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COMPARATIVE DESCRIPTION OF CONSCIOUSNESS AND EMOTION IN THE FRAMEWORK OF SYSTEMIC UNDERSTANDING OF BEHAVIORAL CONTINUUM AND INDIVIDUAL DEVELOPMENT

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ABSTRACT

Consciousness and emotions are compared with reference to two "temporal axes": dynamics of realization of a behavioral continuum and individual development. The comparison reveals analogies in their role in the control of activity and their dynamics. Both consciousness and emotion have communicational significance. This similarity is due to the fact that different terms "consciousness" and "emotion" describe one and the same systemic organization underlying behavior. Consciousness and emotion are considered as characteristics suitable for different levels of this organization that are transformed stages of development. Psychophysiological characteristics of the organization of behavior are discussed that correspond to different levels of consciousness and different intensities of emotion.

1. Introduction

The main task of the present report is to compare emergence and significance of consciousness (C) and emotion (E) and formulate the unified conception of C and E. C and E are compared with reference to two "temporal axes": dynamics of realization of a behavioral continuum and individual development.

As it was described in detail elsewhere (Alexandrov, this volume), behavioral continuum is viewed at as a chain of behavioral acts, the results of which arc achieved due to the simultaneous realization of functional systems of different "age", these systems representing the elements of individual experience (EIE). This approach to a behavioral continuum made it possible to describe the contents and dynamics of C and to define its levels. Level I of C is related to the stage of the realization of a behavioral act during which the predicted parameters of intermediate subresults are compared with the actual ones. The second, higher level - with the transitional processes of comparison of the predicted and actual parameters of the result of a performed act linked with the processes of organization of a next act. The contents and significance of C are described as an organism's evaluation of its relations with environment at the mentioned stages that depends on the individual experience (IE) and results in its updating.

2. Significance of Consciousness

2.1. The Specificity of Human Consciousness

All of the above is true for both humans and animals. In humans, the processes of evaluation of own behavior were described: "doubling of behavior", or behavior consisting of evaluation of one's own behavior, according to L.S.Vygotsky (1982). Indeed, animals also evaluate the results of their behavior. One cannot expect that C came to humans "as a sudden illumination" (Eccles. 1992. p. 7320). Then what is the specificity of human C?

In the context of the present analysis the aforementioned processes of evaluation in animals may be called prc-consciousness. The contents of IE involved in these processes differs from that in humans. Animals use only their own experience of relations with environment or, possibly, in special cases, the experience of individuals they have a direct contact with. **For** example, in a group of primates, an experience may be passed from one individual to another. But animals do not use knowledge imprinted in material objects composing World III (Popper & Eccles, 1977).

Human's experience is represented by specific elements that are, in fact, transformed units of social experience (Rubinstein. 1989) assimilated during individual development. Thus humans, unlike animals, use for their own reflection the products of social reflection accumulated in World III. The use of these transformed units means that while evaluating the results of own behavior, a human looks at himself as if "through the eyes of society".

2.2. Consciousness as a "Report" to Society

An evaluation of one's own behavior that was described above and that results in updated IE and is related to the organization of a future behavior may be compared with what is traditionally defined as the role of C in the control of subject's activity. Along with this function, the communicational role of C is stressed: C is inseparable from language and language-generated structures, since C is essential for joint activity, collective achievement of results (Jarvilchto, 1994; Kostandov, 1994; Leontyev, 1972; Rubinstein, 1989). "Conscious facts" can be shared through communication with other members of society (Hilgard, 1980; Simonov, 1994). The main significance of C is to provide the high-level interactions with other conscious being (Frith, 1995). Thus C, as an evaluation of one's own behavior in terms of this or that language, may be considered to be a "report" to society which is interested in the results of individual's behavior.

