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# **ORIGINAL RESEARCH**

# STUDY ON THE CORRELATIONS BETWEEN CERTAIN FUNCTIONAL INDICES AND THE CONDITIONAL MOTOR SKILLS ON AGE GROUPS IN ATHLETES

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### **Abstract**

Effort represents in sports one of the essential environmental factors, vital both in the body's harmonious development, and in maintaining its health. Motor activity, through the phenomena of adaptation, compensation and overcompensation that it generates, stimulates and in some cases guides in growth and development, has two components: a genetic one, referring to inborn characteristics, the genetic information making up the genotype and manifested as the fenotype (the external manifestation form), and an acquired one, obtained through exercises influenced by environmental conditions. The present study undertaken by means of multivaried analysis of conditional motor skills evinced that the indices of conditional motor skills may remain strongly connected during many years with certain functional indices, and then these correlations may suffer essential alterations.

Key words: motor skills, hemoleucogram, blood biochemistry, athletes, multivaried analysis

# Introduction

Physical or motor skills constitute the basic motor premises or requirements the athlete needs to build his own technical skills. Demeter, A. [1], defines motor skills as those motor dimensions manifested in parameters identical to movement, with the same measurement benchmark and based on similar physiological and biochemical mechanisms. Despite methodological differences among co-existing theories a group of abilities playing a special role in the processes of motor control and learning is a general acknowledgement. These abilities were identified and named in a different way by scientists: Fleishman [2] proposed to distinguish "perceptual-motor abilities", Gundlach [3] suggested to consider "coordinative abilities" while Keele et al. [4] identified "general coordination factors". Conditional motor skills are directly dependent on physical shape, are based on the metabolic effectiveness of muscles and other apparatuses and systems (circulatory, respiratory, nervous system, etc.) [5,6]. The limiting factors are related to the quantity of energy available in the muscles and the mechanisms regulating the energy influx (enzymes), speed and strength of contraction, given by the quality and number of motor units involved in the activity. The most important stage of their development is situated at the beginning of puberty, between 12 and 17 - 18. The coordinative motor skills are mainly determined by the processes of movement control and regulation [7].

Taking into account that these motor skills have two components: a genetic one referring to the inborn characteristics, the genetic information making up the genotype and manifest as the fenotype (the form of external manifestation), and an acquired one, obtained by exercise influenced by the environmental conditions, the aim of the study is the evaluation of possible correlations on age groups between the functional indices and the conditional motor skills in athletes, by means of a multivaried study [8.9]

### Material and method

The study included 60 voluntary male athletes aged between 14 and 16 years, all members of CSS and LPS Galati and Brăila. Three study groups were constituted as follows:

Group 1-20 athletes aged 14;

Group 2-20 athletes aged 15;

Group 3-20 athletes aged 16.

For the functional indices the complete hemoleucogram was tested, as well as the blood biochemistry through the automated analysis, using biochemical analyzer Hitachi 917, Japan, together with the complete urine exam (summary and sediment) through the same automated analysis method. The initial test was

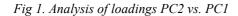
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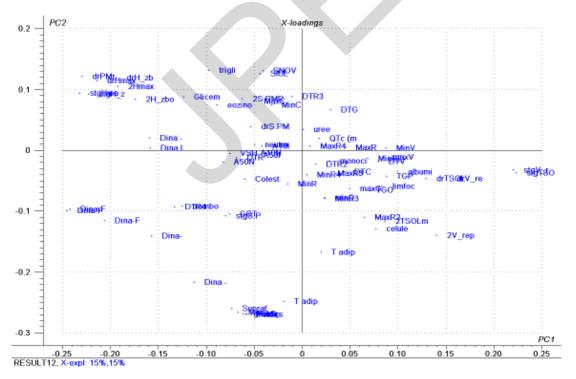
performed in July, and the final test in November, at 8 a.m., after a rest of at least 12 hours from the most recent training session. The tests of conditional motor skills (speed, strength, endurance) took place at LPS and CSS in July (initial testing) and November (final testing) and consisted in: speed testing by the event of speed racing 50 m starting from an upright position; strength testing through the event of long jump with static take-off; endurance testing through the event of 1000 m endurance running. The data gathered after the two evaluations were centralised in an excel-type database. A multivaried analysis study of the hybrid database was performed, made up of 40 functional indices and of the conditional motor skills. These indices were measured in 60 subjects, on age groups of 14, 15 and 16, aiming at finding certain correlations according to age. The training of the multivaried analysis system in the n- dimensional space (n=40) was initiated, starting from the input data matrix of 60 x 40 data and a number of 20 main components. By the analysis of the variation tendencies of the residual variant and the explained variant the system was adjusted to a more robust model, of 8 PC, without significantly decreasing the total explained variant. At the same time, by analyzing the graphs corresponding to the loading values for various main components, a new iteration was decided in training the system, viz. modeling on the basis of balanced variables according to the standard deviation. This approach led to reducing the residual variant X by one size grade.

