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The Structure of Connotative Dimensions Judo and Karate

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Abstract

The research was conducted in order to determine the specificity of conative dimensions of judo and karate athletes as well as their differences.

To determine the specificity of the structure of the tested anthropological dimensions, the researchers tested 200 judo and karate athletes, members of judo and karate clubs in Serbia (about 100 judokas and about 100 karatekas), aged 18 to 27.

For the assessment of conative characteristics, the researchers chose the measuring instrument CON6 to assess the following conative regulators: activity regulator, regulator of organic functions, regulator of defense reactions, regulator of attack reactions, system for coordination of regulatory functions, and the system for integration of regulatory functions.

All the data in this study were processed at the Multidisciplinary Research Center, Faculty of Sport and Physical Education, University of Pristina through the system of data processing software programs DRSOFT developed by [19, 28, 17].

The algorithms and programs realized in this study are fully presented, and the results of the programs are analyzed.

Keywords: Conative Dimensions ; Discriminant ; Structure ; Correlation ; Algorithms.

Introduction

The reason for the increased number of studies of an athlete`s personality should be sought in the characteristics of a sporting activity which sets specific and different requirements not only on motor skills, but also on the personality. This justifies the assumption that an active and successful participation in a sport, as well as in martial arts (judo and karate), requires a specific pattern of personality dimensions, most suitable for the sport, or a pattern of personality dimensions suitable for participation in sport, and not in other activities.
Observing the technique of judo in general, it can be noticed that it is composed of a great number of simple and complex motor actions. All of them require a certain speed, coordination, flexibility, precision and strength of the performers. Since they are executed in close contact (guard) with an opponent, this greatly complicates their proper and timely performance. So, it can be argued with certainty that the technique of judo, compared to other sports, is the richest. In this sport, it is possible to perform over 1 500 different motor movements. Therefore, it is characterized by a large number of technical elements, and even greater number of their variations, as well as an inexhaustible number of movement structures that are executed to carry out the game plan. The richness of movements in judo is also conditioned by the need to execute most of the technique as coordinated movements and actions combined with each other. All of them are oriented in various directions of the frontal, sagittal and horizontal planes. The fact that with the change of opponents, it is often necessary to correct, at least partially, the adopted dynamic stereotype, makes the technique of this sport even richer. A judo match is governed by changing conditions that can be defined as the opponent's characteristic body constitution, characteristic guard, fighting style (offensive or defensive), the manner of moving in new situations, the

repertoire of techniques, which requires the judoist`s creativity so that he can, in a split second, modify the dynamic stereotype and properly respond to the activity of the opponent. Judo, as a sporting discipline, is constrained by rules and, therefore, the techniques (motor actions) must be drilled to perfection because only then they can be evaluated [29]. During training sessions and matches, mobilization of large amounts of energy is required per unit of time. Proper and quantitatively sufficient nutrition provides a judoist with the optimal amount of energy he needs at any time.

Judo Technique can be Divided into Eight Groups:

1. Basic natural standing posture techniques (Shizen hon tai)
2. Body shifting techniques (Tai Sabaki)
3. Breakfalling techniques (Ukemi waza)
4. Throwing techniques (Nage waza)
5. Joint locking techniques (Kansetsu waza)
6. Choking or strangulation techniques (Shime waza)
7. Pinning or holding techniques (Osaekomi waza)
8. Kata execution techniques (Kata waza)

During development of this sport, a group of body-striking techniques (Atemi Waza) was put out of use. A separate chapter is the technique of executing Kappo (first aid techniques) and Kuatsu (resuscitation techniques).

The sport of karate has long been rooted in the world, including Serbia. It consists of complex motor actions that have a single goal - efficiency. Unlike the sport of judo, in karate, blows are allowed, with, of course, the use of protective equipment for prevention of injuries. It is characterized by movements in the sagittal, frontal and horizontal planes. For proper execution of karate techniques, speed, strength and flexibility with maximum concentration of both physical and mental energies are required.

