	2.02	2.07	0.04
AVONAD	–0.57	–0.15	–0.11	0.48	–1.89	1.60	–1.18	0.24

Multiple correlation (R), coefficient of determination (R^2), F-value by which the statistical significance of the multiple correlation is tested (F), standard error prediction (SEE), the value of the independent variable for the zero values of the independent ones (Intercept), standardized regression coefficient (β), partial correlations (rp), correlations of dependent and independent variables (r), standard errors of standardized regression coefficients (βe), non-standardized regression coefficients (B), standard errors of non-standardized regression coefficients (Be), t-value by which the significance of regression coefficients is tested (t), level of significance (p)

TABLE 10
THE RESULTS OF THE FORWARD STEPWISE REGRESSION ANALYSIS IN THE MANIFEST AREA BETWEEN KINEMATIC PARAMETERS OF SPRINTER'S RUNNING AT MAXIMAL SPEED RUNNING AND GIRLS' ANTHROPOMETRIC CHARACTERISTICS

R= 0.37; R^2=0.14; F(3.71)=3.94 p<0.011; SEE=0.856								
KT50	β	r_p	r	β_e	B	B_e	t(54)	p
Intercept					12.74	1.14	11.15	0.00
% Fat	0.67	0.37	0.37	0.20	0.08	0.02	3.34	0.00
AVOPOD	–0.48	–0.27	–0.26	0.20	–0.13	0.06	–2.39	0.02
ANPOTK	–0.12	–0.12	–0.12	0,12	–0.01	0.01	–1.06	0.29
R= 0.64; R^2=0.41; F(5.62)=8.75 p<0.000; SEE=0.01								
KTK	β	r_p	r	β_e	B	B_e	t(54)	p
Intercept					0.05	0.04	1.26	0.21
ALVT	0.17	0.10	0.09	0.20	0.00	0.00	0.86	0.39
AVONAD	0.80	0.41	0.37	0.22	0.00	0.00	3.70	0.00
AVOPOT	–0.64	–0.36	–0.32	0.20	0.00	0.00	–3.22	0.00
ALDST	0.27	0.17	0.14	0.19	0.00	0.00	1.41	0.16
ATDLZ	–0.17	–0.13	–0.11	0.16	–0.01	0.01	–1.09	0.28
R= 0.58; R^2=0.34; F(5.62)=6.44 p<0.000; SEE=0.01								
KTL	β	r_p	r	β_e	B	B_e	t(54)	p
Intercept					0.02	0.06	0.28	0.78
AVONAD	–0.45	–0.17	–0.13	0.32	0.00	0.00	–1.38	0.17
ALDST	0.18	0.10	0.08	0.21	0.00	0.00	0.83	0.41
ATDKZ	0.50	0.29	0.23	0.21	0.01	0.00	2.40	0.02
ANPOTK	–0.24	–0.25	–0.21	0.11	0.00	0.00	–2.12	0.04
ATDLZ	–0.17	–0.12	–0.10	0.17	–0.01	0.01	–1.01	0.32
ALDN	0.34	0.21	0.17	0.20	0.00	0.00	1.69	0.10
ALVT	–0.20	–0.10	–0.08	0.25	0.00	0.00	–0.80	0.43
AVOPOT	0.32	0.17	0.13	0.24	0.00	0.00	1.36	0.18
AVTM	–0.54	–0.14	–0.11	0.47	0.00	0.00	–1.14	0.26
R= 0.34; R^2=0.12; F(4.63)=2.16 p<0.08; SEE=0.248								
KFK	β	r_p	r	β_e	B	B_e	t(54)	p
Intercept					6.04	0.59	10.23	0.00
ALDST	–0.29	–0.18	–0.15	0.20	–0.07	0.05	–1.47	0.14
ANPOTK	0.20	0.21	0.18	0.11	0.01	0.00	1.80	0.08
ATDLZ	0.28	0.22	0.18	0.15	0.18	0.10	1.82	0.07
ALDN	–0.25	–0.18	–0.15	0.17	–0.02	0.01	–1.48	0.14
ATDKZ	–0.37	–0.22	–0.19	0.19	–0.16	0.08	–1.90	0.06
AVOPOT	0.28	0.20	0.16	0.17	0.02	0.02	1.64	0.11
R= 0.65; R^2=0.42; F(4.63)=11.76 p<0.000; SEE=0.820								
KDK	β	r_p	r	β_e	B	B_e	t(54)	p
Intercept					0.14	20.84	0.01	0.99
ALDST	–0.04	–0.02	–0.02	0.21	–0.36	1.94	–0.19	0.85
% Fat	–0.68	–0.32	–0.26	0.25	–0.96	0.35	–2.76	0.01
ALVT	0.21	0.10	0.08	0.23	0.35	0.40	0.88	0.38
AVOPOT	0.44	0.25	0.19	0.21	1.47	0.70	2.10	0.04
AVONAD	–0.36	–0.16	–0.12	0.26	–1.27	0.92	–1.38	0.17
ALDN	0.32	0.19	0.15	0.19	0.91	0.55	1.64	0.11
ANNAD	–0.15	–0.17	–0.13	0.11	–0.26	0.18	–1.44	0.16
ATDKZ	0.22	0.15	0.11	0.18	3.57	2.83	1.26	0.21

