CANONICAL RELATION OF BASIC AND SPECIFIC MOTOR ABILITIES IN BOXERS

(Original scientific paper)

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Abstract

Research conducted on 102 (one hundred and two) male subjects, boxers aged 18 to 33 The aim of the research was to verify the canonical relations of some tests that estimate̶ basic and specific motor abilities of the Macedonian boxers. To that purpose a predicting system of 21 motor tests for the estimation of the basic motor abilities and 8 motor tests for the estimation of the specific motor abilities was applied. The results were additionally processed by a canonical correlation analysis. show that the relation between the canonical factors of the tests estimating the specific motor abilities, interpreted as an integral canonical factor of the power-speed coordination of the boxers, and the canonical factor of the system of tests estimating the basic motor abilities, interpreted as a basic canonical factor of the power-speed coordination abilities (agility, explosive power, frequency's speed of punches), is statistically significant. Thus the results completely support the hypothesis of the relation of both variables.

Keywords: *motor tests, motor agility, motor explosive, frequency's speed,*
power-speed coordination of the boxers, canonical correlation analysis,

INTRODUCTION

A human being should always be observed as a complex system whose functions depend on the characteristics of its structure, i.e. the quality of its subsystems, as well as the relations between them. Since the anthropological status of the man is multidimensional , scientific research in the field of kinesiology, as well as in sports, will gain a complete insight only if the man is thoroughly studied as a bio-psycho-social entity. This indicates that any anthropological status of the man assumes a value̶depend ing on the other dimensions of the organized system.

Boxing as a sport belongs to the group of poly-structural acyclic sports where the acyclic unpredictable movements predominate resulting in a binary variable (victory-defeat). Movements are restricted to a direct encounter with the opponent in order to avoid the punch and the destruction.

This complex activity requires the boxer to be versatile throughout the battle and his repertoire has to hold adequate fighting stances (left-sided, right-sided, and front). He also has to posses various tactics for every technique, too. The boxer always has to be ready to fight against various opponents (short, tall, with an opposite stance- "guard stance") (Ćirković, 1978; Kuznjecov,

1980; Savić, 1986a; Savić, 1996; Chatzilelekas, 1999; Filimonov (Филимонов), 2000).

The process of training in the boxing lasts long enough in order to cause adaptive changes in the single organs and the organ system (Zahorjević, 1976; Zulići Milošević, 1987; Popović, 1988; Malacko and Rađo, 2004; Malacko and Popović, 2001).

Before determining the specific characteristics of a particular sport it is common to determine the general anthropological relations.

Knowing the regulations and relations of the system, in this case the regulations and relations between the basic and specific motor segments of the human anthropological status can enable a complete selection, remodeling and programming of every action cau ing changes in any of the dimensions or the sum of dimensions of that person.

The aim of this research is to verify the relations between tests that estimate basic motor abilities and tests that estimate specific motor abilities of the Macedonian boxers.

METHODS

102 research subjects, male boxers between the ages of 18 to 33 took part in this research, ̶The research

subjects are all specified as active boxers (athletes) from all categories, including boxing contestants in the Macedonian national league championship and contestants competing in the international tournaments. All research subjects are healthy, displaying no physical disabilities or aberrant motor manifestations.

The basic criteria for all subjects to be included in the research active engage ment in boxing for at least a year, competing and practicing at least three times a week.

Following variables were used to determine motor abilities: T-test (MTTEST), run-step crisscross (MO-SNAV), crane exercise on a balance bench with the eyes opened (MSGOCD), crane exercise on a balance bench with the eyes closed (MSGZOD) and standing leg lift exercise with the eyes opened (MSTGOS), lifting body for 30 seconds (MP30SE), side step exercise (MCEKST), sitting hamstring stretch (MDLPSE), bench forward lean (MDLPRK), arch up exercises (MZGIVI), standing long jump (MSKDAM), leg tapping (MTAPNO), arm tapping in the frontal plane (MTAPRF), arm tapping in the sagittal plane (MATPRS), shooting long arrows toward a target (MSTMDS), shooting short arrows toward a target (MSTKST), kicking a boxing pear (MST-BKR), doing back extensions (MZTHPM),batting (MISKPAL), supine chest throw with a medicine ball weighing 1 kg (MFMPGR), seated medicine ball chest pass, with a medicine ball weighing 1 kg (MFMGST).

To estimate the specific motor capabilities following variables, i.e. motor tests, were applied: rope skipping, 10-second skip (SKI10S), rate of throwing 100 direct punches at a heavy bag (SP100D), rate of throwing 100 combined punches at a heavy bag (SP100C), 10-second two-leg hop and performing left-right cross punch (SUNPOD), 10-second two-leg hop and performing left-right hook punch (SUNPOK), 10-second two-leg hop and performing left-right uppercut (SUNPOA), cross armed defence from a left-right cross punch and applying 6 punches in the coach's palms (OBROTK), a series of 100 combined punches in the coach's palms (CEP100).

