Sport SPA Vol. 18 Issue 2: 63-69
DOI 10.51558/1840-4561.2021.18.2.63

THE INFLUENCE OF THE BASIC MOTOR ABILITIES ON THE FIVE ATHLETIC DISCIPLINES IN 17-YEAR-OLD STUDENTS

Bejtulla Emini[1], Blerim Saiti[1], Zorica Stankovska[2], Zarko Kostovski[3]

[1]Mother Theresa University, Faculty of Social Sciences, Sport and Sport Sciences, Skopje, Republic of North Macedonia
[2]University Ss. Cyril and Methodius, Faculty of Physical of Pedagogy Ss.Kliment Ohridski, Skopje, Republic of North Macedonia
[3]University Ss. Cyril and Methodius, Faculty of Physical Education, Sport and Health, Skopje, Republic of North Macedonia

Original scientific paper

Abstract
For the realization of the research, a research procedure was conducted on 250 male students from the fourth year in two municipal high schools, aged 17 to 18 years, with a difference in age of ± six months. The subject of the research is the basic motor space in students, as a predictor system and their impact on the five athletic disciplines that are an integral part of the program in the competition system of the Federation of School Sports as a criterion system of variables. By applying the Multiple Regression Analysis, the influences of the predictors on each of the criterion variables were determined.
Key words: morphology, motor abilities, regression analysis

INTRODUCTION

The movements that a person can make are conditioned by motor abilities (anthropomotor, biomotor and psychomotor). Motor abilities, to a greater or lesser degree, are genetically predisposed, ie they are innate or acquired (Stoilkovich, 2003). Motor abilities are manifested through various physical activities and can be measured with appropriate measuring instruments, where the result depends on the physiological, biochemical, cognitive and conative mechanisms of the organism. (Naumovski, A. 2004). The term motor abilities means established "command algorithms", located in appropriate motor centers of the CNS that enable the realization of motor structures of movement. The "command algorithm" is responsible for activating and deactivating different muscle groups according to the order, intensity and duration of a task, which results in the performance of a specific motor operation. (Zatsiorsky, V.M. 1975). According to previous research, the following basic motor abilities have been identified: strength, velocity, endurance, coordination, elasticity, balance and precision. Specific motor abilities are most often acquired and conditioned by the training process in each sport.
Athletics is one of the basic sports and a necessary branch of physical education, which includes running, especially as a racing discipline, which dates back to the earliest times, ie the first Olympic Games from 776 BC, where running in a certain period (129 meters), was the only racing discipline. Athletics is also known as the queen of sports because there are many branches and sports disciplines in it (Iseni, A. 2013).
With the plan and program of the Bureau for Development of Education of the Republic of Macedonia, in the curriculum of the subjects, in the schools for secondary education is represented the subject Sport and sports activities, in which the students realize a large part of the needs for physical activity. This subject in the gymnasium schools is represented by 3 (three) hours per week, ie 108 hours per year, while in the vocational schools in secondary education this subject is represented by 2 (two) hours per week or 72 hours per year, which indicates the importance of physical activity and its impact on the formation of the personality of the young person, especially in his psychomotor growth and development. In the schools for secondary education, with the program for the subject sport and sports activities, there are physical activities from several sports branches, among which with a certain number of classes is represented athletics with disciplines for which there are optimal infrastructural conditions. The motivation for a more serious approach in the work of the classes, the students get by receiving an appropriate objective grade. By checking the degree of adoption of the performance technique, at the same time checking the condition of the basic motor abilities (speed, endurance, explosive force, etc.) has been done, which indicate the psychomotor status of the students.

MATERIAL & METHODS

In order to achieve the goals of the research, a research procedure was conducted on 250 male students from the fourth year in two municipal high schools, "Drita" and "Mirko Smileski" from Kicevo, aged 17 to 18 years, with a difference in age of ± six months.
The subject of the research is the basic motor space of 17-year-old students (fourth year), and their impact on the five athletic disciplines that are an integral part of the program in the competition system of the Federation of School Sports.
The problem that is studied is directly related to the motor abilities of students, because these athletic disciplines are an integral part of the curriculum for the subject of sports and sports activities in high schools in the Republic of Macedonia.

