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CANONICAL RELATIONS OF MORPHOLOGICAL DIMENSIONS AND FLEXIBILITY OF SELECTED SCHOOLCHILDREN FOR SPORT

Abstract

This research was conducted on a sample of 104 subjects, selected for sport, in East Sarajevo, aged 11 years \pm 6 months. The aim of the research was to determine canonical relations of morphological dimensions and tests for the estimation of flexibility in the subjects selected for sport. Research problem was to investigate the degree of the influence morphological dimensions exert on the flexibility results. There were applied seven anthropometric measures which define the following: circular dimensionality, body mass and subcutaneous adipose tissue. Flexibility was estimated by means of three tests. Results of the canonical correlation analysis have shown that between morphological dimensions (as a predicting system) and flexibility (as a criterion system) there is one significant canonical factor and high correlation.

Key words: *schoolchildren athletes, morphological dimensions, flexibility, canonical correlation analysis.*

1. INTRODUCTION

Effects of the training process management depend on the degree of which the collected data enable the insight into the state of the anthropological characteristics of the athletes. Apart from that it is of vital importance to determine the guidelines of their transformations and at the same time to obtain constant feedback information on the working results and their advancement.

This is achieved according to some researchers (Matvejev, 2000; Željaskov, 2004; Milanović, 2007) by means of the qualitative methodological modelling of the training process whose basics is characterised by the planning process and programming of the working process, methods of work and correct dosing of the volume and the load intensity according to the individual abilities and characteristics of the athletes.

In sport and various sports disciplines one strives to achieve top sports results by

revealing maximal abilities and characteristics of the athletes, whereby one targets training activities to be focused on the development of primarily those anthropological characteristics which condition and shape achievement of the sports success, which is in turn reflected in the equation of the specification of the single sports.

Most success in sport will be achieved by those subjects whose anthropological characteristics are the nearest to the equation of the specification (targeted state) of the sports activity by which one realizes already envisaged and defined objective of the transformation.

Diagnosis of the factors which condition the success in certain sports activity is not only important for the adequate direction and selection but also for the programming and implementation of the process of exercising and monitoring of the manifested working effects. This is so because it is hardly possible to administer transformation procedure if one does not know which abilities and characteristics compose the success and how much one single ability and one single characteristics is important, whereby assuming that the influence of the learning process on certain ability and certain characteristics is possible at all (Pržulj, 2012).

With the implementation of such a procedure one provides reliable dataset for taking eventual corrective measures and interventions in the practical realization of the working program (Malacko, 2004; Bompa, 2006). Such kind of research was conducted by many authors on the sample of athletes and non-athletes, school age children. Large body of research has also shown that there is statistically significant correlation of the morphological characteristic with the results of the motor abilities of the elementary schoolchildren and high school students attending and following the regular physical education curricula and teaching process (Stojanović et al., 1980; Stojiljković, 2005; Višnjić, 2006.).

Connecting to this domain the problem of this research is defined as the effort to find out statistically significant relations between the single latent dimensions of the morphological characteristics and dimensions of the flexibility. These are important in single sports activities to check on the one hand, anthropological harmony in the athletes of this age and on the other hand, to realize targeted training technology and to justify the choice of the programs and curricula contents envisaged for the development of the ability and characteristics.

The aim of the research was to determine statistically significant relations between the system of the anthropometric measures of the circular dimensionality, body mass and subcutaneous adipose tissue, on the one hand, and variables of flexibility on the other hand, in fifth grade elementary schoolchildren selected for sport. The obtained research results would be used to check out the harmonization of their development and if possible to determine adequate and targeted projections of their further development.

2. METHODS

This research was conducted on a sample of 104 subjects, selected for sport, in East Sarajevo, aged 11 years \pm 6 months.

There were applied seven anthropometric measures of the morphological dimensions: 1. circular dimensionality and body mass: mean diameter of chest (AOGRK), diameter of upper arm (AONDL), diameter of lower leg (AOPTK) and body mass

(ATEŽT); 2. subcutaneous adipose tissue: abdominal skin fold (ANTRB), upper arm skin fold (ANNAD); lower leg skin fold (ANPTK). Proposed model of the sample of the anthropometric measures for the estimation of the morphological characteristics was used on the bases of the recommendations of the International Biological Program (Lohman et al., 1988).

