4-22-1978

Measurements of the eye during orthokeratology

Terry Adams
Pacific University

Steve Davis
Pacific University

Helen Foley
Pacific University

Kris Hill
Pacific University

Duance Kovarik
Pacific University

See next page for additional authors

Measurements of the eye during orthokeratology

Abstract

Measurements of the eye during orthokeratology

Degree Type

Thesis

Degree Name

Master of Science in Vision Science

Committee Chair

Lynn J. Coon

Subject Categories

Optometry

Author

Terry Adams, Steve Davis, Helen Foley, Kris Hill, Duance Kovarik, Rich Luekenga, Dick Newton, Mike Ornstein, Bruce Parker, and John Tsue

MEASUREMENTS OF THE EYE

DURING

ORTHOKERATOLOGY

Research Performed at:

Pacific University

College of Optometry

Date of Project Completion:
April 22, 1978

By:

Terry Adams
Steve Davis
Helen Foley
Kris Hill
Duance Kovarik
Rich Luekenga
Dick Newton
Mike Ornstein
Bruce Parker
John Tsue

Advisor: Lynn J. Coon, O.D.

MEASUREMENTS OF THE EYE

DURING ORTHOKERATOLOGY

Clinicians	Grade
Terry Adams	
Steve Davis	
Helen Foley	
Kris Hill	
Duane Kovarik	
Rich Luekenga	
Dick Newton	
Mike Ornstein	
Bruce Parker	
John Tsue	

Faculty Advisor: Lynn J. Coon, O.D.

ACKNOWLEDGEMENTS

The Project II research group would like to thank the following staff and students for the time and support they have given us throughout the project:

Staff: Lynn Coon, Robert Yolton, Roger Tabb, Joy Hirsch;

Students: Dave Benson, Ken Berk, Greg Gore, Dale Graf, Brian Grudem, Mark Jaehning, Rick Meier, Bob Miller, Terry Reeder, L.T. Schaefer, Roger Taylor, Mike Weideman;

Contributors: Dan Bishop, Bradley Coffey, Karen Divis, Bruce Hammonds, Jack Inverso, Marlene Inverso, Cheryl Long, Joyclyn Redwine-Westfall, Bob Rothbard, Ron Schaeffer, Doug Shiro, Liz Yanagitani.

In addition, we would like to thank the International Orthokeratology Section of the National Eye Research Foundation and Wesley-Jessen for providing financial support.

The Project II Orthokeratology Research Group

TABLE OF CONTENTS

INTRODUCTION

"Orthokeratology is operationally defined as the reduction, modification or elimination of refractive errors by the programmed application of contact lenses or other related procedures."[1] In 1962, at the Seventh National Contact Lens Congress the corrective aspect of wearing contact lenses were discussed and it was agreed that the visual acuity of an individual could be increased through a refractive change due to the wearing of contact lenses. A survey of the literature revealed that many investigators have successfully applied various orthokeratology techniques to reduce ametropias, but the actual mode of action of orthokeratology has not yet been published in the literature.[2,3,4,5,6,7]

There are many ocular variables to be considered, and for purposes of this study approximately 84 variables have been considered. These are specified in the section on methodology and results. In a long-term study just completed several variables were measured and analyzed. Some of the more notable observations were the effect of different contact lens base curve - cornea relationships on corneal rigidity, induced with-the-rule astigmatism,[8] and variability in the corneal curvature changes.[9,10,11,12]

This is the second part of a two part study conducted

at Pacific University College of Optometry. Project I was a pilot study lasting for six months which was concerned with determining the significance of many refractive tests and physical measurements of the eye during orthokeratology. Project II, as this study is named, will be a refined longitudinal study of Project I and will run over a period of two to five years.

EXPERIMENTAL DESIGN

Project I included fifteen patients who were randomly placed into three study groups: a spectacle control group, a contact lens control group, and an orthokeratology group. Project II consisted of thirty-two patients: ten contact lens control patients, and twenty-two orthokeratology patients. Ten of the orthokeratology patients were carried over from Project I. The three groups were necessary so that differential changes could be noted among standard contact lens patients, new orthokeratology patients, and continuing orthokeratology patients. The new orthokeratology patients herein will be referred to as Project II orthokeratology patients. The patients carried over from Project I will be referred to as Project I orthokeratology patients. Actually, Project I orthokeratology patients have a heterogenous background. Some are former orthokeratology contact lens patients, some are former contact lens patients, and some are former spectacle control patients. Thus, they comprise three subclasses of contact lens wearers during the Project II phase of the study.

The patient selection was based on the closest possible conformity to the following criteria:

1. Little or no previous contact lens wear;
2. No previous ocular pathology;
3. Myopia between 1 and 3 D.;
4. Flattest Keratometric finding between 41 and 46 D.

Following are the actual group profiles at the start of Project II.

Project I Orthokeratology Group

Six males, four females.
(Six of these patients were alreading wearing contact lenses; three were control contact lens wearers; three were orthokeratology contact lens wearers.)
Mean age: 26.4 yrs.; range: 14 to 34 yrs.
Mean distance refraction sphere: -2.12 D.; range: -0.75 to -4.00 D.
Mean distance refraction cylinder: 0.13 D. with-the-rule; range: 0.75 against-the-rule to 0.75 with-the-rule.
Mean Keratometer power (flattest meridian): 43.92 D.; range: 40.87 to 45.87 D.
Mean Keratometer cylinder: 0.49 with-the-rule; range: 0.12 against-the-rule to 1.12 D. with-the-rule.

Project II Control Group

Two males, eight females.
Mean age: 28.2 yrs.; range: 15 to 33 yrs.
Mean distance refraction sphere: -2.32 D.; range: -0.50 to -4.00 D.
Mean distance refraction cylinder: 0.13 D. with-the-rule; 0.87 against-the-rule to 1.00 D. with-the-rule.
Mean Keratometer power (flattest meridian): 43.17 D; range: 41.50 to 46.25 D.
Mean Keratometer cylinder: 0.58 D. with-the-rule; range: 1.00 against-the-rule to 1.62 D. with-the-rule.

Project II Orthokeratology Group

Three males, nine females
Mean age: 23.16 yrs.; range: 15 to 32 yrs.
Mean distance refraction sphere: -1.76 D.; range: -0.75 to -3.25 D.
Mean distance refraction cylinder: 0.13 D. with-the-rule; range: 0.75 against-the-rule to 1.00 D. with-the-rule.
Mean Keratometer power (flattest meridian): 43.00 D; range: 41.75 to 44.75 D.
Mean Keratometer cylinder: 0.47 D. with-the-rule; range: 1.00 against-the-rule to 1.62 D. with-the-rule.

Patients were examined on a bimonthly basis and the following tests were performed.

1. Refractive status and visual acuity by standard optometric objective and subjective test battery were measured. Six standard tests were used to evaluate refractive status. They were:
   a) visual acuity without contact lenses;
   b) the distance retinoscopy finding (#4);
   c) the binocular maximum plus to 20/20 at far (#7B);
   d) the binocular maximum plus to best visual acuity at far (#7AB);
   e) the monocular maximum plus to 20/20 at far (#7M);
   f) the monocular maximum plus to best visual acuity at far (#7AM);
   g) the monocular maximum plus sphere (only) to best visual acuity at far (#7AMS).

   Note: the visual acuity was also taken for the #7AB, #7AM, and #7AMS.
2. Ocular anterior segment health was evaluated by slit lamp biomicroscopy.
3. Contact lens fit was evaluated by slit lamp biomicroscopy, and contact lens parameters were verified.
4. Phorias were measured with the Von Graefe technique, and nearpoint accommodative tests were performed.

5. Anterior corneal curvature measurements were evaluated by central keratometry, ophthalmometry, photoelectric keratoscopy with Wesley-Jessen PEK and Reynolds Corneascope.
6. Corneal thickness was evaluated by pachometry and ultrasonography.
7. Anterior chamber depth was evaluated by pachometry, ultrasonography, and biomicroscopy.
8. Anterior and posterior crystalline lens curvatures were measured by ophthalmophakometry.
9. Vitreous depth and axial length were measured by ultrasonography.
10. Intraocular pressure was evaluated by the AO Non-Contact Tonometer.

Instruments used in the study were calibrated for accuracy and reliability in Project I. The calibration findings are listed in the EXPERIMENTAL METHODS AND INSTRUMENTATION section of this report.

The Tabb method of orthokeratology is based on a mathematical relationship for increasing contact lens tear reservoir by modifying peripheral curves and optic zone diameters. Dr. Tabb believes that this method allows orthokeratologic changes to occur from hydrodynamic forces induced by the tear layer under the contact lens.

To insure that all contact lens patients would begin

therapy equally, all new patients in Project II were initially fit with lenses based on the Tabb method of orthokeratology. Those patients in the orthokeratology group carried over from Project I were already wearing lenses of the Tabb orthokeratology design. The control patients were fit with a 30% tear reservoir; the orthokeratology patients were fit with a 32.5% tear reservoir.

The specifications of the initial lens design are listed below.

Base Curve: The flattest Keratometer reading (hereafter referred to as K_f) + 0.25 D. for corneas with 1.00 D. of central corneal cylinder or less. For corneas with more than 1.00 D. cylinder, the base curve is slightly steeper than K_f + 0.25 D., from K_f + 0.50 D. to K_f + 0.75 D.

Overall Diameter: K_f (in mm.) + 1.0 mm.

Optic Zone Diameter: This depends on the tear reservoir desired. The tear reservoir is defined as:

$$1 - \left(\frac{\text{Area OZD}}{\text{Area Total Diameter}} \right) \times 100\% \ .$$

If Area = r^2, and r_1 = OZD/2, and r_2 = Total Diameter/2, then

$$\text{OZD} = 2\sqrt{X\left(\frac{\text{Total Diameter}}{2}\right)^2}$$

where X = 1 - tear reservoir. (Ex.: 1 - .325 = 0.675)

The initial orthokeratology design calls for a 32.5% tear reservoir.

Center Thickness: Standard thickness to standard thickness plus 0.02 mm. is recommended. The standard thickness of a -2.00 lens is 0.14 mm. and decreases 0.01 mm. for each diopter of minus power to a minimum of 0.10 mm. The thickness increases 0.01 mm. for each relative diopter of plus power. At times thickness was varied from the above relationship to effect the fit of the lens or the orthokeratology effect.

Power: Power of the subjective #7A.

Peripheral Curve Radii:

First intermediate = OZR + 1.0 mm.
Second intermediate = OZR + 2.0 mm.
Third intermediate = OZR + 3.0 mm.

Peripheral Curve Widths: (depends upon the tear reservoir)

First intermediate = 0.2 to 0.3 mm.
Second intermediate = 0.3 to 0.4 mm.
Third intermediate = 0.2 to 0.3 mm.

Note: The second intermediate curve width was always slightly greater than either the first intermediate curve width or the peripheral curve width.

All peripheral curves were well blended to simulate a near aspheric peripheral area. A blend series was done on all lenses. A blend series was defined by lightly blending the lens with a tool radius of OZR + 0.5 mm. and then lightly blending with a series of tools in 0.5 mm. increments from OZR + 0.5 mm. up to OZR + 3.0 mm. The initial blend was accomplished on a velveteen pad with

water; subsequent blends were done with velveteen pads and Silvo silver polish. At times it was necessary to modify the lens with a tool radius of OZR + 4.0 mm. to OZR + 5.0 mm. to promote orthokeratology.

The initial orthokeratology lens design called for a 32.5% tear reservoir. When the unaided visual acuity stabilized, the tear reservoir was increased incrementally to 35.0%, 37.5%, and 40.0%, by keeping total diameter constant and decreasing the OZD. No change in unaided visual acuity on two consecutive checks signalled the change to the next larger tear reservoir. Beyond the 45.0% tear reservoir, the lens was usually too unstable for a proper fit and either a larger diameter was chosen based on the new K_f [13] or the total lens diameter was decreased until the lens would restabilize.

Example Contact Lens Design:

K's: $\frac{44.00}{45.00}$ #7A: -1.50 D.

Initial Lens Design:

B.C. (OZR): 44.00 + 0.25 D. = 44.25 D. (7.63 mm.)

Total Diameter: 7.63 mm. + 1.0 mm. = 8.6 mm.

OZD: $2\sqrt{0.675\left(\frac{8.6}{2}\right)^2}$ = 7.1 mm.

PCR's: 8.6 mm., 9.6 mm., 10.6 mm.

PCW's: 0.2 mm., 0.35 mm., 0.2 mm.

Power: -1.50 D. C.T.: 0.14 to 0.16 mm.

EXPERIMENTAL METHODS AND INSTRUMENTATION

Visual Acuity: Distant visual acuity was measured in a clinical examination room under moderate illumination. A standard AO Projectochart was used at each session. A reduced Snellen card was used to measure near acuities at 16 inches. Unaided acuity among the contact lens patients was measured within five minutes of removal of the lenses. Each patient was measured at approximately the same time every session (± 2 hours).

Refraction: A standard optometric objective and subjective test battery was done at each session. Distance retinoscopy and a #7A complex (maximum plus to subjective best vision) was performed on contact lens patients with the lenses in place. Then, after the contact lens removal, all patients were tested with the following sequence of tests: distance retinoscopy; monocular J.C.C. (subjective cylinder test); 20/25 equalization; monocular and binocular #7 (maximum plus to 20/20); monocular and binocular #7A (maximum plus to best visual acuity); monocular #7A with spheres only (#7AMS); distance phoria using Von Graefe technique on a row of 20/20 letters; near phoria at 16 inches using the Von Graefe technique with threshold letters of a reduced Snellen chard; #21 binocular blur out and recovery; and #14B near binocular cross-cylinder. (See Recording Form, Appendix B, p. 74 .)

Slit Lamp Biomicroscopy: The contact lens fit was evaluated with and without fluorescein at each visit with a biomicroscope. (See Slit Lamp Observations form, Appendix B, p. 73 .) Without fluorescein, the movement of the contact lens was estimated by the fast phase of the lag upon blinking. The fast phase of the contact lens lag was defined as the first position of rest of the contact lens upon blinking. Lens position after the fast phase of the lag was evaluated with respect to the center of the pupil in two directions: vertical position and horizontal position. Decentration of the center of the contact lens from the center of the pupil was estimated in millimeters (mm.). The vertical position was graded 0 to 4, with grade 2 as the vertical position where the center of the contact lens would be approximately over the center of the pupil. Grade 0 was the most superior positioning, decentered two millimeters higher than the center of the pupil. Grade 4 was the vertical position below the central pupil by two millimeters. The lateral position was graded 5 to 9; grade 7 was the centered contact lens position over the center of the pupil; grade 5 was two millimeters most nasalward, grade 9 most temporalward with respect to the pupil center. Thus, a lens centered over the center of the pupil was coded "27."

Upon fluorescein installation, the corneal-contact lens relationship was evaluated, and the tear reservoir was estimated under 10X magnification. An alignment fit was graded as zero; its appearance was defined as an evenly thin layer of tears under the optic zone area of the contact lens. (Note Appendix A, Table I , p.63.) Minimal apical clearance (MAP) was rated as +1; its appearance was as a slight pooling of tears under the contact lens optic zone. A moderate clearance lens was graded +2, extreme clearance was +3. A flat fitting lens, with a central bearing area seen as an absence of tears under the center of the optic zone, was graded as to the relative flatness, ie., -1 as minimal touch, -2 as moderate touch, and -3 as heavy touch.

The tear reservoir was an estimation (in per cent) of the peripheral curve area including the blend area in comparison to the total lens area. This was evaluated with the aid of fluorescein. Lenses were cut on the basis of a standard formula to attain the desired tear reservoir. (Note Experimental Design.) However, the final evaluation of tear reservoir was made with the contact lens <u>in situ</u>. Intermediate and peripheral curve adjustments were sometimes necessary to attain the desired tear reservoir.

After the contact lenses were removed, anterior segment health was evaluated. Anterior segment health obser-

vations were graded as to the severity of the following: corneal edema, fluorescein retention, conjunctival injection, perilimbal injection, tear break-up time (B.U.T.), anterior chamber angle, and any other complications noted. (See Appendix A, Table II, p. 64 .) Gonioscopy was not performed on any of the patients during Project II. Anterior segment photography was performed on an occasional basis, prior to any tonometric or ultrasonagraphic measurements.

If a finding fell between two grade levels, then it was recorded as half-way between the levels. For example, the simultaneous presence of superficial foreign body stain (Grade 1) and light, punctate staining (Grade 2) was recorded as "1.5." The openness of the anterior chamber angle was evaluated on the slit lamp with an optic section and the illumination system at approximately 60^{o}. A ratio of the apparent thickness of the interval (shadow) of the anterior chamber (lying between the corneal optic section and the iris) to the apparent corneal thickness was made. For example, if the width of the anterior chamber was three-fourths of the corneal thickness, the grading was "0.75 AC/C."

Keratometry, Ophthalmometry, Wesley-Jessen Photo-Electric Keratoscopy: Central anterior corneal curvature was measured with the B & L Keratometer, the AO Ophthalmometer,

and WJ PEK. Peripheral corneal topography was determined by the "shape factor" of the PEK analysis and the Reynolds Corneascope.

The basic principle of photoelectric keratoscopy is the same as keratometry. They both use the relationship between a target and its virtual image formed by the cornea. From this relationship, the unknown radius of corneal curvature can be determined from optical formulas for mirror imagery. The advantage of the Photo-Electric Keratoscope is that its target may be composed of many parts which act as separate objects whose images may be used to measure curvature in all meridians and over a large corneal area.[15, 16, 17]

There are four technical requirements for reliable photokeratoscopy. These requirements are theoretically met by the Wesley-Jessen Photo-Electric Keratoscope and are listed below.

1. The units used to describe the topography should be independedt of the shape being measured. The PEK system calculates sagittal depth at various chord lengths for two principal meridians.
2. The instrument should consider at least the total area of interest. The PEK analyzes the cornea in 0.5 mm. increments over a diameter of 9 mm.
3. The technique should acquire all information simul-

taneously. The System 2000 photographs and computes data concerning a large corneal area simultaneously

4. The total system should have high accuracy and excellent reproducibility. PEK instruments are tested to measure radii of three known spheres to within ± 0.015 mm. Reproducibility studies show a maximum standard deviation of 1/16th D.[18] (See Table III, Appendix A, p.67 for the calibration results on the PEK.)

The model for corneal form used in the PEK is based on shape factor. The shape factor, a factor equal to the eccentricity squared, describes the departure of an ellipse from a circle. The human cornea has been described as an ellipse. A positive shape factor means the cornea flattens in the periphery and describes a prolate curvature. A negative shape factor means the cornea steepens in the periphery, and this describes an oblate curvature. The higher the number, the greater the flattening or steepening. A shape factor of +0.25 is considered normal. Nolan feels that a high positive shape factor is better for orthokeratology prognosis than a low shape factor.[19]

Pachometry: Corneal Thickness and Anterior Chamber Depth. A Haag-Streit pachometer and a modified Haag-Streit pachometer were used to measure corneal thickness and anterior chamber depth, respectively. These instruments

measure the apparent thickness of an optic section of the cornea and anterior chamber. When the pachometer is properly adjusted on the appropriate biomicroscope, the angle between the light slit and the right ocular is 40^{o}, as determined by a bar consisting of a narrow slit through which the light passes. The right ocular is 10X and splits the corneal image horizontally allowing for a vernier alignment measurement technique. After proper alignment, thickness or depth can be read from a linear scale. The scales measure the rotation of one of the two plane parallel plates of glass, one above the other, which bisect the returning light rays. Appropriate corrections need to be applied to correct for variations in the corneal radius to calculate the actual corneal thickness and anterior chamber depth.

The Haag-Streit pachometers provide accurate and reliable data. Alsbirk found a standard deviation between three consecutive readings of 0.007 mm. for corneal thickness and 0.01 mm. for anterior chamber depth.[20] In a study of corneal thickness measurements, Lowe found the mean corneal thickness of 0.517 ± 0.003 in 157 subjects.[21]

Most investigators agree that patient fixation of the slit does not insure a perpendicular alignment of the slit to central cornea. The patient's visual axis is in alignment and the optic axis is decentered by angle kappa.

Since the Haag-Streit pachometers fix the slit on the patient's right, asymmetrical measurements are made with respect to the two eyes. Differences in measurement by 0.02 mm. for anterior chamber depth and 0.019 mm. for corneal thickness have been noted.[22] This difference has been positively correlated to angle kappa.[23]

In this study, corneal thickness measurements were taken following the procedure listed below.

1. The pachometer was set up on a Mentor slit lamp biomicroscope and the optic section was made as narrow as possible. Illumination intensity was high and the slit lamp to biomicroscope angle was set at 40°.
2. The patients were instructed to fixate the slit.
3. For central corneal measurements, the slit was first focussed on the iris, bisecting the pupil. Then the microscope focus was moved out to the cornea and the measurement was taken. The right eye was measured first and then the left eye.
4. For peripheral corneal measurements, the slit lamp was moved to the right (nasal for the right eye and temporal for the left eye) and the measurement was made immediately to the right of the specular reflection of the bulb filament.

Anterior chamber depth measurements were taken by

following steps 1 through 3 in the preceeding procedure, except the focus of the instrument was maintained in the middle of the anterior chamber. Calibrations were made on the pachometers for reliability and the results are listed in Table IV, Appendix A, p.68.

Ultrasonography: The Ocular Reflectoscope was used to measure corneal thickness, anterior chamber depth, lens thickness, vitreous thickness, and axial length. This instrument was engineered and constructed by Automation Industries Research Division after the design of Doctors Ernest J. Giglio, William M. Ludlum, and Sidney Wittenberg. It utilizes a Hewlett-Packard model 175A oscilloscope with a 175 A four-channel amplifier.

The first channel is externally triggered by the reflection from the front surface of the cornea, preventing the pulse to the crystal from appearing on the screen. The channels are sequentially gated and are synchronized with the repetition rate of the pulser. The imposition of a short variable calibrated delay at the beginning of channel B permits the display of the front and rear lens surfaces. Another calibrated delay which can be varied from 20 to 40 usec. is interposed at the start of channel C, thus displaying the tissue at the rear of the eye. This arrangement permits the simultaneous recording of the echoes from the eye with a magnification up to 25X

from the face of a 5-inch cathode ray tube. Magnification is limited by the thickness of the lens, and 20X magnification is normally used to prevent overlap of channels. Channer D carries time marks with a 10 msec. interval produced by the 4 mHz. crystal oscillator used to synchronize the entire system.

The transducer is a partially focussed 20 mHz. lithium sulfate crystal 9.5 mm. in diameter with a 2 mm. aperture. It delivers 5 mW./cm.^{2} to the liquid immediately in front of the crystal. The transducer has an effective beam diameter in the focal plane of 0.304 mm. and spreading to 0.457 mm. one centimeter before and after the best focus. The pulse repetition rate is 1953 with a pulse duration of less than 0.1 usec. The transducer used in this study has been calibrated over a five year period by William M. Ludlam, O.D.[24,25]

The probe standoff is an open-ended, flexible, cone-shaped device made of clear silicone rubber which fits snugly on the ultrasound transducer. Clear silicone was needed to visibly inspect for bubbles and discontinuities in the fluid comprising the sound pathway. Wall thickness decreases toward the narrow opening in three steps to provide maximum stability with minimum aperture and wall thickness at the probe tip so that lashes and lids of the patient could be avoided.

The axis at which maximum amplitude reflections occur is in the region of the optic axis. In obtaining sound measurements of the intraocular distances, reflections from the tissue at the rear of the eye is required. The optimal sonic axis must be near perpendicular to the retinal curvature as well as the anterior corneal curvature. Testing of the present probe indicated that angulation of the probe axis greater than $\pm 2^{o}$ horizontally or vertically for non-mydriatic pupils produces changes in quality and amplitude of the resulting echoes which are unacceptable. Translation in the horizontal or vertical meridians more than $\pm$ 0.5 mm. also produced an unacceptable result.[26]

The following procedure was followed in making out ultrasonic measurements.

1. Patient corneas' were anesthesized with one drop of 0.5 % proparacaine.
2. Patients were instructed to keep both eyes open and fixate at an object fifteen feet away.
3. The probe was placed to the eye at the proper angle and a water meniscus made contact with the eye.
4. A polaroid picture was taken of the oscilloscope trace when all acoustic interfaces were seen. Two pictures of each eye were taken: 1X picture of the overall eye and a 10X picture of the cornea.

