Degree and quality of the connection of motor skills and judo techniques

Miloš D. Popović, Jasna D. Popović

University of Priština (with temporary seat in Leposavić, Republic of Serbia), Faculty of Sports and Physical Education, Leposavić

Published: 20/05/2023

Corresponding author:
Miloš D. Popović

Correspondence email:
milos.popovic@pr.ac.rs,
jasna.popovic@pr.ac.rs

DOI: 10.5937/bastina33-43439

Abstract:

The research was conducted with the aim of determining the degree and quality of the connection between judo techniques and motor skills defined as manifest and latent dimensions. Therefore, 237 male respondents aged 11 to 12 years were tested. This sample can be considered representative of judokas of the same age. 20 motor tests were used to assess motor skills. They were chosen for the structural analysis to be performed at the level of second-order factors according to the structural model. For the evaluation of the technical competence of judokas, 7 representatives of certain major groups of techniques were taken. The groups of judo techniques are taken to cover: hand techniques, side techniques, leg techniques, sacrifice techniques, ground hold techniques, chokes and leverage techniques. All variables used in previous research were subjected to thorough validation. Canonical analysis of latent motor dimensions and judo techniques indicated a significant correlation. However, apart from the fact that this method is currently considered the optimal research procedure, numerous further researches are needed that would continuously supplement knowledge about the methods and laws of the relationship between motor skills and judo techniques.

Keywords: Canonical analysis; judokas; method; structure; reliability

INTRODUCTION

The influence of motor dimensions on the judo-techniques performance efficacy certainly depends on the correctness of process orientation, the selection of judokas, the training process efficacy and therefore on the achieving the top results.

The researches directed towards the determination of the connectivity between motor dimensions with judo-techniques, at least in our country, are very scarce (Popovic 1993). The 1reasons should be probably looked for in insufficiently reliably determined existence of primary motor factors and in almost not defined space of variables criteria. At motor variables there are more objective means of assessment, while at criteria variables there are not still enough reliable methods for their determination.

Specific character of activities at achieving judo results practically shut the door on standardization of monitoring of competition conditions. There should be always the same rival, who should always react in the same way, to react during certain practices by the same reaction…, which is in practice impossible.

Nowadays due to these facts a level of special training of judokas is valued only by quantity methods which, understandably, are under the influence of subjective influences.

From the mentioned reasons a goal of this research stems: to determine the size and the direction of motor dimensions connectivity with judo techniques.

MATERIAL AND METHODS

Respondents' Sample

Among others, the choice of respondents is conditioned by organizational and financial possibilities required for conducting of the research procedure. It was necessary to ensure a sufficient number of qualified and trained measurers, necessary intrumentarium and standardized conditions in which a certain research was to be organized.

Limited financial funds and organizational possibilities influenced on the fact that the measuring wasn't done on a randomly chosen sample which would be representative for the whole population.

The measuring was conducted in judo clubs in Kruševac and Novi Sad regions.

In order for the research to be done correctly and the results stable enough in terms of sample error, it was necessary to take satisfactory number of respondents for this research. The size of the sample, for such a research, is conditioned by the research goals and tasks, by the size of the population and by the variability degree of applied parameters system.

Besides these, the number of the respondents in the research depends also on the level of statistical inference as well as on the choice of mathematical and statistical model.

Regions of Kruševac and Novi Sad which along with their athletes were chosen for this research were conditioned by:

- a region must have pioneer judo school;
- a region must have relatively balanced work programs;
- judo club administrations and coaches must be ready to cooperate(to enable realization of scheduled research program with adequate participants, with necessary premises and requisites).

On the bases of the chosen statistical and mathematical model and program, goals and tasks, we decided to include minimally 200 respondents, that is 100 from each region. But, for the final statistical data processing 120 respondents from Kruševac region were taken. From Novi Sad region, 117 respondents were taken. The size of such a sample should have met the following criteria:

- the effectiveness of the sample should be planned in such a manner as to enable so many degrees of freedom, so that any coefficient in the matrix of the frame, or any coefficient of the correlation is either equal or higher than 0.18 in order to be considered different from the zero with a mistake of inference lower than 0.01,
- in order to successfully apply adequate statistical measures, according to the latest convictions a number of subjects in a sample must be five times larger than a number of applied variables (Popovic 1990).

