
BLIND SPOT MEASUREMENTS
AND
REMEDIAL READING PROBLEMS

by

T. A. BROMBACH

BLIND SPOT MEASUREMENTS
and
REMEDIAL READING PROBLEMS

T. A. Brombach

Copyright 1937

by

T. A. Brombach

PRINTED THROUGH COURTESY OF
AMERICAN OPTICAL COMPANY

THE IMPORTANCE OF BLIND SPOT MEASUREMENTS IN REMEDIAL
READING PROBLEMS

T. A. Brombach

The perfection of reading, writing, and speech depends upon education. Although the lower animals may have some way of communicating with one another, speech and the allied functions, reading and writing, are peculiar to the human being and are the result of a great deal of instruction in the line of imitation and study.

These functions depend upon a healthy brain.

Like all knowledge the art of reading is acquired from sensory impressions. It is firmly established that the art of speech is not inborn but its possibility and mechanism are found in the normal human organism.

The art of reading and writing is derived partly from the sense of hearing; but, primarily, from the sense of sight.

In right-handed people, perception of the printed or written words are formed and their memories stored in the cortex of the left occipital lobe; and from this area impulses pass along the association fibers beneath the angular gyrus to the base of the left inferior frontal convolutions and the base of the left middle frontal convolutions, where are stored the innervations of speech and writing respectively.

Therefore, lesions in the region of the left angular gyrus will cause word-blindness.

The person thus afflicted is incapable of normal speech for want of visual memories of written or printed words.

He cannot read written or printed words or letters.

He cannot execute written commands, but readily obeys verbal ones.

In speaking he rarely uses a wrong word, and if he does he is conscious of his mistake.

He can write from dictation imperfectly, but not at all from copy and makes many mistakes in spontaneous writing.

He cannot read what he has written.

Fortunately, cases of true wordblindness are exceedingly rare.

Education has much to do with the development of the activities of the cerebral cortex and obviously with the intelligence and response to special educational and training methods, but there are individuals who, partly in consequence of a defective brain and partly due to some transitory partial aphasia of visual sensations and impressions, present insurmountable obstacles to the educator as well as to the specialist.

Enlarged blindspots in children during the formative period appear to occupy a very important and easily measurable part among the various causative factors of remedial reading problems.

Since the study of the blindspot, a part of the visual field, is the study of the eye in use, the foundation of the subject is in the anatomy and physiology of the retina. For this reason a short review of the essential processes involved is almost necessary before discussing actual case records.

THE BLIND SPOT

In 1668, Mariotte discovered the blind spot in the human eye. He presented his discovery to the king, using a simple method. His Majesty was directed to fix his eye on a stationary object while Mariotte brought into his field a lighted candle, the flame of which disappeared when its image fell upon the physiologic blind spot.

This normal blind spot is located on the nasal side of each eye. According to H. S. Gradle, the following information regarding the location and size of the blind spots is generally accepted. He used an inner pole magnetic screen to obtain results.

Distance from fixing point to exact center is $16^{\circ} 35' 32''$.

Distance from fixing point to int. border is $13^{\circ} 15' 35''$.

Distance from fixing point to ext. border is $18^{\circ} 9' 35''$.

Horizontal diameter is $4^{\circ} 54'$.

The top is $2^{\circ} 58'$ above the horizontal meridian.

The bottom is $4^{\circ} 47'$ below the horizontal meridian.

Vertical diameter is $7^{\circ} 45'$.

The blind spot over a period of decades has received a great deal of attention in the diagnosis of glaucoma, this treacherous disease of middle age with the inevitable end "blindness", even enucleation of the eyeball if not discovered in the early stages. In pathology of sinuses enlarged blind spots have been found. The location of the blind area may be altered somewhat by high degrees of myopia or hypermetropia. Generally speaking, abnormalities of the blind spot have been associated with actual pathology.

It has been claimed that the glaucoma blind spot is a distinctive type, a finger-like defect proceeds from the blind spot sooner or later and is one of the earliest signs of glaucoma. It is called the Seidel sign. The Bjerrum sign is a large finger-like process from the blind spot extending in the form of an arc toward and often involving the fixing area. This is considered a late sign of glaucoma simplex.

Recent investigations of form fields conducted at the San Francisco Polyclinic and Post-Graduate College and among a large number of persons in private practice have produced information of form field collapse which undoubtedly will affect the diagnostic value of blind spot measurements in glaucoma.

The form field measurements below cover the examination of 150 patients. Among these, the form field taken with a 5mm. white target, 30 left eyes and 31 right eyes definitely were including a portion of the blind spot; while in 23 left and 25 right eyes the form field approached the blind spot so closely that

the usual elongation of the standard glaucoma signs could not be ascertained accurately.

FORM FIELD MEASUREMENTS MADE AT THE
SAN FRANCISCO POLYCLINIC AND POST-GRADUATE COLLEGE

Number of patients examined - 150 (non-selected group)								
Age	Male	Female	10°		15°		20°	
			L.	R.	L.	R.	L.	R.
Under 40	3	10	4	4	5	3	3	4
41 - 50	6	5	2	2	3	4	6	5
51 - 60	8	14	4	4	6	8	11	10
61 -	1	12	2	3	6	3	3	6
			12	13	18	18	23	25

The same ratio exists in subsequent lists prepared at the San Francisco Polyclinic and similar results were obtained in private practice. It is obvious that if measurement of the blind spot is made in these cases without considering the restricted form fields, many enlargements will be noted. It does not appear to be out of the question to assume that many errors have been made in the interpretation of these early signs of glaucoma. Among these patients showing restricted form fields, no symptoms of glaucoma were noted.

These decisive collapses of the form field occur in adult life and are usually the result of focal infection and possibly other types of pathology. After the removal of the causative agent the size of the form field returns to normal within 24 to 48 hours.

BLIND SPOTS IN CHILDREN'S EYES

In young persons of school age, collapsed form fields are rarely found. The simple technique generally utilized to measure the size of the blind spot can easily be acquired. In office or clinical practice a campimeter or tangent screen is employed to make this test. It consists of a flat surface, either a

screen made of black cloth or an ordinary blackboard. In the center is placed a fixation target, often a white spot with a black cross. The size of the fixation target should be in harmony with the size of letters used in the elementary grades.

TECHNIQUE OF MEASURING BLIND SPOTS

The technique is as follows: One eye is occluded, and the patient's open eye is placed in line with the fixation target at a distance indicated by the size of the screen. The child is then told to look at the white spot, never to lose sight of the fixation mark. While the child's attention is thus fixed on this spot, the target-holder is brought into position between the blind spot and the fixation point. Upon questioning, the child will decide if two objects are seen or one. Again the child's attention is directed toward the fixation mark, and then the target is moved outward until it disappears completely. If the target cannot be seen, it is evident that the object falls within the blind spot. Again impressing upon the child never to lose sight of the fixation mark, the target is then moved in various directions - up, down, in, and out, until the child can detect its presence in the field. These various points are marked and represent the extent of the blind spot. For finer measurement a smaller-sized target is utilized.

SUGGESTIONS FOR BLIND SPOT MEASUREMENTS FOR TEACHERS

In office practice blind spot measurements are usually made on a black surface with a white target, and while they may represent the result of careful calculations on the part of technicians, I suggest a departure from this method of procedure. A white card 9" x 13", the size based on a distance of 12-1/2" from the eye to the fixation mark, with blind spots marked at the proper angle, is suggested. The card should be placed on the school desk. The only measurement necessary, therefore, is the distance from the eye to the mark of the test chart

which must never be altered. The fixation mark can consist of the letter "X"; the size to be determined by the grade of the child under examination. Then a thin strip of white cardboard about $1/4$ " in width is utilized. One end contains a black mark 5mm. in diameter; on the other side a black dot 1mm. in diameter - letters can be used on the other end. This target then is moved by the teacher as indicated in the previous paragraph. A pencil will be utilized to make the marks. Other data necessary are the name, the age, the grade, the date, and the time of day at the time the tests are made. This method will approximate natural reading conditions, and the results will closely resemble those obtained in office practice.

The following standard cases appear to demonstrate the importance of enlargements of the blind spot not associated with disease, but resulting from transitory visual aphasia, the apparent reason appearing to be a desire to eliminate double vision or abnormalities in binocular perception. There is no doubt in my mind that many cases of young people present reading problems as a result of the reduced usable area between the blind spots and the fixation point. This will naturally reduce speed and efficiency of reading, due to improper perception of groups of letters and words and may produce symptoms which resemble wordblindness.

The most sensitive portion of the human eye, the fovea centralis, and the immediate macular region covering an angle of five degrees is the only portion endowed in the retina to receive detailed perception of form and line, small stationary letters and objects. Immediately surrounding the macular region, we find retinal elements particularly adapted to receive the contours and outlines of form, and moving objects are more readily recognized. The small angle produced by macular perception does not permit continuity of interest in reading. Strong impressions received by the pericentral and paracentral visual fields after proper education occupy an all-important role in mastering the art of reading.

A child properly trained with no physical handicap in the relative size of his visual fields often retraces his fixation when a new word of unknown construction is inserted in his reading matter, and then may study the alphabetic structure of that word before committing it to memory.

Enlarged blind spots reducing the area of visual perception will not permit satisfactory results in intelligent reading unless their causes are analyzed and eliminated. A very simple procedure, occlusion of one eye for a few days, will establish the status of enlarged blind spots.

1. If they are physiologic in character and voluntarily produced by the higher centers of the brain to permit comfortable vision, they will reassume normal shape when the control tests are being made.

2. If they are the results of pathology, no change in relative size will be observed.

- - - - -

It appears very definitely established that these decisive enlargements and subsequent recoveries of blind spots occur primarily in young persons prior to the age of 14. Comparative tests made among adults with definitely established phorias have not produced the same results. It is also very interesting to note that enlarged blind spots in young people manifesting during the course of a day are always associated with difficulty in maintaining binocular perception.

CASE I

Male, age 7, made October 9, 1935.

