Human Physiology, Vol. 28, No. 1, 2002, pp. 16–26. Translated from Fiziologiya Cheloveka, Vol. 28, No. 1, 2002, pp. 23–34.

On the So-Called Alternative Vision or Direct Vision Phenomenon

N. P. Bekhtereva*, L. Yu. Lozhnikova, S.G. Dan'ko**, L. A. Melyucheva*, S. V. Medvedev[1]*and S. Zh. Davitaya*****

** Institute of Human Brain, Russian Academy of Sciences, St. Petersburg, Russia*

*** International Academy of Human Development, Moscow, Russia*

**** International Academy of Human Sciences, St. Petersburg, Russia*

Received August 8, 2001

Abstract—In this work, we present the first results of the study of the so-called alternative or direct vision of sighted and weakly-sighted subjects and the related brain activity. The aim of the work was the verification of the facts of alternative (direct) vision and testing the possibility to measure the related physiological parameters (physiological correlates). In this paper, we present the results of the visual observation of subjects displaying the ability to see with the eyes closed and the electrophysiological analysis (EEG, evoked potentials) of the brain of these subjects. To detect the brain correlates of this phenomenon, we compared the spontaneous activity of the brain (EEG) during the viewing of pictures and the comparison of evoked potentials (EP) during the execution of the same type of tasks involving the classification of pictures with common visual perception and the so-called alternative vision. Seven students of a high school who were trained with the B.M. Bronnikov method took part in the study. All subjects exhibited the ability of alternative vision in various test conditions. EEG data support the reorganization of brain activity to a different functioning mode during the functional tests involving "viewing" objects with the eyes closed. Alterations of the β-activity are the most demonstrative. Statistically significant differences in the EP between image classification with and without a mask were revealed. These differences are individual-specific and nonstationary in their pattern. The discussion emphasizes the preliminary character of the study and the complexity of the instrumental methods used. However, the results are positive both with respect to the existence of the phenomenon and the possibility to study its objective correlates. It is hypothesized that the "skin vision" and activation of brain reserves could be involved in this phenomenon.

Recently, training in the so-called alternative or direct vision of sighted, weakly sighted, and blind subjects was conducted in several cities of Russia and CIS. It uses the method by V.M. Bronnikov [1, 2].

The possibility of direct vision caused much doubts, both with respect to the existence of the phenomenon and its physiological explanation. We present the first results of the study of this phenomenon and some of its brain correlates.

This work is a strictly qualitative pilot study not pretending to discover any quantitative patterns. This is associated, first, with the heterogeneity of the subject group and difficulty to work with them. The aim of the study was the verification of the facts of alternative (direct) vision and the possibility to measure the associated physiological parameters (physiological correlates).

This study is based on visual observations of the behavior of subjects pretending to be able to see with eyes closed and the results of electrophysiological analyses (EEG, evoked potentials) of the brains of these subjects. To reveal the brain correlates of the phenomenon, we compared spontaneous electric activity of the brain (EEG) during the viewing of visual stimuli and the comparison of the evoked potentials (EP) during the execution of same type of tasks by the subjects involving the classification of the visual stimuli during the common visual perception and in the state of the so-called alternative vision.

METHODS

Seven high school students took part in the study. They were previously trained by the method of V.M. Bronnikov. Characteristics of the subjects are given in the table.

The faces of all subjects were covered with black mask made of an nontransparent cloth, covering the entire face, from forehead to lips. The subjects were asked to read a text from a book, brochure, and a text message.

To verify this phenomenon, S.V. Medvedev conducted an experiment with double blind control. Two identical blind masks were made of thermoplast for the subject K.Z., which covered part of the face, from the

[1] Medvedev performed the experimental verification of the existence of this effect.

0362-1197/02/2801-0016$27.00 © 2002 MAIK "Nauka / Interperiodica"

hairline to the upper lip and to ears laterally. One mask was given to K.Z for training, and another mask was kept in the laboratory. It was said that letters, numbers, and signs will appear on the PC screen, which must be identified. In fact, photographs of physiological experiments and devices, unknown to the subjects, were inserted into this sequence. Various stimuli were administered in a random order, unknown to subjects, observing the experiment. The picture was presented at a 15-inch LCD color monitor of a portable computer with the program Power Point. In total, 48 pictures were presented. The computer was located so that no one could see the pictures. There were no reflecting surfaces behind the computer. All observers were not closer than at 3 m from the tested subject. Two observers kept independent data records of the experiment. The mask, kept in the lab before, was taken by the tested subject. The tested subject and the observers had previously no access to this mask. The interstimulus interval ranged from 5 to 10 s (Fig. 1).

A Nihon Kohden electroencephalograph was used for EEG recording. EEG was recorded by means of 19 bridge electrodes in standard derivations of the system 10–20. Electrodes, located on the earlobes were used as reference electrodes. The tested subjects lied in a comfortable bed in a room with common natural illumination. Recording of biological potentials was conducted with the eyes closed, during the opening of eyes, at photostimulation, hyperventilation and mental recall of visual images, and actual viewing of the objects and the texts under the same conditions. The test subject was asked to activate alternative vision, which was controlled by possibility of reading and recognition of pictures with the mask on the face, hampering the common vision. EEG was compared between the alternative vision turned on and off.