During all the factor procedures one should always bear in mind that the results of the analyze depend on three main systems which determine the choice and the transformations of the information: on sample of variables, the sample of the respondents and the chosen extract, that is, rotational method (Popovic 1993).

Having in mind these criteria, and on the basis from the previous researches, we considered that the figure of 237 respondents was sufficient for this research.

Besides already mentioned, the respondents had to fill in the special conditions also:

- the respondents had to be of a male gender;
- the respondents' age was defined on the basis of chronological age so that the respondents could be old between 11 and 12 years;
- the respondents had to have finished judo school(one-year-long) and at least to be a yellow belt holder (V KYU);
- the respondents had to attend training classes regularly, which was checked in the paper records held by the coaches;
- that every respondent at least once took part in an official regional championship;
- the respondents had to be somatically healthy- no somatic deformities and aberrations, and they had to be both mentally and physically healthy.

When defining the population from which the respondents' sample was taken, besides the previously mentioned, no other restrictions were imposed and also no stratific variables.

The sample of motor variables

With this research it was impossible to cover the whole space of mobility. Due to this fact, a certain reduction of the tests was done. The segments which would offer the adequate information were considered, and which were significant for this research.

As it was already said, when choosing tests which define motor space, it was taken into consideration that they were, in the previous researches on the Yugoslav population, verified as relevant for this age. The battery of tests was constructed so as to meet, in the first place, the needs which stem from the subject, goals, tasks and the purpose of this research. The final forming of this battery of tests was largely influenced by the intention that the given results could be compared with the results which were found by the group of our authors: [4,5] 20 motor tests were used for the assessment of motor skills.

They were chosen in order for structure analysis to be done on the level of second-order factor (according to the structural model of (Gredelj et al. 1975); (Blazevic et al. 2005) defined as: structuring of movements, tonus regulation and synergistic regulation, regulation of excitation intensity and regulation of duration of excitation.

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

a) the mechanism for movement structuring
1. agility on the ground
2. hand tapping
3. foot tapping
4. coordination with a stick
5. hand and foot drumming

b) the mechanism for functional synergies and regulation of muscle tone)
1. deep forward bend)
2. standing sideways on a balance beam
3. shoulder flexion with exercise bar
4. darts
5. horizontal target shooting

c) the mechanism for regulation of excitation intensity
1. standing long jump
2. 20m run from a standing start
3. lying medicine ball throw
4. standing high jump

5. hand dynamometry

d) the mechanism for regulation of excitation duration
1. flexed arm hang
2. chin-up hang
3. 60-second trunk lift
4. lying straight leg raise
5. straight-leg hanging leg raise for leg muscle endurance

The sample of criteria variables

A large number of technical elements and their complexity make it impossible to overcome all judo techniques but in the same quality. Because of this, in practice, we often meet quality competitors on a high technical level who learnt only those techniques which they efficiently perform in a fight and which are in accordance with their morphological, motor and other characteristics.

For the technical assessment of judokas, seven representatives of certain larger groups of judo techniques were chosen. They were chosen as to cover: hand techniques, hip techniques, foot techniques, sacrifice techniques, pinning techniques, chocking techniques and joint-locking techniques.

Table 1. Criteria variables

a) For assessment of hand techniques	Ipon seoi - nage
b) For assessment of hip techniques	Tsuri - komi - goshi
c) For assessment of foot techniques	O - soto- gari
d) For assessment of sacrifice techniques	Tomoe - nage
e) For assessment of holding techniques	Kesa - gatame
f) For assessment of chocking techniques	Kata - juji - jime
g) For assessment of lever techniques	Ude - hishigi - juji - gatame

Statistical data processing

Data in this research were processed on an electronic computer by the help of NUCLEIN algorithm[6]. This algorithm analysis canonical relation between two sets of latent dimensions, and they are isolated in accordance with PB criterion and sets of original variables. Firstly, the algorithm performs componential analysis of variables' set and transforms latent dimensions into orthoblique position thus determining the componential variances of variables and latent dimensions, and also the reliability of latent dimensions within both solutions. After that, the algorithm performs canonical correlative analysis of the main standardized components and determines canonical factors within the space of the original variables of the main components, orthoblique factors and ante image variables. In the end, the algorithm performs not orthogonal parsimonic transformation of canonical factors, defined in the space of variables by direct procedure (Momirović, Popović 2003); (Popovic et al. 2016) determines the relations of such transformed canonical dimensions and compares found canonical latent dimensions with latent dimensions defined by the orhoblique factors.