C cannot be localized in any certain anatomical structure (Alexandrov, this volume). In connectionwith this, local brain damages, that do not result in coma-like states (e.g. after lesions of reticular formation), impair not the report in general.

but only certain kinds of it. This statement is confirmed by the data received by A.R.Damasio and his colleagues. Positron emission tomography reveals anatomically separable regions outside the classic language areas which, according to A.R.Damasio et al. (1996) tend to process words for distinct kinds of items: animals, humans, tools, etc. In terms **of** the proposed approach it means that neurons in these areas are specialized with respect to distinct kinds of BIE and, consequently, provide for the processes of achievement and evaluation (report) of distinct kind of results of both internal and external behavior. It is the realization of these processes that is observed with positron emission tomography, and the impairment of these processes following damages of the respective regions is revealed in neuropsychological experiments. In connection with this, the available data on possible problems with operation with only certain kinds of the mentioned items (e.g. animals, humans, but not non-natural objects) in patients with local brain damages (Damasio, 1990) may be interpreted as follows. The report in the behavior of interaction with animals and humans suffers, whereas the report in interaction with non-natural objects remains relatively intact.

It must be stressed that not a word in itself, but the socially-accumulated knowledge represented by this word is a pivot of C (Rubinstein, 1989). That is why here we consider language not as a certain tool (speech) but rather, in a broader sense, as a linguistic communication ensuring the interaction of humans. The place of speech in this communication may be occupied by a sign language. Cerebral basis of linguistic communication appears to be virtually similar irrespective from this or that tool used. The marked left hemisphere specialization has been experimentally demonstrated for both sign and spoken language in deaf as well as in hearing persons skilled in these languages. Authors relate this specialization to the linguistic nature of the movement, but not to a skilled movement as such (Corina et al., 1992).

It must also be stressed that C is inseparable from language also in cases when **the** evaluation of result acts as a self-report. It was demonstrated that the language areas are involved into the organization of behavior even when the report is not required by instruction (Ivanitsky, 1997).

It may be suggested that subresults, the evaluation of which at the given stage of individual development composes the contents of the lower, first level of C, were the results of behavioral acts during the earlier developmental stages. They could be transformed into subresults in the process of automatization of behavior that consisted of the constant succession of behavioral acts (Pashina, 1979). In connection with the above thesis about the relation of C to "report" to society, it may be assumed that such transformation was due to the "loss of interest" of a society in the given result - it may be not controlled any more since it is inevitably connected with the achievement of the final result which is "socially evaluated". However, if the given intermediate result remains to be important for society (for

the organization of joint activity) by itself, it is not transformed into a subresult (not moved from the second to the first level). The reversed transformation of a subresult into a result may take place in case of discrepancy between the anticipated and actual parameters or when an obstacle for a realization of behavior occurs, etc.

Any system is an EIE (Alexandrov, this volume) which does not emerge in its final form not only when it is individually-specific, but even if this clement is characteristic for all individuals of a given species. It is formed in course of individual development and depends on individual characteristic of this development (Alexandrov, 1989; Khayutin & Dmitrieva, 1991). However, the results of some systems, probably the most archaic ones, were never the results of whole acts at any stage of individual development (Alexandrov. 1989). Society "does not pay" (and "did not pay") "attention" to these subresults. does not evaluate them. Such subresults are evaluated at **subconscious** level. Normally, **this** group may include also the systems the evaluation **of** results of which is related to functioning of some interoreceptors (blood vessels, liver, lien. etc.).

2.3. Similarity of the Significance of Consciousness and Emotion

E that is already formed at the very earliest developmental stage have the significance comparable to that of C in the control of activity. However, the IE involved in this process does not yet contain transformed elements of a social experience.

E may be considered as an individual's evaluation of own behavior (Vygotsky, 1982; cf. Vygotsky's definition of C presented above) and is related to the evaluation of correspondence between the program of actions and its actual realization (Reykovsky, 1979; cf. level 1 of C). E appearing during the termination of realization of behavioral acts, like C, are related to the processes of comparison of predicted and actual parameters of results, the significance of E being evaluated in connection with its influence on the organization of systems ensuring the achievement of these results (Anokhin, 1978; cf. level 2 of C).

There are also marked analogies between the dynamics of E and C with respect to the dynamics of behavioral continuum. E, like C, is related both to the process of achievement of a result during the realization of action and to the evaluation of achieved results; its role includes control and sustenance of behavior as well as its activation and termination (Anokhin, 1978; Rolls, 1986; Rubinstein, 1989; Strongman, 1987).

