

Specifics of motor abilities of track-and-field athletes and basketball players

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Abstract

The research was conducted in order to determine differences in motor dimensions between track-and-field athletes and basketball players.

For the purpose of determining the differences in the manifest and latent motor spaces, 100 male respondents aged 14 and 18 were tested. This sample can be considered representative of athletes of those ages. To assess motor abilities, 20 motor tests were selected so that the structure analysis could be performed at the level of the second-order factors according to the structural model designed by (Gredelj, Metikos, Hosek & Momirovic 1975), which was defined as

1. Movement structuring
2. Muscle tone regulation and synergistic regulation
3. Regulation of excitation intensity
4. Regulation of excitation duration.

All the data in this study were processed at the Multidisciplinary Research Center of the Faculty of Sport and Physical Education, University of Pristina, through the system of data processing software programs developed by Popovic, D. (1980), (1993) and Momirovic, K. & Popovic, D. (2003). In order to determine differences between the groups, canonical discriminant analysis was applied.

The researchers calculated the discriminant coefficient values, canonical correlation coefficients, percentage of the explained group variability, Bartlett's chi-square test value, degrees of freedom, Wilks' Lambda values, error probability in rejecting the hypothesis that the actual canonical correlation value equals zero.

The standardized coefficients of participation of the tests in the formation of significant discriminant functions, as well as centroids of the groups on the significant discriminant functions, were also calculated.

The discriminant analysis of motor variables of track-and-field athletes and basketball players shows that there is a difference in their motor abilities and this difference is determined by two discriminant functions.

Keywords: / coefficient / variable / discriminant analysis / track-and-field / basketball / motor abilities /

1. Introduction

It is known today that for achieving superior athletic performance, a large amount and high intensity of exercise are necessary. In order to optimize the athletic training, studies contributing to the changes of this process are constantly conducted. This is understandable taking into account the fact that a person's achievements are limited by his or her physiological and genetic potentials. Careful analysis of the work and achievements realized in modern elite sports in Serbia and abroad will reveal lack of substantive efforts aimed at modernizing the technology of work in the preparation of elite athletes. Attention has, in fact, been more focused on providing financial, technical, spatial, organizational, programmatic and other conditions, while very little has been done on providing conditions for accurate programming, monitoring and controlling the effectiveness of the process of preparation of athletes. Therefore, in most cases, the achieved effects are not equivalent to the investments and cannot be a relevant indicator of the efforts made and public funds invested. These facts are the final consequence of neglecting the organized scientific research and professional work in this area, which results in application of the obsolete technologies of work in elite sports. That means it is necessary to bear in mind that successful development of this part of physical education cannot only be provided by mere increase of the number of facilities, professional staff, funding, institutional and

other organizational conditions because the expected effects can only be achieved through a qualitatively different approach to the process of training and competitions. Achievement of top results in modern sport is increasingly being conditioned by applying the latest scientific findings in the processes of selection and orientation of athletes, programming and control of training, recovery programming, and planning and programming of competition performance. Therefore, efficient and economical work toward achieving top athletic results depends substantially on the systematic collection and use of the information and training programs, determination of the content, scope and intensity of the activities composing the training programs, selected recovery method, athletic shape planning and competition performance planning.

The amount of time and effort, as well as the amount of funding, required for achieving top sports results is steadily growing. This trend can be slowed down or stopped only by making the training more efficient and economical, when devoting the same amount of money and energy, the best possible results are achieved. This is not possible without collecting a big amount of information about the degree of an athlete's preparation as well as synthesis and creative interpretation of the data which are continually collected in a systematic way, processed and forwarded to the experts who make decisions of crucial importance for themselves and those who they work with.

In the last decades, a substantial increase of the importance of measurement in sport is conditioned by the general tendencies of the development of the modern science of physical culture. The progress of science and technology has provided development of metrologic techniques and methods applied in the field of physical culture. It sounds almost unbelievable that in the last fifty years, the timing error in sport has declined from 0.1 sec. to 0.0001 sec.¹ and in the science of physical culture these measurements have been overcome to observe the studied phenomena more objectively. The newest measurement instruments immediately find their place in sport research institutions, which is not surprising given that rationally organized measurement is the only method of gaining an objective experience, a prerequisite of any scientific knowledge.

Such knowledge provides timely selection and orientation of sport talents as well as contributes to the optimization of sports training. Determination of the degree of development of certain psychosomatic characteristics makes it possible, at a certain age, to pay more or less attention to some psychomatic dimension.