The aim of the research is to determine the impact of basic motor abilities on the five athletic disciplines in 17-year-old students. Motor abilities are of fundamental importance to human, so determining the structure of motor dimensions and determining the validity of measuring instruments, which monitor and evaluate motor ability are of primary importance. For this purpose, the following tests were used to assess the motor abilities according to the methodology of Metikos & Associates (1989).

Sample of basic motor variables

Long jump from place (MSDM), triple jump from place (MTOM), triple jump with a stronger leg (MTJN), triple jump with a weaker leg (MTSN), sprint at 30 m. (MS30m.), Throwing a medicine ball from lying (3kg.) (MFML), shot put (6kg.) (MFGPG), push-ups (MSKT), push-ups on bars (MSKP), deep bent on bench (MPRK), back muscle workout on Swedish bench (MGMSHS), abdominal muscle workout on rip bench (MSMR), bench press 50 kg in 20 sec. (MBP) and bar pull-ups in 20 sec. (MZV20s).
The subject of the research in this paper are five athletic disciplines that are an integral part of the curriculum for sports and sports activities for high school students, and also an integral part of the competition calendar of the Federation of School Sports of Macedonia (FUSM).

Sample of Criterion Variables

Sprint at 100 m. (KS100m.), shot put (6 kg.) (KFRGU6kg.), Long jump (KSKDAL), Running at 400 m. (KT400m.), Running at 1000m. (KT1000m.).
Multiple regression analysis is applied in the research procedure of this paper. The following statistical parameters were calculated in the regression analysis: Beta coefficients, Standard error of beta coefficients, Standardized partial regression, Determination coefficient, multiple correlations, T-test and F-test to determine the significant impact for each variable on the criterion and the whole predictive system on the criterion variables.

RESULTS

Table 1 shows the results of the regression analysis of the predictor system (basic motor variables) on the criterion Sprint at 100 meters (KSP100m). From them it can be concluded that there is a statistically significant impact at the level of p <0.000.

Table 1. Regression analysis of the basic motor variables with the criterion variable - Sprint at100 m. (KSP100m.)

	BETA	St. Err.of BETA	B	St. Err. of B	t(211)	p-level
Intercpt			12.74823	1.756336	7.25842	.000000
MSDM	-.116682	.090192	-.00749	.005792	-1.29370	.197184
MTOM	-.122600	.110480	-.00316	.002848	-1.10970	.268389
MTJN	-.021071	.145362	-.00046	.003142	-.14496	.884883
MTSN	.051422	.134009	.00115	.002987	.38372	.701572
MS30m	.419119	.065076	1.57481	.244519	6.44043	.000000
MFML3kg	-.067542	.071954	-.00078	.000834	-.93868	.348969
MFGPG	-.035842	.067620	-.00044	.000837	-.53005	.596638
MSKT	-.045431	.086035	-.00735	.013916	-.52805	.598019
MSKP	.009021	.088843	.00343	.033737	.10154	.919220
MPRK	.010305	.051498	.00224	.011199	.20011	.841590
MGMSHS	-.003150	.056901	-.00035	.006306	-.05537	.955897
MSMP	-.088493	.060154	-.00792	.005383	-1.47109	.142757
MBP	.049577	.072682	.01521	.022300	.68210	.495921
MZV	-.127535	.080168	-.04969	.031235	-1.59084	.113143

R	R_c Adjusted	R_c	F	Std.Error	p<
.708	.501	.468	15.148	1.162	.000

The value of the multiple correlation coefficient is relatively high R = .708 which confirms that the whole predictive system of the basic motor variables has a statistically significant impact on the criterion variable Sprint at 100 m. The coefficient of determination R_c = .501 explains the total variability of the system of predictors with the criterion of 50%. The remaining 50% can be attributed to other features and capabilities.