Chief complaint: Cross-eyedness was first noticed by mother at eleven months of age. Glasses were prescribed when he was eighteen months old, and he has worn them constantly. Except for frequent changes in glasses, nothing else was done.

Anterior inspection: Left eye reveals two minute corneal scars.

Static retinoscopy at 20 feet: O.D. +8.50
O.S. +5.50

Dynamic retinoscopy at 18 inches: O.D. +11.50
O.S. + 7.00

Visual acuity with prescription: O.D. 1%
O.S. 100%

The right eye showed a decided deviation in, a convergent strabismus of 33 degree angle.

CASE ANALYSIS

Convergent strabismus with a definite amblyopia exanopsia of the right eye.
Prognosis - good.

THERAPY

In order to re-stimulate visual perception in the right eye, the following method was employed:

His left eye was bandaged during the entire performance of a talking picture show. Maximum visual stimulation is possible due to the continuity of interest aroused while the plot develops on the screen, and through the coordinative influence of auditory perception continually aroused by sound synchronizing with the motion picture story, sight was restored in a remarkably short period of time.

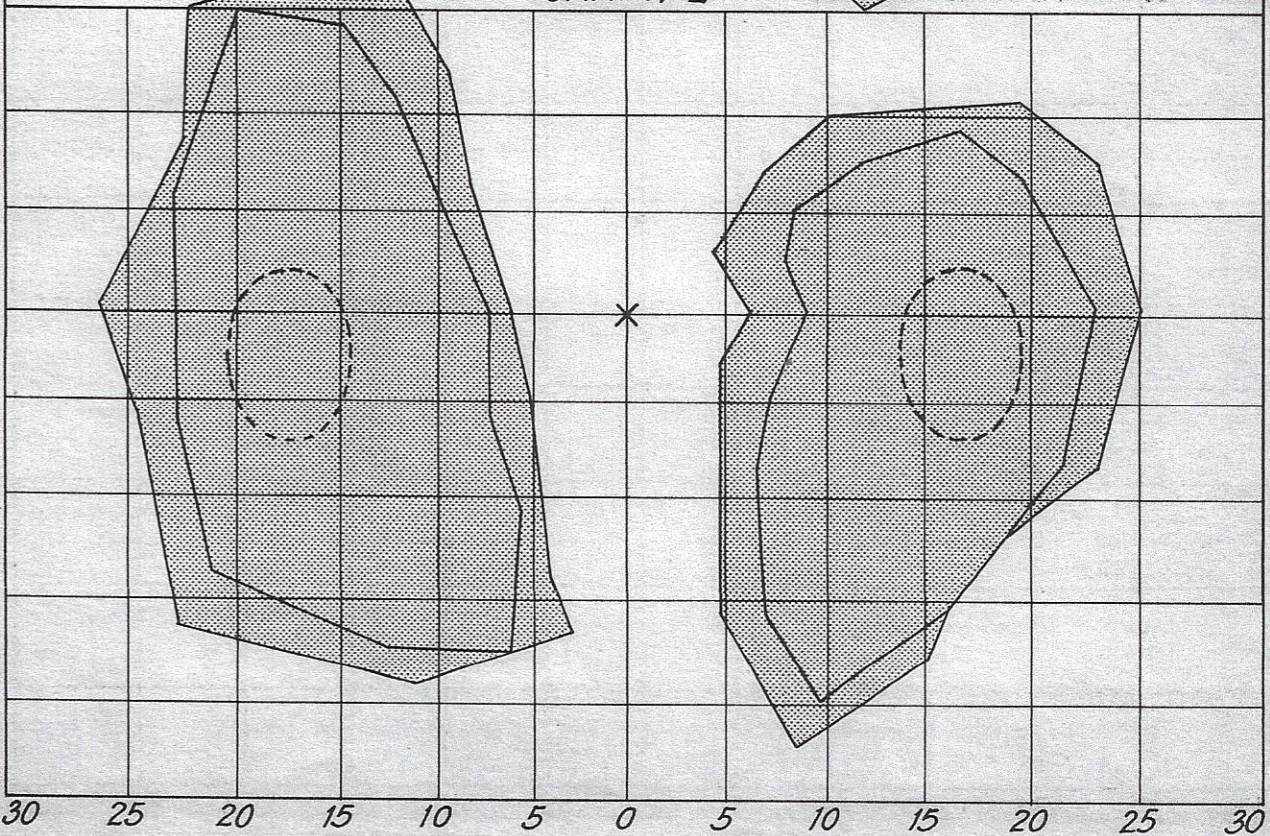
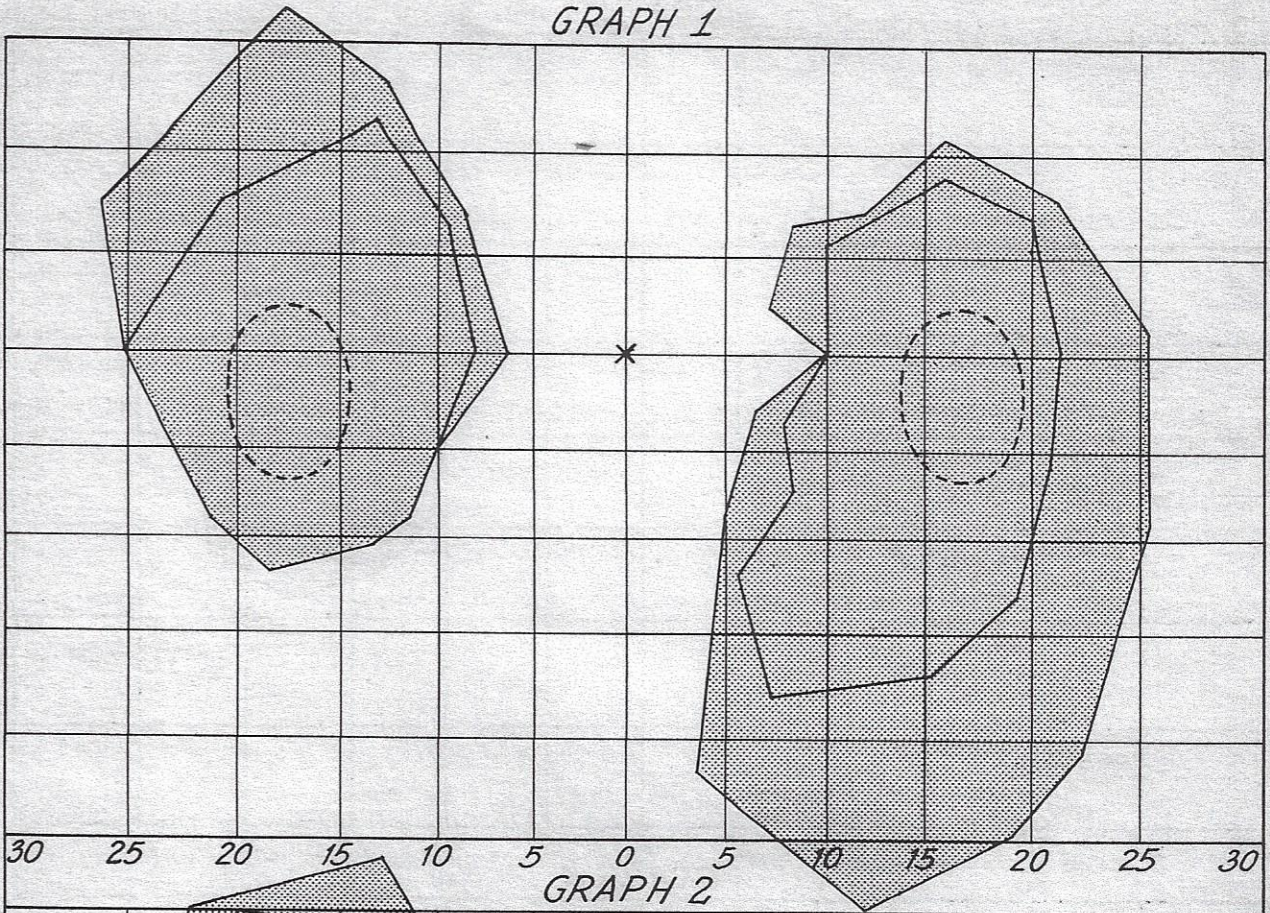
Previous visual efficiency	Right eye	1%
After attending one show	Right eye	20%
After 3 visits to a talking picture, following the same procedure	Right eye	76.5%

The boy returned to the office on November 12, 1935, showing a collapse of the visual efficiency in his right eye of 20%. One visit to a show restored his visual acuity to 76.5%.