Facial expression and non-linguistic vocalization, that are characteristic for E, makes it possible to postulate that E, as well as C, has a great communicational significance (Izard, 1980). E is thought to give opportunity to communicate information about intentions, possible behavior (Plutchik, 1962).

Thus**,** comparing the views of different authors on the significance of C and E,

one may conclude that their' role in organization and realization of behavior is essentially similar. This similarity is so pronounced that it provokes the following question: Are not we using terms "C" and "E" to describe one and the same process, underlying behavior? To answer this question, we have to introduce another temporal axis - individual development.

3. Consciousness and Emotion as Characteristics of Different Levels of the Organization of Behavior

3.1. Emotion and Consciousness at Successive Stages of Individual Development

Formation of new EIE during individual development results in progressively growing differentiation of organism-environment relations (fig. 1). The low level of differentiation may be compatible with a concept "emotion" (Shvyrkov, 1984). Systems formed at the earliest stages of ontogenesis are related to the minimal level of differentiation: good - bad, attractive - repulsive, etc. A.Ortony et al. (1988) even suggested limiting the class of basic types of "affective responses" to two types - positive and negative. They consider these types as minimally differentiated forms, and their further development - as increasing differentiation of E. Sharing the views on differentiation in general, we must note that, from our point of view, the above idea about the minimal level of differentiation "good-bad" does not imply that the

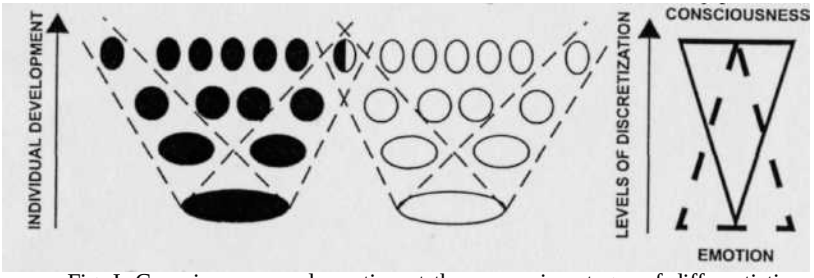

Fig. I. Consciousness and emotion at the successive stages of differentiation. *Left fragment* - systems of different level of differentiation starting with the lowest (two systems below correspond to the earliest forms of behavior) and to more and more differentiated. Dashed lines delineate the sets of systems of different age - the simultaneous realization of these systems subserves achieving results of different behavioral acts. The scheme shows that both least and most differentiated systems may be shared by different behaviors.
Right fragment - (the idea of the scheme is derived from J.A.Ponomarev (1976)) illustrates the views at emotion (up triangle) and consciousness (down triangle) as characteristics of an integrated multilevel systemic organization of behavior; it also illustrates that the levels of differentiation (stages of individual development) differ in relative markedness of these characteristics.

most early developing systems are "good-systems" or "bad-systems", "positive-systems" or "negative-systems". All systems are aimed at receiving positive

adaptive results. Thus, indeed, "emotions are all fundamentally "positive" (Plutchik, 1991). The realization of systems that are actualized in "bad" situation directed at transformation of organism-environment relations to a "good" condition may be characterized as "negative affective reaction" ("bad" situation may be related to the appearance of a threatening factor, with obstacles on the way to achieve the goal, etc.). Realization of systems in "good" situation (e.g. for a contact with attractive object) may be considered as "positive affective reaction". It is interesting that B.Spinoza (1957) related "pleasure" to a transition to a greater perfection and "displeasure" to a limitation of ability to act.

In course of individual development the formation of more differentiated systems takes place, but not the "differentiation of emotions"; this formation may be considered as a factor determining the enrichment of emotional palette of a behavior (sec below).

Considering the fact that in the framework of the present report systems are considered as EIE, we may agree with the statement of A.Ortony et al. (1988) that E is an experience. Only one edition is required here: like C (Alexandrov, this volume), E is not "equal" to experience, but is just one of the characteristics of its realization. And since the realization of EIE implies its readout from memory, it is clear, why E is associated with memory recall (Heath, 1986).