From this table it can be seen that from the predictor variables (basic motor variables) only the variable Sprint at 30 m has a statistically significant impact on the criterion. (MS30m.) with a value of the BETA coefficient = .419 and with a level of significance p = .000. While in the rest of the predictor variables there is no special effect on the criterion Sprint at100 m. (KSP100m).

Influence of predictors (basic motor variables) on the criterion Shot put of 6 kg. (KFRGU6kg.) shown in Table 2, and it indicates a statistically significant impact on the level of (p <0.000).

The value of the multiple correlation coefficient is high R = .758 which confirms that the whole predictive system of basic motor variables has a statistically significant impact on the criterion variable shot put of 6 kg. The coefficient of determination R_c = .546 explains the total variability of the system of predictors with the criterion of 54%. The remaining 46% can be attributed to other characteristics and abilities.

Table 2. Regression analysis of basic motor variables with the criterion variable – shot put of 6 kg. (KFRGU6kg.)

	BETA	St. Err.of BETA	B	St. Err. of B	t(211)	p-level
Intercpt			253.5482	106.9402	2.370934	.018644
MSDM	.061527	.083298	.2605	.3527	.738647	.460942
MTOM	-.095823	.102034	-.1629	.1734	-.939130	.348738
MTJN	.069383	.134250	.0989	.1913	.516818	.605825
MTSN	.154317	.123765	.2267	.1819	1.246860	.213831
MS30m	-.032432	.060102	-8.0340	14.8884	-.539616	.590031
MFML3kg	.311940	.066454	.2383	.0508	4.694099	.000005
MFGPG	.223304	.062451	.1822	.0510	3.575679	.000433
MSKT	-.033929	.079458	-.3618	.8473	-.427005	.669811
MSKP	-.031049	.082051	-.7773	2.0542	-.378413	.705504
MPRK	.037612	.047561	.5392	.6819	.790814	.429941
MGMSHS	-.010435	.052551	-.0762	.3840	-.198571	.842790
MSMP	-.044310	.055556	-.2614	.3278	-.797575	.426014
MBP	.268924	.067126	5.4398	1.3578	4.006239	.000086
MZV	.037575	.074040	.9652	1.9019	.507502	.612332

R	R_c Adjusted	R_c	F	Std.Error	*p<*
.758	.501	*.546*	*20.358*	*70.762*	.000

From this table it can be seen that from the predictor variables (basic motor variables) a statistically significant impact on the criterion have: the variable Throwing a medicine ball from lying 3 kg. (MFML) with a value of the BETA coefficient BETA = .311 and with a significance level of p = .000; shot put (MFGPG) with a value of the BETA coefficient BETA = .223 and with a significance level of p = .000; Bench press 50 kg. for 15 sec. (MBP50 kg.) with a value of the BETA coefficient = .268 and with a level of significance of p = .000.

The influence of the predictors (basic motor variables) on the criterion Long jump (KSKDAL) shown in table no.3. The values in the table indicate that there is a statistically significant influence of the predictive system on the fast variable criterion at the level of p <0.000. The value of the multiple correlation coefficient is high R = .736 which confirms that the whole predictive system of basic motor variables has a statistically significant impact on the criterion variable Long jump. The coefficient of determination R_c = .512 explains the total variability of the system of predictors with the criterion of 51%. The remaining 49% can be attributed to other characteristics and abilities.

Table 3. Regression analysis of basic motor variables with the criterion variable – Shot put of 6 kg. (KFRGU6kg.)