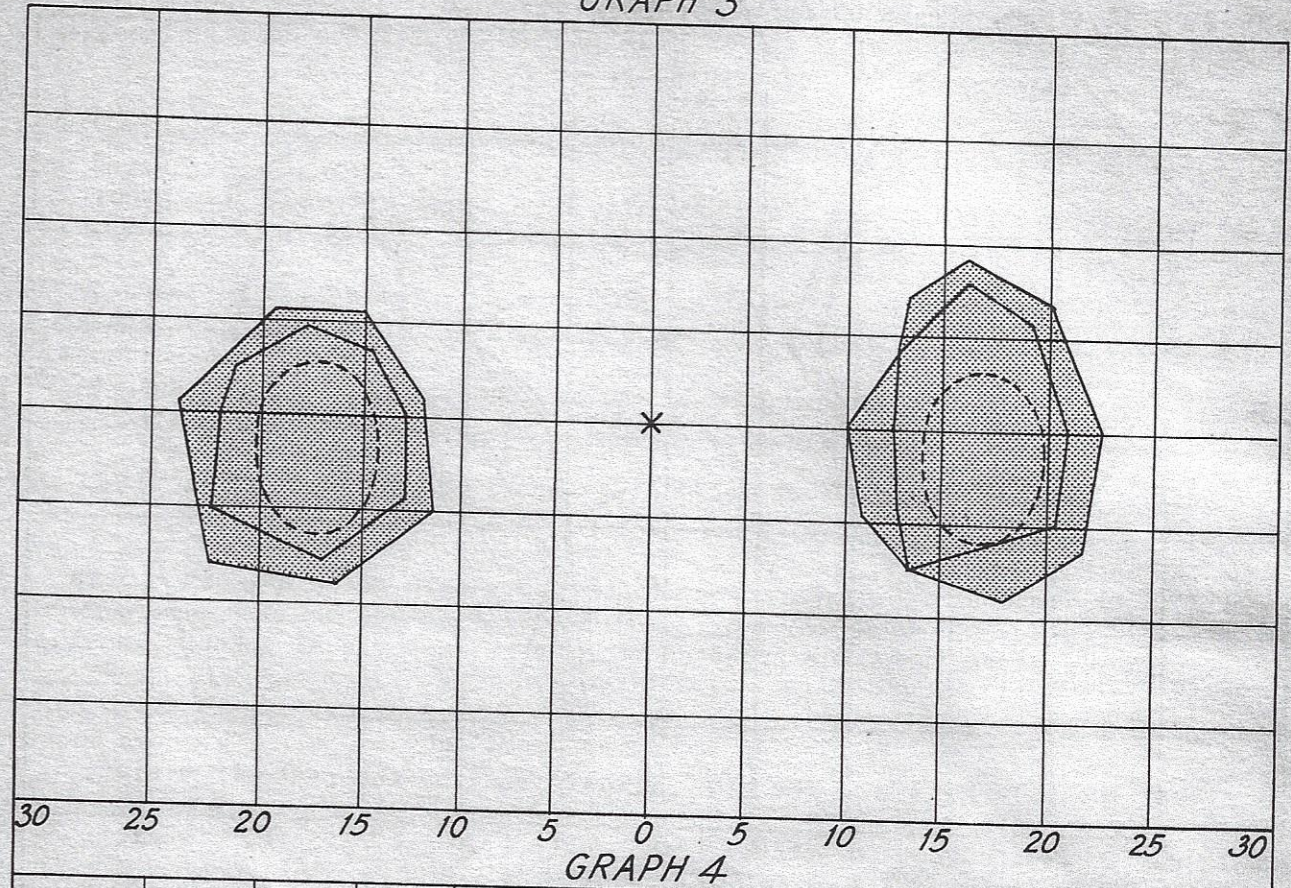
Instructions were sent to his teacher to bandage the left eye for a period of not less than one hour daily, thus permitting the boy to read and write, gradually reducing the size of the print. The teacher cooperated and on December 23, 1935, re-examination of his right eye revealed visual efficiency of 95.5%.

The cross-eyed tendency was under control in the forenoon hours with an occasional deviation of the right eye nasalward whenever fatigue manifested.

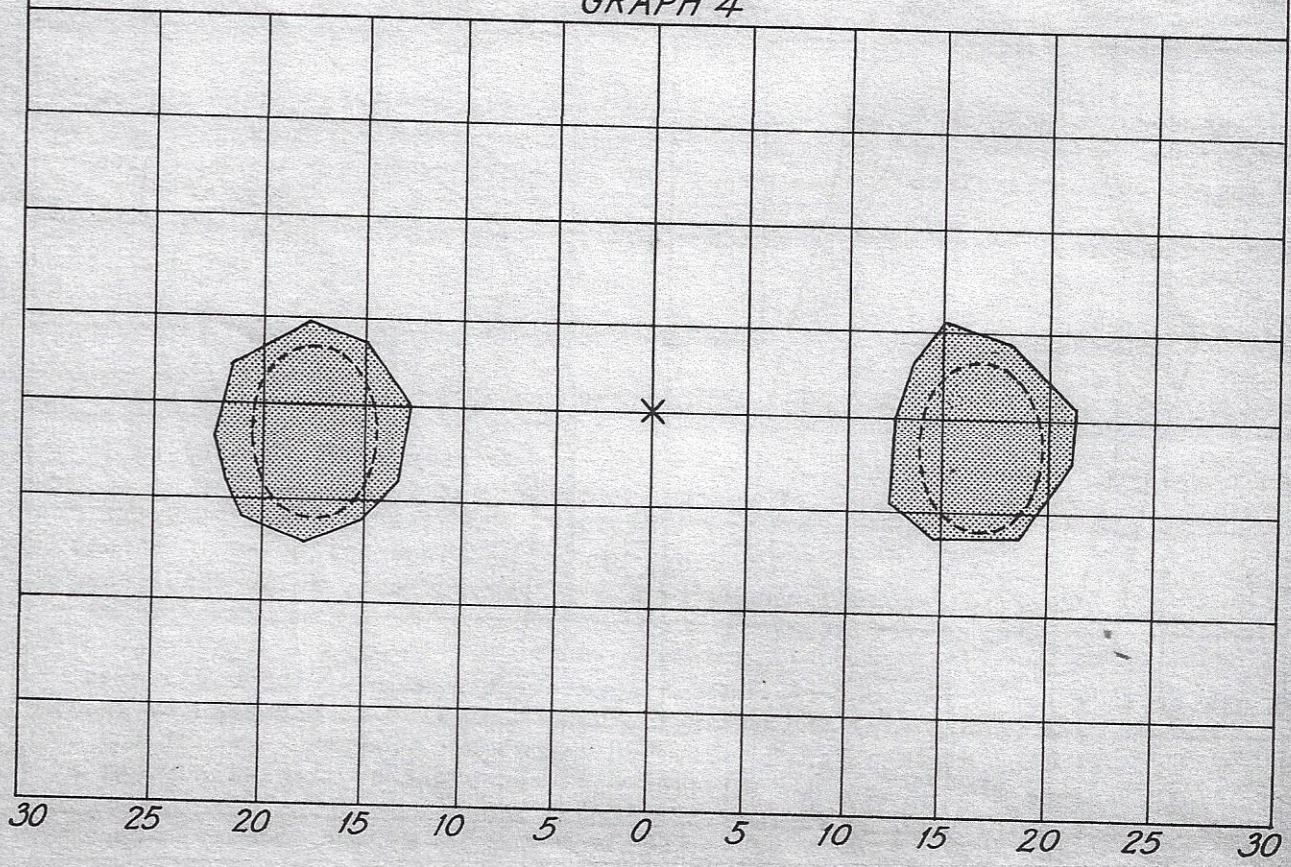
CASE I
GRAPH 1



CASE I
GRAPH 3



GRAPH 4



Graph 1.

On June 16, 1936, the blind spots were measured. Instructions were given to the mother to bandage one eye occasionally.

Graph 2.

Re-examination made on June 18, 1936. The boy, being extremely fatigued, showed similar large blind spots.

The mother was then instructed to keep the right eye of the boy constantly closed after supper time until he retired, and bandage the other eye as soon as he opened his eyes the following morning.

Graph 3.

On June 19, 1936 at 9:20 A.M. normal blind spots were revealed. This case record definitely establishes the presence of a transitory visual aphasia, manifesting after binocular usage of the two eyes became burdensome. It is also evident that the enlargement of the blind spots, reducing the range of vision, was voluntarily created by the active visual centers in the cerebral cortex.

Graph 4.

Measurements made September 17, 1936 indicated almost normal blind spots. Home stereoscopic exercises given every night for a period of ten minutes established orthophoria.

CASE II

Male, age 8-1/2, examined April 1, 1936.

Chief complaint: Deviation of right eye outward. Occasional difficulty in reading, parts of certain words appear to fade out.

Present history: Occasional double vision, biting of fingernails, and presence of self-consciousness toward his eye defect, well-established monocular vision.

Past history: A few months before, an eye specialist examining the boy's eyes and recognizing the divergent squint offered to the boy the following explanation: "Jim, you cannot use your two eyes at the same time. You can only see with the right or the left eye at a time." Nothing further was done.

Ocular examination made on April 1, 1936.

Fundus: Normal.

Anterior inspection: Normal.

Visual acuity: O.U. 100%

Static retinoscopy: O.U. +.25 x 90

Dynamic retinoscopy: O.U. +1.50 +.25 x 90

Binocular tests were impossible. To all tests the boy replied that he could only see with the right or with the left eye. After three weeks' attention, the boy finally registered binocular perception showing a divergent squint of 24 prism diopters.

CONCLUSION

It is obvious that the suggestion offered by the eye specialist regarding one eye usage was readily accepted by the boy's mind as a solution of his disturbing double vision. Both eyes were equally alert and normal.

Graph 1.

Blind spot measurements made on April 1 revealed a transitory visual aphasia, offering a possible explanation of the occasional disappearance of words during his reading.

Graph 2.

