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Abstract

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REHABILITATION OF AN EFFICIENT
BINOCULAR PATTERN THROUGH THE
INSTITUTION OF VISUAL TRAINING

by

Hyman Arthur Diamond

A Thesis Submitted to the Faculty
of Pacific University College of
Optometry in Partial Fulfillment
of the Requirements for the Degree
Doctor of Optometry

January 1953

CASE HISTORY:

Date: January, 1953

Patient: M. O., female, age 26 years, Forest Grove, Oregon

COMPLAINT: The patient was first examined in the clinic at Pacific

University on November 3, 1949. At that time she complained she had to squint to see clearly at near and far. She complained of headaches after reading for a short while, and also stated at that time that on occasions she saw double. This occurred when she was upset or nervous. Lens therapy was prescribed but visual training was not because it interfered with her domestic household routine. At subsequent examinations lens changes were made but visual training was not started because of her domestic routine interfered.

In February, 1952, she still had the same complaints as above, but the doubling had become more aggravated. Visual training was started at that time.

OCULAR HISTORY: The patient stated that she had been strabismic as a child and that it had been corrected through lens therapy and occlusion.

HEALTH HISTORY: The patient's past history includes numerous operations for removal of ovarian cysts. She also had several miscarriages. She had ocular discomfort after each. Some of the cysts have started to grow again and this affects her menstrual cycle. She noticed that her visual disturbances were intensified at those times.

PRELIMINARY FINDINGS:

EXTERNAL EXAMINATION: Both eyes were of normal proportions to other facial features and were equal in apparent size.

The cilia, all surfaces and lid margins were clear and uninjected.

All media were apparently clear and homogeneous. Lacrimal drainage appeared adequate. Tension as determined by palpation was equal between the two eyes.

PUPILLARY REACTIONS: The pupils of both eyes were about 6 mm. in diameter in medium illumination. The contraction to both light and near-point stimuli was immediate, smooth, and consensual. The contractions remained for the duration of the stimuli with very slight fluctuations.

OPHTHALMOSCOPIC EXAMINATION: At each refraction a complete ophthalmoscopic examination was performed. No pathology was observed. All media were clear and homogeneous, and there were no apparent inflammations or injections. The fundus coloration was pinkish-red. The vessels had a ratio of approximately 3:2.

OPTOMETRIC FINDINGS: (See Table I)

VISUAL SKILLS: (See Table II)

The versions, rotations, and pursuit movements of the November, 1949, examination were all performed smoothly. There was a tendency to undershoot on the fixations, in all directions. The saccadic fixations were fair. There was some undershooting in the diagonals.

In the October, 1950 examination there were slight corrective movements in the rotations, and pursuit fixations. The remainder of the skills were approximately the same as before.

In the February, 1952, examination the binocular versions, rotations, and pursuit movements were quite adequate but the monocular ones were irregular in several areas. The fixations were good while the saccadic fixations showed undershooting and arcing.

In the May, 1952, examination the same picture prevailed.

In the September, 1952, examination there was a general improvement in all areas. This was after training had been accomplished.

The near point of binocularity in each examination was 2 or 3 inches with doubling.

The Donders Amplitude in each examination was 3 inches; once it was 4 inches and then at the last examination it was 3 inches. These were O.D., O.S., O.U..

DIAGNOSIS: Using the standard case analysis of the Optometric Extension Program in the November, 1949, it was determined to leave the patient undercorrected at far and at near to start moving her into plus. The patient had two pair of lenses to wear when she came in.

The far lenses were: O.D. -1.25 -0.50 X 90
O.S. -1.75

The near lenses were: O.D. -0.75 -0.50 X 90
O.S. -1.25

She was to wear the same far lenses, but for near she was to wear ~~40.25~~. However due to her than present condition of pregnancy, lens

therapy was postponed and visual training, which had been suggested, was also postponed.

The patient exhibited an esophoria picture throughout the ~~exami-~~nation. In doing the far ductions, the screen and target moved to the right indicating a suppression of the right eye. This was not shown in the near ductions. The analytical exhibited a high organization and all the recoveries were well up. The suppression of the right eye was further corroborated in the 14A test. The upper grid would alternately vanish indicating alternate suppression of the right eye.

