

# Successful Visual Training for a Presbyopic Patient Following Unsuccessful Prism Therapy

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## Abstract

*Orthoptic therapy was instituted on a presbyopic patient having convergence insufficiency. The combination of presbyopia and convergence insufficiency has often suggested a poorer prognosis. Prism therapy had been attempted previously and the measurement over ten years indicated some form of prism adaptation as well as reduced measured fusional reserves. During visual training and after cessation of visual training the increased positive fusional vergences were monitored and recorded.*

## Abrégé

*Un presbyte souffrant d'une insuffisance de la convergence a été soumis à un programme d'orthoptique. La presbytie et l'insuffisance portent à pronostic douteux. La prescription de prismes durant une dizaine d'années démontre une certaine compensation ou adaption à leur effet ainsi qu'une diminution de l'amplitude de la fusion.*

*Au cours du programme et à la suite les réserves de la fusion positive ont manifesté un regain d'amplitude.*

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## History

A 52-year old male was referred to the Binocular Vision Clinic at the School of Optometry, University of Waterloo. His complaints consisted of blurred vision at his reading position and occasional diplopia.

The diplopia in the distance occurred while driving when tired.

His bifocal prescription was as follows:

right lens:

+1.00  $\subset$  2 $\Delta$  B.I. +1.75 addition

left lens:

+0.75  $\subset$  2 $\Delta$  B.I. +1.75 addition

Interpolar separation was 68/65 which equaled his interpupillary distance.

This prescription adequately corrected his hyperopia and presbyopia.

Tests measured over the above glasses gave the following results:

## Cover tests

- 1) unilateral cover test at 6M: monofixational exophoria.<sup>1,2,3</sup>
- 2) alternating cover test at 6M: 7 $\Delta$  exo + 4 $\Delta$ (in Rx)=11 $\Delta$  (total exodeviation).
- 3) unilateral cover test at 40 cm: monofixational exophoria and intermittent exotropia.
- 4) alternating cover test at 40 cm: 18 $\Delta$  exo + 4 $\Delta$ (in Rx)=22 $\Delta$  total.

## Loose Prism Vergence Tests

- 1) negative fusional vergence at 6M: x/10/8
- 2) positive fusional vergence at 6M: x/10/4
- 3) negative fusional vergence at 4M: x/20/18
- 4) positive fusional vergence at 4M: x/6/2

## Fixation Disparity Tests

- 1) at 6M: 4 $\Delta$  B.I. required to alleviate the fixation disparity
- 2) at 4M: 1 $\Delta$  B.I. required to alleviate the fixation disparity.

## Tests for Sensory Fusion

indicated that the deviation occasionally became manifest at 40 cms.

## Stereoacuity

at 40 centimeters was reduced to 50 seconds of arc.

## Near Point of Convergence

was measured as 11 centimeters from the bridge of his nose.

The diagnosis, therefore, consisted of:

- 1) hyperopia
- 2) presbyopia
- 3) basal exodeviation
- 4) convergence insufficiency

The recommended optometric therapy consisted of visual training to increase reflex positive fusional reserves and voluntary vergence. Records of the patient's previous visual care over the past 10 years were acquired, evaluated and recorded in Table 1.

After eight weeks of training consisting of five in-office visits and home training, glasses were supplied without the relieving prisms. The patient's binocular vision status was monitored over the following year.

His progress also is recorded in Table 1 for comparison and is described under **Data**.

## Procedures

The methods used in the office to improve positive fusional vergence



consisted of gradually increasing the stimulus to convergence on Brewster stereoscopes, Wheatstone stereopsis, anaglyphic targets, vectographic targets, and prism bars while ascertaining that there is no induced suppression and that bifoveal fixation is present.

Similar methods were used at home excluding the Wheatstone and Brewster stereoscopes.

To improve voluntary vergence, the stimulus to convergence was altered to induce retinal disparities of such large magnitudes that reflex fusional vergence was not stimulated, i.e. — a 10 Δ base-out prism was placed in front of either eye while the patient is viewing a target.

Data

In Table 1 are recorded the negative and positive fusional limits measured at 6M (upper half) and at .4M (lower half). (All recordings are

total positive fusional vergence, no added prisms necessary).

Visits #1-6 indicate the ten years before entering the binocular vision clinic in visit #7.

Visit #5 indicates the visit when the 4 Δ base-in relieving prisms were first prescribed.

Visit #8 indicates the 8 weeks of visual training, and therefore

Visit #9 indicates the fusional vergence reserves after training.

Visit #10 indicates the fusional limits after wearing the prescription with no prism and no visual training.

Visit #11 indicates the fusional limits after 4 months home training and 6 months of no visual training. N;Y means no;yes respectively indicating the presence or absence of blur or diplopia (DIPL) in the case history.

NPC means near point of convergence.

The column Rx indicates whether

the refractive error was corrected (yes) or not (not) and if the 4 Δ base-in (4 Δ BI) was prescribed or removed (0BI).

The three measures of NPC with asterisks (\*) were taken through the 4 Δ BI relieving prisms.

□ — indicates break

0 — indicates blur

X — indicates magnitude of the deviation.