During the recording of evoked potentials, the tested subject was sitting at the table on which a PC monitor was situated at a distance 120 cm from the subject's face. Twenty different black and white images were presented to the subject with equal probability. Ten objects included living objects (elephant, dragonfly, snail, etc.), and ten included inanimate objects (telephone, table, pen, etc.). The exposure was 100 ms. One second after the exposure, the question mark was presented to the subject, which allowed motor reaction of the tested subject. The subject must respond by pressing the button one time if a living object was presented, and two times, if it was an inanimate object. Between the exposures, a point was presented in the center of the screen, and the subject should visually fix on this point. The tests were administered consecutively with intervals, randomly varying within 5.5–6.5 s. In total, 240 or 480 tests were administered in one session.

The electric activity of the head surface was recorded as in EEG study. We also recorded the electrooculogram (EOG) from electrodes located in the preorbital position and temporal corner at the left (in the subject N.M., right) eye.

EEG and EOG amplification was conducted in the frequency band 1.5–100 Hz with the sampling rate of 250 Hz. Electric activity, EOG, and signals from the button were entered into the recording computer with visual control of signal quality and adequacy of the subject's response. After the termination of the recording session, we kept samples without pronounced EOG potentials or other clear artifacts.

Evoked potentials were analyzed using an apparatus and software complex developed at the Institute of Human Brain (programmers V.A. Ponomarev. P.A. Brazovskii, and V.A. Polyakov). In addition to

Subjects, trained to alternative vision using the method of V.M. Bronnikov

Subject	Age, years	Time after training*			Health condition
		I stage	II stage	III stage (alternative vision)	
V.V.	17	8 years	8 years	8 years	Healthy
L.A.	15	6.5 years	6.5 years	6.5 years	Congenital degeneration of optic nerves. Posttraumatic cataract of the right eye. Vision 0, Left eye, weak vision; Before training, 0.01 D, after training, 0.2 D
N.M.	13	2 years	1 year	6 months	Congenital glaucoma of the left eye. Neurodermitis
V.M.	16	2 years	1 year 3 months	6 months	Periodical disturbance of thermoregulation (during two or three days) with overexcitation
B.L.	13	2 years	1 year 3 months	6 months	Numerous expressions of the convulsion syndrome at 5 years of age
K.Z.	13	6 months	5 months	4 months	Practically healthy. January 2001, slight concussion of the brain
Zh.N.	10	6 months	5 months	4 months	Slight intracranial hypertension. February 2001, slight concussion of the brain, April 2001, fracture of the left elbow joint

* Training of alternative vision by the method of V.M. Bronnikov consists of three stages, each including 10 2-h lessons during one month.

Fig. 1. Conducting visual observation of the subject K.Z. using a thermoplastic mask.

synchronous logging of the evoked responses, the software allows the automatic assessment and presentation of statistical significance of the differences between the averaged EP from the average value of the process at the prestimulus interval, based on nonpaired Student's *t*-test, and differences between the compared EP obtained at various recording conditions based on paired Student's *t*-test. The computation of differential EP and the statistical assessment of the differences (comparison of EP) in this system is possible only for processes recorded during one session.

RESULTS

Visual observations. All seven subjects were able to easily read almost any text in the mask with their eyes closed. Only sometimes did short pauses occur at unknown words. The subjects also freely moved in the experimental room, avoiding any obstacles (e.g. chairs).

The subject K.Z. in a blind thermoplastic mask was able to call the signs and described pictures on the PC screen about which she was not aware. The results of the exposure was 100% recognition of all presented stimuli in the files and the coincidence of recordings across the two session records. The session records were signed by participants and are now archived in the Human Brain institute, Russian Academy of Sciences.

Electroencephalogram. *In the subject K.Z.* in the EEG recorded with eyes closed without mask practically normal bioelectric activity was recorded. The α-rhythm was well modulated and had a frequency of 10 oscillations/s. A small deviation from the norm was some sharpening of the α-waves and presence of sharp waves with the period of α-oscillations in the posterior areas of hemispheres, which could presumably be due to a head trauma that occurred a few months ago. Responses to standard functional tests was normal in this subject.

A black mask was applied to the subject's eye. The pattern of the EEG did not change. The task was to turn on alternative vision and imagine a screen with a black point in the middle. The EEG became 15–20% lower in amplitude, the spatial distribution of rhythms was again normal, and there was neither sharpening of the α-rhythm nor an increase of sharp waves. When the subject was asked to "view" the picture on the book cover and read the text under it; a high-amplitude β-activity with the frequency 28–30 oscillations/s appeared in the EEG from the medial areas of the brain. Gradually, during the task, the β-rhythm spread to all areas of temporal lobes of both hemispheres. More pronounced slow waves were observed in the left parietal–occipital area. After the successful completion of the task and the turning-off of alternative vision by request of the experimenter, the sharp β-rhythm in the EEG completely disappeared and the EEG returned to the original pattern (Fig. 2).

Subject V.B. At the beginning of the study, V.B. was watchful and carefully examined the equipment. Low-amplitude (12–20 μV) flat and disorganized bioelectric activity was recorded in the EEG. After a few minutes, the subject adapted to the experimental conditions, calmed down, and the amplitude of the bioelectric activity increased. The α-rhythm had correct spatial distribution, with a frequency of 10 oscillations/s. Single low-amplitude waves were observed in all derivations of the EEG, more frequently, in central frontal areas, on the right more than on the left.

