

ALEXITHYMIA FORMATION AS AN ADAPTATION TO EVERYDAY STRESS IS DETERMINED BY THE PROPERTIES OF THE NERVOUS SYSTEM

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ABSTRACT

The aim of the study was to determine the psychological nature and mechanisms of alexithymia formation by way of the analysis of its relation to the properties of the nervous system, mental states, and characteristics of the emotional sphere of the personality.

Materials and methods: In the process of the study, for the diagnostics of alexithymia, we used the 26-item Toronto Alexithymia Scale (TAS-26) developed by G.J. Taylor and a block of psycho-diagnostic methods aimed at the diagnostics of properties of the nervous systems, the emotional sphere and mental states of respondents. The relationships were evaluated using Spearman's rank correlation coefficient and Pearson's correlation coefficient.

Results: The main factors related to alexithymia were weak nervous system, low stress resistance and such characteristics of the emotional sphere as marked extraversion, high level of trait anxiety, neuroticism, indirect verbal aggression, low levels of aggressiveness. The emotional exhaustion and reduction of personal achievements, the Resistance Phase, chronic fatigue and depression were the most pronounced within the alexithymia group. The alexithymic personality type demonstrated less developed spatial anticipation.

Conclusion: In accordance with our results, the weakness of the nervous system and high Trait Anxiety facilitate the adaption to stressful situations by avoiding and crowding out negative emotions, lead to the inability of verbal description and expression of emotions. A low level of stress resistance conduces to neurotization, chronic fatigue, and emotional burnout. The predominance of refractory and dysphoric reactions causes a negative vision of the situation and can provoke the development of psychosomatic disorders.

KEY WORDS: alexithymia, the emotional sphere, mental states, features of nervous system

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INTRODUCTION

The problem of alexithymia has been started to be discussed in the scientific psychological literature relatively recently, and the first one to use this term was the French scientist P. Sifnenos in 1973. The term "alexithymia" means the absence of words for description of feelings (a – "absence", lexis – "word", thymos – "emotion") [1].

Alexithymia is manifested in such particularities of the personality as problems in the recognition and verbalization of own emotions and of emotions of surrounding persons, the difficulty in discrimination of emotions and physiological feelings, a "concrete" way of thinking, the decline of the ability to fantasize, more focusing on external events to the detriment of internal experience, and the deficit of inter-personal communication [2; 3; 4; 5; 6].

The etiology of alexithymia remains undetermined. As to reasons of alexithymia, there are two main approaches, which view it either as primary, genetically determined phenomenon [7; 8] caused by the pathology of the brain, or as a secondary phenomenon occurring in result of psychological traumas [9; 6] or trauma of the brain [10]. The development of alexithymia is associated with organic

and functional disorders of various brain structures. As the anatomic correlative of alexithymia (more precisely, of one of its symptoms, the Difficulty Describing Feelings) in cases of bulimia nervosa (BN), the denseness of the grey matter of the parietal lobe of the brain, in particular, of the right angular gyrus, is distinguished [11]. The topographical alteration of functional links in cases of alexithymia in resting state reflects the changes in informational and emotions activating processes [12]. In cases of alexithymia, changes are found in inter-regional structural networks (fronto-insular cortex) associated with social effective processes, perception of emotions and empathy [13]. Alexithymia is associated with multiple neural clusters of reward processing, namely, with the reward and the loss prospect phases, the insula, midbrain, and pons, the inferior and middle frontal gyri, and the dorsolateral prefrontal cortex (DLPFC) [14]. The latter is indicative of alexithymia as an acquired characteristic, a reversible phenomenon which is explained as a psychological defense in the form of opposition, avoidance, and negative emotionality [15; 16].

The adaptation approach allows considering alexithymia as one of the consecutive adaptation reactions to anxiety, on

the one hand [17], and as the factor, which preconditions the formation of the somatization – on the other hand [10; 17]. The phenomenon of alexithymia generates the most interest due to its relation to psychosomatic disorders. According to the alexithymia concept of psychosomatic disorders [18; 19; 20], the limitation of apprehension and cognitive processing of emotions, as well as difficulties with their verbalization, facilitate the intensification and prolongation of physiological responses to negative effects of the external environment, which facilitate the creation of conditions for the development of the psychosomatic symptoms.