	BETA	St. Err.of BETA	B	St. Err. of B	t(211)	p-level
Intercpt			138.8679	69.66562	1.99335	.047511
MSDM	.169462	.086383	.4507	.22975	1.96176	.051106
MTOM	.312631	.105814	.3338	.11299	2.95455	.003487
MTJN	-.013847	.139223	-.0124	.12462	-.09946	.920870
MTSN	.074067	.128349	.0684	.11847	.57707	.564506
MS30m	-.152725	.062328	-23.7658	9.69894	-2.45035	.015086
MFML3kg	-.064720	.068915	-.0311	.03308	-.93912	.348740
MFGPG	.110169	.064764	.0565	.03320	1.70108	.090401
MSKT	-.066497	.082402	-.4455	.55200	-.80699	.420583
MSKP	.025552	.085090	.4019	1.33821	.30029	.764249
MPRK	.013784	.049323	.1241	.44421	.27947	.780158
MGMSHS	.068927	.054497	.3164	.25015	1.26477	.207349
MSMP	.015604	.057614	.0578	.21352	.27083	.786784
MBP	-.086111	.069613	-1.0942	.88456	-1.23700	.217463
MZV	.156881	.076782	2.5314	1.23896	2.04319	.042276

R	R_c Adjusted	R_c	F	Std.Error	*p<*
.736	*.542*	*.512*	*17.872*	*46.098*	.000

From this table it can be seen that from the predictor variables (basic motor variables) the statistically significant influence on the criterion have the variables: Triple jump (MTOM) with value of BETA coefficient BETA = .312 and with significance level of p = .003, Sprint of 30 m (MS30m) with a value of the BETA coefficient BETA = -. 152 and with a level of significance of p = .015 and Bar pull-ups (MZB) with a value of the BETA coefficient BETA = .156 and with a level of significance of p = .042. While in the rest of the predictor variables there is no special impact on the criterion. Influence of predictors (basic motor variables) on the criterion Running 400 m. (KT40m.) shown in table no.4. It can be concluded that a statistical impact on the level of 0.000 has been established. The value of the multiple correlation coefficient is relatively high R = .682 which finds that the whole predictive system of basic motor variables has a statistically significant impact on the criterion variable running at 400 m. The coefficient of determination R_c = .465 explains the total variability of the predictors system with the criterion of 46%. The remaining 54% can be attributed to other characteristics and abilities. From this table it can be seen that from the predictor variables (basic motor variables) only the variable Sprint at 30 m has a statistically significant impact on the criterion. With a value of the BETA coefficient BETA = .440 and with a significance level p = .000. While in the rest of the predictor variables there is no special impact on the criterion Running at 400 m.

Influence of predictors (basic motor variables) on the criterion at Running 1000 m. (KT1000m) shown in Table 5 indicates that it is statistically significant (p <0.000). The value of the multiple correlation coefficient is high R = .637 which confirms that the whole predictive system of basic motor variables has a statistically significant impact on the criterion variable running at 1000 m. While the coefficient of determination is R_c = .406 which explains the total variability of the system of predictors with the criterion of 40%. The remaining 60% can be attributed to other features and capabilities.

Table 4. Regression analysis of basic motor variables with the criterion variable - Running at 400 m. (KT400m.)

	BETA	St. Err.of BETA	B	St. Err. of B	t(211)	p-level
Intercpt			54.29849	14.90139	3.64385	.000338
MSDM	-.066045	.093381	-.03476	.04914	-.70726	.480182
MTOM	-.106004	.114386	-.02240	.02417	-.92671	.355133
MTJN	-.205049	.150502	-.03632	.02666	-1.36243	.174514
MTSN	.228601	.138748	.04175	.02534	1.64760	.100922
MS30m	.440634	.067377	13.56738	2.07459	6.53979	.000000
MFML3kg	-.053293	.074498	-.00506	.00707	-.71536	.475178
MFGPG	-.003620	.070011	-.00037	.00710	-.05170	.958813
MSKT	.090397	.089078	.11982	.11807	1.01482	.311355
MSKP	-.073902	.091984	-.22997	.28624	-.80342	.422638
MPRK	-.047505	.053319	-.08465	.09502	-.89096	.373967
MGMSHS	-.075002	.058913	-.06812	.05351	-1.27311	.204380
MSMP	-.100686	.062282	-.07383	.04567	-1.61663	.107452
MBP	.074310	.075252	.18684	.18921	.98747	.324542
MZV	-.104109	.083003	-.33240	.26501	-1.25428	.211127

