

Conference Paper

# Hemispheric Asymmetry and Stress Exposure Model in a Professional Evaluation Situation

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## Abstract

The urgency of the study on the system of psychophysiological and psychological (temperamental and personal) factors of stress exposure in a situation of professional evaluation of the subjects is considered. The results of the empirical study of stress factors including psychophysiological, temperological and personal characteristics of the subjects are given. The analysis is made with the use of hardware–software system ‘Aktivatsiometr 9K’ by Y.A. Tsagarelli to detect psychophysiological parameters (functional hemispheric asymmetry, activation of the brain hemispheres, strength and lability of the nervous system), «Structure of temperament questionnaire» by V.M. Rusalov, and diagnosis of the strategic options for choosing a life journey of the ‘Typology of Personal Choice’ by V.G. Gryazeva-Dobshinskaya and A.S. Maltseva. Individually typological, as well as dynamic and activity-situational (in a situation of professional evaluation) characteristics of activation and hemispheric asymmetry of the subjects are calculated. Stress reaction is detected, provided individual-typological and activity situational characteristics of activation of the subjects differ by more than 1.5 times. Fifty-six senior students aging between 20 and 25 are the sample of the analysis. The sample is divided into two groups in accordance with the response to the situation of assessment of professional competence: group 1 ( $n_1 = 19$  people) with a detected stress reaction, group 2 ( $n_2 = 37$  people), in which the stress reaction is not detected. The correctness of the obtained differentiation in the groups of students, differing in the system of indicators of psychophysiological, temperological and personal characteristics is proved with the help of discriminate analysis. The model of stress exposure in a situation of professional evaluation is developed.

**Keywords:** functional hemispheric asymmetry, everyday stress, professional evaluation, temperamental characteristics, personal choice

## 1. Introduction

Situation of professional competencies evaluation of subject’s activity (evaluation of professional qualities or quality of done work) are fairly common, and study of their

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stressogenicity is one of main problems of everyday stress researches. As with other stress factors, how this situations influence person depends on how meaningful they are for recipient, type of emotional experience, personal factors and recipient's age, this was confirmed by many researches of critical situation's experience, everyday stress, professional stress [4, 5, 34, 37–39, 41]. Study of structure of everyday stressors discovered, that for young people (age 18–25) the most significant stressors appears to be «lack of professional knowledge», «consequences of wrong actions» [12]. This allows to assume that professional competencies evaluation situation are significant stressors for this age group. Study of personal factors of susceptibility to such stressors is relevant in context of psychological adaptation to professional activity [5].

Many researchers found correlation between susceptibility to psychological stress and neurodynamic and psychological characteristics of recipients, while characteristics of functional hemispheric asymmetry in context of stress were less studied.

Following properties of the nervous system were studied as stress predictors that lower stress tolerance: strength, lability, stability, as well as characteristics temperament, such as emotional stability, ergogenicity, plasticity [15, 25, 36].

Study of functional asymmetry of the brain discovered personal characteristics of mental processes, behavior and recipient's activity that was connected to stability of dominant and subdominant hemispheres, their differentiation and interactions [11, 16, 19, 30]. The degree of stability and characteristics of dynamic of brain hemisphere's activity in different situations, as well as dynamic of brain hemisphere's activity (before its inversion) are discovered under influence of physiological and psychological stressors [9, 10]. In applied researches of different ages and profession samples were discovered significant differences in education, sport activity under extreme conditions, in extreme activity between two subjects with different functional asymmetry profiles, as well as different lateral profiles, including aside from hemispheric asymmetry, sensory nervous and locomotor systems asymmetry [2, 20, 32, 33].

Following personal characteristics influencing susceptibility to psychological (professional) stress were studied: anxiety, frustration, tensivity, impulsiveness, emotional immaturity, dominance, suspiciousness, impatience and fear of uncertainty [3, 8, 25, 34]. Personal predictors of stress tolerance are found: positive activity motivation, including high motivation toward success, need to self-realization, self-actualization, high self-esteem, self-acceptance, tolerance toward uncertainty, constructive behavior in conflict situations, openness to communication and trust toward other people [17, 25, 28].

