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INTELLECTUAL-PERSONAL POTENTIAL AND THE DYNAMICS OF STUDENT’S STATE OF ANXIETYIN CONDITIONS OF EXAMINATION STRESS

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The article discusses the results of a longitudinal study of anxiety state dynamics in students in a situation of examination stress. With the help of a of modeling method the latent changes revealed non-linear form of changes individual trajectories in the state of anxiety. Intellectual and personal potential is considered as a covariate to explain the dispersion at the initial level and the speed of changes in the state of anxiety among students.

Key words: state anxiety, intellectual - personal potential, latent growth modeling.

У статті розглядаються результати лонгітюдного дослідження динаміки стану тривожності студентів в ситуації екзаменаційного стресу. За допомогою методу моделювання латентних змін виявлено нелінійну форму індивідуальних траєкторій змін стану тривожності. Інтелектуально-особистісний потенціал розглядається як коваріата, що пояснює дисперсію як на початковому рівні, так і швидкість змін стану тривожності серед студентів.

Ключові слова: стан тривожності, інтелектуально-особистісний потенціал, моделювання латентних змін.

В статье рассматриваются результаты мини лонгитюдного исследования динамики состояния тревожности студентов в ситуации экзаменационного стресса. С помощью метода моделирования латентных изменений выявлено нелинейную форму индивидуальных траекторий изменений состояния тревожности. Интеллектуально-личностный потенциал рассматривается как ковариата, объясняющая дисперсию как на начальном уровне, так и скорость изменений состояния тревожности среди студентов.

Ключевые слова: состояние тревожности, интеллектуально-личностный потенциал, моделирование латентных изменений.

The psychical states of students in conditions of examination stress have been the subject of many studies [7, 10, 11]. They show that the examination stress causes the students`psychical state, the subjective aspect of which is characterized by a sense of tension, anxiety, gloomy apprehension, and the objective aspect of stress is expressed in the increase of pulsus and blood pressure, as well as in significant changes in the cardial rhythm. Described condition is commonly believedas the state of anxiety [8]. Consequently, the situation of exam requires a high exertionof self-regulation resources of the subject of educational activity.

As the resources of self-regulation of the activity subject are most commonly considered a variety of integrative qualities of personality: the personal adaptive capacity [5], the personal potential [1, 4], the intellectual-personal potential [2, 6], the intellectual resource [9].

The term «potential” has become widespread in the psychology in the past decade. Its implementation is due to the need for such an integral representation of the person that would be: 1) theoretically justified, 2) was the subject to operationalize, 3) have quantitative expression. The person in the concept of “potential” is regarded, on the one hand, as a resource of consumption, but a special kind of resource, which is capable of detecting the non-deterministic activity.

D. A. Leontiev proposed a theoretical model in which the number of variables, which are the components of personal potential, correlatewith different levels of responsiveness to external negativeinterferences such as resistance, psychological defenses, coping [4].

The studies of M.A. Holodnaya and A.A. Aleksapolskiy had found out that individuals with a high level of intellectual resources are characterized by greater flexibility and variability in the choice of a wide range of coping strategies [9].

T.V. Kornilova had shown that intellectual-personal potential is a resource, actualized in styles and coping strategies, which manifests itself in the choice of its focus and methods of actions in difficult situations [2].

In this way, the analysis of works shows that the integrative individual constitutives are predictors of the stress. At the same time, the unknown question is how these variables are related to stress dynamic, in particular, its initial level and individual variability in time.

The Object of the research is to study the impact of the intellectual-personalpotential on the inter-individual variability of the initial status and trajectories of change in the state of anxiety of students in the conditions ofexamination stress.

Method

The study involved 98 test persons (52 males and 46 females) agefrom 17 to 26 years (M = 20,6, SD = 1,18). Previously, they were participants in the study of verification of the intellectual-personal potential [6], which made it possible to recieve factor scores for each test persons.

The study was organized by the mini longitudinal scheme. To measure the anxiety state Spielberger scale was used. The measurement was carried out for four times: the first time was for 2.5 weeks before the examination session, the second was before the first exam, the third was after the end of the final exam, but be-

fore the announcement of grades, and the fourth was after 2.5 weeks after the exam session. All four "waves" of measuring of anxiety state were carried out with the same time interval.