R	R_c Adjusted	R_c	F	Std.Error	*p<*
0.682	0.465	0.429	13.119	9.860	.000

From table 5. it can be seen that from the predictor variables (basic motor variables) a statistically significant impact on the criterion have: the variable Sprint at 30 m. (MS30m.) with a value of the BETA coefficient BETA = .299 and with a level of significance p = .000 and back muscle workout on Swedish bench (MGMSHS) with a value of the BETA coefficient BETA = -. 173 and with a level of significance p = .005.

Table 5. Regression analysis of basic motor variables with the criterion variable - Running at 1000 m. (KT1000m.)

	BETA	St. Err.of BETA	B	St. Err. of B	t(211)	p-level
Intercpt			211.8574	51.22312	4.13597	.000051
MSDM	-.126115	.098403	-.2165	.16893	-1.28162	.201382
MTOM	-.101477	.120537	-.0699	.08308	-.84188	.400811
MTJN	.052510	.158595	.0303	.09163	.33110	.740898
MTSN	-.024024	.146208	-.0143	.08711	-.16432	.869640
MS30m	.299376	.071000	30.0697	7.13135	4.21655	.000037
MFML3kg	-.001125	.078504	-.0003	.02432	-.01434	.988575
MFGPG	.137538	.073776	.0455	.02441	1.86427	.063672
MSKT	-.030249	.093867	-.1308	.40587	-.32226	.747576
MSKP	-.164401	.096930	-1.6688	.98395	-1.69608	.091346
MPRK	.023042	.056186	.1339	.32661	.41010	.682150
MGMSHS	-.173910	.062080	-.5152	.18393	-2.80137	.005562
MSMP	-.117287	.065630	-.2806	.15699	-1.78709	.075358

MBP	.106605	.079299	.8743	.65039	1.34434	.180281
MZV	.019148	.087466	.1994	.91097	.21892	.826926

R	R_c Adjusted	R_c	F	Std.Error	$p<$
0.637	0.406	0.366	10.316	33.894	.000

DISCUSSION

Analyzing the available literature, there are studies that compare the influence of anthropometric characteristics and motor skills, which are related to certain athletic disciplines. Of all the racing disciplines including short, medium and long distance running, the sprint as a running technique is among the first to start with general training for children aged 10-12 and specialized exercises for 14-16 year olds (Bompa, 2000). Very few articles focus on running sprint for athletes and students under the age of 14. Some authors believe that functional and motor abilities are among the most important abilities used for success in sprint running (Homenkov 1977; Brown, Ferrinho and Santana 2000; Milanovic 2007). Antekolovi et al., (2003) based on structural analysis explains that plyometric training or training for the development of explosive force and speed affects the development of strength as the ability and muscle speed of the legs and hips. Apart from the fact that the type of training affects the quality of the muscles, it also increases the value of the results in the basic manifesting abilities such as: jumps, start acceleration, sprints and movements by changing the direction of movement (agility). Jakoljevic & Batricevic, (2008), in their study tried to determine the quantitative differences between motor and functional abilities under the influence of an experimental model for the development of explosive force. The study was longitudinal in nature and lasted 8 weeks with 32 hours of training. Possible differences between the initial and final measurements between motor and functional abilities were analyzed using t-test for small dependent specimens and discriminant analysis. It was determined that in the final measurement of the experiment was found to show a statistically significant difference from the application of the experimental model for the development of explosive force, mostly between motor variables for assessing repetitive and explosive force and functional variables vital lung capacity and systolic and diastolic blood pressure. Zivkovic and Lazarevic, (2011) investigated the effect of flexibility and explosive force on the result of long and high jumps. The sample of respondents consisted of primary school students aged 14 years, who, in addition to regular physical education, were included in the section on school sports. 6 variables were used to assess flexibility and explosive strength. As a criterion the following disciplines were applied - long jump and high jump.

