Determinations of Differences in Motor Dimensions between Judo and Karate Athletes

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Abstract: The research was conducted in order to determine specificity of motor dimensions of judo and karate athletes and their differences. In order to determine the specificity of the structure of the tested anthropological dimensions, the researchers examined 200 judo and karate athletes, members of judo and karate clubs of Serbia (about 100 judokas and about 100 karatekas), aged 18 to 27 years. To assess motor abilities, the researchers used 16 motor tests selected according to the structural model, defined as a mechanism for movement structuring, mechanism for functional synergies and tonus regulation, mechanism for excitation intensity regulation, and a mechanism for excitation duration regulation. 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 Popovic. The algorithms and programs realized in the research are fully presented, and the results of the programs are analyzed.

Key words: Motor dimensions, judo, karate, function, mechanism.

1. Introduction

Motor skills are usually considered to be directly responsible for solving tasks in sport and physical education, regardless of whether these tasks are related to educational, competitive or recreational activities. Measurement of motor skills is the starting point in all the processes of the mentioned fields of physical education because it is impossible to imagine the management of the process without information about the initial transformational and final states of the system to be managed.

Determining the level of individual dimensions of motor space is recent and falls into the domain of motor diagnostics. Since the abilities that define motor space are not given directly but as latent dimensions whose quantity and quality are concluded about on the basis of outputs of the system, their measurement is not feasible with direct methods. Therefore, motor skills are measured indirectly via conventional motor manifestations called motor tests. In addition, latent dimensions of motor space do not manifest themselves as pure properties but they are usually combined in a variety of variations, and it further increases difficulties in measuring the dimensions.

Motor tests are used as instruments of motor space and represent a set of tasks for which previous studies determined a way of stating and assessing results as well as their measured characteristics. The motor tests, as standardized procedures, represent the most important source of information about the level and development of motor abilities of a subject.

2. Methods

2.1 Sample of Respondents

Based on the selected statistical-mathematical model, as well as the program, objectives and the stated 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. Most 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 or greater than 0.21, different from zero with an inference error less than 0.01.

To apply the appropriate statistical methods effectively, according to the latest convictions, the number of respondents must be five times bigger than the number of the applied variables. In addition, the respondents had to fulfill the following specific requirements: (1) the respondents were male; (2) the respondents’ age was defined on the basis of chronological age, so that the research covered respondents aged 18 to 27 ± 0.5 years; (3) 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; (4) 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.

2.2 Sample of Variables

To assess motor abilities, the researchers used 16 motor tests selected according to the previous structural model [1-5], defined as a mechanism for movement structuring, mechanism for functional synergies and tonus regulation, mechanism for excitation intensity regulation, and a mechanism for excitation duration regulation.

2.2.1 Movement Structuring

Bending and skipping (BENSKIP); tennis ball target kicking (TARKICTB); figure eight with bending (FIGEIBEN); backward polygon (BACKPOL).

2.2.2 Muscle Tone Regulation and Synergistic Regulation

Transverse bench one leg standing with eyes closed (TBSTACLE); dominant hand tapping test (TAPDH); 20 m standing start running (STASTRUN); deep forward bend on bench (DEFBEBEN).

2.2.3 Regulation of Excitation Intensity

Standing long jump (STALJ); standing high jump (STAHJ); standing triple long jump (STATRLJ); seated medicine ball throw forward with both hands, the back against a wall (SMEDB).

2.2.4 Regulation of Excitation Duration

Chin-ups (CHUP); supine leg lift (SULELIF); 60-second supine trunk lift (SUTRLIF); 60-second prone trunk lift (PROTRLIF).

2.3 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 consideration 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:

(1) latent dimensions which were the subject of measurement performed with the applied measuring instruments had multivariate normal distribution;

(2) 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 [6-9].

3. Results

Motorics, or anthropomotorics, is a system of motor manifestations by means of which a person interacts with his/her surroundings. This system is generally defined as the ability to move the whole body or its parts in space with a certain amplitude, rhythm, direction, intensity and, of course, purpose. Knowing that the number of manifest motor activities, or combinations, is practically infinite, the orientation to identification of the structure of motor abilities as a system which is the base of these manifestations and which is, with respect to motor manifestations, reasonably reduced and limited by the available number of latent dimensions, is logical, or even the only possible one.

Planned, systematic and program aimed training also causes changes in the anthropological status of athletes. These changes mostly manifest themselves in the field of some abilities and characteristics, especially in the domain of motor abilities and motor skills. Anthropological characteristics appear, develop and change in quantitative and qualitative terms. Quantitative changes are the ones that are expressed in space or reduction of efficacy of an ability, characteristic, or motor information. Qualitative changes imply changing relations among characteristics. Both types of change are inevitable. Changes in general can significantly be affected by various means and in different ways. So, they are under visible influence of exogenous factors, i.e. the influence of the surroundings on formation and expression of changes in motor space is very important.

