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Influence of some anthropometric and motor parameters on triple jump

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Abstract

Athletics disciplines are characterized by motor movements that can be successfully applied during the educational process or through other forms of exercise, which significantly affect the development of general psychophysical abilities of individuals. Each of the disciplines of athletics acts on the development of individual abilities, but also on the general psychophysical status of man and for this reason athletics is called the "queen of sports". Athletic activities have a characteristic of participant inclusion. The values of the paper will be based on the purpose of anthropometric, basic motor and specific motor characteristics of students aged 21 years \pm 6 months. A total of 70 male students, 7 anthropometric variables, 7 motor variables and 1 specific motor variable that were tested during the period of May, of the academic year, 2020/2021 were included in the research. In the basic parameters students, based on the results achieved in this anthropometric variable, are presented as a moderately homogeneous group. Although it is seen that the acquired flexibility and convexity (Skewness and Kurtosis) have a pronounced asymmetry, in the vast majority of anthropometric variables. Although it is seen that the acquired flexibility and convexity (Skewness and Kurtosis) have a pronounced asymmetry, in the vast majority of motor and criterion variables. Thus the statistically significant coefficients of the variables with the highest degree of statistical inference ($p < 0.01$) are denoted by two asterisks. With easier statistical conclusion criterion ($p < 0.05$) correlation coefficients. All variables have statistically significant correlation to all anthropometric, basic and criterion motor variables.

Keywords: anthropometric variables, motor, specific, student, regression.

INTRODUCTION

Athletic jumps are exercises, characterized by an extended phase without support, running over obstacles as a result of momentum and energetic beating on the ground with one foot. [1] These types of exercises are associated with great neuromuscular strain, within a short time [2] As such they develop with priority explosive force and speed as well as sensations of orientation in space

and time. Long and triple jumps are natural forms of movement, in general, and athletics in particular. These types constitute one of the basic tools of all-round training: physical, functional and psychological. This is the main reason why they are constantly appreciated, especially in the context of peak exercise for sporting achievement. [3] The data show that the triple jump is the discipline of the old Olympic Games and the first result found is 16 m, but this result is assumed to be the sum of the results of three separate jumps, to jump in a row. The triple jump is part of the group of monostructural movements and is quite complex. Momentum, as the first phase, is cyclic motion, while the other phases belong to acyclic motions. [1,2,4] During the jump, large loads (300-500 kg) are exerted on the moving system of the jumpers, so the three-step jump is approached after the students have reached a proper quantum of basic motor properties, such as speed, strength, mobility and proper condition. Speed and strength mainly dominate in this discipline. The sporting result depends on the size of the initial flight speed, the flight angle as well as the height of the overall center of gravity. that the jumper makes in space on every flight. [5,6] High ump is a complex movement. Its structure consists of: momentum as cyclic motion, thrust, flight and fall belong to the acyclic group of motions. High jump belongs to the monostructural group of movements where the determining element is strength and speed. [7,9,10] The complexity of this discipline increases with the increase of the sports result which is characterized by the high degree of connectivity of these elements as well as by the high degree of harmony and coordination of movements in space.

THE PURPOSE OF THE STUDY

The problem which is addressed in this paper is as important as it is current, because all students have different characteristics, so even in the sport of athletics there is an increasing need for objectification of indicators of the impact of physical exercise and especially the various jumps, can safely and efficiently diagnose, program, directly manage and control transformational processes in the subject of athletics and sports in general at Faculty of Physical Education and Sports. The main purpose of this research is to determine the impact of some anthropometric, motor and criterion variables in the triple jump to the students of the Faculty of Physical Education and Sports at the University of Prishtina "Hasan Prishtina" - Prishtina, male students in the first year of study of the academic year 2020/2021, aged 19 years \pm 6 months. It also aims to verify the anthropometric, motor and motor specific characteristics of the Faculty of Physical Education and Sports students.

The basic criteria for participation in the research was: a) that during the year they were always present in athletics classes, b) they were present in the teaching process, c) they were not sick during the test.