Personal factors influencing susceptibility to stress, stress tolerance and coping strategies mainly studied in context of adaptation, self-regulation [4, 7, 8, 20, 40]. Another tendency of study of personal factors of overcoming psychological stress based on understanding of human as open, self-developing system with expressed tendency toward nonadaptive, suprasituational activity, searching activity, meaningfulness, creativity in critical situations [1, 3, 6, 23, 24, 27, 31].

The relevance of research of susceptibility to stress in situations of professional competencies evaluation of young people come from personal significance of such situations to them, subsequent effect it causes on recipient's performance and frequency of such situations. Study gives opportunity to identify, based on results on empirical study, how strong influence of psychophysiological and psychological factors, that provides adaptive and nonadaptive activity tendencies, on the whole picture of stress susceptibility.

## 2. Methodology

The objective of the research is to identify the importance of psychophysiological and psychological (psychodynamic, personal) stress factors in a situation of professional evaluation of the subjects. To develop a predicative model, the study includes not only the known psychophysiological, psychodynamic factors (functional hemispheric asymmetry, characteristics of the nervous system and temperament), but unexamined variables of personality connected with the targeting of a person as well, these are strategic choices of a life journey. The systematic study of stress exposure in a situation of professional evaluation including psychophysiological, cognitive and motivation functions is based on the method of syndrome analysis of psychical functions by A.R. Luria and its interpretation in accordance with the post-non-classical paradigm of psychology in the aspect of multiple determination, that is casual providing determination of past structures and a goal one providing determination of the future [18, 21, 22].

### 2.1. Hypothesis of the research

Psychological stress exposure in a situation of professional evaluation represents the system of stable and dynamic psychophysiological and psychological characteristics having different vectors of determination such as adaptive and inadaptive; casual and goal vectors.

## 2.2. Design and structure of the research

Factors of stress exposure are studied at different levels which are:

1. a psychophysiological level, including individually typological characteristics of activation of the brain hemispheres and functional hemispheric asymmetry, strength, lability of the nervous system, effectiveness; activity-situational characteristics of activation of the brain hemispheres and functional hemispheric asymmetry; dynamic characteristics of activation of the brain hemispheres and functional hemispheric asymmetry in professional evaluation situation and
2. a psychological level, including a psychodynamic level, that is the indicators of the characteristics of temperament; and a level of personality, that is strategic choice of a life journey determining the type of a personal choice.

Individually typological indicators of activation of the brain hemispheres and functional hemispheric asymmetry are estimated on the basis of 13 samples in comfortable surroundings. Activity-situational, dynamic indicators of activation of the brain hemispheres and functional hemispheric asymmetry are obtained on the basis of a single sampling in a situation of professional evaluation. A test (a number of case tasks) in a field-oriented subject with a professional competence assessment is chosen as a situation of professional evaluation. The stress reaction was diagnosed provided activity-situational characteristics of activation exceed individually typological characteristics of activation of the brain hemispheres by more than 1.5 times.

To develop a model of stress exposure, a discriminate analysis of quantitative data of psychological diagnosis of the students is used. The calculations are made with the help of statistics package IBM SPSS Statistics [26].

## 2.3. Sample

The sample consisted of 56 students aged from 20 to 25 years. The sample was divided into 2 groups in accordance with the reaction in situation of professional evaluation: group 1 – ( $n_1 = 19$  students) with stress reaction; group 2 – ( $n_1 = 37$  students) without stress reaction.

## 2.4. Research methods

For the propose of studying psycho-physiological factors of stress susceptibility was used complex 'Activatiometr' by Yu.A. Tsagarelli [35]. Individual typological characteristics of activation were diagnosed by the following parameters: activation of the left hemisphere (AHL), activation of the right hemisphere (AHR), total hemispheres activation (AH) and functional hemispheric asymmetry (FHA). Activity-situational characteristics of activation were diagnosed by the following parameters: total hemispheres activation (AH) and functional hemispheric asymmetry (FHA). Brain hemispheres activation parameters and functional hemispheric asymmetry parameters were diagnosed by skin-galvanic reaction.

