

The Biophysical Modeling of Psychological Aspects

Janos Vincze *, Gabriella Vincze-Tiszay

Health Human International Environment Foundation, Budapest, Hungary.

*Corresponding Author: Janos Vincze, Health Human International Environment Foundation, Budapest, Hungary.

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Abstract.

The notion of stress has become as the same time very popular but is sometimes used improperly or with many exaggerations especially concerning the recommendations of practical solutions suggested for stress management. The stress producing stimuli, many physiological processes go into action, probably through different paths in close connection; the response is, therefore, an interaction between the organism and his environment. The emotional component takes part in the response reactions through the somatic effect of which it influences the behaviour. The man having lost his last connection with the world grieves double and his environment must pay great attention not to lose also him. Every medico-surgical intervention belongs to the stress factors. Both contain psychopathological elements and a long psychotherapy accomplished by a specialist is needed, considerate-protective environment for the accommodation in the normal life, for the resocialization. The biological stress is a long succession of active, interactive mutual effect. This relation which always consists of the difference of value-power-intensity is, like an example of today, a chain of action of two fighter during which they get the offensive and defensive conduct in exchanged role. From the point of view of the human individual life the psyche (psychism) is a subsystem. If still we take it out of this relationship with investigational aim then we have to consider it a system.

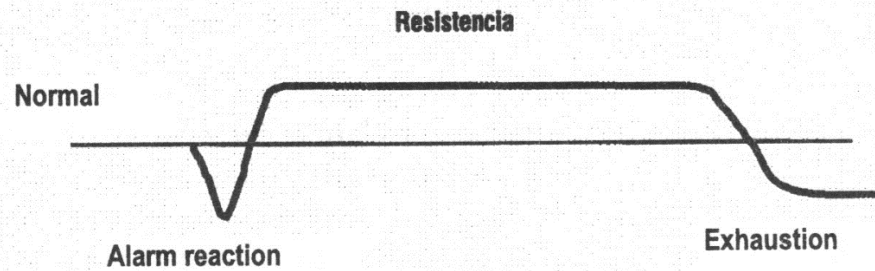
Key words: stress; psychological balance; psychical stressors; psychical system

Introduction

The 19th century pathology development as well as clinical diagnosis were based on this concept. Hans Selye, while a student in Prague, already observed what others failed to notice, namely that there are many similarities among the various illnesses. However, due to their general nature these did not help the physician to make a proper diagnosis, thus they were overlooked. It struck Selye though that those hospitalised with various all looked more or less distressed, weary or restless, feverish, pale or flushed as the case may be. He came to the conclusion that in most cases these symptoms were more or less identical. His attention was caught especially by the „physical symptomatology”. Selye’s theory of stress was already launched in 1936 [1] when he described the General Adaptation Syndrome.

What is stress? Stress is the non-specific response of the living organism

to a stressor. Such stressors include effort, focused attention, pain, illness, failure, joy, success [2]. Stress can be either pleasant or unpleasant, whereas distress always denotes something troubling and unpleasant. Although the natures of the stressors may differ, similar physiological/biochemical changes are produced. Selye distinguishes three stages of the stress in its development: 1) the phase of “alarm reaction”, which occurs when the harmful factor begins to act and large amounts of the adrenocorticotrophic hormone and glucocorticoids are released; 2) the phase of resistance, when the increased amount of glucocorticoids circulating in the blood leads to the development of resistance to the harmful effects; 3) the phase of “exhaustion” during which the adrenals no longer produce sufficient glucocorticoids (which Selye considers protective or adaptative hormones) and the condition of the organism deteriorates.



The general adaptation syndrome

In 1949 Selye discovered that an inflammatory reaction [3], which can be induced in the rat by the parenteral administration of egg white, is inhibited by cortisone or by purified ACTH [4]. In his review article in Science entitled „Stress and disease” [5], he describes the stress response. His conclusion is as follows:

“If I may venture a prediction, I would like to reiterate my opinion that research on stress will be most fruitful if it is guided by the principle that we must learn to imitate – and if necessary to correct and complement – the body’s own autopharmacologic efforts to combat the stress factor in disease.”

About the stress

The stress response is an essential component of the body’s regulatory systems. Stress is nowadays a reality of the contemporary life which implies as well various categories of society as the entire population.