But, in this research only those tables which are related to canonical correlative analysis will be presented and interpreted, and which the algorithm explicitly processes in its second part.

RESULTS

The connection between motor dimensions and judo techniques is to be explained only with one pair of canonical factors whose mutual connection may be considered moderately high (.58).

The canonical factor in space of latent motor dimensions (Table 2) is best defined by the factor in whose base lies the mechanism for the structuring of movement, and then by the second and the third factor in whose base is a mechanism for energetic regulation.

Table 2. Canonical orthoblique factors of motor set

	K1
OBQ1	-.96
OBQ2	.59
OBQ3	.40
KAN. KOR = .58	Q = .00

Mapped factors in space of original variables show that the canonical dimension is, before all, defined by the factor of coordination, then by the frequency of movement, by balance, by flexibility and by explosive and repetitive strength. From the Table 3 it is obvious that the primary motor factors do not equally participate in the forming of structure of canonical factor. Therefore, it is obvious that this canonical dimension is to some extent different from a general motor factor. It may be said that larger number of motor factors influence on the efficient performance of judo techniques, but their influence is various and, it seems, characteristic for judo.

Table 3. Canonical factors of motor variables (the first set)

	K1
Agility on the ground	-.58
Hand tapping	-.53
Foot tapping	.40
Coordination with a stick	.67
Deep forward bend	.63
Standing sideways on a balance beam	.69
Shoulder flexion with exercise bar	.57
Darts	-.44
Horizontal target shooting	.66
Standing long jump	.83
20m run from a standing start	-.47
lying medicine ball throw	.32
Standing high jump	.48
Hand dynamometry	.38
Flexed arm hang	.71
Chin-up hang	.67
60-second trunk lift	.14
Lying straight leg raise	.52
Straight-leg hanging leg raise for leg muscle endurance	.38

Canonical dimension isolated from judo techniques represents, without any doubt, a general factor of technical qualification (Table 4). Only a technique of holding Kesa gatame and a technique Tomoe-nage contribute less to forming of this factor.

Table 4. Canonical factors of Judo Techniques set (the second set)

	K1
Ipon-seoi-nage	.83
Tsuri-komi-goshi	.83
O-soto-gari	.82
Tomoe - nage	.75
Kesa-gatame	.63
Kata-juji-jime	.82
Ude-hishigi-juji-gatame	.86

Such statement is a consequence of homogenous structure of all variables defining the dimension. Although this canonical dimension does not represent the whole space of success of criteria dimensions in judo (since it is obvious that that system is not one-dimensional) yet relatively moderate canonical connectivity between judo techniques and motor abilities may be considered satisfying.

DISCUSSION

With the parallel analysis of canonical factors in both sets it may be concluded that the efficient performance of judo techniques is primarily under the influence of those motor regulating mechanisms which are, in the first place, responsible for the structuring, control and movement regulation, with a permanent balance control and controlled force exercise.

It is obvious, that efficient judo technique performance depends, in the first place, on the most complex motor regulating mechanisms which simultaneously include those mechanisms which are cortically and sub cortically located where those mechanisms necessarily have to act in a synchronized manner. Thereby, a certain level of some mechanisms for energetic regulation is probably required though the performance of judo techniques at the examination did not require great engagement of these very mechanisms. So, the overall energetic load was on such a level that, without difficulty, any judoka could have overcome [8].

Yet, the mechanisms which are responsible for the duration of physical labor significantly participate in the forming of the first canonical dimension within the motor space. Probably, the present relations are the consequence of the transformational effects of training process, and partly of the preparation of the examination for the degrees which require knowledge of great number of judo elements. As the process of learning judo techniques requires extremely great number of repetitions, judokas, with over average level of mechanisms which are responsible for the duration of work, have a significant advantage because they can realize a larger number of repetitions during the whole training process (Popovic, Mitić 2018).

Such treatment at the same time contributes also to the transformation of those dimensions. So, the significant relations of repetitive strength with the first canonical factor, in the space of the motor dimensions, are the consequence of the significant influences of these dimensions on the efficacy of

exam preparation, and also on the transformational effects of the training process (Popovic et al. 2018).

CONCLUSION

The research was conducted with the aim to establish the degree and the quality of connectivity between judo techniques and motor abilities defined as manifest and latent dimensions.