Different studies demonstrate the link between alexithymia and the coronary heart disease, arterial hypertension, diabetes mellitus, bronchial asthma, gastric and duodenal ulcer, ulcerative colitis, and malignant tumors [21; 22]. Also, links were confirmed between alexithymia and substance-use disorders [14], alcohol dependency [23], panic disorders and phobias [2; 3; 20; 24; 25], depression [8; 20; 26], and autistic spectrum disorders [13]. The link between alexithymia and the emotional burnout is, possibly, very important, because the latter is potentially a phase of development of the depressive disorder [27]. Genetic factors of the link between alexithymia and depression have to be mentioned [8]. Alexithymia can be an independent risk factor of the emotional burnout [28]. This assumption is supported by positive correlation relationships between alexithymia and the emotional exhaustion and depersonalization) and negative correlation relationships with the sense of family support and personal achievement) [26].

The problem of alexithymic personalities is the inability and impossibility to discriminate own emotions and experiences of other persons; they show low expressivity which makes them indifferent, cold and lacking in understanding for persons surrounding them. They are unable to show to their conversation partner their understanding and to express their compassion, and in result inter-personal relations worsen, the adaptation level within a team decreases, and the person him/herself may feel that he/she is different from the others. A low socio-psychological adaptation, in turn, may lead to the experience of loneliness, isolation, inability to master assistance professions (psychologist, physician, social worker) and decreases the level of satisfaction with life and also promotes the development of bad habits. [29, 30].

In contemporary scientific literature, discussions are held in respect of the nature of the phenomenon of alexithymia, and until now one of the most common has been the hypothesis of the alteration in the interaction between brain hemispheres with the insufficient function of the right hemisphere. Without contradicting the justification of putting forward such hypotheses, we would like to mention that the attempt of explaining the nature of alexithymia by solely physiological reasons is clearly insufficient and not only does not exclude, but also does provide for the necessity of a substantial psychological analysis of this phenomenon, that is, the study of the matter of its psychological nature and mechanisms. The

knowledge of these mechanisms can help to develop and to give scientific credence to ways of its psychocorrection and psychotherapy.

THE AIM

The aim of our research was to determine the psychological nature and mechanisms of the alexithymia formation by way of the analysis of its relationships with the properties of the nervous system, mental states, and characteristics of the emotional sphere of the personality.

The goal: to determine the level of alexithymia in respondents; to determine the correlations between alexithymia and properties of the nervous system (the strength of processes of the excitation and the inhibition, mobility of nervous processes); to find correlation relationships between alexithymia and mental states: emotional burnout, chronic fatigue, depression, anxiety; to show the correlation between alexithymia and low stress resistance, neurotization, neurotism and the expressiveness of psychological stress; to determine the correlation between alexithymia and aggressiveness and anxiety.

The hypothesis of the research was the supposition about the existence of a correlation between alexithymia and properties of the nervous system, which, in turn, determine particularities of the emotional sphere and mental states of persons with alexithymia traits.

MATERIALS AND METHODS

PARTICIPANTS

The objects of survey were 329 healthy volunteers (242 women and 87 men, aged 18 to 26 years old, $M_{age} = 18.91$, $SD = 1.6$ years), first-third year students of the Taras Shevchenko National University of Kyiv (Educational and Scientific Centre “Institute of Biology and Medicine” and Faculty of Psychology) and National Aviation University (Institute of the Humanities), Kyiv, Ukraine. The participants were eligible to enroll in the study if they were ≥ 18 years old and had no clinical manifestations of mental or cognitive impairment. Exclusion criteria were: the use of psychoactive medication, drug or alcohol addiction and psychiatric or neurological complaints. All participants were tested 1-3 months before the exam time (baseline session).

The study was approved by the Bioethics Commission of Educational and Scientific Centre “Institute of Biology and Medicine”, Taras Shevchenko National University of Kyiv and written informed consent was obtained from each subject in accordance with the World Medical Association (WMA) declaration of Helsinki – ethical principles for the medical research involving human subjects (Helsinki, Finland, June 1964).

QUESTIONNAIRES

To determine the level of alexithymia we used 26-item Toronto Alexithymia Scale (TAS-26) developed by G. J. Taylor and co-authors in 1985 [31].

Alexithymia is determined by following cognitive-affective psychological features: difficulties in the determination (identification) and description of own feelings; difficulties in the discrimination of feelings and bodily sensations; decrease in the symbolization ability (feeble imagination and poorness of other imagination manifestations); more focus on external events than on internal experiences. In Russian language, the methodology was adapted in Bekhterev Research Institute [32].

