

## “MYOPIA CURES”

S. JUDD BEACH, M.D.

Portland, Maine

The purpose of this communication is to discuss some evidence consistent with the unorthodox theory that improvement in vision in nearsighted persons which follows sight-training exercises may in some instances be due to a genuine reduction of the myopia. This was the claim of Bates and of Simpkins. Though scouted by most authorities, it still has advocates, especially among laymen. Patients devoted to these courses for “perfect sight without glasses” have always been convinced that they see more clearly. Occasionally they have come under observation of ophthalmologists. The general conclusion is that the gain is in improved recognition of objects which are not actually seen more distinctly.

Recently two series of cases were studied, one by Post and his group, the other by Woods and his associates. Post says, “Most improvement was on the cerebral level, rather than on the retinal level,” and Woods is convinced that “the training had no effect on the myopia, but educated some patients to interpret retinal images more carefully.” In other words, they conclude that visual training makes observation more accurate; it does not increase visual acuity. This view is summarized in an editorial in the *Journal of the American Medical Association* (April 24, 1948).

Such training of the observation is a common experience. Printers are found to identify letters so small that persons not familiar with the shapes of type are unable to distinguish them, even when their visual acuity is as good. Sailors on our coast will recognize a ship on the horizon which is invisible to landlubbers, and will often determine its course. This reasonable explanation is so comfortable and convenient

that there is a tendency to use it without discrimination for every instance of improvement following visual training. Such analogies require this qualification. Skills of this sort are specific. They are confined to one field. The sailor has training in observation of marine objects, but at discerning letters he is no better than the landlubber. Then again facility of this sort is permanent when once learned. The sailor does not lose his faculty of observation between occasions for using it and then recover it immediately by voluntary effort when necessity arises. These skills are acquired slowly, and are permanent. This distinguishes them from several fleeting episodes of visual improvement.

Such temporary improvement in acuity occurred during World War II in candidates for the Air Corps who were often enabled by visual-training methods to pass the tests. Under stress of flying many lost this ability and had to be grounded.

Another sort of increased acuity which is not improvement in observation might be mentioned in passing. This is the slightly sharper vision described by Post, which follows rather promptly when glasses are taken off. The essence of the popular courses for discarding glasses is of this transitory character. Devotees describe blinks of intensely vivid vision which they can elicit. They claim acuity at times of 20/10. They are impatient with ophthalmologists for neglecting this experience which to them is all-important. This keenness of vision may occur in one eye, and later be found to have shifted to the other eye. It may occur in both eyes. When binocular, one eye may predominate at one time, the other eye at a later time. This seems to place it on the ocular level. *To be accepted as entirely due to the improved cerebral interpretation of blurred retinal images, gain in sight should (1) be a permanent skill and (2) not be found to shift from one eye to the other.*

Some time ago I had the opportunity to report on the examination of a young man, the product of a sight-training course, whose gain was not the improved recognition of

blurred images. It was quite definitely an increase in visual acuity. It is true that there was some general over-all increase in seeing ability, but the dramatic sharpening of vision was produced by an act of the will. It was immediate, and not confined to the recognition of letters. It was temporary. Either eye might predominate.

CASE 1.—A male, aged 23 years. O.D. V 14/200 —3.00 D.S. —1.00 D.C. ax. 27 = 20/15. O.S. V 10/200 —2.25 D.S. —1.00 D.C. ax. 145 = 20/15. In spite of his low uncorrected vision, such that he had to walk  $\frac{1}{2}$  to  $\frac{1}{2}$  of the way down the range to see the top letter of the card, he could at 20 feet by voluntary effort see most of the 20/30 line. Often this sharp vision was in but one eye, though later it might shift to the other. In this way it resembled the flashes of acute vision just mentioned that characterize the sight-training courses.