On the basis of this final PCA model, the multivariate correlations were determined and analyzed between the indices of the conditional motor skills and the functional ones (lab analyses). The type of correlations (positive or negative) was determined, as well as a hyerarchisation of the intensity of correlations between various variables (indices). This analysis led to the determination of those main components discriminating between various types of indices, and also between the different indices of conditional motor skills.

# Results and discussions

It may be observed from the correlation PC1 vs. PC2, Fig 1 that the values of the indices of the conditional motor skills A50I (the time of the 50 m race measured in July), A50N (the time of the 50 m race measured in November), are characterized by low negative *loadings* PC1 and PC2.





The values of the scores PC1 and PC2 associated to the time of 50 m race are:`

PC 01 (X-Variables) PC 02 (X-Variables) -5.178e-02 -7.985e-03 A50I A50N -8.263e-02 -1.898e-02

It can be noticed that irrespective of the season of measurement for these conditional motor skill indices during the first year of analysis, the performances A50I and A50N are positively correlated especially to the indices shown in Table 1.

Functional indices:	Correlation to the time of 50 m race	
	A50I	A50N
Thrombocytes	-0.125	-9.226e-02
GGT	-7.616e-02	-0.104

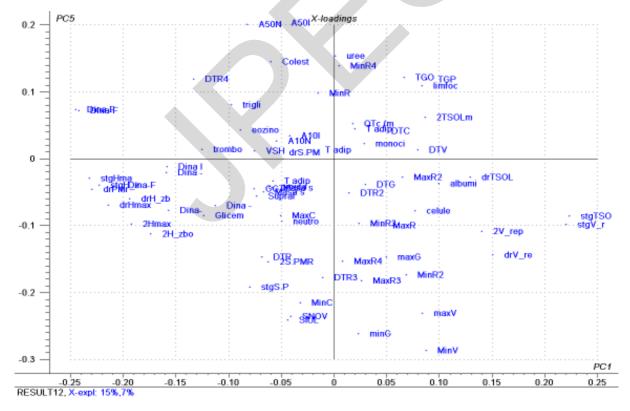
A completely different behavior is displayed by the indices of the conditional motor skills related to the length in the long jump, measured in July (variable code SIUL) and November (variable code SNOV), both characterized by low negative PC1 loadings and high positive PC2 loadings.

	PC1 loadings		PC2 loadings
SIUL	-4.389e-02	0.126	
<b>SNOV</b>	-4.091e-02	0.131	

These indices are in a very strong positive correlation to triglycerides,

The analysis shown in Fig 2 shows that PC5 distinguishes between the variables which are highly and positively correlated to A50I and A50N, respectively the variables *cholesterol, triglycerides* and the ones in a very strong negative correlation to A50I and A50N but in a strong positive correlation to SIUL and SNOV, respectively *neutrophils*.

Fig 2. Analysis of the loadings PC4 vs. PCI



The best discrimination between the indices of conditional motor skills and the variables multidimensionally correlated to them is provided by PC1 together with PC5 and PC6, and that is why only these main components are to be taken into account in the age groups analysis.

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### **Conclusions**

It can be noticed that the indices of the conditional motor skills may remain strongly correlated to certain functional indices during several years, after which these correlations undergo essential alteration.

It is to be noticed that A50I and A50N are in a strong positive correlation to the VSH values in 15 and 16 year-old subjects, but not in the 14 year-old subjects. Another example is the fact that the indices A10I and A10N are in a strong positive correlation to the variable triglycerides in the 16 year-old subjects, but in a weaker correlation in 15 year-old subjects, and in a considerably weaker correlation in the 14 year-old subjects. Regarding the indices SIUL and SNOV, they are in a strong positive correlation to triglycerides, but the intensity varies with age.

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