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Portland presbyopia onset delay study

Abstract

The Portland Presbyopia Onset Delay Study (PPODS), was designed to ascertain if nearpoint visual abilities responsible for comfortable, clear nearpoint vision can be improved through vision therapy (VT) for 35+ year old pre-presbyopes. Subjects were divided into two groups: a control group and a VT group. Four months of home based VT were prescribed. Procedures used were accommodative push-ups, loose lens "tromboning", monocular lens rocks, binocular lens flips, distance rocks, eye stretches, and vergence stimulation. Improvement was seen in the vision therapy group as compared to the control group in increased vergence ranges, increased AC/A ratio, and increased accommodative facility. Accommodative amplitude was resistant to the therapeutic intervention, as was accommodative posture as measured by subjective cross grid techniques. Anecdotal comments from the VT subjects supported improved near point ability. Suggestions for further study are provided.

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Bradley Coffey

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PORTLAND
PRESBYOPIA
ONSET
DELAY
STUDY

BY TAMMIE CALEF

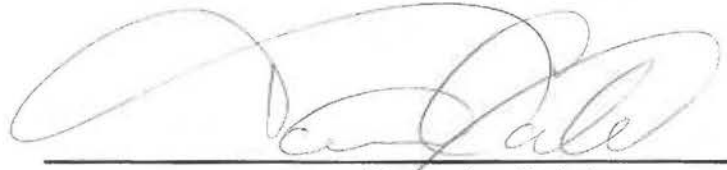
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ADVISOR:
BRADLEY COFFEY, OD, FAAO

PORTLAND
PRESBYOPIA
ONSET
DELAY
STUDY

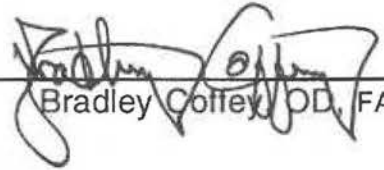
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Author:



Tammie Calef

Advisor



Bradley Coffey OD, FAAO

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ABOUT THE AUTHOR:

Tammie Calef holds a BA in Studio Art and Literature from Claremont Men's College. She decided that optometry would be a great job after having several other great jobs, ranging from Apprentice Stairbuilder in Rhode Island to Chef on a 120 foot private motor yacht. She counts among her blessings having had the opportunity to live with her Grandmother for the past four years. She plans to settle somewhere near an ocean after graduating with an OD and an M.Ed, vision function in learning.

ABSTRACT

The Portland Presbyopia Onset Delay Study (PPODS), was designed to ascertain if nearpoint visual abilities responsible for comfortable, clear nearpoint vision can be improved through vision therapy (VT) for 35+ year old pre-presbyopes. Subjects were divided into two groups: a control group and a VT group. Four months of home based VT were prescribed. Procedures used were accommodative push-ups, loose lens "tromboning", monocular lens rocks, binocular lens flips, distance rocks, eye stretches, and vergence stimulation. Improvement was seen in the vision therapy group as compared to the control group in increased vergence ranges, increased AC/A ratio, and increased accommodative facility. Accommodative amplitude was resistant to the therapeutic intervention, as was accommodative posture as measured by subjective cross grid techniques. Anecdotal comments from the VT subjects supported improved near point ability. Suggestions for further study are provided.

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Acknowledgments

This study grew from an assignment in Dr. Coffey's Behavioral Optometry Science class in which we were to write a proposal for a study that we had no intention of actually running. Our dream study was not restricted by practical aspects or logistics. My naiveté (and my excellent advisor) allowed me to plunge in and make the study a reality. To the class mates involved in the original project-Bill Hall, Bill Hefner, Liz Davis-Wallace, Kristi Iverson, Stephanie McIntyre, Jimmy Su, Mike Saxerud- and especially to Lois Meacham, who proposed this topic, I owe thanks.

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INTRODUCTION

Presbyopia is considered to be an inevitable part of the aging process. Enoch¹ states that the hallmark of aging of the body is the loss of flexibility. A widely accepted explanation for presbyopia is the loss of flexibility of the lens. But, as with the gymnast who, through continued exercise, can remain flexible late into life, perhaps with exercise the crystalline lens, too, can retain much of its flexibility. And, just as it is unlikely that a no longer limber person who begins a gymnastics program at an advanced age will ever regain the flexibility he had in his youth, it is not surprising that vision therapy has not been shown to be effective in reversing presbyopia once the eye has lost its accommodative abilities. Wold² showed an 80% improvement in accommodative amplitude and a 76% increase in accommodative facility in 100 children who completed an accommodative VT program. Hoffman and Cohen³ showed that accommodative insufficiency and lack of amplitude was improved in 70 of 80 patients through VT using Morgan's criteria as a judge of improvement. A study conducted by Haynes and McWilliams⁴ considered the accommodative changes that occurred when looking from near to far, and from far to near. They reported on the effects of training this near-to-far response in school-age and college students and found an improvement in the function with the use of vision therapy. If accommodative abilities can be improved in prepresbyopic adults as well, it should be possible to delay the onset of presbyopia as there will be a larger 'cushion' of surplus ability between normal function and presbyopia. The goal of this study was to determine if it is possible to improve near point abilities in prepresbyopic adults through vision therapy procedures.

There is no consensus on the mechanism(s) involved in the development and irreversibility of presbyopia. The standard text book teachings⁵ describe the process as being a combination of several factors: loss of lens elasticity⁶; increased refractive index

Koretz's study⁹ showed that although the older lens does lose flexibility, it is still able to assume enough of a spherical shape that this alone cannot explain accommodative loss. Koretz¹⁰ hypothesized that the lens may be mechanically restricted anteriorly by the zonules due to age-related reconfiguration of the lens and muscle, and thus prevented from steepening its curvature, while the posterior of the lens is still free to do so. Fisher¹¹ reports increased adhesion between lens fibers with age, but Koretz and Handelman⁹ observed that sliding between lens fibers is not involved in accommodation, and that sliding between zones of discontinuity during accommodation is minimal. Koretz suggests⁹ that redistribution of minute amounts of cytoplasm in each lens fiber during accommodation is responsible for the increased steepness of curvature seen in accommodation.

Changes in refractive index of the crystalline lens or the shape of the lens have been suggested as possible mechanisms in presbyopia. The refractive index of a substance indicates how much the substance will refract light, with a higher value indicating greater bending of the light rays. The refractive index of water is 1.003; for diamond, it is 2.42. The classic reasoning regarding age-related changes in refractive index of the lens is that as additional lens fibers are added to the lens, the fluids are forced out, thereby increasing protein density and increasing the refractive index of the lens. Although this seems reasonable, there is no evidence of an increase in refractive index^{12, 13} in the human crystalline lens. Pierscionek⁷ studied the refractive index in eleven human lenses of various ages and did not find evidence of an age-related increase in the refractive index of the lens. Regarding a change in shape of the lens, Lowe¹⁴ and Brown¹⁵, in separate studies, found the curvature of the lens to steepen rather than flatten with age. In the absence of other changes, one would expect a steepening to increase the power of the eye, just as increasing the steepness of an ophthalmic lens makes it more powerful. Pierscionek considers the nucleus to be the element of the lens responsible for accommodation⁷. Brown¹⁵ states that with age the unaccommodated lens

makes it more powerful. Pierscionek considers the nucleus to be the element of the lens responsible for accommodation⁷. Brown¹⁵ states that with age the unaccommodated lens nucleus approaches a spherical shape similar to the shape of the accommodated young eye, thus reducing the ability of the nucleus to act as an aid to increasing the steepness of the lens¹¹. Pierscionek⁷ suggests that lens growth and distribution of cortical refractive index must be coordinated as the lens ages in order to maintain clear unaccommodated vision, with the cortical refractive index gradient decreasing to counteract the increased steepness in curvature. Simply put, if, in isolation from other possible changes, the curvature of the lens becomes steeper, the refractive index must decrease to maintain the status quo of the optical system. Regarding ciliary muscle strength, Fisher¹⁶ found that the ciliary muscle of older humans was actually 50% stronger than in youths. Any of these explanations may be correct. The hypothesis of this study was not based on any particular explanation of the mechanism of presbyopia.

In this study, vision therapy procedures were investigated as a method of improving and preserving nearpoint ability - comfortable, clear nearpoint vision - in adults. No publications were found that address this topic specifically. The notion that VT will improve accommodative ability in adults, as was shown in children¹⁷, is based on the idea that perhaps the sensory motor processes of the eye, like skeletal muscle, will benefit from and be improved by regular exercise. In independent studies, Marg¹⁸, and Provine and Enoch¹⁹ showed that accommodation is under autonomic control. Cornsweet and Crane found that voluntary control can be attained²⁰. As a person can remain limber late into life by regular stretching and exercising, perhaps so too can the eye retain more of the flexibility of youth by following a certain regimen.

Vision therapy is very effective in improving binocularity in presbyopic nonstrabismic patients. Typically, presbyopes are treated for convergence insufficiency. In a retrospective study by Wick²¹, subjective complaints were eliminated in 97% of the 161 convergence insufficient presbyopic patients between the

ages 45 and 89 years who were treated using vision therapy procedures. As well, 92% of the patients improved their performance on standard stereopsis and convergence tests.

The Portland Presbyopia Onset Delay Study compared the near point abilities of subjects in two groups - the VT group and the control group. The goal of the study was to determine if certain eye exercises could improve clarity and comfort of nearpoint vision. Subjective improvement among the pre-presbyopes, in the absence of objective improvement in accommodative amplitude or accommodative facility, was to be considered success. This study was to be a stepping stone in the pathway from which further studies will branch in hopes of finding a way to prevent or delay the onset of presbyopia.

METHODS

OVERVIEW: The study was conducted at 14 study centers in private optometric practices and coordinated through a study center at the College. Each subject participated for four months. The Vision Therapy group was instructed once a month in home-based VT. The control group did nothing out of their normal routine. All subjects were given an entrance and an exit exam, and brief monthly evaluations.

SUBJECTS: Subjects were recruited by Pacific University College of Optometry and by the 21 private optometrists participating in the study. A segment was aired on local and national TV. Interested persons called a central number, and a preliminary screening was done over the phone. The questions asked are in table 1, and are on the top of the "Entrance Criteria" form (appendix A). Prospective subjects were disqualified if they could answer yes to any of these questions. If they responded "yes" to the medications question, the name(s) of the medications were requested, and if a mentioned drug was known to have untoward effects on accommodation or binocular vision, they were excluded. Appendix B lists drugs known to interfere with accommodation or binocular vision. The questions regarding cataracts applied whether they currently had

cataracts or had previous cataract surgery. The "Entrance Criteria" form for qualifying subjects was then faxed to one of the fourteen study centers. These study centers were in the offices of private optometrists in the Portland area. The study center called the subject and scheduled the screening and entrance exam.

<i>Under age 35?</i>	Yes	No
Currently wearing reading glasses?	Yes	No
Radial keratotomy?	Yes	No
Strabismus?	Yes	No
Cataracts?	Yes	No
Medications?	Yes	No
if yes, list:_____		

Table 1. Pre-qualifying questions asked in preliminary over-the-phone screening.

Of the 177 people who responded, 108 met these initial requirements, and 50 actually completed the entrance exam and joined the study. The control group consisted of 14 subjects, 8 men and 6 women. The average age in the control group was 42.6 years (± 4.3) with a range from 37 to 50 years. For the VT group, there were initially 44 subjects. Twenty-four of these subjects dropped out of the treatment protocol. Of those who dropped out of the VT group, there were 9 subjects who stopped doing the VT procedures before the end of the first month and who were asked to join the control group. These subjects were asked to refrain from continuing VT, and to join the control group, starting their four months as control group subjects from the last day they had attempted the VT procedures. In the final VT group, there were 20 subjects, 7 men and 13 women. The average age in the final VT group was 44.1 years (± 4.5) with a range from 35 to 53 years.

Prior to the exam, subjects signed an "Informed Consent Form" (appendix C) and completed a screening exam to determine their fulfillment of visual inclusion criteria. The screening exam consisted of the tests in table 2. The bottom of the "Entrance Criteria" form was used to record this information.

BVA 40 cm 20/40? (OD, OS, OU, w/ dist R _x)	Yes	No
BVA 6 m 20/20? (OD, OS, OU, w/ dist R _x)	Yes	No
50 seconds stereopsis?	Yes	No
NPA 33 cm?	Yes	No
NPC 15 cm?	Yes	No
Signed informed consent?	Yes	No

Table 2. Tests performed in the screening exam.

If the subjects passed all the criteria, they were given a full vision exam, consisting of habitual near and far phorias, refraction with & without cycloplegia, monocular & binocular cross-cylinder accommodative posture tests, dynamic retinoscopy, positive relative convergence (PRC), negative relative convergence (NRC), positive relative accommodation (PRA), negative relative accommodation (NRA), monocular \pm accommodative amplitudes, gradient AC/A \pm 1.00, a measure of pupil size, Donders amplitudes subjectively, binocular distance rocks (using the Haynes Distance Rock Test), and monocular & binocular lens rocks at near (table 3), as well as an ocular health exam. Protocol for the specific tests can be found in appendix D. The instructions for the Haynes Distance Rock Test are in appendix E, and the chart used for the near lens rocks is in appendix F. The subjects paid the doctors' regular fee for the entrance exam. The exit exam and the evaluations were provided to the subjects by the doctors without reimbursement, and were done by the same doctor to assure consistency of data. A special chart was distributed to the doctors for the exam (appendix G). The participating doctors attended a CE course during which they were refreshed on methods

of examining accommodation and binocular vision, were briefed on the design of the study, and were given all the necessary materials and equipment. The organizational materials given to the doctors are in appendix H. There was a brief clinical evaluation of accommodative function that was done at the entrance and exit exams, and also once a month for the four months each subject participated. These evaluations were done by the doctor or by a technician. The required tests for the evaluation are listed at the bottom of table 3. The protocols for the tests are in appendix D, and the chart used is in appendix G. Two complications arose in the taking of data for the lens rock test used in the evaluation. Most subjects were tested using a ± 2.00 diopter flipper lens, but if they could not clear the target letters, they were given a lens of lesser power. Some of the subjects were tested at the exit exam with a lens power different than was used at their entrance exam. To make the data more comparable, the number of flips in a minute was multiplied by the power of the lens used for the specific test. Also, one study center tested the subjects for 30 seconds rather than 60 seconds. This data was not used, but is included in the raw data table. Both errors were unintentional.

Entrance and Exit Exam Tests
habitual phorias- near
habitual phorias- far
refraction with cycloplegia
refraction without cycloplegia
monocular cross-cylinder accommodative posture tests
binocular cross-cylinder accommodative posture tests
dynamic retinoscopy
PRC (positive relative convergence)
NRC (negative relative convergence)
PRA (positive relative accommodation)
NRA (negative relative accommodation)
monocular minus accommodative amplitudes
monocular plus accommodative amplitudes
gradient AC/A ± 1.00
pupil size- standard room illumination, using Cogan pupilometer
Evaluation Tests
Donders push-up amplitudes
Haynes binocular distance rocks
monocular lens rocks
binocular lens rocks

Table 3. Data gathered in the entrance and exit exams, and at the monthly evaluations.

The subjects who passed all of the criteria of the screening exam were invited to join the study. Subjects were allowed to self-select into one of the two groups: the vision therapy group or the control group. The motivation of wanting to delay wearing reading glasses prompted many subjects to join the VT group. Enthusiasm is important for successful results with VT procedures, as patient motivation plays an important roll in the success of VT. The control group was formed from those who were unwilling to complete the VT procedures but who agreed to refrain from starting to wear reading lenses for the duration of the study.

PROCEDURE: All subjects were mailed a welcome letter (appendix I) and two questionnaires at the start of the study, "How Is Your Vision" and "Vision and Health History" (appendices J and K), which they returned in postage paid envelopes. The "How Is Your Vision" questionnaire was also sent to each subject upon completion of their participation in the study, and again at three month intervals after the study. The questionnaires asked about subjective vision complaints and about lifestyle factors.

The control group subjects were instructed to continue their regular routine, and to not start wearing reading glasses until the end of the study. The VT group subjects were scheduled for four months of VT instruction. These sessions took place at Pacific University's Portland Family Vision Center in the evenings, with the instruction in the VT procedures being given by the researcher. Two techniques were prescribed each month, along with eye stretches. The subjects were expected to do the procedures at home. The procedures prescribed are listed by month in table 4, and are described in appendix L.