In the October, 1950, examination visual training and lens therapy was indicated. Visual training was postponed because of the patient's domestic time schedule. The following prescription would satisfy the analytical findings at far and near:

O.D. -2.25
O.S. -2.50 -0.25 X 120
O.U. ~~2.00~~ ADD.

The phoria picture was still in esophoria and there was a slight decrease in the binocularity picture.

In the February, 1952, examination the following prescription would satisfy the analytical findings at far and near:

O.D. -2.75 -0.50 X 165
O.S. -2.25 -0.75 X 15
O.U. ~~1.75~~ ADD.

The visual skills were the same here. Alternate suppression of the right eye was still evident. The patient was unable to fuse the far point stereopsis at any shaft setting. There was a change in the retinoscopic findings and in the subjective findings. The anisometropia

was reversed. These were consistent findings throughout the entire examination. The prescription gave the patient good acuity, but not good binocularity. There are times when the patient gives evidence of turning to a strabismic behaviour (as an out to her binocular problem). Visual training was strongly indicated, but again she found it incompatible.

Training was instituted in April, 1952. The program prescribed follows:

- A. 1. Monocular Rotations & Fixations
- 2. Dissociated Rotations
- 3. Binocular Rotations
- B. Accommodative Rock
 - 1. Minus Phase
 - 2. Plus Phase
 - 3. Modified Updegrave
 - a. Pine Fusion series
- C. Hand & Eye Coordination
 - 1. AN Pointer Series
- D. Vectographic Work
 - 1. Michigan Boulevard
 - 2. Old Mill
 - 3. Checker Board

Supplementary Testing in the Visual Training Laboratory:

- 1. Rotations were checked. The patient showed gross irregularities and cutting in all quadrants.

2. The patient could not float the Brock Rings at near or far. She saw two rings which varied in their distance from each other laterally.
3. Vecto-Illuminator slides were checked. Michigan Boulevard and the Checker Board were used. There were indications of suppression and lack of fusion on the vecto-graphic material. Binocular performance was hard to obtain on all of the slides used.

PRESCRIBED TREATMENT:

Training of the patient's basic skills was started. All of the training was done through habitual lenses. The Suint Korrektor was used for rotations. At the beginning of the first six sessions monocular, binocular and dissociated rotations were performed. Dissociated rotations were performed by using a six diopter prism base down held alternately in front of each eye. At first the binocular rotations were fair, while the monocular and dissociated were very irregular. At times she reported seeing one target and then it would become two. She also reported that staring directly at the target made it easier to follow but it became slightly fuzzy. At the end of the first six sessions, her rotations had progressed to a point where they were smooth and regular.

Accommodative Rock training using the Modified Updegrave method was started. Fine Fusion cards were used as targets in the Tel-Eye Trainer with # 2 rotor. There were immediate responses from the

patient as: it blurs, it is fuzzy. The patient was carefully instructed to concentrate upon the targets and to try to clear the details in each. Starting with $+0.25$ and -0.25 there was a gradual increase in her accommodative facility until at the conclusion of training she was able to rock through $+2.50$ and -2.50 with ease.

Hand and Eye Coordination using the AN Pointer Series was started in the early part of the program. She was able to perform very adequately on AN 1. However when AN 2 was substituted she reported seeing double with an oscillating movement of the two half-views. There were times when she could fuse them. She would make inaccurate landings pointing to the outside with each hand. These errors were pointed out to her and she was constantly instructed to point with both hands at the same time. She was told to fuse the half-views, maintain a single view, and not allow it to double. She was able to perform adequately on AN 1-6 by the end of the second session. The even number AN cards were used for the rest of the training program. When the errors were pointed out to the patient she would make a very strong effort to correct them. Through these efforts the patient was aided in overcoming the binocular difficulties that she had had at first with the half-views.

Training was started during the eighth session on the Vecto-Illuminator. At first the patient could see pictorial depth, but she was unable to obtain a floating of the numbers. After a great deal of coaxing she was able to differentiate between the picture and the number configuration. She saw the top row of numbers come out and the

two rows going in. She was instructed to hold them there and look from one to the other. She reported that at first one would become flat, but after awhile she was able to perform adequately. She was given the Checker Board scene to work on. At first there was a great deal of pictorial depth and then by degrees she was able to float the checkerboards. However she could not locate the boards in space. She was also unable to tell which control number floated out.