Multiple correlation (R), coefficient of determination (R^2), F-value by which the statistical significance of the multiple correlation is tested (F), standard error prediction (SEE), the value of the independent variable for the zero values of the independent ones (Intercept), standardized regression coefficient (β), partial correlations (rp), correlations of dependent and independent variables (r), standard errors of standardized regression coefficients (βe), non-standardized regression coefficients (B), standard errors of non-standardized regression coefficients (Be), t-value by which the significance of regression coefficients is tested (t), level of significance (p)

The fourth criterion variable is the step frequency (KFK), and the correlation between the predictive set and the independent variable is R=0.34, thus not being statistically significant. The predictive set has explained only 12 per cent of variance, and correlation between predictive variables and the criterion variable has not been determined.

The fifth criterion variable is the step length (KDK), and the obtained results indicate a statistically significant correlation between the predictive set and the independent variable (R=0.65). The predictive set has explained 42 per cent of variance, while a statistically significant correlation with the criterion variable has been determined for the variable percentage of fat (%MASTI; r=–0.26) and perimeter of the lower leg (AVOPOD; r=0.19).

The variable percentage of fat (%MASTI) has the highest negative influence on the criterion variable boys' 50 m running time (KT50), while the variable body mass (AVTM) has a positive influence on the same criterion variable. For girls, the highest negative influence is shown for the variable percentage of fat (%MASTI), while the perimeter of the forearm (AVOPOD) has a positive influence. The positive influence of the variable perimeter of the forearm (AVOPOD) can be explained by the fact that in running, the arms give rhythm to the legs, so this variable is shown as significant in girls' 50 m sprinter's running.

In 2007 Čoh, Tomažin and Rausavljević determined that better girl sprinters had a lower level of subcutaneous fatty tissue and more muscular tissue than poorer sprinters, while in 2008 Vučetić, Matković and Šentija declared that athletes had a lower percentage of fatty tissue and higher perimeters of all body segments when compared to the normal population. According to results reached in this research it can be concluded that the success in boys' and girls' 50 m running is proportional to lower values of subcutaneous fatty tissue and higher value of body mass, especially the non-fat body mass. Girls and boys of a younger school-age who have a lower percentage of fatty tissue and higher non-fat body mass reach a better 50 m running time result.

