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On the Issue of Neurophysiological Mechanisms of Giftedness: Creative Type of Personality as an Objective Reality

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Abstract: In the article, from the point of view of evolutionary diatropics, a special cognitive structure of the personality is considered: the versative-ingenational-rapid intellectually gifted individual (VIR-type), which is the author's rethinking of the concept of urethral fixation by Z. Freud. The historical context of the formation of this concept is traced, its modern meaning is revealed, both from the point of view of the psychiatric clinic and from the position of pedagogical psychology. The material of the study of cross-correlation analysis of the electroencephalogram of 36 subjects with a VIR-type of personality demonstrates the features of the neurofunctioning of the cerebral cortex of these individuals: increased interaction of remote areas of the cortex and weakened integration of closely located zones. Illustrates the formation of a specific neurophysiological pattern, dubbed the “ikaric wings” and represents an intensive synchronization of the frontal and occipital lobes of the brain with the enhancement of their interaction both ipsilateral and contralateral. A comparison is made of the resulting pattern of functional activity of the cerebral cortex of the subjects with a VIR-type personality and patients with mental pathology. It is concluded that the presence of signs of mental disorders in the human population is necessary in order to form a special group of highly intelligent, creatively gifted individuals.

Keywords: Alpha rhythm, archetypal structures, diatropics, Icarus syndrome, neurophysiological indicators, Clinical signs, electrophysiological method, clinical and psychopathological method, hemispheric asymmetry, mythological archetypal structures, theory of evolution.

1. Introduction

Recently, more and more attention has been paid to issues related to the understanding of certain pathogenetic mechanisms, clinical features and the course of a number of neurological and mental disorders. A lot of research is also devoted to giftedness and the development of human creative abilities, personal maturity and "full functioning" from the

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standpoint of modern ideas about the functional asymmetry of the brain hemispheres. There is an opinion that the functioning of non-specific brain systems that provide various types of its activity is not always identically organized in the hemispheres. One-sided change in the activity of these formations and the disruption of their interhemispheric interaction can be important factors that reveal the mechanisms of the formation of pathological forms of psycho-emotional response. Despite this, up to the present, the sufficiently clear neurophysiological criteria for the differentiation of these disorders have not been developed. Very few data are based on the study of the cerebral mechanisms of various forms of borderline mental pathology. For example, the question of the substrate-functional basis of such mental formations as “complexes” still remains open. Back at the beginning of the last century, KG Jung as "an emotionally charged group of ideas or images grouped around the core-archetype and imprinting on the behavior of a person as a person as a whole." Recognized by most researchers, they, nevertheless, have not yet been studied. However, the role of these complexes is evident in the description of "symptom-complexes of diseases", and in the description of personal types of people with accentuations, including "accentuations" of creative abilities.

Such formations include, in particular, described by Murray and Wiklund "Icarus complex". In the classification of S. Freud there is no stage of psychosexual development, which could be called "urethral". Nevertheless, in several of his works, he noted the desire of some individuals to experience pleasure when urinating, as well as their inherent “burning ambition”. In the future, many authors of the psychoanalytic direction wrote about urethral eroticism and often accompanying the last urethral fixation: Horney, Fenichel, Ferenci, Abraham, Sadler, Klein and others. However, this concept received full coverage only after the release of the works of Murray. As part of his teaching on infantile forms of activity, a separate “urethral complex” is distinguished, which received the additional name “Icarus complex” (Badalov, Sumanov, & Galako, 2016; Murray, 1955; Wiklund, 1978; Aksarina et al., 2019). It includes the following signs: cathexes of fire, enuresis, and the desire for immortality, pronounced narcissism and high ambitions with low tolerance to frustration. For several years, we systematically investigated this mental education (under the general name “Icarus syndrome” introduced by Wiklund), using various methods in the structure of an interdisciplinary approach to its study, and as a result we concluded that there is a universal scheme basis and called the "principle of chimera." This design indicates the need to combine the characteristics of the three main circles of mental pathology in the composition of this disorder: schizophrenic, epileptic, cycloid, which did we originally demonstrate based on clinical data and the results of the pathopsychological experiment. Nevertheless, we consider it necessary to extend the use of the claimed concept. Observations on individuals with the features of the “Icarus complex” showed that they represent a special personality structure with a predisposition to dis-adaptation and the occurrence of disorders in the form of depression, anxiety, panic attacks, suicidal behavior. Persons with Icarus syndrome are also prone to the development of long-term depressive states, especially with the melancholy-dreamy component into which they willingly sink and who are intensely experienced by them. Due to the presence of the above-mentioned pain and tactile sensitivity disorders in individuals with Icarus syndrome, as well as the so-called phenomenon of “tunnel vision” of the development of events with the inevitable poor outcome, such states often end in suicide attempts. Also typical for them are quite frequent changes of feelings of grandeur with feelings of inferiority, transitions from increased to reduced activity. They tend to be recognized / recognized, to attract attention. However, unlike narcissism, the state of demonstration and active interaction with the world is often replaced by periods of desire to avoid social intercourse, isolation, loneliness. There is a diffuse identity (a sign of borderline personality disorder). The weakness of identity is manifested, in particular, in fuzzy gender identification, the emergence of fragmentary personal states dominant in the content of the psyche and behavior (transition to functioning inherent in children or adolescents; becoming familiar with the role of a real or mythical hero. Persons with such symptoms are also prone to magical thinking, premonitions and predictions, they have recorded the phenomenon of self-affirming prophecies and, quite often, a deja vu experience appears (Badalov et al., 2020; Badalov, & Brovkina, 2017a; Badalov, & Brovkina, 2017b).