VARIABLES SAMPLE

1. Anthropometric variables

The following anthropometric parameters have been applied to identify anthropometric variables: Body height (BH), Arm length (AL), Leg length (LL), Body weight (BW), Subcutaneous abdominal fat tissue (SAFT), adipose tissue of the arm (ATA), adipose tissue of the thigh (ATTH).

2. Specific-motor variables

Standing long jump with two legs (SLJTL), Standing high jump (SHJ), Standing long jump with the left foot (SLJLF), Standing long jump with the right foot. (SLJRF), Hand tapping (HT), Foot tapping (FT), Flexibility - body bending forward (BBF) and running 30 meters high start (RHS 30 m.).

3. Specific motor variables

Triple jump with momentum

METHODS FOR PROCESSING THE RESULTS

Taking into account all these facts, for the purposes of this research, procedures have been chosen that are considered to correspond to the nature of the problems being researched. For each variable, the following values will be calculated:

1. Central basic and Distribution Parameters: Arithmetic Mean (AM), Standard Deviation (SD), Minimum Value (Min), Maximum Value (Max).
2. The distribution curve is tested by the coefficient of asymmetry (Skewness), and the degree of curvature of the vertex of the distributed results curve (distribution height) through the flat coefficient (Kurtosis).
3. Interconnections reports between variables in the manifest space, as well as correlations between the systems of variables.
4. To determine the relationship between predictor variables (anthropometric and motor characteristics) and criterion variables (triple jump with momentum), regression analysis was applied in the manifest space.

DESCRIPTIVE ANALYSIS OF ANTHROPOMETRIC AND MOTOR SPECIFIC VARIABLES

In Table 1 descriptive analysis of anthropometric and motor specific variables is presented to the 19-year-old students of the Faculty of Physical Education and Sports.

The sample included a group of 60 male students, where the arithmetic mean values, minimum value, maximum value, standard deviation, distribution or asymmetry parameters (Skewness - tilt, asymmetry) and the degree of extension of the curvature peak of the distribution of results (Kurtosis - convexity).

Table 1. Basic statistical parameters of anthropometric and motor specific variables in students of the Faculty of Physical Education and Sports.

Tabela 1.	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
ALATR	70	165.5	197.6	178.6764	5.9658	0.52	0.654
AGJKRA	70	74.3	88.7	80.3586	2.817	0.484	0.361
AGJKEM	70	90	110	99.7	4.8008	-0.025	-0.118
APTRU	70	54.6	87.8	72.0371	7.46061	0.114	-0.371
AIDHBA	70	22	34.02	27.5446	2.55105	0.255	-0.094
IDHKRA	70	3.08	12	6.4231	1.85318	1.022	1.035
AIDHKOF	70	4.2	19.02	10.5109	3.68237	0.426	-0.676
MKGJVE	70	1.9	2.8	2.35	0.1956	-0.045	-0.371
KLVEN	70	29.2	47	36.7886	4.34109	0.512	-0.322
MKMAJ	70	13.7	25.7	19.0214	2.63091	0.57	0.343
MKDJA	70	14.3	29.4	19.5229	3.61251	0.668	-0.22
MTDOR	70	28	42	36.8429	3.44159	-0.765	0.253
MTKEM	70	22	35	27.8286	3.01672	0.42	-0.055
MPPARA	70	40	64	53.3286	5.65614	-0.285	-0.385
MV30M	70	4.25	4.71	4.3967	0.11918	0.359	-0.99
K3HAP	70	6.5	9.7	8.1457	0.79266	-0.17	-0.679

The arithmetic mean of the anthropometric variable, body height (BH), (Table 1 and Histogram 1) is (178.67 cm). The minimum result (165.50 cm) and the maximum result (197.60 cm) of the variable, body height shows that there is a significant difference between students in this anthropometric variable, and a slight tilt of the variables has the lowest results, because in the asymmetry test dominates the results in between, the asymmetry test is mesocortical (mesokurtikal).