After the mask was applied and the experimenter asked the subject to turn on alternative vision; a short (up to 4 s) desynchronization response; a small increase of the β-activity in the temporal areas; and then, short (1–2 s) burst of α-activity were observed in the EEG, after which the response was "yes." Presentation of a black point on a paper sheet did not cause any significant alterations of the EEG. Viewing a book cover with a picture and reading text was accompanied by the short-term reduction of the amplitude of bioelectric activity. No consistent alterations in the EEG were observed during the task.

EEG recording was conducted many times. Each time, alterations of the EEG were minimum and transitory.

One day, V.B. came to the EEG recording tired after a large work load (prolonged intense work and movement from another city). He completed all tests as usual, but low-amplitude β activity appeared in the EEG in the right temporal area with the frequency 20–28 oscillations/s. After an attempt to view the picture on the book cover, the amplitude of the β-rhythm in the right temporal area increased up to 50 μV. Then, a sharp β-rhythm with the frequency 28 oscillations/s in the central frontal areas of both hemispheres appeared. The picture appeared fuzzy to the subject, and he was unable to identify it. However, the pattern of the EEG changed: the frequency of the β-rhythm reduced to 20–22 oscillation/s, and its amplitude decreased almost by the factor of two. Amplitude of the α-rhythm increased in the occipital areas, and bursts of sharp α oscillations were found. V.B. Was nervous. He did not suppose that failure could occur. He took the book once again and tried to view the picture. A θ-activity appeared in the EEG with the frequency 4.5–5 oscillations/s, and then bursts of paroxysmal activity in the θ-rhythm appeared. Separate deformed complexes (sharp wave–slow wave) appeared in bursts in the temporal areas. Then, pulselike oscillations appeared in all EEG derivations, which indirectly pointed to strong emotional tension with vascular reaction.

After several days of rest, V.B. in a mask with his eyes closed was able to easily conduct all tests, and he easily recognized the picture on the book cover and fluently read aloud an unknown text. There was no alterations in the EEG as compared to the original.

Subject Zh.N. The α-rhythm unstable. Low-voltage slow waves are observed in all EEG derivations. However, a wave with a higher frequency and lower amplitude was imposed on this rhythm. Slow waves dominated in the parietal and temporal–occipital areas of both hemispheres, having 2–3 oscillations/s. On the left, they were slightly more pronounced than on the right. Deformed complexes (sharp wave–slow wave) were observed in the temporal–occipital areas, on the left more than on the right. Bursts of paroxysmal activity were recorded in medial and posterior derivations of the EEG in the baseline recordings. At standard functional loads, they spread to the frontal areas of the brain. The θ-activity with the frequency 5–6 oscillations/s dominated in the central frontal derivations. α- and Δ-oscillations with the sharp wave–slow wave complexes were observed in temporal–occipital areas. These alterations of the EEG were probably associated with the recent head trauma and intracranial hypertension.

After the mask was put on and the subject was requested to turn on alternative vision, a small reduction of the EEG amplitude was observed. During the viewing of picture on the book cover and reading a small text, sharp β-rhythm with the frequency 28–32 oscillation/s was found in temporal areas of both hemispheres. The local center of slow waves and the sharp wave–slow wave complexes in the parietal–temporal–occipital area became more clear. All tests were performed by subjects quickly and without errors. After alternative vision was requested to be turned off, the EEG returned to the original.

Subject N.M. Diffuse changes of the bioelectric activity was recorded at the EEG. The α-rhythm was deformed, sharpened, and had a frequency of nine oscillations/s. Slow waves dominated in the right temporal area. Sharp waves and separate sharp wave–slow wave deformed complexes were observed in parietal–occipital areas of both hemispheres, on the right more than on the left. Bursts of paroxysmal activity were recorded in frontal and posterior areas of the brain.

After putting on the mask and turning on alternative vision, the expression of slow waves reduced as compared with the original and the sharp wave–slow wave activity became less pronounced. All tests were passed quickly without consistent alterations of the EEG. During the viewing of a bright-colored picture on the book cover, temporal desynchronization of the bioelectric activity was observed in the EEG. A short-term (about 2 s) increase of low-amplitude β-activity with a frequency of 28 oscillations/s appeared at the moment of reading small-font text in the book.

Subject V.M. The subject was for the first time in the laboratory, afraid of the study.

Low-voltage slow θ- and Δ-waves predominated, which were imposed to a deformed unstable α-rhythm. Separate sharp wave–slow wave complexes were observed in the right parietal–occipital area. A sharp β-rhythm with a frequency of 22–28 oscillations/s was recorded in the temporal areas of both hemispheres ($S > D$).

After putting on the mask and turning on the alternative vision, the α-rhythm almost disappeared in the EEG, which was retained during completion of all tests.