In the future, this syndrome was compared Korolenko and Zavialov with the "temporal" and some other disorders of personality and behavior described by them. In many respects (simplicity of isolation, sufficiently clear delineation of signs-markers, their clinical significance), this syndrome is available for its study not only descriptive (clinical and pathopsychological), but also instrumental-functional methods. These factors determine the relevance of the development of certain neurophysiological criteria for a given condition. The predominance of the right hemisphere activity compared with the left one in the subjects under study explains a rather large number of disorders occurring in individuals with Icarus syndrome. Deglin and Dobrovokhovoy describe these traits (characteristic of the dominant right hemispheric functional asymmetry):violationsof the body scheme, pain, tactile, stereognostic sensitivity, diencephalic disorders, derealization-depersonalization changes, depression with a melancholy hue and dreamy component, ease of anxiety disorders (Deglin, 1996; Dobrokhotova, 2006; Korolenko & Dmitrieva, 2010).

In addition, this asymmetry explains the following characteristics of these individuals: reduced ability to cope with difficulties, that is, overcoming abilities, reduced arbitrariness of mental activity, initiative, difficulties in overcoming frustrating situations and reducing the ability to predict (which coincides with the classical signs described by Murray) (Murray, 1955); violation of attention in the form of “distraction”, the predominance of the past and the present (often with a change in the course of the present compared with the future) and a high frequency of escape from reality into the world of dreams and fantasies (Badalov, Sumanov, & Galako, 2016). The features of individuals with Icarus syndrome identified by us and other scientists and practitioners convincingly demonstrate the need for further

studies of the neurophysiological and clinical features of individuals with Icarus syndrome to substantiate its clinical independence. In our long-term studies of this syndrome, it has been revealed that the main features of the clinical manifestations of Icarus syndrome, correlated with specific data of neurophysiological indicators, are: 1) impaired sensitivity, stereognosis, body patterns, visual disturbances in the perception of the environment; 2) the presence in these patients of mental disorders anxiety-depressive circle with a high probability of suicidal attempts; 3) frequently occurring visceral-vegetative and vestibular disorders, sleep disorders, and also disturbances of the "sleep — wakefulness" rhythm (Badalov, Sumanov, & Galako, 2016; Korolenko & Dmitrieva, 2010). The very concept of signs relating to the painful changes in the mental sphere of an individual needs to be extended beyond the abnormal. The frequency of their occurrence in various combinations and relationships is too great, including among recognized healthy individuals. Therefore, that it is easy to eliminate the need for their presence in the human population. In addition, it is essential to find a way to justify the presence of the described features from the point of view of their inherent morphofunctional basis, since only a systematic interdisciplinary approach allows you to look at mental disorders from a different angle and provides new opportunities for understanding their nature. The most promising theoretical basis for this kind of research is, in our opinion, the theory of evolutionary diatropics. Diatropics is the science of diversity and its laws. In the application of diatropics to the theory of evolution it is postulated that diversity is genetically programmed. From this point of view, Icarus syndrome is an exceptionally convenient and promising model of the stated research, because, as mentioned above, it carries signs of all major circles of mental disorders in approximately equal proportions. It is necessary to add that the essential feature of persons with Icarus syndrome is that they have a higher than average level of intellectual development, which allowed us to come to a paradoxical, at first glance, conclusion: the structure of this disorder should include an individual's intellectual profile as an additional parameter. Here we should note that the very concept of "intelligence" is interpreted by us from a system-integrative point of view much broader than just the ability to effectively solve the problems declared in common tests of the intellectual level as reference ones. Intellect should be considered as a synergistic complex with several measurement parameters: volume, specific complexity, and system-building pace, which received, respectively, the names of versativeness, ingenitivism and rapidity, or breadth, depth and quickness of mind. That is, the definitions of intelligence as the degree of efficiency of the brain of an individual and as a complex composite system that determines the development of a population, where it is not the individual himself who is important, but the product of activity created by him is not identical to each other. The latter most clearly characterizes the system of cognition and creativity that is obtained from the combination of characteristics encoded by the described parameters, which is necessary from the point of view of the evolution of populations. According to the results of the study of the features of the cognitive functions of persons with Icarus syndrome, we can rightly say that they have all of the above properties (versatility, ingenitivism and rapids). Moreover, these properties, apparently, are formed just because of a combination of high efficiency of the brain and potentially pathological signs of schizoid, epileptic and cycloid character that is why the described personality structure was called the person's VIR-type. In order to obtain confirmation of the presented concept, we need to fix the presence of the described signs not only from the phenomenological, as was done previously, but also from the neurophysiological position, as this will allow us to exclude the constructions that are part of its structure (Arpentieva, 2015; Arpentieva, 2018; Badalov et al., 2018; Rusinov, Grindel, & Boldyreva, 1988).