Behavior subserved by early formed systems may be correlated with what K.Koffka (1934) called emotion-like perceptions which are basic for the subsequent development of C. He considered such qualities as "rcpulsiveness" and "attractiveness", "tenderness" and "unkindness" but not elementary "sensory perceptions" to be the simplest nondifferentiated structures. Moreover, a ncwlyborn possesses them in the form that is "completely similar to ours" (Koffka, 1934, p. 90). In the framework of such analysis individual development is the formation of the systems that subserve the individual-environment interaction becoming more and more discrete (fig. 1). The number of goal objects individual interacts with increases. The structure of IE becomes more complicated due to both the increase in the number of EIE and to the increasing complexity of interactions among them, due to the appearance and growing number of EIE opponent, as well as synergic to the given one. The number of alternative variants of behavior increases. Following some cortical damages, affecting, possibly to a large extent, the later formed **EIE,** an agnosia is manifested that is characterized by a more marked influence on relatively high-differentiated levels. Patients can recognize a wide variety of physiognomic expressions on the faces which they fail to identify individually. It is suggested that the identification of one expression among a limited set is simpler (and, in our terminology, is related to less differentiated systems) than identification of one individual face among thousands (Damasio, 1990).

Individual's abilities to differentiate environment are practically limitless, since

they are subserved by the accumulation of elements of a social experience. The gradual differentiation results, firstly, in formation of different behaviors on the basis of one and the same low-differentiated system and, secondly, it may appear that certain system is involved into behaviors characterized by different E (see fig. 1). A simple example: an animal may be trained to press one and the same pedal to get food in one situation and to avoid electric shock - in another (Bobrovnikov, 1982). It is easy to think about lots of such systems in humans. Thus it is clear that one of the significant problems in using behavior to study E is that one and the same form of behavior may be characterized by very different E, while different forms of behavior - by one E (Ortony et al., 1988).

It may be assumed that in course of the differentiation of behavior the number of systems shared by different E increases. In connection with this, the emotional palette of behavior may be very diverse (cf. "mixed states" in Plutchik, 1962) due to the connections between any of such systems and all other EIE that were realized together with it. However, the emotional palette may become more definite when the prevailing realization of elements of IE occurs that are unequivocally related to this or that pole of the minimal differentiation, e.g. attractive vs repulsive.

It is important to stress that the formation of new, higher levels of differentiation (comparable with C) does not cancel the previous ones. Performance of a behavioral act is subserved by simultaneous realization of systems corresponding to both minimal and maximal (for a given individual) levels of discretization of environment. Thus C and E may be considered as characteristics suitable for different levels of systemic organization of the given behavioral act that are transformed stages of development and that correspond to different levels of environment's differentiation .

Of course, it is impossible to mark a clear borderline on a temporal axis of individual development - since that moment C appears. We can only claim that at each successive stage, as elements of social knowledge are absorbed and differentiation of systems grows, "C-characteristic" increases (fig. 1; see the right fragment). It must also be stressed that in behavior different organizational levels do not exist independently from each other, and a single isolated system among numerous systems being realized simultaneously (Alexandrov, this volume) may be defined only for didactic purposes (Anokhin, 1975). Thus it is clear that though C and E are different characteristics, they nevertheless characterize the same systemic

Individual reflects not an environment as such, but own relation to it. Individual's description of environment is based on the evaluations of its relations to goal objects of behavioral acts, i.e. on the evaluations of results; this description may be given only in terms of individual's behavior (Alexandrov, 1997; Maturana, 1996; Shvyrkov, 1995). That is why when we discuss "environmental differentiation", we certainly simplify the problem, selecting only one aspect of developmental changes of individual-environment relations.

organization. Consequently, any change of this organization will entail, to some extent, some changes in both "(C-characteristic" and "E-characteristic".

Considering the above, it is not surprising that after lesion or stimulation of cerebral structures or during the analysis of activity in these structures authors may observe the influence of the corresponding structure on "C-" or "E-characteristic" or establish the relation of activity to the former or latter, depending on which of them is currently the focus of experimenter's attention. lor example, on the basis of one pool of data septohippocampal structures arc associated with the main mechanisms of C (Gray, 1995), whereas on the basis of another pool these structures are considered to be the principal clement of the mechanism generating E (Heath, 1986).