In anthropology and kinesiology, it is not possible to directly measure the factors relevant for success in any human activity. We conclude about the existence of these factors on the basis of their indicators, or reactions. Therefore, one of the

1 Agrez, F. Unification of tests and methodology of testing of elite athletes, Belgrade, 1983

basic tasks of kinesiology is to find those methods that enable us to determine the factors, or psychomatic characteristics, which are responsible for achieving success in kinesiologic activities.

2. Methods

2.1. Sample of respondents

The selection of the sample of respondents is conditioned, among other things, by the organizational and financial capabilities required for the implementation of the research process.

It was necessary to ensure a sufficient number of qualified and fully trained measurers, appropriate instrumentation and standardized conditions to carry out the research. Limited financial resources and organizational capabilities caused the decision not to perform the measurement throughout Kosovo and Methohia, but only in one of its regions.

The measurement was carried out on randomly selected samples representative of whole Kosovo and Methohia. The measurement was conducted in the following sports: track-and-field and basketball. In order to carry out the research correctly and obtain results stable enough in terms of sampling error, it was necessary to take a sufficient number of respondents into the sample. The sample size for this type of research is conditioned by the research objectives and tasks, population size, and the degree of variability of the applied system of parameters. In addition, the number of respondents in the sample depends on the level of statistical inference and the choice of mathematical and statistical models.

Based on the selected statistical-mathematical model and programs, objectives and tasks, 100 respondents were included in the sample. In all factor procedures, it should constantly be kept in mind that the analysis results depend on three main systems which define the selection and transformation of the information: a sample of variables, sample of respondents and the selected extraction, or rotary, method. Taking these criteria into account, based on the experience from previous studies, a sample of 100 respondents is considered to be sufficient for this research. In defining the population from which the sample was drawn, no other restrictions or stratification variables, except for the above, were applied.

2.2. Sample of variables

For the assessment of motor abilities, the researchers used 20 motor tests selected according to the structural model which was designed by Gredelj, Metikos,

Hosek and Momirovic in 1975 and defined as a mechanism for movement structuring (MMS), mechanism for functional synergies and regulation of muscle tone (SRT), mechanism for regulation of excitation intensity (REI), and a mechanism for regulation of excitation duration (RED).

For this measurement program, significant motor dimensions were assessed by using the following measurement instruments:

- a) the mechanism for movement structuring (MMS)
 1. agility on the ground (MAOG)
 2. hand tapping (MHT)
 3. foot tapping (MFT)
 4. coordination with a stick (MCS)
 5. hand and foot drumming (MHFDR)
- b) the mechanism for functional synergies and regulation of muscle tone (SRT)
 1. deep forward bend (MDFB)
 2. standing sideways on a balance beam (MSSBB)
 3. shoulder flexion with exercise bar (MSF)
 4. darts (MD)
 5. horizontal target shooting (MHTS)
- c) the mechanism for regulation of excitation intensity (REI)
 1. standing long jump (MSLJ)
 2. 20m run from a standing start (M20SS)
 3. lying medicine ball throw (MLMBT)
 4. standing high jump (MSHJ)
 5. hand dynamometry (MHD)
- d) the mechanism for regulation of excitation duration (RED)
 1. flexed arm hang (MFAH)
 2. chin-up hang (MCUH)
 3. 60-second trunk lift (MTL)
 4. lying straight leg raise (MLSLR)
 5. straight-leg hanging leg raise for leg muscle endurance (MSLHLR)

2.3. Data processing methods

The value of a study does not only depend on the sample of respondents and sample of variables, or the values of basic information, but also on the applied

procedures for transformation and condensation of the information. Some scientific problem can be solved by means of a number of different, and sometimes equally valuable, methods. However, with the same basic data, different conclusions can be drawn from the results of different methods. Therefore, the problem of selecting certain data processing methods is rather complex.

In order to obtain satisfactory scientific solutions in a research, it is necessary to use, in the firstplace, correct and then adequate, unbiased and comparable procedures which correspond to the nature of the stated problem and provide extraction and transformation of appropriate dimensions, the testing of hypotheses about those dimensions and establishment of basic regularities within the research area.

Taking this into account, for the purposes of this study, the researchers selected those methods that were considered to correspond to the nature of the problem.

To determine differences between the groups, a method of discriminant analysis was applied. The values of discriminant coefficients (Eigenval.) were calculated as well as canonical correlation coefficients (Can. Cor.), percentage of the explained group variability (chi-square test (Chi)), degrees of freedom (DF), Wilks' Lambda values (WL), and error probability in the rejection of the hypothesis that the actual canonical correlation value equals zero (Sig).