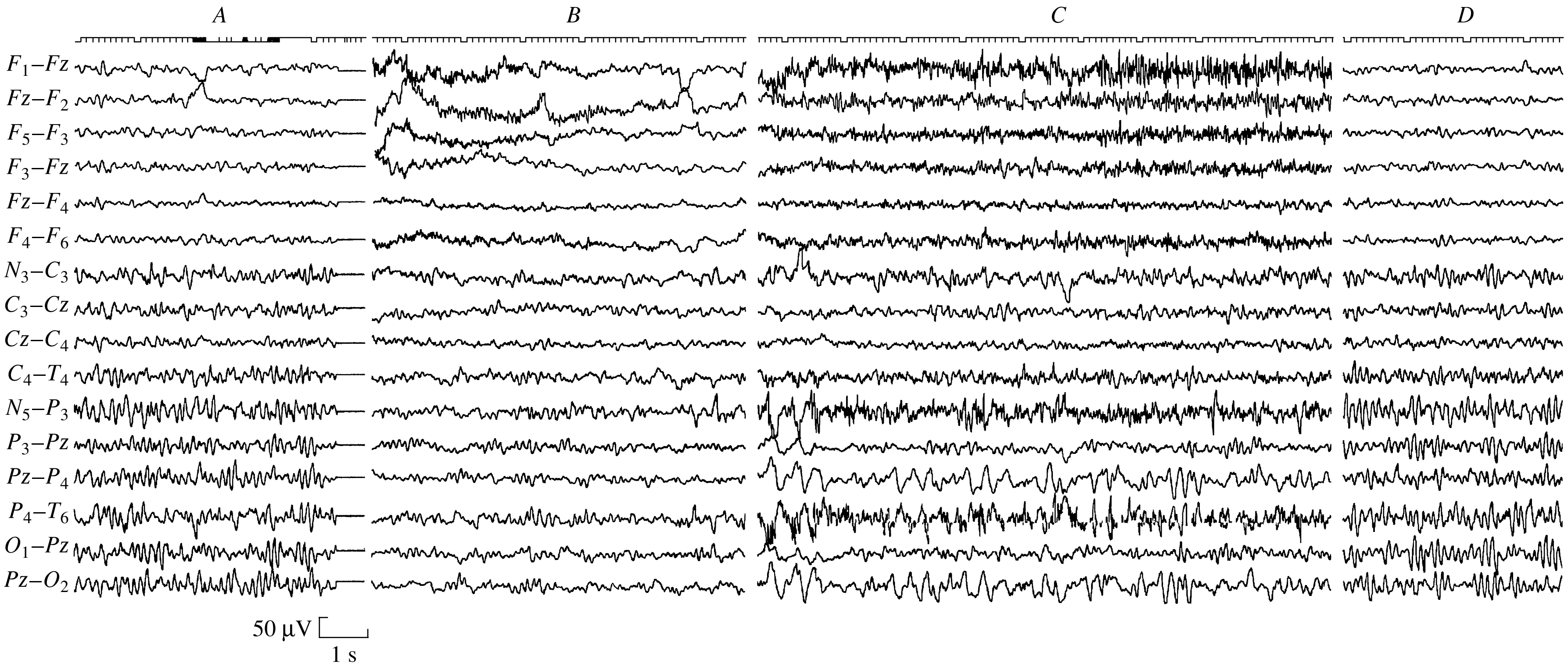

Fig. 2. Examples of EEG of the subject K.Z. during various tests. *A*, baseline; *B*, direct vision ON; *C*, viewing a picture; *D*, direct vision OFF.

Slow waves dominated in all derivations, in frontal central areas, in the form of bursts. During the work, the subject got involved into the study and his fear disappeared completely. The β-rhythm completely disappeared from the EEG and did not appear again during turning on of alternative vision, neither during the reading of unknown text behind the mask nor during the description of the presented picture.

Subject B.L. Distorted α-rhythm with right spatial distribution and a frequency of 10 oscillations/s was recorded. Separate complexes sharp wave–slow wave were observed in posterior temporal areas of both hemispheres, on right more than on left. There were no pathological alterations of the EEG.

Viewing the picture and reading in mask with eyes closed was quick, without errors, and routine. There were no visible alterations of the EEG.

Subject A.L. Low-amplitude disorganized bioelectric activity with a amplitude of 20–25 μV was recorded in the EEG. The α-rhythm was deformed, unstable, and alternated with sharp and slow oscillations. Slow waves were recorded in all EEG derivations, dominating in the right temporal-parietal area. Separate sharp wave–slow wave complexes appeared in the right temporal area at standard functional loads.

A short burst of sharp β-rhythm with a frequency of 28 oscillations/s appeared 3 s after putting on the mask and turning on alternative vision, and the report was finished. The amplitude of the β-rhythm reduced. A specially prepared book laid on the bed near the subject. The subject took it and at once begun reading without command. The sharp β-rhythm became more pronounced in the EEG. The subject was asked to read the same text without the mask. He was reading slowly and often interrupted and confused words, which he explained by the small illegible typeface. During such reading, the β-rhythm completely disappeared in the EEG.

The study of bioelectric activity during different tests was conducted four times. The patient with a clear degradation of the optic nerve rapidly adapted to the work. He was coming for the study and went back, freely orienting in the room. The expression and frequency of the β-rhythm continuously reduced (from 28 to 20 oscillations/s) during the administration of the same tests.

At all heterogeneity of the EEG in the studied subjects, a clear reduction of the α-rhythm and the appearance of the β-rhythm with the frequency 20 oscillations/s, mainly in frontal areas of the brain, was found in alternative visual tests, especially during reading. In the subject V.B., who was trained in alternative vision eight years ago, the β-rhythm appeared only in suboptimal physical conditions.

Evoked potentials. *Subject V.B.* The study was first conducted with the eyes of the subject open. In the first sessions, we encountered an unusually large number of erroneous classifications (up to 40%), increasing towards the end of the session. However, the subject thought the task easy, and in short preliminary runs, worked without errors. Most probably, this was caused by insufficient attention to the task, appearing easy, and loss of concentration on the images. Upon request, in the following runs, the subject worked practically without errors (1–2 errors per 240 tests). For averaging in this and other cases after visual control, approximately 55–65% of tests were retained; the others were rejected because of the absence of clear EOG potentials, motor or muscular artifacts.

