THE CANONICAL RELATIONS BETWEEN MORPHOLOGICAL CHARACTERISTICS AND TESTS USED TO EVALUATE EXPLOSIVESTRENGTH AMONG ELEMENTARY SCHOOL CHILDREN

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Nataša Branković, Danica Piršl, Dejan Stojiljković, Milica Petković and Jelena Radičević

University of Niš, Faculty of Sport and Physical Education, Niš, Serbia

Abstract:

The study was carried out on a sample of 46 subjects, elementary school children in Niš, aged 12, who regularly took part in their physical education classes and trained in their school sports section. The aim of the study was to determine the canonical relations between morphological characteristics, on the one hand, and the tests used to evaluate explosive strength on the other, in the case of the selected sample of subjects. The subject matter of the study was to analyze the influence of morphological characteristics on the achieved results for explosive strength. A total of 10 anthropometric measurements for morphological characteristics were used, which define the longitudinal and transversal dimensionality of the skeleton and circular dimensionality and body mass. Explosive strength was evaluated using five tests. The results of the canonical correlation analysis have indicated a significant canonical factor as well as a strong relation between morphological dimensions (as the predictor system) and explosive strength (as the criterion system).

Key words: *anthropometrical measures, motor tests, regular classes, supple mentary classes, canonical correlation analysis*

INTRODUCTION

In order to rationalize physical education and the training process within school sports sections, we need to give fresh information to our teachers. One-sided focus in the curriculum on the acquisition of ever increasing motor knowledge (which today is sometimes characteristic of the work carried out in elementary and high schools), is no guarantee that any positive transformations of anthropological characteristics will take place, nor that the motor knowledge of the school children will increase (Bala, 1981; Arunović, Berković, Bokan, Krsmanović, Madić, Matić, Radovanović & Višnjić, 1992; Branković, 1998, Bompa, 2006).

The development of abilities and skills in elementary and high schools should begin with a determination of the current state of the school children (a diagnosis of their abilities and characteristics and control), followed by the planning, programming and development of work and the analysis of the teaching process effects. This is of special importance, since it is impossible to apply any transformational exercise procedure if we have not previously determined which anthropological features and motor skills are responsible for success in certain sports activities, what their relations are, with the help of which programs, methods and loads any transformational process exercises can take place to the fullest, and the like (Branković, 2001; Hirtz & Starosta, 2002, Goodway, Crowe, & Ward, 2003).

In the studies carried out so far on high school students it has been determined that there are significant positive relations between morphological

characteristics and the results for any explosive strength tests and that both spaces are closely connected to the effectiveness of motor task performance, which is significant for the achievement of top results in the physical education process (Brown, Vance, Fergo, & Santana, 2004; Višnjić, 2006; Milanović, 2007).

We can assume that our research results will approximately be the same results for this sample of subjects, made up of elementary school children. In this study, the aim is to determine the canonical relations between morphological characteristics and the tests used to evaluate explosive strength of elementary school children.

The research results have an applicable value in terms of enabling a higher quality realization of any program tasks as part of regular and additional physical education classes. On the basis of the determined relations between the morphological characteristics and explosive strength of the subjects, we can determine the criteria for the guidance and selection of children talented at sports dominated by explosive strength.

METHODS

The research was carried out on a sample of 46 subjects, elementary school children from Niš, aged 12, all of whom took part in their after school sports section. A total of 10 anthropological measures of morphological characteristics which define longitudinal dimensionality of the skeleton were used: body height (AVIS), arm length (ADUR), leg length (ADUN); transversal dimensionality of the skeleton: shoulder width (AŠRA), pelvic width (AŠKA), hip width (AŠKU); and circular dimensionality and body mass: forearm volume (AONL), thorax volume (AOGR), upper leg volume (AONK), body mass (AMAS). Explosive strength was evaluated with the help of five tests: the standing depth jump (MSDM), the triple standing jump (MTRS), the standing quintuple jump (mpts), the standing high jump (MSVIS) and throwing a medicine ball with one hand, standing firm (MBMR). The tests were taken from the research of Kurelić, Momirović, Stojanović, Šturm, Radojević & Viskić-Štalec, (1975).