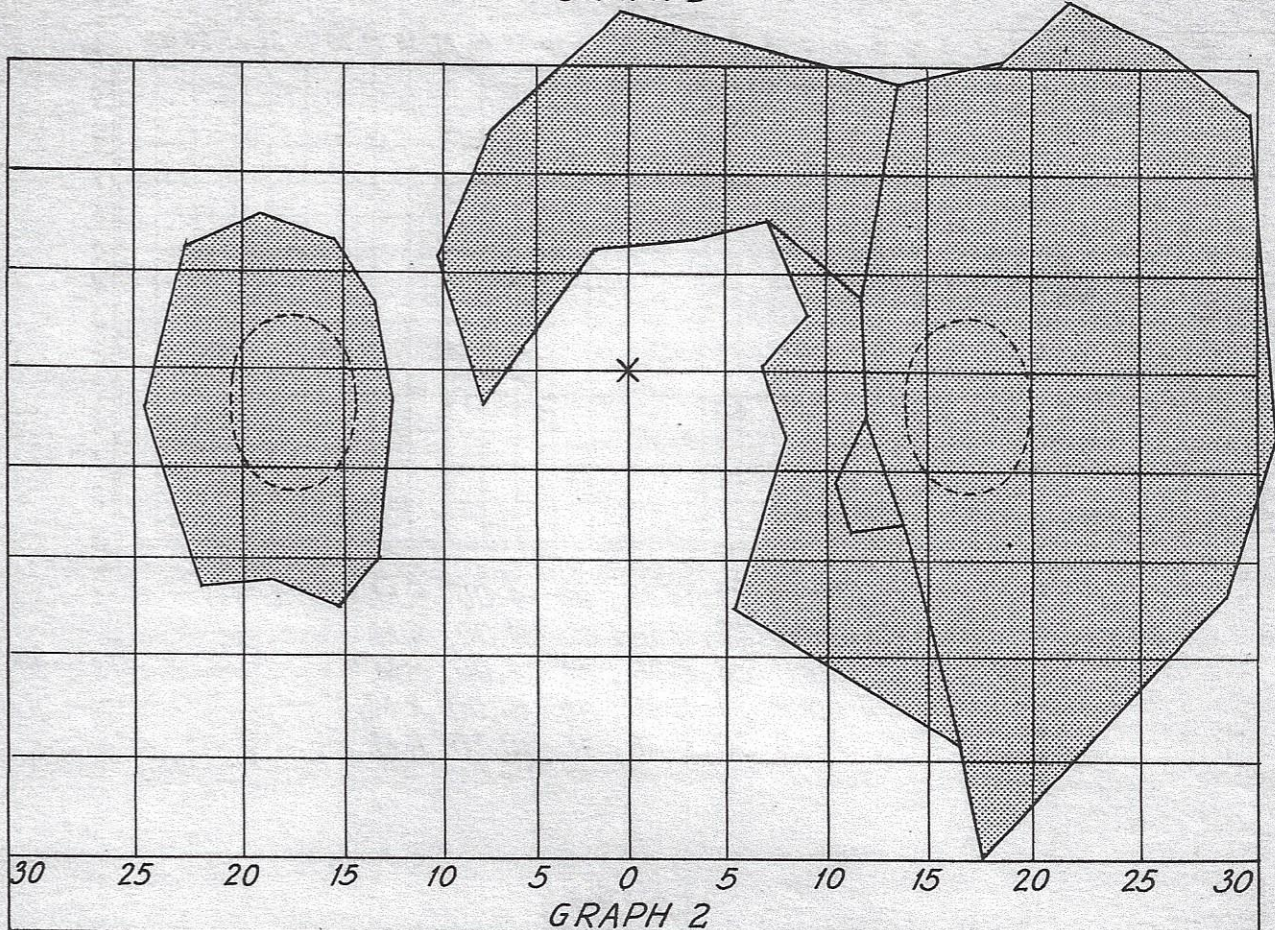
Blind spot measurements made on April 28, 1936 at 4:00 P.M., after wearing a bandage over the right eye in the forenoon and over the left eye in the afternoon, registered a decisive recovery.

Graph 3.

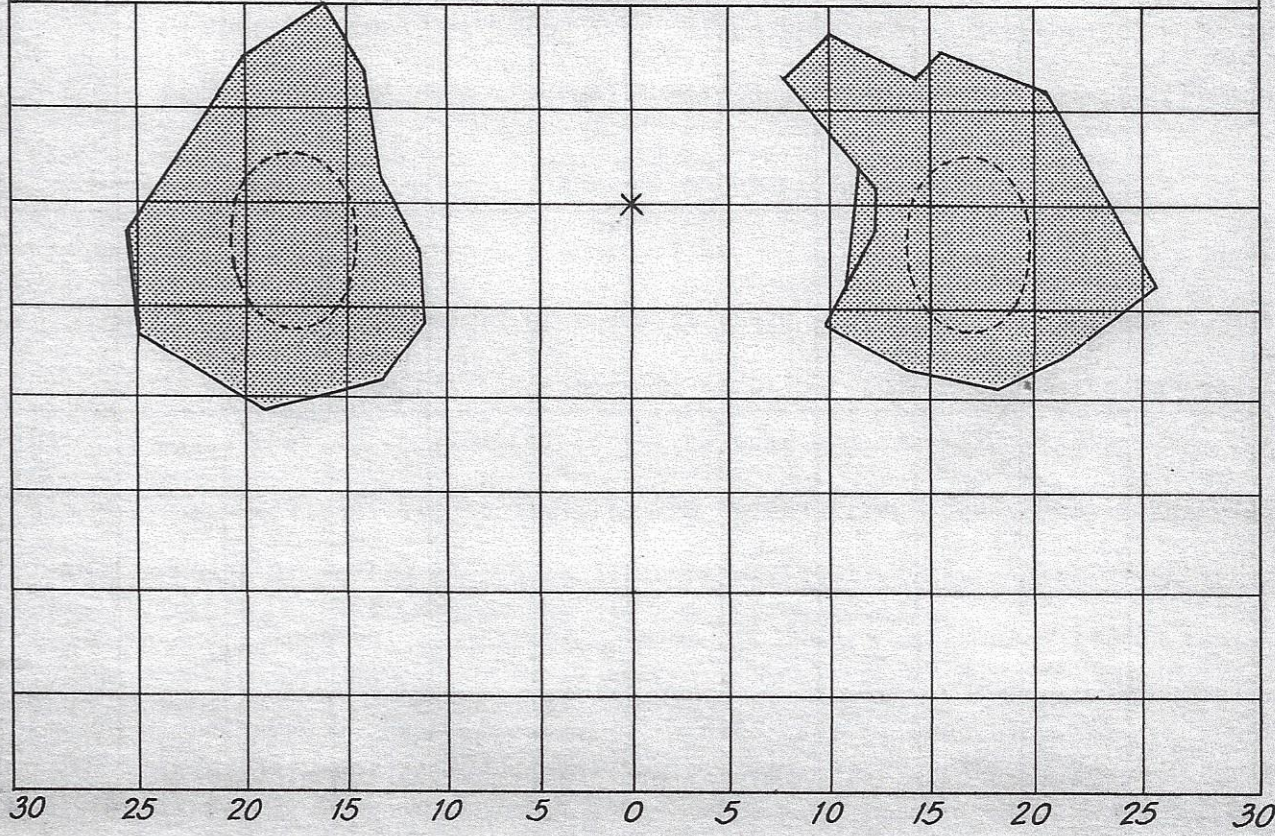
Myoculator measurements made at the distance of 40 inches, using the red and green color technique indicate the progress made in the case.

- A. April 27, 1936, at 4:00 P.M., single vision with 24 prism diopters base in. This was prescribed and the boy was sent to a talking picture. (No occlusion.)
- B. April 28, 1936, at 11:00 A.M., prescription was reduced to 18 prism diopters base in. Again he was sent to a talking picture.