Evoked potentials (EP) with significantly different readouts from the prestimulus interval were found in most derivations (the only exceptions were frontal- and medial-temporal derivations), but their pattern was different in different zones. For example, in the frontal areas, median latency (latency 200–300 ms) components of the EP were expressed, and the EP to presentation of the allowing sign were almost absent. In the central and parietal zones, this difference was less pronounced, and it was even less pronounced in occipital zones. However, in occipital zones, significant readouts had even more short-latency (latency less than 100 ms) EPs (Fig. 3), which usually reflect processes in the visual cortex. These components could be noted in the left and central parietal cortex, but they were masked by the residual noise of the α-activity, well expressed in the subject even with eyes open, and did not reach a significant level.

At the beginning of the work using the mask, the subject had difficulties, which were expressed in the high percentage of classification errors and an unacceptably high level of eye movement artifacts (many tests with well expressed EOG potentials). Therefore, we made a break in the study, which was used for additional training for putting gauze pads under the mask to reduce the number of eye movements. Furthermore, we also placed the right finger to the outer corners of the eyes of the subject above the mask. The exposure of the pictures was increased by 200 ms.

Comparison of the results of EP accumulation under conditions I (eyes open) and II (work with the mask) revealed the following. The pattern of mean-latency components of the EP on the presentation of the classified pictures in the frontal, central, and parietal areas did not change. The most significant alteration was observed in occipital zones (Fig. 3). Here, under condition II, relatively short-latency components of the EP, which were significantly pronounced under condition I, were not observed. Unfortunately, we did not have the technical possibility to compare the EP obtained in various studies statistically.

To assess the repeatability of the results, and for the statistical analysis of the differences, we decided to conduct the following analyses in such a way that the same subject could work both in mask (condition I) and without the mask (condition II) during one session. Two such sessions were conducted with the subject V.B. In the first session, he conducted 120 tests without

