

Typological Features of Fields of Peripheral Vision of Human

The research started with variable time darkening and lighting up of different parts of the far and middle peripheral vision of humans. Different forms and sizes of blinders of light-tight and semi-transparent materials were tried, different sources of light as well. Time of exposition differed from seconds to hours. Caused changes were registered on both physiological (blood pressure, pulse, muscle tension) and psychological (self-reports of tested and visible changes in their mood) levels. The individual reactions on light-dark stimuli were mostly feeble and indefinite. But those of them, that were definite, were stable during several months at least. They formed individual maps, consisting of some spots in the fields of peripheral vision, every one of them giving certain psychological or physiological reactions on exactly darkening or on lighting up. With time it became obvious, that any of a great variety of registered reactions was related to one of two groups: rejection and acceptance (negative and positive reactions). The most common negative reactions were increasing of muscle tension, oppression of breathing, growing irritation, and anxiety. The most common positive reactions were growing muscle relaxation, the liberation of breathing, growing calmness, and joy. I found that increasing of exposition time multiplied and intensified displayed reactions, thus increasing the definite outcome of tests to its maximum within the time of exposition up to 30 minutes. Increasing of darkened areas increased the definite outcome of tests too, reaching its maximum at the darkening of half of the total field of vision for each eye. The burst of the number of definite reactions was a result of the use of strictly vertical or horizontal borders of blinders, covering half of a field of vision for each eye. That was the point in my empirical research when the types of darkening with typological features were found (Figure 1, Figure 2, Figure 3, Figure 4). They caused the most of individual

reactions and the most obvious contradiction in the positive-negative implication of them in the most of individual tests. These four types of darkening turned out combined in pairs: the positive-negative value of individual reactions on the darkening of outer fields almost always was opposite to the one of inner fields; upper-lower fields of peripheral vision formed another pair of opposition. Further, it became clear, that despite the great variety of individual patterns of preferences, every one of them still might be reduced to the scheme of two independent positive-negative choices, formed with upper-lower and outer-inner preferences, in other words, those individual fractional patterns were included in the pattern of a certain group. As long as this research needs massive statistics to be verified, the most simple procedure of testing will be introduced here. It is simple enough to be provided without a special supplement and precise enough to be the most efficient in stating the described preferences.

Background

There exists the Divided Visual Field Paradigm (DVFP) that is an experimental technique based on separated stimulating of left and right visual fields (Banich, 2003). This technique is the only one approaching presented here the method of Partial Darkening of Visual Fields (PDVF). But still, they differ considerably. The first difference is in PDVF eyes are not immobilized. The second difference is that DVFP has very strict time limitations, because of the speed of transference of a signal between two hemispheres; on the other hand in PDVF the longer time of exposition, the more manifested reactions are displayed. The third difference is that DVFP deals with cerebral hemispheres and left-right visual fields. At the preliminary stage of the research, I tried different ways to stimulate those visual fields with dark and light, but reactions were always indefinite. That is quite explainable - cerebral hemispheres just exchanged information and thus any outcome of the stimulating was indistinct. I refused using those types of darkening in the present version of PDVF. And

more, this means, that in PDVF we are dealing not with differences between cerebral hemispheres, that means not with left-right distinctions, but with differences inside some other parts of the human brain, having left-right functional symmetry; and defining of which is the matter of following researches. It may be, for example, the lateral geniculate nucleus, that is known to proceed visual information from inner and outer visual fields separately (Nicholls, Martin, Wallace & Fuchs, 2001); and it may be the primary visual cortex, having separated fields of neurons to proceed information from upper and lower visual fields.