A 20X travelling microscope was used to measure between the acoustic relections of the oscilloscope tracings. For the anterior cornea, the starting point was 10% of the negative phase trace of the first echo. The posterior corneal surface was measured at 10% of the positive phase trace (mirror image echo). Other surfaces were measured the same way using 10% of the phase:

anterior chamber - start at + phase
lens - start at - phase
vitreous - start at + phase.

(See Table V, Appendix A, p.69 for overall eye and corneal magnification tracings.)

After the measurements were completed on each trace, the following computations were done to determine the actual millimeter distance through each tissue in the eye.

1. The distance in millimeters measured between phases was divided by a standard velocity (8.2 mm./usec.) and the resultant was divided by two (since the echo is a measure of a completed round trip). The resultant is now in units of time (usec.).
2. The time in microseconds was then multiplied by an assumed velocity for each tissue. The assumed velocity for the cornea is 1.600 mm./usec. For lens it is 1.641 mm./usec. For vitreous it is 1.532 mm./usec. The resultant product is again

in units of length (mm.).

3. To derive vitreous length, one must take into consideration time delay from channel B to C. One-half of the total delay (13 microseconds) is added in step 1 before the final millimeter length is calculated in step 2. For vitreous measurements, anterior cornea to retina was measured and converted into microseconds. The delay was added and then the microsecond values of cornea, anterior chamber, and lens were subtracted. The final value was multiplied by the assumed vitreous velocity.
4. The corneal, anterior chamber, lens, and vitreous thicknesses were then added together to arrive at the axial length.

Photographic Ophthalmophakometry: The method of photographic ophthalmophakometry is used to monitor changes in radii of either the front or back lens' surfaces or both. This method is based upon the ophthalmometer principle whereby the size of an image produced by reflection of an object at sufficient distance from a spherical surface is linearly related to the radius of curvature of that surface. For a given object, the size of the Purkinje image from either lens surface can be measured and compared in size to the Purkinje image of the anterior corneal surface. If the radius of curvature of the anterior

corneal surface is known, an apparent radius of curvature of the lens surface may be directly calculated by proportion. To calculate the actual radii of curvature, the anterior chamber depth and lens thickness must be known from independent measurement. This data was provided from the ultrasonic measurements.

In the study, the light source used to provide the object for the Purkinje images consisted of two collimated sources contained in an integral unit so that a constant angle is maintained between the two collimated beams. The subject was positioned where the two light sources intersect, thus providing the brightest possible image. Since there are two light sources, two spot images will be seen from each reflecting surface. It is the distance between the two images which is measured and referred to as image size. Since cycloplegics were not used, the patient was instructed to fixate at a target 15 feet away in order to provide a control on accommodation.

A Nikon F camera with a 1:1 macro-lens arrangement was used to photograph the first, third and fourth Purkinje images in order that their relative sizes could be determined. A 20X travelling microscope was used to measure the image size directly from the film negative. The average of three measurements on each Purkinje image

was used for calculation.

The difference between calculated lens surface curvatures and true lens curvatures depends on the validity of the assumptions made in the calculations and the accuracy of the experimental data. For the present experimental arrangement, it is likely that some error will result from measurement of refracting surfaces which do not lie exactly on the visual axis. Another possible source of error is the assumed refractive indices needed in the ultrasonography and phakometry computations. These assumed indices are 1.3333 for aqueous and cornea; 1.4163 for crystalline lens; and 1.3333 for vitreous humour. It is assumed that these possible sources of error will remain constant and therefore should not preclude the determination of relative changes in the lens power.

Ludlam, Wittenberg, and Rosenthal[27] consider that a good estimate for the standard deviation of photographic measurements to be $\pm$ 0.02 mm. A mathematical error analysis shows that accurate measurement of the fourth Purkinje image is the most critical to the calculation of lens power and that an uncertainty of $\pm$ 0.02 mm. results in a potential error of $\pm$ 0.22 D. When the measurement uncertainty on all Purkinje spots is considered, the predicted deviation is 0.27 D. This corresponds to an error not greater than 0.54 D. at the 0.05 confidence level.

An experimental evaluation of the reliability of photographic ophthalmophakometry by Francis[28] found maximum variation of 0.33 D. in calculated lens power. Since the methods used in this study are similar, these figures should be realistic indications of the degree of accuracy which can be expected. (See Table VI,Appendix A for additional calibration information.)

Intraocular Pressure Measurement: Tonometry. The AO Non-Contact Tonometer was used to measure intraocular pressure on every session. The NCT has been found to be relable and accurate. It typically reads 1 mm. Hg higher than the Goldman tonometer and 5 mm. Hg lower than the MacKay-Marg electronic tonometer.[29] Such factors as cardiac cycle, cessation of breathing, lid tension, head-torso position, and anxiety can influence repeatibility.[30]

In this study, patients were measured in the morning or early afternoon, and each patient was measured approximately the same time at each session (± four hours). (See TableVII, Appendix A for calibration of the NCT.)

DATA ANALYSIS

Data was tabulated for each individual patient. For data analysis, patients were separated into three groups:

1. Project I Orthokeratology: patients carried over into Project II from Project I; n = 10 paitents (20 eyes).
2. Project II Control: patients with no previous contact lens wear, randomly selected for subjects by criteria set forth in the experimental design, and fitted with a standard Tabb lens design with a 30% tear reservoir; n = 10 patients (20 eyes).
3. Project II Orthokeratology: patients satisfying the identical criteria for random selection and lens fit as in the Control group, except the initial tear reservoir was 32.5% and that was subsequently increased in succeeding weeks; n = 12 patients (24 eyes).

The means of each variable for each session for each experimental group were then graphed versus time.

It should be noted at the outset of data analysis that in the study only Project II Control patients and Project II Orthokeratology patients were under the close control as to baseline data, start of initial fit, and subsequent modifications and data measurement. Project I patients who were carried over into Project II had diverse

backgrounds in terms of contact lens wear; three had been fit with Tabb design orthokeratology lenses prior to the start of Project II, three had been contact lens control patients in Project I, and four had been spectacle control patients in Project I. At the start of Project II, Project I contact lens control and spectacle control patients were put on Tabb designed orthokeratology lenses with a 32.5% tear reservoir. The data for Project I carry-over patients is presented in this thesis merely for completeness and it cannot be assessed the same significance as the Project II data with the method of analysis used in this thesis. The significance of Project I data should emerge in the master computer analysis, which will correlate each variable with refractive error change and visual acuity for each patient and group, all subjects equalized over time by assigning time as the start of contact lens wear. This analysis is in progress but was not available at the writing of this thesis.

Twenty variables of the 84 measured were selected by the research group for analysis after consultation with the faculty advisor. The criteria for selection was based on which variables showed most change on preliminary examination of data from individual patients. These variables were:

1. Decimal Visual Acuity without contact lenses mea-

sured within ten minutes of removal (VA w/o CL);

2. OEP 7A power in meridian nearest 180° (7A 180);
3. OEP 7A power in meridian nearest 90° (7A 90);
4. OEP 7A meridian nearest 180° (7A M180);
5. OEP 7A monocular sphere only (7AMS);
6. OEP binocular cross-cylinder at near (from 7A), (14B);
7. OEP 21 recovery net, negative relative accommodation (from 7A), (21R);
8. Keratometer power in meridian nearest 180° (K180);
9. Keratometer power in meridian nearest 90° (K90);
10. Keratometer meridian nearest 180° (K M180);
11. Wesley-Jessen PEK power in meridian nearest 180° (PEK 180);
12. Wesley-Jessen PEK power in meridian nearest 90° (PEK 90);
13. Wesley-Jessen PEK meridian nearest 180° (PEK M180);
14. Wesley-Jessen PEK shape factor in meridian nearest 180° (PEK e^2 180);
15. Wesley-Jessen PEK shape factor in meridian nearest 90° (PEK e^2 90);
16. Ultrasound corneal thickness, 10X (US CT);
17. Ultrasound anterior chamber depth (US ACD);
18. Ultrasound axial length (US AL);
19. Contact lens peripheral tear reservoir (CL Res);
20. Contact lens position on cornea (CL Pos).

Symbols in parentheses refer to notation used in the subsequent tables. Definitions of the data derivations are presented in the introduction to this thesis.

As stated previously, for group analysis of the data, patients were analysed separately in three groups: 1) Project I Orthokeratology; 2) Project II Control; 3) Project II Orthokeratology. For each group, data was graphed for each of the 20 variables with time (in weeks) as the independent variable. This method of data presentation was selected in order to show how the measurable ocular parameters change as a function of time during the progression of orthokeratology. This method of presentation was selected as being a more complete presentation than achieved in the Project I thesis in which primarily initial and final values were reported. It also emphasizes the variability of the data and illustrates where trends can be assessed. The disadvantage of this method of presentation is that it does not allow for correlating changes in variables that occur at different points in time. These types of correlations are planned for the master computer program analysis which is in progress.

The data tables were set up with the vertical columns containing variables sampled on a specific week. The specific variables are labelled in the first vertical column and the number of weeks from the time baseline data

was taken is labelled at the top of each succeeding column.

In averaging the data for each group for a given variable, the baseline measurement for each patient individually was subtracted from the measurement at week X, and then the resulting difference values were averaged for the entire group to give the data point plotted on the graph. This method of averaging was employed for all variables except visual acuity because absolute differences in decimal visual acuity are not comparable from the start to the end of the project. Therefore, for the visual acuity variable, per cent change at week X was defined as the decimal acuity at week X minus the baseline decimal visual acuity, divided by the baseline decimal visual acuity, or:

$$\frac{\text{test VA - baseline VA}}{\text{baseline VA}} .$$

This was performed for each patient individually and then averaged for each session to yield the group mean. In order to show the variability of the data and hence to point out the difficulty in making these types of measurements with the currently available instrumentation standard error bars have been plotted for each data point. These error bars were plotted as one standard deviation above and one standard deviation below the mean. Also, they are standard deviations for the differences from the baseline, which maximizes the variability. Therefore, a large vari-

ability should not necessarily negate statistical significance of the changes. In order to ascertain which changes were statistically significant from the baseline data, a Student's t-test was performed on the data at each session of measurements taking the baseline data for the group as one experimental population and the data at week X as the second experimental population. Student's t-test was then performed on these two populations to yield a level of signficance for the change in the variable at week X. The level at which the change from baseline was statistically significant is indicated on the graph below the error bars for each data point. For example, 0.1 under the data point indicates that the change from baseline was statistically signficant at the 0.1 level but not at the 0.05 level. Data is presented in this manner because different investigators choose different criteria for statistical significance. This method of presentation shows the actual levels of significance and conclusions can be drawn accordingly.

The graphs contain a dotted line which indicates the change in visual acuity over time and a solid line which indicates the change in the specific variable over time. This enables one to visually compare the change in visual acuity with the variable to be considered.

RESULTS

1. Visual Acuity without Contact Lenses

This variable was the most significant indicator of orthokeratology change of any of the variables measured. All three contact lens groups showed an improvement in visual acuity over the duration of the study; however, the improvement in acuity for the Project II Orthokeratology group was approximately four times as large as the improvement in the Project II Control group for the duration of the study, except at week 17 where the Control group had a much higher level of significance than in the Project II Orthokeratology group. The Project I Orthokeratology group also showed improvement in acuity, although the findings were more variable. The improved acuity in the control patients is likely due to an orthokeratology effect with the standard Tabb lens. Therefore, the increase in visual acuity is the best indicator of the orthokeratology process with the Tabb method. For the Project II Orthokeratology group, the increase in acuity was greater than 200% from an average starting acuity of 20/90, with several eyes reaching an acuity approaching 20/20, and two eyes gaining 20/15 in a duration of only 20 weeks. The average ending acuity for the Project II Orthokeratology group was 20/30.

2. 7A Power in Meridians Nearest 90° and 180°

The 7A showed a general reduction on myopia for all groups and, as would be expected, the visual acuity increased as the myopia decreased. The Project I group showed the greatest variability and the Project II Control and Orthokeratology groups showed about the same reduction in myopia, approximately 0.75 D. The Project I group showed a consistent decrease in with-the-rule refractive astigmatism from the baseline astigmatism of about -0.50 x 180. The decrease averaged about 0.25 D. refractive cylinder for Project I while the PEK central readings and Keratometry readings showed a consistent increase in with-the-rule corneal cylinder of about -0.25 x 180. The Project II Orthokeratology group showed an insignificant change in refractive astigmatism---varying between zero and -0.12 D. x 180. The central PEK and Keratometry findings showed an overall increase in corneal cylinder of about -0.12 x 180. The Project II Control group also showed little change in refractive cylinder. During the first eight weeks a slight decrease in refractive astigmatism, less than -0.25 D. x 180, was noted for the Project II Control group while Keratometry and PEK findings indicated a similar trend in corneal astigmatism. After that, the overall variation was small with no particular trend noted in the 7A, while Keratometry and PEK both

continued to indicate a reduction in corneal with-the-rule cylinder. The most significant finding here is that induced astigmatism with this method of orthokeratology was essentially non-existant, with, if anything, a slight decrease in astigmatism as a result of wearing these lenses,

3. 7A Monocular Sphere

This variable was included at the start of Project II. The 7AMS as measured was the post-contact lens wear sphere power that gave the best measurable subjective visual acuity, not necessarily the spherical equivalent of the 7A finding. The results showed a gradual decrease in myopia over the length of the study from the baseline. Project I Orthokeratology showed a maximum decrease of 0.57 D., occurring on week 69. It is evident that the slope of the graph tends to parallel the fluctuations of the visual acuity although the level of confidence is greater than 0.20 in most cases. Project II Orthokeratology patients also showed a decrease in myopia maximized at 0.46 D. on week 20. Again the slope of the graph for the Project II Orthokeratology group tends to parallel the fluctuations of visual acuity; however, a low level of significance (greater than 0.20) was observed during the first eleven weeks, thereafter the significance level was higher. Project II Control patients also demonstrated a decrease in myopia maximized on week 17 at 0.65 D. The slope of visu-

al acuity increase again tends to parallel the slope of the 7AMS. With the exception of the greater than 0.20 significance level on week 3, all the following weeks for the Project II Control group indicate a significant difference from baseline.

4. PEK Shape Factor

This variable showed wide variability for all three experimental groups throughout the duration of the study. Nevertheless, there seems to be a trend toward negative changes in the shape factor for all three groups, a trend toward making the cornea more spherical (flattening of the central cornea and steepening of the peripheral cornea). Most of the variability in Project II patients occurred during the first eight weeks of contact lens wear, which may be a result of adaptation. Project I patients showed less variability but it should be remembered that these patients were a highly varied population with regard to the type of contact lens wear and length of wear.

Following is a short summary of the three groups.

Project I Orthokeratology

(Average change from baseline)
Shape Factor in 90th meridian:
Greatest positive change from baseline = 0.04 (Week 60)
Greatest negative change from baseline = -0.12 (Week 66)
Ending shape factor = -0.07 (Week 69)
Shape Factor in 180th meridian:
All negative changes from baseline

Shape Factor in 180th meridian, cont.:
Greatest negative change from baseline = -0.10 (Week 69)
Ending shape factor = -0.10 (Week 69)

Project II Control

(Average change from baseline)
Shape Factor in 90th meridian:
All negative changes from baseline
Greatest negative change from baseline = -0.17 (Week 17)
Ending shape factor = -0.16 Week 20)
Shape Factor in 180th meridian:
All negative changes from baseline
Greatest negative change = -0.14 (Week 17)
Ending shape factor = -0.11 (Week 20)

Project II Orthokeratology

(Average change from baseline)
Shape Factor in 90th meridian:
Greatest positive change from baseline = 0.09 (Week 8)
Greatest negative change from baseline = -0.07 (Week 11)
Shape Factor in 180th meridian:
Greatest positive change from baseline = 0.07 (Week 8)
Greatest negative change from baseline = -0.08 (Week 17)
Ending shape factor = -0.07 (Week 20)

The general trend indicates that the central cornea flattens while the peripheral cornea steepens. This result was also found in the Project I thesis report.

5. PEK Power in Meridians Nearest 90° and 180°

Standard deviation of measurements on any given meeting date stayed at about ± 0.37 D.; this was certainly narrower than the deviation of most of the variables selected for study. Earlier calibrations made on steel balls

showed a variation in readings of ± 0.12 D. Several trends can be pointed out here. There was a definite trend toward slight flattening of the 180th meridian in all three groups. The degree of flattening only amounted to about 0.25 D., but it did parallel the generally improving acuity as time progressed. The vertical meridian's power remained approximately the same for the Project II Orthokeratology group, and almost paralleled the horizontal meridian's power change in the Project II Control group and the Project I Orthokeratology group. With the Project I and II Orthokeratology groups, the small increase in corneal cylinder (0.25 D.) was due to more flattening in the horizontal meridian than the vertical meridian. The Project II Control group showed more flattening in the vertical meridian, amounting to about 0.25 D. change in corneal astigmatism.

6. Keratometry

Central corneal Keratometer findings showed little change over the duration of the study for any of the three groups. There was an overall slight flattening of about 0.25 D. in the 180th meridian while the 90th meridian was essentially unchanged for Project I Orthokeratology patients. There was a slight steepening of the 90th meridian by about 0.25 D. while the 180th meridian was essentially unchanged for Project II Orthokeratology patients.

For Project II Control patients there was no overall change from baseline. However, even in the orthokeratology groups there was no general trend exhibited in Keratometer findings. The maximum change over the duration of the study to date was less than 0.50 D. for any of the three groups. As indicated by the significance levels on the graph, these small changes from baseline were generally not significant. These findings are generally consistent with the corneal power changes found with the PEK, indicating that measured central corneal power changes do not account for the marked increase in acuity.

7. Meridians of 7A, PEK, and Keratometry Nearest 180°

The mean meridian of the 7A closest to 180° varied less than 10 degrees on either side of the mean baseline horizontal meridian for the two orthokeratology groups over this phase of the project. (See p. 198, 146, 148.) The Project II Control varied about 14 degrees on week 17 from the mean baseline measurement. The horizontal meridional mean obtained from PEK readouts varied within 10 degrees of the baseline horizontal mean meridian over all observations made on Project II Control group. Project I Orthokeratology's mean PEK horizontal meridian varied about 12 degrees from the baseline mean on week 11; Project II Orthokeratology's mean PEK horizontal meridian varied about 12 degrees from baseline on week 3. The

mean horizontal Keratometry meridian nearest 180° varied less than 8 degrees from the baseline mean for all three experimental groups. Thus, the meridian nearest 180° showed essentially little change over the course of the project; there appeared to be no trend in any consistent direction of the meridian nearest 180° from the 7A, Keratometry, or PEK measurements.

8. Axial Length and Anterior Chamber Depth

Axial length showed wide variability with a general trend toward shortening. The statistical significance was low however. The Control group in Project II maintained a fairly constant axial length and visual acuity throughout the 14 week period. The estimated standard deviation in reading photographs from the ultrasound unit is 0.05 mm. for axial length and 0.09 mm. for anterior chamber. The changes that were seen in the data are near the limits of readout capability. Considering these limitations, it is interesting to note that the Project II Control group showed relatively constant axial length and anterior chamber depth, which paralleled the visual acuity recorded during the 14 week period that ultrasound measurements were taken, while both orthokeratology groups showed a trend toward shorter axial length. Anterior chamber depth showed litlle overall trend for Project I or II Orthokeratology groups with a great deal of variability.

9. Corneal Thickness: Ultrasound

This measurement showed essentially no change for all three groups. Irregular fluctuations on the order of 0.01 mm. occurred from week to week with maximum changes of about 0.02 mm. Since the estimated accuracy of the readout for this measurement is 0.03 mm., no definite trends were evident. The apparent trend toward thinning of the cornea for the Project I group, although statistically significant of the 0.01 level, is still within the error of measurement and hence not much credulence is placed on this trend.

10. Binocular Cross-Cylinder at Near (14B)

The binocular cross-cylinder at nearpoint showed only a small variation of change from baseline data. The Project I Orthokeratology data varied within $\pm$ 0.25 D. of baseline, with the standard deviation from 0.37 D. to 0.75 D. Project II Control data varied within 0.37 D. from baseline, generally showing a tendency of relative hyperactivity of the accommodative system. This trend toward greater accommodative activity may be related to the associated decrease in myopia (or increase in the hyperopic direction). The findings in the Project I Orthokeratology thesis were similar. The Project II Orthokeratology group also showed the trend toward greater accommodative activity of a similar magnitude. Levels

of significance are generally greater than 0.20.

11. Negative Relative Accommodation at Near (21 R)

The 21 recovery findings (Negative Relative Accommodation at Nearpoint) generally reflected the 14B findings. Here, again, the Project II Control and Orthokeratology groups showed a small increase in accommodative activity while the Project I Orthokeratology group revealed no particular trend. The change from baseline for Project I Orthokeratology varied from +0.40 D. on week 55 to -0.64 D. on week 57 with an ending value of +0.05 D. For Project II Orthokeratology, the change from baseline varied from -0.27 D. on week 8 to +0.02 D. on week 14 with an ending value of -0.02 D. The change from baseline for Project II Control varied from -0.07 D. on week 17 to -0.71 D. on week 20, with an ending value of -0.71 D. It is important, however, to note that any observations made about this variable are to be tempered by the fact that most mean changes from baseline data were greater than or equal to the 0.20 level of significance.

12. Contact Lens Positioning

The initial contact lens positioning of all groups tended to be slightly temporal and slightly inferior. (See pages 176 & 199.) The mean positioning was within 0.75 mm. of being centered over the pupil's center.

The vertical lens position varied more over time

in Project I versus Project II patients. (See Table on p.199; Graphs p.176.) The tear reservoir was consistently larger for Project I patients; the lens may thus have been less stable.

Contact lens position appears to be diphasic as the orthokeratology effect occurs. The initial contact lens position was slightly low. In the first phase, the contact lens position changed from slightly low to slightly high with respect to the pupil center. This trend was seen in both orthokeratology groups by comparing baseline to week 14 (60) vertical contact lens position. (Week 14 was chosen since the vertical contact lens positioning was highest then.) The mean change for Project II Orthokeratology during this time was 0.47 mm. and for Project I 0.79 mm; the mean change for Project II Control was 0.32 mm.; the Control group's mean vertical position was centered. Two factors possible causing the position change are a contact lens physiological adaptation proeess and an orthokeratology effect.

In the second phase, the slightly high vertical contact lens position lowered. This phase was shown by both orthokeratology groups between weeks 14 and 20. (See Graph p. 178.) The mean lowering for Project II was 0.31 mm. and for Project I was 0.21 mm. The Project II Control's mean vertical contact lens position remained

centered during this time interval. In the orthokeratology groups the tendency of the contact lens to lower parallels an increase in contact lens reservoir, as can be seen by inspection of Graphs on p. 176-181. Project II Orthokeratology mean tear reservoir, for example, on week 11, was 32.0%; by week 20, it was 34.15%. The increase in tear reservoir effectively loosened the contact lenses, which then positioned lower on the corneas most likely.

The initial mean horizontal contact lens position tended to be slightly temporal. Both orthokeratology groups' horizontal position tended to become slightly more temporal (p. 176 and 178). The increased tear reservoir over time probably caused a less stable lens, thus affecting positioning. The ranges of horizontal positioning can be seen on table on p.199. There was a tendency for the contact lenses to ride slightly temporal with respect to the pupil's center (0.5 to 1.0 mm.).