Month One	Month Two	Month Three	Month Four
Distance Screen Rocks	Distance Screen Rocks	Monocular Lens Rocks	Binocular Lens Flips
Push-Ups	Loose Lens Tromboning	Vergence Stimulation 1	Vergence Stimulation 2
Eye Stretches	Eye Stretches	Eye stretches	Eye stretches

Table 4. Vision Therapy procedures prescribed to VT subjects

The VT subjects were required to fill out a weekly record of their exercise completion (appendix M). It was stressed to them that truth was more important than showing having done the exercises every day. Subjects from both groups were asked to complete a "near work record" weekly (appendix N), which would allow the researchers to determine how much near work the subject did. Once a month, all therapy subjects returned to their study center for the brief evaluation, and at the end of the four months, the all subjects returned to their study center for the exit exam. Results from these exams were faxed or mailed to the researchers. Subjects were contacted at three month intervals following the study to monitor any changes in subjective nearpoint vision. They were asked to answer the "How is Your Vision" sheet they answered prior to and following the study. The follow-up "How is Your Vision" asked if the subject was continuing to do the VT procedures (appendix O). The VT subjects were asked if they had voluntarily continued doing the VT procedures and, if so, which procedures and for what amount of time.

Subjects were encouraged to remain in the study by incentives generously donated by various groups. These consisted of discounts on eye wear through each subject's study center upon completion of their participation in the study, coupons for discounts at BlockBusters Video, free tickets for two to concerts by the Oregon Symphony Association, free drink coupons from Coffee People, and free ski lift tickets from Timberline Lodge and Ski Area at Mt. Hood.

DATA ANALYSIS: By design, the study is bivalent. The independent variable was treatment group. The data were analyzed using simple unpaired t-tests which compared the amount of pre-to-post change in findings between the VT and control groups. The amount of change in each variable was calculated as the difference between the pre-treatment and post-treatment values. Non-parametric rating data were analyzed in similar fashion using the Wilcoxon Signed Ranks Test. Correlations between the change

data and several measures of compliance with treatment were calculated and examined. Compliance time was recorded for each subject in the VT group, and the mean compliance time and variability was calculated. This variable enabled the researchers to index any change in nearpoint ability to the actual effort of the subjects, rather than to the ideal set by the prescribed VT procedures. In order to reveal patterns of change in the data, five "index scores" were created by summing the Z scores which corresponded to the change values for included variables. The five index scores were: accommodative posture, accommodative amplitude, accommodative facility, vergence range, and AC/A ratio. The specific tests that were summed to form each index score are listed in the results section. Each of the index scores was compared between groups using unpaired t-tests.

RESULTS:

The data for all tests combined was be found at the end of the paper. These consist of a raw data table, a Z-score table, and the Z-score index table. Graphs are in the figures section at the end of the paper.

ACCOMMODATIVE POSTURE: Accommodative posture was tested using three tests: dynamic retinoscopy, monocular cross cylinder, and binocular cross cylinder. (see Figures) An index was made by adding together the change Z score of each subject for these three tests, and comparing the overall effect on accommodative posture for the VT group versus the control group. For the VT group, accommodative posture shifted out slightly so that the subjects had readings on dynamic retinoscopy and on monocular and binocular cross cylinder tests of higher plus lens values at the exit exam than at the entrance exam. The shift for the control group was in the opposite direction than that of the VT group. This difference was not significant ($t=-1.491$, $p=0.1466$).

For the monocular cross cylinder test only there was a significant difference between groups. For the right eye, the findings changed from 1.39 D (± 0.74) to 1.58 D

(± 0.56) for the VT group, and from 1.73 D (± 0.72) to 1.40 D (± 0.36) for the control group ($t = -2.123$, $p = 0.0421$). For the left eye, the findings changed from 1.34 D (± 0.75) to 1.58 D (± 0.65) for the VT group, and from 1.79 D (± 0.77) to 1.44 D (± 0.39) for the control group ($t = -2.802$, $p = 0.0088$). The binocular cross cylinder test showed trends in the same direction that were not significant. The dynamic retinoscopy test showed both groups tending to have reduced plus findings, with the control group showing a greater reduction, but this was not significant.

ACCOMMODATIVE AMPLITUDE: Accommodative amplitude was tested using five tests: positive relative accommodation, negative relative accommodation, monocular minus lens to blur, monocular plus lens to blur, and Donders push-up amplitude (see Figures). The trend in the accommodative amplitude index showed the VT group to increase in accommodative amplitude relative to the control group, but the differences were not significant. The findings on the PRA and minus to blur tests showed the VT group having changes in accommodative amplitude ranging from a gain of 0.03 D (± 0.59) to a loss of 0.47 D (± 0.87), with less loss seen on the monocular tests than on the binocular tests. The control group showed changes in accommodative amplitude ranging from a loss of 0.38 D (± 0.70) to 0.78 D (± 0.84). On the Donders push-up, with OD, OS, OU blur and recovery measurements averaged together, the VT group measured 1.93 cm (± 1.49) further away at the end of the study, as compared to the control group, which brought the Donders chart 1.59 cm. (± 0.84) further from their eyes after the study than before. If only the monocular findings are compared, the VT group lost 2.28 cm (± 1.68), compared to the control group, which lost 1.21 cm. (± 0.79), and on only the binocular findings, the VT group lost 1.22 cm (± 0.52), compared to the control group, which lost 2.36 cm. (± 0.02). None of these differences were significant.

ACCOMMODATIVE FACILITY: Accommodative facility was tested using two tests: monocular and binocular lens flips and the Haynes Distance Rock Test (see Figures).

Using the Z-score index, the VT group showed increases in accommodative facility, whereas the control group showed losses. This change was significant ($t=2.424$, $p=0.0261$). There were significant differences on four of the tests: flips per minute, OS ($t=2.386$, $p=0.0265$), flips per minute OU ($t=2.465$, $p=0.0224$), flips per minute multiplied by lens power used OD ($t=2.411$, $p=0.0257$), and flips per minute multiplied by lens power used, OS ($t=2.837$, $p=0.0102$). An explanation of “flips per minute multiplied by lens power used” can be found in the methods section. There were not significant differences on the tests of flips per minute OD ($t=1.912$, $p=0.0696$) and flips multiplied by lens power used OU ($t=1.928$, $p=0.0682$). On the Haynes Distance Rock Test, the VT group showed an increased number of cycles per 30 seconds on both the 20/80 and the 20/25 targets. The control group showed a slight increase of cycles per 30 seconds on the 20/80 target, and a decrease on the 20/25 target. The differences between groups for the Haynes Distance Rock Test were not significant.

VERGENCE RANGES: Vergence ranges were tested using two tests: positive relative convergence and negative relative convergence (see Figures). The vergence range index score showed an increased vergence range for the VT group, and a decreased vergence range for the control group ($t=2.565$, $p=0.0157$). There was a significant difference in the PRC recovery ($t=3.47$, $p=0.0016$). The VT group increased their convergence recoveries from 9.45 prism diopters (± 7.10) to 20.65 prism diopters (± 11.6), versus the control group, who showed an increase from 9.57 (± 8.0) to 9.77 prism diopters (± 8.01). The divergence recovery of the VT group decreased from 10.85 (± 4.49) to 8.53 prism diopters (± 6.79), as compared to the control group, who decreased from 12.07 (± 5.77) to 10.77 (± 6.61) prism diopters. The difference between groups was not significant. When the three convergence change measures are averaged together (PRC blur, break, and recovery), the VT group showed an increase of 8.8 (± 1.7) prism diopters, versus the control group, with 0.83 (± 0.48) prism diopters. An average of the three divergence test change data (NRC blur, break, and

recovery), showed the VT group decreasing in divergence ability by 0.4 (± 1.35) prism diopter, versus the control group, who decreased by 1.02 (± 0.28) diopter.

ACCOMMODATION-CONVERGENCE INTERACTION: Accommodative vergence interaction was measured using two tests: near and far phorias and a gradient AC/A test. There was a significant difference between the groups, with the VT group increasing their AC/A index relative to the control group ($t=2.78$, $p=0.0094$). There was a significant difference between the groups on the gradient AC/A test ($t=2.204$, $p=0.0356$), with the VT group's AC/A shifting from 2.95 (± 2.27) to 4.5 (± 3.87), versus the control group's AC/A, which shifted from 3.11 (± 2.55) to 2.7 (± 1.58). On the 40 cm phoria through a plus one lens, the VT group shifted from 5.13 (± 5.35) exo to 1.88 (± 5.11) exo, versus the control group, which shifted from 5.54 (± 2.75) exo to 5.36 (± 3.84) exo ($t=2.056$, $p=0.048$). On the phoria through a minus one lens, the VT group shifted from 0.76 (± 7.51) eso to 6.84 (± 7.6) eso, versus the control group, which shifted from 0.68 (± 5.55) eso to 0.02 (± 4.63) eso ($t=2.451$, $p=0.0205$). The changes in distance and near phorias were not significant. The trend in the VT group was an increase in esophoria at far, and a decrease in esophoria at near. In the control group, the trend was a decrease in exophoria at far, and an increase in exophoria at near. These trends are in the same direction for both groups.

OTHER: There were not significant changes in the other measurements, such as pupil size, refractive condition, or cycloplegic refraction. The average age of the groups did not differ, with the VT group having a mean age of 44.1 yrs (± 4.5) versus the control group, which had a mean age of 42.6 yrs (± 4.3) ($t=.954$, $p=.347$). Although the study was designed to require a four month participation by each subject, many subjects remained in the study longer, due to their missing and rescheduling appointments or, in the case of the control group subjects who started out as VT group subjects, their 'four months' started again from the last day they attempted to do the VT procedures. The only incentive for subjects to go for the exit exam was a discount on

glasses. The VT group averaged 147 (± 27) days in the study, versus the control group, who averaged 179 days (± 69). The VT subjects averaged 94 (± 31.98) days of VT procedures done, over 14.5 (± 2.54) weeks, and averaged 4.9 (± 1.22) days of VT per week.

DISCUSSION:

The data provide some support for the idea that VT can improve nearpoint vision in the pre-presbyopic adult population. Anecdotal comments from subjects also support the efficacy of the program, and indicate that the exercises must continue to be done on a regular basis. Four of the five index scores showed a shift in the predicted direction: accommodative amplitude ($t=1.201$, $p=0.2462$), accommodative facility ($t=2.424$, $p=0.0261$), vergence ranges ($t=2.565$, $p=0.0157$), and AC/A ratio ($t=2.78$, $p=0.0094$). The accommodative posture shifted opposite to the predicted direction ($t=-1.491$, $p=0.1466$).

ACCOMMODATIVE POSTURE: Typically, an increased plus acceptance, or greater plus lens values on the accommodative posture tests, indicates more of a willingness of the eyes to rely on plus lenses at near, or simply stated, it can be an indication of the need for reading glasses, and suggest a suitable power for such lenses. The increased plus lens power found on the cross cylinder tests for the VT group was not predicted. However, it may be a result of the increase in AC/A ratio and esophoria found in the VT group. With a higher AC/A as found in the VT group after treatment, the subjects would attain the same convergence with less accommodation than before. This, coupled with the increase in esophoria in the post-treatment VT group, which would result in less convergence demand (from phoria to demand) than before, could result in a reduced accommodation on the ambiguous target of the cross cylinder tests, since the convergence-driven accommodation would be reduced due to reduced convergence. The target for the cross cylinder tests is designed to stimulate only the amount of

accommodation called on when regarding a near target singly, rather than the full amount needed to see a near target clearly as well as singly. A decrease in the amount of convergence needed would be reflected in a decrease in the accommodation resulting from convergence. The results of dynamic retinoscopy show little change for the VT group, which indicates that the eye itself has not changed. For the control group, there is a reduction in plus power on dynamic retinoscopy, indicating a change in the state of the eye and the lens. The data on refractive condition shed no light on this change, and the data from the cycloplegic exams are too limited to draw any conclusions (many subjects refused to be cycloplegated at the exit exam).

ACCOMMODATIVE AMPLITUDE: Both groups showed a decreased accommodative amplitude, with the VT group tending to have smaller declines than the control group overall. This trend was not significant. On the Donders push-up test, the VT group lost less than the control group on the binocular tests, but lost more than the control group on the monocular tests. This may indicate that the VT techniques helped teach the VT subjects to use the eyes better together, working on the complex interaction of convergence and accommodation rather than on the monocular accommodation alone. However, on the monocular minus lens to blur test, the VT group virtually maintained the level of amplitude they had at the entrance exam, while the control group showed reduced monocular accommodative amplitude at the exit exam as compared to the entrance exam. Binocularly on the minus lens to blur test, the VT group also showed less loss than did the control group. As the goal of the study was to investigate a method of delaying the onset of presbyopia, rather than reversing existing presbyopia, these data are encouraging. The longer it is possible to maintain the existing level of accommodation, of course, the later one will experience the inconveniences of presbyopia. Perhaps if the study were longer than four months, the control group would have shown a greater loss in accommodative amplitude, and if the VT group maintained close to their initial level of accommodative amplitude, as they did, the results would

have been significant. These data support the notion that presbyopia is irreversible, as there was not an increase in accommodative amplitude, but rather an absence of loss of accommodative amplitude.

ACCOMMODATIVE FACILITY: Accommodative facility was tested using two tests, plus and minus flipper lenses, and the Haynes Distance Rock test. As described in the methods section, some of the subjects were unintentionally tested at the exit exam with a lens power different than was used at their entrance exam. To make the data more comparable, the number of flips in a minute was multiplied by the power of the lens used for the specific test. There were three VT subjects and two control subjects who were tested with a stronger lens power on the lens rock tests at the exit exam than on the entrance exam, and one VT subject and two control subjects who were tested with a weaker lens power on the lens rock tests in the exit exam than in the entrance exam, on some combination of OD, OS, or OU. The VT group showed an increase in the number of flips per minute, and the control group showed a decrease. The VT group improved on the Haynes Distance Rock test with both 20/80 demand and with 20/25 demand, with negligible changes in the number of errors. The control group had no change on the 20/80 demand targets, but decreased in ability with the 20/25 targets, and had more errors with the smaller targets. This increased facility shown by the VT group reflects a more fluid system, which assists with near point vision, especially the type of vision used when glancing at one's watch while doing otherwise distance vision tasks.

VERGENCE RANGES: The convergence ranges of the VT group increased greatly, versus a slight increase in the convergence ranges of the control group. Control of voluntary convergence was taught to the VT group in the last two months of the VT program using the mini vectogram^a. Divergence decreased in both groups, with less decrease seen in the VT group than in the control group. There were no divergence procedures, although the eye stretches may improve all ranges somewhat. Increased

^a Bernell Corporation. 422 East Monroe Street, South Bend, Indiana. 46601. (219) 234-3200

vergence ranges will assist with nearpoint comfort, as the greater reserve of ability one has, the more comfortable one's vision should be. A common complaint of early presbyopes is that the plus lenses interfere with their ability to converge, so the convergence training should assist the VT group when they do begin wearing reading lenses.

ACCOMMODATION-CONVERGENCE INTERACTION: There was an increase in the interaction between accommodation and convergence. This was measured using the distance method, involving the near and far phorias, and using the gradient method, measuring the 40 cm phoria through a plus one lens and through a minus one lens. For the distance method, both groups became more eso or less exo at the post exam on the distance phoria and less eso or more exo on the near phoria. The VT group had a greater change for both distances. For the gradient 40 cm phoria measurement, the control group showed a negligible decrease in exophoria through the plus lens, and a slight decrease in esophoria through the minus lens. The VT group showed a large decrease in exophoria through the plus lens, and a large increase in esophoria with the minus lens. This additional convergence per unit of accommodation will assist the VT group subjects in fusing nearwork as they mature into presbyopia. The procedures with the minivectograms involved convergence, so it is not surprising that the near and far phorias shifted eso-ward, in addition to the increase in convergence ranges described above.

OTHER: The results of this study indicate that although accommodative amplitude is resistant to improvement, other nearpoint skills, such as accommodative facility and vergence ranges, are amenable to changes which will help the pre-presbyopic patient function at near. Comments from some subjects indicated that they found their general nearpoint vision was more comfortable while doing the VT procedures. They were aware of a decrease in the benefit after they ceased using the techniques. The data indicated that

it was not necessary to complete the procedures daily, but data were too limited to derive an optimum number of days of VT per week.

An office-based study might produce stronger results than this home-based program, and a longer study might reveal greater changes in both groups. The attrition rate of VT subjects was great, especially as summer approached. Stronger incentives might have held more of the original 44 VT subjects, and were especially needed to reduce the number of subjects who left the study just prior to the point of the exit exam.

The subjective questionnaire data did not reveal any significant insights. The follow-up questionnaire data is too limited at this point to warrant analysis, but could prove to be interesting, particularly if any of the subjects continue to utilize the techniques.