The standardized coefficients of the participation of the tests in the formation of significant discriminant functions, as well as centroids of the groups on the significant discriminant functions, were also calculated.

All the data in this study were processed at the Multidisciplinary Research Center of the Faculty of Sport and Physical Education, University of Pristina, through the system of data processing software programs developed by Popovic, D. (1980), (1993) and Momirovic, K. & Popovic, D. (2003).

Canonical discriminant analysis in Mahalanobis space

Canonical discriminant analysis can now be defined as a solution of the quasi-canonical problem $\mathbf{M}\mathbf{x}_k = \mathbf{k}_k$, $\mathbf{G}\mathbf{y}_k = \mathbf{l}_k$ | $c_k = \mathbf{k}_k^t \mathbf{l}_k = \text{maximum}$, $\mathbf{x}_k^t \mathbf{x}_k = \mathbf{y}_k^t \mathbf{y}_k = \delta_{kq}$ $k = 1, \dots, s$; $s = \min((g - 1), m) = m$ where δ_{kq} is the Kronecker symbol and \mathbf{x}_k and \mathbf{y}_k are unknown m -dimensional vectors.

As $c_k = \mathbf{x}_k^t \mathbf{A}\mathbf{y}_k$, the function to be maximized is, for $k = 1$, $f(\mathbf{x}_k, \mathbf{y}_k, \lambda_k, \eta_k) = \mathbf{x}_k^t \mathbf{A}\mathbf{y}_k - 2^{-1} \lambda_k (\mathbf{x}_k^t \mathbf{x}_k - 1) - 2^{-1} \eta_k (\mathbf{y}_k^t \mathbf{y}_k - 1)$.

After differentiating this function by elements of vectors \mathbf{x}_k , $\partial f / \partial \mathbf{x}_k = \mathbf{A}\mathbf{y}_k - \lambda_k \mathbf{x}_k$, and after differentiating it by elements of vectors \mathbf{y}_k , $\partial f / \partial \mathbf{y}_k = \mathbf{A}\mathbf{x}_k - \eta_k \mathbf{y}_k$; after equalizing with zero, $\mathbf{A}\mathbf{y}_k = \lambda_k \mathbf{x}_k$ and $\mathbf{A}\mathbf{x}_k = \eta_k \mathbf{y}_k$.

Through differentiating by λ_k and η_k , from the condition that $\mathbf{x}_k^t \mathbf{x}_k = 1$ and $\mathbf{y}_k^t \mathbf{y}_k = 1$, it is easily obtained that $\lambda_k = \eta_k$. As $\mathbf{A}^t = \mathbf{A}$, by multiplying the first result by \mathbf{x}_k^t

and the second result by \mathbf{y}_k^t , $\mathbf{x}_k^t \mathbf{A} \mathbf{y}_k = \lambda_k$ and $\mathbf{y}_k^t \mathbf{A} \mathbf{x}_k = \lambda_k$, so $\mathbf{x}_k = \mathbf{y}_k$ and the problem comes down to an ordinary problem of eigenvalues and eigenvectors of matrix \mathbf{A} , or the solution of the problem $(\mathbf{A} - \lambda_k \mathbf{I}) \mathbf{x}_k = \mathbf{0}$, $k = 1, \dots, m$, and $c_k = \rho_k^2 = \mathbf{x}_k^t \mathbf{A} \mathbf{x}_k = \lambda_k$, $k = 1, \dots, m$ are squares of the canonical correlations between linear combinations of variables from \mathbf{M} and \mathbf{G} which are proportional to the differentiation of centroids of the subsamples defined by selector matrix \mathbf{S} in the space spanned by the vectors of variables from \mathbf{M} .