13. Tear Reservoir

The goal was to start Project II Control patients with a 30% tear reservoir and Project II Orthokeratology patients with a 32.5% tear reservoir. Among Project I patients, a few patients were already wearing Tabb designed orthokeratology lenses of greater than 32.5% tear reservoir and their unaided visual acuity was fairly stable. For this reason their tear reservoirs were main-

tained at the week 52 level, until a retainer wearing schedule is initiated. The Project II Control patients started at a mean tear reservoir of 29.56% ± 3.60%, and reached a tear reservoir of 32.17% ± 1.99% after 17 weeks. This occurred because some of their lenses needed peripheral modifications to improve their physiological fit; also, corneal changes may have tended to increase the apparent tear reservoir without any modifications being made on the contact lenses. As the tear reservoir was increased, an increase in the visual acuity was noted. In the Project II Orthokeratology group the tear reservoir started at 31.08% ±3.87%, and increased through lens modifications and/or induced corneal changes to 34.16% ± 2.09% after 20 weeks. The increase in the tear reservoir showed a corresponding increase in the visual acuity for the Project II Orthokeratology patients. In the Project I Orthokeratology group, the mean tear reservoir at week 52 (week 6 for Project II) was 35.67% ± 2.53%. The mean weekly reservoirs varied within 1.00% of baseline tear reservoir; this is due to the varied contact lens wearing background of patients in this group. At week 66, the mean tear reservoir was 35.90% ± 1.53%. The unaided visual acuity tended to fluctuate with tear reservoir in these patients. There was a greater increase in visual acuity toward the end of the observation, while the tear reservoir remained

constant. This is probably due to those few patients who formerly were spectacle control patients and contact lens control patients, who were just beginning to develop orthokeratology effects.

14. Biomicroscopy Analysis

a) Patient Population

Project II's screening criteria stipulated no previous ocular pathology. At the baseline observations on the patient population some anatomical abnormalities were revealed. Over the course of Project II, there were no changes in these abnormalities. The observations included the following conditions: bilateral pingueculas, subcapsular lenticular stars, intraocular lens vacuoles, limbal conjunctival brown pigment deposits, an orange-colored iris nevus, a wart-like growth of the lower outer eyelid, a very light cobblestone lower conjunctival appearance. One male patient had a chronic internal hordeolum in the right lower temporal eyelid. A 30 year old female patient had what appeared to be a grayish lipid deposit in the anterior corneal stroma; it looked like an arcus senilis.

b) Method of Analysis

The biomicroscopy findings were evaluated in a different manner than the analytical findings, due to the low incidence of change from baseline. The incidence

of each grade level in each experimental group was tallied over the period from approximately January to November, 1977. In cases where there was a grade level higher than Grade 2, the findings past November 1 were tallied in order to observe follow-through care and resolution of the problem. Thus, the statistics tend to report a higher incidence of the higher grade levels.

The per cent frequency of each grade level was calculated in two different ways. The first method collectively pooled all observations of all experimental groups to arrive at an overall incidence of each grade level. The second method pooled only the observations of each experimental group together; thus there were three pools of data. The per cent frequency of a grade level was calculated for each group. This effectively equalizes each group for direct comparison to each other.

c) Corneal Edema

The overall incidence of corneal edema was only 17.6%; approximately 82% of the time there were no reports of any apparent cormeal edema (Grade 0). Seven of the 22 patients of Project II were edema-free, even during contact lens adaptation. In the Project I group, two out of ten always had Grade 0 edema; in the Project II Control, two out of ten had Grade 0; in the Project II Orthokeratology group, five of 12 were edema-free.

The second most frequent grading of edema was Grade 0.5. It accounts for approximately 12% of the overall reports. The incidence of Grade 0.5 in each group was as follows: 8.4% in Project I Orthokeratology, 14.4% in Project II Control, and 13.2% in Project II Orthokeratology. Edema Grades 0 to 0.5 occurred at one time or another in the following number of patients: six of ten Project I, six of ten Project II Control, and nine of 12 Project II Orthokeratology patients.

The per cent occurance in each respective group of Grade 1 edema or less is as follows: 96.4% for Project I, 100% for Project II Control, and 98.6% for Project II Orthokeratology. Thus the Project II Control group never had a report of worse than Grade 1 edema, and only a small percentage of the other groups did. This was limited to six patients and nine observations. At the end of this phase of Project II, nine of the ten Project I Orthokeratology patients were edema-free. Six of the ten Project II Control and seven of the 12 Project II Orthokeratology patients were edema-free. All Project II patients were reported to have a Grade 1 edema or less by the end of this phase of the project.

The most severe case of edema reported was Grade 4. (See page 64 for key.) This was observed bilaterally in a Project I Orthokeratology patient. (This was at the

last session covered by this phase of Project II, but in this instance the case was observed past the closing date, in the light of follow-up results.) The contact lenses were cleaned; the patient was instructed to limit wear to 14 hours per day. In a week the edema was resolved to Grade 2. A contact lens blend series was performed; in two weeks the edema was Grade 1. By the next visit it was reduced to Grade 0.5.

The second most severe level of corneal edema noted was Grade 2 by one Project II and two Project I Orthokeratology patients. The Project II patient was instructed to maintain a regular pattern of contact lens wear; the edema resolved itself by the next visit. In general, a contact lens blend series was found to clear this level of edema.

d) Fluorescein Retention

The overall occurance of fluorescein retention was 36%. There were, however, six patients who never developed any fluorescein retention (two patients from each group). The majority of reported cases of staining was approximately divided between light foreign body staining (Grade 1) and a light, diffuse punctate staining (Grade 2). (See Table II, p. 64 .) Considering each group individually, slightly more Grade 1 than Grade 2 was developed by Project I patients (3.6% difference); Pro-

ject II Control and Orthokeratology patients developed slightly more Grade 2 (4.5% difference and 3.8% difference respectively).

The most severe case of staining was epithelial dimpling (Grade 4) of one cornea. In an effort to improve contact lens stability and optimalize the corneal-contact lens relationship, the contact lens was reduced 0.4 mm. in overall size and a Tabb blend series was performed. Within a month all fluorescein retention disappeared.

The second most severe case of fluorescein retention was a superficial punctate stain, heavy and coalesced (Grade 3). This developed in three Project I and in two Project II Orthokeratology patients. One patient had switched her lenses; with proper placement on the respective eyes, the condition resolved itself. It was found that, in general, if there was no apparent corneal edema and a corneal-contact lens minimal clearance relationship, a Tabb blend series tended to clear up the corneal staining. (The Tabb blend series tended to decrease the optic zone diameter by 0.1 mm., and sometimes 0.2 mm.) The presence of an allergy flare-up or cold tended to coincide with this level of staining; upon clearing of the flare-up or cold, the fluorescein retention tended to reduce itself to a degree without contact lens modification. It was sometimes necessary to flatten the

last peripheral curve radius (OZR + 4 mm.) to aide the resolution of the staining. If there was a moderate clearance relationship between cornea and contact lens coincident with the staining, a light Tabb blend series tended to resolve the staining, by increasing the tear exchange between the central and peripheral zones under the contact lens. The occurance of a light, diffuse punctate stain (Grade 2) tended to be resolved most easily by a light Tabb blend series on the contact lens, wherein the optic zone area was left untouched; this maintained the alignment to slight clearance relationship of the contact lens with respect to the cornea.

In review, approximately 70% of the time there was little or no fluorescein retention in the Project I and II patients over this phase of the project. Approximately 93% of the time there was little or no corneal edema.

d) Conjunctival and Perilimbal Injection

Injection of the perilimbal and conjunctival blood vessels was at a consistently low level during this project. Five patients revealed no change from the pre-contact lens wearing level of conjunctival injection. Three were of the Project II Control group, and two were of the Project II Orthokeratology group. Of the changes noted (about 56%), almost all were of a minimal conjunctival injection, with no chemosis (Grade 1). (See Table II,

p. 65 .) The number of patients per group only developing conjunctival injection of Grade 1 or less were as follows: six of the 10 Project I Orthokeratology group, all ten of the Project II Control group, and 11 of the 12 Project II Orthokeratology group. Thus approximately 97% of all observations of conjunctival injection were of Grade 1 or less.

Moderate conjunctival injection with moderate chemosis (Grade 3) was noted once in one eye of a Project II Orthokeratology patient. It occurred spontaneously; the patient remarked that it happened to him infrequently and later reported that it resolved within a couple days. Moderate conjunctival injection without chemosis (Grade 2) was reported in four Project I patients and one Project II Control patient. The injection cleared spontaneously in one case where the contact lenses had been switched around. An allergy flare-up was coincident with this level of injection; the patient habitually exhibited low-grade conjunctival and perilimbal injection. In general, it was found that a light Tabb contact lens blend series reducing the optic zone by 0.1 mm. or less and/or an overall lens diameter reduction by 0.2 mm. tended to resolve this level of conjunctival injection.

To review, then, the degree of conjunctival injection 97% of the time was no more severe than a minimal injec-

tion with no chemosis (Grade1). In the Project I Orthokeratology groups, there was a 6% occurance of moderate conjunctival injection without chemosis (Grade 2). In the Project II Control group, only one eye developed a Grade 1.5 injection (counted as 0.8% incidence). In Project II Orthokeratology group, only one eye developed a congestion greater than Grade 1; this was Grade 3 (the incidence was 0.5%). Conjunctival injection was of a very low degree in the Tabb method of contact lens design, and relatively infrequent in occurance.

Perilimbal injection was absent in 42% of the observations. One patient from each experimental group remained free of any perillimbal injection. Six patients from Project I, nine from Project II Control, and 11 from Project II Orthokeratology never developed worse than a mild congestion of normal limbal blood vessels (Grade 1).

The worst report of perilimbal injection was Grade 2, a severe congestion and dilation of the normal limbal vessels. This occurred in four Project I patients a total of eight times, or 4.8% incidence (in the group's observation). One patient from each Project II group developed Grade 2 injection. One Project II patient developed this on a baseline observation before contact lens wear; throughout the project he habitually exhibited low grade conjunctival and perilimbal injection. Dirty contact lenses were

found coincident with injection; thorough cleaning of lenses tended to resolve the injection without contact lens modification. A Tabb contact lens blend series tended to eliminate perilimbal injection or reduce it to a minimal level (Grade 0.5).

In summary, only 4.8% of the observations made of perilimbal injection of the Project I group were worse than a mild injection (Grade 1), and that 4.8% was of a Grade 2 moderate injection. Only 2.3% of Project II Control observations were of a mild injection or none at all. Perilimbal injection was of a low degree in the Tabb method of contact lens fitting, and of infrequent occurance.

f) Tear Break-Up Time

The tear break-up time (B.U.T.) appeared to be a normal 15 seconds or longer in approximately 73% of the observations made. This is based on the assumption that a reading was taken on each eye at each session. All reported decreased B.U.T.'s were tallied. Three Project I, one Project II Control, and two Project II Orthokeratology patients maintained normal break-up times over this phase of the study.

In general, the most frequent reduction of the break-up time was down to the six to ten second range. In each group respectively, the per cent occurance of decreased B.U.T. was highest in the 10 to 12 second range.

DISCUSSION

The results of this thesis generally reinforce the findings of the Project I thesis of 1977. Total corneal topography seems to be the major contributor to the mode of action of orthokeratology. Of the variables considered, the best single indicator of the orthokeratology effect in Project II was the unaided visual acuity. Change in refractive error, although generally paralleling the change in visual acuity, was less than expected from tables correlating visual acuity with refractive condition.[30] For example, the Project II Orthokeratology group had an average beginning acuity of 20/90 and an ending acuity of 20/30 while their 7A power in meridians 90 and 180 only decreased by about 0.50 D. Central corneal power changes were small as compared to the change in the visual acuity.

Further analysis using Pearson's product-moment correlation coefficient indicates that the PEK shape factor of the Project II Orthokeratology group correlates extremely well with the increase in visual acuity.

PEK SHAPE FACTOR VS. VISUAL ACUITY

Group	Coefficient of Correlation	Significance Level
Project II Orthokeratology		
shape factor (90th meridian)	0.82	0.05
shape factor (180th meridian)	0.80	0.05
Project II Control		
shape factor (90th meridian)	0.66	0.20
shape factor (180th meridian)	0.71	0.10

PEK SHAPE FACTOR VS. VISUAL ACUITY, CONT.

Group	Coefficient of Correlation	Significance Level
Project I Orthokeratology		
shape factor (90th meridian)	0.56	0.20
shape factor (180th meridian)	0.20	0.20

The most likely reason for the control group having as high a correlation as was found is because there was some orthokeratology effect among these patients as indicated by their significant increase in visual acuity. The correlation between shape factor and visual acuity was lower for Project I Orthokeratology patients.

PEK and Keratometer central corneal power measurements for all three groups did not show a significant change from baseline and thus could not satisfactorily account for the changes in visual acuity. Corneal astigmatism changes as noted in the results were minimal with no observed trends in all three groups. Changes in refractive astigmatism as reflected by the 7A were similarly unremarkable. (See Tables and Graphs of mean values for PEK, Keratometry, 7A---first and last.)

In terms of refractive error, a significant statistical correlation was found between the 7AMS and the visual acuity for all three groups. (See chart below.) For the two Orthokeratology groups, the graphs show that the actual increase in visual acuity was significantly greater than the expected increase in visual acuity based on the

amount of plus sphere change (decrease in minus corrective power) in the 7AMS.[31] The Control group, however, did not have a like increase in visual acuity for an equal amount of plus sphere change. Perhaps, this is the reason for the Control group having a lower correlation between 7AMS and visual acuity.

7AMS VS. VISUAL ACUITY

Group	Coefficient of Correlation	Significance Level
Project II Orthokeratology	0.89	0.01
Project II Control	0.68	0.10
Project I Orthokeratology	0.77	0.05

Contact lens positioning in the vertical meridian was significantly correlated with visual acuity change in the Project II Orthokeratology patients (coefficient of correlation (r) = 0.87, at the significance level of 0.02). From the graphs, this may be interpreted as meaning that well centered to low positioning lenses of Tabb orthokeratology design cause an increase in visual acuity whereas high positioning lenses of the same design do not cause a visual acuity increase. Horizontal contact lens positioning of the Project II Orthokeratology group showed a poor relationship to visual acuity changes (r = 0.40, with greater than a 0.20 significance level). For the Project II Control group, both vertical and horizontal contact lens positioning showed low correlations with visual acuity change. Contact lens vertical positioning correlated with

visual acuity change to produce a doefficient of correlation of only r = 0.18 with a greater than 0.20 significance level. Contact lens horizontal positioning correlated with visual acuity change to give a coefficient of correlation of only r = 0.20 with a greater than 0.20 significance level. These lower correlations for the Control group are to be expected because this group wore the standard Tabb lenses and efforts were made to keep them on the same lens design throughout the project. The Project I Orthokeratology group had a vertical contact lens positioning which correlated with visual acuity change at r = 0.06, with a greater than 0.20 significance level while the horizontal contact lens positioning correlated with visual acuity change at r = 0.90, with a significance level of 0.01. Again, it must be remembered that the Project I Orthokeratology patients had diverse backgrounds in terms of contact lens wear and several of these patients had been wearing contact lenses for a longer period of time than the Project II patient population, the longer time period perhaps affecting quite different results.

The change in tear reservoir for the Project II Control and Orthokeratology groups showed a good correlation with increases in visual acuity. For the Control group, the correlation between increase in tear reservoir and increase in visual acuity was r = 0.76 with a 0.05 level of

significance. The Project II Orthokeratology group also had a correlation of $r = 0.76$ with a 0.05 level of significance. This would indicate that the change in visual acuity was strongly influenced by an increase in tear reservoir. Project I Orthokeratology patients, however, had a low correlation between tear reservoir change and visual acuity change, $r = 0.03$ with a greater than 0.20 level of significance.

Of the intraocular parameters measured, only axial length of Project I Orthokeratology and Project II Orthokeratology groups showed a consistent trend toward shortening with the orthokeratology process. However, this change was generally less than 0.2 mm. and the statistical significance was low. Pearson's product-moment correlation analysis comparing axial length change with visual acuity change revealed poor correlations with low levels of significance. Change in axial length, albeit insignificant, would nevertheless support the shape factor measurements indicating flattening of the central cornea with steepening of the peripheral cornea. Corneal thickness as measured by ultrasound did not show any significant change for any of the three groups.

Biomicroscopy observations of ocular physiology were unremarkable for the majority of the patients during the length of the project. The few physiological changes ob-

served were those occasionally seen in the normal contact lens wearing population. It can be said that the Tabb method of orthokeratology is as safe as many of the other non-orthokeratology contact lens fitting methods.

SUMMARY

During the course of this project it has been determined that the most likely explanation for the mode of orthokeratology to be a sphericalization of the corneal topography. Sphericalization seems to be induced by a steepening of the peripheral cornea with a simultaneous flattening of the central cornea. This is substantiated by the significant visual acuity - PEK shape factor correlation found in the Project II Orthokeratology and Control groups. All other ocular parameters measured either showed little change or no significant correlations to visual acuity.

For the future duration of the project we recommend greater emphasis be placed on the total corneal topography measurements. With regard to ultrasound and PEK measurements, methods to increase precision and repeatability are desireable. Also, during the process of manufacturing lenses for Control patients, care must be taken that tear reservoirs do not exceed the 30% level or orthokeratology changes will probably take place. Finally, future researchers in this project might be observant for high positioning contact lenses in Orthokeratology patients. We feel that minimal orthokeratological effects are brought about with high positioning lenses. All lenses in the Orthokeratology group should be well centered to slightly

low positioning in the vertical meridian if changes in orthokeratology are to be expected.

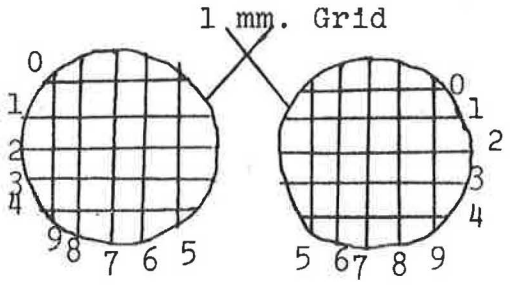
APPENDIX A

TABLE I

Contact Lens Fit Evaluation

I. Contact Lens Positioning

Centered lens over the pupil = "27"
(each number on the diagram represents 1 mm.)
Position of the lens after the fast phase of the lag upon blinking, with respect to the center of the pupil.



II. Movement

Estimated in millimeters of movement at the end of the fast phase of the lag upon blinking.

III. Corneal-Contact Lens Relationship

+ 3 = Extreme Clearance
+ 2 = Moderate Clearance
+ 1 = Minimal Apical Clearance (MAP)

0 = Alignment Fit

- 1 = Minimal Central Bearing (Touch)
- 2 = Moderate Central Bearing
- 3 = Heavy Central Bearing

IV. Tear Reservoir

Estimation of peripheral curve area including the blend area in comparison to the total lens area with the aid of 10X magnification.

TABLE II
Biomicroscopy Evaluation

		Grade	
I.	Edema		
	A. None	0	
	B. Corneal Edema		
	1. Slight amounts, seen as very light gray haze, limited to less than 10% of the corneal area.	1	
	2. Moderate amounts, definite grayness to corneal appearance, limited to less than 25% of corneal area.	2	
	3. Moderate amounts, definite grayness to corneal appearance, limited to less than 50% of corneal area.	3	
	4. Dense edema, heavy grayness in corneal appearance, limited to less than 25% of the corneal area.	4	
	5. Dense edema, heavy grayness in corneal appearance, limited to less than 50% of corneal area.	5	
	6. Other (expaain)	6	
II.	Fluorescein Retention		
	A. None	0	
	B. Foreign body staining, superficial	1	
	C. Punctate staining, light and variable	2	1.5 =a combination of 1 & 2
	D. Superficial punctate staining, heavy and coalesced	3	
	E. Epithelial dimpling	4	
	F. Abrasions of the epithelium	5	
	G. Deep corneal abrasions, ulcerations, or other severe complications	6	
	H. Other (explain)	7	

		Grade
III.	Conjunctival Injection	
	A. None	0
	B. Minimal conjunctival injection, no chemosis	1
	C. Moderate conjunctival injection, no chemosis	2
	D. Moderate conjunctival injection, moderate chemosis	3
	E. Severe conjunctival injection, no chemosis	4
	F. Severe conjunctival injection, moderate chemosis	5
	G. Severe conjunctival injection, severe chemosis	6
	H. Other (explain)	7
IV.	Perilimbal Injection	
	A. None	0
	B. Mild congestion and dilation of limbal vessels which was not characteristic of the prefitting condition.	1
	C. Severe congestion and dilation of the normal limbal vessels.	2
	D. Conjunctival hyperemia (chemosis)	3
	E. Other (explain)	4
V.	Tear Break-up Time	
	A. Evaluated as time in seconds before first indication of tear break-up on the cornea, normal being 15 seconds or longer.	
VI.	Anterior Chamber Angle	
	A. Estimated as the anterior chamber thickness to corneal thickness ratio when measured at the limbal margin with the ocular-illumination angle set at 60°. An <u>open</u> angle ratio is greater than or equal to 1 : 1.	

VII. Other Complications

A.	None	0
B.	Present - (explain)	1

TABLE III

PEK Calibrations

I. Steel ball - 7.33mm = 46.06 D
shape factor = 00.00

	D	mm	s.f.
PEK measurements:	46.13	7.32	-0.02
	46.13	7.32	-0.06
	46.17	7.31	-0.01
	46.13	7.32	-0.03
	46.06	7.33	-0.07
	46.09	7.32	-0.04
	46.19	7.31	-0.01
	46.05	7.33	-0.08

II. Steel ball - 7.67mm = 44.02 D
shape factor = 00.00

PEK measurements:	44.11	7.65	0.04
	44.04	7.67	-0.02
	44.05	7.66	0.04
	44.00	7.67	0.00
	44.09	7.66	0.07
	44.05	7.66	0.04
	44.13	7.65	0.02
	44.17	7.64	-0.01

III. Steel ball - 8.00mm = 42.20 D
shape factor = 00.00

PEK measurements:	42.23	7.99	-0.04
	42.12	8.02	-0.09
	42.12	8.02	-0.04
	42.13	8.01	-0.05
	42.05	8.03	0.00
	42.05	8.03	0.09
	41.99	8.04	-0.01
	41.95	8.05	-0.01

shape factor: mean= .037 std. dev.: .0277 var.: .00073

IV. Human subject- R. Holling O.S.

PEK					Ophthalmometer	
H	sf	V	sf		H	V
43.85	0.22	44.44	0.19	@115	43.62	44.50 @92
43.76	0.33	44.42	0.40	@090	43.62	44.75 @92
43.96	0.26	44.43	0.22	@ 120	43.75	44.62 @90
43.91	0.34	44.52	0.34	@ 110	43.75	44.75 @89

TABLE IV

Pachometry Calibrations

Corneal Thickness Pachometry — subject - R.H.

Mentor slit lamp # 73316 — #253

* O.D. mm	O.S. mm	O.D. mm	O.S. mm
.53	.515	.505	.515
.52	.515	.515	.50
.525	.515	.515	.515
.53	.515	.505	.515
.52	.515	.505	.525
.525	.525	.510	.515
.53	.53	.505	.515
.535	.52	.505	.515
.525	.525	.505	.52
.525	.52	.50	.515
mean .527	.520	.507	.515
variance .00002	.00003	.00002	.00004
st. dev. .0047	.0055	.0048	.0062

$O.D._m - O.S._m$ = +.007mm = -.008mm

Anterior Chamber Depth Pachometry

Mentor slit lamp # 73316 — #253

* O.D. mm	O.S. mm	O.D. mm	O.S. mm
3.50	3.61	3.52	3.61
3.58	3.62	3.54	3.59
3.56	3.62	3.56	3.57
3.58	3.61	3.50	3.60
3.57	3.62	3.52	3.61
3.54	3.61	3.50	3.61
3.52	3.61	3.54	3.59
3.55	3.62	3.50	3.61
3.52	3.59	3.53	3.61
3.53	3.61	3.52	3.61
mean 3.542	3.612	3.523	3.601
variance .00068	.00009	.00045	.00018
st. dev. .0262	.0097	.0212	.0138

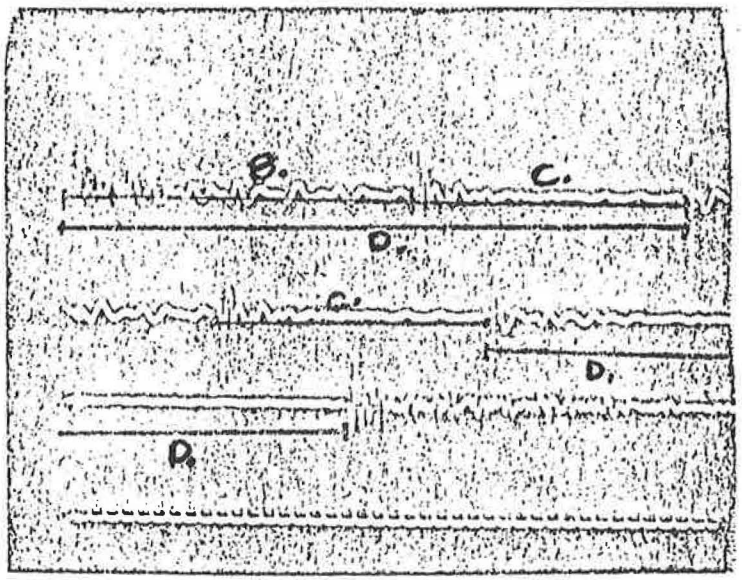
$O.D._m - O.S._m$ = -.070mm = -.078mm

* data taken from instrument scale and has not been corrected with corneal curvature charts.

