NEURAL NETWORK ANALYSIS OF SOMATOTYPE DIFFERENCES AMONG MALES RELATED TO THE MANIFESTATION OF MOTOR ABILITIES

Damjan Jakšić and Milan Cvetković

Faculty of Sport and Physical Education, Novi Sad, Serbia

Original scientific paper

Abstract
In order to determine somatotypes and their individual relationship with motor abilities anthropometric measurements and motor testing were applied on a sample that included 99 male subjects, all of which were the 7th- and 8th-grade students in primary schools in five cities in Vojvodina. Among the population of the students three somatotypes were identified: astenomorphs (41.4%), meso-ectomorphs (31%) and endomorphs (25%). In case of motor abilities the best type turned out to be the meso-ectomorphs who appeared as the dominant ones in all types of motor abilities assessment, except for in the tests where no difference between morphological types was observed (Arm plate tapping and Crossed-arm sit-ups). Members of this somatotype are identified as accelerants and it might be one of the possible reasons for its dominance.

Key words: *ectomorphy, meso-ectomorphy, endomorphy, 15-years-old*

Introduction and aim

Constitution represents a specific pattern of structural-morphological, physiologically functional and psychological cognitive-conative features of a person which distinguish this person from all the others (Pende, 1929; Tucker, & Less, 1940; from: Mišigoj-Duraković, 2008). There has been a lot of interest in identifying a morph type. The first researches date back to far in the past, at the time of Hippocrates, who observed the type differentiation of the people with respect to their constitution. The research carried out by Kretschmer (1926, 1955), and then Conard (1963) are considered to be the beginnings of a modern definition of morphological types. Their findings are based on the aetiology of the formation of constitutional type.

A somewhat different approach was used by Sheldon, Stevens, & Tucker (1940) and Sheldon, Dupertuis, & McDermott (1954) whose starting point was the hypothesis that only organic systems, as parts of three types of development (endoderm, mesoderm and ectoderm) show a different tendency in growth and development. In this way, Sheldon et al. (1940; 1954) proposed a classification according to the dominance of one of the three embryonic components. Distinguished researchers working in our region would include Saltykow, a pathologist, Škrelj, a Slovenian anthropologist, as well as the entire team of researchers gathered around Momirović. The last-named have provided a whole series of recommendations. And have proposed new algorithms which have their practical implementation only in defining morpho-typologies. In the paper written by Momirović, Hošek, Prot, & Bosnar (2003) there are listed instructions necessary to follow in order to achieve satisfactory success in defining of somatotypes. It is said here that it is necessary to fulfill three fundamental conditions:

1. it is necessary to choose a sufficient number of respondents who are representative of the population, who are of the same sex and who are undergoing a specific phase of morphologic development,
2. it is necessary to make a good choice of anthropometric variables and strictly follow the technique of measuring, and
3. probably, the hardest condition to fulfill – it is necessary to make a selection of adequate taxonomic algorithms; because it is widely known that cluster problems do not have a solution in a closed algebraic form.

There are a huge number of such algorithms today and the biggest problem is the selection of algorithm, which is necessary to be discriminative enough to distinguish quality clusters, with satisfactory efficiency ratio algorithm, and without the risk of distinguishing pseudo taxons. Another important condition and necessary to fulfill is that the used variables must be normally distributed, because almost all the anthropometric variables, except for skin folds, in any population of any age are normally distributed.

Lately, the most up-to date method for defining somatotypes has been the one according to Carter (1970, 1984a, 1984b) and especially to Carter, & Heath (1992), who gave the formulas abundant in adjustable, regression coefficients which identified three main constitutional types, but also defined the mid-types on the basis of the results obtained by calculating the implementation of the formula. In addition to this, in the same publication the same authors have one whole chapter dedicated to issue of the relationship between somatotypes occurring in some sports and how successfully their motor abilities are expressed. The aim of this paper is to analyze and point to this issue. Therefore, the aim of this paper is to identify constitutional types in the sample of young males and to determine the differences in the manifestation of somatotypes in motor abilities.