Let $\rho^2 = (\rho_k^2)$, $k = 1, \dots, m$ be a diagonal matrix whose elements are squares of canonical correlations, let $\mathbf{X} = (\mathbf{x}_k)$, $k = 1, \dots, m$ be a matrix of eigenvectors obtained by solving the canonical discriminant problem, let $\mathbf{K} = \mathbf{M} \mathbf{X}$ be a matrix of discriminant functions and let $\mathbf{L} = \mathbf{G} \mathbf{X} = \mathbf{P} \mathbf{M} \mathbf{X}$ be a matrix of the discriminant functions projected into the hypercube defined by vectors of matrix \mathbf{S} . As $\mathbf{K}^t \mathbf{L} = \mathbf{X}^t \mathbf{A} \mathbf{X} = \rho^2$ and as, of course, $\mathbf{K}^t \mathbf{K} = \mathbf{I}$ and $\mathbf{L}^t \mathbf{L} = \rho^2$, the canonical discriminant analysis produces two biorthogonal sets of vectors of variables by such transformation of the vectors of variables from \mathbf{M} and \mathbf{G} that orthogonalizes those vectors and maximizes cosines of the angles between the corresponding vectors from \mathbf{K} and \mathbf{L} , with the additional condition that cosines of the angles of non-corresponding vectors from \mathbf{K} and \mathbf{L} are equal to zero because correlations between variables from \mathbf{K} and \mathbf{L} are $\mathbf{K}^t \mathbf{L} \rho^{-1} = \mathbf{X}^t \mathbf{A} \mathbf{X} \rho^{-1} = \rho$.

Vectors \mathbf{x}_k from \mathbf{X} are, obviously, the vectors of standardized partial regression coefficients of variables from \mathbf{M} that generate discriminant functions \mathbf{k}_k which, together with discriminant functions \mathbf{l}_k formed by the vectors of standardized partial regression coefficients \mathbf{x}_k of variables from \mathbf{G} , have maximum correlations. But as $\mathbf{M}^t \mathbf{K} = \mathbf{X}$, the elements of matrix \mathbf{X} are, at the same time, the correlations of variables from \mathbf{M} and discriminant variables from \mathbf{K} , which, unlike the standard canonical discriminant model, allows for easy testing of hypotheses on partial impact of variables on the formation of discriminant functions. For the identification of discriminant functions, the cross structure matrix elements defined as correlations between variables from \mathbf{M} and \mathbf{L} , that is, the elements of matrix $\mathbf{Y} = \mathbf{M}^t \mathbf{L} \rho^{-1} = \mathbf{A} \mathbf{X}^{-1} \rho = \mathbf{X} \rho$, can also be of certain significance; note, by the way, that \mathbf{Y} is a factor matrix of matrix \mathbf{A} because, naturally, $\mathbf{Y} \mathbf{Y}^t = \mathbf{X} \rho^2 \mathbf{X}^t$.

As elements x_{jk} of matrix \mathbf{X} and elements y_{jk} of matrix \mathbf{Y} are ordinary correlations, their asymptotic variances are $\sigma_{x_{jk}}^2 = (1 - x_{jk}^2)^2 n^{-1}$, respectively $\sigma_{y_{jk}}^2 = (1 - y_{jk}^2)^2 n^{-1}$, therefore, hypotheses of type $H_{0x_{jk}}$, or $H_{0y_{jk}}$, can be tested on the basis of the functions $f_{x_{jk}} = x_{jk}^2 ((n - 2)(1 - x_{jk}^2))$, or $f_{y_{jk}} = y_{jk}^2 ((n - 2)(1 - y_{jk}^2))$, because under these hypotheses, the functions have the Fisher Snedecor F-distribution with the degrees of freedom $v_1 = 1$ and $v_2 = n - 2$.

Unfortunately, with usual application of canonical discriminant analysis, the main, and often the only, set of hypotheses related to the parameters of that model

is the set $H_0 = \{\varphi_k = 0, k = 1, \dots, m\}$ where φ_k are hypothetical values of canonical correlations in population \mathbf{P} .

To test hypotheses of type $H_{0k}: \varphi_k = 0, k = 1, \dots, m$, researchers usually apply the function of the known Wilks measure $\lambda_k = \sum_{t+1}^s \log_e (1 - \rho_{t+1}^2), k = t + 1, t = 0, 1, \dots, m - 1$ proposed by Bartlett (1941) who found that under the hypothesis $H_{0k}: \varphi_k = 0$, the functions $\chi_k^2 = -(n - (m + g + 3)/2) \lambda_k, k = 1, \dots, m$ have, approximately, χ^2 distribution with the $v_k = (m - k + 1)(g - k)$ degrees of freedom.

However, the results of Bartlett's test are not, even when dealing with large samples, in full accordance with the results of the tests of type $z_k = \rho_k / \sigma_k, k = 1, \dots, s$ which are based on the fact that canonical correlations also have asymptotic normal distributions with parameters φ_k and $\sigma_k^2 \sim (1 - \varphi_k^2)^2 n^{-1}$. (Kendall & Stuart, 1976; Anderson, 1984).