TABLE V

Ultrasonography Tracings

12X Mag



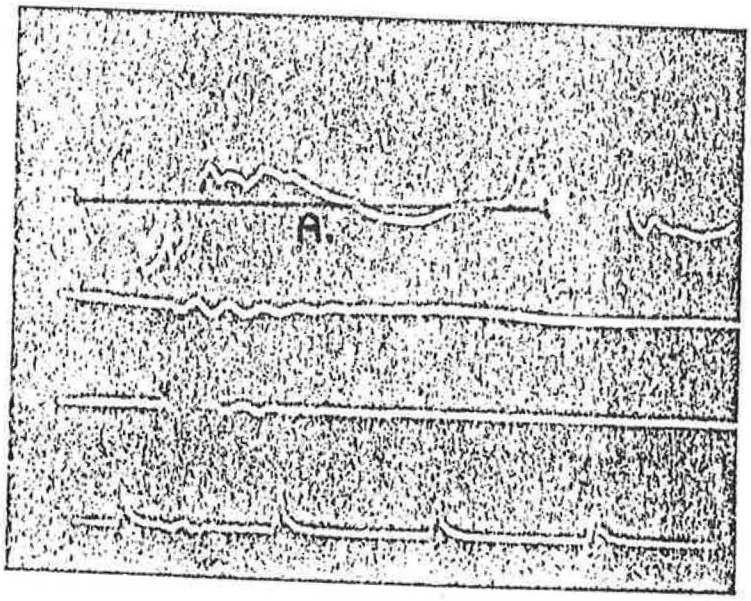
Channel A

Channel B

Channel C

Channel D

20X Mag



Channel A

A = Corneal Thickness

B = Anterior Chamber Depth

C = Lens thickness

D = Interval needed for Vitreous computation

TABLE V-a

Ultrasonography
Calibrations

Subject- R.H. O.D.

			mm's		
Cornea	0.580	0.583	0.512	0.581	0.553
Ant. Chamber	3.054	3.186	3.278	3.092	3.044
Lens	4.120	4.029	4.011	4.088	4.093
Vitreous	16.300	16.168	16.142	16.179	
Axial Length	24.054	23.966	23.943	23.940	
Corneal Mag	0.583	0.584	0.589	0.586	

	mean	variance	std, dev.
Cornea	0.5618	0.0007	0.0270
Ant. Chamber	3.1525	0.0075	0.0869
Lens	4.0620	0.0019	0.0439
Vitreous	16.1972	0.0036	0.0608
Axial Length	23.9757	0.0021	0.0462
Corneal Mag	0.5855	0.0000	0.0022

TABLE VI

OPHTHALMOPHAKOMETRY

Anterior Lens Curvature:	6.80 D
Std. Dev:	.0530
variance:	.0028
Posterior Lens Curvature:	13.60 D
Std. Dev:	.2000
variance:	.0400
Total Lens Power :	20.14 D
Std. Dev.:	.1700
variance :	.0290

TABLE VII

Tonometry Calibrations for
AO Non-contact
Tonometer

subject: L.R. eye: O.S.
time : 3:00 pm

16	mm Hg.
15	
16	
16	
16	
18	
16	
14	
16	

mean:	15.9
variance:	.9888
std. dev.:	.9944

APPENDIX B

Name _____

RECORDING FORM
ORTHO-K PROJECT II
C.L. WEARER

VAR. #	DATE		DATE
	History:		History
66	VA / CC	OD: OS:	VA / CC OD: OS:
20 21 22	OR:	OD: OS:	OR: OD: OS:
	SLE: See Additional Form		SLE: See Additional Form
34 35 36	K:	OD ____/____ @ OS ____/____ @	K: OD ____/____ @ OS ____/____ @
1	VA / SC	OD: OS:	VA / SC OD: OS:
4 5 6	S:	OD: OS:	S: OD: OS:
7 8 9	7B	OD: OS:	7B OD: OS:
10 11 12	7AB	OD: OS: VA OD OS #2 OU	7AB OD: OS: VA OD OS #2 OU
59 60	7M	OD: OS:	7M OD: OS:
61 62	7AM	OD: OS: VA OD: #67 OS:	7AM OD: OS: VA OD: #67 OS:
63	7AMS	OD: OS: VA OD: #68 OS:	7AMS OD: OS: VA OD: #68 OS:
64	#8	NVA / CC 7AB OD:	#8 NVA / CC 7AB OD:
65	#13B	#3 OS:	#13B #3 OS:
17	#21B NET		#21B NET
18	#21R NET		#21R NET
19	#14B NET		#14B NET

C.L. Verification

OZR(55)	OZD(56)	CT(57)	P(58)
R:			
L:			

C.L. Verification

OZR(55)	OZD(56)	CT(57)	P(58)
R:			
L:			

Slit Lamp Observations

Patient _____

Date _____

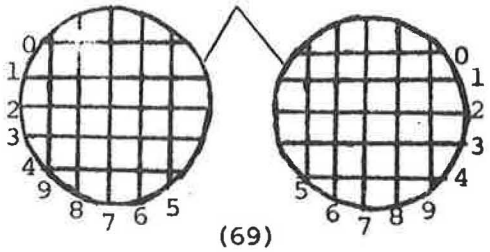
VAR. #	Grade Classification OD	OS	
44			AC/C
45			Edema
46			Fluorescein Retention
47			BUT
48			Injection
49			Perilimbal Injection
			Other

OD OS

(54)
____ Movement ____

Position After Fast Phase Lag (53)

1mm Grid



(69)
____ Reservoir ____

(70)
____ Clearance ____

Slit Lamp Observations

Patient _____

Date _____

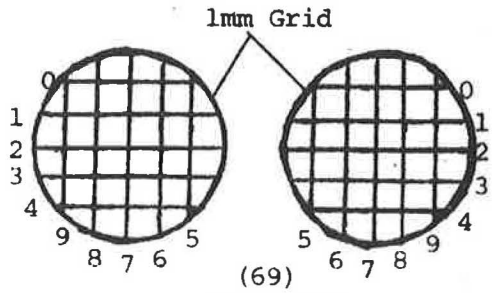
VAR. #	Grade Classification OD	OS	
44			AC/C
45			Edema
46			Fluorescein Retention
47			BUT
48			Injection
49			Perilimbal Injection
			Other

OD OS

(54)
____ Movement ____

Position After Fast Phase Lag (53)

1mm Grid



(69)
____ Reservoir ____

(70)
____ Clearance ____

NAME / DATE												
	OD	OS	OD	OS	OD	OS	OD	OS	OD	OS	OD	OS
OPHTHALMOMETRY												
C L C	@	@	@	@	@	@	@	@	@	@	@	@
PACHOMETRY												
CORNEA C. MEASURED												
CORNEA C. CORRECTED												
CORNEA P. MEASURED												
CORNEA P. CORRECTED												
ANT. CHAMB. MEASURED												
ANT. CHAMB. CORRECTED												
ANT. CHAMB. TRUE												
PHAKOMETRY ✓ IF DONE												
PEK ✓ IF DONE												
TONOMETRY												
ULTRASONOGRAPHY ✓ IF DONE												
(1x) C.T.												
(10x) C.T.												
A.C.												
L.T.												
V.T.												
AXIAL LENGTH												
GONIOSCOPY ✓ IF DONE												
COMMENTS												

APPENDIX C

PROJECT I
ORTHO-K

Patient M.S.
Eye LEFT
Age 35
Sex M

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	0.067	0.1			0.1	0.2			
7A 180	-4.00	-3.50			-3.25	-2.75			
7A 90	-4.00	-4.00			-3.25	-3.25			
7A M180	180	20				165			
7AMS		-4.00			-3.50	-4.00			
14B	+.50	+.75			+0.50	0.25			
21R	+2.50	+2.50			+2.00	2.25			
K 180	45.00	44.50			45.25	45.00			
K 90	45.87	45.62			45.75	45.50			
K M180	180	004			180	007			
PEK 180	45.06	44.91			44.94	44.77			
PEK 90	45.59	45.59			45.59	45.26			
PEK M180	180	180			010	160			
PEK e^2 180	.52	.14			.19	.18			
PEK e^2 90	.27	.12			.22	.23			
U.S. CT	.532					.495			
U.S. ACD	3.424					3.406			
U.S. AL	24.501					24.516			
CL Res.		35%				37%			
CL Pos.		47				28			

PROJECT I
ORTHO-K

Patient M. S.
Eye RIGHT
Age 35
Sex M

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	0.067	0.1			0.1	0.10			
7A 180	-3.50	-3.00			-3.25	-3.50			
7A 90	-3.75	-3.25			-3.25	-3.75			
7A M180	014	165				30			
7AMS		-3.50			-3.50	-4.00			
14B	+.50	+.75			+.50	+0.25			
21R	+2.50	+2.50			+2.00	2.25			
K 180	44.75	44.75			45.00	45.00			
K 90	45.50	45.50			45.00	45.00			
K M180	180	004							
PEK 180	44.90	45.05			45.21	44.72			
PEK 90	45.41	45.20			45.56	45.58			
PEK M180	180	160			180	005			
PEK e^2 180	.51	.25			.23	.12			
PEK e^2 90	.26	.21			.12	.16			
U.S. CT	.555					.509			
U.S. ACD	3.18					3.430			
U.S. AL	24.38					24.57			
CL Res.		.35				.37			
CL Pos.		47				38			

PROJECT I
ORTHO-K

Patient S. V.
Eye LEFT
Age 20
Sex M

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	0.67	0.67	1.00	0.80		1.00			
7A 180	-1.50	-1.25	-1.00	-0.50		-.50			
7A 90	-1.50	-1.75	-1.25	-0.50		-1.00			
7A M180	180	30	180	180		13			
7AMS	-1.50	-1.50	-1.00	-0.75		-1.00			
14B	+2.00	1.25	1.75	1.50		1.75			
21R	+3.00	2.25	2.50	2.25		2.50			
K 180	40.87	40.50	40.37	40.25		40.37			
K 90	41.75	41.50	41.12	41.12		41.50			
K M180	90	95	105	93		90			
PEK 180	41.01	40.70	40.45	40.50		40.54			
PEK 90	41.45	41.39	41.12	41.09		41.37			
PEK M180	95	180	180	180		175			
PEK e^2 180	0.22	0.05	0.07	0.13		0.12			
PEK e^2 90	0.13	0.18	0.22	0.08		0.21			
U.S. CT	.642		0.577	0.641					
U.S. ACD	3.79		3.042	2.964					
U.S. AL	24.51		24.446	24.670					
CL Res.		0.37	0.34	0.38		0.38			
CL Pos.		28.	29.	48.		48.			

PROJECT I
ORTHO-K

Patient S. V.
Eye RIGHT
Age 20
Sex M

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	0.5	0.80	1.00	1.00		1.33			
7A 180	-1.00	-0.50	-0.75	0.00		-.25			
7A 90	-1.00	-0.50	-0.75	0.00		+.25			
7A M180	180	180	180	180		157			
7AMS	-1.00	-0.50	-0.75	-0.25		-0.50			
14B	+2.00	1.25	1.75	1.50		1.75			
21R	+3.00	2.25	2.50	2.25		2.50			
K 180	41.00	41.00	40.50	40.50		40.50			
K 90	41.87	41.75	41.25	41.12		41.75			
K M180	90	95	90	83		90			
PEK 180	41.22	40.78	40.45	40.64		40.54			
PEK 90	41.60	41.55	41.61	41.34		41.57			
PEK M180	95	180	180	175		180			
PEK e^2 180	.18	0.12	0.07	0.10		0.09			
PEK e^2 90	.22	0.25	0.22	0.23		0.29			
U.S. CT	.622		.586	.676					
U.S. ACD	3.38		2.942	2.907					
U.S. AL	24.56		24.393	24.476					
CL Res.		0.37	0.37	0.38		0.38			
CL Pos.		47.	38.	38.		48.			

PROJECT I
ORTHO-K

Patient P. M.
Eye LEFT
Age 23
Sex M

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	0.20	0.50	0.40	0.40	0.40	0.33		0.20	
7A 180	-1.25	-0.75	-1.25	-1.25	-1.00	-1.50		-1.50	
7A 90	-2.25	-2.00	-1.75	-2.25	-2.00	-2.25		-2.00	
7A M180	030	030	045	030	035	040		040	
7AMS	-1.75	-1.37	-1.50	-1.75	-1.50	-1.50		-1.75	
14B	1.25	0.50	1.25	1.00	0.75	0.50		1.00	
21R	2.50	2.50	2.75	1.75	1.75	2.25		1.25	
K 180	45.25	45.25	44.75	44.50	45.00	45.50		45.50	
K 90	46.37	45.75	46.00	45.75	46.25	46.37		46.50	
K M180	015	180	018	010	013	180		022	
PEK 180	45.22	44.83	45.17	45.08	44.88	45.37		45.39	
PEK 90	46.35	46.21	46.20	46.03	46.16	46.31		46.62	
PEK M180	140	015	180	180	015	180		005	
PEK e^2 180	0.12	0.19	0.26	0.32	0.07	0.19		0.01	
PEK e^2 90	0.16	0.32	0.34	0.26	0.16	0.07		0.13	
U.S. CT		.538	.546	.541	.542	.532			
U.S. ACD		3.698		3.691	3.794	3.743			
U.S. AL		23.510		23.642	23.661	23.485			
CL Res.	0.35	0.35	0.32	0.33	0.33	0.33		0.33	
CL Pos.	38	37	27	26	27	37		37	

PROJECT I
ORTHO-K

Patient P. M.
Eye RIGHT
Age 23
Sex M

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	0.40	0.66	1.00	0.66	0.40	0.80		0.50	
7A 180	-1.25	-1.25	-1.00	-0.75	-0.75	-0.50		-0.75	
7A 90	-0.75	-0.75	-0.50	-1.25	-1.25	-1.00		-1.25	
7A M180	015	045	035	155	140	150		140	
7AMS	-1.25	-0.75	-0.50	-1.00	-1.00	-0.75		-1.00	
14B	1.25	0.50	1.25	1.00	0.75	0.50		1.00	
21R	2.50	2.50	2.75	1.75	1.75	2.25		1.25	
K 180	45.25	45.25	44.75	44.50	45.00	45.25		45.75	
K 90	46.00	45.25	45.75	45.50	45.75	45.75		46.25	
K M180	180	180	168	175	165	180		179	
PEK 180	45.27	45.11	44.93	45.11	45.16	45.08		45.79	
PEK 90	45.61	45.64	45.53	45.79	45.64	45.54		46.24	
PEK M180	180	155	160	005	155	160		005	
PEK e^2 180	0.13	0.20	0.03	0.11	0.13	-0.10		0.11	
PEK e^2 90	0.09	0.22	0.12	0.18	0.21	-0.04		0.14	
U.S. CT		.551	.557	.544	.547	.543			
U.S. ACD		3.540	3.554	3.547	3.595	3.449			
U.S. AL		23.331	23.235	23.349	23.386	23.402			
CL Res.	0.32	0.32	0.32	0.32	0.34	0.33		0.33	
CL Pos.	38	37	27	38	27	38		37	

PROJECT I
ORTHO-K

Patient R. D.
Eye LEFT
Age 29
Sex M

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	.2	.1	.2	.25	.30	.8	.8	.8	.8
7A 180	-1.75	-3.25	-3.50	-3.75	-2.75	-2.25	-2.00	-1.50	-2.25
7A 90	-2.00	-3.00	-2.75	-3.25	-3.00	-2.00	-2.00	-1.00	-1.75
7A M180	155	175	155	160	25	160	180	180	145
7AMS		-3.00	-3.12	-3.50	-3.00	-2.12	-2.25	-1.75	-2.00
14B	+1.00	.25	1.50		1.75	.50	1.00	1.75	.50
21R	+2.25		3.25		2.75	2.50	2.75	2.75	2.25
K 180	45.75	46.50	46.50	46.75	45.75	46.50	46.50	46.50	46.50
K 90	45.75	45.75	46.00	45.75	47.25	46.25	46.00	46.50	46.25
K M180	180	20	180	15	180	180	20	180	180
PEK 180	45.94	46.42	46.07	46.44	46.10	45.99	46.72	46.28	
PEK 90	45.50	45.95	46.06	45.79	46.54	46.44	45.97	46.36	
PEK M180	10	25	15	145	160	180	140	180	
PEK e^2 180	.14	.19	.10	.20	.16	-.09	.16	-.03	
PEK e^2 90	.01	.03	.05	-.02	.25	.03	.08	-.06	
U.S. CT	.502		.520	.513	.516	.525			
U.S. ACD	3.70		3.67		3.692	3.714			
U.S. AL	24.048		24.038		24.060	24.219			
CL Res.		.30	.37	.325	.33	.37	.37	.37	.38
CL Pos.		26.	27.	27	28.	27.	28.	28.	28.

PROJECT I
ORTHO-K

Patient R. D.
Eye RIGHT
Age 29
Sex M

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	.2	.1	.2	.25	.25	.33	.4	.3	.5
7A 180	-1.75	-3.25	-3.50	-4.25	-2.25	-2.25	-2.00	-2.25	-1.75
7A 90	-1.75	-2.75	-2.75	-3.50	-2.75	-2.00	-2.00	-2.25	-1.50
7A M180	180	155	155	15.	20.	10.	180	180	175
7AMS		-3.00	-3.12	-3.87	-2.25	-2.12	-2.25	-2.00	-2.00
14B	+1.00	.25	1.50		1.75	.50	1.00	1.75	.50
21R	+2.25		3.25		2.75	2.50	2.75	2.75	2.25
K 180	45.75	46.50	46.75	46.50	45.75	46.25	46.00	46.50	46.50
K 90	45.87	46.00	46.00	46.00	46.25	46.00	46.00	46.25	46.00
K M180	180	180	170	165	150	180	180	180	180
PEK 180	46.05	46.69	46.89	46.71	45.90	46.07	46.12	46.08	
PEK 90	45.83	46.04	46.12	46.27	46.14	46.43	45.96	46.22	
PEK M180	05	140	155	150	165	30	165	180	
PEK e^2 180	.25	.23	.19	.13	.11	.14	.16	.08	
PEK e^2 90	.26	.11	.02	-.03	.20	.17	.22	.10	
U.S. CT	.501		.516	.525	.514	.533			
U.S. ACD	3.669		3.596		3.646	3.686			
U.S. AL	24.15		23.914		23.979	24.096			
CL Res.		.35	.35	.325	.33	.35	.37	.37	.38
CL Pos.		27.	37.	27.	27.	27.	28.	28.	28.

PROJECT I
ORTHO-K

Patient L. S.
Eye LEFT
Age 34
Sex F

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	0.5	0.8			0.5	0.5	0.8	1.	
7A 180	-0.75	-1.00			-0.75	-1.25	-1.00	-0.50	
7A 90	-0.75	-0.75			-0.75	-1.25	-0.50	0.	
7A M180	180	157			180	180	175	170	
7AMS		-1.25			-0.75	-1.25	-1.00	-0.25	
14B	+1.50	+1.25			+0.75	+1.00	+1.00	+1.00	
21R	+2.25	+2.25			+2.00	+2.50	+2.50	+2.00	
K 180	44.50	43.87			44.50	44.50	44.00	44.00	
K 90	44.75	44.50			45.00	45.00	44.75	44.75	
K M180	180	180			180	180	180	180	
PEK 180	44.00	44.00			44.25	44.00	43.00	44.25	
PEK 90	44.50	44.50			44.75	44.37	43.75	45.00	
PEK M180	10.	175.			20.	20.	180.	180.	
PEK e^2 180	0.2	0.22			0.06	0.16	-0.02	0.11	
PEK e^2 90	0.2	0.2			0.08	0.16	-0.04	0.26	
U.S. CT	0.539				0.482	0.480			
U.S. ACD	3.61				3.636	3.606			
U.S. AL	23.46				23.365	23.274			
CL Res.	0.35	0.35			0.35	0.35	0.375	0.375	
CL Pos.	46.	28.			26.	27.	26.	28.	

PROJECT I
ORTHO-K

Patient L. S.
Eye RIGHT
Age 34
Sex F

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	0.33	0.50			0.67	0.5	0.5	0.67	
7A 180	-1.00	-1.00			-0.75	-1.25	-1.25	-1.00	
7A 90	-0.75	-1.00			-0.50	-1.25	-0.75	-1.00	
7A M180	180.	180.			150.	180.	5.	180.	
7AMS		-1.25			-1.00	-1.25	-1.25	-1.00	
14B	+1.50	+1.25			+0.75	+1.00	+1.00	+1.00	
21R	+2.25	+2.25			+2.00	+2.50	+2.50	+2.00	
K 180	44.75	44.00			44.50	44.50	44.25	44.25	
K 90	45.25	44.50			45.00	45.25	44.75	44.75	
K M180	180.	165.			180.	180.	180.	180.	
PEK 180	44.25	44.00			44.12	44.25	43.00	44.25	
PEK 90	44.75	44.87			44.37	44.87	43.25	45.12	
PEK M180	180.	170.			20.	175.	175.	180.	
PEK e^2 180	0.1	0.02			0.28	0.16	-0.03	0.03	
PEK e^2 90	0.06	0.12			0.2	0.25	-0.08	0.15	
U.S. CT	0.526				0.501	0.479			
U.S. ACD	3.74				3.606	3.518			
U.S. AL	23.55				23.284	23.345			
CL Res.	0.35	0.35			0.35	0.35	0.375	0.375	
CL Pos.	38.	38.			28.	28.	28.	28.	