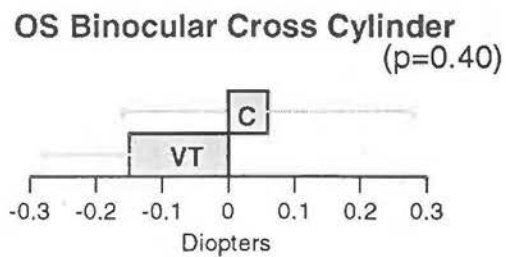
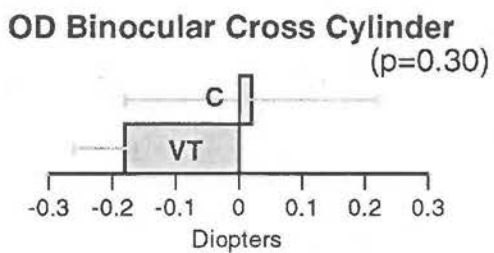
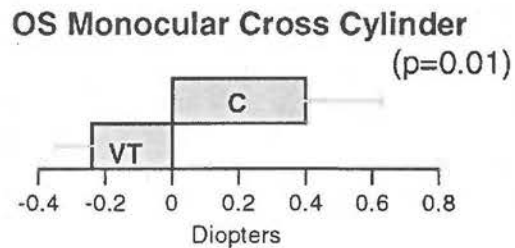
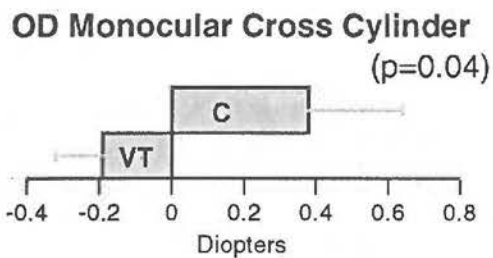
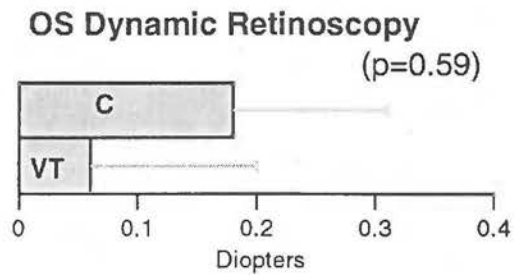
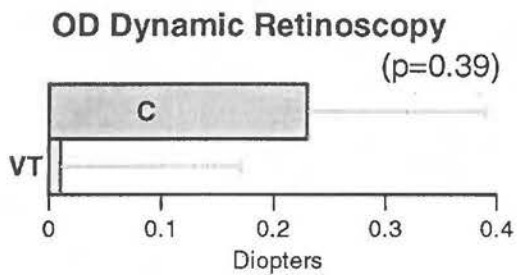
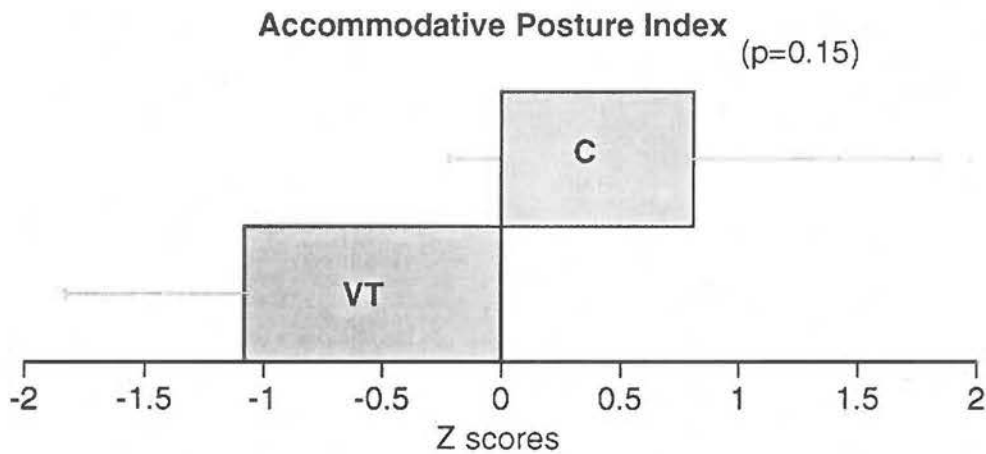
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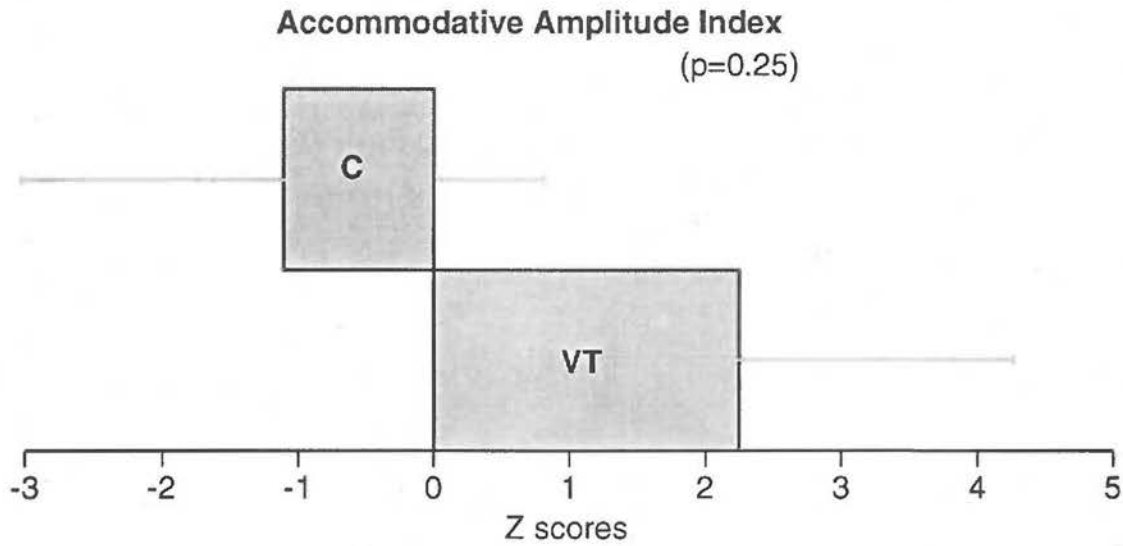
ACCOMMODATIVE POSTURE

Changes in accommodative posture pre to post between groups

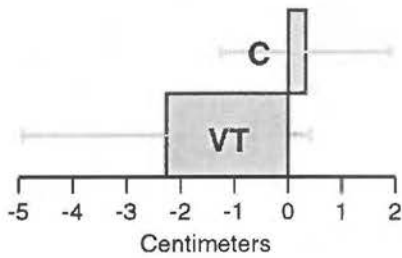


ACCOMMODATIVE AMPLITUDE

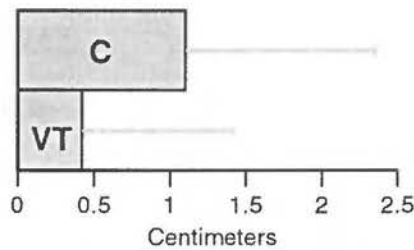
Change in accommodative amplitude pre to post between groups



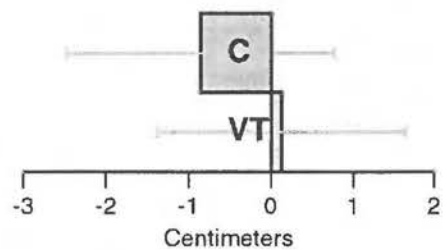
OD Donders push-up blur
(p=0.49)



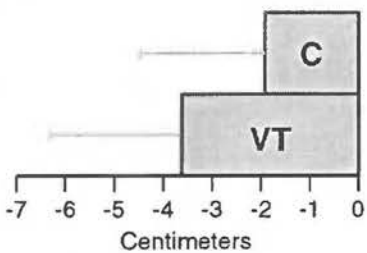
OS Donders push-up blur
(p=0.68)



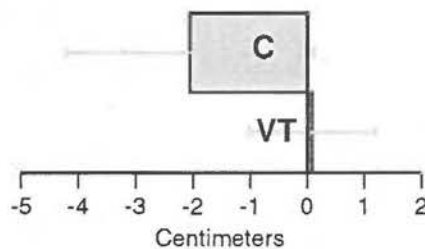
OU Donders push-up blur
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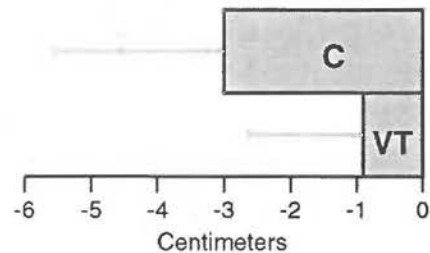
OD Donders push-up rec
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OS Donders push-up rec
(p=0.34)



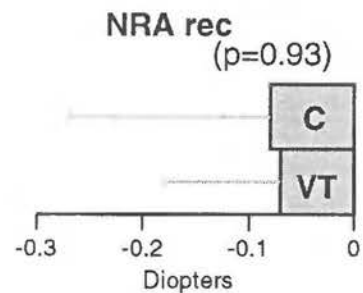
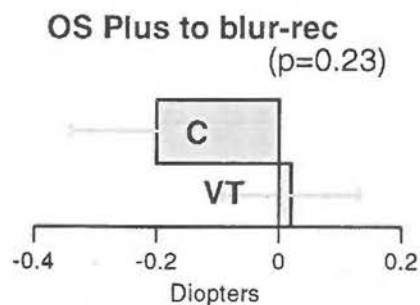
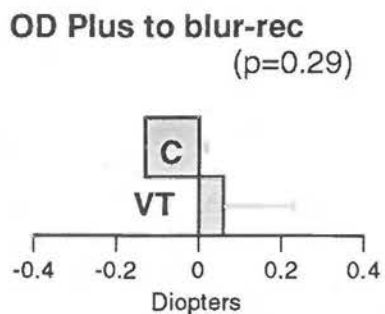
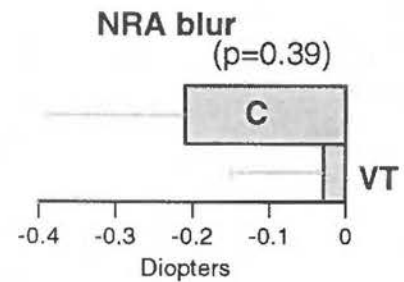
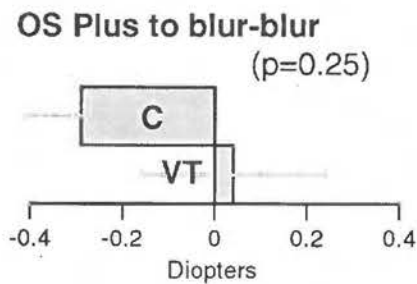
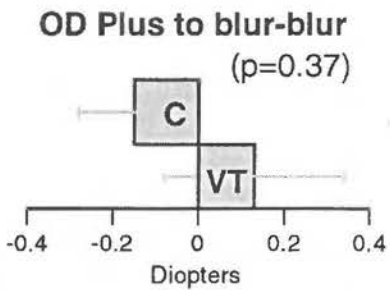
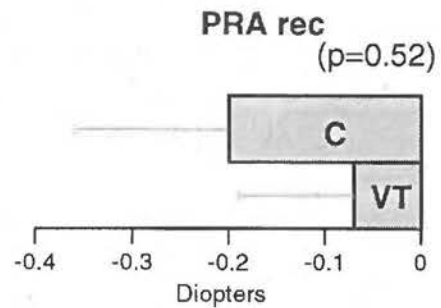
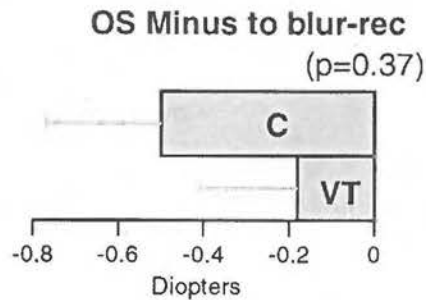
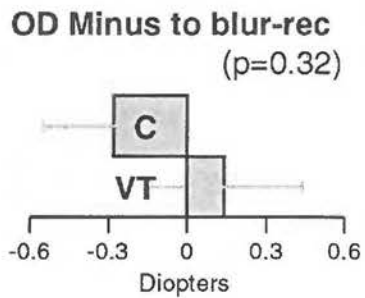
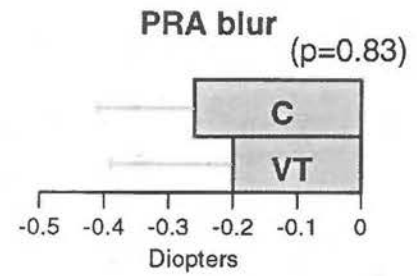
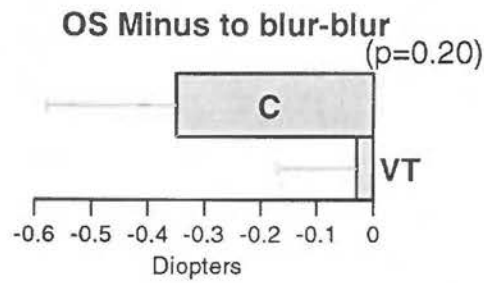
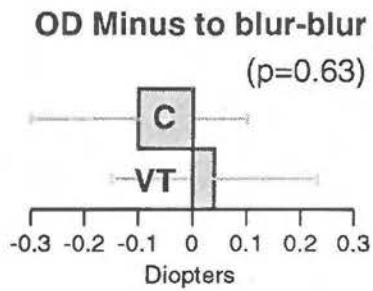
OU Donders push-up rec
(p=0.49)



Negative values denote a decrease in amplitude.

ACCOMMODATIVE AMPLITUDE - Continued

Changes in accommodative amplitude pre to post between groups



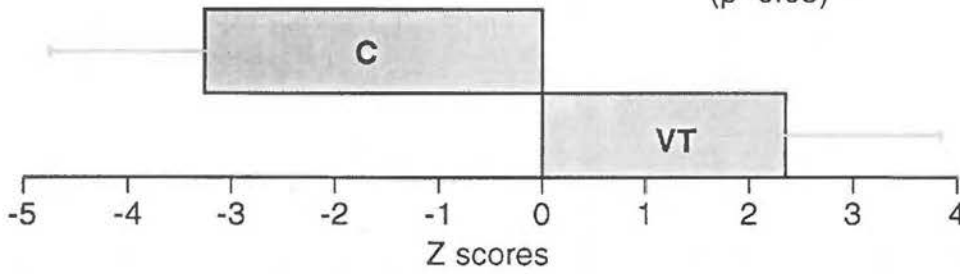
Negative values denote a decrease in amplitude.

ACCOMMODATIVE FACILITY

Changes in accommodative facility pre to post between groups

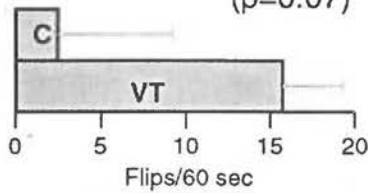
Accommodative Facility Index

($p=0.03$)



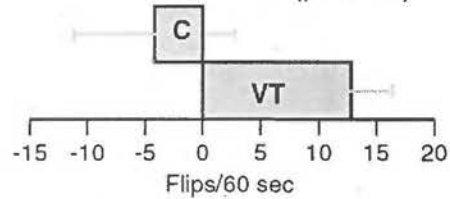
OD ± flips

($p=0.07$)



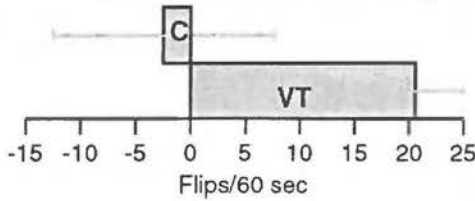
OS ± flips

($p=0.03$)



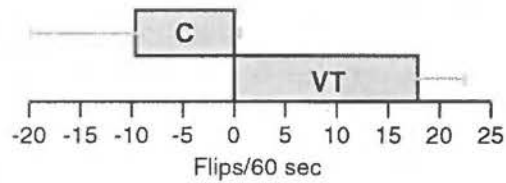
OD ± flips multiplied by power of lens used

($p=0.03$)



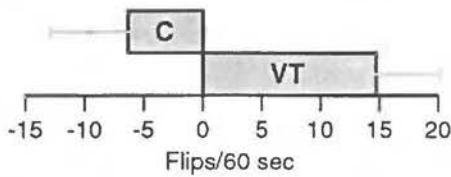
OS ± flips multiplied by power of lens used

($p=0.01$)



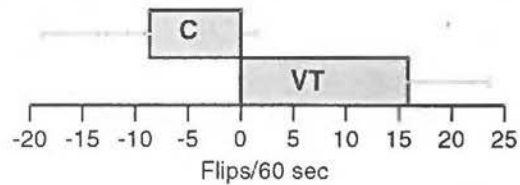
OU ± flips

($p=0.02$)



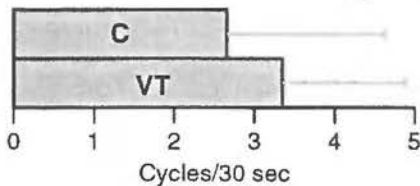
OU ± flips multiplied by power of lens used

($p=0.07$)



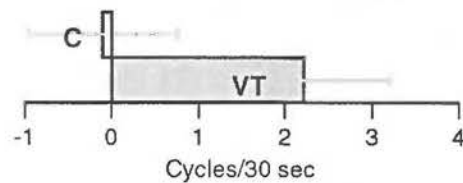
Haynes Distance Rock 20/80

($p=0.79$)