The effect of the manifested predictive system on the criterion system is determined by the canonical correlation analysis. The normality of the applied variables distribution is verified by the Kolmogorov-Smirnov test.

RESULTS AND DISCUSSION

The coefficients of the canonical correlation, the roots and their significance are shown in Table 1. The analysis shows that only one characteristic root is enough to describe the relation between the two systems of the examined variables. The relation between the first canonical vector pairs equals to .81 and describes 66% of the mutual variance of the system. Through the values of the redundant variances we can notice that amount of the data from the system of variables estimating the basic motor ability tests is greater than the amount of the data from the system of variables estimating the specific

motor ability tests. This means that by using the basic motor abilities we can predict a successful performance of the specific motor ability tests, characteristics of the boxing.

Table 1. Common roots and coefficients of the canonical correlation

R	R^2	χ^2	Df	p	Lambda
0,81	0,66	238,34	168,00	0,00	**0,03**

Table 2. Structure of the canonical factors in the system of variables determining basic motor abilities

	Variables	CAN1
1	MTTEST	**0,48**
2	MOSNAV	**0,56**
3	MCEKST	**0,48**
4	MSGOCD	-0,31
5	MSTGOS	-0,03
6	MSGZOD	-0,20
7	MTAPNO	**-0,45**
8	MTAPRF	**-0,75**
9	MATPRS	**-0,66**
10	MSTMDS	**-0,33**
11	MSTKS	**-0,34**
12	MSTBKR	**-0,35**
13	MDLPRK	-0,28
14	MISKPAL	0,05
15	MDLPSE	0,11
16	MZTHPM	**-0,34**
17	MP30SE	**-0,42**
18	MZGIVI	**-0,52**
19	MSKDAM	-0,27
20	MFMPGR	**-0,37**
21	MFMGST	**-0,54**

Table 3. Structure of the canonical factors in the system of variables-determining basic motor abilities

	Variables	CAN1
1	SPJ10S	**-0,73**
2	SB100U	**0,94**
3	SB100K	**0,69**
4	SSPLDD	**-0,47**
5	SSPZDK	**-0,44**
6	SSPLDA	**-0,42**
7	SOLDDK	**0,54**
8	S100RT	**0,62**

Table 2. shows that a statistically significant projection of the first canonical factor in the system for

the estimation of the motor abilities have the following tests: MTTEST, MOSNAV, MCEKST, MTAPNO, MTAPRF, MATPRS, MSTMDS, MSTKS, MST-BKR, MZTHPM, MP30SE, MZGIVI, MFMPGR and MFM-GST. Particularly high projections of the first canonical factor have the motor tests estimating the speed of various movements (frequency speed of punches), arm tapping in the frontal and sagittal plane where the values range from .66 to .75. The first canonical factor can be defined as a factor of power-speed coordinating abi-lities.

Among the variables that estimate specific motor tests (Table 3.), the first canonical factor has statistically significant projections in all of the tests. The highest projections of the first canonical factor have the motor tests of SPJ10S and SB100U, values ranging from .73 to .94. This factor can be defined as a specific boxing activity of the power-speed coordination.

According to the results and the prognosis of the statistically significant saturation coefficients of the first pair of statistically significant components, we can establish that boxers with better coordination, agility (the ability to efficiently change the body's direction and position), an especially better speed of various punches, better developed body, arm and torso musculature, as well as explosive power of the upper extremities, achieve better results in all motor tests typical for boxing.

The canonical correlation analysis results show that the relation between the canonical factors of the tests estimat ing the specific motor capabilities, interpreted as an integral canonical factor of the power-speed coordination of the boxers, and the canonical factor of the system of tests estimate ing the basic motor abilities, interpreted as the basic canonical factor of the power-speed coordination abilities (agility, explosive power, frequency speed of punches), is statistically significant. Thus the results support the hypothesis of the relation of both variables indicating that in order to carry out the tests for specific motor abilities boxers require basic motor ability. This ability has an integral-interactive basis which confirms that one segment of the anthropological status cannot develop if the other segments are inactive for that segment's effects. The data can be significant factors in the programming of the transformation processes in boxing, more specifically, with the development of the basic motor abilities the relative specific motor dimensions of the boxers can indirectly grow.

CONCLUSION

According to the obtained results, we can conclude that:
• A statistical significance is verified only among the first pair of the canonical factors;
• The first canonical relation in the system of the tests shows that boxers with better coordination, agility (the ability to efficiently change body direction and position), especially higher speed rate of various punches, better developed body, arm and torso mu-

sculature, as well as explosive power of the upper extremities, achieve better results in all motor tests typical in for boxing.