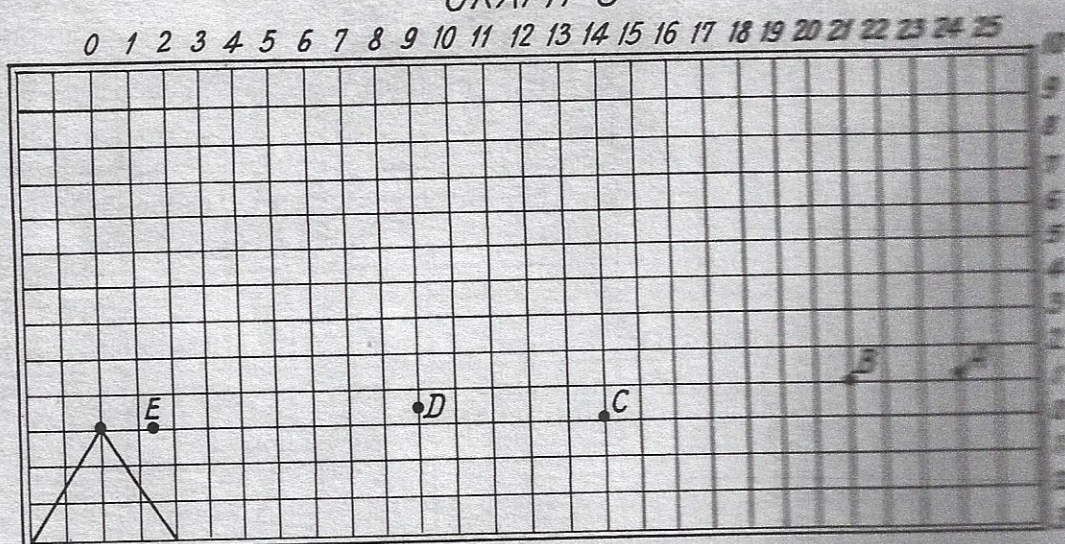
CASE II
GRAPH 1



GRAPH 2

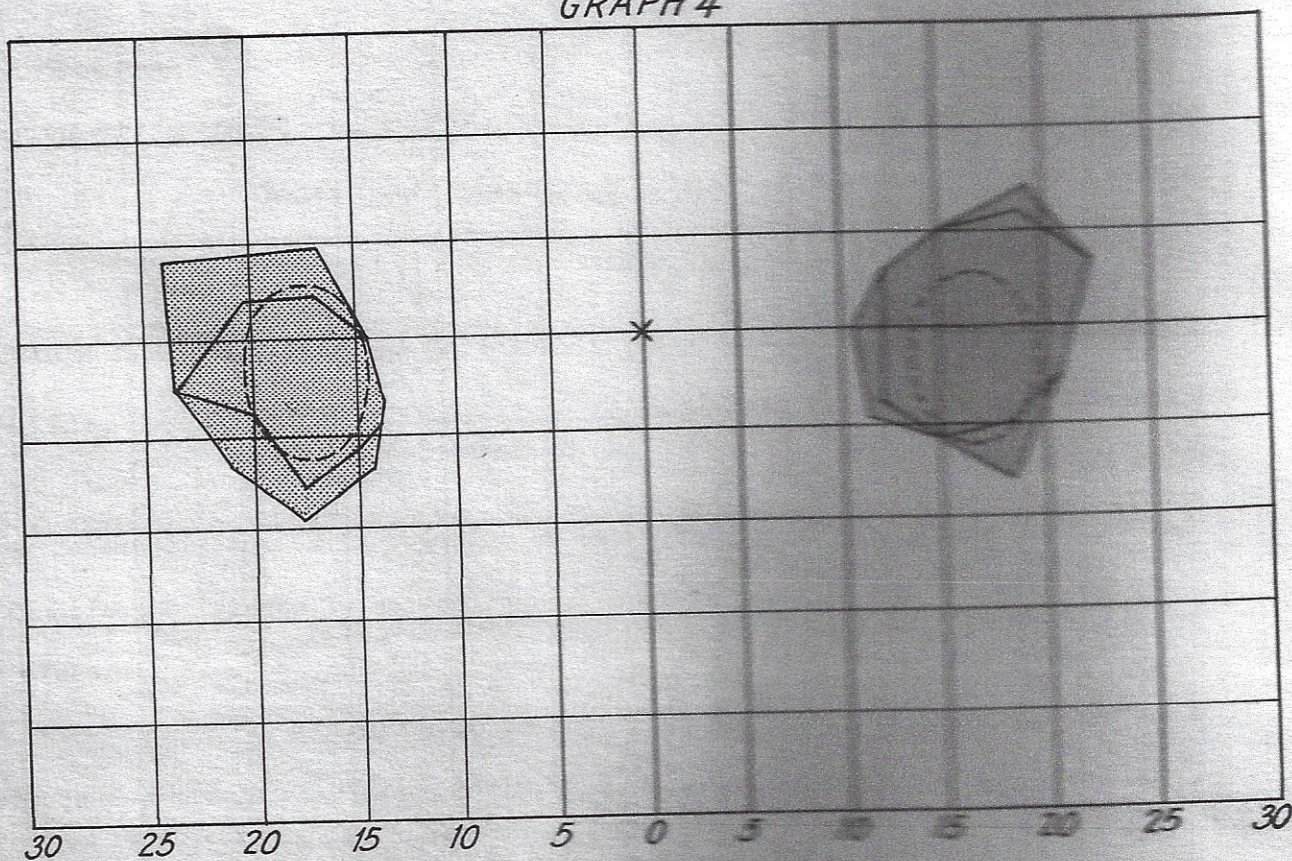


CASE II
GRAPH 3



- A. April 27, 1936, at 4:00 P.M.
- B. April 28, 1936, at 11:00 A.M.
- C. April 28, 1936, at 4:00 P.M.
- D. April 29, 1936, at 10:00 A.M.
- E. April 30, 1936, at 10:30 A.M.

GRAPH 4



- C. April 28, 1936, at 4:00 P.M., prescription was reduced to 14 prism diopters base in.
- D. April 29, 1936, at 10:00 A.M., prescription was reduced to 9 prism diopters base in. Orthoptic exercises for twenty minutes.
- E. April 30, 1936, at 10:30 A.M., prescription was reduced to 3 prism diopters base in. Binocular test showed fusion and both eyes had assumed a normal relationship as indicated by graph. Instructions were given to the mother regarding the posture and reading distance, emphasizing the necessity of sitting erect and looking straight at the reading range indicated by the right-angle position of his arm.

The boy returned to the office after having worn a broken frame, tilting the position of his lenses, and a divergent tendency was again noted. The lenses were placed properly in front of his eyes and he immediately re-assumed control over his two eyes. In order to re-establish permanency of eye control, stereoscopic exercises at home were prescribed and the case was discharged a month later.

Graph 4.

Taken June 22, 1936, at 11:30 A.M. Blind spot measurements taken with a 5 and a 1mm. target indicate a normal condition. Wearing of prismatic correction was discarded, divergent squint had entirely disappeared.

CASE III

The following case record of a boy 13 years of age presents almost a classical procedure, establishing the necessity of blind spot measurements in reading problem cases. The very decisive indications of recovery achieved through the analysis of the visual difficulty produced by enlarged blind spots encroaching upon his range of vision and the subsequent application of special educational training and attention, synchronizing with ocular training, make it advisable to give as much of the pre-history of this case as possible.

The efficient and detailed examinations and reports made by various special-

ists prove that every effort had been made to correct the boy's difficulty in acquiring the art of reading.

PAST HISTORY

Correspondence relating to previous reports of investigations made in Case III.

November
Tenth
1933

Report of Ophthalmologist to Physician

Case III, whom I first saw in March, 1931, had a convergent alternating strabismus of twenty degrees, favoring the right eye. He was hyperopic +1.75, for which I prescribed glasses. Patient did not wear them. His vision was 8/10, and JI, each eye. The optic discs were slightly congenitally anomalous. Although functionally normal, such appearance of the optic disc is regarded as a not uncommon stigma in congenital anomalous children.

Upon seeing the boy again on November 3, 1933 he was very carefully examined in the light of some new work we have been doing with the following interesting results.

Vision: R. 5/10 and L. 8/10; convergent strabismus without glasses. With his glasses (which he has not worn) the eyes are sometimes straight; for near they are always straight - that is, he has binocular vision for near. He shows a very marked dominance of the left eye. He is naturally a left-handed individual and writes with his left hand. He throws a baseball, plays golf, etc., with his right hand. He is a typical mirror writer, writes and reads very slowly. He picks up right-handed tools in a left-handed way - that is, when picking up a knife with the right hand, the cutting edge is turned outward.

We have, therefore a definitely left-eyed boy with acquired right-handedness; he uses his eyes together for near; his ductions are slow and stereopsis is definitely reduced. There is, in my opinion, no question but that if his brain pat-

terns were definitely right or left-sided, as in a normal individual, and not cross-wired, he would be relieved of confusion and of a great coordinative effort which he is now required to expend.

I believe that such small neurotic trends and actions which he shows, twitchings, etc., are in indirect relation to the excessive energy which it is necessary for him to waste upon his eye coordinations.

During the course of our tests, which afford us a rather good conception of the patient's intelligence, and the general conversation which was entailed, it is our impression that he shows a normal understanding of many subjects, normal planning and actions in every way for a boy of his age. His reading and writing, and, therefore, any educational quick effort, seemingly demand a great effort on his part. Yet, he would not seem to show any feeling of inferiority on any subject, even in his school work, nor does he ever apologize for any action performed by him.

In my opinion, this boy should be changed back to left-handedness in all things, as his brain pattern is centered and more active for left-handed coordination. We would suggest, by means of exercise, to reduce the dominance of the left eye by rebuilding a right-handed brain pattern of action when the right eye is used. This would induce a certain ambidextrousness which will result in his using either eye with its correlated hand.

Naturally, I do not presume that these eye factors are the whole or even the major part of his difficulties, and whatever work is done in this line will bear better fruit by taking care of his endocrine anomalies at the same time.

From our experience in the last year with this type of thing, I do feel very hopeful that this boy will markedly respond and that his school work will materially improve - his writing, for instance, I should say by 50% at least, as a result of the above-mentioned coordinations.

It would require some four to six months of work, at first under active

supervision, later much of the work can be done at home. I would much appreciate the opportunity of discussing this very interesting case with you personally, as I am most interested in it and feel that the boy can be definitely helped in the above-outlined way.

November
Twenty-fourth
1933

Report of Neurologist to Examining Physician

Re: Case III

Chief Complaint: Lack of concentration.

Present Illness: The patient has suffered from birth from the condition he has now. He was a premature child, and at birth had a contracture of both Achilles tendons, so that he could not get his heels down on attempts to walk. His speech is slow, and of a scanning, irregular type, and has always been of this character.

The boy likes athletics; is very athletic, but rather clumsy with his hands and feet. He likes to play football and golf; plays golf well. (??)

Does not play tennis, because of clumsiness with the hands.

Does not go to dancing school.

Patient is not allowed to go to parties, because of fear of ridicule of other children.

The child is amiable and jovial; is quite gregarious, gets on well with other children, but they are all younger than he is.

He knows what he wants to do, and pursues his routine with promptness - does not vary much from this.

When given several things to do at the same time he will perform them all correctly.

Child has a distinct moral and ethical sense of high development.

At the present time the patient is in the second grade at school; does well in some subjects, and poorly in others to be described later.

He does not read at all - knows a few letters - cannot see words as they are, they mean nothing to him.

Poorest subjects are reading and arithmetic. Changing money means nothing to him.

Writes more or less with his left hand, at first he was definitely left-handed. Plays golf with his right hand.

Past History: Premature birth; normal feeding, breast fed. At the age of two to three began to talk, and used words entirely normally. At the age of seven suffered from "terrible tantrums". No history of faints or convulsions.

Diseases: Pneumonia between six and seven.

Operations: Tenotomy at the age of seven.

Systems: Occasional uncontrolled bowel movements, systems otherwise negative.

Physical Examination: The patient is very well developed.

Head: is fairly well shaped, just slightly receding forehead, no other abnormalities about the head.

Ears: are well placed, same size.

Eyes: there is some muscular disturbance of the eyes which is being taken care of, no gross pathology.

External Genitalia: normal - both testicles are descended.

The physical examination is entirely negative, except for a scar of tenotomy performed at the age of seven.

Neurological Examination: shows a gait which is slightly spastic and clumsy.

Romberg: is negative.

Ataxia: slight ataxia both finger to nose tests.

B L I N D S P O T M E A S U R E M E N T S A N D

Deep reflexes: are all hyperactive.

Superficial reflexes: positive Babinski both sides.

Cranial nerves: are apparently normal.

Muscular tonus: slight increase in tonus only. No clonus. There are no atrophies.

Sensibility: intact throughout.

Mental Examination: The child is very pleasant, agreeable, his vocabulary is fair for his age, and for the amount of instruction he has had.

He sells papers of his own volition on Saturday mornings, making change well, but he cannot calculate even simple problems in addition, such as adding four and four; cannot subtract.

Spelling simple words of three letters is good, but beyond that means nothing.

He has learned to read according to the silent consonant system, but he fails in reading, or understanding words of more than four or five letters.

He writes left-handed, but not mirror writing. The configuration of the letters themselves looks like the writing of a two or three year old child, but this might be due to the defect of muscular tonus, and coordination.

