

RELATIONS AND DIFFERENCES OF MORPHOLOGICAL CHARACTERISTICS AND MOTOR ABILITIES IN TWO GENERATION STUDENTS IN THE ATHLETIC DISCIPLINE - SHOT PUT

DOI: <https://doi.org/10.46733/PESH2090035s>
(Original scientific paper)

Aleksandar Simeonov, Mitrichka Dzambazovska-Stardelova

Ss. Cyril and Methodius University, Faculty of Physical Education, Sport and Health, Skopje, Macedonia

Abstract

In a sample of 100 respondents, consisted of full-time second year students at the age of 20 years with \pm of 6 months at the Faculty of Physical Education Sport and Health in Skopje, divided into two groups, 50 respondents in both, generations surveyed - 2016 and 2018. At the end of the semester in May, a colloquium athletic is used, which consists of 5 athletic disciplines - 100-meter sprint, long jump, javelin throwing, high jump and 1500 meters running. The colloquium contains norms for grades of 6 to 10, according to the result achieved. With this colloquium we check the speed, strength and endurance of the students, and of course the technical performance of the studied techniques of athletic disciplines. From the applied morphology we noticed that morphological structure plays a significant role in achieving greater lengths in shot put. Regarding the motor skills that were the subject of analysis in our research, we found that all five motor variables used to test their abilities have a significant impact as a system on the criterion variable – shot put. According to the multivariate and univariate analysis of the results of both groups of entities, we noticed that both groups of respondents differ in their morphological characteristics and biomotor abilities. The differences between the respondents would be smaller if they pay more attention to the preparation for the fulfillment of the norm in this athletic discipline, because from our experience, so far we can say that it is one of the most difficult athletic disciplines. Based on the results obtained from the applied research procedure, we concluded that the morphological structure of the respondents has a significant role in achieving greater lengths in the athletic discipline – shot put. In terms of motor skills, we came to the conclusion that students should use the motor tests that were used in the research in the preparation phase, in order to be able to successfully meet the norm and achieve better results in the discipline – shot put.

Key words: morphology, biomotor abilities, analysis, regression, differences,

Introduction

Athletics can practically be said to exist from the origin of man, because segments such as walking, running, jumping and throwing are an integral part of every person's daily life. Athletics in social life is considered a basic sport, which gives generations of all ages the basis for all movements, forms motor skills of all ages from an early age to people's recreational activities, especially in sports activities regardless of the sport.

At the Faculty of Physical Education, Sports and Health, athletics is represented by 15 athletic disciplines in the second year, the students take two colloquia with a presentation of the technique of athletic disciplines. At the end of the semester in May, a colloquium is used, which consists of five athletic disciplines – 100 meter sprint, long jump, shot put, high jump and 1500 meter running (athletic pentathlon). The colloquium contains norms for grades from 6 to 10, according to the result achieved. With this colloquium we check the speed, strength and endurance of the students, and of course the technical performance of the studied techniques of athletic disciplines.

The subject of the research is the morphological characteristics and motor skills in the athletic discipline throwing balls, in the two-generation students of the Faculty of Physical Education, Sports and Health.

The aim of the research is to determine the impact and differences in morphological characteristics and motor skills in athletic discipline throwing a ball at both generations of students at the Faculty of Physical Education, Sports and Health.

Methods

The sample of respondents consists of male students in two generations from the second year of the Faculty of Physical Education, Sports and Health, aged 20 years with a difference between them of \pm six months. Students are full-time students at the Faculty. The sample is a total of 100 entities, 50 students per generation. During the exam, all respondents were in good health and had a good toleration of biomotor loads during the exam. The research was conducted on the generations of 2016 and 2018.

In order to realize the set goal of the research procedure, a total of 14 morphological features were used, as follows:

Skeletal dimensional dimensionality:

1. Body height (AVT)
2. Foot length (ADNO)
3. Hand length (ADRA)

Body mass and volume:

1. Body weight (AMT)
2. Forearm Volume (AOPL)
3. Volume of the upper arm (AONL)
4. Volume of lower leg (AOPK)
5. Knee circumference (AONK)

Transversal body dimension:

1. Shoulder width (ASHRA)
2. Hip width (ASHKO)

Subcutaneous adipose tissue:

1. Skin flap of the back (AKFG)
2. Skin flap of the abdomen (AKFS)
3. Skin flap of the upper arm (AKFL)
4. Skin flap of the thigh (AKFK)

Motor variables for assessing the psychomotor abilities of the respondents:

1. Triple jump from a place - MTM
2. Throwing a jack (6kg) with your back over your head - MFĠPG
3. Jump from a place - MSOM
4. Abdominal musculature - MSM
5. Shaft joints - MZV

In the research, the athletic discipline - throwing balls - was used as a criterion variable. Throwing garbage is a discipline that overcomes the horizontal space by throwing out a heavyweight, in the case of a 7,257 kg bag, which the respondent should use force and explosiveness to dispose of the device as far away as possible from the disposal segment, without committing an offense.