In the theoretical part of our research, much attention was paid to the problem of the content and functions of mythological and archetypal structures. These structures were considered in connection with ideas about the types of people, including those who exhibit Icarus syndrome (Arpentieva, 2018; Gorelova, & Arpentieva, 2018; Green, et al., 2019; Kassymova et al., 2020; Kassymova et al., 2019; Kendal et al., 2018; McAdams & Reischer, 2019; Roubekas & Ryba, 2020; Uchiyama & Muthukrishna, 2019). There are few such studies even in modern psychology: they are rarely found abroad, in the countries of the former USSR. attempts to include and integrate the works of Jung and other studies of archetypes are still far from complete, there is no full and harmonious fusion with the problems of psychophysiological research (Becker & Neuberg, 2019a; Becker & Neuberg, 2019b; Boschetti et al., 2016; Chan, 2017; Cona et al., 2019; Fox et al., 2017; Maltsev, 2019).The linguistic approach to studying the mythological and archetypal structure is given in Makovsky's books: (Makovsky, 2012; Makovsky, 2013; Makovsky, 2014a; Makovsky, 2014b; Makovsky, 2018), with special reference to Indo-European languages and Indo-European mythologies. Among them, the corresponding lexemes of Ancient Greek and Latin are analyzed there; they are considered in systems of lexical-semantic fields are tool of expression mythpoetically-valued meanings and senses. Thus, we can conclude that the linguistic dimension of archetypes has to be taken into account too. That idea seems to be more important if we consider the issue of origin of language and language ability of human along with the development of human cognition. Then, the idea of ritual function and ritual origins of language as Makovsky writes: "The ritual was such an initial locus where the emergence of language as specific sign system had took place in" (Makovsky, 2014b, p. 5-6) got significance when studying historical development of human language and human cognition.

2. Material And Methods

Our approach to the study of the phenomenon of giftedness can be called a kind of phenomenological. Considering the variety of signs used in the description of the studied mental education, we identified their main triad: fire cathexes, frequent dreams with flights, history of enuresis or clinically proven urethral fixation. The basis of choice was the frequency of use of these signs by our predecessors. For 5 years, we studied 2433 students of 1-5 courses of the Kyrgyz-

Russian Slavic University and the Kyrgyz State Medical Academy. Among them, we selected 36 subjects with a VIR-type of personality (the main group is MG). In order to objectify the study, a group of 17 students (control group - CG) was selected who did not record any of the above signs. The exclusion criteria were age younger than 18 years and the use of psychotropic drugs at the time of the survey. For the control group, an additional exclusion criterion was the presence of signs of pathological changes on the electroencephalogram (EEG). When selecting individuals included in the study, we took into account some of the difficulties encountered in the process of clinical diagnosis of Icarus syndrome. Firstly, these are terminological difficulties, connected with the fact that the authors offered different descriptions of this disorder and also gave different weight to its individual symptoms. For example, the classic description of Murray includes “high but fragile ambitions”, while Viklund emphasized “high creative activity with a desire to achieve” without indicating the degree of frustration tolerance. Secondly, as we have indicated earlier, Icarus syndrome may be comorbid with a wider range of psychopathological disorders than has been described so far. Third, the symptoms of this disorder have different diagnostic value in the clinic. Thus, the hypersensitivity to odors (with a change under the influence of olfactory stimuli of the emotional state of patients), often referred to Korolenko as a diagnostic sign, manifested in patients in the clinic with very different intensity. At the same time, such properties as ascensionism, narcissism, and high ambition with low tolerance to frustration can hardly serve as a convenient aid in differential diagnostics (Korolenko & Dmitrieva, 2010).