We used a canonical correlation analysis in the Statistics 7.0 program to process the data.

RESULTS AND DISCUSSION

The results of the canonical correlation analysis indicate (Table 1) that in the relations between the predictor system, which is made up of the anthropometric measurements for the evaluation of morphological characteristics and criteria, and the criterion system, which is made up the variable for the evaluation of explosive strength, a statistically significant canonical factor R was obtained which explains the extent of the correlation coefficient by 84%, which also confirms the percentage of the common variance of the determinant coefficient R^2 for both groups of variables by 70%. The canonical factor is statistically significant at the P= .000 level, which is also confirmed by the Chi square test (Chi-sqr.) with a high coefficient of 88.40.

Table 1. The canonical correlation analysis of the morphological characteristics and explosive strength

R	R^2	Chi-sqr.	p
.84	.70	88.40	.000

Table 2. The canonical factors of the anthropometric measurements

VAR.	Root 1
AVIS	.62
ADUR	.55
ADUN	.56
AŠRA	.44
AŠKA	.42
AŠKU	.46
AONL	.70
AOGR	.71
AONK	.78
AMAS	.79

Table 3. The canonical factors of the variables of explosive strength

Variables	Root 1
MSDM	.46
MTRS	-.55
MPTS	.71
MBMS	.75
MSVIS	.82

Table 4. The cross-correlational analysis of anthropometric measures of the morphological characteristics and tests of explosive strength

	MSDM	MTRS	MPTS	MBMR	MSVIS
AVIS	.54	.74	.23	-.29	.84
ADUR	.47	.55	.63	-.74	.89
ADUN	.65	.52	.23	.21	.55
AŠRA	.62	.50	.55	-.02	.46
AŠKA	-.44	-.41	.20	-.37	.87
AŠKU	-.24	.50	.10	.21	.82
AONL	-.54	-.40	.28	.42	-.49
AOTR	-.21	-.52	.50	.46	-.73
AONK	-.65	-.26	.82	.56	.54
AMAS	-.72	-.15	.78	.27	.80

Considering the extent of the canonical correlation coefficient (R) and the common variance (R^2), we can conclude that the explosive strength of the subjects can be manifested to a great extent depending on their morphological characteristics.

Table 2 shows that anthropometric measurements of circular dimensionality and body mass have the greatest projections onto the canonical factor, and as such, have influence on the results of all the tests used to evaluate explosive strength. A somewhat smaller, but still significant influence on the manifestation of explosive strength can be found in the longitudinal and transversal dimensionality of the skeleton.

Table 3 shows the obtained results which indicate great projections of the tests of explosive strength on the canonical factor. A significantly high projection of the values of the standing high jump – MSVIS (.82) and throwing a medicine ball with one hand, standing firm –MBMS (.75) on the canonical factor is probably the result of some biomechanical laws, since the structures of the performances are somewhat similar, considering the fact that in both tests the motor activity is partially realized by the activity of the upper musculature of the upper extremities of the shoulder region.

Based on the cross-correlation matrix of the anthropological measures of the morphological characteristics and variables for success at explosive strength tests (Table 4), in the case of the selected subject sample, we can determine a high value of the correlation coefficient. The explosive strength test of the standing high jump (MSVIS) shows the greatest correlation with the anthropometric measurements.

The results of the canonical correlation analysis of the selected subject sample, elementary school children from Niš, have indicated that there are significant relations between the anthropometric measurements of morphological characteristics and the results of the motor manifestations of explosive strength. By analyzing the data from these relations and their effect on the effectiveness of explosive strength, we can conclude that the anthropometric measurements of the circular dimensionality of the skeleton are the most informative: forearm volume (AONL), thorax volume (AOGR), upper leg volume (AONK) and body mass (AMAS), and that because of that, they can be used effectively in the selection procedure and development both in regular and additional physical education classes and in the training process of elementary school children at this age.