In the visual system of humans every part of the retina has its exact representation in the primary visual cortex (Holmes, 1918). The darkening I use causes “switching off” of certain portions of retina and exactly connected to it parts of the brain as well. At this point, there may be an objection, that only rods cease their activity in darkness, while cones go on firing. (Hecht, 1937). That is why I do not darken central areas of the retina, freaked with cones. The darkening I use covers peripheral areas of the retina, that include rods mostly. In this context, a human doesn't see darkened areas, instead of this you may say, that one just feels a lack of stimuli coming to one`s certain parts of the brain. It is very important to understand, that in this research I am dealing not with visual stimuli, but with partial lack of habitual stimuli as a matter of "switching off" of parts of the brain. The visual system goes on working as always except one part. Retina produces both visual information and proper level of electrical activity, sourcing visual system and all parts of the brain, which activity depends on the level of illumination (Zaidi et al., 2007). Thus doing with aimed darkening and lighting up of retina, I am doing with electrical sourcing of exact parts of the brain.

The next question is eye movements. It is obvious, that all previous considerations are worthwhile on condition that eyes are immobilized. I refused to cease eye movements to provide technical simplicity of procedure and its being the most plain to the tested. That is why increasing of exposition time was so useful. The averaged eye movements are the central

position of each eye. The more movements – the more precisely. And if there is a partial blinder attached still in the field of peripheral vision, its shade moves on the retina following the eye movements. If there are hundreds of such movements, they tend to average and the shadow becomes more and more evident at the exact spot on the retina, where it should be. And this is the reason for the experimenter to take into account the activity of eyes during tests.

Method

Participants

For this research 30 participants were recruited. Their age was from 7 to 65 years. Both male and female, with normal vision and intact visual system. Their condition before each test should be self-reported as “normal”, “usual”, “good” or “nice”. I avoided involving in tests persons with abnormal conditions (nervous, depressed, alcohol intoxicated, angry, hysterical, ecstatic, happy, in love, etc.).

Materials

Light-tight black tissue or mat black carton, patch.

Stimuli. Partial blocking of visual perception with darkening of parts of peripheral vision during the time up to 30 minutes, symmetrical and simultaneous for both eyes. Rectangular light-tight blinders with mat black surface faced to eyes were used. It is important to leave visual perception at not darkened fields of vision as usual, with the habitual level of illumination, the eyes opened and eyes movements not ceased. To be precise, the main stimulus is the contradiction between habitual visual perception and manifested lack of visual stimuli from certain parts of fields of vision.

Procedure

The ambiance should be quiet and calm, familiar to the tested, predisposing to relax. The illumination was comfortable, either artificial or natural. The tested were asked about

their condition. It had to be indicated as “normal” or ‘usual” or anything likewise without extreme manifestations. For all that, if the tested was gloomy or nervous, feeling pain or sickness, the test was delayed. The given instructions might vary, but the main point was to indicate for the tested possibility of the absence of any reactions at all and equal possibility of positive and negative reactions, once they were mentioned. For example: “Now I am going to darken some parts of your vision to find out whether this causes any changes in your state and mood or not. We will try four different types of darkening with short breaks between them and you will have to do nothing special during that time”. After this, I attached the blinders. The tested was asked to look straight ahead at an object 1x1 meters approximately in size, replaced at the level of eyes at a distance of about three meters. Without head moving one eye was closed, the other was covered with the blinder so that it abutted the image of the object, the border of the blinder should be vertical or horizontal without inclinations. Then the eye was closed, another one was opened and supplied with the blinder the same way. Thus I left the central spot of pure vision free. The blinder should be its black mat side to the eye, affixed to the skin with a patch, no rifts or gaps allowed. It was important to check not to touch eyelashes with the blinder. Then time started. The tested might sit, stand or walk, do simple housework or look out of a window, might chat with the experimenter or just sit still and calmly. The main rule was to prevent the tested from deepening in any kind of activity, which might withdraw one`s attention. Time to time I asked the tested about one`s mood and state. A definite reaction might appear at first seconds, but usually, it took 10-15 minutes to clearly define acceptance or rejection. The reactions were registered with self-reports of tested and observation of the experimenter. Negative reactions were: increasing irritation or oppression, increasing muscle tension or embarrassment of breathing, sick weakness, statements "I don`t like it", "Something is wrong", wish to remove the blinder, motional anxiety, panic attacks, and aggression. The total negative reaction on the physiological level