To do this he produced an effect similar to the accidental squeezing so fatal to cataract operating. Observers differed as to the mechanics of the procedure. One believed that he was narrowing the palpebral aperture, producing a pinhole effect; another thought that by squeezing he flattened the globe. His own belief was that he squeezed the globe between 2 hammocks, the posterior composed of the rectus muscles, the anterior made up of the obliques.

To this solution, Lancaster raises the objection that constriction of the globe by the external muscles might be expected to bulge the globe at the ends rather than pull it together. Such lengthening of the eyeball would increase the myopia and be inconsistent with improved vision.

In passing, another explanation might be cited applicable to all instances where more than 1 lens system seems to exist in the same eye. Common examples are those where the axis, or power, or both change when the eye accommodates. This occurrence has variously been attributed to cyclotorsion, asymmetrical accommodation, or tilting of the lens. There are objections to these theories which do not apply to Lancaster's simple explanation, based on the ordinary aberrations of the eye. Refracted rays do not meet at a geometrical point. Irregularities in the ocular media exaggerate this

normal spherical aberration. Lancaster has pointed out that congeries or clusters of rays group at different levels. He believes that an eye usually selects one cluster to use as a focus, but can change to another under other circumstances. This is the most ingenious and reasonable explanation of most instances of multiple refraction in the same eye, but these "myopia cures" seem quite different.

#### "SQUINTING" (SQUEEZING)

Improving vision by squeezing in this way resembles that used by ordinary myopes who squint to see better. This is a familiar trick. It is so common that Army regulations caution examiners to be on the watch for it. A little investigation shows that not all myopes possess this faculty. A high proportion actually see less well while trying to squint. Those who see better get considerable improvement but far less than the squeezer just described who had taken the course in sight training. Such improvement is usually attributed to narrowing the palpebral aperture.

Improvement by narrowing the aperture is possible even in some hyperopes who see better by squinting. This is certainly not due to shortening the globe, as that would increase the hyperopia and further impair the vision.

CASE 2.—Male, aged 14 years. O.D. +0.50 +1.75 ax. 85 = 20/20.  
O.S. +1.00 ax. 81 = 20/20.

	<i>Squeezing</i>	<i>1 mm. Pinhole</i>	<i>1 mm. Pinhole and Squeezing</i>
O.D. V = 20/50	20/40	20/30	Same
O.S. V = 20/30	20/25	20/30	Same

In this case squeezing while using the 1 mm. pinhole did not further improve vision, proving that the narrow aperture and not the pressure improved the sight.

If you watch the eyes of myopes who are squinting to see better, you soon find that they do not all do the same thing. As in the case of the young man who had practiced sight

training, it is not easy to be certain just what they do. The lids flicker so that it is difficult to tell at exactly what point best vision occurs. Some patients lower the upper lid to the upper pupillary margin. These are sometimes adults with pupils of around 2 mm. diameter. Here there is little, if any, narrowing of the aperture. Some adolescents with pupils 4 to 7 mm. in diameter definitely contract the lid slit. Some bring the lower lid up at the same time the upper comes down. This makes a stenopeic slit across the middle of the pupil about 2 mm. wide. Others use a technique resembling that used by the trained patient. The head is thrown back, the upper lid comes down to within about 1 mm. of the lower pupillary margin. This leaves a very small crescentic visual opening, through which the patient looks obliquely. In this way a young woman made a rather notable gain in vision.

CASE 3.—Female, aged 27 years. O.D.  $-4.75 -0.75$  ax.  $75=20/20$ . O.S.  $-2.75 -2.25$  ax.  $165=20/20$ .

<i>Uncorrected</i>	<i>Squeezing</i>
O.D. 6/200	20/200
O.S. 20/200	20/70

On the other hand some patients see better by a squeezing which does not encroach on the pupillary opening. These differences in manner of squeezing the lids may account for the varying degrees of improvement experienced by these patients. If this is the same maneuver that is developed by the sight trainers, such differences could explain their inability to tell how much any individual will gain from their training, and the uneven results of these courses.

