Original scientific paper *UDC 159.922.72.075-857.874*

Influence of cognitive abilities, conative characteristics and social status on student school grades in mother tongue

PhD Dragan Popović[1], full prof., PhD Evagelia Boli[1], full prof.,
PhD Eyal Shagal[2], full prof. and Vladimir Savić[1],
[1]Faculty of Sport and Physical Education, University of Pristina
temporarily seated in Leposavic, Serbia
[2]The Ribstein Center for Sport Medicine Sciences and Research
Wingate Institute, Israel
e-mail: dragan.popovic @ pr.ac.rs

Abstract

Multivariate regression analysis of the criterion variables of Zc in Mahalanobis distance variables of M can be defined as a solution to the problem $\mathbf{M\beta} = \mathbf{Z}_c + \mathbf{E}|\text{trag}(\mathbf{E}^t\mathbf{E}) = \text{minimum}$.

As $\mathbf{M}^t\mathbf{M} = \mathbf{I}$, the solution that is easily obtained by differentiating the function trag $(\mathbf{E}^t\mathbf{E})$ is

$$\boldsymbol{\beta} = \mathbf{M}^t\mathbf{Z}_c = \mathbf{R}_{rr}^{-1/2}\mathbf{R}_{rc},$$

so the matrix of partial regression coefficients is in fact a matrix of ordinary product moment coefficients of correlation between the regressors transformed in Mahalanobis form and criterion variables. Certainly, because of this the asymptotic variance

of coefficient β_{jp} from **β** matrix is simply $\sigma_{jp}^2 = (1 - \beta_{jp}^2)^2 n^{-1}$, and tests hypothesis H_{0jp}: $\beta_{jp}^* = 0$ is easily

$$f_{jp} = \beta_{jp}^2((n - 2)(1 - \beta_{jp}^2)^{-1}),$$

because under H_{0jp}: $\beta_{jp}^* = 0$ variables f_{jp} have Fisher-Snedecor F distribution with 1 and n2 degrees of freedom.

Regression functions are now defined by the operation $\mathbf{\Psi} = \mathbf{M\beta}$ with covariance matrix

$$\mathbf{G} = \mathbf{\Psi}^t\mathbf{\Psi} = \mathbf{\beta}^t\mathbf{\beta} = \mathbf{R}_{cr}\mathbf{R}_{rr}^{-1}\mathbf{R}_{rc}$$

and the diagonal elements of the matrix $\boldsymbol{\rho}^2 = (\rho_p^2) = \text{diag } \mathbf{G}$ are usual coefficients of determination; and as $\mathbf{Z}_c{}^t\mathbf{\Psi} = \mathbf{R}_{cr}\mathbf{R}_{rr}^{-1}\mathbf{R}_{rc} = \mathbf{G}$, then the elements ρ_p of **ρ** matrix are usual multiple correlation coefficients, and the hypothesis tests H_{0p}: $\rho_p^* = 0$ are defined by the functions

$$f_p = (\rho_p^2(1 - \rho_p^2)^{-1})((n - m - 1)m^{-1}),$$

because under H_{0p}: $\rho_p^* = 0$ f_p functions have Fisher-Snedecor F distribution with min m1 degrees of freedom.

Keywords: /reliability / latent /dimension / matrix / vectors / variance /

1. Introduction

All attempts to explain human behavior using only personality variables or only by means of situational variables, are unsuccessful because the problem itself is set in a wrong way. The sole reason for a particular behavior lies neither in personality variables nor situational variables taken separately, but in their interrelation when activities and performance of an individual provide that interaction with a new quality.

This problem can be brought under the philosophical concept of science and nature, as it is shown, exclusively and widely, by S. Radonjić (1977). Radonjić says: "Nature has proved to be merciless towards scientists. While scientists strive for simplicity and economy in all theories, nature squanders its abundance and diversity. Since nature will not adapt to the standards of science, scientists will have to adapt the abundance and diversity of nature. "

Menčiskaja (1975) points out that there are often complaints that experiments and studies involve only the intellectual side of development, not the personality of a student as a whole. She believes that the development of the whole personality, and not just one aspect of it, should always be borne in mind.

Recognizing the above facts, if we really want to study the behavior of an individual, primarily the success or failure at school, we must deal with his or her personality in whole. Through psychological research in this direction, we will try to clarify what personality traits of a student lead to success and how they affect each other.

