

## SOME EXPERIMENTAL OBSERVATIONS CONCERNING THE INFLUENCE OF COLORS ON THE FUNCTION OF THE ORGANISM<sup>1</sup>

KURT GOLDSTEIN, M.D.

*Clinical Professor of Neurology, Tufts College Medical School*

In the past research about the relation between color and effect on neurological and psychiatric conditions has been restricted for the most part to observations in hospitals where the rooms were painted in various ways. The patients were put in blue, green, and black rooms. Some effects were reported but the results were very ambiguous. The main reason for this is that the studies were not performed from a biological point of view. The patient is an organism and his abnormal physical or mental condition is a modification of organismic life. Therefore, if we do not want to remain on a merely accidental basis, we have to study first the influence of color on the behavior of the organism in general. For many years I have occupied myself with this problem. Thus, I consider it my task to tell you something of my results which may be useful for color therapy.

That colors influence organic life does not need special proof. Looking around at the colorfulness of all living beings, one becomes immediately aware of this fact. You may know that protozoa are influenced in their behavior in various ways by different colors, that bulls are excited by stimulation with red. In human life the various colors are related to various emotional conditions. Those in mourning prefer black; when young and gay we wear vivid colors, apparently because these colors affect the organism in a way corresponding to these emotional conditions.

The influence of colors is increased in neurotics and psychotics. I like to point here to some experiences with patients with organic diseases of the central nervous system. For example: A woman with a cerebellar disease and disturbances of equilibrium whom I observed had a great tendency to fall, and her gait was very unsteady. If she was clad in a red dress, all her symptoms increased to an unbearable degree. She became dizzy and fell. Green or blue had the opposite effect. They made her quiet; her equilibrium improved so that she appeared to be almost normal. This and similar observations induced me to investigate the influence of different colors in special experiments which show that the influence of color on the function of the organism is manifold.

To make things more concrete I would like to begin with the demonstration of an example which brings this influence especially clearly to the fore: the *influence of colors on the position of the body*. If you stretch out your arms in front of you and distract your attention from them, then your arms deviate a little outwardly without your intention and your will. After they have deviated to a certain point, they cease to move, if you do not interfere. Under constant

<sup>1</sup> Presented at twenty-fifth annual meeting of American Occupational Therapy Association, Washington, D. C., September 2, 1941.

experimental conditions, the point at which this happens is always about the same. We call the position in which the arms cease to deviate the preferred position.<sup>2</sup> All these phenomena, the deviation and the influence of different colors, are observed more easily under certain pathological conditions, for instance in patients with a defect of the cerebellum or of the frontal lobe. I am sorry that time does not allow me to explain why this is so.

If, for instance, you have a patient with a left-sided lesion of the cerebellum stretch out his arms, you will observe that his right arm deviates a little, as in normals, but that his left arm—the arm on the affected side—deviates much more. While the right arm stops at the normal, preferred position, the left one stops on a more lateral plane. We say the left arm deviates abnormally. The extent of this deviation in an individual case depends upon the severity of the functional disturbance of the central nervous system. Because this deviation under certain conditions is definite in amount and is changed definitely by different color stimulations, this phenomenon can be used as an indicator in studying the influence of colors on performance.<sup>3</sup>

The experiments are carried out in the following way. The patient, who is seated on a chair, is asked to stretch out his arms. His arms are then hidden from his view by a piece of cardboard placed horizontally over them. Now he is shown a large sheet of colored paper. He is instructed first to close his eyes; then, to open them and to stare at the color. We observe that when the patient's eyes are closed the left arm deviates to a point 70 cm. laterally from the midline, in white stimulation 45 cm., in red 50 cm., and in yellow 55 cm. However, in blue stimulation the arm deviates only 42 cm. and in green 40 cm. We cannot discuss here all the differences in color stimulations, but I would like to emphasize particularly the difference, or better, the contrary effects of red and yellow on the one side and green and blue on the other. In all cases we studied, we found the same relation between the effects of the various colors.

[This behavior was shown in a movie of a patient whose left *and* right arms deviated laterally in an abnormal amount. Because the lesion is more severe on the left side, the left arm deviated more than the right one. Closer observation shows that the different colors change the deviation in various ways.]

