

THWARTED ACTION AND NEED— INFORMATIONAL THEORIES OF EMOTIONS

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The Russian psychologist L. Vygotsky wrote: "The path of definition and classification followed by psychology over the course of several centuries led to the fact that of all the chapters of this science, the psychology of feeling appeared to be fruitless and tedious."

The merit of E. A. Salzen, the author of "Thwarted Action State Signalling Theory," is that much more important. He has tried to suggest a synthetic theory of emotions that integrates their psychologic, neurologic, and evolutionary-biological aspects. While reading Salzen's paper, I became convinced of the similarity of a number of its theses with my approach to the nature of emotions, elaborated by me since 1964 (Simonov, 1991).

The results of psychophysiological experiments done in 1964 brought me to the conclusion that human emotions were determined by an actual need and the estimation of the probability (possibility) of its satisfaction on the basis of phylo- and ontogenetic experience (Simonov, 1975). The individual makes this estimation involuntarily (sometimes unconsciously), comparing the information about the means and time that are predictably necessary for satisfaction of this need with the information at hand. A low probability of goal achievement leads to the negative emotions of fear, alarm, fury, grief, etc.; an increased probability of satisfaction, as compared to an earlier estimation, generates positive emotions of pleasure, joy and encouragement. Attaching great importance to the estimation of the probability of need satisfaction in the genesis of emotions, I called this concept "the need-informational theory of emotions" (Simonov, 1984).

In its most general form, the rule for the genesis of emotion may be presented as a structural formula: $E = fN(I_n - I_a)$, where E = emotion,

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its degree, quality and sign; N = the power and quality of the actual need in the broadest sense of the word. For human beings, it is not only hunger, thirst, sex, etc., but also social needs such as the need to belong to some group, to occupy a definite place in the group hierarchy, to have self respect, and ideal (spiritual) needs to obtain knowledge, to satisfy curiosity, to create artistically, and so forth (Simonov, 1986). ($In - Ia$) is the estimation of the probability (possibility) of need satisfaction on the basis of phylo- and ontogenetic experience; In = information about the means prognostically necessary for satisfaction of the need; Ia = information about the means available to the individual at a given moment. "Information" refers to its pragmatic meaning that can be determined as the change in probability of goal achievement.

In 1984, Price and Barrel confirmed our results. A study was carried out in which participants were asked to mentally conceive of any emotional episode that took place in their life or that they might create by their imagination, and then mark on special scales the strength of their wish, the suggested probability of goal achievement, and the rate of emotional feeling. Quantitative processing of the obtained data confirmed the existence of the relationship, termed the "general law of human emotions" by the authors.

The variety of needs that coexist, as a rule, and comprise complex, hierarchically organized systems, makes constructing any "complete," "detailed" classification absolutely unthinkable and hopeless. This is why most authors try to determine a limited number of basic emotions, not being satisfied with assigning them only as positive and negative. Since the probability of satisfying needs depends to a very large measure on the individual's actions, we suggest that it is precisely the character of the actions that can serve as a classifying principle for disclosing the fundamental emotions that occupy the central position in the sphere of the emotional states of humans. The interaction with the object that satisfies a need, in its turn, is either of the contact type that the individual may interrupt or continue, but not avoid; or of the remote type. As far as remote actions are concerned, according to military terminology, they exist in three basic variants: attack (surmounting), defense (protection, preservation) and retreat (loss of positions occupied earlier). Emotions corresponding to these types of interactions are presented in Table 1.

Besides the character of the actions, the origin of basic emotions may be connected with three basic groups of human need:

1. Vital (biological) needs and the material needs dictated by them: the need for food, clothing, housing, and technology necessary for producing material goods, for means of defense against harmful actions, for ensuring individual and species existence.