The results of discriminant analysis of motor variables indicate that the tested athletes in relation to the preferred branch of sport differ significantly. Analyzing the values in Table 1, it can be concluded that the agreement between the results of the registered indicators of the first and second groups of athletes is very high. Only one significant discriminant function and one canonical correlation (0.83) have been obtained. This indicates correlation of discriminant functions and is the main indicator of the quantitative structure. The significance of differences between the groups is presented with the Wilks lambda, and the significance of canonical correlations is tested with Bartlett’s $X^2$ test.

Table 2 shows the structure of discriminant functions of motor variables which shows contribution of each variable to the general separation of centroids of the groups.

After examining the coefficients of the first discriminant function, it is clear that this discriminant function is best defined by tests for assessing segmentary speed of arm, repetitive strength, coordination and flexibility. Based on the values and signs of the centroids of the groups (Table 3), it can be concluded that judokas have greater strength and coordination, while karatekas have better segmentary

<table>
<thead>
<tr>
<th>F</th>
<th>Can. R.</th>
<th>$\lambda$</th>
<th>$\chi^2$</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>0.83</td>
<td>0.37</td>
<td>217.30</td>
<td>16</td>
<td>0.00</td>
</tr>
</tbody>
</table>
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Table 2 Canonical factor structure in Z space.

<table>
<thead>
<tr>
<th>Variables</th>
<th>D1</th>
</tr>
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<tbody>
<tr>
<td>TAPDH—dominant hand tapping test</td>
<td>-0.45</td>
</tr>
<tr>
<td>STASTRUN—20 m standing start running</td>
<td>0.39</td>
</tr>
<tr>
<td>SUTRLIFT—60-second supine trunk lift</td>
<td>-0.29</td>
</tr>
<tr>
<td>BACKPOL—backward polygon</td>
<td>0.23</td>
</tr>
<tr>
<td>DEFBEBEN—deep forward bend on bench</td>
<td>0.24</td>
</tr>
<tr>
<td>BENSLEEP—bending and skipping</td>
<td>0.19</td>
</tr>
<tr>
<td>PROTRLIFT—60-second prone trunk lift</td>
<td>-0.16</td>
</tr>
<tr>
<td>STATRLJ—standing triple long jump</td>
<td>-0.19</td>
</tr>
<tr>
<td>FIGEIBEN—figure eight with bending</td>
<td>0.17</td>
</tr>
<tr>
<td>SULELIF—supine leg lift</td>
<td>-0.12</td>
</tr>
<tr>
<td>SMEDB—seated medicine ball throw forward with both hands, the back against a wall</td>
<td>-0.09</td>
</tr>
<tr>
<td>TARKICTB—tennis ball target kicking</td>
<td>0.07</td>
</tr>
<tr>
<td>STALJ—standing long jump</td>
<td>-0.07</td>
</tr>
<tr>
<td>STAHJ—standing high jump</td>
<td>-0.06</td>
</tr>
<tr>
<td>CHUP—chin-ups</td>
<td>-0.02</td>
</tr>
<tr>
<td>TBSTACLE—transverse bench one leg standing with eyes closed</td>
<td>-0.01</td>
</tr>
</tbody>
</table>

Table 3 Centroids of the groups.

<table>
<thead>
<tr>
<th>Groups</th>
<th>D1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Judo</td>
<td>-1.44</td>
</tr>
<tr>
<td>Karate</td>
<td>1.56</td>
</tr>
</tbody>
</table>

speed of arm and flexibility, which is consistent with the requirements of the two sports.

4. Conclusion

The research was conducted in order to determine specificity of motor dimensions of judo and karate athletes and their differences.

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

To assess motor abilities, the researchers used 16 motor tests selected according to the structural model. To determine differences between the groups, a method of discriminant analysis was applied. The algorithms and programs realized in the research are fully presented, and the results of the programs are analyzed.

Although it is well known that the practice of a particular sport produces general short and long term physiological and morphological adaptations, if the sport consists of different competitive specialties, it is critical and appropriate to analyze the impact of each one of them individually in order to further clarify the relationships between the activity performed and the related physiological adaptations. Karate is dominated by anticipatory actions, very fast, based feints, kicking and touching, but the hands are not used as much as in judo, in a way that the development of resistance force is not so marked. Speed and anticipation are important for success, although an adequate level of development of basic resistance is needed to ensure a speedy recovery between bouts, several times a day in order to obtain a degree. Judokas prepare for “body to body” combat, they plan or control the movements of their opponents and their defense, over a period of time that may end in a few seconds or, take five or more minutes. This regime demands preparation work to realize intensive efforts, or withstand lower but prolonged effort intensity in relation to karatekas and to maintain a submaximal work supported by the specific resistance.

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**References**