Discussion

It has been shown that presbyopes are amenable to visual therapy,<sup>4</sup> however, is visual training the preferred treatment? Relieving prisms for some intermittent exotropes are not usually recommended.<sup>5</sup> The presbyopic patient described in the text did exhibit prism adaptation. The basal exodeviation measured by the von Graefe method steadily increased in magnitude from visit #4 to visit #7 while 4 Δ base-in relieving

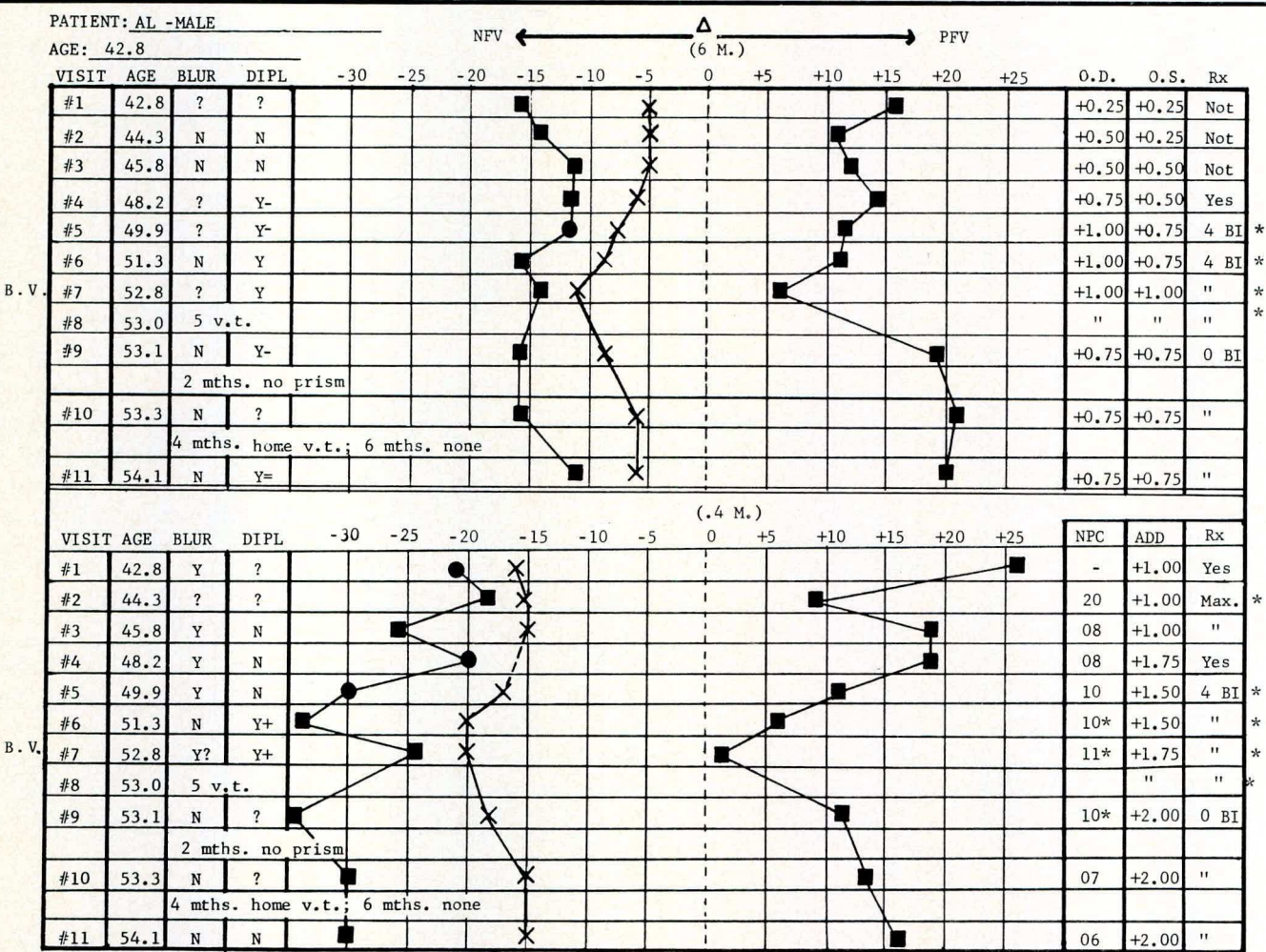


Table I - plots of the negative fusional reserves, exodeviation and positive fusional reserves of patient AL-Male from age 42.8 to 54.1. Symbols are described under DATA in the text.



prisms were being worn. The measured reserves of positive fusional vergence both at 6M and .4M steadily decreased until on visit #7 it was  $2\Delta$  at .4M — at which time the diagnosis was intermittent exotropia. The symptoms of diplopia at 6M and .4M did not appear until the base-in relieving prisms were prescribed. It is interesting to note that the near point of convergence measured in visit #5 with no base-in prism equals the near point of convergence measured in visit #6 with  $4\Delta$  B.I. after 1.4 years of wear.

After visual training was commenced, the basal deviation from visit #7 to visit #9 decreased substantially. With the removal of the  $4\Delta$  B.I. relieving prisms further reduction of the basal deviation was noted and the cessation of diplopia occurred.

After ten months, (4 months of home visual training and 6 months of

no visual training) the basal deviation remained at the same magnitude equaling that measured 9 years earlier before prism therapy was instituted. The positive fusional amplitude did not regress.

## Conclusions

1) The presbyopic patient described in this test did adapt to base-in relieving prisms with accompanying symptoms and signs of intermittent exotropia of the convergence insufficiency type.

2) With visual training and no prism therapy the trend was reversed and better binocular coordination with improved sensory integration was achieved.

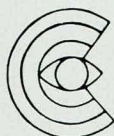
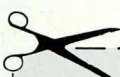
3) The possibility that the presence of the monofixational exophoria was the determining factor of the prism adaptation was not discussed.

4) There is a definite need to evaluate all aspects of binocular mechanisms

before visual training or prism therapy is commenced. These aspects need to be monitored and evaluated throughout the treatment.

## References

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