A statistically significant correlation with the criterion variable duration of contact with the pad (KTK) has been determined with boys for variables percentage of fat (%MASTI), perimeter of lower leg (AVOPOT), foot length (ALDST) and perimeters of the upper leg (AVONAT), while with girls these variables are perimeter of the upper arm (AVONAD) and perimeter of lower leg (AVOPOT). A shorter duration of the foot contact with the pad for boys and girls is linked to a lower percentage of fat and a larger perimeter of the lower leg. This characteristic represents the non-fat body mass (muscles and bones) which has the key role in performing the take-off action. Examinees having higher foot length have averagely longer legs, which is proportionally linked to the steps length. In 2001, Čoh, Mihajlović and Praprotnik concluded that the length of steps was defined by the length of the leg and the take-off power in the contact phase, and the diameter of the knee was determined as a significant indicator. However, in this research the diameter of the knee has not been determined as a statistically significant indicator, while the non-fat body mass (represented by perimeters of body segments) has. Along with that, the longer the step, the smaller the step frequency and the longer the duration of the step contact with the pad[6]. It can thus be concluded that the shorter duration of the contact with the pad (KTK) for girls and boys of a younger school-age is significantly influenced by a higher non-fat body mass and a lower quantity of subcutaneous fatty tissue.

It has been determined for boys that the criterion variable duration of flight (KTL) is significantly correlated with the variables percentage of fat (%MASTI), perimeter of the upper leg (AVONAT) and perimeter of the lower leg (AVOPOT), while for girls it is the correlation with variables diameter of the knee joint (ATDKZ) and skin-fold of the lower leg (ANPOTK). Boys with a higher percentage of fat and girls with higher values of lower leg skin-folds achieve lower values of flight duration, while boys with a larger perimeter of the upper leg and girls with a wider diameter of the knee joint achieve higher values of the flight duration. This means that the non-fat body mass of the upper and lower leg, which also represents the totally higher non-fat body mass surely influence a better take-off action (the force of extension of the ankle and knee joint), which ensures a longer duration of the body in the flight phase. The quantity of fatty tissue negatively influences the duration of the flight phase.

The steps frequency (KFK) has a significantly negative correlation with the variable step length (ALDST) for boys, while the variable percentage of fat (%MASTI) was close to the statistical significance. A significant correlation between predictive variables and the criterion variable has not been determined for girls. The obtained results have shown that boys who have a higher frequency of steps have a smaller foot length, and vice versa. Since the steps length is defined by the leg length[20–23], while the leg length is closely related to the step length, it can be concluded that the step length of boys of a younger school-age is a significant predictor of sprinter's running characterized by a lower frequency of steps and longer steps, as well as a longer duration of the foot contact with the pad. A higher quantity of fatty tissue is a significant predictor of sprinter's running with a higher frequency of steps and shorter duration of foot contact with the pad.

In explaining the variable step length (KDK), the variables body height (ALVT), percentage of fat (%MASTI) and perimeter of the forearm (AVOPOD) have contributed the most for boys, while for girls a significant correlation between variables percentage of fat (%MASTI) and the perimeter of the lower leg (AVOPOT) and the criterion variable has been determined. Boys who are taller and have a highest non-fat body mass on the forearm, and girls with a higher quantity of muscular mass on the lower leg achieve longer steps. Paruzel-Dyja, Walaszczyk and Iskra determined in 2006 that height and body mass influence the longer steps and lower frequency of steps. Lower values of step length are achieved by examinees of both sexes with a higher quantity of subcutaneous fatty tissue. Similar results were obtained by Babić (2005) and Babić, Harasin and Dizdar (2007). It can thus be determined that taller boys of a younger school-age and girls and boys who have a higher non-fat body mass will achieve longer steps at 50 m running. For most variables which have been set as criteria a negative correlation with a higher percentage of fat or higher quantity of subcutaneous fatty tissue with boys and girls have been determined. It has also been determined that variables of body voluminosity, considering which it is possible to predict the non-fat body mass, have a significant positive correlation with all criteria variables.

Boys who have a lower quantity of subcutaneous fatty tissue reach better results at 50 m running, they have a shorter duration of contact with the pad, longer duration of the flight phase and longer steps than boys with higher quantities of subcutaneous fatty tissue. Boys with a higher muscular mass of the body achieve a shorter duration of contact, longer duration of flight and longer steps.