Methods

The data used in the work were collected within the scientific project carried out by the Faculty of Sport and Physical Education - "Anthropological Status and Physical Activity of the Population in Vojvodina", and financed by the Provincial Secretariat for Science and Technology. The sample consisted of 99 respondents whose average age was 14.71 (± 0.38) in decimal years, all males and all students of the schools in Vojvodina, attending the 7th and 8th grade of elementary school. The sample students were from five cities of Vojvodina: Novi Sad, Bačka Palanka, Sombor, Zrenjanin and Sremska Mitrovica. All of them underwent a battery of anthropometric measures and motor tests. The applied anthropometric measures were the following ones: Body height, Body weight, Chest girth, Midarm girth, Forearm girth, Abdominal skinfold, Subscapular skinfold, Triceps skinfold, Abdominal girth. The above-mentioned measures are the best manifestation of morphological latent dimensions: longitudinal skeleton dimensionality, circumference and body mass and subcutaneous adipose tissue (according to e.g. Viskić-Štalec, 1974; Kurelić, Momirović, Stojanović, Šturm, Radojević, & Viskić-Štalec, 1975; Stojanović, Solarić, Vukosavljević, & Momirović, 1975). All anthropometric measures were measured following the recommendations of the International Biological Program formed by qualified measurers. The motor measuring instruments included the following battery: For assessing the speed: 20-m dash, For assessing the coordination: Obstacle course backwards and a three balls slalom, For assessing the speed of alternative movements: Arm plate tapping, For assessing flexibility: Forward bend, For assessing the explosive power of the lower extremity: Standing broad jump, For assessing the static strength of hand and shoulder region: Bent-arm hang, For assessing the repetitive strength of the body: Crossed-arm sit-ups. The above-mentioned tests were measured following the recommendations given by Metikoš, Prot, Hofman, Pintar, & Oreb (1989). In order to determine the morphological clusters a taxonomic neural network was used with the code name Intruder and written in the Matrix programming language so that it could be performed in a standard SPSS environment. The algorithm and a formal mathematical explanation can be found in Momirović (2001). Having obtained the somatotypes in this manner, their defining was carried out based on previous experience. The differences between somatotypes in motor abilities were determined using a multivariate analysis of variance in a complete motor space and a univariate analysis of variance for each motor manifestation separately. The differences between somatotype pairs in each motor test were calculated using the Bonferroni's Post Hoc test.

Results

The tables 1 to 14 show the results obtained by means of a taxonomic neural network Intruder.

Table 1. Input to hidden layer axons

Variable	f1	f2
Body height	0.75	0.35
Body weight	1.02	-0.10
Chest girth	0.17	-0.17
Midarm girth	-1.23	-0.89
Forearm girth	-0.56	-0.60
Abdominal skinfold	-0.46	0.29
Subscapular skinfold	0.14	0.17
Triceps skinfold	-0.07	0.81
Abdominal girth	-0.09	0.05

f = functions

Table 2. Hidden layer to output axons

	g1	g2	g3
F1	0.409	0.336	-0.848
F2	0.736	-0.671	0.089

g = groups

Table 3. Initial and classification in the 1.

	g1	g2	g3
G1	30	0	1
G2	5	32	1
G3	3	1	26

Table 4. Number of objects and accordance

	number	progn.	accord
g1	31	30	0.968
g2	38	32	0.842
g3	30	26	0.867

Table 5. Final input to hidden layer axons

Variable	g1	g2
Body height	0.27	1.14
Body weight	1.64	-1.15
Chest girth	0.15	-1.03
Midarm girth	-1.79	-0.68
Forearm girth	-0.32	-0.19
Abdominal skinfold	-0.83	0.16
Subscapular skinfold	0.02	0.16
Triceps skinfold	0.14	0.94
Abdominal girth	-0.04	0.84

Table 6. Final hidden layer to output axons

	g1	g2	g3
G1	0.43	0.23	-0.87
G2	0.56	-0.83	0.06

Table 7. Centroids of final taxons

Variable	g1	g2	g3
Body height	-0.07	0.59	-0.53
Body weight	-0.55	0.59	0.17
Chest girth	-0.62	0.66	0.21
Midarm girth	-0.79	0.38	0.75
Forearm girth	-0.76	0.61	0.47
Abdominal skinfold	-0.44	-0.34	1.00
Subscapular skinfold	-0.37	-0.26	0.82
Triceps skinfold	-0.27	-0.55	0.98
Abdominal girth	-0.59	0.25	0.61

Table 8. Discriminant coefficients

Variable	g1	g2	g3
Body height	0.76	-0.88	-0.17
Body weight	0.06	1.33	-1.50
Chest girth	-0.52	0.88	-0.19
Midarm girth	-1.15	0.15	1.53
Forearm girth	-0.25	0.08	0.27
Abdominal skinfold	-0.27	-0.32	0.73
Subscapular skinfold	0.10	-0.12	-0.01
Triceps skinfold	0.59	-0.74	-0.07
Abdominal girth	0.46	-0.71	0.09