It is also clear from the proposed understanding of E that, since the subserving of any behavior obligatory involves the most early maturing systems, E of this or that intensity (sec below) is intrinsic characteristic of behavior. Thus one can accept the conclusion made by R.Buck (1989, pp. 209-210): "we always have available feelings of hunger and thirst, warmth or coldness, happiness and anger, etc., but like the feel of our shoes on our feet this information is typically week and repetitive and therefore ignored".

3.2. The Difference of Commnnicational Role of Consciousness and Emotion

In spite of the apparent analogies in the significance of C and E in the organization and realization of behavior, the difference between these characteristics, determined by the difference in their relation to levels of systemic organization, is also evident and most marked in the comparison of the communicative role of C and E.

Unlike the communication related to C and language, communication related to emotional expression characterizes the most early formed systems, and many aspects of it are considered to be innate (Plutchik, 1991). As it was stressed by Ch.Darwin, there is the basic continuity of emotional expressions from lower animals to humans. Now it is believed that the restricted patterns of organization of nervous system have evolved in extant species with minor modifications (Krubitzer, 1995). Among the tendencies determined by such patterns it is possible to name the interspecies similarities in characteristics of realization of systems formed at the earliest stages of individual development - E. Such similarity exists in spite of the fact that the set of early behavioral acts in animals belonging to different species differs significantly. But in any individual it is possible to select the systems corresponding to different levels of environment's differentiation from minimal (E) to maximal (C - in humans, nre-C - in animals).

3.3. Consciousness ami Emotion in Folk Psychology

The concepts of C and E, along with such concepts as feeling, attention, will,

etc., are elements of folk psychology. The latter implies the understanding of psychic processes and states based on common sense and requiring no precise definitions (Churchland, 1986). Folk psychology concepts are not only used in ordinary life to explain and predict a behavior, but affect the formation of scientific knowledge as well. Answering the "requests of society" (it is important for a society to know why one individual is attentive and the other - is not, why one can control his temper and the other - cannot, etc.), scientists use the concepts of folk psychology. For instance, when they formulate the goals of researches designed to reveal neuronal mechanisms of C and E, they usually have no doubt that if special concepts C and E exist, C and E must have some special mechanisms. However, from the thesis that C and E are different characteristics of the same systemic organization (see systemic solution of psychophysiological problem - Alexandrov, this volume), the following conclusion is inferred: there are no special "mechanisms of C generation" or "mechanisms of E generation". In this aspect the proposed viewpoint is in line with some views available in literature: C is an aspect of activity but not a separate mechanism (Neisser, 1976); C is not represented by a single type of brain processes (Churchland, 1986); C is an aspect of organization of biosystems and not a product of a certain neuronal circuitry (Deikman, 1973).

To explain our position it is suitable to use analogies with evolutionary selection. An adaptivity, "successfulness" of a whole behavioral act may be considered to be a criterion of selection (Scvertzov, 1922; Shvyrkov, 1995). Achieving or not achieving the results of behavioral acts determines the survival. Thus natural selection is based on integrated organism-environment relations and not on their separate characteristics: volume and force of muscles, length or sharpness of horns, etc. Though these characteristics may, of course, facilitate the achievement of some results and hamper the achievement of others.

Thus it is suitable to speak about a "value", "significance", or "role" of C or E, implying the significance of these separate characteristics of an integrated systemic organization (together with its numerous other characteristics) in ensuring the efficacy of the given organization - achievement of an adaptive result and, in the long run, survival.

4. Features of Systemic Organization of Behavior Related to Different Levels of Consciousness and Different Intensities of Emotion

In the framework of the proposed views the task of a search for "mechanisms" of C and E is transformed into a task of inquiring into those characteristics of systemic organization of behavior that correspond, for example, to different levels of C or different intensities of E. The data that indicate the existence of such characteristics were obtained in our laboratory as well as by other researchers.

4.1. Levels of Consciousness

It seems attractive to compare the levels of C, described in the present report, with the views on "memory systems" that are based primarily on the data on differences in amnesias following a damage of different brain regions. The most generally-accepted classification is selection of two big groups of "systems": declarative memory (related to the material on which a subject can report) and nondeclarative memory (characterizing subconscious material) (Squire, 1994). It is suggested that different "memory systems" may subserve different types of behavior.