Flexibility is composed of the following tests: deep forward bend on the bench – hyperextension test (MDPK), balancing on the beam (MŠPA) and side step with a baton (MISP). Data were processed by means of the canonic correlation analysis. Measuring instruments for the estimation of the morphological characteristics were taken from the research studies of Kurelić et al., 1975.

To determine relations of the morphological characteristics and repetitive strength software SPSS 12.0 and Statistika 7.0 were used.

3. RESULTS

Table 1. Canonical correlation analysis of morphological characteristics and flexibility

R	R²	Chi-sqr.	df	p
.63	.39	60.44	80	.000

Legend: coefficient of canonical correlation (R), coefficient of determination (R²), Chi-sqr. Test), degree of freedom, significance (p)

Results of the canonical correlation analysis (Table 1) show that in relations between the system of predictors, which is composed of the anthropometric measures for the estimation of the morphological characteristics and the criterion, composed of the variables for the estimation of the flexibility, there was obtained one statistically significant pair of the canonical factors.

Canonical factor significantly accounts for the level of the correlation of the set of the predicting variables with the criterion (R=.63), as well as their common variance (R²=.39), whereby the influence of the morphological characteristics on the success in flexibility is explained by the coefficient of determination with 39%. Canonical factor is statistically significant on the level of P = .000, which in turn confirms Chi-sqr. Test with high coefficient (60.44).

Probability of mistake for the rejection of the hypothesis on whether the function is significant or not was determined between the predictor and the criterion (P=.000) on the level of 99%.

Considering the coefficient of the canonical correlation and mutual variance one can draw a conclusion that the flexibility of the subjects will be manifested to great extent depending on their morphological characteristics.

Table 2. Canonical factors of anthropometric measures

Anthropometric measures	Root 1
AOGRK	0.21
AONDL	0.41
AOPTK	0.38
ATEŽT	0.27
ANTRB	-0.32
ANNAD	-0.35
ANPTK	-0.32

Having insight into the structure of the canonical factors (Table 2) it can be stated that primary factors of the morphological characteristics do not participate equally in the formation of the structure of canonical factor, and this means that this canonical dimension is slightly differing from the general factor. It can also be stated that larger number of factors influences efficiently results of the variables of flexibility, whereby one has to bear in mind that their influence is different. The greatest influence is exerted by the factors: diameter of the forearm (AONDL -0.41) and diameter of the lower leg (AOPTK -0.38).

Table 3. Canonical factors of criterion variables of flexibility

Variables	Root 1
MDPK	-0.52
MŠPA	0.46
MISP	-0.34

Canonical factors of flexibility (Table 3) point towards the existence of the onedimensional structure of the area. Factor of the success of flexibility is best defined by the tests: deep forward bend on the bench – (MDPK -0.52) and balancing on the beam (MŠPA 0.46).

Table 4. Cross-correlation analysis of anthropometric measures and flexibility

	MDPK	MŠPA	MISP
AOGRK	0.22	-0.12	0.31
AONDL	0.42	-0.45	-0.45
AOPTK	0.45	-0.48	0.47
ATEŽT	0.21	-0.28	-0.28
ANTRB	0.32	-0.35	-0.35

ANNAD	0.26	-0.24	-0.12
ANPTK	0.49	-0.12	-0.17

From the matrix of the cross-correlation analysis of anthropometric measures and variables of success in flexibility (Table 4), in subjects, one can notice differing level of the coefficient of correlation. Success in flexibility is significantly contributed and enhanced by the anthropometric measures diameter of the forearm (AONDL) and diameter of the lower leg (AOPTK).

4. DISCUSSION

In recent years the emergence and application of the multivariate mathematical-statistical methods of the data processing enhanced more sophisticated solving of the problem of correlations between the single segments of the anthropological status.

Results of the canonical correlation analysis in Tables 1 to 4 show that anthropometric measures (mean diameter of chest, diameter of upper arm, diameter of lower leg, body mass and subcutaneous adipose tissue as predicting system have statistically significant correlations ($P = .000$) with the achieved results of flexibility (deep forward bend on the bench – hyperextension test (MDPK), balancing on the beam (MŠPA) and side step with a baton (MISP) in selected athletes.

This practically means that in manifesting of flexibility in motor activities morphological dimensions participate almost in similar rate and this further points out that selected athletes of this age manifest their morphological characteristics on the integral basis but with the individual (univariate) statistically significant influence of the anthropometric measures for the estimation of the flexibility.