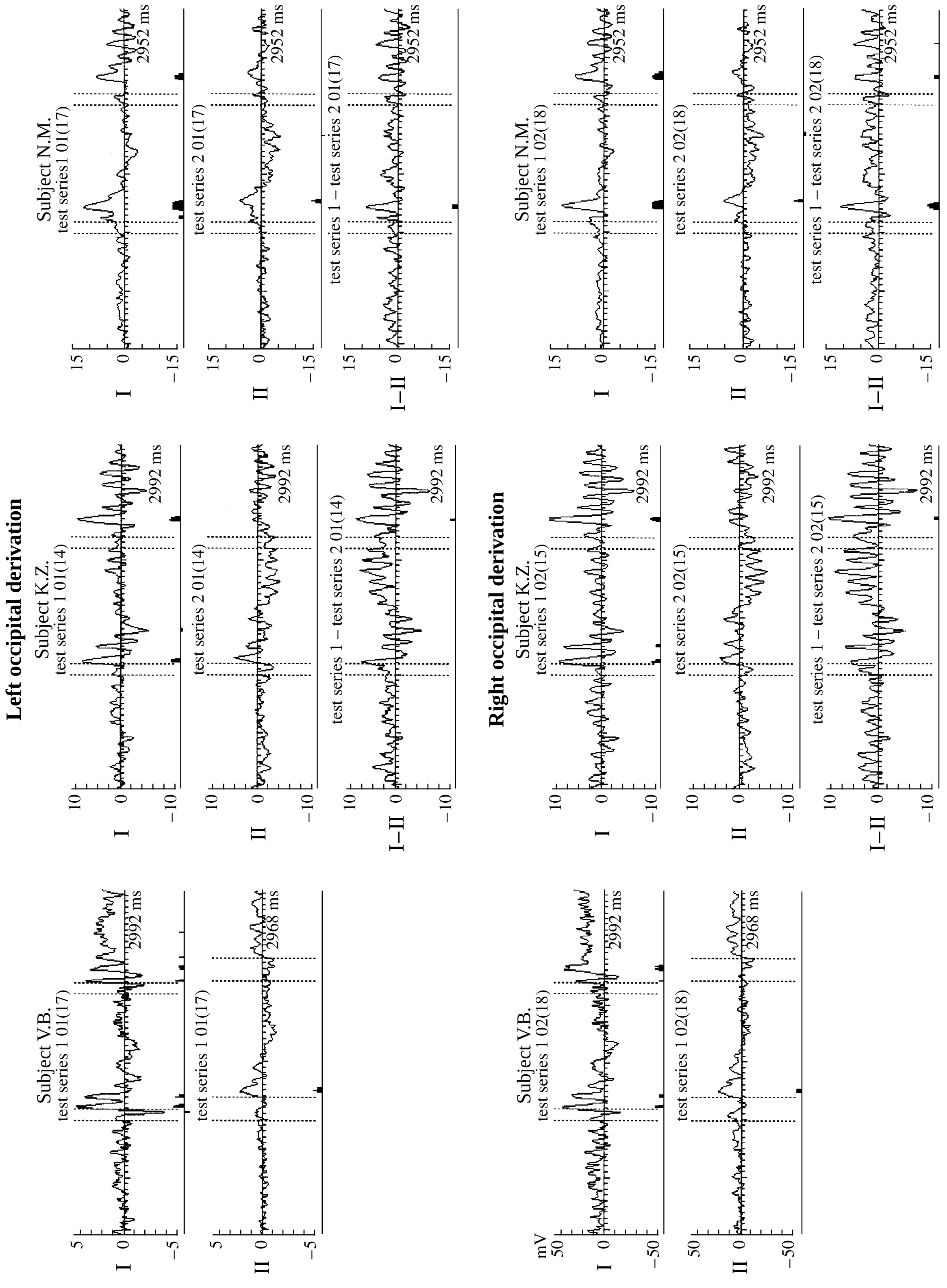

Fig. 3. Examples of EP in occipital derivations (visual area) in subjects during different visual classification tasks. I, without mask, II, in mask, I–II, differential EP in conditions I and II. Ordinate is the amplitude, μV, abscissa, time in ms (scaling factor, 50 ms). Vertical dotted lines depict the moments of the beginning and end of the exposure of the basic visual stimulus (classified picture) and allowance to answer (question mark). Marks of statistically significant differences of readouts of averaged EP from prestimulus areas (for the conditions I and II) and statistically significant differences of EP readouts in conditions I and II (for the differential EP in conditions I and II). The minimum height of the mark depicts $0.05 < p < 0.01$, maximum, $p < 0.001$.

the mask, 240 tests with the mask, and then another 120 tests without the mask. In the second session, the consequences of presentation of the tests with and without the mask was reversed. The original viewing exposure, 100 ms, was retained. A smoothing of the obvious differences in the EP with and without mask was clearly seen. First, we note the absence of obvious short-latency components of the EP in occipital areas and more pronounced medium-latency components of the EP to the allowing the signal, as compared with the data, obtained earlier. With an overall qualitative similarity of the EP in conditions I and II, one could see mean-latency components of response differences to the presentation of classified pictures in the frontal, central, and parietal zones, which reached statistical significance in the derivations Cz, C_4, Pz, and P_4. The biphasic pattern of the differential components indicates that the response was more rapid under conditions I in this session, and under conditions II, it developed later but is stronger (the EP amplitude was higher).

During the consideration of the results of the second session, it became clear that the further reduction of responses under conditions I and II took place. The differential components of the EP disappeared in the background noise, even in a visually detectable way.

Subject K.Z. During the recording with the eyes open, the EP at the background noise were weak in most derivations. The exception was occipital areas O_1 and O_2, where significant EP with high-amplitude waves and the latency about 100 ms were observed to both stimuli.

The subject worked with the mask in the following session without any difficulties. The number of classification errors did not change significantly. The pattern of the EP was generally retained even though the amplitude was reduced by 20% in occipital derivations.

During the following session with the alteration of conditions (without the mask and with the mask) within the session, the subject noted to the end of the session that the pictures started to alternate “too quickly.” Posthoc analysis showed that she begun to press the button in arbitrary time moments. Thus, we did not obtain any useful material for analysis in this session.

The next two sessions were successful with respect to the execution and classification correctness.

In the first session (120 tests without the mask, then 240 tests with the mask, and another 120 tests without the mask), the general pattern of the EP on the head surface changed as compared to that characteristic of the subject in previous sessions. The EP in the frontal, central, and parietal zones exceeded in their peaks the significance threshold from the background; the significance of the differences of the basic EP peaks in occipital zone was retained (Fig. 3).

The comparison of the EP under conditions I and II in this session indicated that in the presence of the mask, the EP are similar to those without mask but their amplitude is usually smaller. The EP to the allowing stimulus was not pronounced at all. Therefore, the differential EP (the group of tests without the mask minus the group of tests with mask) were visually clear and reached a significant level in certain readouts, and to the first approximation, were similar to the EP under condition I.

In the next session (120 tests with the mask, 240 without the mask, and 120 with the mask), significant EP were retained only without the mask. There were no significant peaks in the tests with masks, which was probably because of the increased level of background noise and the increased amplitude of the background EEG. Therefore, the differential EP were almost indistinguishable from noise in this session.

Subject N.M. This subject, as K.Z, did not require any special adaptation to the study conditions. The level of overall classification errors did not exceed 5% in the first session, both without the mask (the first 240 tests) and with the mask (following 240 tests). The EP pattern in the tests without the mask (condition I) in this subject was characterized by the presence of relatively high-amplitude monophasic EP with the latency 250 ms in the parietal and occipital zones. In the occipital zone, collateral to the injured eye, the EP to the test stimulus had approximately the same amplitude and latency, but they were significantly shorter in duration (narrower). The EP in tests with the mask retained the general pattern but had a slightly higher latency (20 ms in the parietal areas and 50 ms in the central area). Respectively, the differential EP were well discernible and reached the level of statistical significance both in occipital and several frontal, central, and parietal derivations (Fig. 4).

In the second session (with alteration following the scheme: 120 tests without the mask, 240 tests with the mask, and 120 tests without mask), the EP were reduced in parietal and occipital zones, as compared with the previous session, and in the occipital zones, lost their multiphasic character. The EP in the central and frontal areas did not change. The pattern of the EP in tests with the mask was retained with the reduction of the EP amplitude in parietal and occipital areas. The differential EP became even more symmetrical in occipital areas (Fig. 3) and less symmetrical in the parietal. The differential EP practically did not change in the frontal and central areas.