So, on the basis of these and other similar findings, the general methodological framework of research of conditionality of a student`s success at school has been extended from environmental variables to personality variables. Therefore, a higher and adequate level of the research approach should provide data on the level of development and way of organization of those personality traits that are relevant to the student`s academic achievement, that is to determine the contribution of each trait in the organizational structure of the personality during the educational process.

Knowledge of the contribution of certain personality characteristics and their organizational structures to educative effects allows establishing eligibility for education, or carrying out particular educational interventions by measuring these traits in students. Today there are a large number of studies, but few scientific findings, on the dependence of educational success on differently organized traits in the personality structure, and if there are any, it could not be argued that the findings are scientific facts or principles and rules, but logical and empirical indications on the level of probability and hypotheticality. The exception is intellectual abilities, motivation and some broader dimensions of personality as well as the social status of a student that will be discussed in the study.

This study is characterized by the complexity of the research subject that will inevitably result in close interweaving of application of various methods and tools for data collection and processing.

2. Methods

2.1.The Sample of Respondents

Among other things, the number of respondents in the sample depends on the level of statistical inference and the choice of mathematical and statistical models. Based on the chosen statistical-mathematical model and program, goals and tasks, the sample included 224 respondents. In all factor procedures, it should constantly be kept in mind that the analysis results depend on three main systems which determine the selection and transformation of information: the sample of variables, sample of respondents and chosen extraction, or rotary method.

Based on these criteria and experience from previous studies, the sample of 224 respondents is considered to be sufficient for this research. In defining the population from which the sample was drawn, except for the above, other restrictions or stratification variables won`t be applied.

The population from which the sample was drawn for this research consists of I, II, III and IV-grade students of a secondary school of chemical technology.

The sample of students systematically covered four classes in each grade of the school. The selection had to meet the requirements of scientific methodology, especially the size, representativeness and homogeneity, which make it possible to generalize the research results to the entire population with a high probability.

The classes selected for the sample shall consist of students who most likely have the same or similar social status characteristics, as well as classes that are not included in the sample.

The use of such a sample had the following objectives:

There is the fact that in this country and abroad problems in students are insufficiently investigated, therefore there is a certain gap in factual knowledge about the personality structure of students.

The fact that four age groups were covered, allowed systematic investigation of the factors which may lead to certain differences in the development of traits depending on the age or reflection of personality development of students of various ages.

2.2. The sample of variables

2.2.1. The sample of cognitive variables

This research has provided unequivocal evidence that the structure of cognitive abilities is of a hierarchical type at the top of which is a general cognitive factor and below are three primary factors of cognitive abilities related to the effectiveness of the perceptual processor (or perceptual reasoning), effectiveness of the parallel processor (or the ability to identify relations and correlates) and effectiveness of the serial processor (or symbolic reasoning).

To evaluate the effectiveness of the input-processor, or perceptual reasoning, IT-1 test was chosen. To evaluate the effectiveness of the serial processor, or symbolic reasoning, AL-4 test was chosen. To evaluate the effectiveness of the parallel processor, or identifying relations and correlates, S-1 test was chosen.

2.2.2. The sample of conative variables

For the assessment of cognitive characteristics, measuring instruments CON6 were chosen to evaluate the following conative regulators: activity regulator (EPSILON), regulator of organic functions (HI), regulator of defense reactions (ALFA), attack reaction regulator (SIGMA), system for the coordination of regulatory functions (DELTA) and system for the integration of regulatory functions (ETA).

2.2.3. The sample of social status variables

To evaluate the social status, a model constructed by the following authors was applied: Saksida and Petrovic 1972; Saksida, Caserman and Petrovic 1974; Momirović and Hošek 1975. Appendix INST2 and questionnaire SSMIN were used in this research.

2.2.4. Dependent variable – students` success at school

To evaluate the students` success at school, school grades were used. School success was checked by means of knowledge tests as indicators of the acquired success and habits. The students` school assessment in the research is presented by the traditional for this country grading system based on numerical grades of 1 to 5 at the end of a school year (final grade) for all the educational-scientific areas:

* Mathematics and logic: Mathematics
* Natural sciences: Physics and Chemistry
* Languages: mother tongue and foreign language

2. 3. Data processing methods

In order to reach satisfactory scientific solutions, in this research there were used, in the first place, correct, then adequate, equitable and comparable procedures which conformed to the nature of the set problem and allowed the extraction and transformation of the appropriate dimensions, testing hypotheses about these dimensions, identifying differences, relations, predictions and diagnoses, as well as setting regularities within the research subject area.

Taking that into account, procedures considered to conform to the nature of the problem and to leave no great restrictions on basic information were selected for the research purposes.