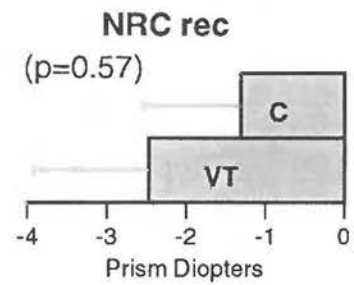
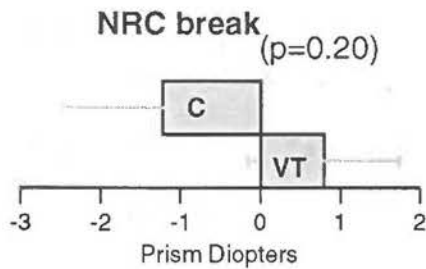
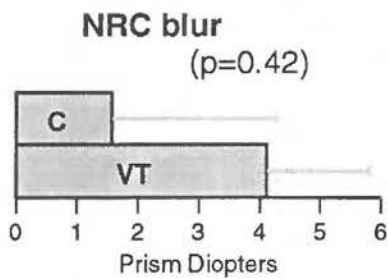
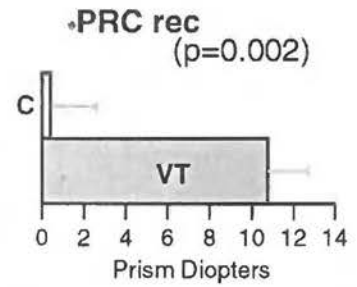
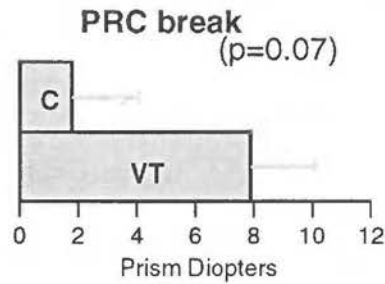
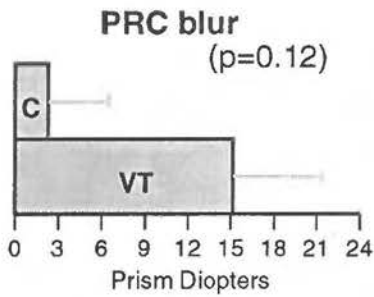
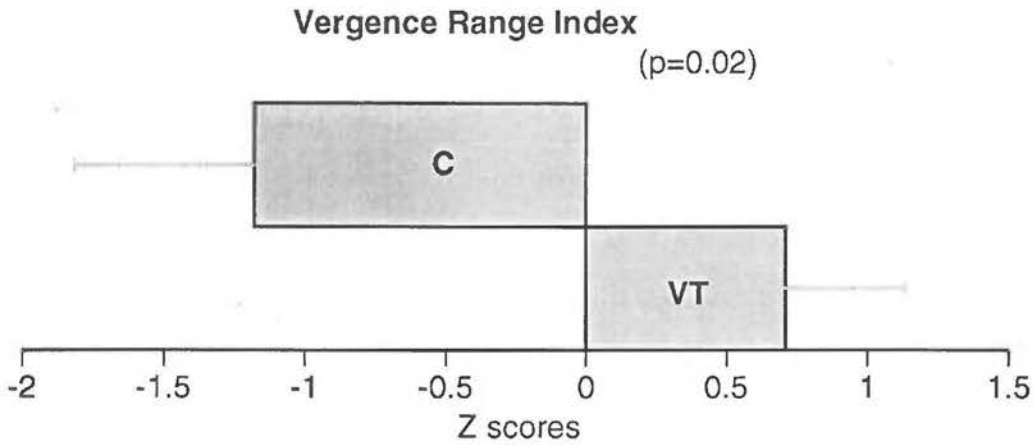
Haynes Distance Rock 20/25

($p=0.14$)



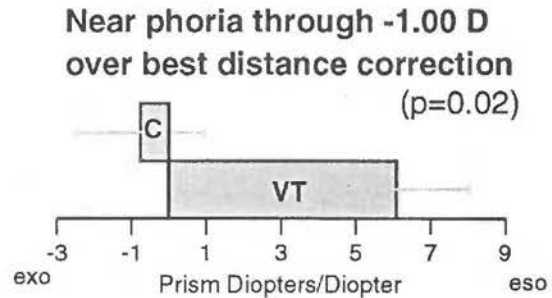
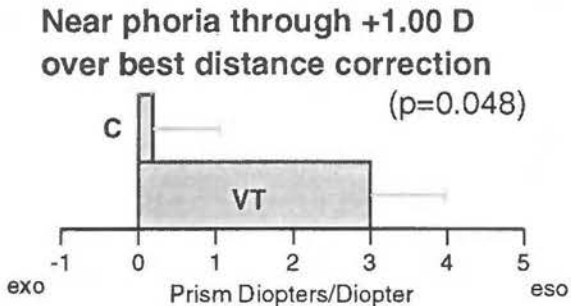
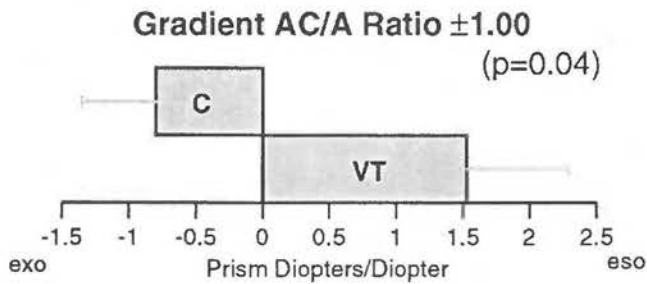
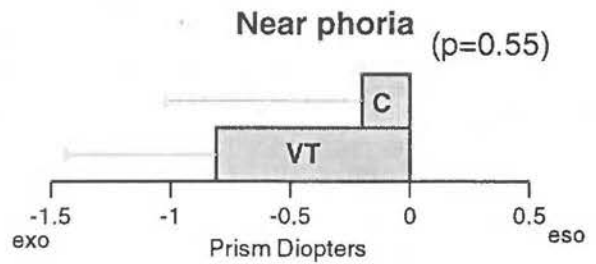
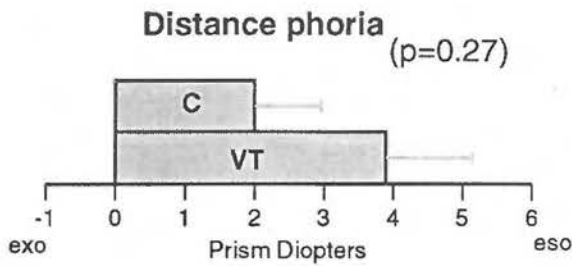
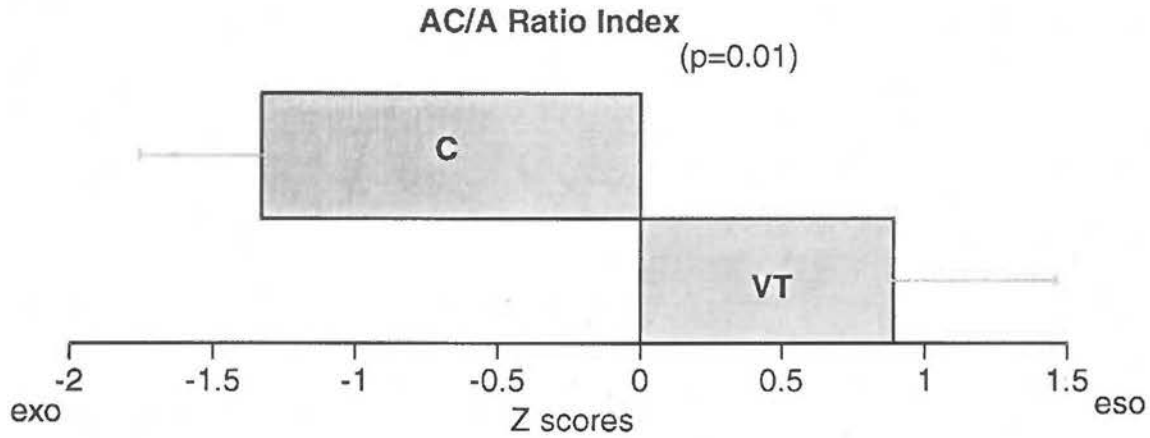
VERGENCE RANGE

Change in vergence ranges pre to post between groups



AC/A RATIO

Changes in AC/A ratio pre to post between groups



test measure	VT Subjects								Control Subjects								Significance
	pre		post		change (pr-ps)		pre		post		change(pr-ps)						
	mean	S.D.	mean	S.D.	mean	S.D.	mean	S.D.	mean	S.D.	mean	S.D.					
#3	-0.59	5.08	3.30	5.56	3.89	5.54	-2.48	3.84	-0.48	2.64	2.00	3.56	p=0.2713				
13a	1.11	3.83	0.30	3.72	-0.81	2.80	-1.00	3.94	-1.20	3.11	-0.20	3.05	p=0.5468				
ODdry Rx eq sph	-0.92	2.47	-0.87	2.44	0.05		-0.77	1.93	-0.69	1.99	0.08						
OSdry Rx eq sph	-0.90	2.42	-0.83	2.44	0.07		-0.99	2.35	-0.92	2.25	0.07						
ODwet Rx eq sph	-0.68	2.53	-1.35	3.39	-0.66		-0.09	1.93	0.38	0.94	0.47						
OSwet Rx eq sph	-0.72	2.52	-1.25	3.46	-0.53		-0.21	2.27	0.38	0.57	0.58						
14a OD	1.39	0.74	1.58	0.56	0.19	0.60	1.73	0.72	1.40	0.36	-0.34	0.90	p=0.0421				
14a OS	1.34	0.75	1.58	0.65	0.24	0.48	1.79	0.77	1.44	0.39	-0.35	0.80	p=0.0088				
14b OD	1.18	0.62	1.35	0.51	0.18	0.35	1.20	0.58	1.14	0.52	-0.06	0.71	p=0.3043				
14b OS	1.14	0.67	1.29	0.69	0.15	0.60	1.25	0.65	1.17	0.49	-0.08	0.79	p=0.3976				
5 OD	1.85	2.36	1.84	2.32	-0.01	0.71	1.46	0.48	1.21	0.51	-0.26	0.54	p=0.3881				
5 OS	1.80	2.36	1.74	2.34	-0.06	0.64	1.42	0.37	1.16	0.53	-0.26	0.42	p=0.5853				
PRC BI	15.67	8.43	23.13	12.28	7.46	17.59	16.50	6.91	17.43	4.86	0.93	10.98	p=0.1201				
PRC Br	20.65	8.78	28.39	10.85	7.74	9.26	18.57	7.38	19.92	6.06	1.35	8.25	p=0.0676				
PRC Rec	9.45	7.10	20.65	11.60	11.20	8.55	9.57	8.00	9.77	8.01	0.20	7.88	p=0.0016				
NRC BI	10.92	5.58	11.56	6.31	0.64	5.11	10.50	4.63	9.86	4.26	-0.64	7.16	p=0.4207				
NRC Br	17.95	5.96	18.42	7.14	0.47	4.13	17.50	5.07	16.39	6.70	-1.12	4.49	p=0.1996				
NRC Rec	10.85	4.49	8.53	6.79	-2.32	6.31	12.07	5.77	10.77	6.61	-1.30	4.42	p=0.5694				
PRA bi	-1.21	1.60	-0.74	1.59	0.47	0.87	-1.30	1.17	-0.55	0.92	0.75	0.52	p=0.828				
PRA rec	-0.95	1.57	-0.49	1.57	0.46	0.53	-1.02	1.20	-0.30	0.97	0.72	0.55	p=0.5234				
NRA bi	2.94	0.63	2.69	1.06	-0.25	0.55	2.95	0.38	2.94	0.95	-0.01	0.63	p=0.3935				
NRA rec	2.69	0.65	2.43	0.95	-0.25	0.47	2.75	0.48	2.79	0.91	0.04	0.64	p=0.9307				
-bi OD bi	-1.08	1.45	-1.08	1.32	0.00	0.87	-1.25	1.41	-0.88	1.19	0.38	0.70	p=0.6346				
-bi OD rec	-1.29	1.56	-1.01	1.34	0.28	1.00	-1.25	1.40	-0.59	1.34	0.66	0.84	p=0.3211				
-bi OS bi	-1.24	1.54	-1.26	1.39	-0.03	0.59	-1.50	1.52	-0.94	1.07	0.56	0.80	p=0.1994				
-bi OS rec	-1.52	1.63	-1.12	1.36	0.40	0.74	-1.46	1.68	-0.68	1.16	0.78	0.84	p=0.3703				
+bi OD bi	2.75	1.07	2.91	0.49	0.16	0.96	3.02	0.32	2.85	0.42	-0.16	0.45	p=0.3664				
+bi OD rec	2.60	0.86	2.75	0.54	0.15	0.60	2.75	0.40	2.55	0.44	-0.20	0.41	p=0.4256				
+bi OS bi	2.90	1.00	2.94	0.47	0.04	0.90	3.07	0.36	2.75	0.43	-0.32	0.42	p=0.2457				
+bi OS rec	2.73	0.71	2.79	0.11	0.06	0.39	2.75	0.52	2.43	0.32	-0.32	0.44	p=0.2259				
+1 ACA	-5.13	5.35	-1.88	5.11	3.26	4.47	-5.54	2.75	-5.36	3.84	0.18	3.21	p=0.0048				
-1 ACA	0.76	7.51	6.84	7.60	6.08	8.41	0.68	5.55	0.02	4.63	-0.66	5.99	p=0.0205				
ACA Ratio	2.95	2.27	4.50	3.87	1.55	3.32	3.11	2.55	2.70	1.58	-0.41	1.91	p=0.0356				
Pup OD	4.03	0.74	4.03	0.86	0.00	1.39	4.63	0.74	4.35	0.78	-0.28	1.18	p=0.8597				
Pup OS	4.18	0.89	4.11	0.91	-0.07	0.62	4.54	1.08	4.00	1.00	-0.54	1.29	p=0.8999				
Flips OD 60	20.38	10.03	36.07	16.03	15.69	13.28	24.60	15.93	20.00	14.60	-4.60	20.15	p=0.0696				
Flips OS 60	23.56	11.36	36.87	16.40	13.31	13.41	31.40	15.90	20.78	13.05	-10.62	20.93	p=0.0265				
xflipsOD 60	29.20	15.76	49.20	23.04	20.00	16.60	38.50	25.98	33.47	27.99	-5.03	28.55	p=0.0257				
xflipsOS 60	32.41	13.38	50.27	23.65	17.86	17.04	45.78	23.06	34.97	25.63	-10.80	28.90	p=0.0102				
flips OU 60	20.81	8.42	35.40	21.36	14.59	20.27	31.80	19.85	17.11	14.47	-14.69	19.53	p=0.0224				
xflipsOU 60	30.97	12.88	46.15	28.10	15.18	28.55	43.25	28.25	28.95	23.87	-14.30	28.88	p=0.0682				
flips OD 30	13.00	2.45	17.75	1.26	4.75		16.50	2.12	15.50	7.78	-1.00						
flipsOS 30	9.50	4.51	17.50	0.58	8.00		16.00	1.41	20.50	4.95	4.50						
xflipsOD 30	18.63	9.76	24.00	6.68	5.38		24.00	8.49	20.75	15.20	-3.25						
xflipsOS 30	14.50	11.27	24.13	8.78	9.63		23.50	9.19	32.50	21.92	9.00						
flips OU 30	13.25	4.86	18.50	2.08	5.25		19.50	0.71	19.50	2.12	0.00						
xflipsOU 30	18.50	8.96	25.88	10.62	7.38		29.00	12.73	24.75	9.55	-4.25						
OU lens	1.49	0.43	1.41	0.48	-0.07		1.50	0.45	1.50	0.38	0.00						
lens OD	1.46	0.45	1.43	0.49	-0.03		1.50	0.45	1.55	0.37	0.04						
lens OS	1.46	0.45	1.41	0.45	-0.05		1.50	0.45	1.57	0.41	0.07						
DxRk80	15.03	6.39	18.38	7.82	3.35	6.88	19.25	7.50	19.45	11.41	0.20	6.27	p=0.7889				
DxRk80 Err	0.70	1.08	0.60	0.88	-0.10		0.75	0.75	0.70	1.06	-0.05						
DxRk25	8.60	3.99	11.16	5.26	2.56	4.37	13.04	9.12	10.25	9.56	-2.79	2.72	p=0.1405				
DxRk25 Err	1.75	1.59	1.68	1.80	-0.07		1.00	1.48	1.30	1.77	0.30						
AABI OD	19.88	7.90	23.08	13.30	3.20	11.62	19.19	7.06	21.54	6.58	2.35	5.27	p=0.4939				
AARec OD	22.95	8.76	27.53	14.34	4.58	11.73	23.73	6.90	25.10	8.67	1.37	8.47	p=0.6753				
AABI OS	19.48	8.10	19.97	8.06	0.50	4.32	19.19	5.49	19.36	6.63	0.17	4.16	p=0.6788				
AARec OS	22.98	8.81	23.84	9.11	0.87	4.82	22.10	4.24	23.05	7.90	0.95	7.20	p=0.3395				
AABI OU	18.05	7.47	18.76	7.90	0.71	6.61	16.97	5.37	19.31	7.65	2.34	5.39	p=0.6768				
AARec OU	21.05	8.19	22.79	10.15	1.74	7.60	20.45	4.79	22.83	9.00	2.38	8.47	p=0.4871				
days to finish	146.85	26.70					178.62	69.21									
days of VT done	94.05	31.98															
Weeks of VT done	14.50	2.54															
days of VT/week	4.91	1.22															
Age	44.05	4.54					42.57	4.31									