In order to measure the severity of emotional burnout in students, we used the 22-item Maslach Burnout Inventory (MBI) and 84-item Boyko's Syndrome of Emotional Burnout Inventory (SEB) [33; 34] adapted for students by Tukaiev and Vasheka [35]. The sub-scales' Cronbach's alpha in the current sample were 0,807 for Emotional Exhaustion, 0,690 for Depersonalization, 0,807 for Personal Accomplishment (MBI), 0,847 for Anxiety Tension, 0,817 for Resistance, 0,759 for and Exhaustion (SEB).

With the purpose of diagnostics of individual topological properties, the emotional sphere and mental states, we used following psychodiagnosis methodologies. The Temperament Diagnostics Test by Jan Strelau and Hans Eysenck's Personality Inventory (EPI) indicates the individual typological characteristics. These methods allowed for determining the strength of excitation and inhibition processes, mobility of nervous processes, tranquility of one's nervous system, and the level of extraversion-introversion and neuroticism [32]. The EPI scales' Cronbach's alpha in the current sample were 0,710 for Extraversion and 0,753 for Neuroticism, whereas for Temperament Diagnostics Test scales Cronbach's alpha was 0,866 for Excitative Processes scale, 0,844 for Inhibitory Processes scale, and 0,819 for Mobility of Nervous Processes.

The Taylor Manifest Anxiety Scale (TMAS) measures the anxiety as general personality trait. The State-Trait Anxiety Inventory (STAI) by C. Spielberger (adapted by Y. Hanin) determines the level of anxiety on the basis of self-assessment scale (high, medium, low anxiety). State anxiety arises as a reaction to socio-psychological stressors. Trait anxiety gives an idea of the individual stress susceptibility base on personality traits [32]. The TMAS scales' Cronbach's alpha in the current sample was 0,887, while STAI's Cronbach's

Also, in order to determine the mental state of the interviewees, emotional reactions the following tests were used:

UN scale (Wasserman questionnaire for express diagnostics of neurotization level) was aimed to evaluate the probability of occurrence of neurotic episodes (a diagnostic scale) and social desirability (control scale). Seven degrees of UN scale indicate acute (negative scores) or low (high positive scores over 30 points) neurotization level. [32]. The sub-scales' Cronbach's alpha in the current sample was 0,856.

V.A. Zhmurov differential diagnostics of depression detects mostly depressed mood or melancholic depression, and makes it possible to establish the severity of the doldrums at the moment on a scale from 1 to 132 points: 1 to 9 points – the depression is not formed, 10 to 24 points—the depression is minimal, 25 to 44 points – the mild depres-

sion, 45 to 67 points – the moderate depression, 68 to 87 points—the pronounced depression, 88 to 132 points – the major depression. [32]. The scales' Cronbach's alpha in the current sample was 0,950.

V. Boyko diagnostics of emotional response to environmental stimuli allows to determine the dominant type of emotional reaction, transformation method of internal and external influences in a positive, neutral or negative energy states and behaviour acts. The test considers two parameters: the type of emotional reaction (outward euphoric, inward refractory and outward dysphoric types of emotional reaction) and the nature of the stimuli (positive, neutral or ambivalent, negative) [32]. The scales' Cronbach's alpha in the current sample was 0,822 for Euphoria scale, 0,696 for Refractory scale, and 0,764 for Dysphoria scale.

Boston the social stress test "Lifestyle Analysis" determines vulnerability to stressful situations to the extent of the life tension. [32]. The scales' Cronbach's alpha in the current sample was 0,600

Lemur-Tessier-Fillion Psychological Stress Measure (PSM-25) was used to assess current work-related stress levels on 8-point Likert scale ("not at all" to "greatly") from 25 to 200 points [32]. The scales' Cronbach's alpha in the current sample was 0,928.

E.P. Illyn and P.A. Kovalev aggressive behaviour test is designed to detect the predisposition to a certain type of aggressive behavior (the tendency to direct and indirect verbal aggression, the tendency to direct and indirect physical aggression, the level of expansiveness). Integral test indicator (expansiveness) is diagnosed over 20 points. The scales' Cronbach's alpha in the current sample was 0,672 for Direct Verbal Aggression scale, 0,661 for Indirect Verbal Aggression scale, 0,662 for Indirect Physical Aggression scale, and 0,699 for Direct Aggression scale. 20-item Assinger Relationship Aggressiveness Test is intended to identify the stable level of external aggressiveness [32].