It is not clear who was the first to propose to perform a regression analysis of criterion variables in the space of continuously distributed regressor variables after transformation of the regressor into Mahalanobis form. This process is formally described in the paper by Hadžigalić, Bogdanovic, Tenjović and Wolf (1994), but fifteen years before that, a program was written in the SS language and called ORTHOREG (Momirović, 1979). It performs a univariate or multivariate regression analysis in Mahalanobis space. A similar program of the same name was also implemented in the SAS programming system, but it is limited only to the case when there is only one criterion variable whose position in the regressor space gives, indeed, very limited information.

As regression analysis in Mahalanobis space has some very convenient comparative properties relative to the standard canonical model of multivariate regression analysis, here will be described an algorithm that generates the greatest amount of usable information about the parameters of the model. The algorithm is implemented in a program written in the Matrix language and the program performance is shown in some previous studies.

All the data in this study were analyzed at the Center for Multidisciplinary Studies, Faculty of Sports and Physical Education, University of Pristina by the software system for data processing developed by Popovic, D. (1980), (1993) and Momirović, K. and Popovic, D. (2003).

Multivariate regression analysis of the criterion variables of Zc in the space of Mahalanobis variables of M can be defined as a solution to the problem

$$\mathbf{Mb} = \mathbf{Z}_c + \mathbf{E}|\text{trag}(\mathbf{E}^t\mathbf{E}) = \text{minimum}.$$

As $\mathbf{M}^t\mathbf{M} = \mathbf{I}$, the solution that is easily obtained by differentiating the function trag $(\mathbf{E}^t\mathbf{E})$ is

$$\mathbf{b} = \mathbf{M}^t\mathbf{Z}_c = \mathbf{R}_{rr}^{-1/2}\mathbf{R}_{rc}$$

and the matrix of partial regression coefficients is, in fact, a matrix of ordinary product - moment coefficients of correlation between the regressors transformed into Mahalanobis form and criterion variables. Of course, therefore, the asymptotic variance of coefficients b_{jp} of matrix **b** is simply

$$s_{jp}^2 = (1 - b_{jp}^2)^2 n^{-1},$$

and the tests of hypotheses H_{0jp}: $b_{jp}^* = 0$ are clearly

$$f_{jp} = b_{jp}^2((n - 2)(1 - b_{jp}^2)^{-1}),$$

because under H_{0jp}: $b_{jp}^* = 0$ variables f_{jp} have Fisher-Snedecor F distribution with 1 and n2 degrees of freedom.

Regression functions are now defined by the operation

$$\mathbf{Y} = \mathbf{Mb}$$

with a matrix of covariances

$$\mathbf{G} = \mathbf{Y}^t\mathbf{Y} = \mathbf{b}^t\mathbf{b} = \mathbf{R}_{cr}\mathbf{R}_{rr}^{-1}\mathbf{R}_{rc},$$

so the diagonal elements of the matrix

$$\mathbf{r}^2 = (r_p^2) = \text{diag } \mathbf{G}$$

are normal coefficients of determination; and since

$$\mathbf{Z}_c^t\mathbf{Y} = \mathbf{R}_{cr}\mathbf{R}_{rr}^{-1}\mathbf{R}_{rc} = \mathbf{G},$$

then r_p elements of **r** matrix are ordinary multiple correlation coefficients, and tests of hypotheses H_{0p}: $r_p^* = 0$ are defined by the functions

$$f_p = (r_p^2(1 - r_p^2)^{-1})((n - m - 1)m^{-1}),$$

because under H_{0p}: $r_p^* = 0$ functions f_p have Fisher-Snedecor F distribution with m and nm1 degrees of freedom.

As the matrix of residual variables is

$$\mathbf{E} = \mathbf{Z}_c - \mathbf{Mb},$$

then

$$\mathbf{W} = \mathbf{E}^t\mathbf{E} = \mathbf{R}_{cc} - \mathbf{G}$$

is a matrix of their covariances. For identification of regression functions, their correlations defined by the matrix

$$\mathbf{C} = \mathbf{r}^{-1}\mathbf{G}\,\mathbf{r}^{-1},$$

could sometimes be useful, as well as correlations of residual variables defined by the matrix

$$\mathbf{F} = \mathbf{S}^{-1}\mathbf{W}\mathbf{S}^{-1},$$

where $\mathbf{S}^2$ = diag **W** is a matrix of variances of residual variables.