The technique of karate implies external elements of karate in the narrow sense. It is mostly a set of physical components of karate, although the division into the physical ones and others are impossible. Karate is an integrated martial skill (art), and any attempt to divide it and its desire to hold at the same time would mean impoverishment, and thus the sense is lost. It is necessary to make a distinction between Karate wasa and Gokataken. Gokataken is the totality of techniques, methods, practices, experiences, kata, traditions, legends, the basic idea and spirit of the school and includes esoteric parts of karate such as massage and self-massage (Katsu), herbal treatment, some types of acupuncture and methods of special impact It can be said that Karate wasa is only an integral part of Gokataken wasa without which it could be incomplete.

The Technique of Karate is Divided into the Following Groups:

1. Basic natural posture (Shizen hon tai)
2. Whole body movement , or repositioning (Tai Sabaki)
3. Hand techniques (Te waza)
4. Leg and foot techniques
5. Blocking techniques
6. Joint locking techniques (Kansetsu waza)
7. Self-defence elements (Jiu-jutsu)
8. Kata execution techniques (Kata waza)

Kata techniques refer to series of karate techniques usually executed in the form of stylized fights against imaginary opponents, during which the stances, blocks, punches and kicks are connected in a certain way and specific order, and because of such established forms, they are the only effective way of learning the authentic karate skill.

During development of this martial art, certain technical elements were added or deleted. However, this did not affect the attractiveness of this sport but, in some way, brought it even closer to the common man.

Methods

Sample of Respondents

Based on the selected statistical-mathematical model, as well as the program, objectives and hypothesis, it was decided to include into the sample about 200 athletes (about 100 judokas and about 100 karatekas of both sexes) aged 18 to 27 years. The majority of the sample must meet the following criteria:

- The effective sample size should be such as to provide as many degrees of freedom as to consider any coefficient in the pattern matrix, or any correlation coefficient equal to or bigger than .21, different from zero with an inference error less than .01;
- To apply the appropriate statistical methods successfully, the number of respondents in the sample, according to the latest convictions, should be five times bigger than the number of the applied variables;

In Addition, Respondents were Required to Fulfill the Additional Conditions:

- The respondents were male,
- The respondents` age was defined on the basis of chronological age, so the research covered respondents from 18 to 27 ± 0.5 years,
- During the research, the respondents regularly underwent a training process in their clubs or the national team of Serbia, which was determined by checking the club`s records of training attendance and the monthly number of training hours,
- The respondents had no somatic deformities and aberrations, and were physically and mentally healthy.

In defining the population from which the sample of respondents was drawn, except the above, no other restrictions were applied.

Sample of Variables for Assessment of Conative Characteristics

For the assessment of conative characteristics, the measuring instrument CON6 was chosen to assess the following conative regulators:

1) Regulator of Activity (EPSILON)
2) Regulator of Organ Functions (CHI)
3) Regulator of Defense Reactions (ALPHA)
4) Regulator of Attack Reactions (SIGMA)
5) System for Coordination of Regulatory Functions (DELTA) And
6) System for Integration of Regulatory Functions (ETA).

Data Processing Methods

The value of a research depends not only on the sample of respondents and the sample of variables, that is, the value of basic information, but also on the applied methods for transformation and condensation of this information. Some scientific problems can be solved with the help of a number of different, and sometimes equally valuable, methods. However, with the same basic data, and from the results of different methods, different conclusions can be drawn. Therefore, the problem of selection of some data processing methods is rather complex.

In order to arrive at satisfactory scientific solutions, the researchers used, in the first place, correct, then adequate, impartial and comparable procedures, which met the nature of the stated problem and ensured extraction and transformation of the appropriate dimensions.

Taking that into account, for the purpose of this study, the researchers selected those procedures that were considered to correspond to the nature of the problem and that did not leave too big restrictions on the basic information and were based on the assumptions:

- Latent dimensions which were the subject of measurement performed with the applied measuring instruments had multivariate normal distribution;
- The relations between manifest and latent variables could be approximated by the Gauss-Markov-Rao generalized linear model.