Table 1. Norms and grades according to the achieved result

Norms/Grades	6	7	8	9	10
Athletic discipline					
Shot Put	8.80 M	9.00 M	9.20 M	9.40 M	9.60 M

The results of the two generations of respondents were first processed with descriptive statistics - arithmetic mean, minimum, maximum score, standard deviation of the arithmetic mean, scanning and courtesy, as parameters for graphical variation of results relative to the central value. The influence of morphological characteristics and motor skills on the criterion variable was determined using linear regression analysis. To determine the differences in the morphological characteristics and motor skills of the students from the 2016 generation, and from the 2018 generation, the following have been applied: multivariate analysis of variance (MANOVA) and univariate analysis of variance (ANOVA)

Results

Table 2. Regression analysis for generation 2016 of variable shot put with morphological variables

Variables	R	Part-R	BETA	T	SIG
AVIS	0,58	0,10	0,17	0,58	0,56
ADRA	0,53	0,10	0,15	0,64	0,53
ADNO	0,41	-0,21	-0,28	-1,28	0,21
ASHRA	0,53	0,18	0,20	1,08	0,29
ASHKO	0,51	0,14	0,14	0,85	0,40
ATT	0,59	0,25	0,57	1,55	0,13
AONL	0,28	-0,16	-0,21	-0,99	0,33
AOPK	0,41	-0,10	-0,12	-0,60	0,55
AONK	0,39	0,03	0,04	0,21	0,84
AKNS	0,42	-0,02	-0,03	-0,13	0,90
AKNL	0,44	0,21	0,32	1,30	0,20
AKNK	0,35	-0,23	-0,31	-1,43	0,16
R=.716		R2=.512		Q=.003	

The analysis of Table 2 shows a significant impact of the system prognostic variables of morphology on the criterion, as evidenced by the coefficients of multiple correlation $R = .716$, variability coefficient $R^2 = .512$ and significance level $Q = .003$. The value of multiple correlation explains the common variability between prognostic variables and the criterion of 51.2%, with the remaining 58.8% remaining on other characteristics and other features that are not the subject of this research.

Table 3. Regression analysis for generation 2016 of variable shot put with motor variables

Variables	R	Part-R	BETA	T	SIG
MTM	0,19	-0,01	-0,01	-0,06	0,95
MFĠPG	0,30	0,14	0,15	0,94	0,01
MSOM	0,53	0,49	0,51	3,70	0,00
MSM	0,04	-0,18	-0,20	-1,19	0,24
MZV	0,13	0,06	0,07	0,41	0,69
R=.662		R2=.316		Q=.004	

Motor variables as predictor variables have a significant effect on the casting criterion shot put, which can be determined by the values of the coefficients of multiple correlation $R = .662$, the determination coefficient $R^2 = .316$ and the coefficient of significance $Q = .004$. The overall variability between the predatory system variables and the criterion variable explains the coefficient of determination by 31.6%, while the other 68.4% belong to other characteristics and abilities that are not subject to analysis in the research. Variables with a special effect are: throwing a medicine ball (6 kg) with the back of the head overhead, with a coefficient of significance (0.01) and a jump from a place (0.00).

By inspecting Table 4 between the variable shot put and the morphological characteristics as predictor variables, a statistically significant influence as a system has been established on the criterion. The value of the multiple correlation $R = .784$ explains the common variability between predictor variables and the criterion of about 61.4% - the coefficient of determination $R^2 = .614$, while the other 38.6% belong to other characteristics and abilities that are not subject to this research. The connectivity is at the significance level $Q = .000$.