test measure	VT Subjects		Control Subjects		Significance
	change (pr-ps)		change(pr-ps)		
	mean	S.D.	mean	S.D.	
Habitual 6m phoria	0.161	1.142	-0.229	0.732	p=0.2705
Habitual 40cm phoria	-0.089	0.974	0.126	1.06	p=0.5447
Monocular cross cylinder-OD	-0.275	0.785	0.46	1.177	p=0.042
Monocular cross cylinder-OS	-0.348	0.707	0.578	1.172	p=0.0088
Binocular cross cylinder-OD	-0.145	0.679	0.226	1.35	p=0.3043
Binocular cross cylinder-OS	-0.122	0.885	0.185	1.172	p=0.3976
Dynamic retinoscopy @50 cm-OD	-0.118	1.084	0.214	0.833	p=0.3871
Dynamic retinoscopy @50 cm-OS	-0.074	1.128	0.134	0.735	p=0.5853
PRC BI	0.377	1.112	-0.433	0.694	p=0.1201
PRC Br	0.277	1.003	-0.386	0.892	p=0.0676
PRC Rec	0.436	0.886	-0.637	0.816	p=0.0016
NRC BI	0.186	0.849	-0.239	1.191	p=0.4187
NRC Br	0.19	0.954	-0.275	1.037	p=0.2007
NRC Rec	-0.084	1.135	0.125	0.796	p=0.5708
PRA bl	0.031	1.16	-0.049	0.698	p=0.8303
PRA rec	0.097	0.994	-0.146	1.032	p=0.5234
NRA bl	0.12	0.951	-0.198	1.089	p=0.392
NRA rec	0.015	0.882	-0.019	1.205	p=0.9275
-bl OD bl	0.067	1.087	-0.111	0.869	p=0.6341
-bl OD rec	0.211	1.079	-0.237	0.904	p=0.3181
-bl OS bl	0.184	0.861	-0.294	1.168	p=0.2001
-bl OS rec	0.207	0.937	-0.205	1.071	p=0.372
+bl OD bl	0.125	1.188	-0.211	0.552	p=0.3664
+bl OD rec	-0.212	0.012	-0.125	0.146	p=0.2868
+bl OS bl	0.161	1.176	-0.268	0.554	p=0.247
+bl OS rec	0.24	0.939	-0.288	1.048	p=0.227
+1 ACA	0.281	1.06	-0.402	0.777	p=0.0483
-1 ACA	0.324	1.027	-0.512	0.731	p=0.0207
ACA Ratio	0.295	1.09	-0.468	0.628	p=0.036
Pup OD	-0.026	1.067	0.045	0.913	p=0.859
Pup OS	0.018	0.7	-0.033	1.458	p=0.898
Flips OD 60	0.302	0.77	-0.47	1.174	p=0.0695
Flips OS 60	0.363	0.729	-0.562	1.14	p=0.0266
xflipsOD 60	0.351	0.694	-0.613	1.195	p=0.0256
xflipsOS 60	0.396	0.672	-0.692	1.139	p=0.0101
flips OU 60	0.371	0.915	-0.578	0.881	p=0.0226
xflipsOU 60	0.291	0.938	-0.513	0.948	p=0.0685
DxRk80	0.036	1.046	-0.069	0.955	p=0.7918
DxRk25	0.201	1.096	-0.38	0.683	p=0.1401
AABI OD	-0.096	1.192	0.167	0.54	p=0.497
AARec OD	-0.058	1.114	0.104	0.802	p=0.6762
AABI OS	-0.059	1.029	0.103	0.99	p=0.6774
AARec OS	0.135	0.834	-0.234	1.246	p=0.3388
AABI OU	0.059	1.081	-0.102	0.881	p=0.6778
AARec OU	0.099	0.968	-0.171	1.079	p=0.4861

Z-scores Table

Index area	VT Subjects		Control Subjects		Significance
	mean	S.D.	mean	S.D.	
Accom. Posture	-1.082	3.361	0.807	3.4	0.1466
Accom. Facility	2.345	5.355	-3.257	3.944	0.0261
Accom Amplitude	2.247	6.37	-1.112	5.753	0.2462
AC/A Ratio	0.894	2.491	-1.328	1.492	0.0094
Vergence Range	0.713	1.79	-1.175	2.312	0.0157

Z-score Index Table

Entrance Criteria

PORTLAND
 PRESBYOPIA
 ONSET
 DELAY
 STUDY

Name _____ Date _____

Address _____

Phone _____

Date of Birth _____

Male/Female

Study Center _____

Under age 35?	Yes	No
Currently wearing reading glasses?	Yes	No
Radial keratotomy?	Yes	No
Strabismus?	Yes	No
Cataracts?	Yes	No
Medications?	Yes	No

if yes, list: _____

Would you be willing to go downtown Portland (10th and Washington) three times during the course of the study for a 10 minute evaluation of how your eyes coordinate while aiming and focusing?	Yes	No
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----	----

BVA 40 cm 20/40? (OD, OS, OU, w/ dist Rx)	Yes	No
BVA 6 m 20/20? (OD, OS, OU, w/ dist Rx)	Yes	No
50 seconds stereopsis?	Yes	No
NPA 33 cm?	Yes	No
NPC 15 cm?	Yes	No
Signed informed consent?	Yes	No

Group preference _____

Dates: Entrance exam: _____

Training 1: _____

Training 2: _____ Progress eval 1: _____

Training 3: _____ Progress eval 2: _____

Training 4: _____ Progress eval 3: _____

Exit exam: _____

Pharmaceutical Agents
that Affect
Accommodation and Vergence

PORTLAND
PRESBYOPIA
ONSET
DELAY
STUDY

Acebutolol	Atropine
Acetaminophen	Atropine Methylnitrate
Acetanilid	Aurothioglucose
Acetazolamide	Aurothioglycanide
Acetohexamide	Azatadine
Acetophenazine	Baclofen
Acetylcholine	Barbital
Adiphenine	Belladonna
Adrenal Cortex Injection	Bendroflumethiazide
Alcohol	Benzathine Penicillin G
Aldosterone	Benzphetamine
Alkavervir	Benzthiazide
Allobarbital	Benztropine
Alprazolam	Betamethasone
Alseroxylon	Bethanechol
Ambenonium	Biperiden
Ambutonium	Bromide
Aminosalicic Acid (?)	Bromisovalum
Amitriptyline	Brompheniramine
Amobarbital	Broxyquinoline
Amodiaquine	Bupivacaine
Amoxapine	Butabarbital
Amphetamine	Butalbital
Amphetaminex	Butallylonal
Amphotericin B	Butaperazine
Amyl Nitrite	Butethal
Anisindione	Caramiphen
Anisotropine	Carbachol
Antazoline	Carbamazepine
Antimony Lithium Thiomalate	Carbinoxamine
Antimony Potassium Tartrate	Carbon Dioxide
Antimony Sodium Tartrate	Carbromal
Antimony Sodium Thioglycollate	Carisoprodol
Aprobarbital	Carphenazine
Atenolol	Chloral Hydrate
	Chloramphenicol

Chlordiazepoxide	Demecarium
Chlorisondamine	Deserpidine
Chloroform	Desipramine
Chloroprocaine	Deslanoside
Chloroquine	Desoxycorticosterone
Chlorothiazide	Dexamethasone
Chlorothiazide	Dexbrompheniramine
Chlorpheniramine	Dexchlorpheniramine
Chlorphenoxamine	Dextroamphetamine
Chlorphentermine	DFP
Chlorpromazine	Diacetylmorphine (Heroin)
Chlorpropamide	Diazepam
Chlorprothixene	Dibucaine
Chlorthalidone	Dichlorphenamide
Clemastine	Dicyclomine
Clomiphene	Diethazine
Clomipramine	Diethylpropion
Clonazepam	Digitalis
Clorazepate	Digitoxin
Cloroquine	Digoxin
Cocaine	Dimethindene
Codeine	Diphepanil
Colchicine	Diphenadione
Colistimethate	Diphenhydramine
Colistin	Diphenylhydantoin
Cortisone	Diphenylpyraline
Cryptenamine	Disulfiram
Cyclizine	Doxepin
Cyclobarbital	Doxylamine
Cyclopentobarbital	Droperidol
Cyclopentolate	Echothiophate
Cyclopentyl Allylbarbituric Acid	Edrophonium
Cycloserine (?)	Emetine
Cyclothiazide	Ephedrine
Cycrimine	Epinephrine
Cyproheptadine	Ergot

Ergotamine
Ethambutol
Ethchlorvynol
Ether
Ethopropazine
Ethotoin
Ethoxzolamide
Floxuridine
Fludrocortisone
Fluorometholone
Fluorouracil
Fluphenazine
Fluphenazine Haloperidol
Fluprednisolone
Flurazepam
Furosemide (?)
Gitalin
Glutethimide
Glycopyrrolate
Gold Au¹⁹⁸
Gold Sodium Thiomalate
Gold Sodium Thiosulfate
Guanethidine
Halazepam
Haloperidol
Hashish
Heptabarbital
Hexamethonium
Hexethal
Hexobarbital
Hexocyclium
Homatropine
Hydrabamine Phenoxyethyl Penicillin
Hydrochlorothiazide
Hydrocortisone
Hydroflumethiazide
Hydromorphone
Hydroxyamphetamine
Hydroxychloroquine
Imipramine
Indomethacin (?)
Insulin
Iodide and Iodine Solutions and Compounds
Iodochlorhydroxyquin
Iodoquinol
Isocarboxazid
Isoflurophate
Isoniazid
Isopropamide
Labetolol
Lantoside C
Levallorphan
Levarterenol
Levodopa
Lidocaine
Lithium Carbonate
Lorazepam
Loxapine
LSD
Lysergide
Marijuana
Mecamylamine
Medprednisone
Medrysone
Mepenzolate
Meperidine
Mephenesin
Mephentermine
Mephenytoin
Mephobarbital
Mepivacaine
Meproamate

Mescaline	Nalorphine
Mesoridazine	Naloxone
Metaraminol	Naphazoline
Methacholine	Naproxen
Methamphetamine	Neostigmine
Methantheline	Nialamide
Methaqualone (?)	Nitrazepam
Metharbital	Nitrofurantoin
Methazolamide	Nitrous Oxide
Methdilazine	Norepinephrine
Methitural	Nortriptyline
Methixene	Opium
Methocarbamol	Oral Contraceptives
Methohexital	Orphenadrine
Methotrimeprazine	Ouabain
Methoxamine	Oxazepam
Methscopolamine	Oxygen
Methsuximide	Oxymorphone
Methyclothiazide	Oxyphenbutazone
Methyl Alcohol	Oxyphencyclimine
Methylatropine Nitrate	Oxyphenonium
Methylene Blue	Paraldehyde
Methylpentynol	Paramethadione
Methylphenidate	Paramethasone
Methylprednisolone	Pargyline
Methyprylon	Pentazocine
Methysergide	Pentobarbital
Metoclopramide	Pentolinium
Metocurine Iodide	Pentylene-tetrazol
Metolazone	Perazine
Metoprolo	Pericyazine
Minocycline	Perphenazine
Mitotane	Phenacetin
Morphine	Phendimetrazine
Nadolol	Phenelzine
Nalidixic Acid	Phenindione

Pheniramine	Procyclidine
Phenmetrazine	Promazine
Phenobarbital	Promethazine
Phenoxybenzamine	Propantheline
Phenoxymethyl Penicillin	Propiomazine
Phensuximide	Propoxycaine
Phentermine	Propoxyphene
Phenylbutazone	Propranolol
Phenylephrine	Protoberatrines A and B
Phenylpropanolamine	Protriptyline
Phenytoin	Psilocybin
Physostigmine	Pyridostigmine
Pilocarpine	Pyrilamine
Pindolol	Quinethazone
Pipenzolate	Quinidine
Piperacetazine	Quinine
Piperazine	Radioactive Iodides
Piperidolate	Rauwolfia Serpentina
Piperocaine	Rescinnamine
Poldine	Reserpine
Polythiazide	Scopolamine
Potassium Penicillin G	Secobarbital
Potassium Penicillin V	Sodium Antimonylgluconate
Potassium Phenethicillin	Sodium Salicylate
Potassium Phenoxyethyl Penicillin	Stibocaptate
Pralidoxime	Stibophen
Prazepam	Streptomycin
Prednisolone	Succinylcholine
Prednisone	Syrosingopine
Prilocaine	Talbutal
Primidone	Temazepam
Probarbital	Tetanus Toxoid
Procaine	Tetracaine
Procaine Penicillin G	Tetracycline
Procarbazine	Tetraethylammonium
Prochlorperazine	Tetrahydrocannabinol

Tetrahydrozoline
THC
Thiamylal
Thiethylperazine
Thiopental
Thiopropazate
Thiopropazine
Thioridazine
Thiothixene
Tolazamide
Tolazoline
Tolbutamide
Tranylcypromine
Triamcinolone
Triazolam
Trichlormethiazide
Trichloroethylene
Tridihexethyl
Trifluoperazine
Trifluoperidol
Triflupromazine
Trihexyphenidyl
Trimeprazine
Trimethadione
Trimethaphan
Trimethidinium
Trimipramine
Tripelennamine
Triprolidine
Tropicamide
Tubocurarine
Urethan
Veratrum
Vinbarbital
Vinblastine
Vincristine

Pacific University College of Optometry Informed Consent

Portland Presbyopia Onset Delay Study (PPODS)

Primary investigators: Tammie Calef and Bradley Coffey, O.D. 357-6151 x2280

DESCRIPTION

The goal of this research is to determine if vision therapy (VT) has an impact on the onset or progression of presbyopia, a visual condition in which there is an age related loss of near point abilities. Pre-presbyopic individuals will be enlisted to complete "at home" VT for a period of four months, with monthly progress evaluations at one of the various research centers. Their nearpoint visual abilities will be compared to those of a control group.

RISKS

The testing included in the diagnostic evaluation consists of visual tests which are routinely used in diagnostic testing at the Pacific University Family Vision Centers. No experimental procedures are included. As such, risk to subjects is no greater than that associated with a routine visual examination.

BENEFITS

The information gained from this study will provide necessary data regarding the effects of VT on near point abilities and may determine if a VT regimen is beneficial in the prevention or delay of presbyopia.

COMPENSATION AND MEDICAL CARE

All efforts have been made to eliminate risk of injury to subjects. In the unlikely event that a subject is injured in this study, it is possible that no compensation or medical care will be provided by the investigators or by any organization associated with the study.

ALTERNATIVES ADVANTAGEOUS TO SUBJECTS

Presbyopia is typically compensated using reading glasses or bifocal glasses or contact lenses. This treatment option is also available from your doctor.

OFFER TO ANSWER INQUIRIES

The investigators will be happy to answer any questions that may arise at any time during the course of the study. If the answers are not satisfactory, please call Dr. James Peterson (357-0422).

FREEDOM TO WITHDRAW

Subjects are free to withdraw their consent and to discontinue participation in project or activity at any time without prejudice toward them.

I have read and understand the above information and I am in agreement with the personal obligations of the consent.

Printed name: _____

Date of birth: _____

Signature: _____

Date: _____

Address: _____

Phone: _____

Name of nearest relative (not living with you): _____

Phone: _____

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**A Protocol
of
the Exam Tests**

habitual phorias- distance and near phorias taken in phoropter with Risley prisms through the habitually worn lenses which should be the distance Rx for both near and far. If not, the subject may be disqualified. The preferred target at far and near is an isolated vertical 20/20 line, but if the subject sees only 20/40 at near, a reduced Snellen chart may be used. At far, if you do not normally use the isolated vertical 20/20 line, use your regular target as long as it has at least a 20/25 acuity demand, and note the target.

refraction without cycloplegia- your standard subjective refraction to yield maximum plus to best visual acuity

refraction with cycloplegia- dosage: anesthetic followed by one drop 1% cyclopentolate. Wait 5 minutes. 1 more drop 1% cyclopentolate. Wait a minimum of 20 minutes before proceeding with refraction. Please remind subjects that they will be cyclopleged for their first and last exams, but not for the monthly progress checks.

monocular 40cm cross-cylinder accommodative posture tests- preset with at least 3.00D plus sphere over distance subjective refraction. Use 90/180° cross grid and cross cylinder. 45/135° grid and cylinder may be used if subject responds poorly to 90/180°. Record the lens value corresponding to the last "equal" response before the blackest grid lines change. If no "equal" response, record the lens value that causes the perception of change in blackness.

binocular 40cm cross-cylinder accommodative posture tests- preset with the monocular test above and record using same criteria.

dynamic retinoscopy- high neutral. Use the "hole card" with 20/40 letters in phoropter at 50 cm. Instruct patient to find, in order, the letters of the alphabet, and to call them out. Add +2 D to your distance retinoscopy finding (or to pt.'s distance subjective BVA lens), then reduce plus while 'scoping both eyes through hole in card with retinoscope right behind (touching) back of card. Record lens value when first neutral is seen. Don't bracket.