Table 9. Correlations of discriminant functions

	g1	g2	g3
G1	1.00	-0.52	-0.61
G2	-0.52	1.00	-0.36
G3	-0.61	-0.36	1.00

Table 10. Structure of discriminant functions

Variable	g1	g2	g3
Body height	-0.07	0.52	-0.40
Body weight	-0.55	0.51	0.13
Chest girth	-0.63	0.57	0.16
Midarm girth	-0.80	0.33	0.56
Forearm girth	-0.77	0.53	0.35
Abdominal skinfold	-0.44	-0.30	0.75
Subscapular skinfold	-0.37	-0.22	0.61
Triceps skinfold	-0.27	-0.48	0.74
Abdominal girth	-0.60	0.22	0.45

Table 11. Pattern of discriminant functions

Variable	g1	g2	g3
Body height	-0.06	0.38	-0.29
Body weight	-0.34	0.35	0.05
Chest girth	-0.39	0.39	0.06
Midarm girth	-0.49	0.20	0.34
Forearm girth	-0.47	0.35	0.19
Abdominal skinfold	-0.26	-0.25	0.50
Subscapular skinfold	-0.22	-0.19	0.41
Triceps skinfold	-0.15	-0.37	0.51
Abdominal girth	-0.36	0.13	0.28

Table 12. Standardized discriminant coefficients

Variable	g1	g2	g3
Body height	0.76	-0.76	-0.13
Body weight	0.06	1.15	-1.12
Chest girth	-0.52	0.77	-0.14
Midarm girth	-1.16	0.13	1.14
Forearm girth	-0.25	0.07	0.20
Abdominal skinfold	-0.27	-0.28	0.55
Subscapular skinfold	0.10	-0.11	-0.01
Triceps skinfold	0.59	-0.64	-0.05
Abdominal girth	0.46	-0.61	0.06

Table 13. Neural network and Fisherian classification

	g1	g2	g3
G1	41	0	0
G2	0	30	0
G3	0	3	25

Table 14. Number of objects and accordance of classification

	number	progn.	diff.
g1	41	41	0
g2	30	30	0
g3	28	25	3

Based on the results obtained by neural network Intruder, listed in Tables 1 to 14, three constitutional types are naturally identified. The first constitutional type, including 41.4% of the population of 7th- and 8th-grade students, was identified to be typical of the respondents of average height, but with significantly reduced values with respect to the circumference and body mass, as well as subcutaneous fatty tissue. This precisely represents their main characteristic. This group of respondents is also found by Momirović et al. (2003) and recognized as an astenomorphic somatotype. Following the completion of classification, the second constitutional type including 31% of the population of 7th- and 8th-grade students seems to be characterized by the above average values in the field of longitudinal and muscle mass, with a significantly reduced value of subcutaneous fatty tissue. This type can be identified as mesomorphic somatotype, however, not clearly identified but with a significant portion of ectomorphic somatotype.

Yet, the identification has a tendency towards meso-ectomorphs. The third constitutional type, which incorporates 25% of the population, is characterized by the sub average longitudinal dimensions of the skeleton and above average amount of muscle mass and a significant amount of subcutaneous fatty tissue.

This somatotype is defined as endomorphic. In addition to this, it must be pointed out that the efficiency coefficient of Intruder neural network in this case was 97%, which is by all means satisfactory, but 3 subjects were not classified as members of any of the three groups, nor were they found to form a separate special taxon of their own.

Table 15. The somatotypes differences in motor performaance tests

Variable	*I Astenomorphy*	*II Meso-ectomorphy*	*III Endomorphy*	f	p
20-m dash (0.1s)	39.54±3.67	36.90±2.92	40.48±4.11	**7.86**	**0.00**
Obstacle course backwards (0.1s)	138.68±32.10	127.27±22.38	163.22±89.39	**3.45**	**0.04**
Slalom with 3 balls (0.1s)	307.80±67.70	286.00±47.73	330.93±65.75	**3.77**	**0.03**
Arm plate tapping (freq.)	31.68±3.71	32.03±5.61	29.79±5.63	1.41	0.25
Forward bend (cm)	44.95±8.07	52.03±9.84	45.96±7.99	**6.25**	**0.00**
Standing broad jump (cm)	195.41±24.99	210.77±26.20	181.96±31.52	**7.96**	**0.00**
Bent-arm hang (0.1s)	444.63±187.28	542.60±232.07	364.50±242.08	**4.78**	**0.01**
Crossed-arm sit-ups (freq.)	42.93±7.19	44.57±7.30	41.71±6.87	0.98	0.38
				F=1.89	**P=0.03**

mean±standard deviation; f-univariate f-test; p-significance of univariate test; F-multivariate F-test; P-significance of multivariate F-test