might be indicated as stress. The one on the psychological level was uncomfortable lack of something important or boring presence of something irritated. The least negative reaction was no changes except hindrance to vision. Positive reactions were: increasing calmness or joy, muscle relaxing, slowing down and deepening of breathing, sudden laugh, statements “I like it”, “This is good”, glad sleepiness, sudden jumping or singing or dancing, joyful activity, euphoria. Total physiological and psychological positive reactions might be indicated as relaxation and joy. The least positive reaction was no changes including no hindrance to vision. In the first trial, some tested displayed mixed forms of reactions during the first one-three minutes, as if they were checking their preferences. For example, sudden laughing might be nervous, sleepiness might be accompanied by tensioned pose. But all they were unstable and passing. The main features of a definite reaction were its stability and force. Displaying of just one such reaction was enough to state the kind of it and to stop the test. Except for the least ones. They might be taken into account just if there were no other reactions for 30 minutes. After 30 minutes I stopped the darkening no matter what.

Sometimes the tested asked to prolong the time in blinders after a positive reaction was definite. I think it is up to the experimenter to decide whether to prolong it to 30 minutes or not. The main rules were: do not continue the test after a doubtless negative reaction was displayed, and after the blinders were off the tested should have a rest for 5 minutes at least.

The order of types of darkening didn't matter. I applied them in voluntary order, but mostly in the order of the pictures (Figure 1, Figure 2, Figure 3, Figure 4). Most of the tested passed all four tests at once. Those four tests were one trial. The first trial gave me the initial results, that showed an individual pattern of reactions for each tested and groups with the same patterns for all the tested. The next some trials had to check the level of stability of initial results and were taken in two to 12 days the second trial and in two to seven months the third trial. If there was no contradiction in the results of trials, three of them considered to be

enough to state the individual pattern of preferences. A contradiction in the results of at least one test demanded the fourth trial, which was usually taken in two to 12 days since the third one. If it confirmed the majority of the contradicting results, then the individual pattern of preferences was stated, if not – the whole series of trials failed.

Results

There was just one fail among 30 tested: a man 45 years old showed contradicting preferences in four trials. His reactions to the darkening of the upper fields of vision were contradictory in three trials, and the fourth one increased the contradiction. He showed contradictory results on the darkening of the lower fields too, but the fourth trial did not increase the contradiction. His results on the darkening of outer-inner fields of vision were consistent. Among the other 29 tested two more (a woman 37 years old and a boy 13 years old) needed the fourth trial, but it confirmed the majority of their preferences. Thus 29 tested showed stability of their preferences, and 27 were without contradictions at all. Among 29 tested 17 showed positive reactions on outer darkening and negative ones on inner darkening. The other 12 reacted positively to inner darkening and negatively to the outer one. Upper-lower preferences divided the tested into almost equal groups: 14 showed positive to upper darkening and negative to lower one, the other 15 displayed the opposite results. Intersection of vertical and horizontal preferences showed their independence: nine acceptances of upper inner quadrants (total rejection of lower outer quadrants), eight acceptances of lower inner quadrants (total rejection of upper outer ones), six acceptances of upper outer quadrants (total rejection of lower inner ones), six acceptances of lower outer ones (total rejection of upper inner quadrants). I should note, that the darkening of quadrants was tried as the method at the preliminary stage of the research, but it caused an increase in the number of indefinite reactions. This may mean, that the research deals with not one, but more likely with two independent brain structures.