In order to identify the presence of chronic fatigue syndrome we used Leonova's the Degree of Chronic Fatigue Syndrome Test, aimed to determine the pre-clinical stages of chronic fatigue that may result in a number of pathological states (neuroses, asthenic syndrome etc). The technique allows diagnosing following 4 main groups of symptoms: symptoms of physiological discomfort, general feeling unwell and cognitive discomfort, abnormalities in the emotional-affective sphere, the decrease in motivation and changes in the sphere of social communication and the overall index of chronic fatigue [36].

Statistical processing of data was carried out using the methods of mathematical statistics in the Statistical Package for the Social Sciences (SPSS 22). We used the Kolmogorov-Smirnov test to determine the type of data distribution. Pearson product-moment correlation coefficient and Spearman's rank correlation coefficient allowed to measure how strong the relationship between variables. Hierarchical clustering was used to identify relatively homogeneous groups of observations for given characteristics.

Table I. Correlation Relationships between Alexithymia and Properties of the Nervous System (J. Strelau methodology), n=329

Alexithymia	Strength of Excitation Processes	Strength of Inhibition Processes	Mobility of Nervous Processes	Anxiety	Depression
	-0.372**	-0.307**	-0.222**	0.439**	0.398**
Alexithymia	Neurotizm	Neurotization	Trait Anxiety	Indirect Verbal Aggression	Aggressiveness
	0.302**	0.457**	0.406**	0.187*	-0.165*
Alexithymia	Inward refractory activity	Outward dysphoric activity	Outward euphoric activity	Non-Resistance to Stress, The Boston Test	Psychological Stress (PSM-25)
	0.314**	0.243**	-0.389**	0.306**	0.350**
Alexithymia	Chronic Fatigue State	Emotional Burnout	Exhaustion	Depersonalization	Reduction of Professional Achievements
	0.389**	0.410**	0.343**	0.243**	-0.415**

* The correlation is significant at the level 0.05 (2-directional).

** The correlation is significant at the level 0.01 (2-directional).

RESULTS AND DISCUSSION

Using the correlation analysis and with the use of Pearson's and Spearman's criteria, correlation relationships of alexithymia were determined, which had the inverse directionality with such properties of the nervous system as the strength of excitation processes, the strength of inhibition, and the mobility of neural processes, which indicated the predisposition to alexithymia of persons with weak nervous system (Table I).

A direct correlation was determined between alexithymia and characteristics of the emotional sphere of respondents: neuroticism, Trait Anxiety (Spielberger), depression, neurotization, anxiety (Tailor), inward refractory and outward dysphoric reactions to external stimuli, indirect verbal aggression, and the inversed correlation with the aggressiveness (Assinger) and the outward euphoric reaction to stimuli.

High level of neuroticism and anxiety, in our opinion, leads to blocking of emotional experiences, especially in psycho-traumatic situations, and to their repression from the conscious sphere, which is eventually manifested in the inability of their verbal description and expression. Highly anxious personalities constantly suppress their feelings and emotional reactions, and that becomes usual for them, and feelings themselves become less expressed even outside of stress situation.

It is interesting that alexithymia turned out to have an inverse relationship with aggressiveness, which is indicative of the pattern of hiding their emotions, especially negative ones, which is typical for persons with alexithymia. And the direct correlation with indirect verbal aggression points at their tending to express negative emotions by way of talking about unpleasant people or events with their friends, but not by way of a direct conflict.

A direct correlation was determined between alexithymia and mental states, such as the state of chronic fatigue,

psychological stress (PSM-25), low level of ability to cope with stress (the Boston Social Stress Test "Lifestyle Analysis"), emotional burnout according to methodologies of V. Boyko and Christina Maslach.

In our opinion, difficulties in the discrimination of feelings and bodily sensations of alexithymic persons may lead to the impossibility to distinguish the chronic fatigue from the state of depression. Herewith, the lack of understanding of own emotions brings up the issue of the adequacy of answers of alexithymic persons to questionnaires, results of which are based on self-reports of respondents. If a person does not understand own feelings, how veracious will be their answers related to them?

The hierarchic cluster analysis was conducted with the use of the Between-Groups Linkage method. In result, the tree diagram shown on Fig. I was obtained, from which it can be understood that alexithymia forms a cluster with properties of the nervous system (the strength of excitation, the strength of inhibition processes, and the mobility of nervous processes). At further steps, this cluster is joined by emotional burnout and psychological stress, which, in turn, join clusters of negative emotions and mental states. In our opinion, obtained results are indicative of the first priority of the nervous system properties in the formation of both manifestations of alexithymia and of the chronic fatigue, exhaustion, stress, etc.