In the data processing and statistical hypothesis revision descriptive statistics methods were used, correlation analysis, the method of latent growth modeling (LGM) [13]. LGM method allows to describe the dynamic process of changing of one or more variables in a complex in the presence of a small number of time samples. The calculations were carried out by means of a package SPSS 21.0 and AMOS 21.0. for Windows [12].

Results and Analysis

The results shown in table 2 are saying that the indicators of state anxiety are positively correlated with each other from stage to stage of measuring. Correlation coefficients are in diapason from 0,508 to 0,582 ($p < 0,05$). Intellectual-personalpotential is negatively correlated with anxiety state at all stages of measurement ($p < 0,05$).

Table 1

Descriptive statistics and correlations between indicators of the state of anxiety and personal-intellectual potentialover the period of four "waves" measurement

	S_ Anx1	S_ Anx2	S_ Anx3	S_ Anx4	IPP
S_Anx1	1				
S_Anx2	,576	1			
S_Anx3	,535	,582	1		
S_Anx4	,508	,518	,580	1	
IPP	-,351	-,398	-,388	-,341	1
SD	5,202	5,945	5,606	5,435	,450
M	38,516	43,335	42,780	37,340	,500

Note. S_Anx1 – S_Anx4 – state of anxiety over the four "waves" measurement.

An additional point is that, the individual averaged trajectories of students` anxiety stateallow us to suggest thequadratic functional form of growth.

Before modeling the primary data were tested for normal multivariate distribution. Asymmetry estimates ranged from -0,006 to 0,173, and kurtosis estimates ranged from -0,345 to -0,769. These values do not reflect the strong deviations from normality. Normalized score of multidimensional kurtosis was equal to 0,817. Considering that it is less than the critical value of 1,96 we can assume that multivariate distribution of theresearchdata does not deviate from the normal. It allowed us to use the method of maximum believability for the receiving of values of model parameters.

Fig. 1 shows the basic model of LGM, which was used to evaluate the hypothesis of a quadratic form of the growth of anxiety state during the four measurement stages. The first factor (F1) is the initial status (intercept) and contains information about the selectiveaverage values(Mi) and the variance (Di) of plurality of individual intercepts. In each of the four observed variables of the state of anxiety during four "waves" of measurement (S_Anx1–S_Anx4) the factor loadings were fixed to 1 in F1 to limit the height of the initial status of the growth curve. Factors 2 (F2) and Factor 3 (F3) are components of forming trajectories of growth for anxiety statesthrough time. F2 is a factor which is the linear component of individual trajectories growth and F3 is the quadratic component of the trajectories of anxiety state. Each of these factors also have two parameters, Ml and Dl,Mq and Dq, respectively, which represent the average value and variances of total individual linear and quadratic components, which are describing the growth curve of each test person. The linear component in the model was set by fixing the linearly increasing forces of observed variables: 0; 1; 2; 3. In the quadratic component of the model the forces of the observed variables were increasing in accordance with a quadratic dependence: 0; 1; 4; 9. Factors are correlated with each other (rF1F2, rF1F3 and rF2F3). The remaining members (from E1 to E4) are measurement errors associated with the four indicators of the state of anxiety.

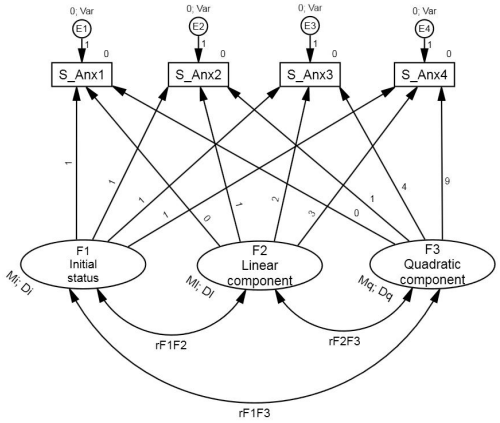

Fig. 1. The model of the latent growth of student's state of anxiety in conditions of examination stress.