Some notes more. The majority of the tested tended to quicker and more intensive reactions with every trial as if they were recognizing once displayed responses of their brains. Most of the once displayed reactions tended to generalization in following trials; and the range of displayed reactions tended to increase, remaining within one certain positive-negative group. The total number of the tests in this research was 372, and just in 14 of them the tested reached the limit of 30 minutes without definite reactions, except the least ones. Approximately 50% of all tests were stopped with definite reactions within 10-15 minutes. And the last note, that probably underlines our dealing with deeply unconscious processes. The tested often didn't connect their displayed reactions with the darkening, tending to explain them with some other reasons. For example, one tested gave a burst of irritation, explaining it with obvious stupidity of the situation. But in the next test he became sleepy, this time explaining own reaction with the tiredness of all that. Another tested started to laugh, explaining it with the stupidity of the situation. And in the next test he became tensioned and nervous without any clear to him reason, still not connecting his reactions with the darkening.

Discussion

Of course, the number of the tested is too modest and there remains a considerable possibility of coincidence. But the real number of the tested at preliminary stages of the research was three times bigger, and the fact excuses me for somewhat self-confidence. The results of 30 tested, described in this publication, may be considered as a vivid demonstration of found amazing effects. The research needs massive statistics and this is the main reason for the publication. And as far as the main aim of the publication was to attract attention to the found regularities, the indicated results may be considered as sufficient. They demonstrate the very high typological potential of the outer-inner and upper-lower parts of fields of peripheral vision of humans.

There is another problem, connected with the procedure. All the tests were provided by the author of the publication, who was undoubtedly interested in a certain outcome. Omitting the variant of conscious shuffling, there existed the possibility of unconscious influence of the experimenter on a tested person. The problem was so serious, that I thought about a certain amount of “blind” tests, provided by someone not aware of the expected results. And the following considerations made me refuse this. First, the preliminary research included some dozens of tests, that gave the same outcome. At that stage of the research, I knew nothing about the described here regularities. And secondly, how powerful might be the influence of an experimenter and how sensible might be the tested to cause the expected reactions on a physiological level? I considered the possibility of this as insignificant and neglected it.

Next is the question of typologies. The research may be not confirmed by a greater number of tests. But if it is, the question of psychological and physiological content of the displayed reactions will appear. Now I can only suggest, that different parts of peripheral vision may have a different meaning for humans. Further, I suggest, that those different meanings were related to the ones of visual information, coming from certain directions into fields of peripheral vision during thousands of years of evolution. For example, visual information coming from the upper fields of vision was related to more distant and less detailed objects, and more illumination too. The opposite lower fields were related to closer and more detailed objects with less illumination. Visual information from the inner fields was related to objects by the aim and intention of humans. And the outer fields were related to accidental objects, that possibly might become important.

Another question of typology is preferences. Even if there is a difference in the content of visual information coming from different parts of fields of peripheral vision, why people give so opposite reactions on partial lack of stimuli from a certain part? It is obvious,

that in such conditions there must be a very manifested predisposition of visual perception acting on both psychological and physiological levels. A predisposition of very simple structure, having just two modes: acceptance and rejection. A system of just two independent switches, with just two positions each seems to me to be correct.

What is the purpose of the research? If it turns to be true, the most simple use of it is psychological and physiological recreation. Many of the people who passed the tests, now go on with regular darkening of their rejected fields of vision to relax or to positively tune their mood. Another vast area of possible usage is the compatibility of people with the same and different types. And it is possible to suggest, that some already existing typology may suddenly find its substantiation in the results of this research. For example, outer-inner preferences may correspond to irrational-rational types, and upper-lower ones may correspond to extraverted-introverted predispositions, described by K. G. Jung (Jung, 1971). And the last and the most important domain for the research is engineering psychology. This research may help improve relationships between people and machines by redesigning equipment, interactions, or the environment in which they take place.

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Figure 1. The darkening of outer parts of fields of peripheral vision of human.



Figure 2. The darkening of inner parts of fields of peripheral vision of human.



Figure 3. The darkening of upper parts of peripheral fields of vision of human.



Figure 4. The darkening of lower parts of fields of peripheral vision of human.