The purpose was to determine the relation between judo techniques and manifest and latent motor dimensions, and therefore, 237 respondents of male gender aged 11 to 12 were tested. This sample may be considered representative for the judokas of the same age.

For the assessment of motor abilities 20 motor tests were used. They were chosen for structure analyzing to be done on the level of the factor of the second order according to the structural model of (Gredelj et all 1975), and they were defined as: movement structuring, tonus regulation and synergetic regulation, regulation of intensity of excitation, regulation of duration of excitation.

For the assessment of judokas' technical qualification, 7 representatives of certain larger groups of judo techniques were taken in order to cover: hand techniques, hip techniques, foot techniques, sacrifice techniques, hold techniques in parter chocking techniques in parter and joint-locking techniques. All the used variables in the frame of the previous researches were subdued to thorough validation. It may be claimed that almost all have more than satisfactory metric characteristics.

All the data in this research were processed on an electronic computer by the help of canonical correlative analysis.

Canonical analysis of latent motor dimensions and judo techniques resulted in only one significantly connected pair of the canonical factors. With the parallel analysis of canonical factors, in both sets, it may be concluded that efficient performance of judo techniques under the influence of those motor regulating mechanisms which, in the first place, is responsible for the structuring, the control and movement regulation, with the permanent balance control and controlled force exercise.

REFERENCES

Blazevic, S., Katic, R., & Popovic, D. (2005). The effect of motor abilities on karate performance. *Coll Antropol*, 30(2), 327-333. [Google Scholar]

Gredelj, M., Metikoš, D., Hošek, A., & Momirovic, K. (1975). A model of hierarchical structure of motor abilities. *Kinesiology (Zagreb)*, 5(1-2), 7-81. [Google Scholar]

Momirovic, K., & Popovic, D. (2003). *Construction and application of taxonomic neural networks*. Leposavić: Faculty of Physical Education-Multidisciplinary Research Center. [Google Scholar]

Popoovic, D., & Mitic, D. (2018). *Judo and Jiu-Jitsu*. Scholars' Press. [Google Scholar]

Popovic, D. (1990). *Research methodology in Physical education*. University of Nis. [Google Scholar]

Popovic, D. (1993). *Determination of the structure of psychosomatic dimensions in combats and and development of methods for their evaluation and monitoring*. Pristina: University of Priština-Faculty of Physical Education. [Google Scholar]

Popovic, D. (1993). *Programs and subprograms for the analysis of quantitative modifications*. Priština: Faculty of Physical Education-Multidisciplinary Research Center. [Google Scholar]

Popovic, D., Boli, E., Popovic, M., Savic, V., Popovic, J., & Bojovic, M. (2016). Determination of differences in motor dimensions between judo and karate athletes. *J Sports Sci*, 170-174. [Google Scholar]

Popovic, D., Mitic, D., Popovic, J., & Boli, E. (2018). Factor analysis as optimal method in determining motoric abilities of perspective judokas. *Facta universitatis - series: Physical Education and Sport*, 16(1). [Google Scholar]

Степен и квалитет повезаности моторичких способности и џудо техника

Сажетак:
Истраживање је спроведено са циљем да се утврди степен и квалитет повезаности џудо техника и моторичких способности дефинисаних као манифестне и латентне димензије. Дакле, тестирано је 237 испитаника мушког пола узраста од 11 до 12 година. Овај узорак се може сматрати репрезентативним за џудисте истог узраста. За процену моторичких способности коришћено је 20 моторичких тестова. Одабрани су да се структурна анализа врши на нивоу фактора другог реда по структурном моделу. За оцену техничке оспособљености џудиста, узето је 7 представника појединих већих група техника. Групе џудо техника су узете у циљу да покрију: ручне технике, бочне технике, ножне технике, пожртвоване технике, технике држања у партеру, гушења и технике полуга. Све варијабле коришћене у оквиру претходних истраживања подвргнуте су темељној валидацији. Канонička анализа латентних моторичких димензија и џудо техника указала је на значајну повезаност. Међутим, осим што се овај метод у овом тренутку сматра оптималним истраживачким поступком, потребна су и бројна даља истраживања која би континуирано допуњавала сазнања о методама и законитостима односа моторичких способности и јудо техника

Кључне речи: Канонička анализа; џудисти; метод; структура; поузданост