Centroids of subsamples $E_p, p = 1, \dots, g$ from E on the discriminant functions necessary to identify the content of the discriminant functions are, of course, the elements of the matrix $\mathbf{C} = (\mathbf{S}'\mathbf{S})^{-1}\mathbf{S}'\mathbf{K} = (\mathbf{S}'\mathbf{S})^{-1}\mathbf{S}'\mathbf{M}\mathbf{X} = (\mathbf{S}'\mathbf{S})^{-1}\mathbf{S}'\mathbf{Z}\mathbf{R}^{-1/2}\mathbf{X}$, and it is clear that they are, in fact, the centroids of the subsamples on the variables transformed into a Mahalanobis form projected into the discriminant space.

DISC PROGRAM

This algorithm is almost literally implemented into DRDISC program written in a matrix language so that it can be realized in the standard SPSS environment. The activation method and some details of the program can be seen from the program symbolic code which is stored at the Multidisciplinary Research Center of the Faculty of Sport and Physical Education, and clear instructions for correct application of the canonical discriminant analysis are given. Modification of the program and its practical implementation in the SAS environment was carried out by Popovic D. in 2004, and the scientists interested in its application can contact the author at any time.

3. Discussion

Table 1 shows eigenvalues (Eigenval.), percentage of the explained intergroup variability (Var. %), canonical correlation coefficient (Can. Cor.), Wilks' Lambda values (Lambda), Bartlett's chi test values (Chi), degrees of freedom (DF), statistical significance (Sig.), pattern of discriminant functions of motor variables (FUNC1, FUNC2), and centroids of the groups indicated by discriminant functions (C1, C2).

Two discriminant variables which maximally separated the groups of athletes on the basis of discriminant coefficients were isolated by means of transformation and condensation of variables in the motor space.

The first discriminant function explains the differences with 70.10% of the intergroup variability in the motor space of the applied discriminant variables.

Having examined the coefficients which determine the first discriminant function, it can be noticed that it separates the athletes on the basis of most of the tests for assessment of the following mechanisms: the mechanism for movement structuring, mechanism for synergistic regulation and regulation of muscle tone, mechanism of excitation intensity, and the mechanism for excitation duration.

Based on the value and sign of the projection of the centroids onto the first discriminant function, it can be concluded that track-and-field athletes have a better expressed factor of repetitive strength, better mobility, balance and speed, while basketball players have good coordination, speed, mobility, and all the forms of power manifestation.

The second function is defined by the tests for assessment of coordination, balance, speed, repetitive strength and flexibility. Based on the value and sign of the centroid projection onto the first discriminant function, it can be seen that basketball players have well-built mechanisms for energy regulation and central movement regulation, while track-and-field athletes have a good ability for simple movement frequency, repetitive strength, flexibility, balance, and mechanism for synergistic regulation and muscle tone regulation.

DISCRIMINANT FUNCTIONS IN MOTOR SPACE

Table 1

Func.	Eigenval.	Var. %	Cum. %	Can.Cor.	Wilks' Lam	Chi ² - test	DF	Sig
1*	.70	70.10	70.10	.62	.42	190.10	36	.00
2*	.26	26.10	100.00	.45	.79	57.11	17	.00

STRUCTURE MATRIX

	FUNC 1	FUNC 2
MDSAK	.74*	-.16
MFLLP	.69*	-.12
MDNLE	.46*	.09
MSUSM	.47*	.37
MDPNK	-.28*	-.26
MKOOOP	-.29*	.07
MTAPR	.29*	.04

Table continued on next page...

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MSPAG	-.27*	.14
MTAPN	.11*	.04
MMSTT	.10*	.03
MINNS	.09*	.02
MS3ME	-.15	.59*
M20VS	-.04	-.48*
MSKLR	.29	.46*
MSUKL	-.09	-.33*
MTTUP	.19	.33*
MPOLN	-.10	-.30*
MPSNK	-.09	.28*
MISKR	.06	-.26*
MBMIL	.04	.24*

CENTROIDS OF THE GROUPS

GROUP	C1	C2
Track-and-field athletes 1	-.44	-.26
Basketball players 2	.58	-.10

4. Conclusion

The research was conducted in order to determine the structures and their differences in motor dimensions of track-and-field athletes and basketball players.

For the purpose of determining the structures and their differences in the manifest and latent motor spaces, 100 male respondents aged 14 and 18 were tested. This sample can be considered representative of athletes of those ages. To assess motor abilities, the researchers used 20 motor tests which were selected so that the structure analysis could be performed at the level of second-order factors according to the structural model designed by Gredelj, Metikos, Hosek and Momirovic (1975) and defined as:

1. Movement structuring
2. Muscle tone regulation and synergistic regulation
3. Regulation of excitation intensity
4. Regulation of excitation duration.