PROJECT I
ORTHO-K

Patient V. D. S.
Eye LEFT
Age 14
Sex F

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	.1	.50	.40	.33	.40	.40		.40	
7A 180	-2.50	-1.50	-1.75	-2.25		-1.75		-2.00	
7A 90	-1.50	-1.00	-1.25	-1.75		-1.50		-1.50	
7A M180	172	170	5	165		170		165	
7AMS		-1.50	-1.00	-2.00		-1.62		-1.75	
14B	+1.00	+1.50	+1.25	+1.00		+.25		1.25	
21R	+2.25	+2.50	+2.50	+3.00		+2.75		2.75	
K 180	45.00	44.62	44.75	45.00		44.50		44.25	
K 90	44.87	44.12	44.50	45.00		44.25		45.00	
K M180	7	153	170			155		25	
PEK 180	45.36	44.34	44.42	44.63		44.52		45.01	
PEK 90	44.69	44.64	44.61	44.91		44.93		45.17	
PEK M180	170	30	35	140		30		5	
PEK e^2 180	.18	-.10	.22	.13		.11		-.03	
PEK e^2 90	.03	-.01	.15	.10		.18		.04	
U.S. CT	.498	.465		.467		.469			
U.S. ACD	3.582	3.585		3.638		3.349			
U.S. AL	23.90	23.882		23.847		23.584			
CL Res.		.32	.35	.35		.36		.36	
CL Pos.			48	38				27	

PROJECT I
ORTHO-K

Patient V. D. S.
Eye RIGHT
Age 14
Sex F

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	.10	.50	.50	.25	.40	.40		.40	
7A 180	-3.00	-1.75	-2.37	-2.50		-2.25		-1.75	
7A 90	-2.00	-1.00	-1.50	-1.75		-1.50		-1.25	
7A M180	15	15	8	15		25		20	
7AMS		-1.62	-1.25	-2.12		-2.12		-1.50	
14B	+0.50	+1.50	+1.25	+1.00		+.25		1.25	
21R	+2.25	+2.50	+2.50	+3.00		+2.75		2.75	
K 180	45.25	44.37	45.00	45.50		44.62		44.50	
K 90	45. 25	44.87	45.00	45.25		45.12		44.75	
K M180	10	168		7		164		180	
PEK 180	44.89	44.36	44.74	45.19		45.21		44,88	
PEK 90	45.66	44.65	44.97	44.85		44.79		44.98	
PEK M180	140	140	165	10		140		180	
PEK e^2 180	0.0	-.08	.09	.19		.26		.04	
PEK e^2 90	.15	-.03	.15	.14		.19		.03	
U.S. CT	.537	.474		.468		.477			
U.S. ACD	3.724	3.485		3.560		3.489			
U.S. AL	23.71	23.793		23.736		23.673			
CL Res.		.32	.35	.35		.36		.35	
CL Pos.			38	37		28		27	

PROJECT I
ORTHO-K

Patient T. D.
Eye LEFT
Age 18
Sex F

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	.067	.50	.33	.50		1.00		.80	
7A 180	-2.50	-2.25	-1.75	-1.25		-1.25		-.50	
7A 90	-2.50	-1.25	-1.25	-.75		-.75		-.75	
7A M180	180	180	180	180		180		175	
7AMS	-2.50	-2.25	-1.75	-1.25		-1.00		-1.00	
14B	.75	2.00	1.50	1.25		1.25		1.00	
21R	2.25	3.00	3.25	2.00		3.25		3.00	
K 180	45.62	45.25	45.25	45.25		45.00		44.87	
K 90	46.50	46.50	46.00	46.25		46.00		46.12	
K M180	180	180	180	180		180		180	
PEK 180	45.82	45.18	45.08	45.41		45.06		45.28	
PEK 90	46.45	46.11	46.17	46.34		46.07		46.21	
PEK M180	125	005	020	180		170		05	
PEK e^2 180	.09	-.04	.16	.14		.16		-.16	
PEK e^2 90	.15	-.10	.09	-.05		-.05		-.21	
U.S. CT	.610	.509	.549	,510					
U.S. ACD	3.356		3.43	3.38					
U.S. AL	23.07		22.94	22.95					
CL Res.		.40	.40	.35		.32		.32	
CL Pos.		37	37	27		38		28	

PROJECT I
ORTHO-K

Patient T. D.
Eye RIGHT
Age 18
Sex F

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	.1	.33	.40	.40		1.33		1.00	
7A 180	-1.75	-2.00	-1.25	-1.25		-1.25		-.50	
7A 90	-1.75	-1.25	-1.00	-.75		-.75		-.50	
7A M180	180	180	180	180		180		20	
7AMS	-1.75	-2.00	-1.25	-1.25		-1.25		-.75	
14B	.75	2.00	1.50	1.25		1.25		1.00	
21R	2.25	3.00	3.25	2.00		3.25		3.00	
K 180	45.87	45.25	45.25	45.75		45.25		45.50	
K 90	45.87	45.75	46.00	46.25		45.50		45.75	
K M180	180	180	180	180		180		180	
PEK 180	45.93	45.30	45.52	45.61		45.35		45.50	
PEK 90	45.92	45.73	45.94	45.87		45.60		45.51	
PEK M180	150	010	165	020		40		180	
PEK e^2 180	.08	.02	.10	.07		.05		.02	
PEK e^2 90	.10	.09	.12	-.05		-.06		-.06	
U.S. CT	.452	.524	.556	.510					
U.S. ACD	3.7	3.73	3.42	3.43					
U.S. AL	23.29	22.98	22.98	22.86					
CL Res.		.40	.40	.35		.32		.32	
CL Pos.		38	38	27		27		28	

PROJECT I
ORTHO-K

Patient M. S.
Eye LEFT
Age 31
Sex M

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	.33	1.0		1.0			1.33		
7A 180	-1.25	-.50		0			-.25		
7A 90	-1.50	0		-.75			-1.00		
7A M180	010	150		45			45		
7AMS		0		0			-.75		
14B	1.37	.75		.75			1.50		
21R	2.50	2.75		1.75			2.75		
K 180	42.00	41.00		41.00			41.00		
K 90	42.25	41.25		40.62			41.62		
K M180	179	180		150			180		
PEK 180	41.96	41.33		40.90			41.41		
PEK 90	42.37	41.82		41.63			41.84		
PEK M180	05	180		10			160		
PEK e^2 180	.16	-.05		.04			-.13		
PEK e^2 90	.20	-.06		.14			-.15		
U.S. CT		.538		.530					
U.S. ACD	.343	3.308		3.322					
U.S. AL	25.446	24.846		24.631					
CL Res.		.4		.4			.37		
CL Pos.		18		18			18		

PROJECT I
ORTHO-K

Patient M.S.
Eye RIGHT
Age 31
Sex M

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	.33	1.0		1.0			1.33		
7A 180	-1.25	-.50		.50			-.25		
7A 90	-1.50	-.50		0			-.50		
7A M180	170	15		135			140		
7AMS		-.25		-.25			-.50		
14B	1.37	.75		.75			1.50		
21R	2.50	2.75		1.75			2.75		
K 180	42.12	41.50		40.75			41.00		
K 90	42.37	41.50		41.62			42.00		
K M180	179	160		150			180		
PEK 180	42.04	41.49		41.02			41.42		
PEK 90	42.46	41.97		41.75			41.75		
PEK M180	180	145		175			180		
PEK e^2 180	.12	.06		-.06			.05		
PEK e^2 90	.13	.09		.15			.06		
U.S. CT		.546		.535					
U.S. ACD	3.397	3.433							
U.S. AL	24.975	42.816							
CL Res.		.4		.4			.37		
CL Pos.		18		18			28		

PROJECT I
ORTHO-K

Patient R. N.
Eye LEFT
Age 28
Sex M

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	0.2	0.2		0.2	0.40	0.40	0.40		
7A 180	-2.75	-1.50		-1.75	-2.00	-2.25	-1.25		
7A 90	-3.00	-2.00		-2.00	-2.00	-2.25	-1.75		
7A M180	160	143		172	180	180	023		
7AMS		-2.00		-2.00	-1.75	-2.50	-1.75		
14B	+1.25	+0.25		+1.25	+1.25	+1.00	+1.00		
21R	+2.75	+1.75		+0.50	+3.00	+2.25	+2.75		
K 180	41.00	41.00		41.00	41.50	41.25	40.75		
K 90	41.75	40.50		41.87	42.00	41.62	41.25		
K M180	180	015		171	150	180	180		
PEK 180	41.16	41.10		41.02	41.16	41.22	40.97		
PEK 90	41.70	41.85		42.13	42.21	42.15	42.02		
PEK M180	165	015		160	160	170	155		
PEK e^2 180	0.30	0.16		0.32	0.30	0.40	0.28		
PEK e^2 90	0.24	0.23		0.42	0.44	0.52	0.27		
U.S. CT	0.507			0.458	0.470	0.465			
U.S. ACD	3.323			3.401	3.392	3.386			
U.S. AL	25.684			25.664	25.687	25.577			
CL Res.		0.37		0.38	0.38	0.40	0.35		
CL Pos.		27.		48.	37	37	19		

PROJECT I
ORTHO-K

Patient R. N.
Eye RIGHT
Age 28
Sex M

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	0.2	0.33		0.28	0.40	0.33	1.33		
7A 180	-2.50	-2.25		-2.00	-2.25	-3.00	-0.25		
7A 90	-2.75	-1.00		-2.25	-2.25	-2.00			
7A M180	005	155		175	180	165	150		
7AMS		-2.00		-2.25	-2.00	-2.25	-0.50		
14B	+1.25	+0.25		+1.25	+1.25	+1.00	+1.00		
21R	2.75	+1.75		+0.50	+3.00	+2.25	+2.75		
K 180	41.00	41.50		41.00	41.75	41.75	41.00		
K 90	41.75	41.50		41.62	41.75	42.00	40.87		
K M180	180	180		171	180	180	180		
PEK 180	41.09	40.93		41.27	41.05	41.59	41.23		
PEK 90	41.63	41.27		41.88	41.84	41.92	41.36		
PEK M180	005	020		180	015	180	010		
PEK e^2 180	0.32	0.28		0.27	0.26	0.34	0.40		
PEK e^2 90	0.29	0.18		0.29	0.37	0.33	0.05		
U.S. CT	0.494			0.445	0.451	0.465			
U.S. ACD	3.371			3.433	3.429				
U.S. AL	25.676			25.689	25.680				
CL Res.		0.35		0.38	0.38	0.40	0.38		
CL Pos.		28		29	37	28	28		

PROJECT I
ORTHO-K

Patient R. N.
Eye LEFT
Age 32
Sex F

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	.1			.4		.2		.075	.2
7A 180	-2.75			-2.50		-2.25		-1.75	-2.00
7A 90	-3.75			-2.50		-3.75		-3.00	-3.00
7A M180	180			180		180		180	170
7AMS	-3.25			-2.75		-3.00		-2.25	-2.50
14B	.75			1.25		1.75		1.25	.75
21R	2.75			2.25		3.50		2.50	2.75
K 180	43.67			43.00		43.50		43.50	43.62
K 90	45.37			45.00		45.87		45.87	45.50
K M180	180			180		180		180	180
PEK 180				43.17					
PEK 90				45.09					
PEK M180				05					
PEK e^2 180				-.08					
PEK e^2 90				.02					
U.S. CT									
U.S. ACD									
U.S. AL									
CL Res.				.32		.32		.32	.32
CL Pos.				28		28		17	17

PROJECT I
ORTHO-K

Patient R. N.
Eye RIGHT
Age 32
Sex F

Week No.	Baseline	52	55	57	60	63	66	69	72
VA w/o CL	.1			.4		.2		.2	.2
7A 180	-2.75			-2.50		-2.25		-2.00	-2.00
7A 90	-3.75			-3.50		-3.50		-1.25	-2.75
7A M180	02			15		180		180	45
7AMS	-3.25			-3.00		-2.87		-2.50	-2.37
14B	.75			1.25		1.75		1.25	.75
21R	2.75			2.25		3.50		2.50	2.75
K 180	44.12			43.25		44.00		44.00	43.75
K 90	45.87			45.50		45.25		46.25	45.50
K M180	180			180		180		180	180
PEK 180				42.50					
PEK 90				44.81					
PEK M180				170					
PEK e^2 180				-.06					
PEK e^2 90				.02					
U.S. CT									
U.S. ACD									
U.S. AL									
CL Res.				.32		.32		.32	.32
CL Pos.				17		18		17	17

PROJECT II
CONTROL

Patient A. B.
Eye LEFT
Age 33
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.1	0.1	0.2	0.25	0.33	0.29	0.40	0.285	
7A 180	-4.00	-4.25	-3.00	-3.25	-2.75	-3.25	-3.25	-2.50	
7A 90	-3.75	-3.50	-2.25	-2.25	-2.00	-2.50	-2.00	-2.25	
7A M180	180	170	160	155	165	180	175	150	
7AMS	-4.00	-5.00	-2.75	-2.75	-2.50	-2.75	-3.00	-3.00	
14B	+1.50	0.0	+1.25	0.0	+1.00	+0.50	-0.50	+1.25	
21R	3.50	+2.50	+2.75	2.25	2.75	2.50	3.25	2.50	
K 180	43.75	43.50	44.00	44.00	44.00	44.25	43.87	44.37	
K 90	43.75	43.75	44.00	44.25	44.00	44.00	43.87	43.75	
K M180		180		180		010		177	
PEK 180	43.95	43.99	43.91	44.02	43.78	44.44	44.01	44.07	
PEK 90	44.02	44.00	43.57	43.75	43.75	43.74	44.14	44.17	
PEK M180	180	180	025	140	005	140	145	180	
PEK e^2 180	.08	.16	.13	.32	.24	.44	.08	.04	
PEK e^2 90	.14	.13	.04	.25	.17	.24	-.02	.02	
U.S. CT	.486	.488	.477	.485	.489	.486			
U.S. ACD	3.219	3.182	3.286	3.258	3.253	3.273			
U.S. AL	23.64	23.23	23.011	23.32	23.53	23.48			
CL Res.		30%	32.5%	32.5%	32.5%	32.5%	37%	37%	
CL Pos.		28	28	28	28	38	38	38	

PROJECT II
CONTROL

Patient A. B.
Eye RIGHT
Age 33
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.2	0.1	0.2	0.29	0.33	0.29	0.29	0.29	
7A 180	-4.00	-4.25	-2.75	-2.75	-2.25	-2.75	-2.75	-2.25	
7A 90	-3.50	-3.50	-2.25	-1.75	-1.50	-2.25	-1.75	-2.00	
7A M180	180	005	010	020	020	007	030	030	
7AMS	-3.00	-5.00	-2.75	-2.50	-2.25	-3.00	-3.00	-3.25	
14B	+1.50	0.0	+1.25	0.0	+1.00	+0.50	-0.50	+1.25	
21R	3.50	+2.50	+2.75	2.25	2.75	2.50	3.25	2.50	
K 180	43.75	43.75	44.50	44.50	44.25	44.00	44.25	44.25	
K 90	43.75	44.25	44.50	44.50	44.25	44.25	44.12	44.00	
K M180		167				002	178	180	
PEK 180	44.35	44.17	43.85	43.75	44.10	43.97	44.54	44.56	
PEK 90	44.32	44.17	44.25	44.30	44.43	44.44	44.12	44.20	
PEK M180	170	155	030	160	010	015	145	160	
PEK e^2 180	.16	.06	.06	.11	.18	.17	-.10	.16	
PEK e^2 90	.09	.26	.19	.22	.20	.34	-.12	.13	
U.S. CT	.487	.486	.499	.491	.499	.493			
U.S. ACD	3.176	3.167	3.127	3.105	2.799	3.160			
U.S. AL	23.32	23.39	23.396	23.41	22.91	23.32			
CL Res.		32%	32.5%	32.5%	32.5%	32.5%	37%	37%	
CL Pos.		28	28	28	28	38	38	38	

PROJECT II
CONTROL

Patient J. P.
Eye LEFT
Age 30
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.20	0.25	0.40	0.40		0.29		0.33	
7A 180	-2.37	-3.00	-2.00	-2.50		-2.25		-2.75	
7A 90	-2.12	-2.25	-1.75	-1.50		-1.75		-1.50	
7A M180	020	175	005	040		45		10	
7AMS	-2.25	-2.25	-1.50	-2.00		-2.00		-2.25	
14B	1.25	1.25	0.75	1.25		1.50		0.75	
21R	2.75	2.00	2.25	2.75		2.75		2.25	
K 180	43.00	43.00	42.75	43.00		42.75		43.12	
K 90	43.00	43.25	42.50	43.00		43.00		43.37	
K M180	161	170	004	162		180		180	
PEK 180	43.16	43.23	43.03	42.94		42.97		43.21	
PEK 90	43.63	43.16	43.05	43.13		42.99		43.20	
PEK M180	140	030	165	165		140		180	
PEK e^2 180	0.23	0.22	0.14	0.19		0.09		0.10	
PEK e^2 90	0.24	0.35	-0.10	0.05		0.20		0.08	
U.S. CT	0.558	0.555	0.553			0.561			
U.S. ACD	3.808	3.764	3.602			3.651			
U.S. AL	25.235	24.970	25.057			25.143			
CL Res.		0.30	0.32	0.30		0.32		0.32	
CL Pos.		37.0	27.0	16.0		17.0		17.0	

PROJECT II
CONTROL

Patient J. P.
Eye RIGHT
Age 30
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.24	0.29	0.25	0.20		0.29		0.20	
7A 180	-2.00	-2.50	-2.00	-1.75		-1.75		-1.75	
7A 90	-2.37	-2.50	-1.75	-2.00		-2.00		-1.25	
7A M180	003	180	005	010		10		175	
7AMS	-2.25	-2.50	-2.25	-1.75		-1.75		-1.75	
14B	1.25	1.25	0.75	1.25		1.50		0.75	
21R	2.75	2.00	2.25	2.75		2.75		2.25	
K 180	42.87	42.75	42.75	42.75		42.62		42.62	
K 90	43.50	43.25	43.25	43.25		43.12		43.25	
K M180	001	170	004	170		180		180	
PEK 180	43.28	41.09	43.24	43.15		43.03		43.0	
PEK 90	43.89	41.34	43.21	43.43		43.56		43.47	
PEK M180	175	175	140	155		175		180	
PEK e^2 180	0.42	0.26	0.18	0.42		0.19		0.07	
PEK e^2 90	0.41	0.26	0.20	0.43		-.03		-0.16	
U.S. CT	0.558	0.570	0.579			0.558			
U.S. ACD	3.615	3.793	3.568			3.649			
U.S. AL	25.061	25.041	25.048			25.087			
CL Res.		0.30	0.32	0.30		0.32		0.32	
CL Pos.		37.0	47.0	27.0		37.0		27.0	

PROJECT II
CONTROL

Patient K. B.
Eye LEFT
Age 15
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.20	0.20	0.33	0.50	0.25		0.67		
7A 180	-3.50	-3.25	-3.25	-3.25	-2.25		-0.50		
7A 90	-3.00	-2.50	-2.00	-2.50	-1.75		-1.00		
7A M180	165	175	165	165	175		155		
7AMS	-3.25	-2.87	-2.75	-2.75	-2.00		-0.75		
14B	0.75	0.00	-0.25	1.00	0.25		-0.25		
21R	2.75	2.00	1.75	3.25	2.00		2.75		
K 180	43.50	43.50	42.87	42.50	42.75		42.50		
K 90	44.25	43.75	43.50	43.50	43.75		43.25		
K M180	173	180	160	180	168		175		
PEK 180	43.54	43.10	43.05	42.87	43.18		42.80		
PEK 90	44.23	43.35	43.66	43.74	43.71		43.60		
PEK M180	180	035	175	005	160		175		
PEK e^2 180	0.39	0.14	0.15	0.25	0.04		0.08		
PEK e^2 90	0.29	0.16	-0.06	0.12	-0.09		-0.07		
U.S. CT	0.517		.556	.540	.483				
U.S. ACD	3.683		3.647	3.647	3.712				
U.S. AL	24.521		24.673	24.778	24.695				
CL Res.		0.32	0.30	0.30	0.30		0.32		
CL Pos.		28	28	28	28		28		

PROJECT II
CONTROL

Patient K. B.
Eye RIGHT
Age 15
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.20	0.20	0.33	0.67	0.29		0.40		
7A 180	-3.75	-3.00	-2.00	-3.50	-3.00		-2.25		
7A 90	-2.75	-1.75	-1.50	-2.50	-2.75		-2.75		
7A M180	180	175	150	025	10		140		
7AMS	-3.25	-2.37	-1.75	-3.00	-3.00		-2.50		
14B	0.75	0.00	-0.25	1.00	0.25		-0.25		
21R	2.75	2.00	1.75	3.25	2.00		2.75		
K 180	43.50	43.50	43.00	42.75	43.25		43.00		
K 90	43.75	43.50	43.50	43.00	43.50		43.25		
K M180	180	180	180	175	180		170		
PEK 180	43.59	43.02	43.09	43.21	43.38		42.89		
PEK 90	43.67	43.84	43.17	43.56	43.56		43.22		
PEK M180	140	175	10	165	20		040		
PEK e^2 180	0.28	0.13	0.09	0.21	0.14		0.15		
PEK e^2 90	0.32	0.07	-0.05	0.24	0.02		0.05		
U.S. CT	0.535		.518	.536	.50				
U.S. ACD	3.574		3.660	3.649	3.699				
U.S. AL	24.553		24.642	24.623	24.490				
CL Res.		0.32	.30	.30	0.30		0.30		
CL Pos.		28	28	27	28		28		

PROJECT II
CONTROL

Patient B. L.
Eye LEFT
Age 33
Sex M

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.33	.33	.33				.5	1.	
7A 180	-1.25	-1.75	-2.00				-1.00	-.50	
7A 90	-1.00	-1.25	-2.00				-.25	0.	
7A M180	180	05	180				175	20	
7AMS	-1.12	-1.25	-2.00				-1.25	-.75	
14B	1.25	1.25						1.25	
21R	2.50		2.25					2.25	
K 180	42.50	42.75	42.75				42.00	42.75	
K 90	42.25	42.75	42.75				42.00	42.75	
K M180	180	180	180				180	180	
PEK 180	42.04	42.49	42.00					42.33	
PEK 90	42.36	42.52	42.21					42.00	
PEK M180	10	170	35					180	
PEK e^2 180	.29	.29	.06					.18	
PEK e^2 90	.32	.13	.12					-.03	
U.S. CT	.511	.525							
U.S. ACD	2.593	2.962							
U.S. AL	23.782	24.309							
CL Res.		.32	.32				.30	.30	
CL Pos.		27	27				37	27	

PROJECT II
CONTROL

Patient B. L.:
Eye RIGHT
Age 33
Sex M

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.2	.2	.25				.3	.5	
7A 180	-2.00	-2.25	-2.50				-1.75	-1.50	
7A 90	-2.00	-2.25	-2.50				-1.00	-1.00	
7A M180	180	180	180				05	155	
7AMS	-2.25	-2.25	-2.25				-2.25	-1.75	
14B	1.25	1.25						1.25	
21R	2.50		2.25					2.25	
K 180	42.50	42.50	42.25				42.37	42.75	
K 90	43.00	43.00	43.00				42.00	42.50	
K M180	180	180	180				10	180	
PEK 180	42.15	42.21	42.14					42.18	
PEK 90	42.81	42.62	42.08					42.38	
PEK M180	175	175	25					180	
PEK e^2 180	.14	.17	.10					.10	
PEK e^2 90	.21	.15	-.03					.12	
U.S. CT	.507	.524							
U.S. ACD	3.150								
U.S. AL	24.679								
CL Res.		.32	.32				.30	.30	
CL Pos.		27	27				37	27	

PROJECT II
CONTROL

Patient L. O.
Eye LEFT
Age 32
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.05	0.67	0.1	0.1	.067	0.1	0.1		
7A 180	-3.50	-3.75	-3.50	-3.00	-3.50	-3.25	-3.00		
7A 90	-4.00	-3.75	-3.50	-3.00	-3.75	-3.75	-3.25		
7A M180	15	180	180	180	15	180	145		
7AMS	-4.25	-3.75	-3.50	-3.25	-4.00	-4.00	-3.25		
14B	+1.25	+1.75	+1.25	+1.50	+1.00	+1.75	+1.50		
21R	+2.50	+2.75	+2.00	+2.25	+2.25	+2.50	+2.75		
K 180	42.50	42.50	43.25	42.75	4325	43.00	42.87		
K 90	43.00	43.25	43.50	43.25	43.50	43.37	43.50		
K M180	15	180	160	180	180	180	180		
PEK 180	42.75	42.62	42.87	42.62	42.87	42.62			
PEK 90	43.50	42.87	43.12	43.12	43.62	43.37			
PEK M180	5.	180.	165.	10.	180.	10.			
PEK e^2 180	0.09	0.04	0.1	-0.1	0.1	-0.05			
PEK e^2 90	0.15	-0.09	-0.04	-0.17	0.13	0.02			
U.S. CT	0.529	0.500	0.550	0.496	0.500	0.511			
U.S. ACD	3.227	3.339	3.235	3.412	3.274	3.221			
U.S. AL	24.914	24.874	24.818	24.922	25.000	24.954			
CL Res.		0.3	0.3	0.3	0.3	0.325	0.3		
CL Pos.		38	28	28	28	28	28		

PROJECT II
CONTROL

Patient L.O.
Eye RIGHT
Age 32
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.1	0.1	0.1	0.2	.067	0.067	0.1		
7A 180	-3.00	-3.00	-3.25	-2.50	-3.25	-3.25	-3.00		
7A 90	-3.00	-3.00	-3.25	-2.50	-3.25	-3.50	-2.75		
7A M180	180	180	180	180	180	15	145		
7AMS	-3.00	-3.00	-3.25	-2.50	-3.00	-3.25	-3.00		
14B	+1.25	+1.75	+1.25	+1.50	+1.00	+1.75	+1.50		
21R	+2.50	+2.75	+2.00	+2.25	+2.25	+2.50	+2.75		
K 180	42.87	42.50	43.50	43.00	43.25	43.25	43.00		
K 90	43.37	42.50	43.75	43.00	43.50	43.25	43.00		
K M180	20	180	177	180	180	180	180		
PEK 180	42.87	42.75	43.00	42.75	43.75	42.75			
PEK 90	43.37	42.87	43.12	42.87	43.25	42.87			
PEK M180	165	160	170	155	175	140			
PEK e^2 180	-0.05	0.03	0.03	-0.03	0.05	-0.04			
PEK e^2 90	0.04	0.05	-0.02	0.03	0.12	0.07			
U.S. CT	0.496	0.518	0.504	0.497	0.509	0.511			
U.S. ACD	3.234	3.156	3.229	3.376	3.121	16.952			
U.S. AL	24.779	24.808	24.458	24.825	24.856	24.658			
CL Res.		0.3	0.3	0.3	0.3	0.325			
CL Pos.		38	28	28	28	28	28		