The causes of this phenomenon are multiple:

- high incidence of stress symptoms;
- negative outcomes for health with increased morbidity and even cardiovascular or psychiatric mortality;
- pressure of the mass-media publicity offering many kind of medication proposed by traditional and complementary medicine.

The biopsychosocial concept became a framework in psychosomatics, proving the reemergence of holistic systems theories. Horowitz published in 1976 a first book on stress response syndromes, a concept revisited in several of his publications where have been explored namely the subjective stress in response to psychosomatic life events [6].

Stress syndromes in clinical medicine.

Several researches deal with the impact of chronic distress on the cardiovascular conditions.

- Positive correlations between the stress vulnerable type A personality and the cardiovascular heart disease.
- Association between psychosocial stressors and high risks for myocardial infarction.
- Acute cardiomyopathy (Taco-Tsubo syndrome) occurring after severe emotional stress.
- Sudden cardiac death in young competitive athletes.

The controversies as concern the involvement of stress in the ulcerous disease prove the shortcoming of the view that the psychosomatic dimension and immune processes imply isolated reciprocally excluding mechanisms. After the demonstration of the role of Helicobacter pylori on the genesis of ulcerous disease many clinicians have considered

obsolete the hypothesis that this condition could be the result of psychological stress.

The Psychological Balance

Stress is a complicated concept just as its special literature looks like. For the sake to keep the everyday physical balance, the healthy man creates mentally that stress-level interval which, despite its fluctuations, represents the proper ratio of the equilibrated state. Motivation is one of its facilitating factors composed of intrinsic as well as extrinsic constituents. Both set an adaptation process in the individual, first by imagination, later put into the practice whatsoever step by step.

Although the unsuccess, failure, lack of self-confidence, delay of recognition, uncertain existence, insecure status are negative judgement forms they may also stimulate to search for new variations. In this case drawing a lesson from the failure one must take another course, prepare another strategy accordingly and apply it gradually. The solution of the question depends upon how long a person can tolerate the mass of negative influences, when does a lethargic state ensue resulting in stagnation. [7]

In the natural sciences even with physical phenomena, it is a known fact the summation of small effects the time interval of which we cannot suspect, it is person-dependent. The longlasting unsuccess may generate failure on other fields whether similar or different and the protracted negative status may call in action itself a process of query.

Stress is similar so far to other stimuli as to elicit a lot of somatic responses. We should primarily understand the somatic functions in order to get nearer to the essence of the stress. Alarm reactions originate from the conception of Cannon: once the person is confronted with any kind of difficulty, emotional experience to overcome problems, there happen automatically a long row of somatic changes and although the struggle is mental in the beginning, changes are notwithstanding similar to some kind of „flight”. The usage flight is symbolically general, nothing else but a mental preparedness carrying out the voluntary action to come which is a purposeful activity. The perceptible part of the stress is the internal restlessness preparing with its pulsation the accomplishment of the conceived action. The organic and psychotic behavioural changes don’t run parallelly and on the same frequency where as they appear simultaneously despite the shift.

The physiological activation processes are parts of the psychological mechanisms, these processes are intensity indicators, markers of the behaviour and aren’t any criteria in directional relation. The born and learnt behaviour as forms are composed in an *imperfectly* connected system in complicated interaction with each other [8].

The born and the learned behavioural reactions evolve during the long-term effect of the stimulus and do not by the chaotic short, low intensity appearances. There is no correlation between two somatic variables. But

correlations are modified in functions of more than two variables; such influencing factors are the cultural surrounding, the intelligence level, tradition, national customs, manner of life (conduct), family structure, etc.

The observation, perception, experience of the stress and the adaptation, sufferance to it, forming of defensive mechanisms jointly appear but not in the same time [9]. The different somatic processes have got different role in performing the behaviour, the interaction is of different dimension and of temporal order. The different attitudes of stimuli induce different somatic patterns of response being so the cause of the psychosomatic illnesses. Individuals inclined to produce psychosomatic symptoms possess of different and characteristic attitudes. Also the different emotional states result in deviating physiological response patterns or even when stimuli are unaltered these bring about different subjective states, experiences. The pattern derives from the attitude, expectation of the person. [10] From the complex responses of behaviour, from the complex states of stimuli, one cannot separate the essential factors neither to determine the interactions between the somatic response reactions nor estimate them in advance.

