MYOPIA, IN TH

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This is the third of a series of articles by Doctor Idzal on the topic, "New Optometry; Making It Easy for Yourself." The author's purpose is to reduce to simplest principles the ideas underlying "differential diagnosis" as embodied in the Skeffington 21-point technique. The first article, consisting of three chapters in the Jan. 1, 1935 issue, explained the application of the New Optometry to presbyopia. The second article, also of three chapters, in the June 1 issue, treated hyperopia. In the present article the author speaks of myopia as the result of an oversupply of energy to the accommodative function and presents the theory that latent hyperopia, pseudo myopia and regular myopia may all be one and the same thing, under different names.

VII

After bowling two hours or so, a well-known St. Louis optometrist, whose name (Dr. Gene Ebeling) we cannot divulge at this time (Hi, Gene!), took off his plus 25s and put on his minus 50s so that he could continue to see the pins clearly.

"I got," he said, "a tight hook-up." Just like that!—"a tight hook-up." Whereupon he resumed his innocent pastime of rolling a 16-lb. ball down a 60-ft. alley into a group of inoffensive maple-wood pins. After which your correspondent moved away, mumbling to himself, and commenced drawing pictures on nice white cardboard (see illustrations).

This incident happens to be a good illustration of the proposition to which the New Optometry is dedicated—that errors of refraction (barring corneal astigmatism, which I shall consider as a purely mechanical defect), whether they be hyperopia or myopia, can be traced to a maladjustment of the innervational supply being sent to the accommodative function. Hyperopia being the result of a low, or interfered-with nerve supply. Myopia being the result of an oversupply of energy to the accommodative function. (Take it easy, gentlemen! You can have your "long eyeballs" if you want them after I get through.)

Just how this condition may be brought about I will attempt to show in this article. Those of you who have read the previous two articles of this series should have no difficulty in following the line of thought here to be presented.

There is no personal theory of my own presented here. I am merely trying to reduce to simplest principles, and illustrate by diagrams, the ideas underlying "differential diagnosis" as embodied in the 21-point technique (Skeffington) which has come to be more or less standard practice for many in analyzing causes of ocular discomfort.

Nor is there anything here that is particularly new. Sheard, in his *Physiological Optics*, published in 1918, mentions, on page 430, as a cause of ocular discomfort the fact that "Any cause which renders the ciliary muscle less responsive to its motor impulses thereby necessitates increased impulse to accommodation." And Sheard, in turn, refers to the articles by J. C. Eberhardt on "The Dynamics and Economics of the Binocular Functions," which appeared in THE OPTICAL JOURNAL-REVIEW in 1916 and 1917.

It's a poor rule that won't work both ways. And so we may take as a rule that: *Any cause which renders the adductive function less responsive to its motor impulses thereby necessitates an increased impulse to convergence.* And thereby hangs a tale.

And so we come again to our bowler mentioned in the first paragraph. He bowled until his voluntary functions began to fatigue (bowling being at present entirely voluntary). His adductive function, being also a voluntary function, also began to fatigue. And when a fatigue interference occurs in the adductive function, what happens? That's right! The nerve center supplying the adductive function begins to crowd on more "juice" to overcome the fatigue (see chart 8).

And when an extra amount of energy is

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being sent over the wires to the adduction, the accommodative function sympathetically picks up some of this unneeded and unwanted energy. In most cases this results in no particular harm, there being a sort of a loose-coupling between the adduction and the accommodation—play between the functions—that allows either one or the other to be receiving a certain extra amount of energy before the other function is affected. However, in this case a "tight hook-up" existed that resulted in an actual myopia at once.

Make no mistake. This myopia is just as real as any other myopia.

VIII

There is one fact concerning the adduction or convergence function that does not ordinarily receive enough consideration. That is, that the adductive function must receive energy from its brain center even while the eyes are in a parallel position for distant seeing. Neither the adduction nor the accommodation is "at rest" even in "emmetropic" eyes, while engaged in distant binocular vision. Lack of consideration of this fact has resulted in an unnecessary stumbling block for many. Hence the conditions and problems involved are the same in principle for *either near-point or far.*

By way of further illustration of what I am talking about, I am going to show how latent hyperopia, pseudo myopia, and the regular common variety of myopia may, indeed, be all one and the same thing, posing under different aliases (see chart 9).