The structure of regression factors in the Mahalanobis space is simply

$$\mathbf{S} = \mathbf{M}^t\mathbf{M}\mathbf{b}\mathbf{r}^{-1} = \mathbf{b}\mathbf{r}^{-1},$$

so sjp elements of matrix S are ordinary product-moment correlation coefficients. Therefore, the asymptotic variance of sjp coefficients of S matrix is

$$x_{jp}^2 = (1 - s_{jp}^2)^2 n^{-1},$$

and tests of hypotheses H0jp: SJP * = 0 are defined by the functions

$$f_{jp} = s_{jp}^2((n - 2)(1 - s_{jp}^2)^{-1}),$$

where under H_{0jp}: $s_{jp}^* = 0$, f_{jp} variables have Fisher-Snedecor F distribution with 1 and n2 degrees of freedom.

As **b** is, in fact, a correlation matrix, in the matrix

$$\mathbf{V}^2 = \mathbf{b} \bullet \mathbf{b} = (v_{jp}^2),$$

where • is the Hadamard multiplication operator, there will be regressor variance components and criterion variables under this model of regression analysis. If we mark the sum vector of row g with $\mathbf{e}_g$ and the sum vector of row m with $\mathbf{e}_m$, the elements of the vector

$$\mathbf{j}^2 = \mathbf{V}^2\mathbf{e}_g$$

will be fractions of the variance of each regressor which was involved in the prediction of a set of criterion variables; of course, in the vector $(\mathbf{e}_m{}^t\mathbf{V}^2)^t$ = vec $\mathbf{r}^2$ there will be coefficients of determination, and the elements in the columns of matrix $\mathbf{V}^2$ are parts of the variance of each criterion variable which can be attributed to certain regressor variables.

In the tables in the appropriate columns the following is calculated and shown:

R - product-moment coefficients between each of the predictive variables and criteria

PARC R - partial correlation coefficients of each predictor variable with the criterion variable

BETA - standardized regression coefficients, i.e. coordinates of the criterion vector projected in the space of predictor variables

P - percentage of contribution of each predictor variable to the explanation of the variance of the criterion variable

SIGMA B - standard deviation of the partial regression coefficients

Q - likelihood that a beta coefficient will appear, if the actual value of the coefficient is zero.

In the last part of the regression tables the following is marked with:

DELTA - coefficient of determination, i.e. part of the criterion variance which can be explained by the variance of the predictor variables

RO - coefficient of a multiple correlation between predictor variables

SIG D - standard error of prediction of the criterion variable based on the system of predictor variables

F - usual F test for testing the significance of the multiple correlation coefficient with DF1 and DF2 degrees of freedom

Q – probability of getting a certain value of F relationship, if the actual value of the multiple correlation is zero.

3. Results

In research in applied psychology as well as other anthropological sciences, latent dimensions are estimated in the rule, on the basis of the patterns of variables formed within the theoretical models which have been the subject of verification in the previous exploratory or confirmatory analyses of the latent structure of manifest anthropological variables.

Hypothetical latent structure in applied research is therefore explicitly defined, and hypothetical latent dimensions are covered by a large number of manifest variables whose objects of measurement are known from previous analyses or can be assumed with a high probability on the basis of theoretical models cybernetically formulated in the rule.

In psychological literature, three types of the definition of intelligence are most often mentioned. In behavioristic circles, intelligence is usually identified with »learning capacity«, or the ability to acquire new knowledge. Less common is the identification of intelligence with »the ability of abstract thinking.« Particular attention is given to the definition of intelligence as »the ability to adapt to new situations.« It is rather common in animal psychology. This, of course, does not mean the adaptation in terms of tolerance to exogenous factors, nor to adjustment in the clinical sense.

As school success depends on a number of factors, it is important to have reliable indicators on which dimensions influence the achievement of maximum results and to what extent. Conative space is the part of personality which is responsible for the modalities of human behavior. Since there are normal and pathological modelities of behavior, analogously, there are normal and pathological conative factors.

The characteristic of normal conative factors is that they are mostly independent of each other and normally distributed in the population. There are few attempts to research the normal modalities of behavior and normal conative factors, so that subspace of personality is not clearly enough defined.

Pathological conative factors are much better defined than normal conative factors in previous studies and in most cases there are certain theoretical explanations for them.

Pathological conative factors are thought to be responsible for those types of behavior which reduce the adaptive level of humans considering their potential possibilities. The impact of conative factors on different activities is not the same. There are activities that are less susceptible to the influence of conative factors, and there are those on which the influence of these factors is crucial. This influence can be positive or negative depending on the type of factors and activities. So, there is no activity that would be completely independent of the influence of conative factors.