Psychical Stressors

The greatest loss is the mourning known by everybody. The mourning reaction has a regular course giving rise to psychical injury and one needs a certain definite time for its conscious treatment. Because of the shock we don't believe, don't accept the reality. Shock retards, delays every psychical function moreover sometimes temporary constriction of mind sets in.

Doubts, scruples, charges and self-accusations take their origin but mourning passes off in the form as it is prescribed by the tradition how one must adapt such occasion. To have respect for the cultural tradition, to keep customs and rites facilitates the process of the mourning being a diverting scheme. Death arises in the mind, the person left alone struggled against despair, vacuity and hopelessness feels the final secession [11].

The natural mourning, lasts for 6–12 months. Henceforth living have to speak without sorrow of the deceased. The survivor has to create new connections setting in the positive identification. During the treatment of mourning it is first the sorrow to be dominant and lessens by the time, the bequeathed things, inheritance are attended to care, testimony fulfilled and people try to do their best according to the deceased's wish which would have been liked to see. In this last tribute the apology is included, too.

A state similar to the mourning reaction occurs on the course of stress condition due to losing parts of the body. After an accident or as the consequence of a disease surgeons often have to amputate. The final cessation of a lost function is a grave "object loss" after which one have to learn once more to live under other circumstances, to realize oneself by restricted living space and means of earning of a livelihood chance to learn with the special insufficiency feeling as he were of sound mind in an impaired body [12]. Every medico-surgical intervention belongs to the stress factors.

Losing the native-, homeland elicit a grave stress condition the feeling of homelessness after a period of residence in a new, chosen country. In the new, recipient country the settler counts as a stranger and everything – beyond the elementary selfsufficiency – has to be learnt again on another basis, to live practically impersonal „without countenance”.

The nationalization of the private property, giving „in the hand of the people” the forfeiture of the property, losing the landed property set off an irreversible process which was equal with genocid and makes its effect feel for the time being. The loss of the personal goods and immovable property as the results of a lifetime work is again a new stress which cannot heal like the trauma of losing the homeland. The deprivation of

protection means harmful stress for a lifetime. To be threatened by losing the living space, and to be in jeopardy appears as a fatal disease, as the experience of a catastrophe like a state after survival of a trauma. The loss of life space shows increased negative activity which lasts for a long time [13]. The longer the threat and losing period of the life-existence space was the greater is the chance for an irreversible state to happen. Psychogenic damages proceed, previous pathologies recrudescence or worsen, turn into chronic. The uncertainty of existence, the threats menacing brings about mental crisis, personality impairment which in itself makes impossible the balanced participation in the society.

The subsistence is of vital importance. The loss of a post-work (unemployment and worklessness) if somebody becomes unemployed through no fault of his own but by irrationality of mismanagement his working place have been reduced and passed over to foreigners then it means a mockery of the constitutional human right, the life element of man. The involuntary change of employment: re-education and retrained for other work is up to the stress of a personality change because the skill and experience gathered throughout a lifetime, the profession-conformed personality will be inhuman, cruel degrade to zero.

The appearance of life danger-threats provoke experience like disease, natural catastrophe or as the survival of war or an accident. The destructing elementary calamities signify increased threats because possessing the same chance one cannot figure out who shall survive and who falls victim to. The man who had thought of his invulnerability suddenly realizes the critical situation that he is in the centre of the catastrophe. People behave embarrassed in every life danger, in fact they don't grasp by-gones and drift along with the tide. War brings about stress reaction similar to the symptoms of the life-danger stress. Both contain psychopathological elements and a long psychotherapy accomplished by a specialist is needed, considerate-protective environment for the accommodation in the normal life, for the resocialization.

In the state of isolation there arise affective disturbances specious solutions to give themselves purpose and task. The sexual life, the instinct of self-preservation belongs to the line of instinct frustration. To give it up, to cease it, induces stress process. Nourishment also belongs to the instincts. Keeping the dietary prescription or the over-eating as supplemental actions are not primary stressors but the consequences of secondary problems of other nature.

In childhood, the stress is diffuse and multicausal, the appearing disturbances are: negativism, elective mutism, resistance-spite and fit of fury, opposition, aggression, eating disturbance, emptying troubles. In the case of children these are notorganic manifestations but prove the loosened connection with their surroundings, their therapy shouldn't aim the conscious treatment of life-danger or threats [14].