For diagnosis of individually typological characteristics of nervous system were studied: tapping test (nervous system strength and effectiveness), method of registration critical flicker-fusion frequency (nervous system lability and its stability).

Dynamic characteristics of brain hemispheres activation and functional hemispheric asymmetry were calculated as difference between individually typological and activity-situational characteristics of brain hemispheres activation and functional hemispheric asymmetry: dynamic of total hemispheres activation ( $\Delta$  AH) and dynamic of functional hemispheric asymmetry ( $\Delta$  FHA).

For the purpose of studying temperamental factors of stress susceptibility was used «Structure of Temperament Questionnaire (STQ)» by V.M. Rusalov [29]. It includes 8 independent scales, designed to diagnose «socio-verbal» and «physical» aspects of temperament: (1–2) «subject ergonicity» and «social ergonicity» (subject's activity in motor activity or in social contact); (3–4) «subject plasticity» and «social plasticity» (speed of switching from one type of thinking to other one, or from one person to other while interacting with them); (5–6) «subject tempo» and «social tempo» (speed of physical motor activity in progress or verbal motor activity in communication); (7–8) «subject emotionality» and «social emotionality» (sensitivity while evaluating thought out and actually achieved results in activity or social communication).

For the purpose of studying personal factors of stress susceptibility was used «Typology of Personal Choice» (TPC) questionnaire by V.G. Gryazeva-Dobshinskaya and A.S. Mal'tseva [13]. This questionnaire diagnose strategic framework of person's way of life and include two independent scales: «reflection and supporting of inner complexity» (RSIC) and «recognizing and accepting an external complexity» (RAEC). Four types of life path choices are determined on the basis of these indicators: hedonistic, realistic, axiological, creative types of selection. The reflection and supporting

of inner complexity of personality determined through choosing unique, indefinite, spontaneous, non-pragmatic way of life (axiological and creative types of selection). The recognizing and accepting an external complexity realized through choosing risky, suprasituational, active, critical, independent, process-oriented, persistent strategies of realization chosen way of life (realistic and creative types of selection). The validity of this questionnaire is proved by various studies [14].

### 3. Results

#### 3.1. Testing subjects' differentiation into groups based on the system of indicators of exposure to stress in the situation of professional evaluation. Model of exposure to stress based on the discriminative analysis

Differentiation of subjects into groups based on the system of indicators of exposure to stress in the situation of professional evaluation was implemented on the basis of psychophysiological, temperological and personal characteristics selected with the use of theoretical analysis as differentiation factors, and was tested using the discriminative analysis.

Results of the discriminative analysis prove differences in the system of indicators of psychophysiological, temperological and personal characteristics of the group of students differentiated by the level of relevance of stress reaction in the situation of professional evaluation; the accuracy of distribution of the subjects into groups amounted 94.4%.

The main discriminant function, which is a linear equation (including only relevant variables) for implementing the classification of the subjects with presence or absence of stress reaction in the situation of professional evaluation, looks as follows:

$$F = (-0.254 * ST + 0.166 * SubP + 0.135 * SP - 0.115 * SubE) + (0.116 * RSIC + 0.104 * RAEC) + (0.103 * L + 0.083 * E - 0.012 * AH) + (0.023 * \Delta AH + 0.013 * \Delta FHA) - 2.551$$
, where discriminant function equation of stress exposure include: (1) temperamental indicators: ST – social tempo, SubP – subject plasticity, SP – social plasticity, SubE – subject emotionality; (2) personal indicators: RSIC – reflection and supporting of inner complexity, RAEC – recognizing and accepting an external complexity; (3) psychophysiological indicators (typological): L – lability, E – effectiveness, AH – total hemispheres activation; (4) psychophysiological indicators (dynamics):  $\Delta AH$  – dynamic of total hemispheres activation,  $\Delta FHA$  – dynamic of functional hemispheric asymmetry.