#### PINHOLE CAMERA

A pinhole camera operates by overcoming the multiplicity of conflicting images. Duke-Elder illustrates this by showing how several pinholes will produce an equal number of overlapping images the outlines of which do not coincide. The smaller the pinhole, the fewer there are of these confusing

outlines. By experiment you can demonstrate that the smallest pinhole which will sharpen up an image is about 1 mm. Smaller holes cause diffraction and reduction of illumination which interfere with vision. Tscherning, according to Cowan, found that interference by diffraction begins when the opening is less than 2 mm. Even the 1 mm. hole causes so much interference that not all persons can use it. So, making a pinhole smaller than 1 mm. won't help vision. Further improvement by squeezing must then come from the pressure.

CASE 4.—Male, aged 24 years. O.D. -1.00 = 20/15. O.S. -1.25 = 20/15.

	<i>Squeezing</i>	<i>1 mm. Pinhole</i>	<i>1 mm. Pinhole and Squeezing</i>
O.D. V = 20/50	20/50	20/30	20/20??
O.S. V = 20/200	20/100	20/40	20/30

He was already looking through the smallest practical hole. Hence, the gain was presumably from pressing the globe. This is not the same in all patients. Some cannot improve either eye by squinting; some can improve both eyes; others can improve one eye but not the other. This seems odd, but probably most of us have seen persons who can wink one eye alone but not the other.

These cases are samples for illustration and not sufficient in number for statistical purposes. A variety of results is evident.

<i>Case</i>	<i>Un- corrected</i>	<i>Squeezing</i>	<i>1 mm. Pinhole</i>	<i>Squeezing and 1 mm. Pinhole</i>	<i>Effect of Squinting</i>
5					
Female	(-1.25 - .50 × 115 = 20/15)				
Aged 16	(-1.00 - .50 × 65 = 20/15)				
	20/200	20/50	20/30	20/30	No
	20/100	20/100	20/30	20/25	improvement
6					
Female	(-2.00 - .37 × 90 = 20/20)				
Aged 22	(- .75 = 20/20)				
	20/200	20/200	20/30	blur	Impairment
	20/70	20/70	20/20	blur	
7					
Female	(- .75 = 20/15)				
Aged 10	(-1.37 = 20/15)				
	20/100	20/100	20/25	20/25	No
	20/200	20/200	20/50	20/30	improvement

Case	Un- corrected	Squeezing	1 mm. Pinhole	Squeezing and 1 mm. Pinhole	Effect of Squinting
8					
Female	(+ .25 - .37 × 0 = 20/20)				
Aged 35	( -1.25 × 175 = 20/20)				
	20/20	20/20	20/20	20/20	..
	20/70	20/20	20/30	20/20	..
9					
Female	(- .87 - 1.00 × 170 = 20/20)				
Aged 40	(-1.50 - 1.75 × 10 = 20/20)				
	20/200+	20/200+	20/50	20/40	..
	20/200?	20/40	20/30	20/25	..
10					
Male	(-1.25 - .62 × 170 = 20/20)				
Aged 25	(-1.50 - 1.75 × 5 = 20/20)				
	O.D. Not improved by squeezing				
	20/200+	20/70	20/50	20/30	..
11					
Male	(-1.00 = 20/15)				
Aged 24	(-1.25 = 20/15)				
	20/30	20/30	20/25	20/20	..
	20/200	20/100	20/30	20/25	..
12					
Female	(-1.50 - .50 × 160 = 20/15)				
Aged 36	(-1.00 = 20/15)				
	20/100	20/50	20/20	20/15	..
	20/70	20/25	20/25	20/25	..
13					
Male	(-1.25 = 20/15)				
Aged 15	(- .75 - .25 × 160 = 20/15)				
	20/70	20/40	20/30	20/20	..
	20/30	20/30	20/20	20/15	..
14					
Female	(-.75 - .75 × 80 = 20/20)				
Aged 18	(-.50 - .62 × 83 = 20/20)				
	20/100	20/70	20/70	20/25	..
	20/200	20/200+	20/100	20/30	..