Results of the correlation analysis show the inverse relationship between alexithymia and the strength of the nervous system, that is, average and low strength of excitation, inhibition and mobility of nervous processes is mainly observed in persons with alexithymia. Persons with weak nervous system cannot withstand durable exertion, get tired very soon, are unable to efficiently work for a long time, demonstrate weak self-control and slow reactions to stimuli. In our opinion, properties of the nervous

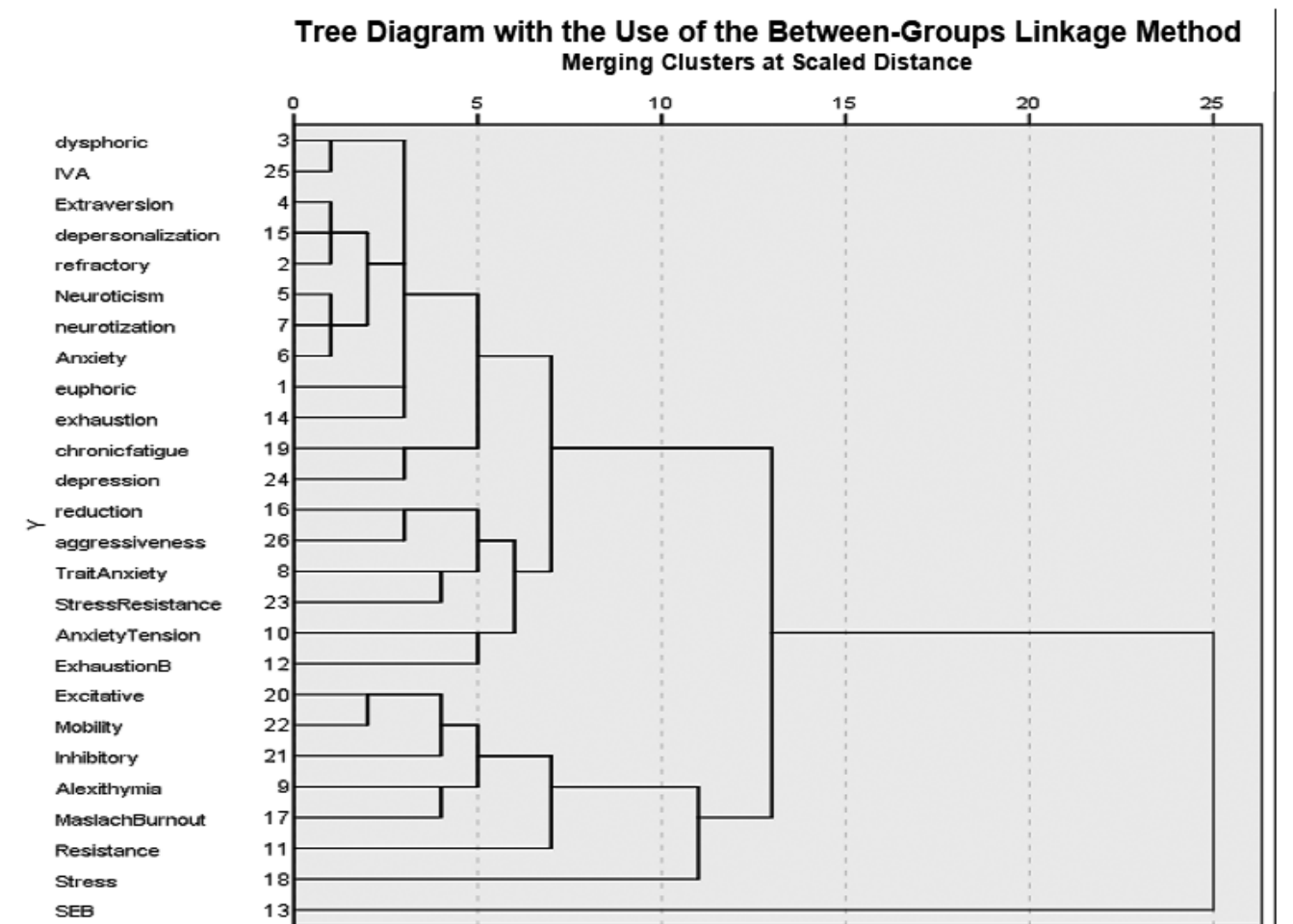


Fig. I. Results of Hierarchic Cluster Analysis

system (the low level of the of excitation and suppression processes) determine the low level of resistance, the submission to stress, which, in turn, forms chronic fatigue, neurotization and emotional burnout in persons with alexithymia. Also, a weak nervous system determines the sensitivity to external stimuli, including to pain, which was experimentally determined by Nyklíček et al [37]. Their experiments demonstrate that patients with alexithymia are hyper sensitive to both unpleasant internal somatic sensations and to external pain stimuli.