Students based on the results achieved in this anthropometric variable are presented as a moderately homogeneous group with a larger number of values towards the lower ones. Although there is a marked difference between the minimum and maximum result, it is seen that the acquired flexibility and convexity (Skewness and Kurtosis) have pronounced asymmetry. All variables presented in table 1 are homogeneous; no variable presented in this table is heterogeneous.

INTERCORRELATION MATRIX BETWEEN BASIC AND SPECIFIC ANTHROPOMETRIC AND MOTOR VARIABLES

Intercorrelation coefficients of basic and specific anthropometric and motor variables in students of year (I) of the Faculty of Physical Education and Sports

Table 2 presents the intercorrelation matrix of anthropometric and motor-specific variables in Faculty of Physical Education and Sports students. Due to the better reflection of the table and to more clearly observe the intercorrelation coefficients, the significant coefficients of the different connection levels are identified with the asterisk. Thus the statistically significant coefficients of the variables with the highest statistical conclusion ($p < 0.01$) are marked with two asterisks. With the easiest statistical conclusion criterion ($p < 0.05$) the correlation coefficients are marked with

an asterisk. The interpretation of simple linear correlation coefficients as it is known in most cases depends on the number of tested, respectively more precise on the degree of freedom. The sample of 70 students tested, the degree of freedom number is 48. With the inspection of the table of limited values, with Pearson coefficients it is noticed that the value of the limit for 48 degrees of freedom (df (N-2) is $r = 0.250$ with the easiest criterion ($p = 0.05$) respectively $r = 0.325$ with stricter statistical inference criteria ($p = 0.01$) (Bala, 1990).

Table 2. Intercorrelation coefficients of basic and specific anthropometric and motor variables in students of year (I) of the Faculty of Physical Education and Sports

Tabela.2	ALATR	AGJKRA	AGJKEM	APTRU	AIDHBA	IDHKRA	AIDHKOF	MKGJVE	KLVEN	MKMAJ	MKDJA	MTDOR	MTKEM	MPPARA	MV30M	K3HAP
ALATR	1	.989**	.758**	.501**	-0.06	-0.121	0.205	0.005	0.05	0.184	0.191	0.213	0.125	0.061	0.026	0.123
AGJKRA	.989**	1	.752**	.502**	-0.034	-0.092	0.219	0.004	0.105	0.199	0.201	0.215	0.14	0.099	0.034	0.096
AGJKEM	.758**	.752**	1	.307**	-0.143	0.011	0.162	-0.014	0.11	.275**	0.235	0.164	0.153	-0.03	0.01	0.056
APTRU	.501**	.502**	.307**	1	.490**	0.069	.440**	0.022	0.064	0.217	-0.059	0.22	0.12	0.161	-0.031	-0.086
AIDHBA	-0.06	-0.034	-0.143	.490**	1	.481**	.266**	-0.025	0.141	-0.128	-0.148	0.171	0.082	0.23	-0.039	-.274*
IDHKRA	-0.121	-0.092	0.011	0.069	.481**	1	0.21	0.061	0.086	-0.156	-0.074	.237**	-0.069	0.1	-0.136	0.042
AIDHKOF	0.205	0.219	0.162	.440**	.266**	0.21	1	.278**	.353**	.241**	-0.002	0.195	0.192	0.145	-.343**	-0.001
MKGJVE	0.005	0.004	-0.014	0.022	-0.025	0.061	.278**	1	.368**	0.152	.332**	0.221	.263**	0.118	-.780**	0.079
KLVEN	0.05	0.105	0.11	0.064	0.141	0.086	.353**	.368**	1	.518**	.595**	0.217	0.022	0.054	-.325**	-0.045
MKMAJ	0.184	0.199	.275**	0.217	-0.128	-0.156	.241**	0.152	.518**	1	.623**	0.11	0.01	0.047	-0.066	0.176
MKDJA	0.191	0.201	0.235	-0.059	-0.148	-0.074	-0.002	.332**	.595**	.623**	1	.320**	-0.145	-0.12	-.309**	.345**
MTDOR	0.213	0.215	0.164	0.22	0.171	.237**	0.195	0.221	0.217	0.11	.320**	1	0.197	0.144	-.278**	0.196
MTKEM	0.125	0.14	0.153	0.12	0.082	-0.069	0.192	.263**	0.022	0.01	-0.145	0.197	1	0.183	-.239**	-0.093
MPPARA	0.061	0.099	-0.03	0.161	0.23	0.1	0.145	0.118	0.054	0.047	-0.12	0.144	0.183	1	-0.053	-0.167
MV30M	0.026	0.034	0.01	-0.031	-0.039	-0.136	-.343**	-.780**	-.325**	-0.066	-.309**	-.278**	-.239**	-0.053	1	-0.165
K3HAP	0.123	0.096	0.056	-0.086	-.274*	0.042	-0.001	0.079	-0.045	0.176	.345**	0.196	-0.093	-0.167	-0.165	1