These cases are samples illustrating different reactions to squeezing. There are not enough to permit any conclusions as to the relative frequency of the different responses so it is not to be inferred that the number of eyes improved by simple squinting is equal to those not improved; that 4 times as many show further gain by use of the 1 mm. pinhole as do not; that twice as many, while looking through the 1 mm. pinhole, make still further gain by squinting as do not gain. These cases merely illustrate a number of possibilities.

If it is admitted that sight cannot improve through narrowing the aperture to less than 1 mm. since that would blur the vision more, then the natural inference is that the myopia must have diminished. Presumably the globe has shortened. This does not determine whether the assumed shortening of the globe is due to compression by the lids, or to influence of the extra-ocular eye muscles. Nor does it indicate whether the action of the extrinsic muscles is squeezing according to my patient or relaxation of the obliques as maintained by Bates. It is customary to deride this notion of squeezing with the extra-ocular muscles. Yet such a possibility is not wholly fantastic. Some such action has to be assumed to explain the squeezing in cataract patients which can take place even after the lids are paralyzed by akinesis. This suggests the use of akinesis to determine in these cases whether the lid muscles are responsible. Someone may have a chance to try paralyzing the lids of a squinter with a Van Lint or O'Brien injection. If he can still improve his vision while looking through a pinhole, the inference is that it is done with the extrinsic muscles, and not the eyelids. A retrobulbar injection might be tried to control the muscles within the orbit. These might be acting independently, or their contraction might be an accompaniment of squeezing the orbicularis.

#### THE VALUE OF SQUEEZING

Just a word as to the value of this sort of accomplishment. It is customary to ridicule these sight-training exercises as a waste of time. The patient who attained the remarkable improvement by squeezing did not agree with this. He was delighted to be able to discard glasses in a number of common situations like recognizing friends on the street and reading signs. He valued it most in sailing. He pointed out that it is useful to be able to sail without having to keep wiping spray off glasses. It might be lifesaving to be able to recognize landmarks and pick up buoys if his glasses blew off. Such advantages are too real to be laughed off, and may account for

some of the popularity of this system of training. Yet, I understand he is likely to use his glasses much of the time.

#### SUMMARY

The kernel of popular and unorthodox sight-training courses lies in the flashes of distinct vision they elicit. This is the feature that keeps the devotees faithful. As it frequently is monocular, and shifts from one eye to the other, it cannot be ascribed to improved interpretation of blurred images on the cerebral level. In a sample case it seemed to be a development of the squinting used by myopes to clear their sight. One observer concluded that this was the pinhole phenomenon; another thought it shortened the globe. Myopes do not all squint alike. Use of the pinhole shows that in some cases there is further gain apart from narrowing the aperture. Use of akinesis of the orbicularis and of retrobulbar akinesis of the extra-ocular muscles might give a clue to whether this is due to pressure by the orbicularis, squeezing or relaxation of the extrinsic musculature. A synergistic action is conceivable. It should not be surprising to find these effects produced in several ways.

#### BIBLIOGRAPHY

- Duke-Elder, S.: Arch.Ophth., **30**:582, October, 1943.  
 Hildreth, H. R., Meinberg, W. H., Milder, B., Post, L. T., and Saunders, T. E.:  
 Am.J.Ophth., **30**:1563, December, 1947.  
 J.A.M.A., No. 17, **136**:1100, April 24, 1948.  
 Lancaster, W. B.: Arch.Ophth., **32**:167, September, 1944.  
 Woods, A. C.: Am.J.Ophth., **29**:28, January, 1946.