There arc well-known problems with the interpretation of data yielded by the analysis of local brain damages, since a brain damage is not just a removal of its part, but the reorganization of projections of IE to intact regions. It was demonstrated that bilateral lesion of visual cortex affected the pattern of systemic specialization of neurons in intact motor cortex (Alexandrov et al., 1990). However, in the most general form the data accumulated within this research field may be accessed as follows. Systemic processes underlying a behavioral act have an all-brain nature (Alexandrov, this volume). A behavioral act is subserved by a set of systems of different "age". Symptoms that make possible speaking about the damage of this or that "memory system" are manifested after this set is affected. From this viewpoint a position of D.L.Schacter & E.Tulving (1994) seems adequate: they proposed that different "memory systems" are involved in subserving of a given behavior. These systems share a common feature - they are aimed at the achievement of result and differ in time of their appearance in onto- and phylogenesis. The different characteristics of amnesias may be determined by what specific elements of this set are damaged to a larger extent and, consequently, what specific alterations in the integrated organization are most prominent: the use of transformed units of a social experience in the evaluation of the results of own behavior ("report to society" - level 2) or the use of IE in the processes of realization of behavior and evaluation of subrcsults (level 1).

The phenomenon of "blindsight" is well-known. As a result of a damage to striate cortex accompanied by a degeneration of LGN and retinal cells (Coway & Stroeg, 1991) patients cannot report changes of a visual environment. However the latter can affect many characteristics of behavioral organization (skin conductance, eye movements, etc.). An analogous phenomenon was observed in patients with face agnosia: they fail to give discriminatory verbal ratings of familiar versus unfamiliar faces. Nevertheless, they had a larger-amplitude skin conductance changes related to the presentation of familiar faces as compared with non-familiar ones (Tranel & Damasio, 1988). It may be supposed that the evaluation of results of corresponding behaviors at the level 2 is impaired in such patients, whereas the evaluation at the level 2 may still occur, determining the appropriate modifications

in the organization of a current behavior.

Event-related potentials recording may be used to compare cerebral processes related to the initiation of movements in a situation when it occurs in course of a realization of a substage within a given act (level 1) and in the situation of transition from one act to another when subject gives a report on the initiation of movements (level 2) (Keller & Ileckhausen, 1990). An amplitude of a readiness potential appeared to be lower in the former situation than in the latter one. Authors propose an explanation that different pools of neurons are involved in two situations; in particular they report, in the first situation, a decreased or even missing activity of the medial premotor system. The concept of a specificity of a set of neurons activated in relation to transitional processes from one act to another (Alexandrov, this volume) is in line with the above proposition.

It was demonstrated in our laboratory that neuronal discharges and ERP corresponding to the achievement of a result of a behavioral act and to a transition to the next act of a continuum are radically changed when, in course of automatization of complex instrumental behavior, this result becomes a subresult (Pashina, 1979). Substantial changes of unit activity and ERP are also observed in psychophysical experiments, when a stimulus - a flash of light - that is the result of "waiting act" appears to be a subthreshold one, i.e. not determining the transition to the next act - report (in this case - pedal pressing in animals and button pressing in human subjects) (Maksimova & Alexandrov, 1987). In the former experiment the ERP that had been observed in rabbits before automatization in relation to the sound of feeder eventually disappeared. The latter experiment revealed that ERP accompanying the undetected flash of light had smaller amplitude and reorganizations of unit activity in motor and visual cortex were less marked than those in relation to the detected light (lash. Activity changes following undetected flashes were observed only in the cells belonging to old systems. It is the absence of activations in neurons belonging to new, most differentiated systems that accounts for "non-detection" - absence of an act of report. Nevertheless, though cerebral processes occurring after the undetected flash do not result in changes at the level of behavioral acts (level 2), they do affect the future behavior. If these processes take place, the latency of report onset in human subjects is decreased and the probability of signal detection in animals is increased.