Taking into account the above, to identify the peculiarities of electrophysiological indicators in individuals with Icarus syndrome, we used the following basic triad of signs: “enchantment with fire”, enuresis and frequent dreams with flights. The latter are due to the fact that they are not only quite often found in the description of this disorder, but also more correct in terms of the origin of the term “Icarus syndrome” (Icarus is an ancient Greek hero who gained fame primarily due to his ability to fly) as well as easily defined in clinical practice. The cross-correlation analysis of the EEG makes it possible, first, to determine the connections between different parts of the brain, that is, to trace the work of the latter over time. Cross-correlation analysis of the EEG was performed using the software of the hardware complex Mitsar EEG Studio. This software uses the method of the theory of projection of graphs in a visual form. It allows you to reflect the dynamics of moving the foci of maximum activity and the associated inhibition of the areas of the left and right hemispheres of the brain. In the language of graph theory of this kind, regions are designated, respectively, as centers of the “source” and “drain”. The degree of similarity or connection of two EEG in cross-correlation analysis is determined by the magnitude of the cross-correlation coefficient (CCC), which can take values from -1 to +1. The value of the CCC can be judged on the strength of the connection of two processes: when the value of the CCC is from -1 to 0.3, the link is weak, from 0.3 to 0.5 is the average bond strength, and from 0.5 to 1.0, the link is tight. The maximum shift time of the cross-correlation function t characterizes the temporal relations of 2 processes. The value t = 0 indicates that the oscillations are in phase in two EEG leads. When comparing leads 1 and 2, t with the “+” sign characterizes the advance of the process in lead 1 as compared with lead 2, on the contrary, t with the “-” sign characterizes the lead in lead 2 compared to lead 1. In addition, the amplitude t is significant: at an absolute value exceeding the limit of 200 ms, it can be concluded that the impulse signal is carried out mainly through the subcortical parts of the brain. When the amplitude t is below 200 ms, the pulse moves along the cortex. Statistical processing of the results was performed using the SPSS 16.0 for Windows application package. The critical level of significance when testing statistical hypotheses in this study is assumed to be 0.05 (p is the achieved level of significance). The verification of quantitative traits for compliance with the normal distribution law was performed using the Shapiro-Wilk test. The description of normally distributed quantitative traits is presented as a mean and standard deviation. The description of the quantitative traits, the distribution of which does not correspond to the normal law, is given in the form of a median and inter-quarter range. Comparison of independent samples was carried out using student's criterion. Comparison of quantitative data that do not correspond to the normal distribution law was carried out using the Mann – Whitney test.

3. Results

We dased our investigation on the theory of dynamic localization of higher mental functions, Luria (Luria, 1973; Luria, 2017; Muthukrishna & Henrich, 2016; Muthukrishna et al., 2018; Oatley, 2019). The term “functional system” was introduced into physiology by the well-known Russian researcher Anokhin, who can also be considered as representative of non-classical physiology. Luria, using these ideas and relying on the concept of Vygotskiy, created his theory of systemic dynamic localization of higher mental functions. Based on the ideas of his predecessors in neurology (including Jackson), in physiology (Anokhin and Ukhtomskiy) and in psychology (Vygotskiy), he came to the conclusion that the brain works as a single and systemically organized whole. When solving a specific task by a subject, different parts of the cortex of his brain are “involved” every time. At the same time, if the work of any link of this system is disrupted, the work of the entire system is disorganized, but each time in different ways depending on the specific damage. For example, consider some violations of the most complex letter activity. For its implementation requires the work of various parts of the brain. The loss of the “own” function of a specific part of the brain leads to a partial disruption of the work of the entire system as a whole, however, due to functional reorganizations, compensation can be observed (up to certain limits) of the arisen defect. The more complex the mental function, the more “widely” it is localized in the brain structures. The individual elements of this system can replace each other when solving the same problem (to a certain extent). At the same time, brain localization changes in ontogenesis. We study the functioning of connections in the cerebral cortex

of the subjects; we chose the so-called associative areas: pre-frontal and temporal-parietal-occipital. In addition, we investigated the relationship between the same areas of the cerebral hemispheres of persons with Icarus syndrome, because the dynamics of their work also underlies the emergence of mental disorders that can be attributed to the above-mentioned main psychopathological circles. All the data obtained are summarized in table 1.

When analyzing the data in the table, you must first pay attention to the indicators t. Their difference between the studied groups is not statistically significant for the overwhelming majority of the links chosen for the description, which, in turn, allows us to conclude that individuals with Icarus syndrome maintain the normative nature of the latter. That is, the selected links retain the "severity" / "source" characteristic that is inherent in the norm (and, therefore, there is no link inversion effect occurring with pathological changes in the central nervous system), as well as a sign that the signal passes through the cerebral cortex, not subcortical structures.

Table 1(beginning of table). Cross-correlation coefficient (CCC), maximum time in ms (t ms) and statistical significance of differences (P) in the main group (MG) and control group (CG) by lead (Res.)