Girls who have a lower quantity of subcutaneous fatty tissue achieve a better 50 m running time, have a shorter duration of contact with the pad and longer steps.

It has been found that taller boys have longer steps, and longer steps significantly influence the longer duration of contact with the pad and a decrease in the frequency of steps.

In relation to the obtained results, the H2 hypothesis can be accepted, according to which there is a statistically significant influence of anthropometric characteristics on kinematic parameters of sprinter's running at maximal speed running, for both boys and girls.

Conclusion

This research has been carried out on a sample of 150 boys and girls (70 boys and 80 girls) of the first and second grade of a Pula (Croatia) primary school. The sample of variables was made of 14 anthropometric characteristics variables and 5 kinematic parameters variables of sprinter's running. The relations between anthropometric characteristic of running and kinematic parameters of sprinter's running have been determined by the multiple regression analysis and the results have shown that the boys' statistically significant variable is the percentage of fat (%MASTI). The same variable is on the limit of statistical significance for girls. In the factor structure of anthropometric characteristics, two factors have been separated for boys and three for girls.

The forward stepwise regression analysis has confirmed that success in 50 m running with both boys and girls is proportional to lower values of subcutaneous fatty tissue and higher values of body mass, especially the non-fat body mass. A shorter duration of foot contact with the pad is linked to a lower percentage of fat and longer perimeter of the lower arm for boys and girls. The quantity of fatty tissue negatively influences the duration of the flight phase. The frequency of steps has a significant negative correlation with the variable foot length (ALDST) for boys, while a significant correlation has not been determined for girls.

REFERENCES

1. ROSS A, LEVERITT M, RIEK S, Sports Med, 51 (2001) 409. — 2. CHOW JW, J Appl Biomech, 3 (1987) 110. — 3. PRAPOTNIK U, ČOH M, Biomehanika atletike (Fakulteta za šport, Ljubljana, 2001). — 4. PIŠOT R, ŠIMUNIČ B, Vloga biomehanskih lastnosti skeletnih mišic v gibalnem razvoju otrok (Univerza na Primorskem, Koper, 2006). — 5. LETZELTER S, New Studies in Athletics, 21 (2006) 15. — 6. BRAČIĆ M, TOMAŽIN K, ČOH M, Sodobni diagnostični postopki v treningu atletov (Fakulteta za šport, Ljubljana, 2009). — 7. BABIĆ V, BLAŽEVIĆ I, RADETIĆ-PAIĆ M, Napredak: časopis za pedagogijsku teoriju i praksu, 152 (2011) 49. — 8. BABIĆ V, Mogućnosti otkrivanja za sprint nadarenih djevojčica. MS Thesis. In Croat (University of Zagreb, Zagreb, 2001). — 9. BABIĆ V, HARASIN D, DIZDAR D, Kinesiology, 39 (2007) 28. — 10. BISSAS AI, HAVENETIDIS K, J Sport Med Phys Fit, 48 (2008) 49. — 11. CUNHA L, The relation between different phases of sprint run and specific strength parameters of lower limbs. In: Proceedings (XXIV ISBS Symposium, Beijing, 2005). — 12. SMIRNIOTOU A, KATSIKAS C, PARADISIS G, ARGEITAKI P, ZACHAROGIANNIS E, TZIORTZIS S, J Sport Med Phys Fit, 48 (2008) 447. — 13. NESSER TW, LATIN RW, BERG K, PRENTICE E, J Strength Cond Res, 10 (1996) 263. — 14. TOMAŽIN K, Povezanost morfoloških in motoričnih spremenljivk z uspešnostjo mladih šprinterk v teku na 60 metrov. MS Thesis. In Slovenian (University of Ljubljana, Ljubljana, 1999). — 15. MAULDER PS, BRADSHAW EJ, KEOGH J, J Sport Sci Med, 5 (2006) 359. — 16. TOMAŽIN K, ŠKOF B, DOLENEC A, ČOH M, Coll Antropol, 32 (2008) 821. — 17. ZAGORAC N, RETELJ E, BABIĆ V, BAVČEVIĆ T, KATIĆ R, Coll Antropol, 32 (2008) 843. — 18. ČOH M, TOMAŽIN K, RAUSAVLJEVIĆ N, Biol Sport, 24 (2007) 115. — 19. VUČETIĆ V, MATKOVIĆ B, ŠENTIJA D, Coll Antropol, 32 (2008) 863. — 20. ČOH M, MIHAJLOVIČ S, PRAPROTNIK U, Biomehanika atletike (Fakulteta za šport, Ljubljana, 2001). — 21. HUNTER J, MARSHALL RN, MCNAIR, P, Med Sci Sport Exer, 36 (2004) 261. — 22. BABIĆ V, Utjecaj motoričkih sposobnosti i morfoloških obilježja na sprintersko trčanje. DS Thesis. In Croat (University of Zagreb, Zagreb, 2005). — 23. PARUZEL-DYJA M, WALASZCZYK A, ISKRA J, Studies in Physical Culture and Tourism, 13 (2006) 33.