Copies long words, but cannot re-write the words after the original word is taken away. Does not know the meaning of words.

When asked questions of moral and ethical significance he is very accurate and sensible about the answers. Defines charity and other words of complex meaning very well.

No hallucinations or delusions.

The mental examination reveals an I.Q. of 40-50. According to the Binet scale the patient reaches an intelligence of about five years of age.

Diagnosis: in this case is Cerebral Diplegia, moderate in degree, with mental retardation.

Recommendations: I believe this boy, with this positive form of intelligence defect, can be very markedly developed if he has the proper psychological training by a psychologist who could instruct him in the methods of expression and language. This training need not interfere with his regular school training with other children. I do not believe that any form of gland, or other treatment, would help this child, at this time, and might be detrimental.

The training he should receive would be purely for the matter of development, and as the boy is nearing maturity, and is at the age when he is pliable and eager to learn, any effort in this direction would possibly be followed by excellent results, as the seed would be sown in better soil now than at any other time in his life.

November
Twenty-ninth
1933

Reports of Ophthalmologist and Neurologist

Re: Case III

All the Doctors are decidedly interested in Dr. X's method, which is new to this part of the world and represents the last word in that aspect of science. Dr. N told me that his written report of November 24th does not today fully reflect his opinions; that since his report was written he has studied Dr. X's system, and is convinced that it is the most important thing that can now be done for the boy. He originally felt that the boy would never be more than 60% of normal mentality.

Dr. X says that his report, written three weeks ago, should also be changed, for he has now seen enough of the boy to feel much more certain of his (X's) success.

All the Doctors agree that the boy will never be wholly normal, but they are of the opinion that within a year, with a careful adherence to X's treatment, and with the necessary attention to such minor details as thyroid and teeth, his mental processes will closely approximate those of other children of his age. This applies only to his mental development: his arms and legs will never be wholly right. They assured me that the boy is in no sense feeble-minded, and that he is merely "retarded". This, they believe, Dr. X can measurably overcome. They feel that at the end of three months there will be so much improvement in his ability to read and write, to make change, etc., that their ultimate success will be apparent to all of us.

The Doctors feel that as the boy will have to see Dr. X three times a week for a long time to come, it would be wise to have him live in the city during that period.

They agree that, when Dr. X's treatments are measurably completed, the boy should be trained for at least one hour a day by a psychologist.

Dr. N feels that if a woman nurse is to be in attendance on the boy at his home, extraordinary precautions as to her prior training, moral habits, and personal qualifications are necessary. He does not believe that a housemaid should be intrusted with this duty.

I questioned each of the Doctors personally as to what is likely to happen to the boy when he reaches maturity, i.e., adolescence. My questions ran something like this: Is he likely to have tantrums and become violent at intervals? Is he likely to develop an abnormal sexual side? Is sterilization necessary? Is there any danger of his doing anything at any time after maturity that would bring sorrow and suffering upon his family?

To this they all agreed that, with a careful adherence to the plans and treatment above outlined, the chances are that the boy will steadily improve; that the chances are not more than two or three out of 100 that he will at any

time become dangerously violent, and that the so-called tantrums will become less and less frequent until finally they will disappear altogether. They feel that at the end of another year they will be able to give positive assurances on this point, and I notice that the more they study the boy, the more they consider X's method and the probable accomplishments of the psychologist, the more hopeful they become. The physician says if the boy is not sensibly improved at the end of a year or two, he will recommend sterilization, but he does not now consider that probable.

Summarized, here is the situation as of today: The boy should rigorously continue Dr. X's treatment. In the meantime those who have charge of him must decide, when the reports from the Doctors arrive, whether they want him trained by a psychologist or sent to a school.

March
Twenty-three
1934

Letter of Ophthalmologist to Guardian

Re: Case III

As far as his actual visual mechanism is concerned, the following has been accomplished: His mirror writing has ceased; that is, the reversion of numbers and letters. The sizes of the images of both eyes match up very much more closely than they did before and are practically equal; they are as yet too large. His doubling-up of vision has practically ceased.

Corresponding to the above, both his teacher and the boy himself claim he is reading definitely faster and more accurately than before. His reading for pleasure has increased in amount. It is our impression that his general memory tracts have definitely improved, inasmuch as he will recount in detail incidents in a way in which he was unable to do when we first saw him. His teacher states that there is a very definite change in his alertness and that his conduct has

greatly improved; he is not nearly so nervous, able to concentrate over a longer period of time, and is not as fidgety as he was. His general memory of all things has improved; writing and spelling more accurate; there is a 50% improvement over past mistakes; a noticeable change for the better in association habits; he is less inclined to fix on one thought; hysteria and temper of much less frequency and duration.

We are now starting him on the use of large printed letters, having stopped his reading for purposes of study until the present time. We feel he is now ready to start the acquirement of knowledge, etc., through reading and visual pathways and are, therefore, as stated above, putting him on large letters.

The boy has been going to movies which have been upsetting him, as he has the active imagination of a much younger child, combined with the intelligence of an older one, and I would strongly suggest that he be permitted to go only to very carefully picked movies of a comedy type.

We feel that at this time it would be well to have the Neurologist check up on the boy, as also the Physician, to endeavor to determine as to what changes have taken place. Our prognosis for the future will depend upon the Neurologist's and the Physician's examinations, compared with our findings. If it is agreeable to you, will you arrange for the doctors to see the boy. We will then further communicate with you.

CASE III

Male, age 13, examined December 2, 1935.

Chief complaint: Inability to read and difficulty in understanding printed words.

Anterior inspection: Small palpebral fissure.

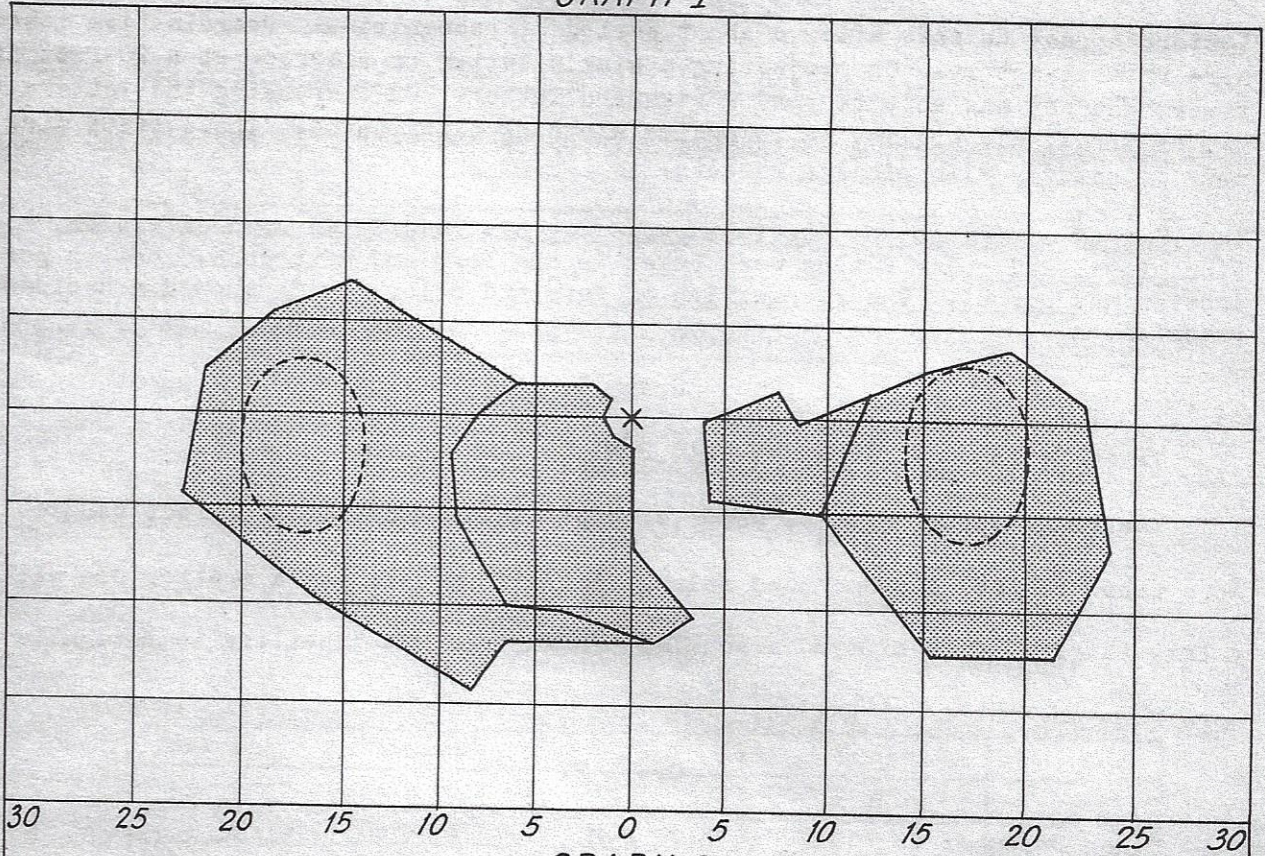
Fundus: Negative.