Res.	CRC MG	CRC CG	P	t msMG	t msCG	P
F3-FP1	0,910 (0,835-0,951)	0,918 (0,865-0,937)	0,912	0 (0 – 0)	0 (0 – 0)	0,840
F4-FP1	0,741±0,152	0,708±0,120	0,148	0 (-2 – 2)	0 (-2 – 2)	0,803
F7-FP1	0,724±0,149	0,830±0,111	<0,001	0 (-2 – 2)	0 (0 – 0)	0,464
F8-FP1	0,566±0,174	0,662±0,156	0,001	0 (-4 – 4)	-2 (-2 – 2)	0,465
C3-FP1	0,506±0,166	0,743±0,134	<0,001	-2 (-26 – 6)	0 (-3 – 2)	0,561
C4-FP1	0,487±0,162	0,599±0,138	<0,001	-2 (-47 – 31)	0 (-4 – 2)	0,532
T3-FP1	0,358 (0,297-0,470)	0,621 (0,519-0,739)	<0,001	-2 (-152 – 62)	-1 (-5 – 2)	0,317
T4-FP1	0,349±0,112	0,511±0,156	<0,001	-16 (-291 – 196)	-3 (-60 – 2)	0,803
T5-FP1	0,383±0,158	0,400±0,127	0,484	3 (-73 – 62)	12 (-40 – 78)	0,237
T6-FP1	0,420±0,166	0,378±0,091	0,042	-2 (-46 – 43)	4 (-55 – 71)	0,580
P3-FP1	0,477±0,180	0,549±0,184	0,014	4 (-28 – 116)	0 (-4 – 4)	0,159
P4-FP1	0,484±0,204	0,471±0,125	0,598	-4 (-95 – 10)	-6 (-101 – 4)	0,739
O1-FP1	0,503±0,183	0,397±0,115	<0,001	-8 (-52 – 5)	5 (-79 – 119)	0,042
O2-FP1	0,520±0,184	0,413±0,127	<0,001	-4 (-48 – 6)	1 (-89 – 73)	0,434
F3-FP2	0,733±0,147	0,729±0,116	0,879	0 (-2 – 2)	0 (-2 – 2)	0,980
F4-FP2	0,895 (0,814-0,946)	0,893 (0,853-0,944)	0,820	0 (0 – 0)	0 (0 – 0)	0,465
F7-FP2	0,541±0,186	0,658±0,162	<0,001	0 (-5 – 25)	0 (-2 – 2)	0,829
F8-FP2	0,759±0,125	0,844±0,088	<0,001	0 (-2 – 0)	0 (-2 – 0)	0,794
C3-FP2	0,443±0,147	0,616±0,114	<0,001	-4 (-160 – 44)	-2 (-4 – 4)	0,093
C4-FP2	0,531±0,180	0,721±0,128	<0,001	0 (-23 – 2)	0 (-4 – 2)	0,840
T3-FP2	0,374±0,105	0,528±0,159	<0,001	-6 (-179 – 86)	-2 (-17 – 3)	0,575
T4-FP2	0,387±0,136	0,578±0,162	<0,001	-2 (-178 – 40)	-2 (-10 – 2)	0,886
T5-FP2	0,452±0,135	0,386±0,125	0,002	2 (-42 – 43)	32 (-60 – 244)	0,083
T6-FP2	0,404±0,153	0,446±0,144	0,081	-4 (-68 – 48)	36 (-2 – 83)	0,001
P3-FP2	0,485±0,188	0,446±0,140	0,157	2 (-4 – 116)	2 (-4 – 44)	0,105
P4-FP2	0,482±0,184	0,533±0,175	0,086	-4 (-94 – 25)	-4 (-70 – 2)	0,916
O1-FP2	0,559 (0,352-0,673)	0,356 (0,305-0,499)	<0,001	0 (-51 – 6)	-3 (-214 – 57)	0,787
O2-FP2	0,508±0,179	0,432±0,137	0,003	-4 (-51 – 6)	2 (-64 – 71)	0,181
F3-P3	0,470±0,166	0,662±0,179	<0,001	2 (-44 – 72)	0 (-2 – 2)	0,545
F4-P3	0,445 (0,324-0,576)	0,564 (0,410-0,669)	0,003	8 (-23 – 126)	0 (-2 – 6)	0,047
F7-P3	0,456±0,154	0,525±0,182	0,013	4 (-28 – 62)	0 (-2 – 5)	0,216
F8-P3	0,426 (0,308-0,610)	0,479 (0,337-0,619)	0,382	8 (-4 – 162)	0 (-8 – 44)	0,062
C3-P3	0,599±0,185	0,813±0,091	<0,001	0 (-8 – 8)	0 (0 – 2)	0,905
C4-P3	0,470±0,123	0,610±0,147	<0,001	0 (-33 – 51)	0 (-2 – 2)	0,354
T3-P3	0,601±0,175	0,740±0,115	<0,001	0 (-4 – 4)	0 (-2 – 2)	0,871
T4-P3	0,406±0,119	0,533±0,188	<0,001	-2 (-62 – 18)	0 (-3 – 4)	0,310
P4-P3	0,660±0,145	0,746±0,131	<0,001	0 (-2 – 2)	0 (-2 – 2)	0,367
T5-P3	0,621±0,171	0,642±0,125	0,363	0 (-6 – 40)	0 (-4 – 2)	0,708