In the second half of the third session (with alteration according to the scheme: 120 tests with the mask, 240 tests without the mask, and 120 tests with the mask), general health conditions worsened in the subject, and a headache appeared. This was accompanied by more errors (40 errors in the last session of the 120 tests) and untimely presses to the response button. Therefore, the number of tests usable for accumulation with the mask was insufficient for adequate comparison of the EP. As for the EP in tests without mask, there were no significant changes as compared to the previous session, excluding further deviation of the EP shape from monophasic in parietal areas.

DISCUSSION

It should be noted, that further studies are necessary for revealing the brain mechanisms of the alternative (direct) vision phenomenon. This paper describes only a pilot study. We think that this paper is the first attempt at a scientific answer to a whole array of publications in the popular press.

Visual observation of the subjects suggests that they are really capable to see with closed eyes.

Studies of the subject K.Z. in the laboratory of S.V. Medvedev indicated that humans can see pictures on the screen with their eyes completely closed by a mask. The use of a mask and double blind control significantly reduces the possibility of the teachers or the subjects to falsify the results. Cheating is also unlikely, because most of the subjects were adolescents and some had serious vision defects. Thus, we conclude that the alternative vision phenomenon does really exist.

Learning the ability of this vision means that it is possible to speak about the method and not only about the phenomenon.

Thus, our study confirmed the alternative vision phenomenon in trained subjects. We speak about alternative vision as an alternative to common vision and use the term "direct" vision to emphasize the ability to see in absence of the visual modality (without projection of the image to the retina).

Discussing the results of instrumental methods of the study, it should be noted that the subjects were willing to be contacted and carefully completed the tasks. Nonetheless, there were many artifacts significantly reducing the power of statistical assessment.

EEG data support brain reorganization to a different action mode during the experiments with the functional "viewing" of objects with closed eyes. The β-activity has the most important role in this mode. The appearance of the β-activity in experiments in the subject V.B. only in suboptimal conditions (fatigue) suggests that β-rhythm characterizes a certain, even though prolonged, phase in the development of the phenomenon. All other subjects had a much shorter duration of training and development of the phenomenon. We cannot exclude that conditionally pathological waves (the sharp wave–slow wave complexes) can be used for these aims in some subjects. These reorganizations of the EEG may reflect the mode of brain activity when its supercapacity can be realized [3]. Similar changes of the EEG in different subjects (with baseline differences between their EEGs) indirectly suggests that it is not an unique phenomenon but rather a reproducible process, which can be taught. The phenomenon does exist, is reproducible, and can be studied physiologically.

Testing the evoked potential method for the study of this phenomenon is another important result of this study. The results are contradictory and far from trivial. In particular, they suggest that analysis of the phenomenon is complicated by nonstationary response patterns in the subjects, individual differences in the patterns of the EP, and possible effects of adaptation processes to the study conditions. At this stage, the most likely hypothesis is that with adaptation to the study conditions, the use of alternative vision by the subjects may even prevail in situations requiring the use of common vision. A more clear differentiation of common and alternative direct vision was observed in the subject V.B. at the beginning of the experiment. Short-latency EP in occipital areas during the work without mask appeared, which disappeared during the test with mask. In the subjects K.Z. and N.M., less trained in the method, alterations of EP after change of the conditions without and with mask were rather quantitative (even though significant). The same was observed in V.B. at the subsequent stages of the study, up to the complete disappearance of any differences in EP under the with mask–without mask conditions.

We assess the seriousness of these data. If the dynamics of the EP in the occipital area, reflecting the presence or absence of information input to this area along the traditional pathway is supported by further studies, it will be necessary to study methods of alternative information transmission. Is it possible in principle? The brain is separated from the environment by several capsules and is protected from mechanical impacts. However, we can record what is occurring within the brain through all these capsules. Moreover, the loss of the signal amplitude is quite small. As compared to direct recording, the signal is attenuated twofold or threefold [4].

The possibility of direct activation of brain cells by external factors, in particular, by electromagnetic waves, conducted during electromagnetic treatment stimulation is easily proven by the stable clinical effect. As a possible variant, it is possible to presume that during the development of direct alternative vision, the result is achieved by direct vision, i.e., direct activation of brain cells by external environmental factors. We cannot exclude the location mechanism of this phenomenon. However, this requires several major discoveries of new brain mechanisms.

Not insisting on the reality of the working hypotheses with minimum transition out of the reality, it can be suggested preliminarily that alternative vision is realized with the help of the skin. There is no direct evidence for this, but there are several indirect ones.

These hypotheses are based on the following.

(1) Skin is formed in the ontogeny from the same anlage with the nervous system.

(2) During the training of alternative vision, an important stage is the comparison of skin sensations with the color and other properties of the object.