The emotional sphere of persons with alexithymia demonstrates the vulnerability to external stimuli, which is manifested by emotional instability, predominance of refractory and dysphoric reactions, depressed states, in the high level of Trait Anxiety. On the other hand, in the study by V. G. Ragozinskaya [38] the assumption is made about the psycho-traumatic nature of alexithymia, according to which alexithymic traits develop as a psychological defense mechanism on the basis of previous anxiety and depression. Based only on results obtained during the study, it cannot be definitely asserted what is the reason and what is the cause: alexithymia or high anxiety level. However, the relation between these two psychological characteristics is incontestable.

Also, tight relations are observed between alexithymia and negative emotional states and such properties of the personality as neuroticism and low stress resistance. In our opinion, due to weak nervous system and low resistance to stress, persons with alexithymia are very vulnerable to difficulties and life and psycho-traumatic factors. They react to stress by the development of emotions blocking (at first, of negative ones, and, later, of positive too), which eventually forms into a persistent unawareness of own feelings.

The lack of understanding of own feelings and of feelings of surrounding people worsen the socio-psychological adaptation of alexithymic persons and leads to the sense of loneliness and experiencing own difference, which decreases the level of satisfaction with life and may form depressive disorders.

The dominant type of response to life circumstances are refractory and dysphoric reactions, which points at the predominance of negative apprehension of situations, continuous rueful feelings over an event, fixedness on negative emotions and the strive not to demonstrate such emotions to others. A pronounced anxiety and the inability to react in a positive way lead to high vulnerability to stress influences and to the formation of a specific avoiding style of behavior.

If alexithymia is viewed as a defense from negative psycho-traumatic experiences, the relation between alexithymia and various forms of addictive behavior and overeating becomes understandable [39]: an alexithymic person abstracts from negative emotions by way of searching for new sources of positive emotions, which are not always safe for health.

CONCLUSIONS

In result of the research conducted, a conclusion can be made that alexithymia as a psychological phenomenon has various natures and manifestations, and due to that no firm conclusion can be made today in respect of its mechanisms. The obtained result of the correlation between alexithymia and properties of the nervous system is indicative of the fact that the predomination of weak nervous system in alexithymic persons, in combination with the high level of neuroticism and Trait Anxiety becomes the trigger mechanism for blocking negative emotions, which, in the course of time, may develop into a generalized process of suppression of entire emotional experiences.

The relations between alexithymia and such mental states as the emotional burnout, chronic fatigue and depression which were determined allow supposing that, firstly, described phenomena are similar in a way, which requires a long-term longitudinal study of the dynamics of mental states, and also confirms the assumption in respect of the vulnerability of alexithymic personalities to the influence of negative stimuli and difficult life situations. The predomination of refractory and dysphoric reactions to stimuli complicates the positive rethinking of a situation by alexithymic persons and worsens their emotional state. Also, in our opinion, refractory reactions directed inwards (accumulation of resentment or anger) in combination with indirect verbal aggression and low level of aggression lead to negative experiences and is an impulse for the development of psychosomatic disorders.

In prospect, of special interest are the studies of specific features of the cognitive sphere of alexithymic personalities and of their ability of anticipation and creativity, which may become the subject matter of future studies in this field.

