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MEMORY AS AN AID TO VISION.

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Associated with all functional eye troubles, including errors of refraction (1), strabismus, amblyopia (2), and various other conditions, is a strain or effort to see. This strain always originates in mental strain of some kind, and when the latter is relieved the sight always becomes normal. But the sensations of the eye and mind supply very little information as to the strain to which both are being subjected, those who strain most often suffering the least discomfort. In the treatment of these conditions, therefore, it is important to have some test by which the patient can know whether he is straining or not. This is supplied by the memory of black.

When the mind is able to remember perfectly any phenomenon of the senses, it is always perfectly relaxed. The sight is normal if the eyes are open, and when they are closed and covered so as to exclude all light one sees a perfectly black field, that is, nothing at all. If one can remember the ticking of a watch, or an odor, or a taste, one's mind is completely at rest, and one will see a perfect black when one's eyes are closed and covered. If one's memory of a sensation of touch could be equal to the reality, one would see nothing but black when the light was excluded from the eyes. If one were to remember a bar of music perfectly when one's eyes were closed and covered, one would see nothing but black. But in the case of any of these phenomena it is not easy to test the correctness of the memory, and the same is true of colors other than black. All other colors, including white, are altered by the amount of light to which they are exposed, and are seldom seen as perfectly as it is possible for the normal eye to see them. When the sight is normal, black is just as black in a dim light as in a bright one. It is also just as black at the distance as at the nearpoint, while a small area is just as black as a larger one, and, in fact, appears to be blacker. Black is, moreover, more readily available than any other color. There is nothing blacker than printer's ink, and that is practically ubiquitous. By means of the memory of black, therefore, it is possible to measure accurately one's own relaxation. If the color is remembered perfectly, one is absolutely relaxed. If it is remembered almost perfectly, one's relaxation is almost perfect. If it cannot be remembered at all, one has very little or no relaxation.

By means of simultaneous retinoscopy, these facts can be readily demonstrated. An absolutely perfect memory is very rare, so much so that it need hardly be taken into consideration; but a practically perfect memory, or what might be called normal, is attainable by every one under certain favorable conditions. With such a memory of black the retinoscope shows that all errors of refraction are corrected. If the memory is less than normal, the contrary will be the case. If it fluctuates, the shadow of the retinoscope will fluctuate. The testimony of the retinoscope is, in fact, more reliable than the statements of the patient. Patients often believe and state that they remember black perfectly, or normally, when the retinoscope indicates an error of refraction; but, in such cases, it can usually be demonstrated, by bringing the test card to the point at which the black letters can be seen best; that the memory is not equal to the sight. That the color cannot be remembered perfectly when the eyes and mind are under a strain, the reader can easily demonstrate by trying to remember it when making a conscious effort to see—by staring, partly closing the eyes, or frowning—or while trying to see all the letters of a line equally well at one time. It will be found that it either cannot be remembered at all under these conditions, or that it is remembered imperfectly.

When the two eyes of a patient are different, it has been found that the difference can be exactly measured by the length of time a black period can be remembered while looking at the Snellen test card with both eyes open, and with the better eye closed. A patient with normal vision in the right eye and half normal vision in the left could, when looking at the test card with both eyes open, remember a period for twenty seconds continuously; but with the better eye closed it could be remembered only ten seconds. A

patient with half-normal vision in the right eye and one-quarter normal in the left could remember a period twelve seconds with both eyes open, and only six seconds with the better eye closed. A third patient, with normal sight in the right eye and vision of one-tenth in the left, could remember a period twenty seconds with both eyes open, and only two seconds when the better eye was closed.

In order that patients under treatment for the cure of functional eye troubles may recognize and avoid the conditions that produce strain, they are advised, whatever other method of improving their sight they may be using, to carry with them always the memory of a small area of black, such as a period. Some patients have obtained a complete cure in a very short time by this means alone. One advantage of the method is that it does not require a test card or any other equipment. At any hour of the day or night, whatever the patient may be doing, he can always place himself in a condition favorable to the perfect memory of a black period.

The condition of mind in which a black period can be remembered cannot be attained by any sort of effort. The memory is not the cause of the relaxation, but must be preceded by it. It is obtained only during moments of relaxation, and retained only as long as the causes of strain are avoided; but how this is accomplished cannot be fully explained, just as many other psychological phenomena cannot be explained. We only know that under certain conditions that might be called favorable, a degree of relaxation sufficient for the memory of a black period is possible, and that by persistently seeking these conditions, the patient becomes able to increase the degree of the relaxation and prolong its duration, and finally becomes able to retain it under unfavorable conditions.

The majority of patients find the conditions most favorable for the memory of black when their eyes are closed and covered with the palms of the hands in such a way as to exclude all the light, while avoiding pressure on the eyeballs. This usually lessens the strain to see to such an extent that the patient becomes able to remember a black object for a few seconds or longer; but there is a considerable minority of cases in which this result is not obtained. Some patients not only get no relaxation by palming, but may so increase their strain as to produce very serious symptoms. Their treatment often requires much patience and ingenuity, and cannot be considered here.