2. Social needs in the narrow and proper sense of the word (since all human drives are socially determined). In this case we are speaking of the need to belong to a social group (community), to occupy a specific

TABLE 1
Classification of Emotions Depending on Extent of Need, Probability of Its Being Satisfied, and Type of Action

<i>Extent of Need</i>	<i>Evaluation of Probability of its Being Satisfied</i>	<i>Contact Interaction with Object</i>	<i>Remote Action</i>		
			<i>Mastery, Possession of Object</i>	<i>Protection, Preservation of Object</i>	<i>Winning the Struggle for Object</i>
Increasing	Exceeding prediction	Delight, satisfaction	Rapture, happiness, joy	Lack of fear, boldness, confidence	Triumph, inspiration, courage
Slight	High	Indifference	Tranquility	Weakening	Imperturbability
Increasing	Dropping	Dissatisfaction, aversion, suffering	Agitation, sadness, grief, despair	Caution, anxiety, fear, terror	Impatience, indignation, anger, rage, fury

place in the group, to enjoy attachments to and the attention of other members of the group, and to be an object of their attention and love. Attempts to reduce all the diverse social needs of people to a "thirst of power" are hopelessly antiquated. The need for leadership is only one of the many varieties in this group of motivations. The need to be a "follower" sometimes hides a desire to be a leader in strength and wit.

3. Ideal (spiritual, cultural) needs for knowledge in the broadest sense: knowing the surrounding world and one's place in it, knowing the sense and purpose of one's existence on earth. Without a doubt, the so-called aesthetic need belongs to this group.

The effect of ablation of the frontal neocortical areas and destruction of the hippocampus on the level of emotional stress suggests the participation of these brain structures in the estimation of the probability of need satisfaction: the probability of reinforcement. Special tests showed that for a lobectomized animal all signals became equally probable, whereas a hippocampectomized rat reacted only to signals of highly probable events. These animals started to behave like living automata without hesitation and doubt (Simonov, 1991).

Unlike the "informational" brain system (frontal neocortex and hippocampus) that estimates the possibility of need satisfaction, the "motivational" system (amygdala and hypothalamus) provides dynamic co-existence, a hierarchy of competing needs, distinguishing primary satisfaction of the dominant need. Individual characteristics of the interaction among the four brain structures form the basis of the extraversion-introversion, emotional stability, and neuroticism parameters. Disturbance of this interaction determines the formation of the main type of neurosis (Simonov & Ershov, 1991). For example, it is highly probable that a state of chronic anxiety may be due to the dysfunction of the hippocampus, in that a very broad complex of external stimuli requires nontypical signaling of vague trouble. Suppression of the amygdala-hypothalamic system function leads to depression: types of anguish, loss of desires and interests. The deficiency in the mechanisms of the frontal neocortex that hinders the inhibition of reactions to signals and their traces after these signals have lost real meaning may play a considerable role in the genesis of fixed actions and ideas.

As a single integrative complex, the four structures are necessary and sufficient for the organization of behavior in the coordinate system "needs/possibility of their satisfaction." In the living organism, needs are the most potent factors and the environment is important (i.e., significant) for the organism to the degree it can satisfy these needs. The postulation of two components in the genesis of emotional reactions, i.e., the need and the reflection (the probability of its satisfaction), neutralizes the long-standing opposition to an energetic and informational approach to studying motivational and cognitive aspects of the emotions (Simonov, 1984).

REFERENCES

- Price, D. D., & Barrel, J. J. (1984). Some general laws of human emotion: Interrelationships between intensities of desire, expectation, and emotional feeling. *Journal of Personality*, 52, 389-409.
- Simonov, P. V. (1975). Parameters of action and measuring emotions. In L. Levi (Ed.), *Emotions: Their parameters and measurement* (pp. 421-432). New York: Raven Press.
- Simonov, P. V. (1984). The need-informational theory of emotions. *International Journal of Psychophysiology*, 1, 277-289.
- Simonov, P. V. (1986). *The emotional brain: Physiology, neuroanatomy and psychology of emotions*. New York: Plenum Press.
- Simonov, P. V. (1991). The motivated brain. A neurophysiological analysis of human behavior. New York: Gordon and Breach.
- Simonov, P. V., & Ershov, P. M. (1991). Temperament, character and personality. Biobehavioral concepts in science, art and social psychology. New York/London: Gordon and Breach.
- Vygotsky, L. (1970). Spinoza and his teaching on emotions in the light of modern psychoneurology. *Voprosy Filosofii*, 6, 127. (In Russian).