At the same time, the degree of synchronization and bond strengths determined by the CCC value significantly differ between MG and CG, and the picture of interaction between different brain regions of individuals with Icarus syndrome takes on a specific and extremely interesting from the functional description point of view. . As follows from the data presented in the table, in general, the tendency of changes in the connections between the different brain regions of individuals with Icarus syndrome compared with the CG can be described as indicating two main features.

First, a decrease in the degree of interaction between centrally localized structures - the frontal, temporal, and upper medullar, as well as a decrease in the strength of their connection with the associative parts of the cortex. Secondly, according to the cross-correlation analysis data, the integration of the anterior and mid-frontal divisions, as well as the inferior, posterior temporal and occipital regions, has been enhanced, and the resulting character of the links indicates not only enhanced functional synchronization within both the front and rear associative zones , but also about strengthening their cooperation among themselves. The latter is formed due to the predominantly increased

interconnection of the front-frontal cortex with occipital lobes both ipsilaterally and contralaterally. The resulting picture of connections, statistically significantly stronger in the MG than in the CG, forms a specific activity pattern, which we called “icaric wings” for its particular form: multidirectional right-angled triangular triangles with common base in the anterior frontal region and acute angles, directed to the occipital parts. That part of the connections that are stronger in the MG than in the CG is of greatest importance in the context under consideration. There are quite a large number of works in which such an increase in the integration of the frontal and occipital-pole parts of the brain is described as a predictor of a high intellectual level of development. Moreover, the enhancement of spatial synchronization of the biopotentials of the left frontal and right occipital parts, called the “cognitive axis”, is observed when solving verbal and non-verbal cognitive tasks of convergent type. The opposite enhancement, in a symmetrical type — between the right frontal and left occipital parts — is characteristic of divergent thinking and creative activity, and is therefore called the “creative axis.” As for hemispheric connections in the MG, they are generally different from those in the CG in the direction of lowering their strength, which again demonstrates a violation of intercortical (associative) interactions.A distinctive feature of persons with Icarus syndrome is an increase in the synchronicity of interfrontal ties that exceed the normative ones.Because in almost all endogenous mental disorders, the picture of the defect, mainly due to a decrease in the interaction of the frontal lobes, increases over time, it becomes clear why the defect with the Icarus syndrome is almost never so pronounced as to completely disable them.

Table 1: (table completion). Cross-correlation coefficient (CCC), maximum time in ms (t ms) and statistical significance of differences (P) in the main group (MG) and control group (CG) by lead (Res.)