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UTJECAJ ANTROPOMETRIJSKIH KARAKTERISTIKA NA KINEMATIČKE PARAMETRE SPRINTERSKOG TRČANJA DJECE

S A Ž E T A K

Sprintersko trčanje djece razlikuje se u odnosu na odrasle prvenstveno zbog razlike u motoričkim sposobnostima, antropometrijskim karakteristikama, fiziološkim i biokemijskim karakteristikama te psihološkim i sociološkim karakteristikama. Cilj ovog istraživanja bio je ispitati utjecaj antropometrijskih karakteristika na kinematičke parametre sprinterskog trčanja djece. Uzorak varijabli čine varijable za utvrđivanje antropometrijskih karakteristika (14 antropometrijskih mjera) i 5 varijabli kinematičkih parametara sprinterskog trčanja. Kinematički parametri sprinterskog trčanja u fazi maksimalne brzine prikupljeni su primjenom tehnologije Optojump (Microgate, Italija) te su izmjerena vremena sprinterskog trčanja svakih 5 metara na dionici od 50 m. Dobiveni rezultati multiple regresijske analize između skupa antropometrijskih karakteristika i rezultata u trčanju na 50 m ukazuju da se kod dječaka izdvojila kao statistički značajna varijabla postotak masti, dok je ista varijabla kod djevojčica blizu granice statističke značajnosti. U faktorskoj strukturi antropometrijskih karakteristika kod dječaka izdvojila su se dva faktora, a kod djevojčica tri faktora. Prvi faktor koji se izdvojio kod djevojčica i dječaka je faktor voluminoznosti tijela, drugi faktor kod dječaka je faktor longitudinalne dimenzionalnosti, dok je drugi faktor kod djevojčica faktor količine masnog tkiva. Treći faktor kod djevojčica je faktor longitudinalne dimenzionalnosti. Kod većine varijabli utvrđena je negativna povezanost s većim postotkom masti odnosno većom količinom potkožnog masnog tkiva kod djevojčica i dječaka. Dječaci koji imaju manju količinu potkožnog masnog tkiva postižu bolje rezultate u trčanju na 50 m, imaju kraće trajanje kontakta s podlogom, dulje trajanje faze leta i veću duljinu koraka u odnosu na dječake s većom količinom potkožnog masnog tkiva. Dječaci s većom mišićnom masom tijela postižu kraće vrijeme trajanja kontakta, dulje vrijeme trajanja leta i veću duljinu koraka. Djevojčice koje imaju manju količinu potkožnog masnog tkiva postižu bolje vrijeme u trčanju na 50 m, imaju kraće trajanje kontakta s podlogom i veću duljinu koraka. Kod dječaka je utvrđeno da viši ispitanici imaju veću duljinu koraka, a veća duljina stopala značajno utječe na dulje trajanje kontakta s podlogom i smanjenje frekvencije koraka.