PROJECT II
CONTROL

Patient S. F.
Eye LEFT
Age 30
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.33	.50	.40	.40	.50	.50	.50	.25	
7A 180	-1.00	-1.00	-0.75	-0.75	-0.75	-1.00	-1.25	-1.25	
7A 90	-1.25	-1.00	-0.50	-0.75	-0.75	-0.75	-1.00	-1.00	
7A M180	45	180	180	180	180	160	150	140	
7AMS	-1.37	-1.12	-0.75	-0.75	-1.00	-1.12	-1.37	-1.12	
14B	-0.25	+0.25	+0.25	+0.25	+1.00	+0.50	-0.50	-0.25	
21R	+1.25	+1.25	+1.00	+1.25	+2.00	+1.50	+1.75	+1.00	
K 180	42.37	42.25	42.00	42.12	41.75	41.75	41.75	42.00	
K 90	43.50	43.00	42.75	42.75	42.62	42.87	42.87	42.75	
K M180	8	7	180	180	180	178	5	18	
PEK 180	42.50	41.94	41.99	42.13	41.98	41.87	42.09	42.11	
PEK 90	43.25	42.83	42.55	42.71	42.79	42.63	42.76	42.60	
PEK M180	10	20	175	180	10	10	180	180	
PEK e^2 180	.38	.24	.19	.29	.16	.24	.26	.22	
PEK e^2 90	.21	.21	-.03	.12	.09	.19	.13	.01	
U.S. CT	.525	.524	.541	.528	.528	.521			
U.S. ACD	3.375	3.379	3.376	3.372	3.377	3.389			
U.S. AL	23.870	24.069	23.942	23.945	24.114	24.069			
CL Res.		30	30	33	30	35	32	30	
CL Pos.		27	17	17	18	27	37	17	

PROJECT II
CONTROL

Patient S. F.:
Eye RIGHT
Age 30
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.40	.50	.67	.40	.67	.67	.40	.25	
7A 180	-0.75	-1.50	-0.75	-0.75	-0.75	-0.75	-1.00	-0.50	
7A 90	-1.00	-1.25	-0.75	-0.75	-1.25	-0.75	-1.25	-0.75	
7A M180	10	25	180	180	180	180	165	148	
7AMS	-1.12	-1.12	-0.75	-0.75	-0.75	-0.75	-1.12	-0.62	
14B	-0.25	+0.25	+0.25	+0.25	+1.00	+0.50	-0.50	-0.25	
21R	+1.25	+1.25	+1.00	+1.25	+2.00	+1.50	+1.75	+1.00	
K 180	42.37	42.50	42.25	42.50	42.00	41.75	41.87	42.12	
K 90	44.00	43.75	43.25	42.75	43.00	43.00	43.00	43.25	
K M180	7	179	175	180	180	176	2	178	
PEK 180	42.37	42.13	41.80	41.89	41.91	41.95	41.96	41.90	
PEK 90	43.66	43.11	42.88	43.01	43.29	43.20	43.20	43.11	
PEK M180	5	175	180	180	180	180	180	180	
PEK e^2 180	.34	.15	.31	.31	.26	.13	.25	.35	
PEK e^2 90	.18	.09	.12	.32	.18	-.01	.16	.29	
U.S. CT	.528	.538	.539	.526	.526	.523			
U.S. ACD	3.301	3.365	3.498	3.326	3.333	3.326			
U.S. AL	24.110	24.051	23.944	23.938	24.021	23.964			
CL Res.		30	30	30	31	35	32	30	
CL Pos.		37	17	18	28	27	27	28	

PROJECT II
CONTROL

Patient S. C.
Eye LEFT
Age 28
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.1	.1		.1		.2	.25		
7A 180	-3.00	-3.00		-2.75		-3.00	-3.25		
7A 90	-2.50	-2.75		-2.50		-2.50	-2.75		
7A M180	180	180		180		180	180		
7AMS	-3.25	-3.00		-2.75		-3.00	-3.00		
14B	1.00	.75		1.00		.75	1.00		
21R	2.50	1.50		1.75		2.00	2.25		
K 180	42.75	42.75		43.00		42.75	42.25		
K 90	44.00	44.00		43.87		43.50	43.25		
K M180	180	180		180		180	180		
PEK 180	42.59	42.75		42.69		42.52	42.59		
PEK 90	43.88	43.82		43.76		42.37	43.67		
PEK M180	05	05		05		175	180		
PEK e^2 180	.29	.24		.14		.28	.07		
PEK e^2 90	.37	.25		.17		.18	-.02		
U.S. CT	.534			.539		.536			
U.S. ACD	3.66			3.632		3.575			
U.S. AL	24.68			24.50		24.54			
CL Res.									
CL Pos.									

PROJECT II
CONTROL

Patient S. C.
Eye RIGHT
Age 28
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.1	.1		.1		.2	.25		
7A 180	-3.00	-3.00		-2.75		-3.00	-3.25		
7A 90	-2.50	-2.75		-2.50		-2.50	-2.75		
7A M180	180	180		180		180	180		
7AMS	-3.00	-3.00		-2.75		-3.25	-3.25		
14B	1.00	.75		1.00		.75	1.00		
21R	2.50	1.50		1.75		2.00	2.25		
K 180	42.75	42.50		42.62		42.75	42.50		
K 90	44.00	43.50		43.62		43.25	43.25		
K M180	180	180		180		180	180		
PEK 180	42.66	42.82		42.40		42.34	42.29		
PEK 90	43.79	43.93		43.43		43.67	43.23		
PEK M180	160	180		165		160	175		
PEK e^2 180	.19	.30		.14		.26	.19		
PEK e^2 90	.28	.29		.10		.40	.10		
U.S. CT	.521			.527		.534			
U.S. ACD	3.53			3.56		3.70			
U.S. AL	24.43			24.26		24.38			
CL Res.				.30		.30	.30		
CL Pos.				27		27	27		

PROJECT II
CONTROL

Patient D. D.
Eye LEFT
Age 31
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.1	.1		.1		.1			.1
7A 180	-2.00	-2.25		-2.00		-2.25			-2.25
7A 90	-2.87	-3.25		-2.50		-3.00			-2.75
7A M180	173	175		15		162			180
7AMS	-2.25	-2.75				-2.50			-2.75
14B	1.25	1.25		1.75		1.25			1.75
21R	2.50	2.25		2.50		2.25			2.25
K 180	43.00	43.87		43.00		43.00			43.25
K 90	44.37	44.50		43.50		44.00			44.50
K M180	173	180		180		180			180
PEK 180	43.37	43.73		43.33		43.29			
PEK 90	44.34	44.96		44.28		44.04			
PEK M180	160	175		180		165			
PEK e^2 180	.06	.49		.32		.41			
PEK e^2 90	.07	.55		.20		.14			
U.S. CT	.525	.525		.535		.525			
U.S. ACD	3.208	3.210		3.199		3.193			
U.S. AL	23.901	23.912		23.978		23.875			
CL Res.		.2		.3		.3			.3
CL Pos.		27		17		18			28

PROJECT II
CONTROL

Patient D. D.
Eye RIGHT
Age 31
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.1	.1		.1		.1			.1
7A 180	-1.75	-2.25		-1.75		-1.75			-2.00
7A 90	-2.62	-3.25		-2.25		-2.25			-2.50
7A M180	180	180		150		174			180
7AMS	-2.25	-2.75		-2.00		-2.00			-2.50
14B	1.25	1.25		1.75		1.25			1.75
21R	2.50	2.25		2.50		2.25			2.25
K 180	43.00	43.87		43.00		43.00			43.25
K 90	44.37	44.50		43.50		44.00			44.50
K M180	7	180		180		180			180
PEK 180	43.09	43.80		43.14		43.12			
PEK 90	44.65	44.63		44.10		43.88			
PEK M180	4	165		180		170			
PEK e^2 180	.04	.42		.16		.23			
PEK e^2 90	.14	.35		.13		.17			
U.S. CT	.522	.524		.533		.513			
U.S. ACD	3.143	3.148		3.197		3.126			
U.S. AL	23.966	23.852		23.912		23.785			
CL Res.		.2		.3		.3			.3
CL Pos.		27		18		18			28

PROJECT II
CONTROL

Patient D. H.
Eye LEFT
Age 30
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.28	0.40	0.50	0.40		0.67	0.50	0.50	
7A 180	-1.50	-2.00	-2.00	-1.25		-1.25	-1.25	-1.50	
7A 90	-1.00	-1.50	-1.50	-1.75		-0.25	-0.75	-1.00	
7A M180	030	034	037	145		028	033	045	
7AMS	-1.75	-1.50	-1.75	-1.00		-0.75	-1.25	-1.00	
14B	+1.75	+2.50	+2.00	+1.25		+1.25	+2.00	+1.50	
21R	+3.00	+2.50	+2.75	+2.50		+1.50	+2.75	+0.50	
K 180	41.50	41.62	42.00	41.25		41.50	41.37	41.75	
K 90	42.12	42.00	42.62	42.00		41.25	41.50	42.00	
K M180	168	015	013	180		160	170	180	
PEK 180	41.89	42.02	41.73	41.25		41.56	41.28	41.74	
PEK 90	42.29	42.47	42.18	41.61		41.47	41.76	42.00	
PEK M180	170	010	180	180		170	180	180	
PEK e^2 180	0.31	0.25	0.41	0.17		0.19	0.06	0.22	
PEK e^2 90	0.25	0.23	0.33	0.19		-0.11	-0.05	0.06	
U.S. CT	0.462	0.442	0.488	0.489					
U.S. ACD	3.330	2.982	3.187	3.194					
U.S. AL	24.670	24.591	24.907	24.868					
CL Res.		0.32	0.30	0.32		0.35	0.32	0.30	
CL Pos.		29.	37	37		27	28	28	

PROJECT II
CONTROL

Patient D. H.
Eye RIGHT
Age 30
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.67	0.50	0.67	0.40		0.67	0.80	0.80	
7A 180	-1.25	-1.75	-1.75	-1.00		-1.25	-1.25	-1.00	
7A 90	-0.50	-0.50	-1.25	-1.25			-0.25		
7A M180	145	145	140	003		165	146	170	
7AMS	-2.00	-2.75	-2.00	-1.00		-0.50	-1.00	-1.00	
14B	+1.75	+2.50	+2.00	+1.25		+1.25	+2.00	+1.50	
21R	+3.00	+2.50	+2.75	+2.50		+1.50	+2.75	+0.50	
K 180	41.50	41.75	42.25	42.25		41.50	41.62	42.25	
K 90	42.25	42.25	43.00	42.75		40.62	41.75	42.75	
K M180	005.	030	015	180		042	180	180	
PEK 180	41.57	41.78	41.94	41.71		40.70	41.21	41.54	
PEK 90	42.19	42.59	42.61	42.44		41.30	41.74	42.12	
PEK M180	020	020	180	025		020	005	040	
PEK e^2 180	0.30	0.26	0.39	0.32		0.08	0.05	0.15	
PEK e^2 90	0.21	0.19	0.36	0.29		-0.03	0.02	0.09	
U.S. CT	.470	0.468	0.500	0.486					
U.S. ACD	3.177	2.876	3.157	3.150					
U.S. AL	24.849	24.731	25.030	24.935					
CL Res.		0.30	0.30	0.30		0.35	0.32	0.30	
CL Pos.		28	37	37		37	28	27	

PROJECT II
CONTROL

Patient M. M.
Eye LEFT
Age 20
Sex M

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.1	.1			..1	.29	1.0	..67	
7A 180	-3.25	-3.50			-3.25	-2.00	-.50	-.75	
7A 90	-2.25	-2.50			-2.50	-1.50	-.50	-.50	
7A M180	165	170			180	180	180	180	
7AMS	-2.75	-3.00			-2.62	-1.75	-.75	-.62	
14B	1.75	1.75			1.75	1.75	2.00	1.25	
21R	3.25	3.25			3.75	2.75	3.75	3.00	
K 180	46.25	46.75			46.62	45.50	45.37	45.50	
K 90	46.25	46.00			46.25	45.00	45.25	45.25	
K M180	180	180			180	180	180	180	
PEK 180	46.35	46.24			45.20		45.20		
PEK 90	46.78	46.68			45.72		45.75		
PEK M180	40	180			40		40		
PEK e^2 180	.21	.10			.20		.20		
PEK e^2 90	.10	.11			.12		.12		
U.S. CT	.536	.550							
U.S. ACD									
U.S. AL									
CL Res.		.30			.30	.30	.32	.32	
CL Pos.		37			28	28	28	28	

PROJECT II
CONTROL

Patient M. M.
Eye RIGHT
Age 20
Sex M

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.1	0.1			0.1	.33	0.5	0.1	
7A 180	-3.75	-4.00			-3.25	-1.75	-1.25	-2.50	
7A 90	-2.50	-2.75			-2.75	-2.25	-1.25	-1.50	
7A M180	30	40			20	165	180	45	
7AMS	-3.12	-3.37			-3.00	-2.00	-1.25	-2.00	
14B	1.75	1.75			1.75	1.75	2.00	1.25	
21R	3.25	3.25			3.75	2.75	3.75	3.00	
K 180	46.75	46.75			46.50	45.50	46.00	46.00	
K 90	45.75	46.25			46.00	45.00	45.50	45.25	
K M180	35	20			180	180	28	180	
PEK 180	46.81	46.58			46.12		46.15		
PEK 90	45.93	45.90			45.14		45.14		
PEK M180	30	140			40		40		
PEK e^2 180	.23	.17			.20		.20		
PEK e^2 90	.11	.18			.10		.10		
U.S. CT	.547	.541							
U.S. ACD	3.833								
U.S. AL	23.909								
CL Res.		.30			.30	.30	.32	.32	
CL Pos.		37			28	28	28	28	

PROJECT II
ORTHO-K

Patient N. H.
Eye LEFT
Age 22
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.15	0.50	0.10	0.50	0.67	1.33		0.67	
7A 180	-1.62	-1.25	-1.25	-1.25	-0.50	-0.25		-0.75	
7A 90	-1.62	-1.25	-1.50	-1.25	-0.75	-1.00		-0.75	
7A M180	180	180	150	180	180	135		180	
7AMS	-1.62	-1.50	-1.50	-1.50	-1.00	0.00		-0.75	
14B	1.12	1.50	1.50	1.75	1.75	.75		1.25	
21R	3.25	2.75	2.75	2.50	2.50	2.50		2.50	
K 180	42.75	42.50	42.37	43.00	42.12	42.00		42.87	
K 90	43.62	43.75	43.37	43.75	43.37	43.50		43.87	
K M180	177	005	180	002	180	180		180	
PEK 180	42.86	42.57	43.05	42.71	42.73	42.49		42.48	
PEK 90	43.93	43.47	44.08	43.79	43.91	43.51		43.80	
PEK M180	170	160	160	160	160	160		160	
PEK e^2 180	0.08	0.05	0.31	0.06	0.01	0.02		0.03	
PEK e^2 90	0.12	0.12	0.40	0.13	0.10	0.13		0.19	
U.S. CT	0.538	0.555	0.535		0.528				
U.S. ACD	3.850		3.804		3.807				
U.S. AL	23.964		24.290		24.018				
CL Res.		0.32	0.34	0.35	0.32	0.32		0.35	
CL Pos.		28.	46.	25.	16			38	

PROJECT II
ORTHO-K

Patient N. H.
Eye RIGHT
Age 22
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.15	0.40	0.10	0.50	0.67	1.00		0.50	
7A 180	-1.62	-1.25	-1.50	-1.25	-1.00	-0.50		-0.75	
7A 90	-1.62	-1.25	-1.50	-1.25	-1.00	0.00		-0.75	
7A M180	180	180	180	180	180	180		180	
7AMS	-1.62	-1.25	-1.50	-1.50	-1.00	-0.25		-0.75	
14B	+1.12	+1.50	+1.50	+1.75	+1.75	+.75		1.25	
21R	+3.25	+2.75	+2.75	+2.50	+2.50	+2.50		2.50	
K 180	42.25	42.25	42.25	42.62	42.12	42.00		42.62	
K 90	43.25	43.25	43.25	43.50	43.37	42.62		43.00	
K M180	177	180	180	002	180	180		180	
PEK 180	42.59	42.38	42.68	42.35	42.28	42.01		41.93	
PEK 90	43.26	43.13	43.72	42.89	43.27	42.83		43.09	
PEK M180	003	180	165	180	010	180		165	
PEK e^2 180	0.12	0.12	0.28	0.18	0.05	0.04		-0.02	
PEK e^2 90	0.05	0.13	0.40	0.11	0.09	0.08		0.15	
U.S. CT	0.494	0.560	0.542	0.552	0.529				
U.S. ACD	3.716	3.910	3.778	3.774	3.755				
U.S. AL	24.120	24.109	24.147	24.175	24.139				
CL Res.		0.32	0.32	0.35	0.32	0.32		0.35	
CL Pos.		28.	46.	27.	38	18		37.0	

PROJECT II
ORTHO-K

Patient P. K.
Eye LEFT
Age 16
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.10	.10	.10	.4	.4	.55	.5	.67	
7A 180	-2.50	-1.75	-2.00	-1.75	-1.75	-1.50	-1.75	-1.75	
7A 90	-2.00	-1.50	-1.75	-1.25	-1.00	-1.25	-1.25	-1.75	
7A M180	170	180	015	165	155	155	150		
7AMS	-2.25	-1.75	-2.00	-1.75	-2.00	-1.75	-1.75	-1.75	
14B	+0.75	+1.00	+1.25	+1.00	+0.50	+1.00	+1.00	+1.75	
21R	2.25	+2.50	+2.00	+2.00	+2.50	+2.25	2.25	+2.75	
K 180	44.25	44.25	45.00	44.75	45.00	44.50	44.12	44.25	
K 90	44.75	44.87	45.87	45.75	45.75	45.50	45.50	44.75	
K M180	015	180	180	007	010	018	020	015	
PEK 180	44.77	44.76	44.79	44.79	44.32	44.55	44.94	44.48	
PEK 90	45.29	45.44	45.73	45.48	45.56	45.58	46.16	45.82	
PEK M180	180	170	175	170	170	175	155	180	
PEK e^2 180	.18	.23	.05	.22	.03	.18	-.05	-.05	
PEK e^2 90	.04	.29	.16	.19	.34	.31	.09	.07	
U.S. CT	.523	.527	.532	.537	.528	.525			
U.S. ACD	3.456	3.556	3.529	3.568	3.480	3.354			
U.S. AL	23.658	23.368	23.401	23.448	23.297	23.358			
CL Res.		32%	32.5%	32,5%	35%	35%	35%	35%	
CL Pos.		28	28	28	28	28	38	28	

PROJECT II
ORTHO-K

Patient P. K.
Eye RIGHT
Age 16
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.1	.1	.29	.4	.67	.70	.75	.67	
7A 180	-2.75	-2.25	-1.75	-1.25	-1.50	-1.50	-1.50	-1.50	
7A 90	-2.00	-2.00	-1.50	-1.00	-.50	-1.00	-.75	-1.00	
7A M180	010	180	005	020	020	025	015	030	
7AMS	-2.25	-2.25	-1.75	-1.50	-1.75	-1.50	-1.75	-2.00	
14B	+0.75	+1.00	+1.25	+1.00	+0.50	+1.00	+1.00	+1.75	
21R	2.25	+2.50	+2.00	+2.00	+2.50	+2.25	2.25	2.75	
K 180	44.75	44.50	45.00	44.75	44.75	44.50	44.37	44.00	
K 90	45.25	45.50	45.62	45.75	45.50	45.50	45.25	45.37	
K M180	165	180	160	158	158	163	167	163	
PEK 180	44.82	44.79	44.58	44.72	44.74	44.81	44.76	44.47	
PEK 90	45.54	45.70	45.71	45.50	45.67	45.93	46.11	46.18	
PEK M180	180	175	005	005	005	175	180	010	
PEK e^2 180	.23	0.18	.17	.28	.08	.06	-.02	-.12	
PEK e^2 90	.16	.24	.20	.22	.05	.10	.06	0.04	
U.S. CT	.493	.550	.523	.529	.528	.527			
U.S. ACD	3.633	3.730	3.591	3.623	3.578	3.610			
U.S. AL	23.493	23.320	23.481	23.470	23.474	23.369			
CL Res.		32%	32.5%	32.5%	35%	35%	35%	35%	
CL Pos.		28	28	28	28	27	38	28	

PROJECT II
ORTHO-K

Patient V. M.
Eye LEFT
Age 29
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.20	0.40	0.28		1.33	1.33	0.80		
7A 180	-1.25	-1.25	-1.25		0.00	0.00	-0.25		
7A 90	-1.50	-1.25	-1.25		0.00	0.00	-0.25		
7A M180	010	180	180		180	180	180		
7AMS	-1.25	-1.25	-1.00		0.00	-0.50	-0.25		
14B	2.00	1.50	1.75		2.00	1.00	1.50		
21R	2.75	2.50	2.25		2.75	2.75	2.00		
K 180	44.12	44.37	43.82		43.25	43.75	43.75		
K 90	45.75	45.25	45.12		44.37	44.50	44.75		
K M180	010	028	003		180	003	175		
PEK 180	44.28	43.99	44.30		43.45	43.49	43.82		
PEK 90	45.60	45.08	45.22		44.24	44.32	45.04		
PEK M180	010	180	180		015	005	180		
PEK e^2 180	0.09	0.18	0.13		-0.14	0.04	0.19		
PEK e^2 90	0.13	0.17	0.03		-0.21	-0.15	0.16		
U.S. CT	0.499	0.507	0.499		0.492				
U.S. ACD	2.978		3.043		2.984				
U.S. AL	22.752		22.572		22.230				
CL Res.		0.34	0.33		0.33	0.35	0.32		
CL Pos.		18	28		18	27	17		

PROJECT II
ORTHO-K

Patient V. M.
Eye RIGHT
Age 29
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.40	0.50	0.66		1.00	1.33	0.80		
7A 180	-1.00	-1.25	-1.00		0.00	0.25	-0.50		
7A 90	-1.00	-1.00	-0.75		0.50	0.25	-0.25		
7A M180	180	005	180		180	180	170		
7AMS	-1.25	-1.12	-1.00		0.00	0.25	-0.50		
14B	2.00	1.50	1.75		2.00	1.00	1.50		
21R	2.75	2.50	2.25		2.75	2.75	2.00		
K 180	44.25	45.00	44.12		43.25	43.75	44.00		
K 90	45.75	45.75	45.12		44.00	44.75	44.50		
K M180	170	174	160		175	173	175		
PEK 180	44.63	44.38	44.28		43.50	43.72	43.97		
PEK 90	45.40	45.24	44.89		44.12	44.16	44.91		
PEK M180	180	170	155		165	180	170		
PEK e^2 180	0.18	0.18	0.22		-0.11	0.14	0.04		
PEK e^2 90	0.23	0.19	0.26		-0.14	-0.03	0.04		
U.S. CT	0.507	0.527	0.502		0.522				
U.S. ACD		3.018	2.792		2.973				
U.S. AL		22.672	22.592		22.601				
CL Res.		0.36	0.33		0.33	0.35	0.32		
CL Pos.		18	27.5		18	28	17		

PROJECT II
ORTHO-K

Patient S. C.
Eye LEFT
Age 30
Sex M

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.2	.4	.33	.4	.5		.4	.8	
7A 180	-2.50	-2.25	-2.00	-2.25	-2.00		-1.75	-1.50	
7A 90	-1.75	-1.25	-1.50	-1.75	-1.50		-1.25	-1.25	
7A M180	12	15	20	15	40		15	25	
7AMS	-2.12	-2.37	-2.00	-2.00	-2.00		-1.87	-2.00	
14B	1.50	2.00	1.25	1.00	1.25		.50	.75	
21R	3.00	3.00	2.50	3.25			2.75	2.25	
K 180	42.50	42.50	42.00	42.50	42.25		42.50	42.75	
K 90	42.00	42.50	42.50	42.50	42.75		42.50	42.75	
K M180	180	10	180	180	180		180	180	
PEK 180	42.75	42.30	42.00	42.25	42.42		42.47	42.52	
PEK 90	42.48	42.44	42.30	42.42	42.52		42.38	42.50	
PEK M180	40	145	20	35	180		180	10	
PEK e^2 180	.27	.11	.22	.27	.13		.11	.26	
PEK e^2 90	.10	.14	.16	.22	.07		-.07	.10	
U.S. CT	.490	.506	.498	.496	.494				
U.S. ACD	3.631	3.637	3.562	3.612	3.655				
U.S. AL	25.035	24.786	24.886	24.831	24.876				
CL Res.		.35	.35	.35	.35		.35	.37	
CL Pos.		27.	17.	28.	27.		27.	27.	