Static retinoscopy at 20 feet: O.D. +.25 +.50 x 105
 O.S. +.25 +.50 x 75

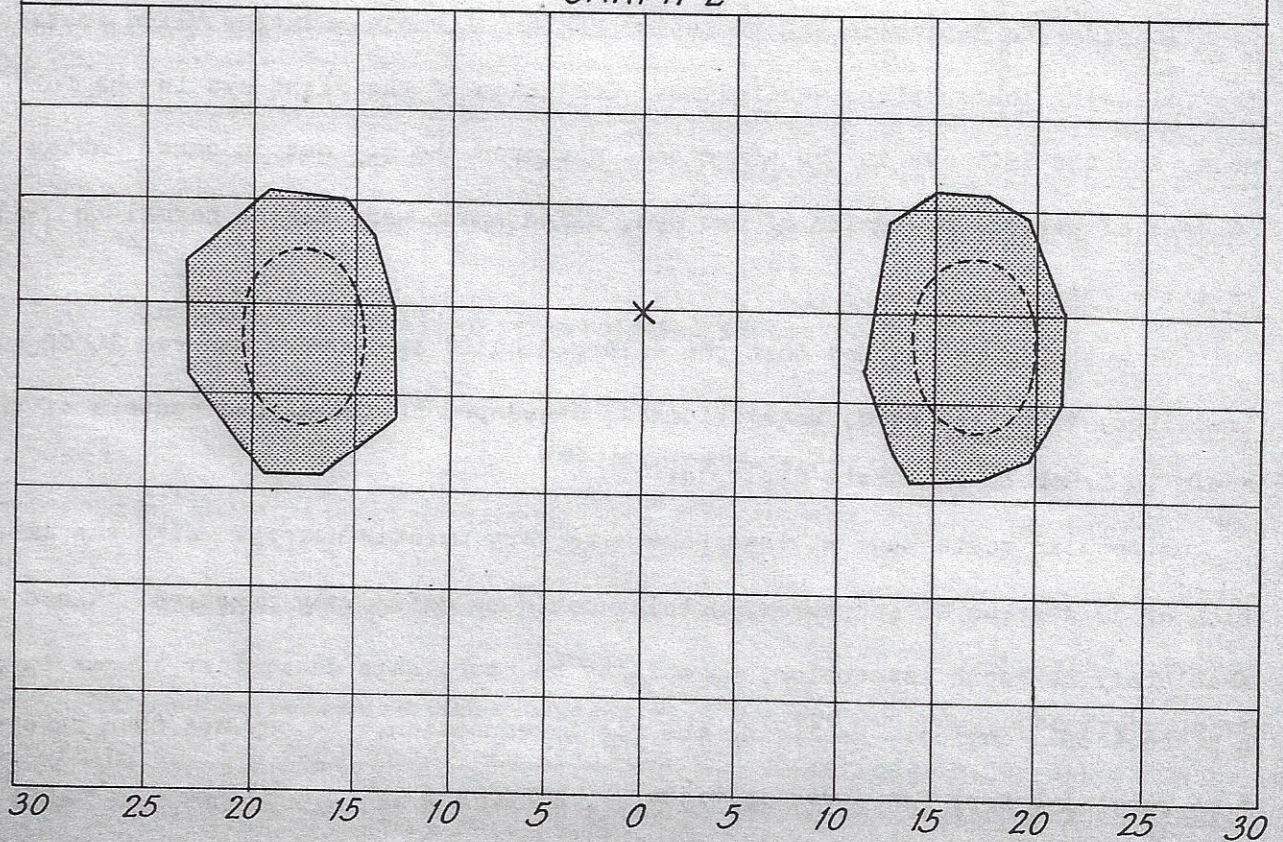
Dynamic retinoscopy at 14 inches: O.D. +1.75 +.50 x 105
 O.S. +1.75 +.50 x 75

CASE III

GRAPH 1



GRAPH 2



BLIND SPOT MEASUREMENTS AND

Visual acuity at 20 feet without glasses: O.D. 20/30
O.S. 20/30

Letters appear to fade after a short period of recognition. Coordinative tests were unsatisfactory. On projecting a single letter on a screen at a 20-foot distance, the boy was able to read a standard letter. On increasing the letters to two or three, his ability to recognize anything disappeared. These tests were made repeatedly with similar results.

In order to determine the possible cause for his restricted span of vision, motion, form, and color fields were taken in the fore and afternoon. Motion perception was normal. The recognition of form and color fields showed a decided restriction.

Graph 1.

Taken December 5, 1935, at 3:45 P.M.

The blind spots measured under controlled illumination of 9-foot candles were found to have a pronounced enlargement with a 5mm. and a greater one with a 1mm. target. This offered a possible reason for his inability to recognize more than one letter at a time.

Graph 2.

Taken December 23, 1935, at 3:30 P.M.

In order to determine the causative factor of these enlarged blind spots, the following instructions were given. Occlusion of the right eye in the forenoon, and the left eye in the afternoon, whenever the boy was indoors. After 18 days of partial occlusion of one eye, blind spots were almost normal in relative size.

It was then determined that the enlarged blind spots were the result of a transitory visual aphasia, unquestionably developed in the higher centers of the brain in order to eliminate diplopia.

Binocular tests made at that time were very unsatisfactory. With the exception of 10 degrees of esophoria, nothing could be definitely measured. There was absolutely no depth perception, no ability to coordinate dissimilar images through a stereoscopic device. Realizing the gap in education, the boy was then referred to a special school for investigation.

INTELLIGENCE TESTS

LEE-CLARK READING READINESS TEST

Made January 1936

		Possible Score	Pupil's Score
Test 1.	Matching	12	12
Test 2.	Matching	12	12
Test 3.	Cross Out	12	12
Test 4.	Cross Out	14	12
	TOTAL	50	48

PINTNER-CUNNINGHAM PRIMARY MENTAL TEST

Score - Excellent Comprehension

NEW STANFORD ACHIEVEMENT TEST

Made January 1936

No.	Test	Score	
1.	Paragraph Meaning	0	92
2.	Word Meaning	0	67
3.	Dictation	0	
4.	Arithmetic Reasoning	0	
5.	Arithmetic Computation	0	
	Total Score ($\div 5$)	0	

Score 0 - depending upon boy's ability to read.

Auditory - teacher reading, boy giving answers -

Paragraph Meaning 92

Word Meaning 67

Satisfied that child is in command of all facts and knowledge.

Inability to see causal factor of 0 score.

KUHLMANN-ANDERSON TESTS

Grade II.

Made May 1936

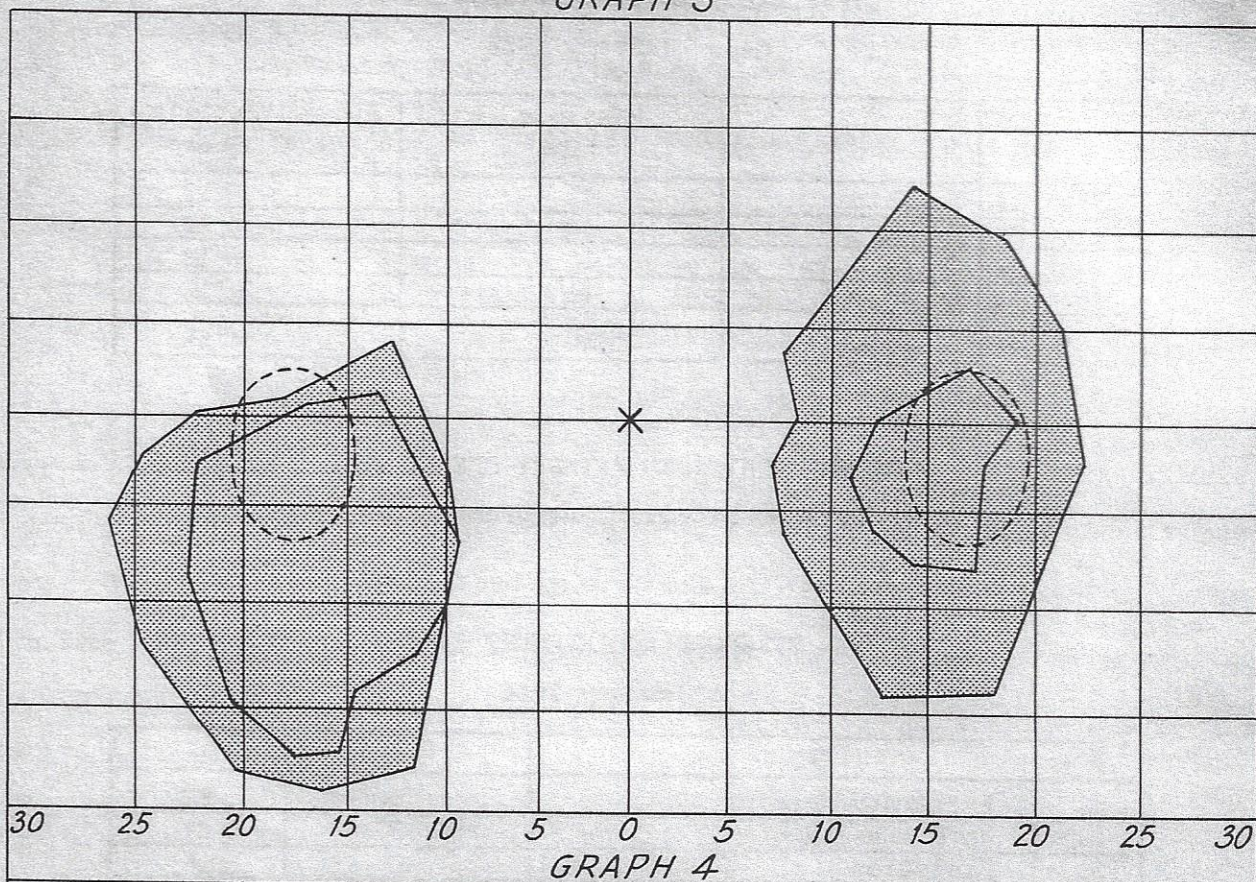
Complete comprehension. Quick in response.