Table 16. Results of Bonerroni's post hoc test

Variable	ST		MD	p
20-m dash	I	II	2.64	0.01
	I	III	-0.94	0.88
	II	III	-3.58	0.00
Obstacle course b.	I	II	11.42	1.00
	I	III	-24.54	0.19
	II	III	-35.96	0.04
Slalom with 3 balls	I	II	21.80	0.43
	I	III	-23.12	0.40
	II	III	-44.93	0.02
Arm plate tapping	I	II	-0.35	1.00
	I	III	1.68	0.51
	II	III	2.03	0.37
Forward bend	I	II	-7.08	0.00
	I	III	-1.09	1.00
	II	III	6.00	0.03
Standing broad jump	I	II	-15.35	0.06
	I	III	13.45	0.15
	II	III	28.80	0.00
Bent-arm hang	I	II	-97.97	0.20
	I	III	80.60	0.42
	II	III	178.56	0.01
Crossed-arm sit-ups	I	II	-1.64	1.00
	I	III	0.96	1.00
	II	III	2.60	0.52

I – Astenomorphy, II – Meso-ectomorphy, III – Endomorphy, St = somatotypes, MD = mean difference, p=probability

The table 15 indicates that in the multivariate space of motor abilities there are statistically significant differences between the somatotypes.

The level of this difference is P=0.025. Moreover, in the case of the majority of other motor skills assessed by the applied battery of tests statistically significant differences occurred. Only in the tests of Arm plate tapping and Crossed-arm sit-ups no differences were found at a statistical significance level. By means of Bonerroni's test differences between two groups were observed. In the first motor test, 20-m dash, the differences were statistically significant between astenomorphic and meso-ectomorphic persons (p=0.009) and between meso-ectomorphic and endomorphic persons (p= 0.001).

The Backward Obstacle Course test indicates statistical significance between meso-ectomorphic and endomorphic somatotypes (p=0.035). In the Three-balls Slalom test a difference was found in motor performance, but also in the previous tests, between meso-ectomorphic and endomorphic somatotypes (p=0.022). The Arm Plate Tapping test is one of the two tests in which there is no statistically significant difference. Another test where no statistical significance was observed is Crossed-arm sit-ups. In the Forward bend test the differences were observed between astenomorphic and meso-ectomorphic somatotype (p=0.003) and meso-ectomorphic and endomorphic type (p=0.032). Between the types of meso-ectomorphs and endomorphs differences occurred in the Standing broad jump test at the level of p=0.000 and Bent-arm hang at the level of p=0.008.

Discussion and conclusion

Clear identification of three taxons implies that it is possible to determine which somatotypes we belong to at any period of our lives. Approximately at the age of 15 the differences depend on many external factors such as food, air conditioning, etc., but most often it depends on the period when an individual enters the phase of puberty. Puberty, described as the most turbulent period in life and development that male persons enter in the period between the ages of 12 and 16, i.e. at the age of 14 on average, according to Mišigoj-Duraković (2008), seems to have a highly significant impact on the identification of somatotypes.

In this paper, we identified three somatotypes, which are practically observed, but which were not determined on the basis of whether one of the respondents was an accelerant. Taxons as hereby defined showed differences in the performance of certain motor skills. No differences were found with respect to the speed of alternative movements of the dominant hand, which only depends on the crossing neuro-motor roads in Pons and prolonged marrow and is not at all related to somatotypes. In addition, the differences did not occur, perhaps unexpectedly, in body repetitive forces. However, when interpreting these findings we must take into account the fact that the test was not suitable for this age. Differences would almost certainly occur if the modification of the test was directed towards the maximum performance, or if the performance time in the test was increased.