4.2. Intensity of Emotion

As for the features of systemic organization of behavior corresponding to different intensity of E (Shvyrkov, 1984), the understanding of E and C as characteristics most suitable for lower and higher levels of differentiation, accordingly, the following hypothesis may be inferred. One of the most significant or, probably, the most important factor determining the markedness of "E-characteristic" of behavior may be the "shift" from higher- to lower-differentiated

systems due to a decreased representation of the former and increased representation of the latter in the systemic structure of behavior. It was found that such "shift" may be experimentally provoked by the acute ethanol administration.

An analysis of modifications of neurons' activity, underlying the behavioral alterations (increased number of mistakes, decreased quickness) induced in animals by acute ethanol intake (1 g/kg), revealed the decreased number of neurons active in behavior. Pattern of neuronal specialization in limbic cortex is changed as follows. The percentage of active neurons belonging to new systems (that were formed at later stages of individual development) is decreased due to the selective suppression of activity of these neurons, especially those localized in upper (II-IV) cortical layers (fig. 2) (Alexandrov et al., 1990a. 1993). It is interesting to note that these layers are phylogenetically younger than the deeper ones, and their evolutionary development is associated with the growing complexity of psychic activity (Luria, 1973).

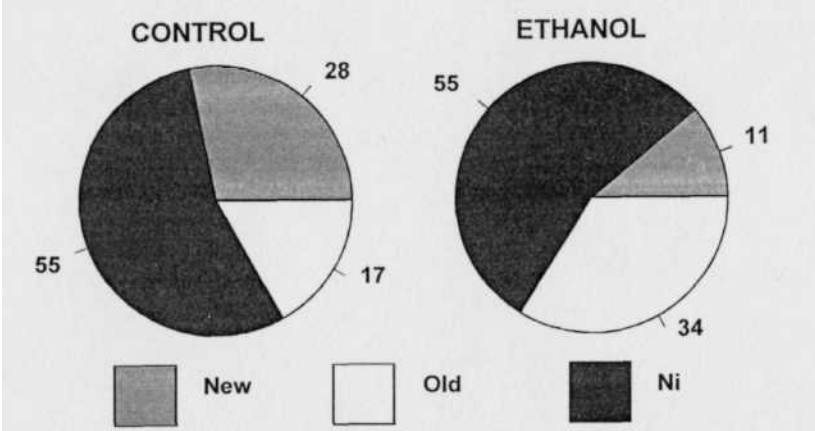

Fig. 2. Pattern of neuronal specialization in rabbit's limbic cortex in **CONTROL** experiments and after acute alcohol administration (**ETHANOL**, 1 g/kg, i.p.)
Sectors correspond to the relative number of neurons belonging to new systems, formed in rabbits during the learning process in the experimental cage (**New**), older systems, formed at earlier stages of individual development (**Old**), and non-involved cells, displaying no activations in a constant relation to this or that behavioral act (**Ni**).

The same tendency was observed in the studies with human subjects. An analysis of influence of acute ethanol intake (1 ml/kg) on ERP related to the realization of a word-categorization task (the task required using IE accumulated at

earlier and later stages of individual development - during learning native and foreign language, correspondingly) revealed the significantly more marked suppression effect during categorization of foreign words (Alexandrov et al., 1997). Signs of euphoria were observed in all subjects and they apparently enjoyed the situation after alcohol intake; all but one subjects claimed that the word classification task was easier after drinking. Nevertheless, after alcohol intake the number of mistakes increased. These results proving the selective influence of alcohol on neurons belonging to newer systems make it possible to infer that in humans the basis of the differential alcohol's effect on EIE of different age is the more pronounced alcohol's influence on those neurons that subserve the actualization of IE accumulated by subjects at later stages of individual development.

After we had defined selective alcohol's effect on EIE, we analyzed the changes in scale values of personality tests under alcohol influence (1 g/kg) (Bodunov et al., 1997). The action of alcohol expressed itself in the increase of emotional sensitivity (Neuroticism and Social Emotionality).

Thus alcohol intake results in the increase in the relative weight of less differentiated, older systems. Such modification of IE structure, determined by suppression of the most differentiated systems, is characterized by the increased emotionality and growing number of behavioral mistakes. Thus the hypothesis on the increase of intensity of E in case of shifting proportion of old and new systems in the direction of the former is proved by the experimental results obtained in our laboratory.

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