In Fig. 1, chart 9, I attempt to illustrate a hypothetical case of latent hyperopia. Suppose you had examined this pair of eyes by whatever method you use and you are convinced that "more plus is going to be needed later on." You have run into plenty of these. This is a case where there is enough fatigue (even after you have given some plus) in the accommodative function to cause discomfort. These eyes would joyfully accept more plus, except that the adductive function is also fatigued and thus drawing so much extra energy that the accommodation is picking it up and

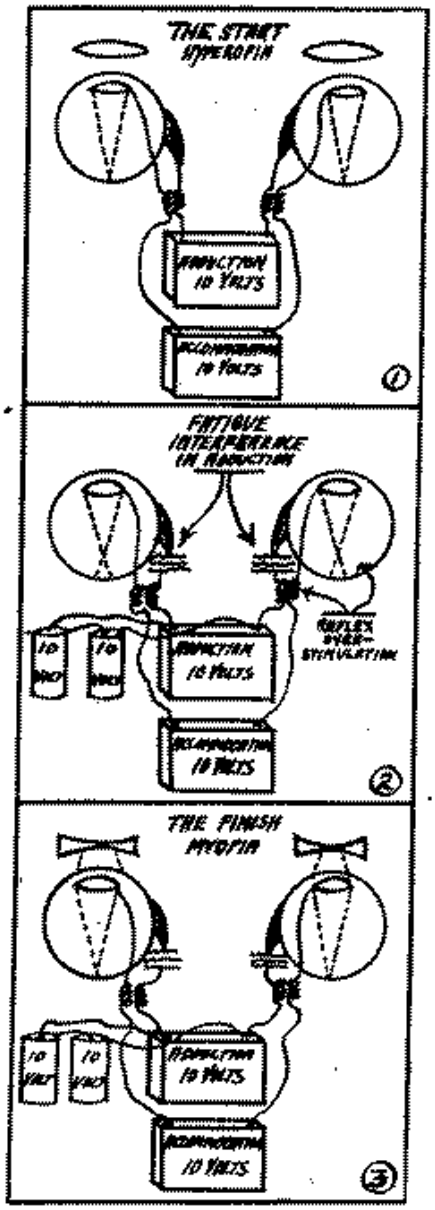

CHART VIII. THE BOWLER

the ciliary is holding a curve on the crystalline that it would cheerfully relinquish if it could.

The time-honored way of dealing with a situation such as this (still Fig. 1, chart 9) is to "crowd on more plus." The effect of this crowding on of plus is to force the *adduction* to get along on its own

hook, without the customary support it has been receiving from accommodation. The extra plus is constantly trying to inhibit (relax) accommodative effort, but at the same time the adductive function must not relax; it must hold the eyes parallel, the same as before. This is in effect a *convergence* "builder-upper" and, where comfort ensues it is proof that the mal-relationship has been broken up and that the adduction has been forced to learn to get along on its own side of the fence without reflexly overstimulating the accommodation.

This is practically the same effect as is obtained with any of the "muscle" machines now on the market, the main difference being that it is "very tough" on the patient. Also it takes a lot more time.

Fig. 2, chart 9, illustrates pseudo-myopia. This is exactly the same set of conditions as existed in Fig. 1, except that things have been carried forward to a greater degree. This time some interference has necessitated a still greater flow of energy to the adductive function and, of course, the accommodation is picking up some of the extra "juice" sympathetically. But now the ciliary not only is unable to relax, but also is actually *being forced to put too great a curve on the crystalline*, thus focusing up too short. (No wonder the eyeball is too long.)

Fig. 3, chart 9, illustrates regular myopia. This is the same set of conditions as shown in Fig. 2, chart 9, except that this situation has existed for such a long time that a new set of habits or "brain patterns" has formed that make it exceedingly difficult to do anything with this case except fit it with glasses. Which is, after all, primarily our business.

Now there may be eyeballs that are actually too long. Who am I to argue? But as long as it is a proved fact that myopia can be reduced, I am partial to the theory presented above.

The medical boys think it is long eyeballs. But, in the same breath, they say it is a condition that grows steadily worse. Evidently they favor rubber eyeballs. In a radio talk sponsored by the A.M.A., which was delivered March 28, 1935, it was stated:

"Among the worst ways in which we are fooled is by a vicious type of recommendation which is now being made to young persons who are afflicted with short-sightedness or myopia. In some cases this is a family trait, and the *disease has a tendency to be progressive*. It is a serious matter, and nothing but correct diagnosis and proper fitting of glasses is of