PROJECT II
ORTHO-K

Patient S. C.
Eye RIGHT
Age 30
Sex M.

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.2	.5	.4	.67	.8		.5	.8	
7A 180	-2.50	-2.00	-1.75	-1.50	-1.50		-1.75	-1.75	
7A 90	-1.50	-1.50	-1.25	-1.25	-1.00		-1.00	-1.00	
7A M180	176	05	10	180	20		05	180	
7AMS	-2.00	-1.62	-1.50	-1.37	-1.50		-1.37	-1.75	
14B	1.50	2.00	1.25	1.00	1.25		.50	.75	
21R	3.00	3.00	2.50	3.25			2.75	2.25	
K 180	42.50	42.25	42.00	42.50	42.25		42.50	42.75	
K 90	42.00	42.00	42.50	42.25	42.00		42.25	42.75	
K M180	172	15	180	180	180		05	180	
PEK 180	42.27	42.38	41.82	42.31	42.43		42.17	42.60	
PEK 90	42.37	42.07	42.16	41.97	41.96		42.57	42.14	
PEK M180	20	160	35	135	155		40	150	
PEK e^2 180	.12	.14	.10	.21	.20		.12	.13	
PEK e^2 90	-.03	.10	.13	.13	.14		.18	.06	
U.S. CT	.486	.486	.504	.484					
U.S. ACD	3.697	3.708	3.675	3.691	3.727				
U.S. AL	25.088	24.937	24.826	24.856	24.742				
CL Res.		.37	.35	.37	.35		.35	.35	
CL Pos.		28	17	28	27		28	28	

PROJECT II
ORTHO-K

Patient L. L.
Eye LEFT
Age 17
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.1	0.067	0.067	0.067		0.2	0.4	0.67	
7A 180	-2.25	-2.00	-2.50	-2.00		-1.50	-1.50	-1.50	
7A 90	-2.50	-2.25	-2.50	-2.75		-2.00	-1.50	-1.50	
7A M180	5.	180.	180.	160.		175.	180.	180.	
7AMS	-2.50	-2.00	-2.25	-2.00		-1.50	-1.75	-1.50	
14B	+1.50	+1.25	+1.25	+0.75		+1.00	+1.25	+1.25	
21R	+2.75	+2.75	+2.50	+3.00		+2.75	+3.00	+2.75	
K 180	44.25	44.00	45.00	44.75		44.25	44.50	44.25	
K 90	44.75	45.00	46.00	45.75		45.75	45.25	45.00	
K M180	10.	180.	7.	180.		180.	180.	180.	
PEK 180	44.75	44.25	44.62	44.87		44.37	44.12	44.25	
PEK 90	45.37	45.25	45.50	45.50		45.50	45.37	45.12	
PEK M180	10	180.	180.	180.		180.	180.	10	
PEK e^2 180	0.16	0.06	0.14	0.37		-0.13	-0.15	0.05	
PEK e^2 90	0.01	-0.03	0.11	0.29		-0.16	-0.19	-0.13	
U.S. CT	0.583		0.575	0.585		0.573			
U.S. ACD	3.551			3.558		3.599			
U.S. AL	23.546		19.916	23.558		23.562			
CL Res.		0.325	0.325	0.325		0.35	0.325	0.325	
CL Pos.		38.	18.	37.		28.	28.	28.	

PROJECT II
ORTHO-K

Patient L. L.
Eye RIGHT
Age 17
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.05	0.067	0.067	0.1		0.1	0.2	0.67	
7A 180	-2.50	-2.50	-2.25	-2.75		-2.00	-2.00	-1.50	
7A 90	-2.50	-2.25	-2.25	-2.75		-2.00	-2.00	-1.50	
7A M180	180.	180.	180.	180.		180.	180.	180.	
7AMS	-2.50	-2.50	-2.50	-2.50		-2.00	-2.25	-1.75	
14B	+1.50	+1.25	+1.25	+0.75		+1.00	+1.25	+1.75	
21R	+2.75	+2.75	+2.50	+3.00		+2.75	+3.00	+2.75	
K 180	44.00	43.50	44.50	44,50		44.00	44.25	43.25	
K 90	44.00	44.25	45.25	45.00		44.75	45.00	44.50	
K M180	180	180.	180.	180.		180.	180.	180.	
PEK 180	44.12	43.87	44.00	44.25		43.75	44.12	44.00	
PEK 90	45.12	44.62	44.87	45.00		44.62	44.87	44.62	
PEK M180	10.	180.	180.	180.		170.	180.	180.	
PEK e^2 180	-0.01	0.1	0.21	0.26		0.21	0.06	0.21	
PEK e^2 90	-0.04	-0.03	0.13	0.22		0.13	-0.12	0.06	
U.S. CT	0.566		0.578	0,584		0.573			
U.S. ACD	3.600		3.690	3.600		3.685			
U.S. AL	23.836		23.540	23.766		23.802			
CL Res.		0.325	0.325	0.325		0.35	0.375	0.375	
CL Pos.		36.	28.	26.		38.	28.	28.	

PROJECT II
ORTHO-K

Patient J. W.
Eye LEFT
Age 27
Sex M

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.67	0.80	0.80	0.80			.67	1.33	
7A 180	-1.75	-1.50	-1.25	-0.75			-.75	.50	
7A 90	-1.00	-0.50	0	-0.25			-.25	1.00	
7A M180	160	160	165	158			160	165	
7AMS	-1.12	-1.00	-1.00				-.75	.75	
14B	+0.75	+0.25	+0.75	+0.25			.75	-.75	
21R	+2.25	+1.50	+2.25	+1.75			2.00	2.50	
K 180	43.25	43.00	43.25	43.00			42.50	42.50	
K 90	42.25	42.25	41.75	42.00			41.62	41.00	
K M180	168	154	158	175			168	177	
PEK 180	43.14		42.88	43.10			42.56	42.35	
PEK 90	42.21		42.11	41.83			41.68	41.73	
PEK M180	5		175	180			180	180	
PEK e^2 180	.14		.27	.27			.11	.12	
PEK e^2 90	.06		.18	.16			-.02	.07	
U.S. CT	.530		.523	.538					
U.S. ACD	3.109		3.153	3.086					
U.S. AL	23.948		23.812	23.848					
CL Res.		30	30	33			33	34	
CL Pos.		38	39	29			17	18	

PROJECT II
ORTHO-K

Patient J. W.
Eye RIGHT
Age 27
Sex M

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.67	1.00	0.67	0.80			1.0	1.33	
7A 180	-1.50	-1.25	-1.00	-0.75			-1.00	-.25	
7A 90	-0.75	-0.75	+0.25	+0.25			-.50	0.0	
7A M180	18	35	35	27			25	175	
7AMS	-1.12	-1.00	-1.25				-.75	-.12	
14B	+0.75	+0.25	+0.75	+0.25			.75	-.25	
21R	+2.25	+1.50	+2.25	+1.75			2.00	2.50	
K 180	42.62	43.00	42.25	43.00			43.37	42.12	
K 90	42.75	43.00	43.25	42.25			41.75	42.12	
K M180	168	12	22	22			05	174	
PEK 180	42.88	42.47	42.55	43.10			42.45	42.45	
PEK 90	42.45	42.10	42.04	42.50			41.95	42.33	
PEK M180	20	30	165	20			15	05	
PEK e^2 180	.09	.19	.26	.12			-.02	-.17	
PEK e^2 90	.06	.08	-.05	-.04			-.70	-.17	
U.S. CT	.545		.523	.525					
U.S. ACD	3.163		3.171	3.131					
U.S. AL	23.842		23.884	23.919					
CL Res.		.30	.30	.33			.33	.34	
CL Pos.		47	47	29			28	18	

PROJECT II
ORTHO-K

Patient D. G.
Eye LEFT
Age 24
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.1	.2	.29	.29	.33	.40		.50	
7A 180	-2.00	-2.00	-2.25	-2.50	-2.50	-2.25		-2.00	
7A 90	-1.50	-1.50	-1.75	-2.00	-1.75	-1.75		-1.75	
7A M180	180	180	180	180	180	180		180	
7AMS	-2.00	-2.00	-2.25	-2.50	-2.50	-2.50		-2.00	
14B	1.25	1/25	.75	.50	.50	1.25		1.00	
21R	2.50	3.00	2.25	2.25	2.00	4.00		3.50	
K 180	42.00	41.50	41.75	42.25	42.00	41.25		41.75	
K 90	42.50	42.50	42.50	42.75	42.75	41.62		42.25	
K M180	180	180	180	180	180	180		180	
PEK 180	41.68	41.52	41.87		41.89	41.33		41.66	
PEK 90	42.25	42.06	42.15		42.38	42.19		42.11	
PEK M180	150	155	160		170	170		180	
PEK e^2 180	.16	.09	.41		.16	.11		.20	
PEK e^2 90	.19	.12	.30		.11	.16		.11	
U.S. CT	.524	.533	.517						
U.S. ACD	2.89	3.08	3.37						
U.S. AL	23.99	23.99	24.718						
CL Res.		.32	.320	.32	.33	.33		.34	
CL Pos.		38	27	27	17	17		18	

PROJECT II
ORTHO-K

Patient D. G.
Eye RIGHT
Age 24
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.1	.2	.29	.29	.33	.50		.50	
7A 180	-2.00	-2.00	-2.25	-2.50	-2.50	-2.25		-2.00	
7A 90	-1.50	-1.50	-1.75	-2.00	-1.75	-1.75		-1.75	
7A M180	180	180	180	180	180	180		180	
7AMS	-2.00	-2.00	-2.25	-2.50	-2.50	-2.50		-2.00	
14B	1.25	1.25	.75	.50	.50	1.25		1.00	
21R	2.50	3.00	2.25	2.25	2.00	4.00		3.50	
K 180	41.75	41.50	41.75	41.75	42.00	40.87		42.00	
K 90	42.25	42.50	42.25	42.75	42.75	42.25		42.50	
K M180	180	180	180	180	180	180		180	
PEK 180	41.20	41.59	41.91		41.71	41.32		41.35	
PEK 90	41.72	41.79	42.09		42.27	42.35		42.36	
PEK M180	020	170	170		020	010		10	
PEK e^2 180	.33	.36	.23		.29	.15		.13	
PEK e^2 90	.30	.31	.16		.29	.14		.16	
U.S. CT	.534	.546	.530						
U.S. ACD	3.05	3.24	3.40						
U.S. AL	24.35	24.69	24.72						
CL Res.		.320		.32	.33	.33		.34	
CL Pos.		38		27	17	17		18	

PROJECT II
ORTHO-K

Patient J. D.
Eye LEFT
Age 15
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.2	.2	.33		.4	.25	.80	.67	.10
7A 180	-2.00	-1.75	-1.75		-1.75	-1.25	-1.75	-1.00	-1.25
7A 90	-1.75	-1.75	-1.75		-1.75	-1.25	-1.75	-1.00	-1.25
7A M180	160	180	180		180	180	180	180	180
7AMS	-1.75	-2.00	-1.75		-1.50	-1.50	-1.75	-1.00	-1.25
14B	1.75	1.50	1.50		1.00	.50	.75	.50	1.00
21R	2.75	2.75	3.25		2.00	3.00	3.00	3.00	3.25
K 180	43.12	43.25	43.25		43.37	43.00	42.87	43.00	43.50
K 90	43.37	44.00	44.00		44.25	43.75	43.75	43.62	44.25
K M180	175	180	180		180	180	180	180	180
PEK 180	43.36	43.42	43.21		43.27	43.03	43.28	42.99	
PEK 90	43.87	43.96	43.86		44.14	43.75	44.02	43.84	
PEK M180	5	165	165		175	175	180	180	
PEK e^2 180	.12	.03	.05		.16	.06	.10	.02	
PEK e^2 90	.03	-.11	-.01		.14	.01	-.02	-.02	
U.S. CT	.527	.536	.529		.536	.531			
U.S. ACD	3.702	3.687			3.388	3.683			
U.S. AL	24.228	24.168			23.959	24.326			
CL Res.		.3	.3		.28	.32	.31	.30	.35
CL Pos.		18	29		38	18	37	38	38

PROJECT II
ORTHO-K

Patient J. D.
Eye RIGHT
Age 15
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.2	.1	.29		.29	.29	.67	.5	.1.0
7A 180	-1.75	-2.25	-1.75		-1.75	-1.50	-2.00	-1.00	-1.25
7A 90	-1.50	-2.00	-1.75		-1.50	-1.25	-2.25	-1.25	-1.25
7A M180	19	180	180		175	175	15	6	180
7AMS	-1.75	-2.25	-1.75		-1.50	-1.25	-2.00	-1.00	-1.25
14B	1.75	1.50	1.50		1.00	.50	.75	.50	1.00
21R	2.75	2.75	3.25		2.00	3.00	3.00	3.00	3.25
K 180	43.00	43.50	43.00		43.37	43.00	42.50	43.00	43.50
K 90	43.00	43.75	43.75		44.12	43.62	43.75	43.75	44.00
K M180	173	180	180		180	20	180	170	180
PEK 180	43.14	43.38	42.89		43.12	42.87	42.93	43.12	
PEK 90	43.66	43.73	43.40		43.85	43.45	43.92	43.99	
PEK M180	180	165	20		175	175	5	180	
PEK e^2 180	.11	.20	.10		.15	.19	.20	.06	
PEK e^2 90	.03	.10	-.11		.09	0.17	-0.29	.01	
U.S. CT	.517	.545			.532	.526			
U.S. ACD	3.569				3.601				
U.S. AL	24.169				24.256				
CL Res.		.3	.3		.28	.32	.31	.30	.35
CL Pos.		27	28		18	28	37	.38	38

PROJECT II
ORTHO-K

Patient L. G.
Eye LEFT
Age 32
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.075	.1		.1	.1	.2	.33	.25	.2
7A 180	-3.00	-3.75		-3.75	-3.75	-3.00	-3.00	-2.25	-2.25
7A 90	-3.25	-3.75		-3.50	-4.00	-3.25	-3.00	-2.25	-2.25
7A M180	178	180		30	177	170	180	180	180
7AMS	-3.50	-4.00		-3.75	-4.00	-3.00	-3.00	-2.25	-2.00
14B	1.50	1.50		1.50	2.50	2.25	2.25	1.50	1.50
21R	3.25	2.75		2.50	3.50	3.00	3.00	3.00	3.00
K 180	42.00	42.75		42.75	42.12	42.12	42.00	41.37	42.00
K 90	42.37	43.50		43.50	43.12	42.87	43.00	42.25	42.50
K M180	180	180		180	10	13	180	180	180
PEK 180	42.15	42.36		42.49	42.44	42.20	42.26	41.62	
PEK 90	43.12	43.16		43.24	43.20	43.04	42.94	42.46	
PEK M180	15	175		180	170	180	180	180	
PEK e^2 180	.16	.37		.23	.28	.22	.26	-.03	
PEK e^2 90	.06	.35		.09	.19	.13	.05	-.30	
U.S. CT	.515			.528				.522	
U.S. ACD	3.293			3.297				3.307	
U.S. AL	24.803			24.522				24.680	
CL Res.		.2		.32	.3	.35	.35	.32	.34
CL Pos.		27		28	27	28	28	28	28

PROJECT II
ORTHO-K

Patient L. G.
Eye RIGHT
Age 32
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	.1	.1		.1	.075	.1	.33	.29	.25
7A 180	-2.75	-3.25		-2.75	-3.00	-3.00	-3.00	-2.00	-2.00
7A 90	-3.25	-3.50		-2.75	-3.50	-3.50	-3.00	-2.00	-2.00
7A M180	175	30		180	4	180	180	180	180
7AMS	-3.25	-3.50		-3.00	-4.00	-3.25	-3.00	-2.00	-2.00
14B	1.50	1.50		1.50	2.50	2.25	2.25	1.50	1.50
21R	3.25	2.75		2.50	3.50	3.00	3.50	3.00	3.00
K 180	41.75	42.50		42.50	42.62	42.25	41.75	41.25	41.75
K 90	42.37	43.50		43.00	42.87	42.87	42.75	42.25	43.00
K M180	165	180		180	175	180	180	180	180
PEK 180	42.12			42.08	42.26	41.82	41.83	41.53	
PEK 90	43.02	43.16		43.24	43.20	43.04	42.94	42.46	
PEK M180	180	170		165	180	175	175	180	
PEK e^2 180	.26	.34		.43	.21	.23	.25	.25	
PEK e^2 90	.24	.25		.44	.13	.21	.12	-.07	
U.S. CT	.511			.512		.512			
U.S. ACD	3.053			3.384					
U.S. AL	24.651			24.689					
CL Res.		.2		.32	.3	.35	.35	.32	.36
CL Pos.		37		27	17	28	28	26	27

PROJECT II
ORTHO-K

Patient C. F.
Eye LEFT
Age 22
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.80	1.0	1.33	1.33	1.33	1.33	0.50	1.00	
7A 180	-0.75	-0.50	-0.25	-0.25	-0.75	-0.25	-0.75	-1.00	
7A 90	-0.75	-0.50			-0.25		-0.50	-1.00	
7A M180	180	180	172	160	142	007.	165	180	
7AMS	-0.75	-0.50		+0.25	-0.25	-0.25	-0.75	-0.75	
14B	+1.50	+1.50	+1.75	+2.25	+1.25	+1.25	+1.25	+1.75	
21R	+3.00	+2.75	+2.75	+2.50	+2.25	+2.25	+2.50	+2.75	
K 180	42.50	42.62	42.75	42.50	42.50	42.75	42.75	42.87	
K 90	43.00	43.00	43.00	43.00	43.00	42.75	43.37	43.37	
K M180	170	177	180	010.	005.	180	180	180	
PEK 180	42.97	42.64	42.39	42.43	42.70	43.14		42.88	
PEK 90	43.47	43.12	43.03	43.12	43.13	42.77		43.36	
PEK M180	175	175	150	150	180	140		180	
PEK e^2 180	0.19	0.19	0.05	0.16	0.22	0.23		0.13	
PEK e^2 90	0.13	0.16	0.24	0.28	0.13	0.08		0.09	
U.S. CT	0.509	0.513	0.486	0.512	0.520	0.505			
U.S. ACD	2.954	3.009	3.059	3.107	3.099	3.254			
U.S. AL	23.673	23.503	23.346	23.491	23.609	23.656			
CL Res.		0.325	0.325	0.33	0.35	0.35	0.325	0.33	
CL Pos.		18.	19.	19.	28.	09.	18.	19.	

PROJECT II
ORTHO-K

Patient C. F.
Eye RIGHT
Age 22
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.20	0.67	1.33	1.00	0.67	0.80	0.33	0.50	
7A 180	-1.25	-1.00	-0.75	-0.87	-0.50	-1.00	-0.75	-1.75	
7A 90	-1.25	-1.00	-0.25	-0.37	-0.75	-0.50	-1.25	-1.25	
7A M180	180	180	023	015	180	030	140	030	
7AMS	-1.50	-1.25	-0.25	-0.50	-1.00	-1.00	-1.00	-1.25	
14B	+1.50	+1.50	+1.75	+2.25	+1.25	+1.25	+1.25	+1.75	
21R	+3.00	+2.75	+2.75	+2.50	+2.25	+2.25	+2.50	+2.75	
K 180	42.50	42.75	42.50	42.37	42.62	42.75	43.00	43.00	
K 90	43.00	43.00	43.00	42.87	43.00	43.00	43.00	43.37	
K M180	180	177	180	180	175	153	180	180	
PEK 180	42.94	42.80	42.70	42.57	42.75	42.81		42.86	
PEK 90	43.34	43.14	42.79	42.93	43.13	43.30		43.34	
PEK M180	170	165	170	005	180	005		005	
PEK e^2 180	0.14	0.21	0.18	0.19	0.14	0.13		0.16	
PEK e^2 90	0.19	0.29	0.16	0.19	0.15	0.15		0.18	
U.S. CT	0.511	0.544	0.487	0.528	0.509	0.499			
U.S. ACD	3.092		3.169	3.153	3.140	3.114			
U.S. AL	23.904		23.850	23.815	23.921	23.853			
CL Res.		0.325	0.325	0.33	0.325	0.35	0.35	0.33	
CL Pos.		28.	18.	18.	28.	08.	18.	19.	