TABLE 1: Contribution of indicators in discriminant function.

System of stress exposure indicators in situation of professional evaluation	Contribution of indicator in discriminant function
Psychophysiological indicators («Activatiometr 9K»)	
Total hemispheres activation	-0.827
Effectiveness	0.533
Nervous system lability	-0.385
Dynamic of functional hemispheric asymmetry	0.247
Dynamic of total hemispheres activation	0.994
Temperamental indicators (scales of STQ)	
Subject plasticity	0.612
Social plasticity	0.396
Social tempo	-0.829
Subject emotionality	-0.426
Personal indicators (scales of «TPC»)	
Reflection and supporting of inner complexity	0.330
Recognizing and accepting an external complexity	0.301

The contribution of each relevant indicator for differentiation of groups of the factor's subjects into the model of exposure to stress is given in Table 1.

A relevant contribution into the model of exposure to stress is made the indicators of psychophysiological, psychodynamic, and personal levels. At the psychophysiological level relevance belongs to indicators connected with individual and typological characteristics of brain activation, effectiveness and lability of nervous system, and with characteristics of the dynamic of total hemispheres activation and dynamic of functional hemispheric asymmetry, based on which the stress reaction in the situation of professional evaluation is diagnosed. At the psychodynamic level relevance belongs to indicators of temperamental characteristics: social tempo, subject emotionality, subject and social plasticity. At the personal level relevance belongs to indicators which characterize the type of personal choice: reflection and support of internal complexity along with recognition and acceptance of external difficulty.

#### 4. Discussion

The determined relevant indicators included into the model of the subjects' exposure to stress in the situation of professional evaluation prove the research hypothesis about a system of stable (typological) and dynamic characteristics of psychophysiological and psychological functionality levels which determine the nature of the subjects'

reaction on a possible stressful situation. One of two dynamic indicators – dynamic of total hemispheres activation – is used in research based on the Tsagareli method for determining the level of stress; the second dynamic indicator – the and dynamic of functional hemispheric asymmetry – was included in this research based on studying the research materials on the issue of interconnection of functional hemispheric asymmetry and stress [9–11, 30] and can also be used for determining the characteristics of the subjects' stress reaction.

Inclusion of individual and typological characteristics of the nervous system into the model of exposure to stress proves the previously determined regularities of interconnection between their indicators with indicators of psychological stress or stress resistance [15, 25, 36].

Inclusion of individual and typological characteristics of temperament into the model is specific (only four characteristics got included) which is probably connected with specificities of the situation of evaluation (communicative aspect) of professional competencies (subject aspect).

The research of exposure to stress also included previously unstudied indicators of types of personal choice – the characteristics connected with strategies of the subjects' goal-setting and, correspondingly, goal determination of activity – the factors determining creative, inadapative, or realistic, adaptive nature of the subjects' settings. Inclusion of these both indicators of types of personal choice – of both self-reflection and support of internal complexity, and recognition and acceptance of external difficulty – into the model on the basis of discriminative analysis proved the hypothesis about the fact that exposure to stress as a system includes characteristics which have different vectors of determination such as adaptive and inadapative, casual and targeted.

## 5. Conclusions

Based on the results of the study, the following conclusions can be drawn:

1. Results of the discriminative analysis prove differences in the system of indicators of psychophysiological, temperamental and personal characteristics of the group of students differentiated per presence or absence of stress reaction in the situation of professional evaluation at a high level of significance.
2. The model of stress exposure in situation of professional evaluation is developed on the base of discriminative analysis. The equation of discriminant function of stress exposure include temperamental indicators (social tempo, subject



plasticity, social plasticity, subject emotionality); personal indicators (reflection and supporting of inner complexity, recognizing and accepting an external complexity); typological psychophysiological indicators (lability, effectiveness, total hemispheres activation; dynamic psychophysiological indicators: dynamic of total hemispheres activation, dynamic of functional hemispheric asymmetry).

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