The source of most problems associated with examining social status either as a research subject or as a control set of features in the study of another phenomenon, lies in the nature of movement on the the basis of which the level of the subject position on a status feature is determined. In fact, most other anthropological characteristics can be precisely, on the basis of common physical measures, reliably and objectively measured or estimated on sufficiently stringent metric variables, simply because they are the result of efficiency of natural (physiological, biochemical and other biological) systems.

The main significance and basic mode of operation of these systems is, of course, regular and universal for every human being. The individual differences, which undoubtedly exist, are a consequence of either genetically conditioned differences or effects of external stimulus (such as, learning or training), or a consequence a disease or some other endogenously or exogenously induced disorders.

However, the criteria for determining social status characteristics are, as a rule, ekstra individual and based on the socio-economic structure of society, the collective value system, particularly on the structure and efficiency of the institutional mechanisms for regulating social relations.

Therefore, the determination of the position of an individual in the social field is hard to be carried out by reasonable estimate, and even harder by exact measurement. Status variables are typically of an actuarial type, the result of conventions that do not necessarily have to be guided by their real sociological significance, and the results are most commonly found on non-metric scales.

From this arises perhaps the biggest problem in the investigation of social status, the problem of metric properties of status variables. Simple operations of encoding, which are at best products of an ordinal variable, are usually performed over the information that is typically of an actuarial type. It is not uncommon that because of the nature of the problem of the observed feature, a certain status variable lies on a semi-ordinal scale. The best example is the variable that is often used to assess the social status of a family and which is related to the education of one or both parents.

However, there are other sources of methodological difficulties associated with examining the social status, and therefore with construction of any verified theory of social differentiation, or social stratification, or class differences, or social distinction at all.

Consideration of these theories and the way of conducting studies of social status, show that the main methodological problems in this area are as follows:

1) The construction or selection of models on the basis of which the universe of is status variables is defined;

(2) The definition of the population to which the results of any research or formulation of any theory could relate, and the method of selecting a sample from the population;

(3) Determination of manifest status categories and development of measuring instruments for their regulation or measurement;

(4) Adequacy of models, methods and techniques for data analysis and hypothesis testing.

Unlike many other anthropological phenomena for which during the development of the appropriate sciences a number of structural models which differ from each other, depending on scientific orientation of the author, have been constructed, at the moment there is only one model of the social status structure, which was developed by a group of authors, associates of the Institute of Sociology and Philosophy, University of Ljubljana. This mode, which in its first international presentation at the International Congress of sociologists in Toronto in 1974 received the most favorable reviews of sociologists of both eastern and western countries, served as the basis for this study.

The results presented in Table 1 show that there is a statistically significant multiple correlation between cognitive dimensions, conative variables and social factors and academic achievement in the Serbian language course (RO = .41).

Detailed analysis of the numerical values of the regression analysis, or partial correlations and beta coefficients, shows that the association of cognitive abilities, personality traits and social attitudes with school grades in the Serbian language course is significant and defined by:

- a single cognitive factor, or a factor of perceptual reasoning;
- a conative factor by which the regulator of attack is estimated;
- the social status of the mother's education, mother's knowledge of a foreign language, education, maternal grandfather`s education and student`s overal academic achievement.

From the above it necessarily follows that technically qualified people who have a developed function of the input processor, or better perceptual reasoning, greater control attack responses, a solid education of mother, her knowledge of a foreign language, maternal grandfather`s better education, and better overall academic achievement, are more predisposed to learning mother tongue which is fully justified in terms of learning theory.

REGRESSION OF THE GRADE IN SERBIAN LANGUAGE AND PREDICTOR VARIABLES

Table 1

	R	Partial R	Beta	t	Sig.
AL-4	04	,04	,05	,68	,49
IT-1	,-,13	-,14	-,15	-2,14	,03
S-1	,05	,05	,06	,79	,42
EPSILON	-,03	-,04	-,04	-,56	,57
HI	,06	,07	,11	1,06	,28
ALFA	-,06	-,06	-,10	-,95	,34
SIGMA	-,18	-,19	-,22	-2,88	,00
DELTA	,05	,05	,07	,78	,43
ETA	,03	,04	,07	,57	,56
OBRAO	,00	,00	,00	,00	,99
OBRAM	,14	,15	,20	2,27	,02
ZSJEZ	,02	,02	,03	,40	,68
ZSJEO	,03	,03	,04	,50	,61
ZSJEM	-,14	-,15	-,19	-2,19	,02
TIPŠK	,09	,10	,11	1,53	,12
KVALO	-,02	-,02	-,03	-,31	,75
KVALM	,00	,00	,00	,03	,97
ODEPO	,10	,11	,16	1,58	,11
ODPOM	-,20	-,22	-,32	-3,24	,00
ŠUSPE	,12	,13	,13	1,87	,05
IBSPO	-,04	-,04	-,05	-,69	,48
TMUPD	-,02	-,02	-,04	-,38	,70
TMUPO	,07	,08	,15	1,20	,23
TMUPM	-,00	-,00	-,00	-,05	,95
R	R %	df1	df2	F	Sig
.41	.17	24	200	1.78	.01