PRC (positive relative convergence)- binocular base out to blur, break, and recovery of single vision. Use vertical 20/20 line at 40 cm. with distance subjective BVA lens in phoropter

NRC (negative relative convergence)- binocular base in to blur, break, and recovery of single vision. Use vertical 20/20 line at 40 cm. with distance subjective BVA lens in phoropter

PRA (positive relative accommodation)- binocular minus lens to blur out, break, and recovery of single vision. Use horizontal 20/20 line at 40 cm.

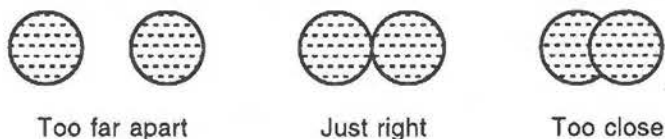
NRA (negative relative accommodation)- binocular plus lens to blur out, break, and recovery of single vision. Use horizontal 20/20 line at 40 cm.

monocular minus accommodative amplitudes- add minus monocularly to blur out and recovery, using a horizontal 20/20 line at 40 cm.

monocular plus accommodative amplitudes- add plus monocularly to blur out and recovery, using a horizontal 20/20 line at 40 cm.

gradient AC/A \pm 1.00- the gradient AC/A consists of two measurements of a 40cm von Graefe phoria using Risley prisms while the subject views the standard phoria target through lenses of 1.00 D greater and lesser than the subjective refraction to BVA. The measurements can be conveniently accomplished immediately after the refraction and prior to other nearpoint measurements. Bracket two phoria measurements with +1.00 D over the subjective refraction, then two phoria measurements with -1.00 over the subjective.

pupil size- this measurement is made using a Cogan pupillometer supplied by Pacific. The pupillometer uses a strip of opaque material with several sets of two adjacent pinholes which are progressively further apart. The subject covers one eye and measures the pupil size of the other by adjusting the pinholes to obtain a set that give the perception of two circles which are just touching, as illustrated below. If no set of circles just touches, the set of circles that appear to barely overlap should be recorded as the pupil diameter. The measurement is repeated for the other eye. It is important that the measurement is taken with exactly the same illumination level for the entrance and exit evaluations. It may be convenient for the subjects to look toward a diffuse light source such as an overhead fluorescent light to satisfy the requirement for use of the same illumination for entrance and exit testing.



Evaluation Tests

Donders push-up amplitudes- subject reads standard nearpoint 0.62M paragraph (e.g., "of Mr. Read, my future wife's father. . .") aloud as card is slowly moved toward subject until subject can no longer read the words. Measure this distance as blur out, move the card slightly closer to the subject, then slowly move the card away until the subject can begin reading again. Record this distance as "recovery." Have the subject read from different parts of the paragraph to avoid memorization. Done out of phoropter, OD, OS, OU with good nearpoint illumination. Record blur out and recovery in cm.

Haynes binocular distance rocks- The targets used are the Haynes Distance Rock Test Charts, which Pacific University will provide. The test is done at both 20/80 and 20/25 acuity demand. The distance target is placed at 6m. The near target at 40 cm, is held by subject. Standard room illumination with additional nearpoint illumination on the near chart. Subject stands relaxed. The subject holds the near target just below eye

level and on line with the distance chart. The subject is asked to look alternately between the two charts at the large letters, keeping the letters clear and single, and call out the first letter of the near chart, then the first letter of the far chart, then the second letter of the near chart, then the second letter of the far chart, and so on, as quickly as possible without losing his/her place. The subject will continue for 30 seconds, starting at the first letter again if necessary. Complete a second trial using the 20/25 acuity demand letters. Record the number of near-far cycles completed without error in the 30 seconds for each acuity level. Subtract one-half cycle for each error (if the subject skips a letter, then continues on with a one letter offset, this should be scored as one error, not as several). A cycle consists of a near-far pair.

monocular lens rocks- subject is seated and views accommodative facility test chart at 40cm with good nearpoint illumination. The subject views the letters on the chart alternately through a ± 2.00 lens flipper (if possible; see below) and calls the letters aloud in groups of two, flipping the lenses after each pair of letters is called. Testing is conducted for one minute and the number of lens flips is counted by the tester and recorded. The subject is instructed to change the focus of his or her eyes when looking through the lenses so that the print ". . ." is as clear with the lenses as it was without the lenses." An eye patch is worn during testing and each eye is tested individually. If the subject is unable to clear the -2.00 lenses, the lens flipper power should be reduced in 0.25 D steps until the maximum power that can be cleared is found. The lens flipper power used for testing should be recorded on the recording form.

binocular lens rocks- as with monocular lens rocks on the previous page, but with both eyes open.

DISTANCE ROCK TESTING PROTOCOL (NEAR FAR ROCK)

PURPOSE OF TEST: Measurement of a combination accommodative, vergence and oculomotor facility.

SET UP: Have the patient standing relaxed 6m. from the distance chart. The near chart should be held at 40 cm. just below eye level and on line with the distance chart. Both charts should be well lit. (Standard room illumination 34-79 foot candles at both charts).

INSTRUCTIONAL SET: "Keep both of your eyes open all the time and look quickly back and forth between this close chart and the other chart in the distance. Call out the first letter on the near chart, then quickly look to the far chart and call out the first letter on it. Look back quickly and call out the second letter on the near chart, then again look to the far chart, and so on. Go as quickly as you can, but be careful not to lose your place. Make sure the letters are clear before you call out the letter on either chart. Call only the large (20/80) letters in the first 30 second test period, ready, begin..... Stop; now we will repeat the test with you calling out only the small (20/25) letters."

RECORD: The number of near-far cycles completed in 30 seconds at each of the two VA demand levels. One cycle consists of a shift from near to far, then back to near. You can easily determine the number of cycles completed by subtracting 1 from the total count of letters called from the near chart. Record also: errors for both portions of the test. (Note: Elite athletes use a slightly different procedure)

NORMS: 20/80:33.8cpm (+-7); 20/25:23.7 cpm (+-6)

	20/80			
	<u>Top Row</u>	<u>Middle Row</u>	<u>Bottom Row</u>	
Far	N O N S H R V O K S	S Z R H O N S K C V	C H R K C Z O H R N	___errors
Near	C Z S H O N R V D K	H R N S Z R V O K S	N D Z C V S K O H R	___cycles
	20/25			
Far	V C Z R N S V O K C	N O H S Z C V C K S	H S K D Z H O R Z C	___errors
Near	N O H D K C V R Z S	O K Z D N R H O V S	V C N R N K O H S D	___cycles

aj	iy	ql	pg	hn	mn	kf	ae	om	hb	dx	es
oe	wb	xs	kj	gh	fw	mb	vf	de	ux	pl	aw
ii	re	wm	cr	ou	bs	wa	zt	md	ni	kv	ft
tr	az	bh	gy	ft	dr	se	mj	nh	bg	vf	cd
aw	se	dr	ft	gy	hu	ji	ko	lp	lk	mj	hg
iu	yt	re	ws	aw	cd	fv	mj	nh	bh	ki	yh
de	fc	xs	hs	lh	nu	bt	cf	em	pt	yr	ez
mh	kc	ox	us	rg	yj	kn	es	wq	pl	mr	fb
jb	yn	rd	ft	es	xv	bh	nj	kd	jf	hg	pm
mh	bj	uy	tr	fc	vd	lo	my	id	is	so	be
um	yn	tb	rv	ec	wx	qz	ao	ef	rr	um	og

Exam Chart
entrance or exit exam

◇ Entrance data
◇ Exit data

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Study Center:.....
Subject:.....
Date:.....

Please fill in the following chart after the entrance or exit exam and mail to:

Tammie Calef '96
Pacific University College of Optometry
2043 College Way,
Forest Grove, Oregon. 97116

habitual phoria near and far	40 cm...../.....	6 m...../.....	
refraction w/o cycloplegia	OD.....	acuity 20 /.....	
	OS.....	acuity 20/.....	
refraction w/ cycloplegia	OD.....	acuity 20 /.....	
	OS.....	acuity 20/.....	
monocular cross-cyl accommodative posture tests	OD.....		net or gross
	OS.....		
binocular cross-cyl accommodative posture tests	OD.....		net or gross
	OS.....		
dynamic retinoscopy	OD.....	OS.....	
PRC (BO @ 40 cm)	BL.....	BR.....	REC.....
NRC (BI @ 40 cm)	BL.....	BR.....	REC.....
PRA (Minus @ 40 cm)	OU: BL.....	REC.....	net/ gross
NRA (Plus @ 40 cm)	OU: BL.....	REC.....	net/ gross
Monocular minus to blur and recovery	OD: BL.....	REC.....	net/ gross
	OS: BL.....	REC.....	
Monocular plus to blur and recovery	OD: BL.....	REC.....	net/ gross
	OS: BL.....	REC.....	
gradient AC/A @ 40cm ± 1.00 over distance Rx to BVA	+1.00 phoria...../.....		
	-1.00 phoria...../.....		
pupil size- standard illum	OD.....mm	OS.....mm	

Control lens for PRC, NRC.....Control lens for calculating nets.....

Recruitment:

Media exposure by Pacific University.
Interested existing patients of doctors.

Subjects referred to study centers via research center information line.

Initial exam:

Qualified subjects commit to study and select convenient study center.

Study center doctor gives full exam at regular fee, and takes supplemental PPODS measurements.

Training of VT group

PUCO researcher will train and motivate subjects.

Subjects will do VT procedures at home and will mail in completed progress sheets.

Monthly Evaluations

Subjects will return to host practice for brief monthly evaluation by optometric assistant.

Progress charts and other incentives will be given to subjects. These will be provided by PUCO researchers.

Final Exam

A repeat of the initial exam and PPODS measurements for final progress evaluation.

Findings Published

Findings will be submitted to refereed journals of optometry.

Subjects Call

"In House Recruits"

- Study Center prequalifies potential subjects using top of "Entrance Criteria". All 'no' on this half means the subject is qualified. (There is a list of disqualifying meds.)
- Gives potential subjects packet with "Welcome to PPODS", "How is Your Vision?", "Vision and Health History", and return envelope. (They'll mail this to Tammie Calef.)
- Schedules entrance exam.

Michelle Newell at PUCO PDX VT Clinic 224-2323 x111

- prequalifies potential subjects over phone.
- completes top of "Entrance Criteria" and faxes or mails it to the appropriate Study Center.
- Calls the appropriate Study Center & gives them the subject's name and phone number.
- Mails to potential subjects the packet with "Welcome to PPODS", "How is Your Vision?", "Vision and Health History", and a return envelope.

Study Center

- Calls subject ASAP to schedule entrance exam- warns subject about effects of cycloplegic exam.

Entrance Exam Day

- Subject signs "Informed Consent"
- Doctor does entrance exam- gets paid.- fills in "Exam Chart".
- Techs do evaluation tests- fill in "Evaluation Chart".
- Fill in bottom of "Entrance Criteria". All 'yes' on this half means the subject is qualified.
- Schedule all qualified subjects for all three monthly evaluations and exit exam on this day. Write dates on bottom of "Entrance Criteria".
- Schedule all VT subjects for all four monthly VT instruction sessions while they're there that day. Write dates on bottom of "Entrance Criteria".
- Mark VT instruction dates on "Vision Therapy Instruction Sessions Calendar" and give to VT subjects to pin up on their frig.
- Mail "Exam Chart", "Evaluation Chart", "Entrance Criteria", and "Informed Consent" to Tammie Calef, using envelope provided.
- Give all subjects a "Near Work Record".

How to schedule the VT instruction.

- First, schedule all three monthly evaluations and the exit exam as close to a month apart as possible.
- Then, schedule the *first* VT instruction as soon after the entrance exam as possible.
- Schedule the *second* VT instruction before the first evaluation. This way the subject will already know how to do the next month's VT and can start on it right after the evaluation.
- Schedule the *third* VT instruction before the second evaluation.
- Schedule the *fourth* VT instruction before the third evaluation.

Evaluations:

- Each month, do the 4 evaluation tests
- Fill in "Evaluation Chart".
- Mail the "Evaluation Chart" to Tammie Calef.

Exit Exam

- Do exam. Fill in "Exam Chart".
- Verify subjects permanent address for quarterly follow-ups which we will mail to them throughout the year.

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ESTIMATED COMMITMENT
BY DOCTORS INVOLVED IN PPODS

One time only:

Initial orientation time between doctor and researcher: 1 hour

Initial training of technicians, if needed: 1 hour

Optional:

Time spent in study development or study status updates

Time per each subject:

Complete initial exam by doctor, paid by subject.

Supplemental entrance and exit PPODS testing by doctor or technician: 30 min

Complete exit exam by same doctor

Monthly progress checks (3) by technician- 20 min/session

Total paid time per subject:

Doctor: full exam

Total unpaid time per subject:

Doctor: full exam

Technician: 1 hour

Additional:

You decide how many subjects you would like to have at your study center. Most centers will have 10-15.

Advantages to being involved:

- New patient base—good will and good word-of-mouth advertising
- One paid exam per subject
- Potential patient after study
- Involved in research - good for the profession and good PR
- Be on the cutting edge of the profession
- Upon publication, you'll be mentioned
- Fame
- Fortune

Advantages to subjects:

- Potential prolonged nearpoint abilities without compensating lenses
- Possible discounts on future optometric care
- Help science- warm fuzzy feeling
- Bribes, such as discounts to local businesses.

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Commonly asked questions about
the PPODS study:

How long will it take me?

All subjects will have two thorough eye exams (about 1 1/2 hours) and three progress checks (about half an hour each). If you choose to do the vision therapy procedures, it will require an additional 15-20 minutes a day, and four monthly 1/2 hour training sessions at our downtown location.

How long is the study?

Four months.

Will it cost me anything?

Yes. You'll pay only for the initial eye exam, which will cost the same as a regular eye exam. This exam will be more thorough than a typical exam, and you certainly can update your current glasses or contact lenses with the doctor who provides the exam. The rest of the program is free to you. Also, you'll get discounts on eye wear.

Where must I go?

There are study centers throughout the Portland area. You can pick most convenient location for you. Those doing vision therapy will go to our Family Vision Center at 10th and Washington, downtown, for the VT instruction.

When can I start?

Right away.

Does this mean I won't have to get reading glasses?

We hope so. This is the first of several studies that will help determine which vision therapy procedures can help delay the onset of presbyopia- the need for age-related reading glasses.

What do I get?

Aside from possibly delaying the need for reading glasses, discounts on future eye care from your study center.

How long does the VT take?

Instruction takes 1/2 hour, once a month for four months. The VT procedures take about 15 minutes a day.

Where do I go to learn the VT procedures?

The Family Vision Center, downtown Portland clinic at 10th and Washington.

When is the next VT instruction session scheduled?

They are held twice a week. You will schedule these at the study center.

If I don't qualify for the study, do I still pay for the exam?

Yes, but it's still a good deal. You will get an extra-thorough exam for the price of a typical exam. You'll get more for your money, and you can use this exam to update your current prescription at the study center.

What to give to whom:

VT Group

The day of the entrance exam:

1 VT Instruction Calendar

Every time:

4 Near work record sheets

4 Return envelopes

Control Group

Every time:

4 Near work record sheets

4 Return envelopes

Stuff to fill out and mail (as you complete stuff) to Tammie Calef '96:

For each subject: 1 Entrance Criteria (Michelle at PUCO fills in top)
 1 Entrance exam chart and eval chart on back
 3 Monthly evaluation charts
 1 Exit examination chart and evaluation on back
 1 Informed Consent form

Additional stuff

for VT subjects: 1 VT instruction calendar filled in with subject's selected dates.

Also:

Give the "Welcome to PPODS" packet only to subjects you've *recruited*, not to those who are simply *interested*. The flyers are for general information.