First, there is an increase or decrease in the amount of the deviation. It seems that red produces a removal of the arm from the center of the body; green brings the arm nearer to it. These motor reactions become apparent under the given experimental conditions with the arms. As a matter of fact, the whole organism (as is demonstrable in the other experiments) through different colors is swung toward the outerworld or withdrawn from it and concentrated toward the center of the organism. We shall see later that to these visible phenomena correspond definite feelings which show that the individual under the influence of various colors differs in his entire attitude toward the world.

<sup>2</sup> See to this and other phenomena, mentioned here and to the authors general point of view in his book "The Organism." Amer. Book Comp., 1932, p. 340 ff.

<sup>3</sup> Goldstein, K. und Rosenthal, O.: Zum Problem der Wirkung der Farben auf den Organismus. Schweizer Archiv für Neurologie und Psychiatrie, XXVI, 1, 1930.

Before discussing these, however, we must become acquainted with another effect of the colors on the organism's behavior, a particularly important fact for our problem. We have mentioned before that pathology expresses itself in an increase of the normal deviation of the arm. Now the different colors effect the organism in such a way that *some increase the pathological deviation; others decrease it; or, in other words, some bring the pathological behavior nearer to normality—others increase the abnormality.*

The contrary effects of green and red—the one improving the pathological condition, the other increasing it—are to be observed not only as disturbances of position. The more performances I studied under these conditions, the more I realized that the contrary effects hold true for all performances. The equilibrium in its entirety is disturbed in our patients to a much higher degree in red than in green stimulation. You remember the example of the woman I mentioned first, who when wearing a red dress was in danger of falling whenever standing or walking. She felt dizzy, was not able to do anything—and all that was diminished or disappeared entirely when she wore a green dress. Experiments show that movements which are executed with the same intention by the patient are performed more exactly as to extent and correctness in green light than in red. Words written in red or green ink (if the patient pays attention to the color) show different size of the letters and different distances between the letters. Handwriting in green light or with green ink is much more similar to normal handwriting than that in red light or with red ink. Estimation of the length of sticks based on visual or touch stimulation is much less correct in red light. The threshold is lower in green and enlarged in red stimulation. Sometimes objects appear to such patients under certain circumstances smaller and under others larger than normal. They suffer from what we call *micropsia* and *macropsia*. If we let them observe the same object under red and green light objects appear in the latter condition more as they appear to a normal individual; micropsia and macropsia are increased in red light. These patients show deviations as to estimation of small spans of time. Some underestimate; for instance, 5 seconds are estimated as 3, 10 as 5, 30 as 15, and so forth. Others overestimate. Both groups behave more like normals if the experiment is performed in stimulation with green light and show greater deviations from the normal in red stimulation.

Corresponding results are obtained by a study of the capacity to estimate weights under green and red lights. The different influences of green and red may cause the patient to be unable to read words printed or written in red colors on a green background, but he may be able to recognize letters in the opposite arrangement. The reason for this is that the red color diffuses toward all sides and so the letters, as other objects, become blurred. If the letters are printed or written in green on a red background, this is not the case. The green letters or objects are clearly in a definite place and show clean-cut contours.

Now that we have become acquainted with the observable phenomena, let us consider the description of the subjective feelings of the patients in green and red stimulations. One of our patients said: "Red disrupts the body as if one would be blown up." It afflicts the organism. It excites it and does not allow

it to be quiet. It throws one forcefully toward the outerworld. It is very disagreeable. Yellow is not as strong as red; it throws one in a smoother rhythm toward the outerworld. According to another patient, "Red is very disagreeable, piercing, obtrusive." Yellow has a similar effect on him. To another patient these colors are disturbing, even painful.