On middle and long course, the effect of stress elicit about psychosomatic diseases (hypertension, cardiac and colon problems, etc.) in the general state of health it means disappointment, withdrawal from the activity, depression. There are changes also in the social behaviour: conflicts become critical, aggressive actions against others thicken, the tolerance threshold of the individual diminishes. Set out from these facts we can declare: the more invalid is a population the worse is the quality of the social life.

The Organization of the Psychical System

The inner life is a multidimensional and at the same time a uniform system. From the point of view of the human individual life the psyche (psychism) is a subsystem. If still we take it out of this relationship with investigational aim then we have to consider it a system.

In this respect the human psychism unifies in itself the attributes of integrity, the openness, the complexity of the synthetic character, the

probabilistic, the self-organization i.e. the (active and passive) homing guidance and the self-regulation so we can draw a picture of the highest grade cybernetic system. This is to explain that in the course of searching the human psyche one has to use the general system theory, the intermetics and the dimensions of the control regulation. Quite apart from our morphological, functional or spiritual approximation we have to emphasize first of all the intermetical connections of its components and peculiar features, those of organization, information delivery, controllability, expediency. The psychology represents a non-substantial, essentially functional system the fundamental role of which is governing and control: referring to the internal conceptual world of the man and by the interest to insure mutual balance as well between the man's attitude and the outside world [15].

One can establish that the physical system is an isomorphic superstructure of material, energetical and informational cycles of events originating from the inside and outside of the organism and realized in the peculiar alphabet of the logical network of the nervous system. This superstructure evolves place through the self-organization of abstract codes created in the course of the juncture of the reflexion-rised imaginal and of the symbolic one. We can plainly say that the spiritual life in cybernetic respect is nothing else but an entropy device subjected to the preservation task of the human-specific psychophysiological homeostasis.

The psychical system in organizational viewpoint is of developing character because it forms and develops within the frame of interaction between the man and his environment. It is, therefore, a self-organizing, developing system.

The organization of the psychical system is subordinated to the domination areas of the universal laws of the evolution and it is directed also by such particular principles which accentuate more concrete its organizational mechanisms and variants. Out of these let's mention some: the Le-Chatelier principle, the weakest chain-loop, the efficiency of the

energy consumption, the ranking, avalanche-effect, the compensation, the principle of action [16].

In reference to the Le-Chatelier principle: if on a system in rest is operative such an external input which changes one of the conditions resulting the equilibrium state then the system evades in the direction reducing the outcome of the effect. The principle of the weakest chain-link declares that during a change-over from a given organization to the new one the modification determined by the effect of the directing factors take place mainly in the vulnerable points or chain-loops of the system. For the energy consumption an excellent example is the formation of dynamic stereotypes. Ranking happens when simultaneously more factors affect the living system. The avalanche-effect is well illustrated by the „it's hit or miss" law of the nervous system in the case of the stimulus-answer reaction. The compensation principle is realized in the living organism in every case of the negative feedback regulation. Action comes into being when it is threatened by an external factor or mediates such adequate, essential information towards the system that has to be replied.

According to the system theory, from the of viewpoint of the steering circumstances in the systems the process of the guiding communication takes its course in compliance with the divergency-convergency principle.

Creativity can be considered as the highest level of the expression of the operational polyvalency of the human psyche. The distance between reality and model the effort and the possibility is such an indicator which determines the real selfimplementation level of the personality. Since these indicators determine the entity of the psychical organization by their help one can estimate the general development level of the personality which expresses the conformity of the behaviour towards the nature and sense of the external effects. This can be estimated by completing the phase profile of the psychical system on the basis of the main psychical indicators which can be expressed in the form of the following relation

$$S = \frac{\sum_{j=1}^m Y_j(t_k)}{\sum_{i=1}^n X_i(t_k)} ; k=1,2,\dots,p$$

Where

$$\sum_{j=1}^m Y_j(t_k)$$

Expresses the sum of the mean (value) of the adaptative answer answers,

$$\sum_{i=1}^n X_i(t_k)$$

Still the sum of their external effects and employments, t_k ($k = 1, 2, \dots, p$) the consecutive moments of the examined period. If the value of S is near the zero then the personality is characterized by considerable absence of psychical organization, i.e., psychical inorganization; if the value of S is near the 1 it can be expected the individual should properly respond, show psychically balanced state and his psychical amplitudes should be minimal.

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