Flexibility can be defined as the ability of the muscles to manifest the force in cyclic regime of work (Malacko and Rađo, 2004; Pržulj, 2006). Most frequent measure of this ability is maximal amplitude of the movement of the body part in joint systems. In some sports it is important to achieve higher flexibility in all parts of the locomotor system, whereas in some other sports demands for the enlarged flexibility are not so emphasised.

Relations between the motor abilities and morphological characteristics have shown that manifest and latent indicators of the energy outlet in males is under strong positive influence of the morphological dimensions of the volume and body mass while in females this influence is significantly weaker.

Previous reserach results show that there exists great influence of the morphological dimensions on the realizations of most motor tasks of the flexibility, which means that it is necessary to perform their paralel studies (Alter, 1996; Pržulj and Cicović, 2011; Milanović, 2007).

Having in mind that the coefficient of the inherited circular dimensionality is around 90 %, there is the possibility of the development, but in a very small percentage, so it is recommended to develop it together with all other morphological characteristics and this

really means very early in childhood (Malacko, 2002). Subcutaneous adipose tissue almost in all sports activities represents parasite factor with the possible .50% of transformation. In both sexes dimension of the subcutaneous adipose tissue has extremely negative influence on the indicators of the energy outlets, especially on the body parts where there is stronger predisposition for fat tissue accumulation. Flexibility represents a significant factor in sport with the possibility of .50% of transformation.

5. CONCLUSION

Results of the research point out that between the anthropometric measures predicting system and the results of the flexibility as the criterion there is statistically significant correlation, which is corroborated by high projections of the measures of the morphological dimensions and the tests of flexibility on the canonical factor. The obtained results of this research will certainly contribute to more rational mode of work with the selected athletes in elementary schools in that in training process special attention will be drawn to the development of those morphological dimensions (circular dimensionality of the skeleton and body mass) and they mostly and primarily explain achieved results in the flexibility and this in turn will bring better sports results. Besides, results of the morphological dimensions and flexibility will contribute to the more individualized mode of work in such a manner that planning, programming, implementation and monitoring of the work will be in line with the individual abilities and characteristics of the selected athletes.

6. REFERENCES

1. Alter, J. M. (1996). *Science of Flexibility*. Champaign, IL: Human Kinetics.
2. Bompa, T. (2006). *Teorija i metodologija treninga*. Zagreb: Nacionalna i sveučilišna knjižnica.
3. Kurelić, N., K. Momirović, M. Stojanović, J. Šturm, Đ. Radojević i N. Viskiće-Štalec (1975). *Struktura i razvoj morfoloških i motoričkih dimenzija omladine*, Institut za naučna istraživanja. Beograd: Fakulteta za fizičko vaspitanje.
4. Lohman TG, Roch AF, Martorell R. *Anthropometric standardization reference manual*. Chicago: Human Kinetics Books. 1988.
5. Malacko, J. (2002). *Sportski trening*. Novi Sad: Fakultet fizičke kulture.
6. Malacko, J. Rađo, I. (2004). *Tehnologija sporta i sportskog treninga*. Sarajevo: Fakultet sporta i tjelesnog odgoja.
7. Milanović, D. (2007). *Teorija treninga - Priručnik za studente sveučilišnog studija*. Zagreb: Kineziološki fakultet Sveučilišta u Zagrebu.
8. Pržulj, D. i Cicović, B (2011). Metrijske karakteristike testova za procjenu fleksibilnosti kod školske djece. *Sport i zdravlje*, Naučno-stručni časopis iz oblasti fizičkog vaspitanja i sporta. Pale: Fakultet fizičke kulture i sporta
9. Pržulj, D. (2006). *Antropomotorika*. Istočno Sarajevo: Fakultet fizičke kulture.
10. Pržulj, D. (2007). *Kondiciona priprema sportista*, Udžbenik. Pale: Fakultet fizičke kulture.
11. Pržulj, D. (2012) *Dijagnostika antropoloških obeležja i treniranosti sportista*, Udžbenik. Pale: Fakultet fizičkog vaspitanja i sporta.
12. Stojiljković, S. (2005). *Osnove opšte antropomotorike*. Niš: Studenski kulturni centar.

13. Željaskov, C. (2004). Teorija i metodika treninga izdržljivosti. U D. Milanović i I. Jukić (Ur.), *Međunarodni znanstveno-stručni skup „Kondicijska priprema sportaša“* (str. 239-245). Zagreb: Kineziološki fakultet Sveučilišta u Zagrebu, Zagrebački Športski Savez.

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