In other motor skills the differences between meso-ectomorphs and endomorphs occurred on a regular basis. This came as no surprise as these two types of somatotypes the Carter-Heat's (1992) chart of morphological types appeared to be the most distinctive ones. In addition, the results of all the tests point to the meso-ectomorphic type, since the fat tissue accumulation, which is the characteristic of endomorphy, as well as the reduced body height value, which implies the delayed development, undoubtedly represent aggravating circumstances in the manifestation of motor abilities. Furthermore, fat tissue accumulation can be a sign of hypokinesis, as well as of inadequate food that people in this region are prone to (Nićiforović-Šurković, Kvrgić, & Ač-Nikolić, 2002; Obradović, Milošević, & Srdić, 2007; Milošević, Obradović, & Srdić, 2007). What is interesting is the fact that the body mass values are on the side of meso-ectomorphic taxon, but that mass is a consequence of the increased value of circumference, resulting from the quality muscle mass.

Thus, it is possible to claim that people classified into this somatotype are either more physically active or are athletes, which certainly contributes to a better quality of motor manifestation. The differences between astenomorphic and meso-ectomorphic somatotypes were found with respect to speed and flexibility, and in both cases they are in favour of a meso-ectomorphic type.

All this considered, looking back upon the growth and development stage in which the subjects are, we may conclude that the members of meso-ectomorphic type are accelerants, in the case of which the process of becoming mature started a little earlier and where the entire anthropological status developed somewhat earlier. According to Tanner (1986), Medved, R., Matković, Mišigoj-Duraković, & Medved, V. (1989a) and Medved, Mišigoj-Duraković, Matković, & Pavičić (1989b), the principal manifestation of a rather early entry into puberty would be height, or pubertal Peak Height Velocity (PHV), which can be seen here as exceeding the average value to a considerable extent.

On the whole, it is possible to conclude that taxons identification is clearly obvious. Each of the three taxons comes with its morphological characteristics, in the motor space, too. A remarkably important period in terms of growth and development of an individual is identified through somatotypes. However, the identified somatotypes only modestly look like Kretshmer's, Sheldon's, Momirović's, Carter-Heat's somatotypes. According to Carter-Heath clear identification is not possible, but it is the most accurate one. Astenomorphic type was clearly identified in this sample, while the other two were not. The second type - meso-ectomorphic type - which proved to be the best in motor sense was identified, but with the emphasized height, which is more common in astenomorphic types. However, characteristics that make a distinction between meso-ectomorphic and astenomorphic types, i.e. somewhat greater circumferences and considerably reduced amounts of sub fatty tissue, were in this case more dominant indicating meso-ectomorphy. The consequences of the increased height were probably the development periods of the subjects, which were also found to have the role of accelerants to a considerable degree. The third somatotype, astenomorphic type, observed by Momirović et al. (2003) is also clearly defined; it includes the largest percentage of the population and represents a 'golden mean' in the manifestation of motor abilities.

References

Carter, J.E.L. (1970). The Somatotypes of Athletes: A Review. *Human Biology,* 42, 535-569.

Carter, J.E.L. (1984a). *Physical Structure of Olympic Athletes.* Part II: Kinanthropometry of Olympic Athletes. Medicine and Sport Science. New York-Basel: Karger.

Carter, J.E.L. (1984b). Somatotypes of Olympic Athletes from 1948 to 1976. In J. E. L. Carter (ed.), *Physical Structure of Olympic Athletes.* Part II. Kinanthropometry of Olympic Athletes, (pp. 80-109). Basel: Karger.

Carter, J.E.L., & Heath, B.A. (1992). *Somatotyping – Development and Applications.* Cambridge: Cambridge University Press.

Conard, K. (1963). *Der Konstitutionstypus.* Berlin-Göttingen-Heidelberg: Springer-Verlag.

Kretschmer, E. (1926). Konstitutionsmischung bei gesunden Ehepaaren. *Dtsch. med. Wsc.*, 20-22.

Kretschmer, E. (1955). *Körperbau und Charakter*. Berlin-Göttingen-Heidelberg: Springer.

Kurelić, N., Momirović, K., Stojanović, M., Šturm, J., Radojević, D., & Viskić-Štalec, N. (1975). *Structure and Development of Morphological and Motor Dimensions of Youth.* (In Serbian). Belgrade: Institute for Scientific Researches of Faculty for Physical Education.

Medved, R., Matković, B. R., Mišigoj-Duraković, M., & Pavičić, L. (1989a). Some Physiological-Functional Signs in Male Children and Youth at 8 to 18 Years Old. (In Croatian). *Medicinski vjesnik, 21* (1-2), 5-9.