The research results of some authors (Željaskov, 2004; Milanović, 2007; Duraković, 2008) indicate that the interpretation of the indicators of the overall fitness of school children as a rule is not possible without knowledge of morphological dimensions and explosive strength, since their levels are the basis for setting goals and tasks in the teaching and training process of school children, especially athletes. Some periods in the development of school children and young athletes are especially suitable for the development of explosive strength, which is characterized by speed-explosive features. These periods are known as the sensibility phases.

Some researchers (Goodway et al. 2003; Bompa, 2006)), indicate that the development of speed-explosive features, which characterize explosive strength, depend on the early start of

work on their improvement, and the most favorable sensibility phases for development are those years prior to puberty and following the period of increased growth and development. These features can be developed to a certain extent even in the final phases of growth and development (at the cadet and junior age) since the tendons and ligaments are developed to a satisfactory extent at this stage.

CONCLUSION

Our determination of the canonical relations between morphological characteristics and tests of explosive strength was carried out on a sample of 46 subjects, elementary school children from Niš, aged 12, who regularly took part in their physical education classes and training sessions as part of their school sports section. The explosive strength space was evaluated by using five tests, while the morphological characteristics were evaluated by means of 10 anthropometric measurements.

The values obtained by the canonical correlation analysis indicate a high inter-correlation between the variables in both groups. A significant canonical factor was obtained, which indicates the significant positive connection between morphological characteristics and explosive strength, and was thus interpreted as a dimension of the general connection between these two spaces. From the structure of this factor it is clear that measurements of circular dimensionality and body mass have the greatest influence on motor activities, while the influence of the remaining measurements are somewhat smaller.

The structure of the canonical factor indicates that in the realization process of regular and additional physical education classes, special attention should be paid to the development of anthropometric measurements determined to be statistically significant, since our research has shown that they are of primary importance for success in motor activities of an explosive character.

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КАНОНИЧКИ РЕЛАЦИИ НА МОРФОЛОШКИТЕ КАРАКТЕРИСТИКИ И ТЕСТОВИТЕ ЗА ПРОЦЕНУВАЊЕ НА ЕКСПЛОЗИВНАТА СНАГА КАЈ УЧЕНИЦИТЕ ОД ОСНОВНИТЕ УЧИЛИШТА

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(Оригинален научен труд)

Наташа Бранковиќ, Даница Пиршл, Дејан Стојиљковиќ, Милица Петковиќ и Јелена Радичевиќ

Универзитет во Ниш, Факултет за спорт и физичко воспитување, Ниш, Србија

Апстракт:

Истражувањето е остварено на примерок од 46 испитаници, ученици од основните училишта во Ниш, на возраст од 12 години кои беа опфатени со редовна настава по физичко воспитување и тренажна работа во Училишна спортска секција. Целта на истражувањето беше да се утврдат каноничките релации на некои морфолошки карак-те-ристики и одредени тестови за проценување на експлозивната снага кај учениците од основните училишта. Проблемот на истражувањето беше егзистенцијата на поврзаноста на тие карактеристики со резултатите од тестовите за проценување на експлозивната снага и евентуално дали таа е статистички значајна на прифатливо ниво за нејзината доволна генерализација. Применети се 10 антропометриски мерки за дефинирање на лонгитудиналната, трансферзалната и циркуларната димензионалност, како и масата на телото. Исто така, се применети и пет моторни тестови за проценување на експлозивната снага кај третираниот примерок на испитаниците. Резултатите на каноничката корелациска анализа покажаа дека морфолошките димензии, третирани како предикторски систем и резултатите на моторните тестови, третирани како критериумски систем, за проценување на моторната способност – експлозивна снага, се дефинирани со поврзаност на еден статистички значаен канонички фактор.

Клучни зборови: *антропометриски мерки, моторни тестови, редовна настава, дополнителна настава, каноничка кореционa анализа*