Training was continued on all of the above material. She would show definite improvement at times and then there would be a lapse. When this was pointed out to her she would make definite efforts to find out why she had lapsed. The patient at this time, was undergoing a great deal of difficulty in her home environment. This would interfere with her training and cause her to lapse. Also, at the beginning of the training she had not been wearing her glasses; this was discussed with her and their importance explained. As a result she started to wear her glasses constantly and her binocularity improved. At the end of twelve sessions training was stopped. An analytical was performed at this time. There was a general improvement in the total analytical picture; i.e., an increase in ductions at far and near and a drop in the esophoria.

The major changes were shown in the visual skills. She was able to pass the rock with great ease. She easily fused the Far and Near point stereopsis cards and was able to pass them with ease. In the Far-Point binocularity test the patient fused the two half-views and saw three

balls. Prior to this she had always seen four. There was a general and definite improvement in the lateral and vertical phoria picture at far and near.

The patient reported that she was no longer having trouble with her glasses. She no longer saw double and she no longer experienced any blurring at far or near. This blurring had been previously noted.

COMMENT:

The assumption was made by the clinician that rehabilitation in the deficient areas in the patient's visual skills behaviour would increase the quality of her performance in her household and outdoor situations. Enhancement of her hand and eye co-ordination, strengthening her binocular seeing skills and building a more fluid relationship in accommodative facility enabled the patient to adapt more adequately to her home and outdoor environment. An important point in the resolving of this case was the patient's interest in the training and her eagerness to try to accomplish the end result - better binocularity.

An interesting aspect to this case is that there were no great changes shown in the analytical as a result of the training. The results were mainly the changes which came about in the skills picture. This is an indication that the skills are a valuable aspect of the patient's overall functioning. The improvement in the formerly constricted duction picture showed an increase in the latitude of the area of visual functioning.

The visual performance of the patient at the time of the progress

report in September, 1952, is very close to being adequate. It not only satisfies her requirements, but her behaviour approaches the standards set for efficient binocularity.

SUMMARY:

The case of M. O., age 26, female, indicated the need for visual training. Twelve sessions were given. The goal was to improve the binocularity and hand and eye coordination.

The contribution to optometric thinking which this case offers is to emphasize the value of visual skills testing in the routine analytical examination. The binocularity difficulties which the skills testing indicated were improved through a training program which emphasized the enhancement of binocularity, and coordination of the hands and eyes.

Table I

OPTOMETRIC FINDINGS*	5/14/52	9/29/52
2 Ophthalmometer: O.D.	--	-0.75 x20
O.S.	--	-0.50 x165
**3 Lat ph thru hab Rx	2 Exo.	2 Exo.
13A Lat ph at 16" thru hab Rx	1 Exo.	4 Exo.
4 "Static" retinoscopy O.D.	-2.25 -0.50 x180	-2.50 -0.25 x180
O.S.	-1.75	-1.75 -0.25 x180
5 "Dynamic" retinoscopy O.D.	-1.00 -0.50 x180	-0.25 -0.25 x180
at 20" O.S.	-0.75	∕0.50 -0.25 x180
6 "Dynamic" retinoscopy O.D.	--	--
at 40" O.S.	--	--
7 Subjective to 20/20 O.D.	-2.25 -0.50 x160	-2.25 -0.50 x180
O.S.	-2.50 -0.50 x180	-2.25 -0.75 x180
7A Subjective to best O.D.	-2.25 -0.50 x160	-2.50 -0.50 x180
visual acuity O.S.	-2.50 -0.50 x180	-2.50 -0.75 x180
8 Lat ph thru #7	4 Exo.	3 Exo.
9 B O to blur thru #7	6	4
10 B O break & recover thru #7	30/12	24/10
11 B I break & recover thru #7	12/3	12/1
12 Vert ph thru #7	Ortho	Ortho.
12 Vert ductions thru #7	6/2 5/2	4/2 4/2
13B Lat ph at 16" thru #7	13 Eso.	10 Eso.
14A Diss cross O.D.	-0.50 -0.50 x160	-1.50 -0.50 x180
cylinder at 16" O.S.	-0.50 -0.50 x180	-1.25 -0.75 x180
15A Lat ph thru 14A	2 Eso.	1 Exo.
14B Binoc cross O.D.	-1.00 -0.50 x160	-1.25 -0.50 x180
cylinder at 16" O.S.	-1.00 -0.50 x180	-1.00 -0.75 x180
15B Lat ph thru #14B	2 Eso.	2 Eso.
16A B O blur out 16" thru #7	--	--
16B B O break and recover thru #7	36/22	40/27
17A B I blur out thru #7	10	12
17B B I break & recover 16" thru #7	24/10	18/4
18 Vert ph 16" thru #7	2 Right Hyper.	Ortho.
18 Vert ductions 16" thru #7	12/4 10/2	3/1 3/1
19 Minus to blur 13" O.D.	-4.50	-5.00
O.S.	-4.50	-5.00
O.U.	-4.50	-5.75
20 Minus to blur out 16"	-4.00	-4.00
20 Lat ph 16" thru (-3.50)	22 Eso.	24 Eso.
21 Plus to blur out 16"	∕1.75	∕1.75
21 Lat ph 16" thru (∕0.50)	2 Eso.	2 Eso.