Athletic discipline - high jump, as an integral part of athletic pentathlon, is used in many faculties in the entrance exam, but also in teaching athletics. This discipline is a practical measure - a test to check psychomotor ability - explosive force.

CONCLUSION

Using Multivariate regression analysis, the influences of the group of predictor variables on each criterion variable are tested separately.

The significant impact of the variable Sprint at 30 meters (MS30m.) on the criterion variable Sprint at 100 meters, is due to the same motor structure of this discipline of running, as well as a similar energy system - anaerobic energy system.

From the obtained results regarding the impact of the system of predictor variables on the three disciplines of running (100, 400 and 1000) meters, it can be concluded that the basic motor abilities have an impact on the success in achieving a significant result in the three disciplines of running.

The impact of the three variables: Throwing medicine ball from lying 3 kg, shot put (6kg.) and Bench press 50 kg. for 15 seconds (MBP50 kg.), on the criterion variable shot put (6kg.), is explained by the fact that the three variables have similar motor abilities to the criterion variable, ie all variables use the same muscular force (on the upper extremities and shoulder girdle).

References

1. Antekolovic, Lj., Zufar, G. & Hofman, E. (2004). Methodology for the development of explosive power such as jumping, International scientific-professional conference, Fitness training of athletes, Proceedings. Zagreb, 13, (7): 127-136, Faculty of Physical Education, University of Zagreb.
2. Brown, L., Ferrigno, V. & Sanatana, C. (2000). Training for speed, agility and quickness. Champaign IL: Human Kinetics.
3. Bompa, T. (2000). Total training for young champions, Human Kinetics, USA.
4. Iseni, A. (2013). Activities in Physical Education and Sport Federation of the Sports Pedagogues of the Republic of Macedonia Vol. 3, No.1, pp.47-50

5. Jakoljevic, D. & Batricevic, D. (2008). Effects of explosive power model for development on motor and functional abilities of students, Sport science 4,(2): 31-37.
6. Milanovic, D. (2007). Teorija treninga, priracnik za studente sveucilishnog studija. (training theory: a hand book for university students. In Croatian). Zagreb: Kinezioloshki Fakultet.
7. Metikoš, D., Hofman, E., Prot, F., Pinter, Ž., Oreb, G. (1989): Merenje bazičnih motoričkih dimenzija sportaša, Zagreb. **[**Measuring of the basic motor dmensions in athletes**]**
8. Наумовски, А. (2004) Мерни карактеристики на некои тестови за проценување на моторните латентни димензии кај спортистите од Македонија и Бугарија, Федерација на спортските педагози на Република Македонија, ISBN 9989965617 **[**Measurement characteristics of some test for assessment of the motor latent dimensions in athletes from Macedonia and Bulgary, Federation of sport pedagogues from Republic of Macedonia**]**
9. Stoiljkovic, S (2003) Osnove opšte antropomotorike, Studentski kulturni centar, ISBN 8677570950 **[**Basis of general antropomotoric, Student cultural center**]**
10. Homenkov, L.S. (1977). Atletika (Athletics. In Serbian). Beograd: Fakultet za fizicka kultura.
11. Zaciorski, VM (1975): Physical properties athletes. NIP Partizan Belgrade.
12. Zivković, M. i Lazarević, V. (2011). Influence of the flexibility and explosive power on the results in sprint disciplines, APES (Skopje), International journal of scientific and professional issues in physical education and sport, vol.1, No. 2, pp. 123-127.

Correspondence to:
Zarko Kostovski
University of SS Cyril and Methodius
Faculty of Physical Education Sport and Health
E-mail: zarkok@ukim.edu.mk