In recent years, a big number of researchers have been abusing their position and publishing a growing number of quasi-scientific papers based primarily on mathematical artifacts. In addition, they have been using the existing statistical products without understanding basically the logic of the majority of multivariate models. Therefore, in this study, special attention will be paid to statistical data processing as well as the selection of algorithms and programs that really have use value.

All the data in this research were processed at the Multidisciplinary Research Center, Faculty of Sport and Physical Education, University of Pristina, through the system of data processing software programs developed by [19, 28, 17].

Methods of Analysis

Canonical discriminant analysis can be defined as a solution of the quasi-canonical problem $\mathbf{Mx}_k = \mathbf{k}_k$, $\mathbf{Gy}_k = \mathbf{l}_k \mid c_k = \mathbf{k}_k^t\mathbf{l}_k$ = maximum, $\mathbf{x}_k^t\mathbf{x}_q = \mathbf{y}_k^t\mathbf{y}_q = \delta_{kq}$ k = 1,...,s; s = min((g - 1), m) = m where δ_{kq} is the Kroneker symbol and $\mathbf{x}_k$ and $\mathbf{y}_k$ are unknown m-dimensional vectors. As $c_k = \mathbf{x}_k^t\mathbf{Ay}_k$, the function to be maximized is, for k = 1 , $f(\mathbf{x}_k, \mathbf{y}_k, \lambda_k, \eta_k) = \mathbf{x}_k^t\mathbf{Ay}_k - 2^{-1}\lambda_k(\mathbf{x}_k^t\mathbf{x}_k - 1) - 2^{-1}\eta_k(\mathbf{y}_k^t\mathbf{y}_k - 1)$. After differentiating this function by elements of vectors $\mathbf{x}_k$, $\partial f/\partial\mathbf{x}_k = \mathbf{Ay}_k - \lambda_k\mathbf{x}_k$, and after differentiating it by elements of vectors $\mathbf{y}_k$, $\partial f/\partial\mathbf{y}_k = \mathbf{Ax}_k - \eta_k\mathbf{y}_k$; after equalizing it with zero, $\mathbf{Ay}_k = \lambda_k\mathbf{x}_k$ and $\mathbf{Ax}_k = \eta_k\mathbf{y}_k$. Differentiating by λ_k and η_k , it is easy to obtain, from the condition $\mathbf{x}_k^t\mathbf{x}_k = 1$ and $\mathbf{y}_k^t\mathbf{y}_k = 1$, that $\lambda_k = \eta_k$. As $\mathbf{A}^t = \mathbf{A}$, after multiplying the first result by $\mathbf{x}_k^t$ and the second result by $\mathbf{y}_k^t$, $\mathbf{x}_k^t\mathbf{Ay}_k = \lambda_k$ and $\mathbf{y}_k^t\mathbf{Ax}_k = \lambda_k$, so $\mathbf{x}_k = \mathbf{y}_k$ and the problem is boiled down to an ordinary problem of eigenvalues and eigenvectors of matrix $\mathbf{A}$, that is, the solution of the problem $(\mathbf{A} - \lambda_k\mathbf{I})\mathbf{x}_k = \mathbf{0}$, k = 1,..., m, and $c_k = \rho_k^2 = \mathbf{x}_k^t\mathbf{Ax}_k = \lambda_k$, k = 1,..., m are squared 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 $\boldsymbol{\rho}^2 = (\rho_k^2)$, k = 1,..., m be a diagonal matrix whose elements are squared canonical correlations, let $\mathbf{X} = (\mathbf{x}_k)$, k = 1,..., m be a matrix of the eigenvectors obtained by solving the canonical discriminant problem. Let $\mathbf{K} = \mathbf{MX}$ be a matrix of discriminant functions and let L = GX = PMX be a matrix of discriminant functions projected into the hypercube defined by vectors of matrix $\mathbf{S}$. As $\mathbf{K}^t\mathbf{L} = \mathbf{X}^t\mathbf{AX} = \boldsymbol{\rho}^2$ and as, of course, $\mathbf{K}^t\mathbf{K} = \mathbf{I}$ and $\mathbf{L}^t\mathbf{L} = \boldsymbol{\rho}^2$, canonical discriminant analysis produces two biorthogonal sets of vectors of the variables by such transformation of vectors of variables from $\mathbf{M}$ and $\mathbf{G}$ that orthogonalizes these vectors and maximizes the cosines of the angles between the correspondent vectors from $\mathbf{K}$ and $\mathbf{L}$ with the additional condition that the cosines of the angles of non-correspondent vectors from $\mathbf{K}$ and $\mathbf{L}$ are equal to zero, because the correlations between variables from $\mathbf{K}$ and $\mathbf{L}$ are $\mathbf{K}^t\mathbf{L}\boldsymbol{\rho}^{-1} = \mathbf{X}^t\mathbf{AX}\,\boldsymbol{\rho}^{-1} = \boldsymbol{\rho}$. 