REFERENCE

- Sifneos P. E. The prevalence of alexithymic characteristic mechanisms in psychosomatic patients. *Psychother. Psychosom.*, 1973; 21: 133-136.
- Bagby R. M., Taylor G. J., Parker J. D. A preliminary investigation of alexithymia in men with psychoactive substance dependence. *The American Journal of Psychiatry*, 1990; 147(9): 1228-1230.
- Taylor G. J., Bagby R. M., Parker J. D. Disorders of affect regulation: Alexithymia in medical and psychiatric illness. Cambridge University Press. 1999.
- Provotorov V. M., Chernov Yu. N., Lyshova O. V., et al. *Zhurnal nevrologii i psikiatrii im. SS Korsakova*, 2000; 100(6): 66-71. (In Russian)
- Moriguchi Y., Komaki G. Neuroimaging studies of alexithymia: physical, affective, and social perspectives. *BioPsychoSocial medicine*, 2013; 7(1): 8. DOI: <https://doi.org/10.1186/1751-0759-7-8>
- Krystal H. *Integration and self healing: Affect, trauma, alexithymia*. Routledge. 2015.
- Jørgensen M. M., Zachariae R., Skytthe A., Kyvik K. (2007). Genetic and environmental factors in alexithymia: a population-based study of 8,785 Danish twin pairs. *Psychotherapy and psychosomatics*, 2007; 76(6): 369-375. DOI: <https://doi.org/10.1159/000107565>
- Picardi A., Fagnani C., Gigantesco A., et al. Genetic influences on alexithymia and their relationship with depressive symptoms. *Journal of psychosomatic research*, 2011; 71(4): 256-263.
- Badura A. S. Theoretical and empirical exploration of the similarities between emotional numbing in posttraumatic stress disorder and alexithymia. *Journal of Anxiety Disorders*, 2003; 17(3): 349-360. DOI: [https://doi.org/10.1016/S0887-6185\(02\)00201-3](https://doi.org/10.1016/S0887-6185(02)00201-3).
- Wood R. L., Williams C., Kalyani T. The impact of alexithymia on somatization after traumatic brain injury. *Brain Injury*, 2009; 23(7-8): 649-654.
- D'Agata F., Caroppo P., Amianto F., et al. Brain correlates of alexithymia in eating disorders: A voxel-based morphometry study. *Psychiatry and clinical neurosciences*, 2015; 69(11): 708-716. DOI: <https://doi.org/10.1111/pcn.12318>
- Tukaiev S., Chernykh M., Zyma I., et al. Topographical reorganization of functional connectivity under alexithymia. In *EUROPEAN PSYCHIATRY*, 2018; 48: 241-241.
- Bernhardt B. C., Valk S. L., Silani G., et al. (2013). Selective disruption of sociocognitive structural brain networks in autism and alexithymia. *Cerebral Cortex*, 2013; 24(12), 3258-3267. DOI: <https://doi.org/10.1093/cercor/bht182>
- Morie K. P., Yip S. W., Nich C., et al. Alexithymia and addiction: a review and preliminary data suggesting neurobiological links to reward/loss processing. *Current addiction reports*, 2016; 3(2): 239-248. DOI: <https://doi.org/10.1007/s40429-016-0097-8>
- Garanyan N. G., Kholmogorova A. B. Kontseptsiya aleksitimii (obzor zarubezhnykh issledovaniy). *Sotsial'naya i klinicheskaya psikiatriya*, 2003; 13(1): 128-145. (In Russian)
- Bilotta E., Giacomantonio M., Leone L., et al. Being alexithymic: Necessity or convenience. Negative emotionality × avoidant coping interactions and alexithymia. *Psychology and Psychotherapy: Theory, Research and Practice*, 2016; 89(3): 261-275. DOI: <https://doi.org/10.1111/papt.12079>
- Iskusnykh A. Yu. Aleksitimiya: prichiny i riski vozniknoveniya rastroystva. *Lichnost', sem'ya i obshchestvo: voprosy pedagogiki i psikhologii*, 2015; 15): 59-68. (In Russian)
- Solozhenkin V. V., Guzova Ye. S. Aleksitimiya (adaptatsionnyy podkhod) i psikhoterapevticheskaya model' korrektsii. *Sotsial'naya i klinicheskaya psikiatriya*, 1992; 8(2): 18-24. (In Russian)
- Cohen K., Auld F., Brooker H. (1994). Is alexithymia related to psychosomatic disorder and somatizing?. *Journal of psychosomatic research*, 1994; 38(2): 119-127.
- Bankier B., Aigner M., Bach, M. Alexithymia in DSM-IV disorder: comparative evaluation of somatoform disorder, panic disorder, obsessive-compulsive disorder, and depression. *Psychosomatics*, 2001; 42(3), 235-240. DOI: <https://doi.org/10.1176/appi.psy.42.3.235>
- Lumley M. A., Stettner L., Wehmer F. (1996). How are alexithymia and physical illness linked? A review and critique of pathways. *Journal of psychosomatic research*, 1996; 41(6): 505-518. DOI: [https://doi.org/10.1016/S0022-3999\(96\)00222-X](https://doi.org/10.1016/S0022-3999(96)00222-X)
- Lumley M. A., Beyer J., Radcliffe A. Alexithymia and physical health problems: A critique of potential pathways and a research agenda. In Vingerhoets A.J., Nyklíček I., Denollet J. eds *Emotion Regulation*, 2008, p. 43-68. Springer, Boston, MA. DOI: https://doi.org/10.1007/978-0-387-29986-0_4