All the data in this study were processed at the Multidisciplinary Research Center of the Faculty of Sport and Physical Education, University of Pristina, through the system of data processing software programs developed by Popovic, D. (1980), (1993) and Momirovic, K. & Popovic, D. (2003). In order to determine differences between the groups, canonical discriminant analysis was applied.

The researchers calculated discriminant coefficient values, canonical correlation coefficients, percentage of the explained group variability, Bartlett's chi-square test values, degrees of freedom, Wilks' Lambda values, error probability in rejecting the hypothesis that the actual canonical correlation value equals zero.

The standardized coefficients of participation of the tests in the formation of significant discriminant functions, as well as centroids of the groups on the significant discriminant functions, were also calculated.

The discriminant analysis of motor variables of track-and-field athletes and basketball players has shown that there is a difference in their motor abilities, and this difference is determined by two discriminant functions.

Having examined the coefficients that determine the first discriminant function, it can be seen that it separates the athletes on the basis of most of the tests for assessment of the following mechanisms: the mechanism for movement structuring, mechanism for synergistic regulation and muscle tone regulation, mechanism for excitation intensity, and the mechanism for excitation duration.

Based on the value and sign of the centroid projection onto the first discriminant function, it can be concluded that track-and-field athletes have a better expressed factor of repetitive strength, better mobility, balance and speed, while basketball players have good coordination, speed, all forms of manifestation of strength and mobility.

The second function is defined by the tests for assessment of coordination, balance, speed, repetitive strength and flexibility. Based on the value and sign of the centroid projection onto the first discriminant function, it can be observed that basketball players have well-constructed mechanisms for energy regulation and central movement regulation, while track-and-field athletes have a better ability for simple movement frequency, repetitive strength, flexibility, balance and a solid mechanism for synergistic regulation and muscle tone regulation.

In addition, some of these relations made it possible to put forward hypotheses about different effectiveness of the functioning of regulatory mechanisms in the central nervous system depending on the type of sports activity.

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Specifičnosti motoričkih sposobnosti atletičara i košarkaša

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Sažetak

Istraživanje je sprovedeno sa ciljem da se utvrde razlike u motoričkim dimenzijama između atletičara i košarkaša.

U svrhu utvrđivanja razlika u manifestnom i latentnom motoričkom, prostoru ispitano je 100 ispitanika muškog pola, starih 14 i 18 godina. Ovaj uzorak se može smatrati reprezentativnim za sportiste tog uzrasta. Za procenu motoričkih sposobnosti upotrebljeno je 20 motoričkih testova, koji su odabrani tako da se analiza strukture vrši na nivou faktora drugog reda, preina strukturalnom niodelu Gredelja, Metikoša, Hošek i Momirovića (1975), definisanom kao:

- 1. Strukturiranje kretanja*
- 2. Regulacija tonusa i singerijska regulacija*
- 3. Regulacija intenziteta ekscitacije*
- 4. Regulacija trajanja ekscitacije.*

Svi podaci u ovom istraživanju su obrađeni u centru za multidisciplinarna istraživanja Fakulteta za sport i fizičko vaspitanje Univerziteta u Prištini pomoću sistema programa za obradu podataka koji je razvio Popović, D. (1980), (1993) i Momirović, K. i Popović, D. (2003).

Da bi se utvrdila razlika između grupa primenjena, je kanonička diskriminativna analiza.

Izračunate su i vrednosti koeficijenta diskriminacije, koeficijenti kanoničke korelacije, procenat objašnjenog grupnog varijabiliteta, vrednost Bartlettovog kvadrata testa, stepeni slobode, vrednosti Wilks' Lambda, i oznaka verovatnoće greške pri odbacivanju hipoteze da je stvarna vrednost kanoničke korelacije jednaka nuli.

Takođe su izračunati normirani koeficijenti učesća testova u formirajući značajnih diskriminativnih funkcija, kao i centri grupe na značajnim diskriminativnim funkcijama.

Diskriminativna analiza motoričkih varijabli između atletičara i košarkaša ukazuje da postoji razlika u motoričkim sposobnostima preferiranih sportova i da tu razliku determinišu dve diskriminativne funkcije.

Ključne reči: / koeficijent / varijabla / diskriminativna analiza / atletika / košarka / motorika /

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