When the closing and covering of the eyes does produce sufficient relaxation for the memory of black, this period of relaxation can be prolonged in one of two ways: Either the patient can open his eyes and look at a black letter by central fixation—by which is meant seeing best the part fixed (1)—at the distance at which it is seen best, or he can shift mentally from one letter to another, or from one part of a letter to another. By this means, and perhaps also through influences that are not clearly understood, most patients become able, sooner or later, to remember black for an indefinite length of time with their eyes closed and covered.

With the eyes open and looking at a blank surface, without trying consciously to see, the unconscious strain to see is lessened so that the patient becomes able to remember a black period, and all errors of refraction, as demonstrated by the retinoscope, are corrected. This result has been found to be invariable; and so long as the surface remains blank and the patient does not begin to remember or imagine things seen imperfectly, the memory and the vision may be retained. But, if with the improved vision, details upon the surface begin to come out, or if the patient begins to think of the test card which he has seen imperfectly, the strain to see will return and the memory of the period will be lost.

When looking at a surface on which there is nothing to see, distance makes no difference to the memory, because the patient can always look at such a surface, no matter where it is, without straining to see. When looking at letters, or other details, however, the memory is best at the point at which the patient's sight is best, because at that point the eyes and mind are more relaxed than when the same letters or objects are regarded at distances at which the vision is not so good. By improving the sight at the most favorable distance, therefore, the memory of the period may be improved in some cases very rapidly.

If the relaxation gained under these favorable conditions is perfect, the patient will be able to retain it when the mind is conscious of the impressions of sight at unfavorable distances. Such cases are, however, very rare. Usually the degree of relaxation gained is markedly imperfect; and is, therefore, lost to a greater or less degree when the conditions are unfavorable, as when letters of objects are being regarded at unfavorable distances. So disturbing are the impressions of sight under these circumstances, that just as soon as details begin to come out at a distance at which they have not previously been seen the patient usually loses his relaxation, and with it the memory of the period. In fact, the strain to see may even return before he has had time to become conscious of the image on the retina, as the following case strikingly illustrates:

A woman of fifty-five who had myopia of fifteen diopters, complicated with other conditions which made it impossible for her to see the big C at more than one foot, or to go about, either in her house or on the street, without an attendant, became able, when she looked at a green wall without trying to see it, to remember a perfectly black period, and to see a small area of the wallpaper at the distance as well as she could at the nearpoint. When she had come close to the wall she was asked to put her hand on the door-knob, which she did without hesitation. "But I do not see the knob," she hastened to explain. As a matter of fact she had seen it long enough to put her hand on it; but as soon as the idea of seeing it was suggested to her she lost the memory of the period, and with it her improved vision, and when she again tried to find the knob she could not do so.

When a period is remembered perfectly, while a letter on the Snellen test card is being regarded, the letter improves, with or without the consciousness of the patient, because it is impossible to strain and relax at the same time, and if one relaxes sufficiently to remember the period, one must also relax sufficiently to see the letter, consciously or unconsciously. Letters on either side of the one regarded, or on the lines above and below it also improve. When the patient is conscious of seeing the letters, this is very distracting, and usually causes him, at first, to forget the period; while with some patients, as already noted, the strain may return even before the letters are consciously recognized.

Thus patients find themselves on the horns of a dilemma. The relaxation indicated by the memory of a period improves their sight, and the things they see with this improved vision cause them to lose their relaxation and their memory. It is very remarkable to me how this difficulty is ever overcome, but some patients are able to do it in five minutes, or half an hour. With others the process is long and tedious. There are various ways of helping patients to deal with this situation. One is to direct them to remember the period while looking a little to one side of the test card, say a foot or more; then to look a little nearer to it; and, finally, to look between the lines. In this way they may become able to note the blackness of the letters in the eccentric field without losing the period, and when they can do this they may become able to go a step further and look directly at a letter, without losing control of their memory. If they cannot do it, they are told to look at only one part of a letter—usually the bottom—or to see the period as part of the letter, while nothing that the rest of the letter is less black and less distinct than the part directly regarded. When they can do this they become able to remember the period better than when the letter is seen all alike. If the letter is seen all alike (1) the perfect memory of the period is always lost. The next step is to ask the patient to note whether the bottom of the letter is straight, curved, or open, without losing the period on the bottom. When he can do this he is asked to do the same with the sides and top of the letter, still holding the period on the bottom. Usually when the parts can be observed separately in this way the whole letter can be seen without losing the memory of the period; but it occasionally happens that this is not the case, and further practice is needed before the patient can become conscious of all sides of the letter at once without losing the period. This may require moments, hours, days, or months.