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 maximal correlations. But since $\mathbf{M}^t\mathbf{K} = \mathbf{X}$, the elements of matrix $\mathbf{X}$ are, at the same time, correlations of variables from $\mathbf{M}$ and discriminant variables from $\mathbf{K}$, which, unlike the standard canonical discriminant model, allows easy testing of the hypothesis about partial influence of variables on the formation of discriminant functions. For identification of discriminant functions, cross-structure matrix elements defined as correlations between variables from $\mathbf{M}$ and $\mathbf{L}$, that is, the elements of $\mathbf{Y} = \mathbf{M}^t\mathbf{L}\boldsymbol{\rho}^{-1} = \mathbf{AX}\boldsymbol{\rho}^{-1} = \mathbf{X}\boldsymbol{\rho}$, could be of certain significance. Notice, by the way, that $\mathbf{Y}$ is a factor matrix of matrix $\mathbf{A}$ because, naturally, $\mathbf{YY}^t = \mathbf{X}\boldsymbol{\rho}^2\mathbf{X}^t$. Since elements x_{jk} of matrix $\mathbf{X}$ and elements y_{jk} of matrix $\mathbf{Y}$ are ordinary correlations, their asymptotic variances are $\sigma_{xjk}^2 = (1 - x_{jk}^2)^2n^{-1}$, respectively $\sigma_{yjk}^2 = (1 - y_{jk}^2)^2n^{-1}$, and hypotheses of type H_{0xjk} or H_{0yjk} can be tested on the basis of the functions $f_{xjk} = x_{jk}^2((n - 2)(1 - x_{jk}^2))$, respectively $f_{yjk} = y_{jk}^2((n - 2)(1 - y_{jk}^2))$ because under the hypotheses these functions, have the Fisher–Snedecor F-distribution with $\nu_1 = 1$ and $\nu_2 = n - 2$ degrees of freedom. Unfortunately, with normal application of canonical discriminant analysis, the main, and usually the only set of hypotheses associated with the parameters of this model is the set $H_0 = \{\varphi_k = 0, k = 1,..., m\}$ where φ_k are hypothetical values of canonical correlations in population P. To test hypotheses of type H_{0k}: $\varphi_k = 0$ k = 1,..., m, researchers usually apply a function of the known Wilks measure $\lambda_k = \Sigma_{t+1}^{s} \log_e(1 - \rho_{t+1}^2)$ k = t + 1, t = 0, 1,..., 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,..., m have approximately χ^2 distribution with $\nu_k = (m - k + 1)(g - k)$ degrees of freedom. However, the outcomes of Bartlett`s test are not, even in case of large samples, in full accordance with the outcomes of tests of type $z_k = \rho_k/\sigma_k$ k = 1,...,s which are based on the fact that canonical correlations also have asymptotically normal distributions with parameters φ_k and $\sigma_k^2 \sim (1 - \varphi_k^2)^2n^{-1}$ [1]. The centroids of subsamples E_p, p = 1,..., g from E on the discriminant functions necessary for identification of the content of the discriminant functions are, of course, elements of the matrix $\mathbf{C} = (\mathbf{S}^t\mathbf{S})^{-1}\mathbf{S}^t\mathbf{K} = (\mathbf{S}^t\mathbf{S})^{-1}\mathbf{S}^t\mathbf{MX} = (\mathbf{S}^t\mathbf{S})^{-1}\mathbf{S}^t\mathbf{ZR}^{-1/2}\mathbf{X}$, and it is clear that these are, in fact, centroids of the subsamples on the variables transformed into Mahalanobis form projected into the discriminant space.