Res.	CRC MG	CRC CG	P	t msMG	t msCG	P
T6-P3	0,384±0,133	0,475±0,173	0,001	0 (-50 – 98)	0 (-4 – 4)	0,798
O1-P3	0,756±0,153	0,626±0,193	<0,001	-2 (-6 – 2)	0 (-2 – 40)	0,003
O2-P3	0,580±0,149	0,495±0,170	0,001	0 (-45 – 4)	3 (-4 – 49)	0,001
F3-P4	0,440 (0,336-0,583)	0,587 (0,479-0,725)	0,002	4 (-43 – 90)	2 (0 – 56)	0,791
F4-P4	0,464 (0,345-0,595)	0,754 (0,603-0,851)	<0,001	6 (-40 – 90)	2 (0 – 7)	0,531
F7-P4	0,408 (0,305-0,569)	0,454 (0,334-0,589)	0,388	2 (-72 – 137)	2 (-1 – 118)	0,502
F8-P4	0,456±0,153	0,612±0,161	<0,001	4 (-40 – 74)	2 (0 – 12)	0,478
C3-P4	0,479±0,148	0,686±0,139	<0,001	2 (-42 – 52)	2 (0 – 7)	0,945
C4-P4	0,614±0,177	0,816±0,117	<0,001	2 (-4 – 6)	2 (0 – 2)	0,882
T3-P4	0,394 (0,322-0,527)	0,679 (0,452-0,767)	<0,001	2 (-48 – 52)	2 (0 – 7)	0,384
T4-P4	0,657 (0,473-0,757)	0,787 (0,627-0,842)	<0,001	0 (-4 – 4)	2 (0 – 5)	0,127
T5-P4	0,424±0,120	0,480±0,158	0,018	0 (-38 – 29)	2 (-2 – 52)	0,131
T6-P4	0,536±0,198	0,637±0,139	<0,001	-1 (-12 – 5)	-2 (-4 – 2)	0,556
O1-P4	0,580±0,163	0,539±0,196	0,203	0 (-6 – 28)	1 (-4 – 48)	0,211
O2-P4	0,784 (0,661-0,882)	0,678 (0,549-0,809)	0,007	-2 (-4 – 2)	0 (-4 – 2)	0,338
F3-T5	0,387±0,145	0,416±0,120	0,194	4 (-62 – 67)	12 (-44 – 84)	0,435
F4-T5	0,389 (0,279-0,572)	0,381 (0,311-0,420)	0,723	2 (-46 – 48)	14 (-10 – 112)	0,062
F7-T5	0,367±0,116	0,402±0,131	0,081	0 (-51 – 70)	6 (-24 – 52)	0,699
F8-T5	0,401±0,175	0,405±0,103	0,864	-1 (-41 – 48)	10 (-56 – 96)	0,194
C3-T5	0,416±0,155	0,499±0,132	0,001	0 (-27 – 18)	2 (-4 – 12)	0,237
C4-T5	0,374 (0,271-0,517)	0,364 (0,309-0,499)	0,555	0 (-106 – 46)	2 (-182 – 42)	0,989
T3-T5	0,639±0,154	0,650±0,171	0,668	0 (-4 – 2)	2 (0 – 6)	<0,001
T4-T5	0,334±0,115	0,418±0,142	<0,001	-3 (-291 – 48)	4 (-4 – 72)	0,045
T6-T5	0,372±0,125	0,429±0,142	0,008	2 (-191 – 88)	6 (-12 – 50)	0,308
O1-T5	0,664±0,161	0,645±0,182	0,491	0 (-2 – 6)	-2 (-4 – 8)	0,327
O2-T5	0,473±0,133	0,489±0,184	0,569	0 (-43 – 11)	2 (-4 – 52)	0,037
F3-T6	0,416±0,158	0,404±0,110	0,551	-2 (-52 – 41)	4 (-31 – 77)	0,125
F4-T6	0,369 (0,276-0,511)	0,388 (0,355-0,531)	0,019	1 (-43 – 57)	4 (-3 – 105)	0,172
F7-T6	0,384±0,164	0,393±0,093	0,656	-4 (-52 – 46)	8 (-55 – 84)	0,111
F8-T6	0,402±0,138	0,487±0,129	<0,001	-2 (-56 – 55)	2 (-6 – 39)	0,691
C3-T6	0,366 (0,255-0,482)	0,373 (0,313-0,501)	0,268	0 (-93 – 52)	2 (-60 – 76)	0,479
C4-T6	0,397±0,147	0,526±0,174	<0,001	-4 (-41 – 59)	0 (-40 – 4)	0,564
T3-T6	0,327±0,121	0,399±0,136	0,001	-8 (-98 – 115)	0 (-91 – 42)	0,975
T4-T6	0,615±0,171	0,706±0,133	<0,001	0 (-4 – 2)	0 (-2 – 4)	0,322
O1-T6	0,425±0,148	0,486±0,182	0,022	-6 (-52 – 17)	-2 (-10 – 40)	0,123
O2-T6	0,579±0,170	0,628±0,182	0,088	-2 (-8 – 4)	-2 (-6 – 2)	0,513
FP1-FP2	0,821 (0,718-0,891)	0,799 (0,646-0,844)	0,040	0 (0 – 0)	0 (0 – 2)	0,215
F7-F8	0,469±0,171	0,588±0,173	<0,001	2 (-50 – 50)	0 (0 – 8)	0,387
F3-F4	0,831 (0,741-0,891)	0,768 (0,638-0,834)	0,014	0 (0 – 2)	0 (0 – 2)	0,887
T3-T4	0,346 (0,289-0,453)	0,625 (0,408-0,679)	<0,001	2 (-80 – 112)	0 (-2 – 4)	0,476
C3-C4	0,585±0,177	0,738±0,089	<0,001	0 (-2 – 4)	0 (0 – 2)	0,906
T5-T6	0,359 (0,289-0,449)	0,455 (0,388-0,567)	<0,001	4 (-163 – 155)	-4 (-28 – 3)	0,339
P3-P4	0,675 (0,561-0,763)	0,838 (0,719-0,910)	<0,001	0 (-4 – 4)	0 (0 – 2)	0,421
O1-O2	0,791 (0,702-0,868)	0,885 (0,721-0,938)	0,01	0 (-2 – 2)	0 (-2 – 0)	0,131