In one case, the following method succeeded:

The patient, a man with fifteen diopters of myopia, was so much disturbed by what he saw when his vision had been improved by the memory of the period, that he was directed to look away from the Snellen test card, or whatever object he was regarding, when he found the letters or other details coming out; and for about a week he went around persistently dodging his improved sight. As his memory improved, it became more and more difficult for him to do this, and at the end of the week it was

impossible. When he looked at the bottom line at a distance of twenty feet he remembered the period perfectly, and when asked if he could see the letters, he replied: "I cannot help but see them."

Some patients retard their recovery by decorating the scenery with periods as they go about during the day, instead of simply remembering a period in their minds. This does them no good, but is, on the contrary, a cause of strain. The period can be imagined perfectly and with benefit as forming part of a black letter on the test card, because this merely means imagining that one sees one part of the black letter best, as the normal eye sees it; but it cannot be imagined perfectly on any surface which is not black, and to attempt to imagine it on such surfaces defeats the end in view.

The smaller the area of black which the patient is able to remember, the greater is the degree of relaxation indicated; but some patients find it easier at first to remember a somewhat large area, such as one of the letters on the Snellen test card, with one part blacker than the rest. They may begin with the big C, then proceed to the smaller letters and finally get to a period. It is then found that this small area is remembered more easily than the larger ones and that its black is more intense. Some patients, instead of a period, find it easier to remember a colon, with one period blacker than the other, or a collection of periods, with one blacker than all the others, or the dot over an i or j. Others again prefer a comma to a period. As it is impossible for the mind to think of one thing continuously, some patients find it helpful in the beginning to shift consciously from one of these black areas to another, or from one part of such an area to another, and to realize the swing, or pulsation, produced by such shifting; but when the memory becomes perfect one object may be held continuously, without conscious shifting, while the swing is realized only when attention is directed to the matter.

Although black, as a rule, is the best color to remember, some patients are bored or depressed by it, and prefer to remember white, or some other color. A familiar object, or one with pleasant associations, is often easier to remember than one which has no particular interest. One patient was cured by the memory of a yellow buttercup, and another was able to remember the opal of her ring when she could not remember a period. Whatever the patient finds easiest to remember is the best to remember, because the memory can never be perfect unless it is easy.

When the memory of the period becomes habitual it is not only not a burden, but is a great help to other mental processes. The mind when it remembers one thing better than all other things possesses central fixation, and its efficiency is thereby increased, just as the efficiency of the eye is increased by central fixation. In other words, the mind attains its greatest efficiency when it is at rest, and it is never at rest unless one thing is remembered better than all other things. When the mind is in such a condition that a period is remembered perfectly the memory for other things is improved. A high school girl reports that when she was unable to remember the answer to a question in an examination she remembered the period, and the answer came to her. When I cannot remember the name of a patient I remember a period, and behold, I have it! A musician, who had perfect sight and could remember a period perfectly had a perfect memory for music; but a musician with imperfect sight who could not remember a period could play nothing without his notes, only gaining that power when his sight and visual memory had become normal. In some exceptional cases, the strain to see the letters on the Snellen test card has been so terrific that patients have said that they not only could not remember a period while they were looking at them, but could not remember even their own names.

The accuracy of the memory of the period may be measured, not only by comparing it with the sight and by means of the retinoscope but by the following tests:

When the memory of the period is perfect it is instantaneous. If a few seconds or longer are necessary to obtain the memory, it is never perfect.

A perfect memory is not only instantaneous, but continuous.

When the period is remembered perfectly perfect sight comes instantaneously. If good vision is obtained only after a second or two, it can always be demonstrated that the memory of the period is imperfect and the sight also.

The memory of a period is a test of relaxation. It is the evidence by which the patient knows that his eyes and mind are at rest. It may be compared to the steam gauge of an engine, which has nothing to do with the machinery, but is of great importance in giving information of the ability of the mechanism to do its work. When the period is black one knows that the engine of the eye is in good working order. When the period fades, or is lost, one knows that it is out of order, until a cure is effected. Then one does not need a period, or any other aid to vision, just as the engineer does not need a steam gauge when the engine is going properly. One patient who had gained perfect eyesight by treatment without glasses said, in answer to an enquiry about the method, that he had not only done nothing to prevent a relapse, but had even forgotten how he was cured. The reply was unsatisfactory to the inquirer, but is quoted to illustrate the fact the when a patient is cured, he does not need to do anything consciously in order to stay cured. It is only those who are imperfectly cured who have to continue the treatment in order to retain what they have gained. It should be added, however, that complete cures, by which is meant the attainment of a measure of microscopic and telescopic vision, are very rare; and even in such cases the treatment can be continued with benefit, for no limits can be set to the visual powers of man, and it is always possible to go on improving them.

REFERENCES.

1. Bates: The Cure of Defective Eyesight by Treatment Without Glasses, New York Medical Journal, May 8, 1915.
2. *Idem*: L'Education de l'oeil dans l'amblyopie exanopsia, *La Clinique Ophtalmologique*, December 10, 1912.