By inspecting the intercorrelation coefficients of anthropometric variables in students we notice that all anthropometric variables among themselves have a high correlation and that that coefficient or all correlation coefficients are statistically significant at the level of $p < 0.001$. Especially the correlation coefficients that belong to the longitudinal dimension (arm lengths) and those that belong to the dimension of body mass and body volume are higher. $r = 0.989$; $p < 0.01$. leg length. $r = 0.758$; $p < 0.01$., body lengths $r = 0.501$; $p < 0.01$, arm adipose tissue $r = 0.481$; $p < 0.01$, adipose tissue of the thigh $r = 0.440$; $p < 0.01$ etc. By inspecting the intercorrelation coefficients of the basic motor variables in basketball players (table 3) are grouped among themselves. In the first group we have the correlation coefficients belonging to the explosive forces of the lower extremities, standing long jump and standing high jump $r = 0.278$; $p < 0.05$. In the second group we have the correlation coefficients belonging to the running speed 30 meters $r = 0.780$; $p < 0.01$. triple jump $r = 0.345$; $p < 0.01$, etc.

Table 3. Regression analysis - correlation and influence of anthropometric and motor variables as independent (predictor) variables on the dependent (criterion) variable - triple jump with momentum (TJM).

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.607 ^a	.369	.193	.71194

ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	15.983	15	1.066	2.102	.024 ^b
1 Residual	27.370	54	.507		
Total	43.354	69			

a. Dependent Variable: K3HAP

b. Predictors: (Constant), MV30M, AGJKEM, MPPARA, IDHKRA, MKMAJ, MTKEM, APTRU, MTDOR, AIDHKOF, KLVEN, AIDHBA, MKGJVE, AGJKRA, MKDJA, ALATR
Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	15.386	7.572		2.032	.047
ALATR	.099	.117	.747	.847	.401
AGJKRA	-.137	.244	-.487	-.563	.576
AGJKEM	-.056	.031	-.341	-1.839	.071
APTRU	.001	.021	.011	.057	.955
AIDHBA	-.109	.056	-.351	-1.948	.057
IDHKRA	.127	.063	.298	2.027	.048
AIDHKOF	.025	.032	.117	.779	.439
MKGJVE	-.785	.749	-.194	-1.047	.300
KLVEN	-.063	.032	-.347	-1.965	.055
MKMAJ	.027	.057	.091	.482	.632
MKDJA	.107	.048	.487	2.221	.031
MTDOR	.015	.031	.065	.486	.629
MTKEM	.012	.035	.045	.337	.737
MPPARA	-.010	.017	-.074	-.600	.551
MV30M	-1.196	1.273	-.180	-.939	.352

a. Dependent Variable: K3HAP

The regression analysis in students shows that the value of the correlation between the group of independent predictor variables (basic anthropometric and motor variables with the criterion dependent variable - Triple jump with momentum (TJM) has been verified. Connectivity of the whole system of independent predictor variables (basic anthropometric and motor variables) - Triple jump with momentum (TJM). Connectivity of the whole system of independent predictor variables (basic anthropometric and motor variables): Body height (BH), Arm length (AL), Leg length (LL), Body weight (BW), Abdominal subcutaneous adipose tissue (ASAT), Adipose tissue of the arm (ATA), Adipose Tissue of the Thigh (ATT), Standing Long