With green stimulation, however, the first patient describes the color as pulling one together toward the inner center; it seems to concentrate; it brings one to himself; it is very agreeable; it quiets one. Another patient said: "Green is smooth and especially agreeable, blue not so much, but more agreeable than yellow or red." Green is experienced by another as a kind color, agreeable, quieting. In the same way the woman mentioned before characterized the experience in red and in green stimulation: "Red is very disagreeable, exciting, obtruding, aggressive, produces nausea." I know it will interest you to hear that the descriptions by these patients of the effect of the different colors corresponds to those given by normal individuals whom we can consider as especially sensitive to colors because of their constitutions and occupations. I would like to draw your attention in this respect especially to the description of the German poet, Goethe, who gives in his book, "Zur Farbenlehre" (theory of color) an excellent description of the effect which various colors have on our feeling and behaving. I mention only a few examples, again concerning red and green.

Goethe says, "yellow-red has an intolerable power; it is active. It seems to penetrate, to pierce the eyes. Yellow is serene, gently stimulating. *The heart becomes expanded.* Red-yellow is more powerful, more magnificent than yellow." For Goethe green is "a real satisfaction to the eyes." Blue is experienced as soft, passive, brings one in the mood of longing. The blue color seems to withdraw from us. For the painter Kandinsky blue is cold; it separates world and spectator. It withdraws from the person. Green to him "does not ask for anything."

These subjective experiences of the patients in stimulation by various colors can be brought into direct relation to the observable phenomena. The stronger deviation of the arms in red stimulation corresponds to the experience of being disrupted, thrown out, abnormally attracted by the outerworld. It is only another expression of the patient's feeling of obtrusion, aggression, excitation, by red. The diminution of the deviation corresponds to the withdrawal from the outerworld and retreat to his own quietness, his center. The inner experiences represent the psychological aspect of the reactions of the organism. We are faced in the observable phenomena with the physical aspect.

The similarity of the descriptions of sensitive normal persons and our patients shows that we have to deal with normal phenomena which probably occur in every individual. Usually one does not pay attention to them and therefore overlooks them. They came to the fore in the mentioned sensitive normals because of their particularly sensitive constitutions; in our patients, because of their exaggeration by pathology.

Certainly our studies are only preliminary especially in the respect that they consider only the effect of colors in isolation, i.e., that they are performed under

abnormal conditions. In normal life we are faced with a number of colors in various combinations.

You all know the different appearance of a color if it occurs in combination with other colors. You know further the influence of the background on which we see a color. The experiments have not taken these factors into consideration enough. Further one should not neglect the relation of certain colors or color combinations to the personal psycho-physical condition and to personal previous experience. The same color may produce different emotions in a different general condition of the same individual. Sensations, ideas, feelings, behavior which a certain color evokes by memory may cause a different effect of a definite color on different individuals. However, the effects which we have pointed to should always be taken into consideration. They are of greatest importance because they concern elementary processes in the organism.

All the factors mentioned ask for special attention in relation to our problem of color therapy. Our result which is of greatest significance is that which points to the various influences of the different colors on the amelioration and making worse of a pathological condition. In this respect I would like to mention the results of color therapy in a condition such as the one I have already referred to, also to tremor and torticollis, some conditions in Parkinsonism. These disturbances can at times be diminished in severity if the individuals are protected against red or yellow colors, if they wear, for instance, spectacles with green lenses. As in organic diseases also in functional disease one is able by elimination of some disturbing stimuli to quiet emotional excitation. How color therapy, based on experimental research about the influence of colors on the function of organism, may be helpful in treatment of neuroses and psychoses the future will reveal.

Let me conclude with the following remarks. If we speak of red as disturbing, green as quieting colors, we must be aware that these characteristics correspond only to the extreme conditions. Red is not always disturbing; in normal life it often stimulates to activity. On the other hand there are activities which we have to fulfill in a situation of quietness, for instance always when great exactness is necessary. Then certainly the indifference of green is especially fortunate. One could say *red is inciting to activity and favorable for emotionally-determined actions; green creates the condition of meditation and exact fulfillment of the task. Red may be suited to produce the emotional background out of which ideas and action will emerge; in green these ideas will be developed and the actions executed.* Excitement and some destructive changes belong to normal life at least as long as it is in a state of growth. Otherwise there is a standstill and that means decay. Indeed destruction must be equalized after a certain time. Life is a condition alternating between excitation, destruction, and unbalance, and reorganization, equilibrium, and rest. In this course of life colors play their role. Each color has a special importance and all colors together help to guarantee normal life.