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VISION THERAPY
Instruction Sessions
Calendar
(Sample)

July							
Monday	Tues	Wednesday	Thurs	Fri	Sat	Sun	
				1	2	3	
4	5	6	7	8	9	10	
11 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	12	13 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	14	15	16	17	
18 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	19	20 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	21	22	23	24	
25 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	26	27 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	28	29	30	31	

August							
Monday	Tues	Wednesday	Thurs	Fri	Sat	Sun	
1 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	2	3 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	4	5	6	7	
8 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	9	10 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	11	12	13	14	
15 No VT	16	17 No VT	18	19	20	21	
22 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	23	24 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	25	26	27	28	
29 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	30	31 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm					

September							
Monday	Tues	Wednesday	Thurs	Fri	Sat	Sun	
			1	2	3	4	
5 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	6	7 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	8	9	10	11	
12 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	13	14 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	15	16	17	18	
19 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	20	21 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	22	23	24	25	
26 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	27	28 VT first visit 6:00 pm second visit 6:30 pm third visit 6:45 pm fourth visit 7:00 pm	29	30			

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**Wish you
didn't have to
wear**

Bifocals?

There's hope.

**A study is currently underway to test a method
of delaying the need for reading glasses.**

**All you have to do is about 15 minutes
of eye exercises each day.**

Ask your Doctor for more details.

Can't put it off any longer?

Want a discount on your reading glasses?

**Want to wait 4 months before you
"commit" to bifocals?**

and *then* get a discount if you still want them?

You can join the study without doing any exercises.

**Just wear your reading glasses
if you're getting your first pair now
or**

**Wait 4 months
before getting any reading glasses.**

Ask your Doctor today.

Study Offered to Avoid Reading Glasses & Bifocals

Participants Needed !!

Would you like to reduce the chances that you may one day need bifocals or reading glasses?

Statistics show that most people begin to have difficulty focusing at near point as they reach their 40's. The result of this condition, which is known as presbyopia, is the need for bifocals or reading glasses in order to see clearly when reading printed materials, working on a computer screen, or doing any other type of activity that requires clear vision up close.

Optometrists in this office and throughout the Portland metropolitan area are conducting a research study that will test a new system of vision therapy (eye exercises) which may help delay the need for bifocals and reading glasses. To qualify for the four-month study, potential candidates must be over the age of 35 who do not currently wear bifocals or reading glasses. In addition, interested persons must not have had radial keratotomy surgery, must not have had cataracts, and must meet specific visual criteria that will be identified in an initial vision examination performed prior to study acceptance.

Persons qualifying for the study will receive a free program of vision therapy which may help reduce the future need for reading glasses and bifocals, and a free comprehensive vision examination at study conclusion. Those who complete the study may also be given discounts on eyewear and/or vision care at the offices of the participating optometrists. Potential study candidates will be required to pay for an initial thorough vision examination which is needed to identify specific visual criteria for study acceptance.

For specific information regarding the study and examination fees, please see the reception staff at this office.

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WELCOME TO PPODS

Congratulations! You are participating in an important study. The goal of the study is to improve the quality of life for us as we get older by finding a way to maintain good nearpoint vision without reading glasses. Typically, sometime in our 40's we find it difficult to focus our eyes on things if they're too close, so we begin to hold reading material or other "targets" at arm's length. This loss of the eye's ability to focus on near objects is called *presbyopia*. Ultimately, our arms become "too short", and we head to the optometrist for reading glasses or bifocals. This is considered one of the landmarks of getting *old*, so most of us put it off for as long as possible. At present, there is no alternative to some sort of reading glasses, whether you choose the traditional bifocals or select instead to wear "invisible adds" or bifocal contact lenses.

It makes sense that there should be a way to maintain the nearpoint abilities of the eye through exercise. We take for granted that if we go to the spa and work out our bodies will be healthier and more flexible. Touching our toes every day makes it easier to keep touching them than if we were only to reach to our knees every day and then try to touch the toes on occasion. But this is the way we usually use our eyes *until* the nearpoint vision starts to deteriorate. When a person with good nearpoint vision reads at a typical reading distance (about 16 inches), the eyes don't have to work very hard. It's like touching your knees when you could really touch your toes if you wanted to. It's there, but we don't use it. Unfortunately, when we lose the nearpoint vision, our eyes have to work to see at that typical reading distance. The reserve ability is gone. Now, it's a stretch just to reach the knees. The toes are impossible. Had we kept in shape, perhaps we would still have the ability to touch our toes- or to see up close.

The doctors at Pacific University College of Optometry and several participating Portland area optometrists have designed a series of "exercises" intended to preserve the nearpoint abilities of the eyes. We want to keep you out of reading glasses for as long as we can. It's called *vision therapy*, or "VT". The procedures are like doing stretches to your toes, but they're for your eyes instead. The procedures don't take very long (about 15 minutes each day), and like any other workout plan, you need to stick with it for it to do any good. The study lasts for four months, which will allow us to see how much improvement in nearpoint abilities you can make in those months. Any increase you make in nearpoint abilities will push into the future the day *you* will need reading glasses.

The hard part is making yourself exercise. If you're like me, you can find a zillion excuses for why you don't have time to workout now, but will *tomorrow*. This never works. Fortunately, these procedures take only about 15 minutes, and you don't have to change or shower afterwards. It's easy. And the reward of not having to wear reading glasses as early in life is a great incentive.

Everyone who participates in the study will receive a discount on eye wear. If you really don't want to do the exercises, but want to help with the study and get a

discount on your glasses, you may join the control group. If you select to be in the control group, you will wait at least until the end of the study before either getting your first pair of reading glasses or bifocals, or starting VT. "Clinical wisdom" says that once a person begins to wear reading glasses or bifocals, it becomes increasingly difficult to do near work comfortably without them. At the end of the study, you will be able to have glasses at a discount. VT is also available.

Participants in both groups will have a thorough eye exam at the start and at the end of the study with your study center doctor, and you'll return to the study center once a month for three months for a quick progress evaluation. You'll pay the standard eye-exam fee for the first eye exam, just like you probably do every year, but this exam will be much more thorough than a typical exam. You'll get more for your money. Most insurance policies will cover the exam. The monthly evaluations and the thorough exam at the end of the study are free. The instruction in vision therapy procedures also is free.

Please fill in the enclosed questionnaires and mail them using the postage paid envelope. Pacific University has arranged for the study center nearest you to contact you to make your appointment at a time convenient to you. At your study center, you will select the group you wish to join- VT or Control. You will schedule your progress evaluations with your study center after your examination, then return to the study center monthly for the next three months for a 15-20 minute progress evaluation. At the end of the fourth month, you will have another thorough exam. If you choose the VT group, you will also schedule the evenings you'd like to attend VT instruction session each month (they take about a 1/2 hour) at our Family Vision Center at 10th and Washington, downtown.

If you have any questions, call 224-2323 x111.

How is your vision?

Please answer the following questions. There are no "correct" answers. "Nearpoint" means at arm's length or closer. Rate the items using the scale 1 through 5. Please write additional information on the back of this sheet.

	never	often
1 I have noticed some recent changes in my nearpoint vision. If yes, please describe. (Use back of sheet.)	1 2 3 4 5	
2 My nearpoint vision is "comfortable". Describe any visual discomfort you experience regularly.	1 2 3 4 5	
3 I can hold reading material as close as I always have.	1 2 3 4 5	
4 Things are blurry at my normal reading distance.	1 2 3 4 5	
5 Things are blurry at an intermediate distance (cooking, TV)	1 2 3 4 5	
6 If I look up from reading, things blur for a moment, then clear up.	1 2 3 4 5	
7 I see double at nearpoint.	1 2 3 4 5	
8 I see double at long distance.	1 2 3 4 5	
9 I read less than I used to due to discomfort. It is difficult to see small things up close.	1 2 3 4 5	10
11 I need brighter surroundings to see clearly at nearpoint now than I used to.	1 2 3 4 5	
12 Bright lights bother me.	1 2 3 4 5	
13 I prefer not to drive at night.	1 2 3 4 5	
14 I am "aware" of my vision, such that I have to make a conscious effort to see well at nearpoint.	1 2 3 4 5	
15 I have headaches.	1 2 3 4 5	
16 I have eyeaches.	1 2 3 4 5	
17 My eyes itch.	1 2 3 4 5	
18 My eyes burn.	1 2 3 4 5	
19 I take off the glasses I wear to see "at far" when I do nearpoint work.	1 2 3 4 5	
20 I wear my "distance" glasses to see at nearpoint and don't wear them to see far away.	1 2 3 4 5	

Is there anything else you would like to say about your vision?

Name:
 Address:
 Phone:

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Vision and Health History

Please answer the following questions. "Nearpoint" means at arm's length or closer. There are no "right" or "wrong" answers. Feel free to include any additional information you feel might be related. All responses will be kept confidential.

Please list the activities you do that require you to see clearly at nearpoint (such as reading, writing, computer work, sewing, carpentry, etc.). Please circle those that are work related, and underline those that are for pleasure.

.....

How often and for how long do you do these activities? Hours a day.....
 Days a week.....

Do you ever experience difficulty with close work (for example, arms too short, headaches, or eyes "blurry") ?

often 5 4 3 2 1 never

Are there any circumstances that make it easier or harder to see clearly (such as brightness, object looked at, fatigue, etc.)? If yes, please describe:

.....

What amount of nearpoint activities have you done throughout your life? For example, did you read or do other close work often, or seldom, as a child, a teenager, an adult? Please circle an answer for each age bracket .

age 5-10	often	5	4	3	2	1	never
age 10-15	often	5	4	3	2	1	never
age 15-20	often	5	4	3	2	1	never
age 20-25	often	5	4	3	2	1	never
age 25-30	often	5	4	3	2	1	never
age 35-40	often	5	4	3	2	1	never
age 45-50	often	5	4	3	2	1	never
age 55+	often	5	4	3	2	1	never

additional info:

Name:
Address:
Phone:

Throughout your life, did you often look at small things so close to your eyes that you had to "work" to see clearly (as opposed to having to move things further away to see them clearly)?
often 5 4 3 2 1 never
.....
.....
Briefly describe what and when.

Do you currently use your eyes to examine tiny things up close in a way that makes you "work" your eyes?
often 5 4 3 2 1 never
.....
.....
Briefly describe what and when.

If possible, tell us when your parents first started using reading glasses?
Your grandparents?
Your brothers and sisters?
.....
.....
.....

If any of your near relatives have had cataracts, at what age did the problem develop? What is their relation to you?
.....
.....
.....

Describe any physical activities you participate in regularly. Please circle those you do at work and underline those you do for pleasure.
.....
.....
.....

How often and for how long do you do the above activities?
.....
.....

Describe your diet. Do you tend to eat a certain type of food, such as vegetarian, organic, fast foods, frozen or prepared foods, etc.? If your diet has changed over the years, describe these changes.
.....
.....
.....
.....
.....

Do you think your diet is "healthy"? often 5 4 3 2 1 never

Do you take vitamins?
If yes, which? How often?
often 5 4 3 2 1 never
.....
.....

Name:

Address:

Phone:

Do you have any habits that you think are particularly healthy or unhealthy?

Do you smoke? often 5 4 3 2 1 never
If yes, how much?

Are you currently taking any medication? Lots 5 4 3 2 1 none
If yes, what?

Have you ever taken any (other) medications regularly? often 5 4 3 2 1 never
If yes, what and how much?

Do you use medications that you buy at the drugstore? Which do you use? How often? often 5 4 3 2 1 never
.....
.....

Do you find your life stressful? often 5 4 3 2 1 never
In the past? often 5 4 3 2 1 never

If yes, is it work related? Family?

Does stress bother you? often 5 4 3 2 1 never
Could you eliminate some stress from your life if you wanted to? often 5 4 3 2 1 never
What do you do to relax?

How often?

Are you generally happy with your life? often 5 4 3 2 1 never

Are you "easy going" or "wound-up"?

Feel free to add anything you'd like to tell us.

Thanks!

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How To Do
Vision Therapy
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Month One

DISTANCE (Screen) ROCK

PURPOSE:

This procedure will increase the speed with which your eyes focus alternately at near and at far targets. This is called "accommodative facility". You will be exercising the focusing and aiming processes of your eyes.

HOW TO:

You will do this with both eyes together, and one eye at a time. Hold the screen (or the small letter chart) as close to your eyes as you can while still seeing the wires clearly. Use the eye patch when you do the procedure with only one eye. When using both eyes, make sure you see the target *singly*. Select a detailed distant target at least 20 feet away (perhaps a tree out the window). Focus sharply on the details of the screen (or the small letter chart), then look through the screen at the distant target, making sure it, too, is clear. Alternate between the two targets as many times as you can in one minute, always making sure each target is clearly in focus before you switch to the other target. Count the number of times you look at *either* target. For example, if you looked at the screen, the tree, the screen, the tree, and the screen, this would be "five". Repeat this exercise at least 3 times (unless otherwise instructed during your VT instruction session) with the right eye, the left eye, and with both eyes, and record the number for each time, along with any comments you would like to add.

GOAL:

You want to be able to do *more* cycles than you could yesterday, always remembering to get the target sharply in focus before switching.

PUSH UPS

PURPOSE:

This procedure will teach your eyes to focus on an object closer to your eyes than is usual for you. This will increase your "accommodative amplitude" - the maximum amount the lens inside your eye can help you to see up close. You will be exercising the focusing system inside your eyes.

HOW TO:

You will do this with both eyes together, and one eye at a time. Use the eye patch when you do the procedure with only one eye. When using both eyes, make sure you see the target *singly*. Start by holding a small letter target at arm's length, then slowly move the target closer to your eyes while still seeing the letters clearly. When the target letters start to become blurry, move the target a bit closer for a brief moment. Try to keep the letters sharply in focus at all times. You should be able to feel your eyes working. Move the target back where you started, then again move it in a bit closer, then back. Continue this for one minute. Repeat this exercise at least 3 minutes each with the right eye, the left eye, and with both eyes, and record the closest distance you can see the target clearly with both eyes and with each eye alone, along with any comments you would like to add.

GOAL:

You want to get the target closer, while still seeing it clearly, than you could yesterday.

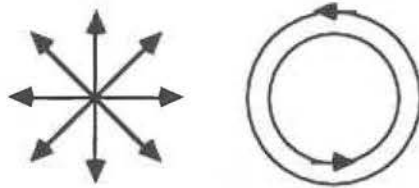
EYE STRETCHES

PURPOSE:

To improve the flexibility and strength of the muscles that you use to aim your eyes, and to "warm up" prior to each day's training.

HOW TO:

Simply look as far as you can in all directions, up, down, left, right, to the four corners diagonally, and then make big circle rotations as if you were looking at a giant O in front of you. Hold each position for two long, deep breaths. You will feel the muscles work, but your eyes won't turn further than is safe for them.



GENERAL RULES

1. Always use good, bright illumination
2. Always wear the glasses or contact lenses (if any) you wear for good distance vision while you are working on training activities.
3. Take a break from the training if prolonged eye discomfort occurs. Slight discomfort is anticipated with certain procedures, but this should reduce with rest and should be no more severe than the muscle tightness that occurs when starting a general fitness program.
4. Look off into the distance at least once every minute while doing training activities.

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How To Do
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Month Two

DISTANCE (Screen) ROCK

PURPOSE:

This procedure will increase the speed with which your eyes focus alternately at near and at far targets. This is called "accommodative facility". You will be exercising the focusing and aiming processes of your eyes.

HOWTO:

You will do this with both eyes together, and one eye at a time. Hold the screen (or the small letter chart) as close to your eyes as you can while still seeing the wires clearly. Use the eye patch when you do the procedure with only one eye. When using both eyes, make sure you see the target *singly*. Select a detailed distant target at least 20 feet away (perhaps a tree out the window). Focus sharply on the details of the screen (or the small letter chart), then look through the screen at the distant target, making sure it, too, is clear. Alternate between the two targets as many times as you can in one minute, always making sure each target is clearly in focus before you switch to the other target. Count the number of times you look at *either* target. For example, if you looked at the screen, the tree, the screen, the tree, and the screen, this would be "five". Repeat this exercise at least 3 times (unless otherwise instructed during your VT instruction session) with the right eye, the left eye, and with both eyes, and record the number for each time, along with any comments you would like to add.

GOAL:

You want to be able to do *more* cycles than you could yesterday, always remembering to get the target sharply in focus before switching.

LOOSE LENS "TROMBONING"

PURPOSE:

This procedure will teach your eyes to focus on an object closer to your eyes than is usual for you. This will increase your "accommodative amplitude" - the maximum amount the lens inside your eye can help you to see up close. You will be exercising the focusing system inside your eyes.

HOWTO:

Put the eye patch on either eye. You'll switch to the other eye next. Hold the lens at arms length and focus on this print through the lens. Slowly bring the lens toward the open eye, keeping the print in focus at all times. When you can't bring the lens any closer and still see the print clearly, reverse direction and move the lens away from you to arm's length again, keeping the print in focus at all times. Repeat at least 10 times with each eye. When you can easily move the lens all the way to your eye and maintain clarity for at least 15 seconds, move on to the next stronger lens (it has a bigger number on it, perhaps -4 instead of -3). Record the lens power used and the nearest distance that you could see clearly through it. Record for each eye since the values may differ.

GOAL:

You want to get the lens as closer to your eye than yesterday, and then move on to a stronger lens, always remembering to keep the print clearly in focus.