4. Discussion

Nevertheless, there is another important aspect of the mental characteristics of the examined population. According to the results of studies on the links between different areas of the cerebral cortex of patients with schizophrenia, epilepsy and endogenous depression, each of these diseases is characterized by a specific pattern of biopotential synchrony. In patients with schizophrenia, the strength of interaction between the hemispheres and between the frontal and parietal regions of the right hemisphere is reduced. They also had reduced integration between the frontal and temporal regions, mostly on the left. At the same time, as the disease progressed, the hemispheres became increasingly disconnected, and the synchronism of the occipital parts gradually increased. In patients with schizoaffective psychosis, a significant decrease in the CRC between the frontal and other cortical zones was found, in depressed patients, between the central and temporal regions of the hemispheres. When epilepsy also decreases the level of interhemispheric synchronization compared with the norm. However, the level of the pole-pole (frontal-occipital) connections and the synchronism of the work of the front-frontal divisions in patients with epilepsy is significantly higher than in healthy subjects. Synchronization of biopotentials with various mental illnesses undoubtedly bears the imprint of a procedural course. This must be taken into account when comparing these patients with persons with Icarus syndrome. However, it can be noted that the above-described picture of the interrelationships of the areas of the cerebral cortex, which we obtained in the process of applying cross-correlation analysis, is of a peculiar, as if “average”, “intermediate” character. Strengthening the relationship of distant parts of the cortex, characteristic of epilepsy and causing the occurrence of attacks of spreading generalization of neural activity is combined with a weakening of the interaction of the central parts with the frontal and occipital. Such interactions determine the peculiarities of the mental structure of patients with schizophrenia. The frequent occurrence of depressive disorders of pronounced suicidal tendencies in individuals with Icarus syndrome is also largely due to a change in their inherent neuroactivity. Its peculiarity is manifested in the weakening of control by the frontal regions of the hemispheres of the temporal zones, which are closely associated with the emotion-generating limbic system. However, it is worth mentioning once again that such a comparison can only be carried out without taking into account the signs of a cognitive and emotional-volitional defect arising from the procedural-progressive course of mental disorders (Merrin, Floyd & Fein, 1989; Norman et al., 1997; Arpentieva et al., 2019; Strelets, Novototskiy-Vlasov, & Golikova, 2001; Nerobokova et al., 2015).

5. Results

Thus, the study of the functional activity of the brain in individuals with Icarus syndrome and the data describing its structure in patients with signs of various mental disorders, as well as the results of psychological experiments conducted by us and other scientists earlier, indicate a large number of indicators of brain functioning in two selected groups. Accordingly, if we now consider the obtained evidence from the point of view of evolutionary diatropics, we can conclude that persons with Icarus syndrome are representatives of a special group of the human population, represented by highly intelligent, creatively gifted individuals. In the described group, genetically determined traits inherent in various mental disorders and lacking the properties of dynamic progression are combined with each other and, manifesting themselves on a highly effective neuro-functional basis. Here they lose their inherent phenotypic pathological phenomenology, simultaneously modifying the specified neurophysiological basis. From this point of view, intelligence is truly synonymous with the degree of efficiency of the brain. However, signs that, being manifested in the population in the most explicit form, initially belonged to the pathological determine the specificity of the brain. Now, their presence in the human gene pool can be interpreted as one of the main means of the evolutionary process associated with the emergence of gifted individuals as the driving force behind the development of the homo sapiens population (Melnikova & Lapin, 2008; Stepanova et al., 2018). But, it needs to be mentioned that the development of humanity cannot be separated from the development of human languages (it does not matter what types, natural or constructed ones), and general background of evolution of homo sapiens is hardly to describe without considering of linguistic issues and features of world languages. It needs to emphasize that creativity has its linguistic dimension, i.e., ability to produce new variations (or types) of signs and senses, moreover new types of languages (it has been mentioned the construction of languages as a part of process of language evolution in introduction of this article).Interestingly, the neurophysiological description of Icarus syndrome as a whole correlates well with the socio-psychological description: Icarus’s “one-dimensionality” of the world lies in the fragmentation and diffusion of its relationship to itself and the world. The asymmetry of social relations and the life scenario is a consequence and cause of violations in the context of a socio-psychological view. Here we can refer to the ideas of Icarus that exist in psychological, existential-humanistic, and personological, sociocultural, models (Rogers et al., 1967; Rogers, 1951). Pride, jealousy, instability and ease of transition from life-affirmation and creativity to life-rejection and stagnation, the desire to "diversify" life, the desire for freedom and the fear of freedom, both in the context of psychological, cultural, and philosophical, create a person, on the one hand , creative, and, on the other hand, living on the verge of the norm and pathology. It is rather an attempt to reach creativity, than creativity itself. There is still no discipline of spirit, soul and body, there is no reintegration and integrity, which is characterized by a "fully functioning", self-actualizing personality: “The organism has one basic tendency and striving - to actualize, maintain, and enhance the experiencing organism” (Rogers, 1951).

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