4. Conclusion

The study was conducted in order to determine the influence of cognitive dimensions, conative characteristics and social status on school grades in the native language of the students of a secondary school of chemical technology .

For this purpose, 224 students of a secondary school of chemical technology were included in the sample. This research has provided unequivocal evidence that the structure of cognitive abilities is of a hierarchical type, with a general cognitive factor at the top and three primary factors of cognitive abilities below it. These three factors are related to the effectiveness of the perceptual processor (or perceptual reasoning), the effectiveness of the parallel processor (or the ability to identify relations and correlates) and the effectiveness of the serial processor (or symbolic reasoning).

To evaluate the effectiveness of the input processor, or perceptual reasoning, IT-1 test was chosen.To evaluate the effectiveness of the serial processor, or symbolic reasoning, AL-4 test was selected. To evaluate the effectiveness of the parallel processor, or identificating relations and correlates, S-1test was chosen.

For the assessment of conative characteristics, KON6 measuring instrument was selected by means of which the following conative regulators were evaluated: regulator of activity, regulator of physical functions, regulator of defense responses, regulator of attack responses, system for coordination of regulatory functions, system for integration of regulatory functions and system for excitation and inhibition.

To evaluate social status, a model constructed by the authors Saksida and Petrovic 1972; Saksida, Caserman and Petrović 1974; Momirović and Hošek 1975 was applied. Appendix INST2 and questionnaire SSMIN were used in this research.

For the evaluation of students` academic achievements, their school grades were used. The academic achievements were checked by means of knowledge tests as indications of the acquired knowledge and habits.

The students` academic achievements in this study are presented by a traditional for this country way of assessment, i.e. numerical grades of 1 to 5 at the end of the school year (the so called final grade) for all educational-scientific areas: languages - mother tongue and foreign language.

All the data in this study were processed at the Center for Multidisciplinary Studies, Faculty of Sports and Physical Education, University of Pristina, using the system of data processing software programs DRSOFT developed by Popovic, D. (1980 and 1993) and Momirović, K. and Popovic D . (2003).

The algorithms and programs implemented within this study are presented in full and the results of these programs are analysed.

The results presented in Table 1 show that there is a statistically significant multiple correlation between cognitive dimensions, of conative variables and social factors and academic achievement in Serbian language (RO = .41).

The detailed analysis of the numerical values of regression analysis, or partial correlations and beta coefficients, shows that the association of cognitive abilities, personality characteristics and social attitudes with school grades in Serbian language is significant and defined by

- a single cognitive factor, or factor of perceptual reasoning;
- conative factor which estimates regulator of attacks;
- social status, mother’s education, mother’s knowledge of a foreign language, maternal grandfather`s education and overall student achievement.

From the above it necessarily follows that technically qualified people have a developed function of the input processor, that is better perceptual reasoning, greater

control attack responses, mother's solid education, her knowledge of a foreign language, maternal grandfather`s better education and a better overall academic achievement, and they are more predisposed to learning their mother tongue which is fully justified in terms of learning theory.

5. Literature

[1.] Boli, E.: (1996) The structure of intellectual and musical abilities and personal traits of girls involved in standard and Latin American dance, Master thesis,Pristina, University in Priština, Faculty of physical education.

[2.] Boli, E., Popović, D., A. Hošek.: (2009) Sport i crime, Leposavić, University in Priština, Center for multidisciplinary research of the Faculty of Sport and Physical Education.

[3.] Boli, E.: (2011) The structure of anthropological dimensions of male and female dancers and procedures processing for their evaluation and monitiring.(Monograph), Leposavić, University in Priština, Center for multidisciplinary research of the Faculty of Sport and Physical Education,.

[4.] Boli, E., Popović, D., Popović, J.: (2012) Structure of dancers' motor skills, International scientific magazine Kinesmetric, 1 (45-65).