The first research question was focused on the LGM form for the state of anxiety and the adequacy of the proposed quadratic form of growth. The results showed that the assumed quadratic form of growth of anxiety state of latent growth model provided an acceptable match on sample data. Minimum value χ^2= 3,380; df= 4; p = 0,496, CFI = 1,00, RMSEA = 0,000 with a lower limit of 90% of bilateral confidence interval 0,00 and the top of 0,094.

Estimated average values associated with each of the latent factors (i.e., intercept, linear and quadratic components), were statistically significant (see table 2). The average value for the intercept is equal to 38,540 (p < 0,0001). The latent average value for linear component is equal to 7,286 (p < 0,0001), and quadratic is equal to 2,565 (p <0,0001). Intercept points to a statistically significant average value of anxiety state before the exam. The average slope (linear component) indicates a significant average increase through the linear functional form of anxiety state values, and the average value of the quadratic component of the model shows its significant change according to the quadraticfunctional form over four «waves» measurement. According to the model, the value of students’state of anxietywill increase on 7,286 units for the linear component and on -2,565 units for quadratic component from phase to phase of measurement starting from the average value of 38,540.

Table 2

Estimates of the average values of the factors in the model of the latent changes in the student’s state of anxiety

	Estimate	S.E.	C.R.	P	Label
Initial status	38,540	,350	110,047	,000	Mi
Linear Components	7,286	,386	18,859	,000	Ml
Quadratic component	-2,565	,125	-20,520	,000	Mq

The next question concerns the extent to which the individual values of the state of anxiety in the sample vary around the trajectory of their group average value. The dispersion of the latent factors was found out statistically significant only for the initial status and point to interindividual variability, which is evident at the primary level.

In addition to the estimation of parameters of average values and variance parameters of the model of the latent changes in the student’s state of anxiety there were assessed the correlations between the latent factors. Statistically significant associations were found between factors 1 and 2, 1 and 3. Correlation of Factor 1 and Factor 2 is 0,98 (p <0,05) and is indicating that a high average initial status of situational anxiety corresponds to a faster average growth rate throughout the study, according to the linear component. Correlation of Factor 1 and Factor 3 is -0,89 (p < 0,05) and it indicates that the highest average initial status of anxiety condition is associated with a slow rate of growth, according to the quadratic component of the model of the state of anxietychanges. Calculated according to the model, the correlation between the linear component (Factor 2) and a quadratic component (Factor 3) was -0,80 and indicates that higher average levels of anxiety states, obtained according to the linear growth, associated with its slow decrease according toquadratic component during the study. In other words, this correlationindicates that students with higher initial levels of anxiety state are prone to its higher growth before the start of the exam and a slower decline in the after examination period.

A modified model of anxiety state dynamics complemented by variable predictor which is calledintellectual-personal potential.Its visual image along with estimates of the parameters is shown in Fig. 2. The indexes of correspondenceof the growth model of anxiety state to sample data show its adequacy. Minimum value χ^2 = 7,311, df= 2, p = 0,525, CFI = 1,00, RMSEA = 0,000 with a lower limit of 90% of bilateral confidence interval 0,00, and the top of 0,073.

This model shows the fact that the higher the level of intellectual-personalpotentialis, the lower the initial level of the student’s state of anxiety is before an exam (β= -0,47; p <0,0001). Also, students with high levels of intellectual-personalpotentialare characterized by slower average growth rate of anxiety states (β = -0,89; p <0,101) and more rapid decline tothe initial level (β = 0,80; p <0,082).

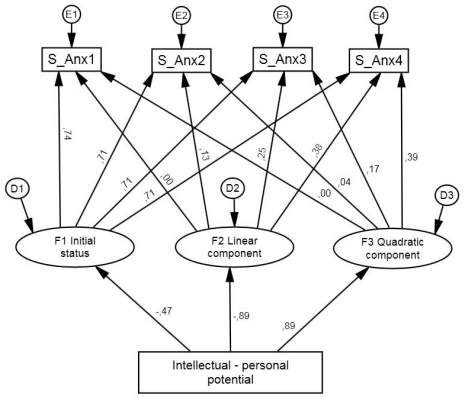

Fig. 2. The modified model of latent changes in the students’state of anxietyin conditions of examination stress.