* The numbers shown are the numerical designations for the indicated tests as adopted by the Optometric Extension Program.

Table I

OPTOMETRIC FINDINGS*	10/27/50	E/11/52
2 Ophthalmometer: O.D.	--	-0.75 xl80
O.S.	--	-0.75 xl80
**3 Lat ph thru hab Rx	7 Eso.	2 Exo.
13A Lat ph at 16" thru hab Rx	10 Eso.	Ortho.
4 "Static" retinoscopy O.D.	-2.25	-2.25 -0.25 xl80
O.S.	-2.00	-1.75
5 "Dynamic" retinoscopy O.D.	-0.50	-1.00 -0.25 xl80
at 20" O.S.	-0.25	-0.25
6 "Dynamic" retinoscopy O.D.	-1.50	--
at 40" O.S.	-1.25	--
7 Subjective to 20/20 O.D.	-2.25	-2.75 -0.50 xl65
O.S.	-2.50 -0.25 xl20	-2.25 -0.75 xl5
7A Subjective to best O.D.	-2.25	-2.75 -0.50 xl65
visual acuity O.S.	-2.50 -0.25 xl20	-2.25 -0.75 xl5
8 Lat ph thru #7	1 Eso.	3 Exo.
9 B O to blur thru #7	--	10
10 B O break & recover thru #7	38/24	24/20
11 B I break & recover thru #7	9/7	8/4
12 Vert ph thru #7	Ortho.	Ortho.
12 Vert ductions thru #7	4/0 4/0	2/1 2/1
13B Lat ph at 16" thru #7	19 Eso.	16 Eso.
14A Diss cross O.D.	-0.25	-0.50 -0.50 xl65
cylinder at 16" O.S.	-0.50 -0.25 xl20	Plano. -0.75 xl5
15A Lat ph thru 14A	6 Eso.	12 Exo.
14B Binoc cross O.D.	-0.25	-0.50 -0.50 xl65
cylinder at 16" O.S.	-0.50 -0.25 xl20	Plano. -0.75 xl5
15B Lat ph thru #14B	2 Eso.	2 Exo.
16A B O blur out 16" thru (-1.75)	34	(14B) --
16B B O break and recover thru (-1.75)	35/23	(14B) 25/11
17A B I blur out thru (-1.75)	19	(14B) --
17B B I break & recover 16" thru (-1.75)	25/2	(14B) 16/9
18 Vert ph 16" thru (-1.75)	Ortho.	(14B) Ortho.
18 Vert ductions 16" thru (-1.75)	4/3 6/1	(14B) 3/1 3/1
19 Minus to blur 13" O.D.	-9.75	-5.00
O.S.	-10.50	-5.00
O.U.	-4.00	-5.00
20 Minus to blur out 16"	-1.00	-5.00
20 Lat ph 16" thru (-1.00)	14 Eso.	(-4.50) 16 Eso.
21 Plus to blur out 16"	+3.50	+1.00
21 Lat ph 16" thru (+3.50)	1 Eso.	(+0.50) 6 Exo.