Results

The reason for the increased number of studies of an athlete`s personality should be sought in the characteristics of a sporting activity which sets specific and different requirements not only on motor skills, but also the personality. This justifies the assumption that an active and successful participation in a sport, as well as in martial arts (judo and karate), requires a specific pattern of personality dimensions, most suitable for the sport, or a pattern of personality dimensions

suitable for participation in sport, and not in other activities.

The results of discriminant analysis in conative space are shown in Tables 1 to 4, and analyzing them carefully, it can be determined that only one significant canonical correlation (.34) has been obtained and it is significant at the .04 level.

The first discriminant function is defined by the mechanism for integration of regulatory functions, mechanism for coordination of regulatory functions, mechanism for defense control, mechanism for control of organic functions, and finally, the activity regulator which, at the same time, models the activating part of the reticular formation, and it is directly responsible for the energy level at which other systems, including cognitive and motor processors, function.

Based on the values and signs of the centroids for the first discriminant function of the groups, it can be concluded that judokas have the ability to adequately model their tonic arousal based on the programs transmitted by the genetic code or formed under the influence of learning that are located in the centers for regulation and control of defense and attack reactions. They are able to co-ordinate functionally and hierarchically different subsystems, both cognitive and conative. Karatekas are able to adequately model their excitatory-inhibitory processes because in this sport, strike control is needed, and this is also required by karate strict rules.

Table 1: Discriminant Analysis of Conative Variables

F	Can. R.	Λ	χ^2	df	Sig.
1	.35	.97	13.97	6	.04

Table 2: Canonical Factor Structure in H Space

Variables	D1
EPSILON	.44
CHI	-.68
ALPHA	.18
SIGMA	-.39
DELTA	.39
ETA	.99

Table 3: Canonical Factor Structure in Z Space

Variables	D1
ETA	.86
DELTA	.59
ALPHA	.49
CHI	.38
EPSILON	.33
SIGMA	.08

Table 4: Centroids of the Groups

Groups	D1
judo	-.37
karate	.33

Conclusion

The research was conducted in order to determine the specificity of conative dimensions of judo and karate athletes as well as their differences.

To determine the specificity of the structure of the tested anthropological dimensions, the researchers tested 200 judo and karate athletes, members of judo and karate clubs in Serbia (about 100 judokas and about 100 karatekas), aged 18 to 27.

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The results of the discriminant analysis in conative space are shown in Tables 1 to 4, and analyzing them carefully, it can be determined that only one significant canonical correlation (.35) has been obtained, and it is significant at the level of .04.

The first discriminant function is defined by the mechanism for integration of regulatory functions, mechanism for coordination of regulatory functions, mechanism for defense control, mechanism for control of organic functions, and, finally, the regulator of activity which, at the same time, models the activating part of the reticular formation and is directly responsible for the energy level at which other systems, including cognitive and motor processors, function.

Based on the values and signs of the centroids for the first discriminant function of the groups, it can be concluded that judokas have the ability to adequately model their tonic arousal on the basis of the programs transmitted by the genetic code or formed under the influence of learning that are located in the centers for regulation and control of defense and attack reactions. They are able to co-ordinate functionally and hierarchically different subsystems, both cognitive and conative. Karatekas are able to adequately model their excitatory-inhibitory processes because in this sport, strike control is needed, and this is also required by karate strict rules.

Practical Implications

1) The results obtained on the sample of variables and sample of respondents can be used during the selection of athletes.
2) The results suggest a high degree of respectability since they have been obtained by modern mathematical-statistic methods.
3) The observed structure of cognitive abilities will also ensure more adequate training methods and more rational selection of athletes.

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