[5.] Boli, E., Popović, D., Popović, J.: (2012) Structure of intellectuall abilities of dancers, International scientific magazine Kinesmetric, 1 (91-105).

[6.] Boli, E., Popović, D., Popović, J.: (2012) The structure of musical abilities of dancers, International scientific magazine Kinesmetric, 1 (121-143).

[7.] Boli, E., Popović, D., Popović, J.: (2012) The structure of personality characteristic of dancers, International scientific magazine Kinesmetric, 1 (161-177).

[8.] Boli, E., Popović, D., Popović, J.: (2012) The structure of the social status of dancers, International scientific magazine Kinesmetric, 1 (193-221).

[9.] Boli, E., Popović, D., Popović, J.: (2012) Differences in the level of musical abilities of male and female dancers, International scientific magazine Kinesmetric, 1 (67-89).

[10.] Boli, E., Popović, D., Popović, J.: (2012) Differences in the level of cognitive abilities of male and female dancers, International scientific magazine Kinesmetric, 1 (107-119).

[11.] Gredelj, M., D. Metikoš, A. Hošek, K. Momirovic (1975): A model of hierarchical structure of motor abilities. Kineziologija, 5 (1-2), 7-81.

[12.] Guttman, L. (1945):
A basis for analysis test-retest reliability.
Psychometrika, **10**:255-282.

[13.] Knežević, G.; Momirović, K. (1996):
Algorythm and program for Orthoblique transformation of the principal components significant according to PB criteria
Technical report, Institute of criminological and sociological research, Belgrade

[14.] Momirović, K. (1996):
On measures of reliability of latent dimensions determined by semiorthogonal transformations of the principal components in S. Bogosavljević and M. Kovačević, *Analysis of grouping,* **2.** Belgrade: Federal Institute of Statistics.

[15.] Momirović, D, Wolf, B.and Popović, D: (1999) The introduction to the theory of measurement and internal metric properties of composite measuring instruments (textbook), University in Priština, Faculty of physical education, Priština.

[16.] Momirovic, K. (1999):
Two measures of low and high reliability of tests with regulatory and singular matrix of particles covariance.

[17.] Momirović, K.; Erjavec, N.; Radaković, J. (1988):
Method, algorythm and program for reasonable validation of measurement instruments under confirmative and explorative model of component analysis. *Applied Psychology*, **9**:157-162.

[18.] Momirovic, K i Popović, D. (2003):
Construction and aplication of taxonomy neural networks
Centre for Multidisciplinary Research, Faculty of Physical Education

[19.] Mulaik, S. A. (1972):
The foundations of factor analysis.
New York: McGraw-Hill.
Technical report, Institute for Criminology and Sociological Research, Gracanicka 18, Belgrade

[20.] Popović, D.: (1980) Research methodology in Physical education, University in Niš, Scientific Youth, Niš.

[21.] Popović, D., Antić, K., Stanković, V., Petković, V. & Stanković, S.: (1989) The procedures for objectification of estimating the effectiveness in performing the judo techniques. *Scientific Youth*, 21(1-2), 83-89.

[22.] Popović, D., Kocić, J., Boli, E. & Stanković, V.: (1995) Conative characteristics of female dancers. *International Congress "Images of Sport in the World",* 75th Anniversary of the German Sport University, Abstract Volume, (pp. 96), Open Forum, Cologne, Germany.

[23.] Popović, D., Petrović, J., Boli, E. & Stanković, V.: (1995) The structure of the personality of female dancers. *3rd International Congress on Physical education and Sport*, Exercise & society supplement issue No. 11 (pp. 196), Komotini, Greece.

[24.] Popović, D., Stanković, V., Kulić, R. & Grigoropulos, P.: (1996) The structure of personality of handball players. *4th International Congress on Physical education and Sport*, Exercise & society supplement issue No. 15 (pp. 164), Komotini, Greece.

[25.] Popović, D. (2005):
GUTTMAN, Programs for analysis of metrical characteristics of composite mesurement instruments in Savić, Z.: **Influence of situational training on transformation of some anthropological dimensions in selected footballers (doctoral thesis)** Leposavić, Faculty of Physical Education.

[26.] Popović, D.: (1988) Application methods of factorial analysis for determining morphological types. *4rd international symposium on the methodology of matematical modelling*, Varna, Bulgarija.

[27.] Popović, D.: (1991) Research methodology in Physical education (textbook), University in Niš, Scientific Youth, Niš.

[28.] Popović, D.: (1992) Methodology of research in physical education, Athens, Greece.