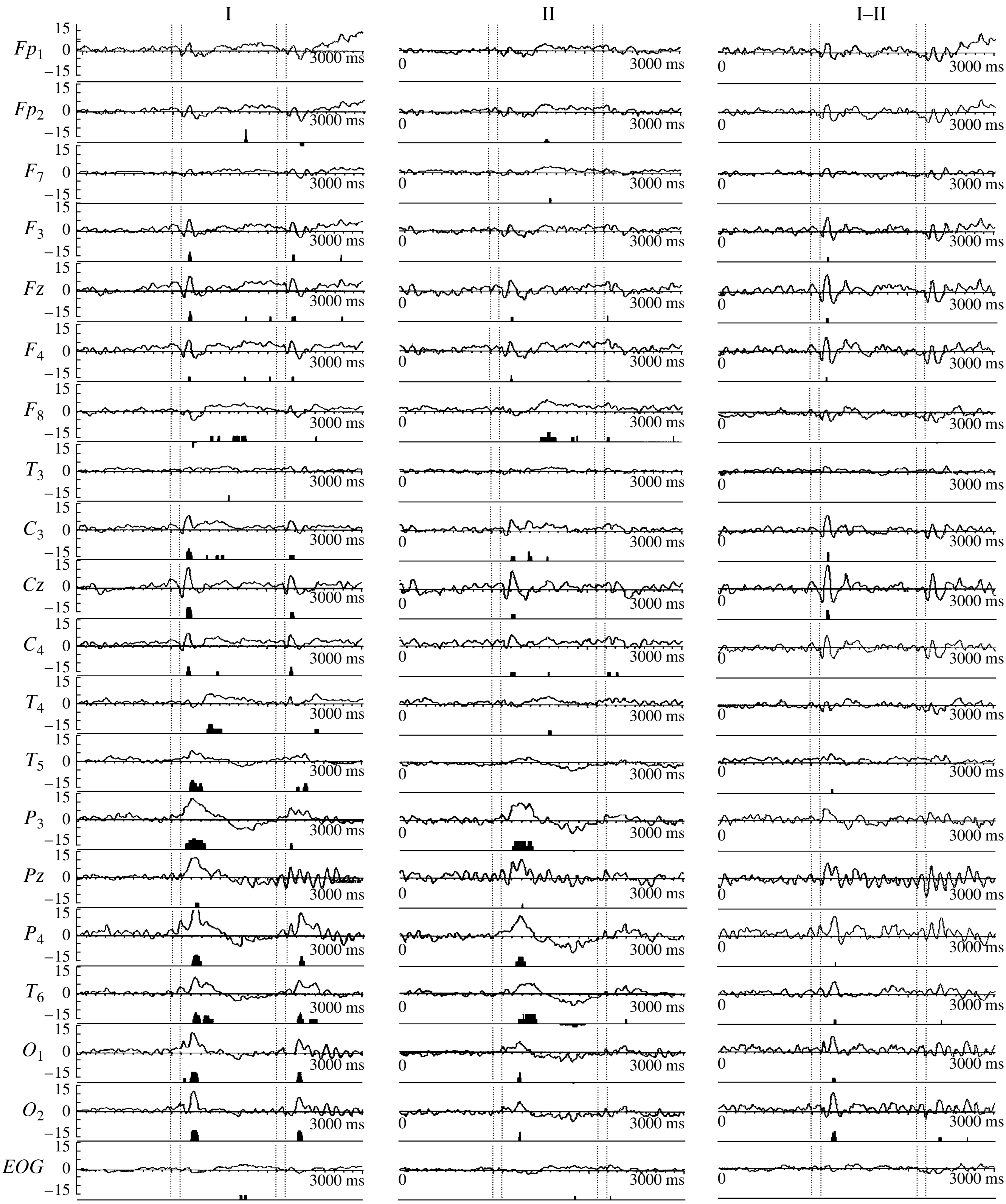

Fig. 4. EP of the subject N.M. in all set of derivations during the visual classification test. I, without mask; II, in mask; I–II, differential EP in conditions I and II. See Fig. 3 for other details. The scaling factor of the vertical scale is 50 μV.

(3) Reduction of the primary EP in the occipital area can be accompanied by an increase of the EP in the somatosensory area.

(4) There exists the phenomenon of vision by the body surface (skin) in some marine invertebrates and in butterflies [5].

(5) Finally, the phenomenon of the reading and recognition of contactly presented words, numbers, and pictures by the skin is well known and reproducible in almost everyone and is enhanced at repetition. Furthermore, the phenomenon of color recognition by hand skin by Roza Kuleshova (1950s) was not rejected even though it was not accepted.

Most probably, the learning of alternative vision involves not only the expression of potential properties of the skin but also relearning of the brain. This may be an expression of one of its supercapacity.

However, we include these hypotheses as possible material mechanisms of the phenomenon and as an antithesis to the possible non-materialistic view on alternative vision. It should be noted that based on the results of our pilot study, *it is impossible to put forward a good hypothesis on possible physiological mechanisms of alternative vision*. Nonetheless, these results suggest that further studies may be advisable.

CONCLUSIONS

(1) The phenomenon of alternative vision was experimentally supported.

(2) Turning on the alternative vision mechanism alters the pattern of EEG.

(3) Statistically significant differences in differential EP components recorded during the classification of pictures during normal and alternative vision were observed.

REFERENCES

1. Bronnikov, V.M., *Poznai sebya* (Know Yourself), Kultura, 1998.
2. Bronnikov, V.M., *Sistemniye technologii razvitiya cheloveka, I stupen' obucheniya* (System Technologies of Human Development, Stage I of Learning), Kultura, 1998.
3. Bekhtereva, N.P., The Human Brain—Supercapacities and Prohibitions, *Nauka i Zhizn'*, 2001, no. 7, pp. 12–21.
4. Bekhtereva, N.P., *Biopotentsialy bolshikh polusharii golovnogo mozga pri supratentorial'nykh opukholyakh* (Biopotentials of Brain Hemispheres at Supratentorial Trumors), Medgiz, 1960.
5. Aizenberg, I., Tkachenko, A., Weiner, S., *et al.*, Calcific Microlenses as Part of the Photoreceptor System in Brittlestars, *Nature*, 2001, vol. 412, p. 819.