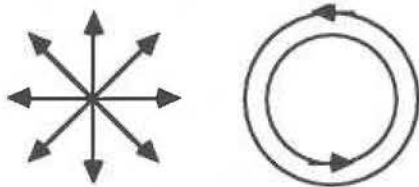
EYE STRETCHES

PURPOSE:

To improve the flexibility and strength of the muscles that you use to aim your eyes, and to "warm up" prior to each day's training.

HOWTO:

Simply look as far as you can in all directions, up, down, left, right, to the four corners diagonally, and then make big circle rotations as if you were looking at a giant O in front of you. Hold each position for two long, deep breaths. You will feel the muscles work, but your eyes won't turn further than is safe for them.



GENERAL RULES

1. Always use good, bright illumination
2. Always wear the glasses or contact lenses (if any) you wear for good distance vision while you are working on training activities.
3. Take a break from the training if prolonged eye discomfort occurs. Slight discomfort is anticipated with certain procedures, but this should reduce with rest and should be no more severe than the muscle tightness that occurs when starting a general fitness program.
4. Look off into the distance at least once every minute while doing training activities.

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Month Three

MONOCULAR LENS ROCKS

PURPOSE:

This procedure will teach your eyes to quickly increase and decrease focus as different lenses are placed before your eyes. This will increase your focusing control and your "accommodative amplitude" - the maximum amount the lens inside your eye can help you to see up close. You will be exercising the focusing system inside your eyes.

HOW TO:

Put the eye patch on either eye. You'll switch to the other eye next. Hold the lens with thick edges (*minus*) in one hand and the lens with thin edges (*plus*) in the other hand and focus on printed letters as small or smaller than this print. Now, put the *minus* lens close in front of your open eye and look at the print. The print may blur slightly - you need to adjust your focus to make it clear again. Keep the print clear for 10-15 seconds, then remove the *minus* lens and replace it with the *plus* lens. Again, adjust your focus until the print is clear, hold it for 10-15 seconds, then replace the *plus* lens with the *minus* lens and keep repeating for five minutes for each eye. When you can adjust your focus through the *minus* lens to make the print clear within 3 seconds, you should call Tammie Calef at 357-1791. Always keep the lenses as close to your eyes as the lenses of a pair of glasses. **Record:** the *minus* lens power used and the distance you've held the lenses from each eye. Only measure once each day, the first time you do the procedure with each eye. Repeat for at least **5 minutes with each eye, keeping the print clear through each lens for 10-15 seconds** before switching to the other lens.

GOAL:

You want to "clear" the print through the lenses more quickly than yesterday. Keeping the print clearly in focus through the lenses is the goal.

VERGENCE STIMULATION I

PURPOSE:

This procedure uses your eye-aiming ability to help you increase your focusing ability. During this procedure, the *MINIVEC* will help you to aim your eyes closer, and your focus point should move closer, too.

HOW TO:

This procedure is fun, but it is *learned*, not a natural task for your eyes, so don't get frustrated if it's hard to do at first. While wearing the special polaroid glasses, hold the Minivec at your normal reading distance. Cross your eyes voluntarily until you see the two separate images overlap to form one 3-D image of two concentric circles. This may be easier if you start with the slides overlapping and hold a finger in front of the slides. Look at your finger and bring it slowly toward you. Keep looking at your finger, but pay attention to the images of the slides. At a certain point, they will jump together to form a 3-D image. The smaller center circle should appear to be coming out **toward** you. Slowly move the "R" slide to the left of the "L" slide, keeping that 3-D image, until the three small lines of letters begin to blur, to separate, or until one of the three lines disappears. It is possible that none will occur. **Record** the separation between the R and L slides when the first of these occurs. To determine the distance between the slides, record the number you see on the holder's "ruler" at the point where the right side of each slide lines up. Notice that there is a zero in the middle of the holder's "ruler". If you have the right side of one slide on one side of the zero and the right side of the other slide on the opposite side of the zero, you must add the two

numbers together to get the total separation between the two slides. Continue to increase the separation between the slides until the image splits apart and becomes double. **Record** the separation when double vision occurs. Then slowly reduce the separation between the slides until single vision is regained and the small rows of letters are clear, and **record** this distance. You can do this with the slides further apart if you voluntarily cross your eyes. These are the three things you should record, once each day. Then, you are ready to do the procedure. Once again, increase the separation until *just before* the small letters begin to blur, separate, or go from three lines to two. Now, slowly move the Minivec holder in small circles and/or move the Minivec holder slightly closer to and farther from your eyes, all the while keeping the small letters clear and single. Finally, with the R and L slides still separated this same distance, look off into the distance (preferably out a window) and relax your eyes for a moment. Then look back to the Minivec and attempt to regain clear and single vision without changing the separation of the R and L slides. You must cross your eyes to regain that 3-D image. Record the three distances described above. Repeat the procedure several times for a total of **5-10 minutes**.

GOAL:

You want to maintain a clear, single, 3-D image while slightly increasing the separation of the slides each day in each of the conditions listed.

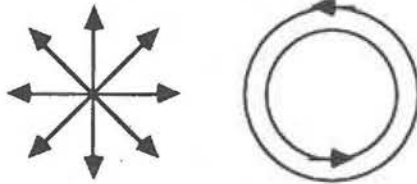
EYE STRETCHES

PURPOSE:

To improve the flexibility and strength of the muscles that you use to aim your eyes, and to "warm up" prior to each day's training.

HOW TO:

Simply look as far as you can in all directions, up, down, left, right, to the four corners diagonally, and then make big circle rotations as if you were looking at a giant O in front of you. Hold each position for two long, deep breaths. You will feel the muscles work, but your eyes won't turn further than is safe for them.



GENERAL RULES

1. Always use good, bright illumination
2. Always wear the glasses or contact lenses (if any) you wear for good distance vision while you are working on training activities.
3. Take a break from the training if prolonged eye discomfort occurs. Slight discomfort is anticipated with certain procedures, but this should reduce with rest and should be no more severe than the muscle tightness that occurs when starting a general fitness program.
4. Look off into the distance at least once every minute while doing training activities.

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Procedures

Month Four

BINOCULAR LENS FLIPS

PURPOSE:

This procedure will train your eyes to focus at a target through two different lenses, a "minus" lens and a "plus" lens. It's like jogging up and down hills for your eyes. This procedure improves your "accommodative facility", the ability to quickly focus on targets at various distances from your eyes. You will be exercising the focusing parts inside your eyes.

HOW TO:

Take this print and place it at your normal reading distance. With your distance glasses or contacts on, look through the special "flipper" lenses, holding the flipper where you would wear spectacles, and make the print clearly in focus. Flip the lenses "upside down" and position the lenses on the other side of the flipper in front of your eyes. Make the print clear and in focus. If you can not "clear" the print through either set of lenses, move the print slightly farther from you or move the lenses slightly away from your eyes (this is sort of "cheating," so try not to make it a habit). Alternate between the lenses on opposite sides of the flipper as many times as you can in one minute, being sure that the print is clear before you flip to the lenses on the other side. Repeat this at least **8-10 minutes**. **Record:** the number of flips for the first and last minute only by counting each time you clear the print through either side of the flipper. When you are able to routinely complete 20 flips per minute, call Tammie Calef at 357-1791. If the letters go double for you when you get them in focus, do the procedure one eye at a time. This is not as good, because in real-life you don't read with only one eye, but teaching your eyes to work together better requires different eye exercises than we are doing in this study. Let Tammie Calef know if the type goes double on you regularly.

GOAL:

You want to be able to do more flips per minute than yesterday, with the print clearly in focus.

VERGENCE STIMULATION II

PURPOSE:

This procedure continues the development of using your eye-aiming ability to help you increase your focusing ability. During this procedure, the *MINIVEC* will help you to aim your eyes closer, and your focus point should move closer, too.

HOW TO:

this procedure is similar to Vergence Stimulation I which you did last month, but with a new twist. While wearing the special polaroid glasses, hold the Minivec at your normal reading distance. Slowly move the "R" slide to the left of the "L" slide until the small lines of letters begin to blur, to separate, or until one of the three lines disappears. Record the separation between the R and L slides when one of these occurs. Reduce the separation of the slides slightly and place the lens flipper in front of your eyes, holding the flipper where you would wear spectacles. Make the three small rows of letters clearly in focus as you view through the flipper. Flip the lenses "upside down" and position the lenses on the other side of the flipper in front of your eyes. Again make the three small rows of letters clear and in focus. If you can not "clear" the print through either set of lenses, reduce the separation of the R and L slides slightly or move the Minivec holder slightly farther away from your eyes. Alternate between the lenses on opposite sides of the flipper as many times as you can in one minute, being sure

that the small rows of letters are clear before you flip to the lenses on the other side. **Record** 1) the maximum separation of the R and L slides used each day, and; 2) the number of lens flips per minute for the first and last minute only by counting each time you clear the small rows of letters through either side of the flipper. Do this for about **8-10 minutes**.

GOAL:

You want to maintain clear, single vision while slightly increasing the separation of the slides each day, and you want to increase the number of flips per minute that can be completed while maintaining clear and single vision.

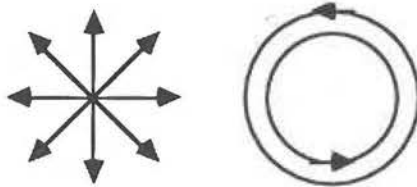
EYE STRETCHES

PURPOSE:

To improve the flexibility and strength of the muscles that you use to aim your eyes, and to "warm up" prior to each day's training.

HOWTO:

Simply look as far as you can in all directions, up, down, left, right, to the four corners diagonally, and then make big circle rotations as if you were looking at a giant O in front of you. Hold each position for two long, deep breaths. You will feel the muscles work, but your eyes won't turn further than is safe for them.



GENERAL RULES

1. Always use good, bright illumination
2. Always wear the glasses or contact lenses (if any) you wear for good distance vision while you are working on training activities.
3. Take a break from the training if prolonged eye discomfort occurs. Slight discomfort is anticipated with certain procedures, but this should reduce with rest and should be no more severe than the muscle tightness that occurs when starting a general fitness program.
4. Look off into the distance at least once every minute while doing training activities.

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Name.....

Date: From..... to

Study Center.....

Vision Therapy Record Month One

Please fill in this chart daily and mail it, along with the "Near Work Record", to the research center at the end of each week. Include the number of cycles you completed, power of lenses used, if any, how long each exercise took, and your level of comfort. Feel free to add additional comments. If you have any questions, please contact Tammie Calef at 357-1791.

DAY	Screen Rocks	Push-Ups	Eye Stretches
MON			
TUES			
WED			
THURS			
FRI			
SAT			
SUN			

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STUDY

Name.....

Date: From..... to

Study Center.....

Vision Therapy Record Month Two

Please fill in this chart daily and mail it, along with the "Near Work Record", to the research center at the end of each week. Include the number of cycles you completed, power of lenses used, if any, how long each exercise took, and your level of comfort. Feel free to add additional comments. If you have any questions, please contact Tammie Calef at 357-1791.

DAY	Distance Rocks	Loose Lens "Tromboning"	Eye Stretches
MON			
TUES			
WED			
THURS			
FRI			
SAT			
SUN			

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Name.....
 Date: From..... to
 Study Center.....

Vision Therapy Record

Month Three

Please fill in this chart daily and mail it, along with the "Near Work Record", to the research center at the end of each week. Include the number of cycles you completed, power of lenses used, if any, how long each exercise took, and your level of comfort. Feel free to add additional comments. If you have any questions, please contact Tammie Calef at 357-1791.

DAY	Monocular Lens Rocks	Vergence Stimulation 1	Eye Stretches
MON			
TUES			
WED			
THURS			
FRI			
SAT			
SUN			

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Name.....
 Date: From..... to
 Study Center.....

Vision Therapy Record

Month Four

Please fill in this chart daily and mail it, along with the "Near Work Record", to the research center at the end of each week. Include the number of cycles you completed, power of lenses used, if any, how long each exercise took, and your level of comfort. Feel free to add additional comments. If you have any questions, please contact Tammie Calef at 357-1791.

DAY	Binocular Lens Flips	Vergence Stimulation 2	Eye Stretches
MON			
TUES			
WED			
THURS			
FRI			
SAT			
SUN			

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Name.....
 Date: From..... to
 Study Center.....

Near work record

Please fill in this chart daily and mail it to the research center at the end of each week. Circle the amount of the time you did near work and your level of comfort. Feel free to add additional comments. If you have any questions, please contact Tammie Calef at 357-1791.

MONDAY

Activity	Hours Spent at Activity	Comfort Level
Reading	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Computer	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
TV (distance from you to your TV is _____ feet.)	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
sewing or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
carpentry or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Other (Please list) _____	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad

TUESDAY

Activity	Hours Spent at Activity	Comfort Level
Reading	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Computer	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
TV (distance from you to your TV is _____ feet.)	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
sewing or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
carpentry or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Other (Please list) _____	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad

WEDNESDAY

Activity	Hours Spent at Activity	Comfort Level
Reading	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Computer	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
TV (distance from you to your TV is _____ feet.)	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
sewing or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
carpentry or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Other (Please list) _____	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad

THURSDAY

Activity	Hours Spent at Activity	Comfort Level
Reading	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Computer	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
TV (distance from you to your TV is _____ feet.)	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
sewing or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
carpentry or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Other (Please list) _____	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad

FRIDAY

Activity	Hours Spent at Activity	Comfort Level
Reading	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Computer	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
TV (distance from you to your TV is _____ feet.)	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
sewing or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
carpentry or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Other (Please list) _____	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad

SATURDAY

Activity	Hours Spent at Activity	Comfort Level
Reading	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Computer	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
TV (distance from you to your TV is _____ feet.)	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
sewing or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
carpentry or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Other (Please list) _____	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad

SUNDAY

Activity	Hours Spent at Activity	Comfort Level
Reading	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Computer	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
TV (distance from you to your TV is _____ feet.)	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
sewing or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
carpentry or similar activity	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad
Other (Please list) _____	less than 1/2 1 2 4 6 8 over 8	great 1 2 3 4 5 bad

Additional comments?.....

Name.....
 Address.....

 Phone.....
 Date.....

How is your vision?

If your address is going to change,
 please give us your new one, and
 check this box: NEW ADDRESS

Please answer the following questions. There are no "correct" answers. "Nearpoint" means at arm's length or closer.
 Rate the items using the scale 1 through 5. Please write additional information on the back of this sheet.

- | | never | often |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------|
| 1 I have noticed some recent changes in my nearpoint vision.
If yes, please describe. (Use back of sheet.) | 1 2 3 4 5 | |
| 2 My nearpoint vision is "comfortable".
Describe any visual discomfort you experience regularly. | 1 2 3 4 5 | |
| 3 I can hold reading material as close as I always have. | 1 2 3 4 5 | |
| 4 Things are blurry at my normal reading distance. | 1 2 3 4 5 | |
| 5 Things are blurry at an intermediate distance (cooking, TV) | 1 2 3 4 5 | |
| 6 If I look up from reading, things blur for a moment, then clear up. | 1 2 3 4 5 | |
| 7 I see double at nearpoint. | 1 2 3 4 5 | |
| 8 I see double at long distance. | 1 2 3 4 5 | |
| 9 I read less than I used to due to discomfort. | 1 2 3 4 5 | |
| 10 It is difficult to see small things up close. | 1 2 3 4 5 | |
| 11 I need brighter surroundings to see clearly at nearpoint now
than I used to. | 1 2 3 4 5 | |
| 12 Bright lights bother me. | 1 2 3 4 5 | |
| 13 I prefer not to drive at night. | 1 2 3 4 5 | |
| 14 I am "aware" of my vision, such that I have to make a
conscious effort to see well at nearpoint. | 1 2 3 4 5 | |
| 15 I have headaches. | 1 2 3 4 5 | |
| 16 I have eyeaches. | 1 2 3 4 5 | |
| 17 My eyes itch. | 1 2 3 4 5 | |
| 18 My eyes burn. | 1 2 3 4 5 | |
| 19 I take off the glasses I wear to see "at far" when I do nearpoint work. | 1 2 3 4 5 | |
| 20 I wear my "distance" glasses to see at nearpoint and don't wear them
to see far away. | 1 2 3 4 5 | |
| 21 My nearpoint vision has improved due to the eye exercises. | 1 2 3 4 5 | |
| 22 If you have continued to do the eye exercises after the study, how
many days each week do you do them? | 1 2 3 4 5 6 7 | |
| 23 Which eye exercises do you do, and for how long? | | |
| | | |
| 24 If you have not always lived in Oregon, or another place with a similar climate, did you ever live in a place with a
<i>much hotter</i> climate? Where, and at what ages?..... | | |
|Did you ever live in a place with a <i>much colder</i> climate? Where, and
at what ages?..... | | |

Please use the back of this sheet to tell me anything else about your vision that you think is interesting, particularly
 any changes you have noticed in your vision due to the eye exercises.