23. Pombo S., Félix da Costa N., Ismail F., et al. Alexithymia and alcohol dependence: Do different subtypes manifest different emotion regulations. *Addiction Research & Theory*, 2015; 23(3): 187-195. DOI: <https://doi.org/10.3109/16066359.2014.949697>
24. Cox B. J., Swinson R. P., Shulman I. D., Bourdeau D. Alexithymia in panic disorder and social phobia. *Comprehensive Psychiatry*, 1995; 36(3): 195-198. DOI: [https://doi.org/10.1016/0010-440X\(95\)90081-6](https://doi.org/10.1016/0010-440X(95)90081-6)
25. Kim J. H., Lee S. J., Rim H. D., et al. The relationship between alexithymia and general symptoms of patients with depressive disorders. *Psychiatry investigation*, 2008; 5(3): 179-185. DOI: <https://doi.org/10.4306/pi.2008.5.3.179>
26. Bratis D., Tselebis A., Sikaras C., et al. Alexithymia and its association with burnout, depression and family support among Greek nursing staff. *Human Resources for Health*, 2009; 7(1): 72. DOI: <https://doi.org/10.1186/1478-4491-7-72>
27. Korczak, D., Huber, B., & Kister, C. (2010). Differential diagnostic of the burnout syndrome. *GMS health technology assessment*, 6: Doc09. DOI: <https://doi.org/10.3205/hta000087>
28. Mattila A. K., Ahola K., Honkonen T., et al. (2007). Alexithymia and occupational burnout are strongly associated in working population. *Journal of psychosomatic research*, 2007; 62(6): 657-665. DOI: <https://doi.org/10.1016/j.jpsychores.2007.01.002>
29. Vasheka T. Aleksytymiya yak nebazhana vlastyvist maybutnikh profesiynykh psykhoholiv. Aviatyina ta ekstremalna psykhoholiya u konteksti tekhnolohichnykh dosyahnen, 2019; 118-123. (In Ukrainian)
30. Gruzjeva T.S., Zhyvotovska A. I. (2019) Prevalence of bad habits among students of the institutions of higher medical education and ways of counteraction. *Wiad Lek*, 2019; 3: 384-390.
31. Taylor G. J., Ryan D., Bagby M. Toward the development of a new self-report alexithymia scale. *Psychotherapy and psychosomatics*, 1985; 44(4): 191-199. DOI: <https://doi.org/10.1159/000287912>
32. Raigorodsky D. Ya. Prakticheskaya psihodiagnostika. Metodiki i testy [Practical Psychodiagnosics. Methodology and Tests]. Moscow: Bahrah—Moscow. 2011. (In Russian)
33. Maslach C. Understanding job burnout. In A. M. Rossi, P. Perrewe, and S. Maslach Sauter Eds., *Stress and quality of working life: Current perspectives in occupational health*, Greenwich, CT: Information Age Publishing. 2006, p. 37–51.
34. Vodopyanova N. E., Starchenkova E. S. Syndrome of burnout: diagnostics and prevention. SPb: Piter, 2009, p. 336. (In Russian)
35. Tukaiev S. V., Vasheka T. V., Zyma I. G. Psikhologicheskiye i neyrofiziologicheskiye aspekty razvitiya sindroma emotsional'nogo vygoraniya. In V. P. Volkoff Ed., *Aktual'nyye aspekty vnutrenney meditsyny*, Novosibirsk: SibAK. 2013, p. 86–107. (In Russian)
36. Leonova A. B. (1984). *Psikhodiagnostika funktsional'nykh sostoyaniy cheloveka*. M.: Izd-vo Mosk. un-ta, 1984, 200 p. (In Russian)
37. Nyklyček I. I., Vingerhoets A. J. Alexithymia is associated with low tolerance to experimental painful stimulation. *Pain*, 2000; 85(3): 471-475. DOI: [https://doi.org/10.1016/S0304-3959\(99\)00295-X](https://doi.org/10.1016/S0304-3959(99)00295-X)
38. Ragozinskaya V. G. (2015). Osobennosti bioelektricheskoy aktivnosti golovnogogo mozga u lits s vysokim urovnem aleksitimii. *Peterburgskiy psikhologicheskyy zhurnal*, 2015; 11: 1-18. (In Russian). Retrieved from <http://ppj.spbu.ru/index.php/psy/article/download/83/50>
39. Nowakowski M. E., McFarlane T., Cassin S. (2013). Alexithymia and eating disorders: a critical review of the literature. *Journal of eating disorders*, 2013; 1(1): 21. DOI: <https://doi.org/10.1186/2050-2974-1-21>

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