Jump (SLJ), Standing High Jump (SHJ), Standing Long Jump with the Left Foot (SLJLF), Standing Long Jump with the Right Foot (SLJRF), Hand Tapping (HT) , Foot Tapping (FT), Forward Body Bend Flexibility (FBBF) with the criterion variable - Triple Jump with Momentum (TJM), these have been proven with multiple correlations. The multiple correlation coefficient has the value $R = 0.607$, which explains the common variability between the system of predictor variables and the criterion variable about 40% ($R^2 = 0.369$). The distribution (F) is obtained as the quotient distribution of the two variances, and in these cases it is always necessary to assign the two degrees of freedom. The first degree of freedom is equal to the number of predictor variables ($df = n$) respectively ($df = 15$), while the second is performed so that the number of subjects (70) is reduced by the number of predictive variables minus 1 ($df = N - n - 1$) respectively ($df = 70 - 15 - 1$). We can emphasize that the test (F-test) is always more valuable if the multiple correlation is greater, in the concrete case of this paper is significant ($Sig = 0.024$), because the value of the F-test is 3.926. In this research, after obtaining a statistically significant multiple correlation ($R = 0.642$), it is necessary to look for the coefficient in the column (Beta) as well as the value of (t-test), which show the impact of each predictor variable (independent) in the dependent or criterion variable (Table 3).

CONCLUSION

Athletic jumps are exercises, characterized by an extended phase without support, as a result of momentum and energetic beating on the ground with one foot. These types of exercises are associated with great neuromuscular strain, within a short time. As such they develop with priority explosive force and speed as well as sensations of orientation in space and time. In the formation of anthropological features of a population, the genetic factor has a primary influence, but the influence of external factors, thus ecological factors should not be left aside. This paper aimed to ascertain the impact of anthropometric, motor - specific parameters on Faculty of Physical Education and Sports students aged 19 years. A total of 70 students were included in this research. The measurements were executed during the month of May in the physical education hall of the Faculty of Physical Education and Sports. Based on the scope and problem of the research and in accordance with the purpose and statistical methods for processing the results, four hypotheses are presented. A total of 15 motor variables and 1 specific motor variable were applied. All these applied variables have been subjected to basic statistical processing, on the basis of which it was proved that all these variables met the application conditions and have had satisfactory metric characteristics. Descriptive analysis were applied in order to determine the arithmetic mean, standard deviation and to determine the asymmetry and curve. In order to determine the factors in psychomotor variables regression analysis has been applied. Regression analysis shows that student results are presented as homogeneous results. The intercorrelation coefficients of the basic motor and specific motor parameters of some variables, the obtained values have a significant statistical correlation, which has been proven based on the research so far according to many authors.

The arguments obtained show that the most realistic picture regarding the selection of students for the sport of athletics based on psychomotor skills are processed through regression analysis.

The application of scientific research methods, in a good way creates the information base in order to valorize the values and program contents during the holding of classes in athletics and other sports as well as training processes. The results of the research for pedagogues and trainers will present important information on the impact of anthropometric and basic motor characteristics on the performance of specific motor tasks in the sport of athletics in order to dose the volume and intensity of loads during regular hours of training processes, special hours and various recreational activities. Based on what was said above, it can be concluded that the results and conclusions of the research will be in function of the identification, monitoring, programming and control of students of this age group who regularly attend the subject of athletics in the Faculty of Physical Education and Sports. The whole research is presented in tabular form of results. I think that this paper will be a small window in this field of science and sports in the subject of athletics.

Based on what was said above, it can be concluded that the results and conclusions of the research will be in function of the identification, monitoring, programming and control of students of this age group who regularly attend the subject of athletics at the Faculty of Physical Education and Sports.

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