To obtain the expected average value of the state of anxiety E (M), during each stage of measurement, we have the following:

$$E(M_t) = E(M_{int}) + E(M_{slp}) \times \alpha_t + E(M_{qdr}) \times \alpha^2_t,$$
$$E(M_1) = 38,54 + 7,29 \times 0 + -2,26 \times 0 = 38,54$$
$$E(M_2) = 38,54 + 7,29 \times 1 + -2,26 \times 1 = 43,26$$
$$E(M_3) = 38,54 + 7,29 \times 2 + -2,26 \times 4 = 42,55$$
$$E(M_4) = 38,54 + 7,29 \times 3 + -2,26 \times 9 = 37,32$$

Projected values are shown in Figure 3, and they show a non-linear growth trend of the students'anxiety state during the four "waves" of measurement.

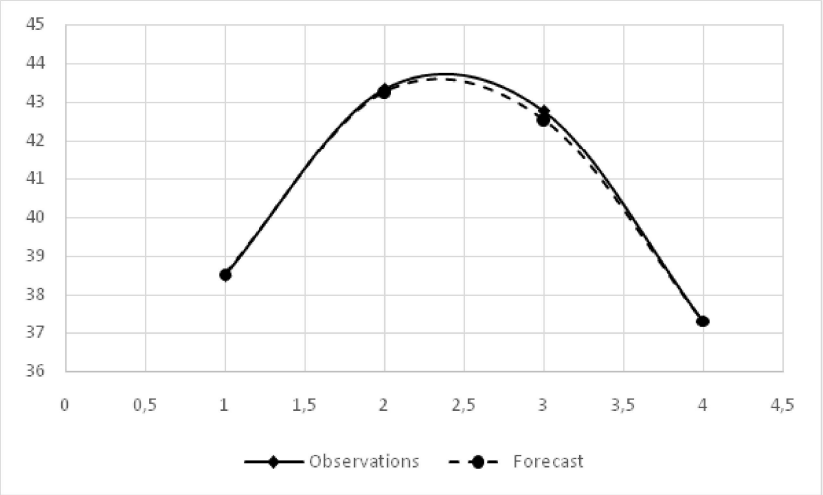

Fig. 3.The observed and predicted by the model assessments of student's anxiety state

The discussion of the results

Based on the developed structural model of intellectual-personalpotential, we obtained estimates of its latent variablefor each tested person, so this allowed us to include it as a predictor in the latent growth model (LGM), predefining the nonlinear dynamics of the students'state of anxiety under exam conditions. In fact, the regulate impact of intellectual-personal potentialon the state of students in the conditions of intense learning activityhas been proven.

Based on these data, we were able to accept the hypothesis of a non-linear (quadratic) functional form of anxiety state changes during four "waves" of data collection in a situation of examination stress.

The results largely confirm the published data about the increase of mental tension of students in a situation of assessment. However, our study allowed us to obtain much more information about the impact of stress on the mental state of students during the examination process. Firstly, the differences were identified in the initial level of anxiety state among the students that raised the question also about the reason of these differences. It has been shown that the students'intellectual-personal potentialexplains the variance of the initial level of anxiety state in the exams conditions. The higher level of intellectual-personal potential, the lower level of anxiety state, i.e., intellectual-personal potentialcan be considered as a factor in stress stability. Secondly, we received theanswer to the question, what is the average rate of change in the state of anxiety, and whether there are differences in the growth rates of different students. Thirdly, it is shown that students who have a higher initial level of anxiety state also have its higher growth rates, and students with lower initial levels, respectively, lower average growth rates.

The model of latent changes of anxiety state allows us to predict the level of mental tension of students in a given period of examinations and to carry out the corrective arrangements on this basis.

Conclusions

1.It was revealedthe quadratic functional form of the temporal dynamics of the students'state of anxietyin conditions of examination stress.

2. It has been shown the influence of the intellectual-personal potentialboth to the initial level of the students'state of anxiety, and also on the average rate of its growth.

3. It was found the influence of the initial status of students' anxiety state on the average rate of its growth. Students with a higher initial level of anxiety state also have a higher growth rates of anxiety and vice versa.

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