Table 4. Regression analysis for generation 2018 of variable shot put with morphological variables

Variables	R	Part-R	BETA	T	SIG
AVIS	0,72	0,26	0,55	1,65	0,11
ADRA	0,61	-0,12	-0,18	-0,74	0,47
ADNO	0,67	0,05	0,08	0,29	0,77
ASHRA	0,46	0,13	0,14	0,80	0,43
ASHKO	0,24	0,02	0,02	0,12	0,91
ATT	0,39	0,28	0,61	1,76	0,09
AONL	0,22	-0,20	-0,29	-1,27	0,21
AOPK	0,22	0,28	0,24	1,74	0,09
AONK	0,13	-0,19	-0,22	-1,15	0,26
AKNS	0,08	0,04	0,06	0,25	0,80
AKNL	-0,09	-0,16	-0,18	-0,96	0,34
AKNK	0,06	-0,16	-0,20	-1,01	0,32
R=.784 R2=.614 Q=.000					

Table 5. Regression analysis for generation 2018 of variable shot put with motor variables

Variables	R	Part-R	BETA	T	SIG
MTM	0,18	0,00	0,00	0,02	0,98
MFÓPG	0,40	0,12	0,13	0,82	0,42
MSOM	0,57	0,50	0,67	3,81	0,00
MSM	0,04	-0,08	-0,10	-0,52	0,60
MZV	0,13	-0,19	-0,25	-1,27	0,21
R=.629 R2=.396 Q=.000					

From the analysis of the results in Table 5 where regression of the criterion with predictor variables was performed, we can see that according to the obtained regression parameters the value of multiple correlation is $R = .629$, and the coefficient of determination $R^2 = .396$ with significance at level $Q = .000$. This means that the value of multiple correlation explains the mutual variability between predictor motor variables and the criterion of about 39.6%, while 60.4% belong to other characteristics and abilities that are not the subject of this research. With a special effect, the variable jump from place (0.00) is noticed.

Table 6. Multivariate analysis of variance – MANOVA

	Value	F	Hypothesis df	Error df	Sig.
Pillai's trace	1,051	6,397	44,000	254,000	,000
Wilks' lambda	,180	7,755 ^a	44,000	252,000	,000
Hotelling's trace	3,257	9,253	44,000	250,000	,000
Roy's largest root	2,798	16,152 ^b	22,000	127,000	,000

Table 6 presents the measures that determine the differences between the two groups of respondents, which we collected according to the coefficients of Raovata F approximation 16.152 with synergy $Q = .000$ and Wilksovata lambda $F = 7.755$ and significance level of $Q = .000$.

Table 7. Univariate analysis of variance – ANOVA

	1 ΓΡΥΠΙΑ		2 ΓΡΥΠΙΑ		F	Sig.
	Mean	SD	Mean	SD		
AVIS	179,37	6,74	180,15	6,29	0,20	0,82
ADRA	59,48	3,23	56,82	3,09	10,17	0,00
ADNO	84,98	4,88	83,18	4,32	5,45	0,01
ASHRA	38,93	2,20	40,88	2,41	8,24	0,00
ASHKO	30,34	2,51	28,05	1,82	20,65	0,00
ATT	75,72	8,97	76,84	9,66	0,21	0,81
AONL	30,28	2,80	31,38	2,92	3,69	0,03
AOPK	37,50	2,51	37,99	2,58	1,33	0,27
AONK	55,16	3,50	56,34	3,78	1,42	0,25
AKNS	11,99	5,29	6,51	1,50	24,29	0,00
AKNL	8,27	3,25	5,65	1,74	23,42	0,00
AKNK	7,99	3,41	12,78	5,61	12,63	0,00
MTM	677,46	45,05	703,82	32,77	6,64	0,00
MFGPG	9,18	1,24	10,32	1,55	7,09	0,00
MSOM	270,64	18,30	273,94	20,90	0,40	0,67
MSM	26,44	6,70	31,18	6,27	13,22	0,00
MZV	9,52	2,22	9,98	2,39	1,21	0,30
KFG	6,46	0,65	6,48	0,61	0,75	0,47

From the analysis for determining the differences between the groups, we can noticed that the respondents from both groups differ in terms of morphological parameters in the following variables: ADRA - arm length $F = 10.17$ and $Sig = .000$. ADNO- leg length $F = 5.45$ and $Sig = .000$. ASHRA - shoulder width $F = 8.24$ and $Sig = .000$. ASHKO = hip width $F = 20.65$ and $Sig = .000$. AONL - volume range $F = 3.69$ and $Sig = .03$. AKNS - skin flaps of the abdomen $F = 24.29$ and $Sig = .000$. AKNL - skin folds of the upper arm $F = 23.42$ and $Sig = .000$. AKNK = skin flap of the thigh $F = 12.63$ and $Sig = .000$. These morphological variables make the greatest contribution to the differences between the two groups of entities.

From the motor variables in three variables, significant differences between the entities were determined, as follows: MTM – triple jump from place $F = 6.64$ and $Sig = .000$. MFGP = throwing medicine ball overhead $F = 7.09$ and $Sig = .000$. MSM - abdominal muscles $F = 13.22$ and $Sig = .000$.