* The numbers shown are the numerical designations for the indicated tests as adopted by the Optometric Extension Program.

Table I

OPTOMETRIC FINDINGS*	9/1/38	11/3/49
2 Ophthalmometer: O.D.	--	-2.50 x180
O.S.	--	-3.00 x180
**3 Lat ph thru hab Rx	6 Eso.	Ortho.
13A Lat ph at 16" thru hab Rx	10 Eso.	6 Eso.
4 "Static" retinoscopy O.D.	-0.50	-1.75 -0.25 x90
O.S.	-0.75 -0.25 x90	-1.75 -0.25 x180
5 "Dynamic" retinoscopy O.D.	1.25	Plano. -0.25 x90
at 20" O.S.	0.75 -0.25 x90	-0.75 -0.25 x180
6 "Dynamic" retinoscopy O.D.	-0.75	-0.75 -0.25 x90
at 40" O.S.	-0.75 -0.25 x90	-1.00 -0.25 x180
7 Subjective to 20/20 O.D.	-0.50	-1.75 -0.25 x105
O.S.	-0.50 -0.50 x90	-2.00 -0.25 15
7A Subjective to best O.D.	--	-2.25 -0.25 x105
visual acuity O.S.	--	-2.50 -0.25 x15
8 Lat ph thru #7	--	3 Eso.
9 B O to blur thru #7	4	--
10 B O break & recover thru #7	40/28	--
11 B I break & recover thru #7	7/0	7/3
12 Vert ph thru #7	--	Ortho.
12 Vert ductions thru #7	--	4/1 4/1
13B Lat ph at 16" thru #7	12 Eso.	10-12 Eso.
14A Diss cross O.D.	0.75	Plano. -0.25 x105
cylinder at 16" O.S.	0.50 -0.50 x90	Plano. -0.50 x15
15A Lat ph thru 14A	12 Eso.	4 Eso.
14B Binoc cross O.D.	1.25	0.12 -0.25 x105
cylinder at 16" O.S.	1.25 -0.50 x90	0.12 -0.50 x15
15B Lat ph thru #14B	10 Eso.	1 Exo.
16A B O blur out 16" thru Plano.	36	--
16B B O break and recover thru Plano.	50/40	32/26
17A B I blur out thru Plano.	3	16
17B B I break & recover 16" thru Plano.	18/0	20/10
18 Vert ph 16" thru Plano.	--	Ortho.
18 Vert ductions 16" thru Plano.	--	3/1 3/2
19 Minus to blur 13" O.D.	Normal	-4.75
O.S.	Normal	-5.00
O.U.	Normal	-4.00
20 Minus to blur out 16"	-0.75	-4.50
20 Lat ph 16" thru -3.50	--	x 19 Eso.
21 Plus to blur out 16"	2.25	1.00
21 Lat ph 16" thru 0.25	--	4 Eso.

* The numbers shown are the numerical designations for the indicated tests as adopted by the Optometric Extension Program.

TABLE II
 SUMMARY OF Visual Skills Record

Techniques or Skills	Dates Given				
	11/3/49	10/27/50	2/11/52	5/14/52	9/29/52
Accommodative Rock	F	F	F	F	P
Simultaneous Perception	F	PF	F	F	P
Far-Point Binocularity	F	F	F	F	P
Far-Point Stereopsis	F	F	F	P	P
Far-Point Pericentral Suppression	F	F	F	P	P
Far-Point Central Suppression	F	P	P	P	P
Far-Point Visual Discrimination	F	F	P	P	P
Hand and Eye Coordination	F	F	F	P	P
Color Vision	P	P	P	P	P
Far-Point Lateral Phoria	P	F	F	F	P
Far-Point Vertical Phoria	P	P	P	P	P
Near-Point Vertical Phoria	P	P	P	P	P
Near-Point Binocularity	F	F	F	P	P
Near-Point Stereopsis	F	P	F	P	P
Near-Point Lateral Phoria	F	F	F	P	P
Near-Point Pericentral Suppression	F	F	R	P	P
Near-Point Central Suppression	P	P	P	P	P
Near-Point Visual Discrimination	P	P	P	P	P

A double ruling indicates a progress report was taken at this point. See Table I.