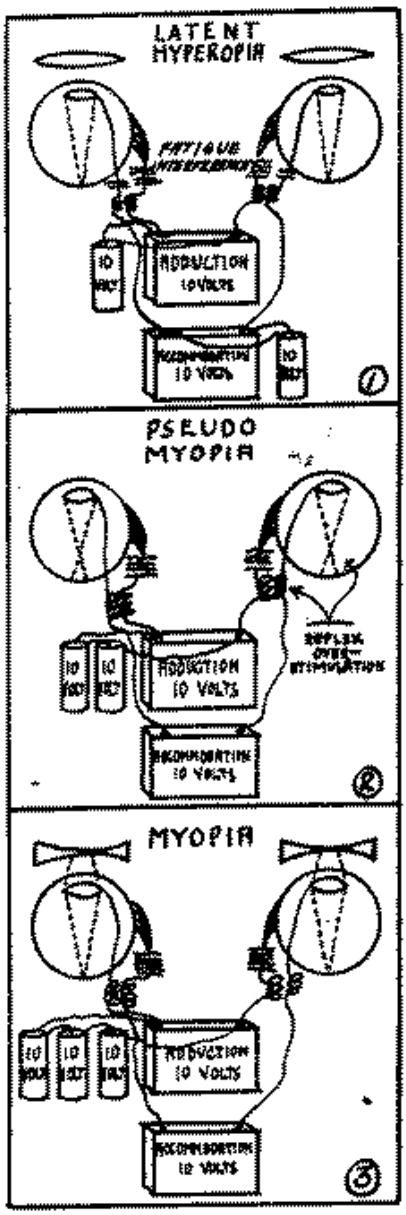

CHART IX

any use. Moreover, such glasses must be refitted from time to time as the *condition grows worse*, or at least rechecked to be sure they are still correct. Advice is given to such young persons to throw away their glasses and indulge in exercises of the *internal* eye muscles. The truth is that no exercises known will favorably affect the internal eye muscles, though certain types of muscle disturbance of the external eye muscles, which move the eyeballs, may be helped by exercises. The internal eye muscles, which control the focusing of the lens, cannot be trained by exercise to

overcome serious *structural deficiency* of the eyeball." (The italics are mine.)

So much for the A.M.A. However, there seems to be plenty of evidence to support the theory that myopia can be considered and treated as an over-accommodation condition.

In reply to a questionnaire sent to him, Otis Wolfe, M.D., Marshalltown, Iowa, recognized as an authority on cataractous conditions as well as on ophthalmology in general, states that "Plus 16.00 ⊂ +3.00 cylinder within 15 degrees of 180 will give good vision in three-fourths the cases of aphakia." This, of course, supports the findings of other authorities.

But the point I am bringing out is this: After the crystalline has been removed, *three-fourths of all eyes refract the same*. But these same eyes must have presented all sorts of refractive conditions, ranging from plus to minus, before the accommodative function was rendered null by the operation. Hence, this should tend to prove that myopia as well as hyperopia is an innervational condition.

Doctor Wolfe also states that the refraction of the eye before the operation does influence the refraction of the eye after the operation. However, it would seem that this statement would apply to the remaining one-fourth of the cases. Personally I am going to let the majority win. You can make any use you wish of this information.

Dr. Floyd Getman, Sioux City, also presents an interesting statement. While doing clinical research on new-born babies in a Chicago hospital it was found that about three-fourths of the infants were myopic. This was the result of findings taken retinoscopically on two-day and three-day-old babies. This contradicts the old notion that babies, having small eyeballs, must necessarily be hyperopic.

Myopia can be reduced and in some cases eliminated. Such procedure is based on handling the case in such a manner that the mal-association between adduction and accommodation is broken up. However, don't expect results overnight.

Formerly the frequency that divergent squint was associated with myopia was considered to be due to the fact that the "long eyeball" precluded any effort on the part of the accommodation; hence a lack of the usual sympathetic support to the adductive function and hence a tendency to relax, turn out.

Now it is considered that the insufficiency in the adduction *exists first*, and the constant effort on the part of the adductive center to send increased innervation to this function results in the accommodative function picking up some of the extra energy *that it does not need* and resulting in an actual *over-accommodation*.

IX

Modern optometry thinks in terms of "innervations" and "end-results"—the innervation being the impulse sent from a brain-center, and the end-result being what happens when the impulse gets there. For instance, "100 volts" of impulse may have always resulted in 3 diopters of accommodation, until we get to be 45 years old and the crystalline loses its easy-working elasticity; then it may take 150 volts to get that same 3 diopters of accommodation. This is known familiarly as presbyopia.

The same conditions apply to adductive function—100 volts of impulse may have always resulted in 15 degrees of convergence, until some fatigue or other interference arises. Then it may take 160 volts of impulse to get that same 15 degrees of convergence. This is designated as a "low convergence" or "adductive insufficiency," etc.

There being no means to actually get into the brain and measure these brain-center impulses, we do the next best thing: We measure the end-results by means of prisms and lenses, and check the findings against each other and compare them to "normals."

In most cases these methods of measuring are in no way different than we have been doing for years. The difference is in the interpretation we put upon the findings.

I have endeavored in this series of articles to make clear the nature of the interpretations.

Skeffington's 21-point technique is a methodical, coordinated system of making, listing, comparing and analyzing ocular end-results and, although this system may seem difficult to master, it seems at the present time to be the most logical one to follow after you have learned the ideas upon which it is based. And, after all, that's what I have been trying to give you right here.

In a future article I expect to deal with "orthoptics" simplified.

An Appreciated Feature

William C. Barnard, R. O., Warton, Ont.—May I congratulate you on the new department, "Questions and Answers in Mechanical Optics." I, for one, certainly appreciate this most useful feature.