Discussion

From the applied morphology, we noticed that in both groups of entities (respondents), there are generations that have high growth and body weight, which is a condition for rational lengths of the upper and lower extremities, as well as the volume of the upper arm and thigh.

Morphological characteristics, in addition to influencing the more successful manifestation of motor skills, should also be one of the conditions for the appearance of the candidate (student) who after graduating from the Faculty of Physical Education, Sports and Health, should work with a certain population from a different age, before which with his appearance and attitude, should be an example for the educators.

Athletic discipline – shot put as an integral part of athletic pentathlon, is used in many faculties for the entrance exam, but also in athletics teaching. This discipline is a practical measure - a test to check the psychomotor ability of force and explosive force. Also, the discipline of shot put finds application in checking physical abilities, in certain police units with special duties and in army structures.

It is for these reasons and the great importance of human motor skills that this athletic discipline has been the subject of our research.

Conclusion

Based on the results obtained from the applied research procedure, we concluded that the morphological structure of the respondents has a significant role in achieving greater lengths in the athletic discipline – shot put. In terms of motor skills, we came to the conclusion that students should use the motor tests that were used in the research in the preparation phase, in order to be able to successfully meet the norm and achieve better results in the discipline – shot put. From our experience so far, we can conclude that the discipline – shot put is one of the most difficult athletic disciplines for students.

References

- Bala, G. (1986): Logičke osnove metoda za analizu podataka iz istraživanja u oblasti fizičke culture. Novi Sad.
- Čoh, M., & suradnici. (2015): Atletski praktikum, Fakultet za Šport, Ljubljana. Gajić, M. (1985): Osnovi motorike čoveka, Novi Sad.
- Kadiski, I., & Kocev, Ch. (2016): Kontrola vo leka atletika, Sofia.
- Metikoš, D., Hofman, E., Prot, F., Pinter, Ž., Oreb, G. (1989): Merenje bazičnih motoričkih dimenzija sportaša, Zagreb.
- Macenzie, B. (2005): 101 Performance Evaluation Tests, London.
- Pavlović, R., Radic Z. & Simeonov, A. (2013): Differences between the students and athletes-junior in space speed and endurance, Research in physical education, sport and health, Skopje.
- Radich, Z., Simeonov, A. (2000), Determining the latent structure of morphological characteristics in students from 6th grade, Skopje.
- Radich, Z., Simeonov, A. (2008): Establishment of the latent structure of the morphological characters and motor abilities and their relations with the shut put performance international conference, „ Track and Field Athletics and Science ", Sofia.
- Radich, Z. (2006): Athletics - Technique, Alkom, Skopje.
- Radich, Z., Simeonov, A. (2013): Athletics - Methodology, Alkom, Skopje.
- Rogers, J.L. (2017): USA Track and Field, Coaching Manual, Human Kinetics.
- Simeonov, A., Radich, Z. (2009): Pulse frequency of the Macedonian record holder on 800 m. Vane Stojanov, International conference, „ Track and Field Athletics and Science ", Sofia.
- Simeonov, A., & Radic, Z. (2006): Influence of Motor Variables on the Result of Long Jump in Athletic Pentathlon, International conference, „ Track and Field Athletics and Science ", Sofia.
- Simeonov, A., & Radich, Z. (2005): Structure and influence of motor skills on specific sprint runs among students of FFK - Skopje.
- Simeonov, A., Radich, Z., Rakovich, A., & Savanovich, V. (2011): Element relation from training in competition period and length of a javelin launch by the Macedonian javelin record holder Dean Angelovski, Univerzitet Mateja Bela Banska Bystrica , Faculta humanitnych vield, Slovenska asocijacija Kondycnich trenerov recenzovany vedecky zbornik Medzinarodney vedeckey Konferencie. Kondicny training.
- Simeonov, A., Radic, Z. & Rakovic, A. (2012): Technique for walking and running with progression methodology and technique, Research in physical education, sport and health, Skopje.
- Simeonov, A., Radic, Z. & Rakovic, A. (2016): Comparative analysis and structure of the morphological, basic and specific motor structure of the students in their second year of studies at the faculty of physical education in the discipline of shot put, Research in physical education, sport and health, Skopje.
- Simeonov, A., Radić, Z. & Pavlović, R. (2019): Determination of relations and differences in motor space in candidates for reception in state institutions in the Republic of Macedonia, Research in physical education, sport and health, Skopje.
- Wolfgang, R., & Harald, M. (2017): Run, Jump, Throw, IAAF, The official IAAF Guide to Teaching Athletics.