- - - - -

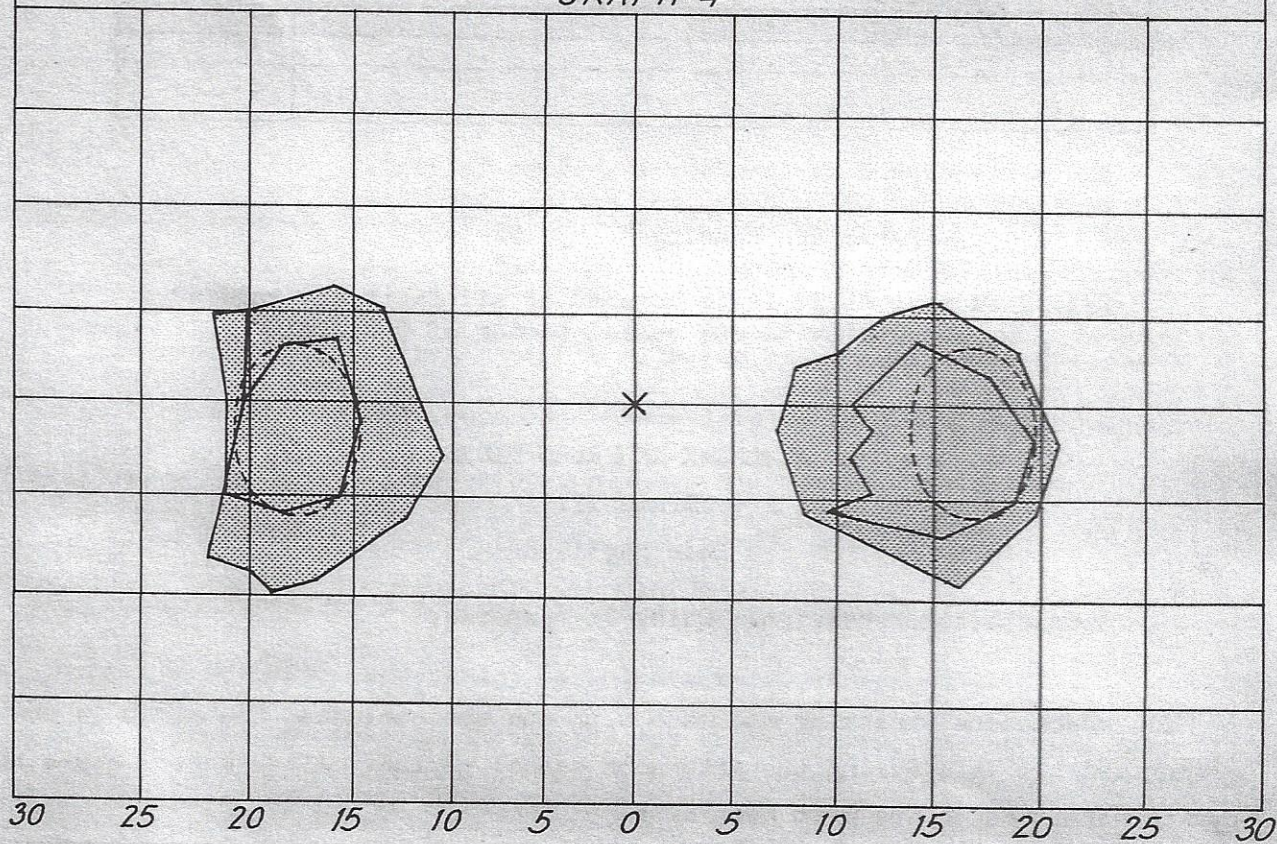
All educational training was made with one eye occluded, the right in the morning and the left during the afternoon school period. After school hours the boy was permitted to see with both eyes.

CASE III

GRAPH 3



GRAPH 4



Graph 3.

Taken February 10, 1936, at 3:30 P.M.

The boy appeared to be very fatigued and nervous. The school was transferred to a new location, and his playmate was in the hospital with appendicitis. Blind spot measurements showed again an increase.

Graph 4.

Taken March 9, 1936, at 3:00 P.M.

The blind spots have again assumed a nearly normal shape, and the first indications of binocular perception were noted. He appeared to respond to all ocular tests readily and was able to maintain bioceptive perception for a long period of time.

BOOKS READ FROM JANUARY 2, 1936 to MARCH 13, 1936

1.	Health Stories Book I Life-Reading Service Series	141 pages
2.	Health Stories Book II Life-Reading Service Series	167 pages
3.	Number Stories Book I Curriculum Foundation Series	141 pages
Unit Study Books No. 110 by Eleanor Johnson		
4.	Library	24 pages
5.	Our Houses	36 pages
6.	Farm Animals	36 pages
7.	Circus	32 pages
8.	Pets	32 pages
9.	Dairy	24 pages
10.	Keeping Our City Safe and Clean	24 pages
11.	Fireman	36 pages
12.	Policemen	36 pages
13.	Travels	36 pages

B L I N D S P O T M E A S U R E M E N T S A N D

Unit Study Books No. 203 by Eleanor Johnson

14.	Milk	36 pages
15.	Cowboys	36 pages
16.	Story of Transportation by Maud and Miska Petersham	30 pages
17.	The Story of Clothes by Maud and Miska Petersham	30 pages
18.	The Story of Houses by Maud and Miska Petersham	30 pages
19.	The Story of Food by Maud and Miska Petersham	30 pages
20.	Outdoors and In Happy Roads to Reading Second Reader by Dopp-Pitts-Garrison	248 pages
TOTAL		1240 pages

On June 2, 1936, the first indication of depth perception and stereopsis were noted and the following reading report indicates a decisive improvement in this case.

1.	Unit Activity Reading Series by Nila Banton Smith Second Reader	238 pages
2.	Visits Here and There by Harris Child Dev. Readers Second Reader	247 pages
3.	Comrades by Hardy and Hecox Good Companion Series	224 pages
4.	Elson Basic Readers Book II	235 pages
5.	We Play by Augsburg Child Activity Readers Primer	141 pages
6.	In and Out of School by Augsburg Child Activity First Reader	191 pages

As soon as the educational level has been raised, proper stereoscopic training will be beneficial. Ophthalmographic records made at certain intervals are self-explanatory. A noted improvement cannot be expected until the boy has advanced more along educational endeavors. The prospect to develop normally is excellent.

This case record clearly indicates the absolute necessity, not alone of better understanding, but of closer cooperation between the educator and the specialist for the benefit of the child with a problem.

CASE IV

Male, age 14, made August 3, 1936.

Chief complaint: Inability to make progress in acquiring the art of reading.

Has been under specialists' care since the age of 3.

Graph 1.

Indicates practically pinhole vision, and suggests bitemporal hemianopsia.

Graphs 2 and 3.

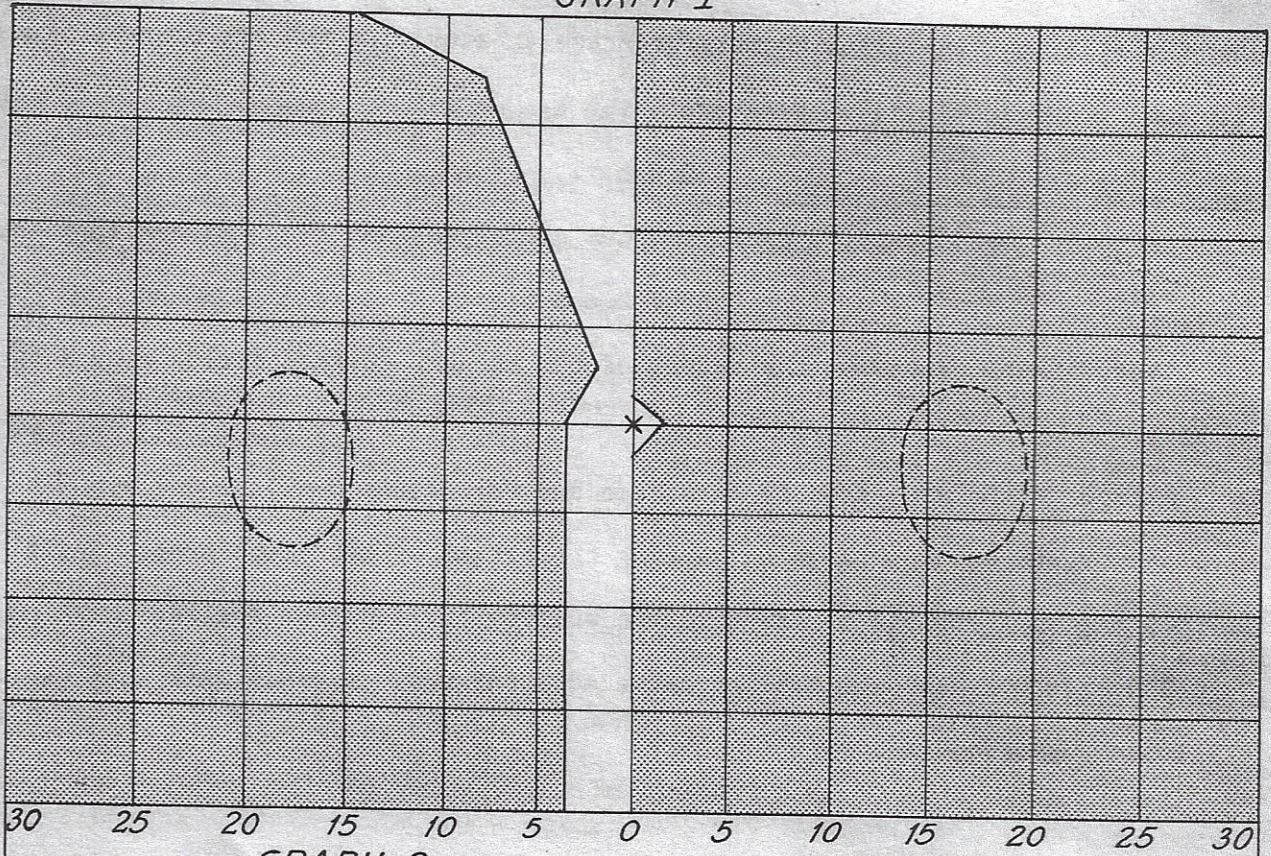
These graphs represent the extent of the motion and form fields with a 5mm. target.

Control tests were made in this case and regardless how long one eye was occluded, there was no change in mapping the extent of the blind area. It is obvious that all efforts to increase the ability to read were futile.

Subsequent X-ray examinations revealed a chiasmal lesion. This case is still under observation.

CASE IV

GRAPH 1



GRAPH 2

GRAPH 3