Medved, R., Mišigoj-Duraković, M., Matković, B. R., & Pavičić, L. (1989b). Growth Signs of Male School Children and Youth at 8 to 18 Years Old. (In Croatian). *Medicinski vjesnik, 21* (1-2), 1-4.

Metikoš, D., Prot, F., Hofman, E., Pintar, Ž., & Oreb, G. (1989). *Measurement of Basic Motor Dimensions of Sportsmen.* (In Croatian). Zagreb: Faculty of Physical Education.

Milošević, Z., Obradović, B., & Srdić, B. (2007). Body Weight Status Of School Girls. In G. Bala (Ed.) *Proceedings Interdisciplinary Scientific Conference with International Participation "Anthropological Status and Physical Activity of Children and Youth"*, (pp. 81-87). (In Serbian). Novi Sad: Faculty of Sport and Physical Education.

Mišigoj-Duraković, M. (2008). *Kinanthropology - Biological Aspects of Physical Exercise.* (In Croatian). Zagreb: Faculty of Kinesiology.

Momirović, K. (2001). *Automatic Classification by Neural Networks*. Technical Report, Belgrade: Institute of Criminological and Sociological Research.

Momirović, K., Hošek, A., Prot, F., & Bosnar, K. (2003). About the Morphological Types of Young Men. (In Serbian). *Glasnik Antropološkog društva Jugoslavije*, *38*, 29-45.

Nićiforović-Šurković, O., Kvrgić, S., & Ač-Nikolić, E. (2002). Nutrition Knowlege and Eating Behavior in Schoolchildren and Their Parents in Vojvodina. (In Serbian). *Medicinski pregled, 55* (11-12), 465-469.

Obradović, B., Milošević, Z., & Srdić, B. (2007). Body Weight Status Of School Boys. In G. Bala (Ed.) *Proceedings Interdisciplinary Scientific Conference with International Participation "Anthropological Status and Physical Activity of Children and Youth"*, (pp. 89-95). (In Serbian). Novi Sad: Faculty of Sport and Physical Education.

Sheldon, W. H., Dupertuis, C. W., & McDermott, E. (1954). *Atlas of Man.* New York: Harper and Brothers.

Sheldon, W. H., Stevens, S. S., & Tucker, W. B. (1940). *The Variates of Human Physique.* New York: Harper and Brothers.

Stojanović, M., Momirović, K., Vukosavljević, R., & Solarić, S. (1975). Structure of Anthropometric Dimensions. (In Croatian). *Kineziologija*, *5* (1-2), 193-205.

Tanner, J. M. (1986). Normal Growth and Techniques of Growth Assessment. *Clinics in Endocrinology and Metabolism, 11* (3), 411-451.

Viskić-Štalec, N. (1974). *Relations of Regulating Movement Dimensions with Morphological and Some Energy Regulating Dimensions.* (In Croatian). M. A. Thesis, Zagreb: Faculty for Physical Education.

Received: November 15, 2008.
Accepted: May 26, 2009.

Corresponding author:
Damjan Jakšić, BSc.
University of Novi Sad
Faculty of Sport and Physical Education
Lovćenska str. 16, 21000 Novi Sad, Serbia
Phone: +381 (0)21 450 188
E-mail: jaksicd@neobee.net

NEURONSKA MREŽA U ANALIZI RAZLIKA MUŠKIH SOMATOTIPOVA U MANIFESTACIJI MOTORIČKIH SPOSOBNOSTI

Sažetak
Na 99 ispitanika muškog spola, učenika 7. i 8. razreda osnovnih škola iz pet gradova Vojvodine vršena su antropometrijska mjerenja i motorička testiranja u cilju utvrđivanja somatotipova i njihovih pojedinačnih odnosa sa motoričkim sposobnostima. U populaciji osnovnoškolaca identificirna su tri somatotipa i to: astenomorfni tip (41,4%), mezoektomorfni tip (31%) i endomorfni tip (25%). Motorički kao najbolji, izdvojili su se pripadnici mezoektomorfnog tipa koji su u svim procenjivanim motoričkim sposobnostima iskazali svoju dominaciju, osim kod testova u kojima nije uočena razlika između morfoloških tipova (Taping rukom i Podizanje trupa za 60 s). Pripadnici ovog somatotipa identificirani su i kao akceleranti te je i to jedan od mogućih razloga za izraženu dominantnost.

Ključne riječi: *astenomorfija, mezoektomorfija, endomorfija, petnaestogodišnjaci*