#### DISCUSSION

DR. WALTER B. LANCASTER, Boston, Mass.: It seems to me this is an important paper and a pertinent paper. Two or three years ago Dr. Reese asked me to read a paper on the subject of eye exercises and I wrote on "The Present Status of Eye Exercises and the Visual Functions." I cited a good many visual functions; for example, color vision, peripheral visual acuity and speed of perception. Patients may be made to discriminate color much better after a little instruction. They may be made to see better—visual acuity

—in their peripheral vision. They may be made to recognize a number of digits with a very short exposure after a little training, and I especially instanced some patients that I have seen who came to me wearing concave lenses, —50, —75, perhaps —1, and I took off the lenses and their vision was not good, so by making them go without and wear plus lenses for a day or two they would have 20/15 without glasses and even 20/15 with + 50, showing they were not myopes; they were simply victims of some incompetent specialist who gave them concave glasses because he used what I call the "primitive method" of measuring refraction—hold up the lens, and if they say it is better, give it to them. Anyone who pays attention to accommodation would not fall into that pit.

The chief attention to the paper, the chief excitement it started, was in the matter of myopia, probably because at that time men who ought to have been kept out were getting into the Armed Services by being taught how to read letters. I think Dr. Woods and Dr. Post instituted their studies of the effect on myopia of training and they corroborated what I said quite categorically in my paper that you cannot change the structure of the eye by exercises. We can teach them to see better. We have not appreciated the importance of that. We have concentrated too much on getting into the Armed Services, and of keeping men out who ought not to be in. But take the civilian population: if we can teach a patient to see better in any other way than by wearing glasses, or in addition to giving him glasses, we are winning a great deal of satisfaction from that patient. We have not exhausted the possibilities. The quacks are paying more attention to it than we are. Therefore this paper is important, if it will only arouse interest to investigate not merely the myopia question, but the general question of visual perception, and how it can be improved by training, by exercises, by other methods than purely optical ones.

DR. S. JUDD BEACH, Portland, Maine, closing: I do not want to drag out this subject too long, but I want to point out that since Dr. Lancaster showed that sight training can improve observation, this was confirmed by Dr. Post and Dr. Woods, and brilliantly corroborated in the last war by Renfrew. Oculists have nevertheless jumped to the conclusion that this is the explanation of all these results. Actually it is only part of the problem. I have mentioned that the skills are permanent and that alternating improvement of the two eyes is not cerebral. We could find out whether it is the lids or some other factor which produces the improvement in visual acuity, and I presume retrobulbar injection might eliminate

the extra-ocular muscles in some way. I think there is a tendency to examine great numbers of patients and find out many of them do not do anything except improve their observation, whereas if we could devote a little time to some of these cases who do gain actual increase in acuity, and try to find out what makes them tick, we might get some sort of answer to the questions which are being asked by the persons who take these sight training courses. As a matter of fact, they are smart enough to know when they see vividly, as they do during what Bates calls central fixation, which is simply another name for these flashes that they get. They know if they see 20/10 vividly they are not getting a simple method of better distinguishing blurred images, and they are discounting statements that are made by oculists whom they feel ought to be stuffed and put in museums.

---

## THE MECHANICS OF INTRACAPSULAR CATARACT EXTRACTION\*

DAVID O. HARRINGTON, M.D.  
San Francisco, Calif.

There can be little controversy among modern ophthalmic surgeons regarding the advantages and desirability of the intracapsular method of cataract extraction.

As Arnold Knapp<sup>1</sup> has pointed out, in his classic paper on *The Present State of the Intracapsular Cataract Operation*: "The amount of literature that has arisen on the subject of the intracapsular extraction is bewildering but some general direction can be recognized. The trend seems to be in favor of an operation in which a firm hold is taken of the capsule with the forceps without tearing it, concentrating the traction to one area and with a hook or similar instrument exerting pressure externally at the lower corneal margin in order to raise vitreous pressure and to rupture the suspensory ligament at that point. After subluxation of the cataract, the

\* From the Department of Surgery, Division of Ophthalmology, University of California Medical School, and the U.S.V.A. Hospital, San Francisco, Calif.