REFERENCE

Blašković, M. (1977). *Relacije između antropometrijskih i motoričkih dimenzija.* [Relations between anthropometric and motor dimensions. In Croatian] (Unpublished docto-ral dissertation, University of Zagreb) Zagreb: Fakultet fizičke kultrure.

Bonacin, D. (2004) *Uvod u kvantitaivne metode.* [Introduction in quantitative methods. In Croatian.] Kaštela: Vlastito izdanje.

Chatzilelekas, E. (1999). Morfološke različitosti hrvača i kara-tista [Morphological differences between wrestlers and karatekas. In Croatian]. U: D. Milanović (Ur.), *Zbornik radova, ''Kineziologija za 21 stoljeće'', Dubrovnik, 1999* (pp. 69-75) Zagreb: Fakultet fizičke culture.

Ćirković, Z. (1978). *Komparacija intenziteta udarnih inpulsa u boksu između direkta i krošea kod ispitanika sa višim i nižim stepenom uvežbanosti mernim metodama balističkog klatna.* [Comparison of the intensity of shock impulse in boxing between jabs and cross in subjects with higher and lower levels of practice measured by the ballistic pendulum methods. In Serbian.] (Unpublished Master thesis, University of Belgrade) Beograd: Fakultet za fizičku kultruru.

Doder, D. (1998). *Relacije između sistema kriterijumskih specifično motoričkih varijabli, morfoloških karakte-ristika i motoričkih spodobnosti kod karatista dečijeg uzrasta.* [Relations between the systems criterion of specific motor variables morphological characteristics and motor abilities in karatekas in childhood. In Serbian.] (Unpublished Master thesis, University of Novi Sad) Novi Sad: Fakultet fizičke kulture.

Филимонов, В. И. (2000). *Бокс. Спортивно-техническая и физичекая подготовка.* [Sport-tehnical and physical preparation. In Russian]. Москва: Инсан.

Hošek-Momirović, A. (1975). *Struktura koordinacije.* [Structure of coordination. In Croatian.] (Unpublished Master thesis, University of Zagreb) Zagreb: Fakultet fizičke kultrure.

Malacko, J., & Popović, D. (2001). *Metodologija kinezio-loško antropoloških istraživanja.* [Methodology of kine-siological-anthropological research. In Serbian.] Priština - Leposavić: Fakultet fizčke kulture.

Malacko, J., & Rađo, I. (2004). Tehnologija sporta i sportskog treninga. [Technology of sports and sports training. In Serbian.] Sarajevo: FASTO.

Savić, M. (1986a). Relacije bazičnih psihosomatskih dimenzija i specifičnih motoričkih sposobnosti boksera. [Relations of basic psychosomatic dimensions and specific motor abilities of boxers. In Serbian.] (Unpublished doctoral dissertation, University of Novi Sad) Novi Sad: Fakultet fizičke kultrure.

Savić, M. (1986). Utvrđivanje strukture psihosomatskog statusa boksera. [Determining the structure of the psycho-somatic status of the boxers. In Serbian.] *Fizička kultura, 40*(4), 266-270.

Savić, M. (1988). Uticaj prediktoskih varijabli na uspešnost izvođenja motoričkih zadataka u boksu. [The impact of the predictor variables on the successful performance of motor tasks in boxing. In Serbian.] *Fizička kultura, 42*(1-2), 45-48.

Savić, M. (1996). *Psihosomatski status boksera i razvoj moto-*

ričkih sposobnosti. [Psychosomatic status of a–boxers and the development of motor skills. In Serbian.] Novi Sad: Fakultet fizičke kultrure.

Zahorjević, A. (1976). *Validacija instrumenata za ispitivanje psihosomatskog stanja i stepena treniranosti boksera.* [Validation of the instruments for the investigation of the psychosomatic condition and the degree of the boxers' fitness. In Serbian.] Novi Sad: Zavod za fizičku kulturu.

Zulić, M., & Milošević, M. (1987). Povezanost nekih antropo-metrijskih i biomotoričkih dimenzija sa udarnim impulsom đaku zuku. [Relations between some anthropometric and biomotoric dimensions with surge pulse dzaku zuku. In Serbian.] *Zbornik radova, III. Kongresa pedagoga fizičke kulture Jugoslavije, Novi Sad, 1987* (pp. 393-396), Novi Sad: Fakultet fizičke kulture.

Savić, M. (1988). Uticaj prediktoskih varijabli na uspešnost izvođenja motoričkih zadataka u boksu. [The impact of the predictor variables on the performance of motor tasks in boxing. In Serbian.] *Fizička kultura, 42*(1-2), 45-48.

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