[29.] Popović, D.: (1993) Programs and subprograms for the analysis of quantitative modifications (textbook), University in Priština, Faculty of physical education, Center for multidisciplinary research, Priština.

[30.] Popović, D.: (1993) D etermination of the structure of psychosomatic dimensions in combats and procedures processing for their evaluation and monitoring (monograph), University in Priština, Faculty of physical education, Priština.

[31.] Kaiser, H. F. (1958):
The varimax criterion for analytic rotation in factor analysis.
Psychometrika, **23**:187-200.

[32.] Kurolić, N., i sr. (1975):
Structure and development of morphological dimensions in youth, Belgrade: Institute for Scientific Research, Faculty of Physical Education, University in Belgrade

[33.] Harris, C. W.; Kaiser, H. F. (1964):
Oblique factor analytic solutions by orthogonal transformations.
Psychometrika, **29**:347-362.

[34.] Stanković, V. & Popović, D. (2009). The results of various factor procedures for establishing the cognitive abilities of handball playersI. I International scientific congress"Anthropological aspects of sport, physical education and recreation", pp. 209-213, Banja Luka, BiH.

[35.] Štalec, J.; Momirović, K. (1971):
Total quantity of reliable variance as the basic criterion for determinantion of the number of significant principal components, *Kineziology*, **1**, 1:83-90.

Received on 11th March 2013
Accepted on 17th November 2013

Original scientific paper *UDC 159.922.72.075-857.874*

Influence of cognitive abilities, conative characteristics and social status on student school grades in mother tongue

PhD Dragan Popović[1], full prof., PhD Evagelia Boli[1], full prof.,
PhD Eyal Shagal[2], full prof. and Vladimir Savić[1],
[1]Faculty of Sport and Physical Education, University of Pristina
temporarily seated in Leposavic, Serbia
[2]The Ribstein Center for Sport Medicine Sciences and Research
Wingate Institute, Israel
e-mail: dragan.popovic @ pr.ac.rs

Summary

The study was conducted in order to determine the influence of cognitive dimensions, conative characteristics and social status on school grades in the native language of the students of a secondary school of chemical technology. For this purpose, 224 students of a secondary school of chemical technology were included in the sample. To evaluate the effectiveness of the input processor, or perceptual reasoning, IT-1 test was chosen.To evaluate the effectiveness of the serial processor, or symbolic reasoning, AL-4 test was selected. To evaluate the effectiveness of the parallel processor, or identificating relations and correlates, S-1 test was chosen.For the assessment of conative characteristics, KON6 measuring instrument was selected by means of which the following conative regulators were evaluated: regulator of activity,

regulator of physical functions, regulator of defense responses, regulator of attack responses, system for coordination of regulatory functions, system for integration of regulatory functions and system for excitation and inhibition.To evaluate social status, a model constructed by the authors Saksida and Petrovic 1972; Saksida, Caserman and Petrović 1974; Momirović and Hošek 1975 was applied. Appendix INST2 and questionnaire SSMIN were used in this research. For the evaluation of students` academic achievements, their school grades were used. The academic achievements were checked by means of knowledge tests as indications of the acquired knowledge and habits.The students` academic achievements in this study are presented by a traditional for this country way of assessment, i.e. numerical grades of 1 to 5 at the end of the school year (the so called final grade) for all educational-scientific areas: languages - mother tongue and foreign language. All the data in this study were processed at the Center for Multidisciplinary Studies, Faculty of Sports and Physical Education, University of Pristina, using the system of data processing software programs DRSOFT developed by Popovic, D. (1980 and 1993) and Momirović, K. and Popovic D . (2003). The algorithms and programs implemented within this study are presented in full and the results of these programs are analysed.The results presented in Table 1 show that there is a statistically significant multiple correlation between cognitive dimensions, of conative variables and social factors and academic achievement in Serbian language (RO = .41).The detailed analysis of the numerical values of regression analysis, or partial correlations and beta coefficients, shows that the association of cognitive abilities, personality characteristics and social attitudes with school grades in Serbian language is significant and defined by

- *a single cognitive factor, or factor of perceptual reasoning;*
- *conative factor which estimates regulator of attacks;*
- *social status, mother's education, mother's knowledge of a foreign language, maternal grandfather`s education and overall student achievement.*

From the above it necessarily follows that technically qualified people have a developed function of the input processor, that is better perceptual reasoning, greater control attack responses, mother's solid education, her knowledge of a foreign language, maternal grandfather`s better education and a better overall academic achievement, and they are more predisposed to learning their mother tongue which is fully justified in terms of learning theory.