PROJECT II
ORTHO-K

Patient B. H.
Eye LEFT
Age 15
Sex M

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.2	0.2	0.1	0.1	0.2	0.2	0.25	0.25	0.25
7A 180	-2.25	-2.25	-2.50	-2.25	-2.75	-2.25	-2.00	-3.00	-2.75
7A 90	-2.25	-2.75	-0.50	-2.75	-3.00	-2.50	-2.25	-2.50	-1.75
7A M180	180	025	180	150	165	160	170	015	165
7AMS	-2.50	-3.00	-2.75	-2.75	-2.75	-2.25	-2.25	-2.75	-2.25
14B	+1.25	+1.00	+2.50	+1.25	+1.50	+1.75	+0.75	+1.00	+1.25
21R	+2.75	+3.25	+2.50	+2.50	+3.25	+3.00	+2.50	+2.75	+2.75
K 180	43.25	43.62	44.00	44.25	44.25	44.00	44.00	44.50	44.00
K 90	44.12	44.37	44.75	45.00	45.00	44.00	44.50	45.00	44.25
K M180	016	025	020	180	170	180	180	180	005
PEK 180	43.81	43.86	43.61	43.82	44.05	43.66	44.02	43.75	
PEK 90	44.31	44.42	44.28	44.52	44.75	44.34	45.06	44.55	
PEK M180	180	010	180	175	180	175	175	180	
PEK e^2 180	0.27	0.32	0.29	0.31	0.32	0.26	0.08	0.28	
PEK e^2 90	0.19	0.22	0.25	0.26	0.20	0.24	0.20	0.28	
U.S. CT	0.517		0.527	0.523	0.527	0.526	0.515		
U.S. ACD	3.549		3.494	3.564	3.568	3.497			
U.S. AL	24.635		24.923	24.599	24.602	24.384			
CL Res.		0.30	0.32	0.35	0.35	0.35	0.37	0.32	0.35
CL Pos.		28	37	48	28	28	29	38	28

PROJECT II
ORTHO-K

Patient B. H.
Eye RIGHT
Age 15
Sex M

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.1	0.1	0.1	0.1	0.2	0.2	0.33	0.28	0.28
7A 180	-2.00	-2.75	-2.50	-2.00	-2.75	-2.00	-1.25	-2.00	-2.00
7A 90	-1.75	-3.25	-2.50	-2.50	-3.50	-2.00	-1.25	-2.00	-1.75
7A M180	005	025	180	008	015	180	180	180	010
7AMS	-1.75	-2.50	-2.50	-2.50	-3.12	-2.00	-1.75	-2.25	-1.75
14B	+1.25	+1.00	+2.50	+1.25	+1.50	+1.75	+0.75	+1.00	+1.25
21R	+2.75	+3.25	+2.50	+2.50	+3.25	+3.00	+2.50	+2.75	+2.75
K 180	43.12	44.00	44.00	44.00	44.25	43.75	44.00	44.00	43.87
K 90	43.75	44.50	44.00	44.75	45.00	44.00	44.00	44.75	44.37
K M180	170	005	180	180	160	174	180	165	170
PEK 180	43.33	43.93	43.69	44.09	43.90	43.83	43.81	43.86	
PEK 90	43.78	44.29	44.37	44.78	44.99	44.63	44.81	44.54	
PEK M180	160	175	160	170	180	165	165	180	
PEK e^2 180	0.34	0.46	0.44	0.35	0.38	0.27	0.15	0.39	
PEK e^2 90	0.12	0.18	0.40	0.23	0.37	0.17	0.19	0.25	
U.S. CT	0.505		0.526	0.519	0.518	0.522			
U.S. ACD	3.594		3.505	3.559	3.775	3.475			
U.S. AL	24.393		24.375	24.417	24.420	24.062			
CL Res.		0.30	0.325	0.35	0.325	0.35	0.37	0.325	0.35
CL Pos.		28	37	48	37	36	29	38	28

PROJECT II
ORTHO-K

Patient C. M.
Eye LEFT
Age 29
Sex F

Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.2	0.67	0.5	0.4	0.33	0.50		.67	
7A 180	-2.25	-2.25	-2.50	-2.25	-2.25	-2.00		-2.00	
7A 90	-2.00	-2.25	-2.50	-2.00	1.75	-1.50		-1.50	
7A M180	015	180	180	180	180	030		15	
7AMS	-2.12	-2.50	-2.50	-2.12	-2.00	-1.75		-2.00	
14B	+2.00	+2.50	+2.50	+2.50	+2.25	+1.50		1.75	
21R	+3.50	+4.00	+3.50	+3.50	+3.50	+3.50		3.25	
K 180	44.00	44.37	44.50	44.25	44.25	44.00		44.50	
K 90	45.37	45.50	45.50	45.25	45.25	45.50		45.75	
K M180	180	180	180	180	180	180		180	
PEK 180	44.11	44.35	44.09	44.20	43.94	44.26			
PEK 90	45.41	45.39	45.31	45.32	44.96	45.17			
PEK M180	180	170	170	170	005	165			
PEK e^2 180	0.13	0.03	0.12	0.10	0.19	-.05			
PEK e^2 90	0.29	0.20	0.29	0.21	0.22	-.04			
U.S. CT	.493		.491	.493	.488				
U.S. ACD	3.365		3.539		3.241				
U.S. AL	23.642		23.786		23.394				
CL Res.		.32	.32	.32	.32	.32		.32	
CL Pos.		38	29	38	38	39		29	

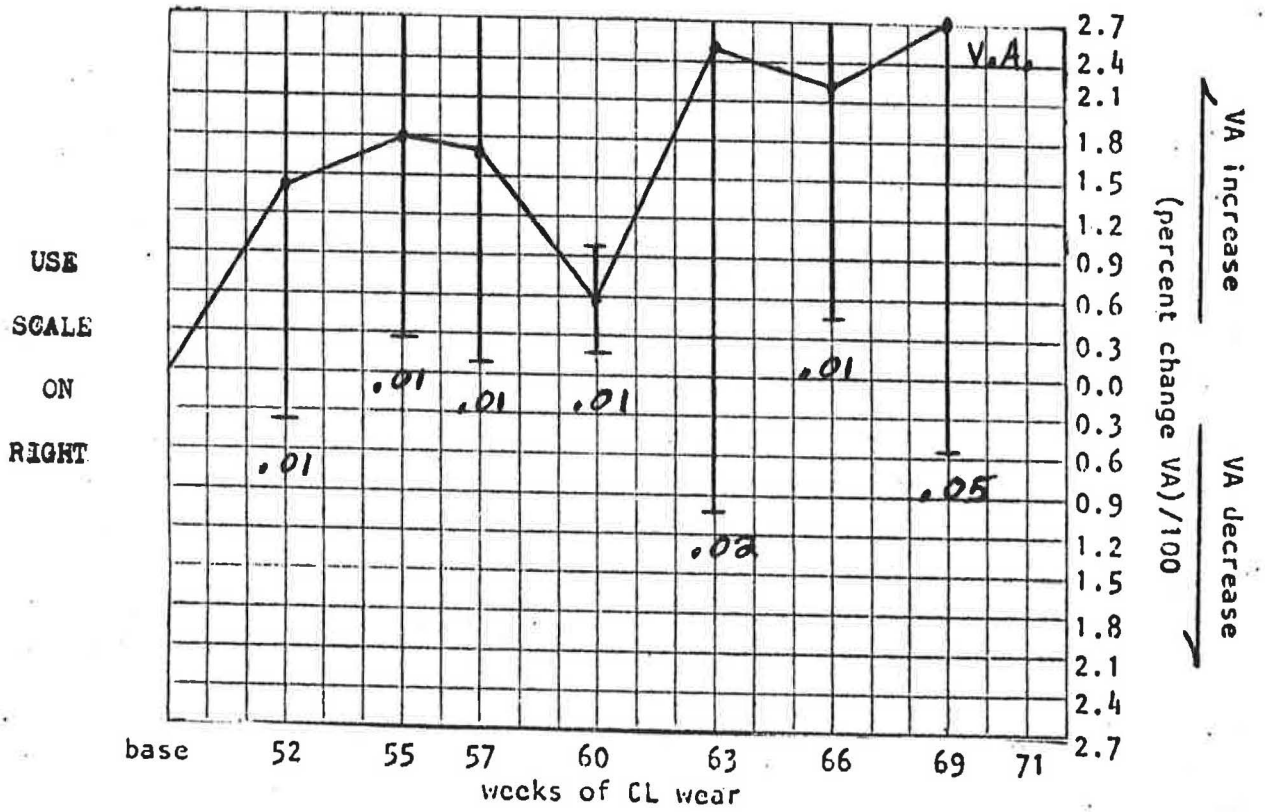
PROJECT II
ORTHO-K

Patient C. M.
Eye RIGHT
Age 29
Sex F

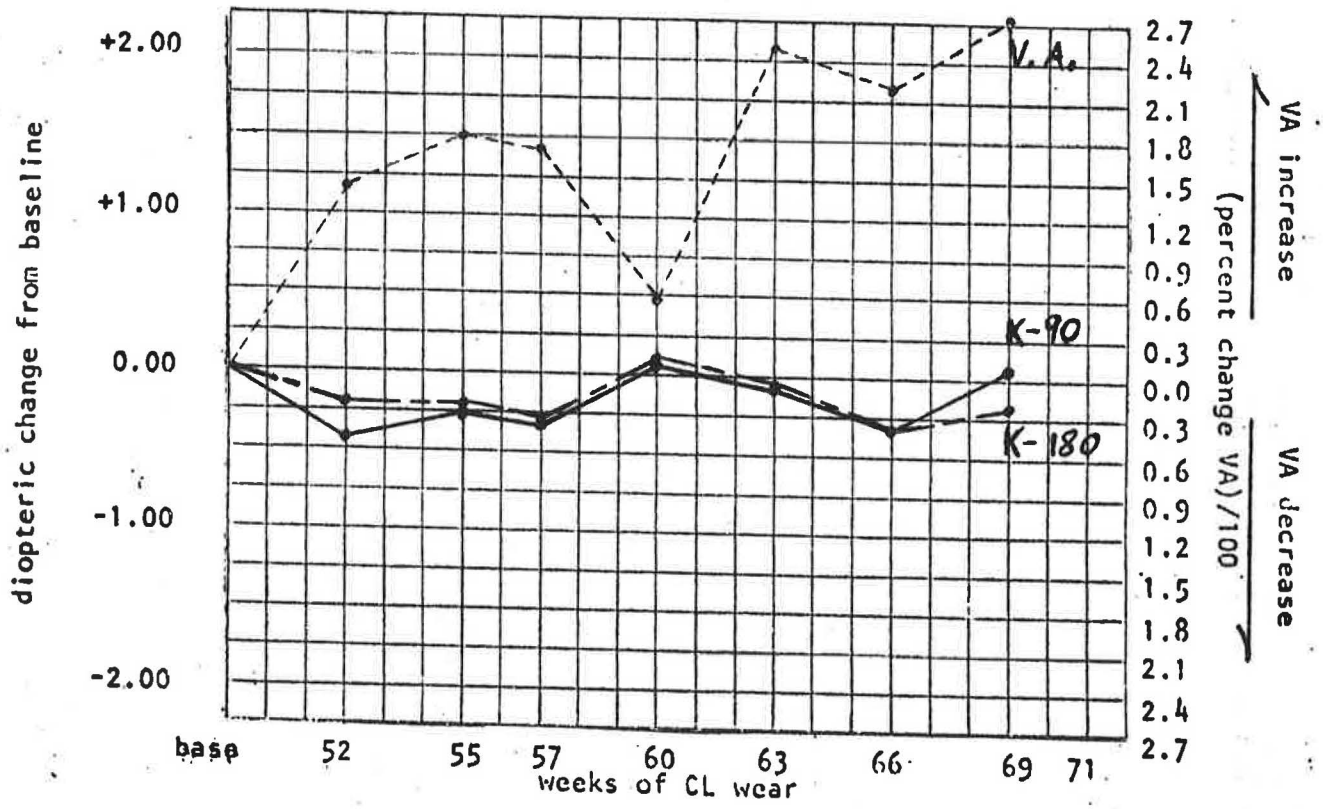
Week No.	Baseline	3	6	8	11	14	17	20	23
VA w/o CL	0.2	0.5	0.4	0.4	0.4	0.33		.5	
7A 180	-2.50	-2.25	-2.00	-2.75	-2.50	-2.50		-2.50	
7A 90	-1.75	-2.00	-2.00	-2.00	-1.50	-1.25		-1.75	
7A M180	015	180	180	180	180	180		175	
7AMS	-1.88	-2.12	-2.25	-2.33	-2.00	-1.87		-2.25	
14B	+2.00	+2.50	+2.50	+2.50	+2.25	+1.50		1.75	
21R	+3.50	+4.00	+3.50	+3.50	+3.50	+3.50		3.25	
K 180	43.75	44.00	44.50	44.37	44.00	44.00		44.50	
K 90	44.50	45.00	44.50	44.88	44.25	44.75		45.25	
K M180	180	180	180	180	180	180		180	
PEK 180	43.86	43.93	44.49	43.94	43.92	44.15			
PEK 90	44.50	44.40	44.50	44.71	44.44	44.89			
PEK M180	180	165	145	180	175	010			
PEK e^2 180	0.16	0.05	0.20	0.26	0.21	.13			
PEK e^2 90	0.19	0.16	0.15	0.31	0.20	-.10			
U.S. CT	.505		.498	.498	.495				
U.S. ACD	3.244		3.300		3.376				
U.S. AL	24.461		23.636		23.820				
CL Res.		.32	.30	.32	.32	.32		.32	
CL Pos.		38	28	38	38	28		28	

APPENDIX D

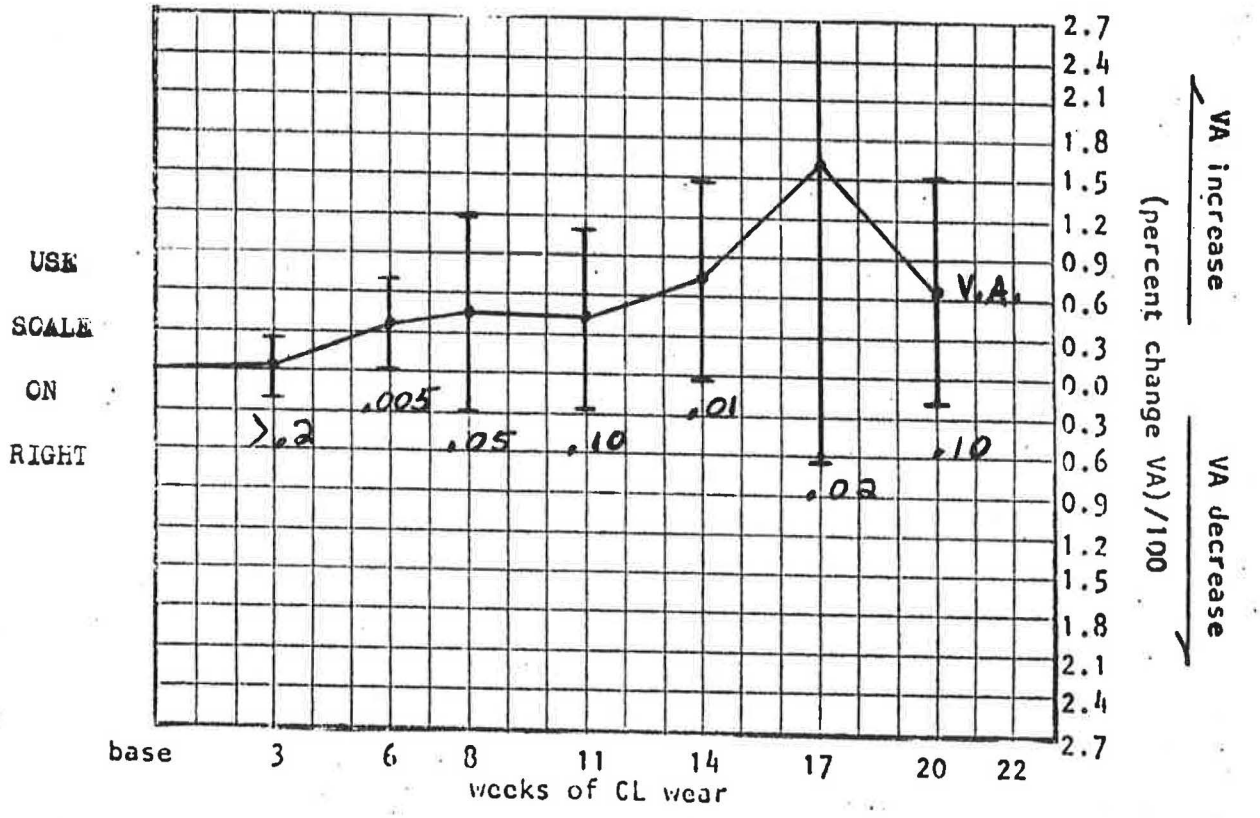
variable graphed: PERCENT CHANGE IN VISUAL ACUITY



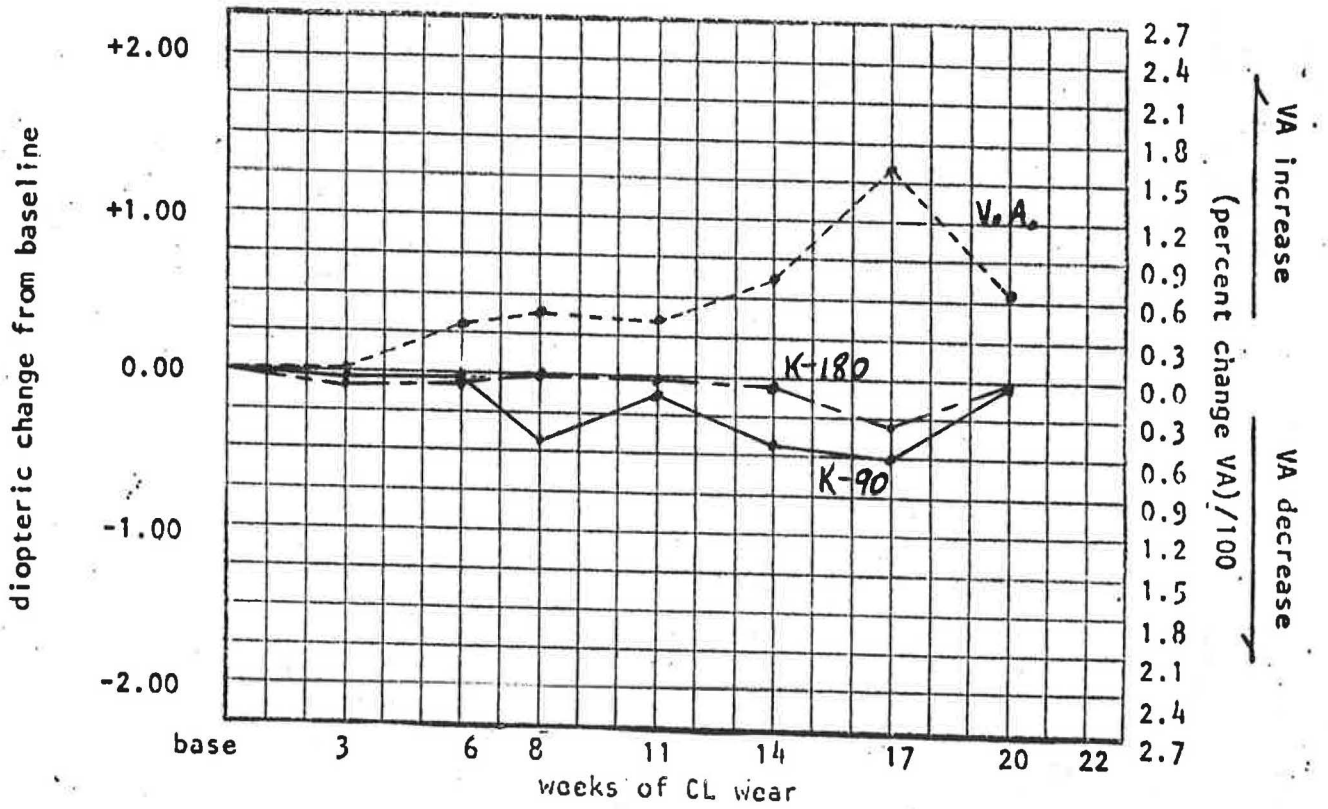
variable graphed: KERATOMETER POWER NEAREST MERIDIANS 90 & 180



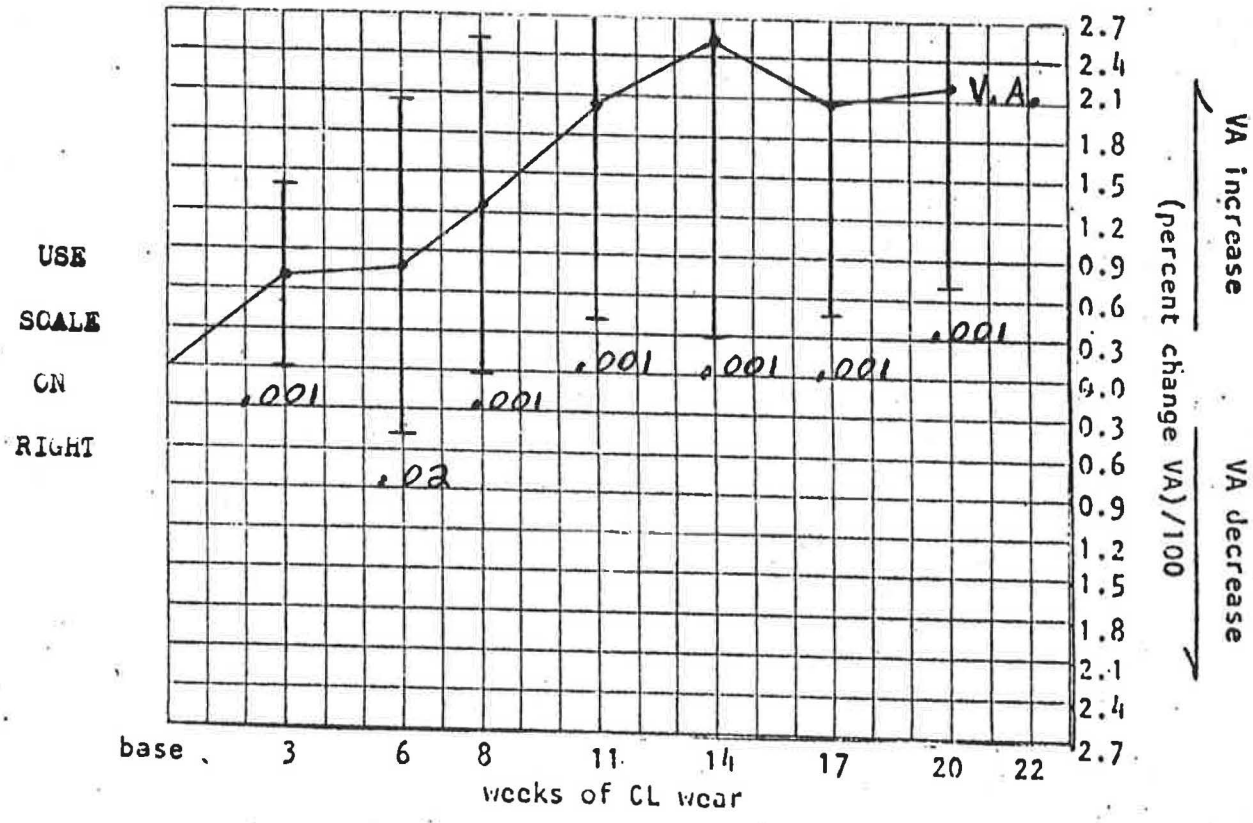
variable graphed: PERCENT CHANGE IN VISUAL ACUITY



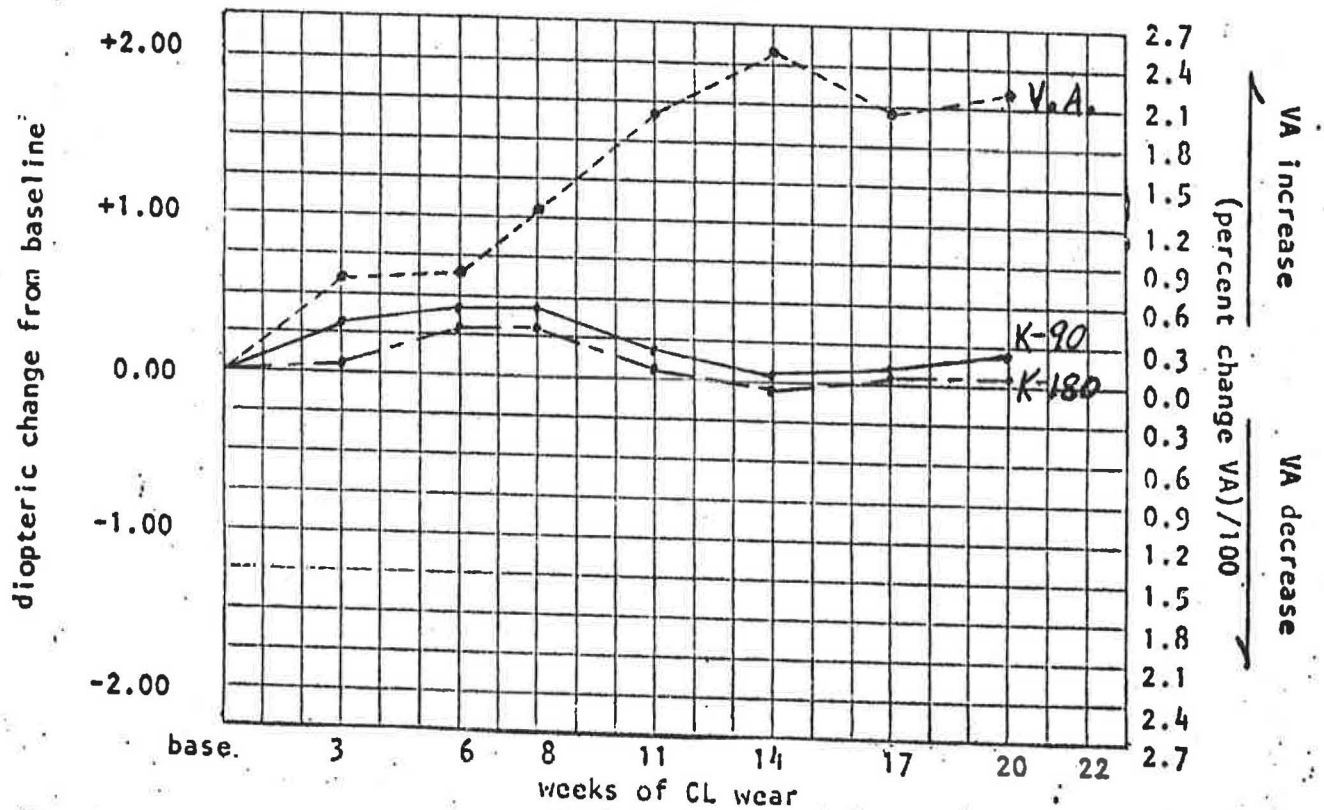
variable graphed: KERATOMETER POWER NEAREST MERIDIANS 90 & 180



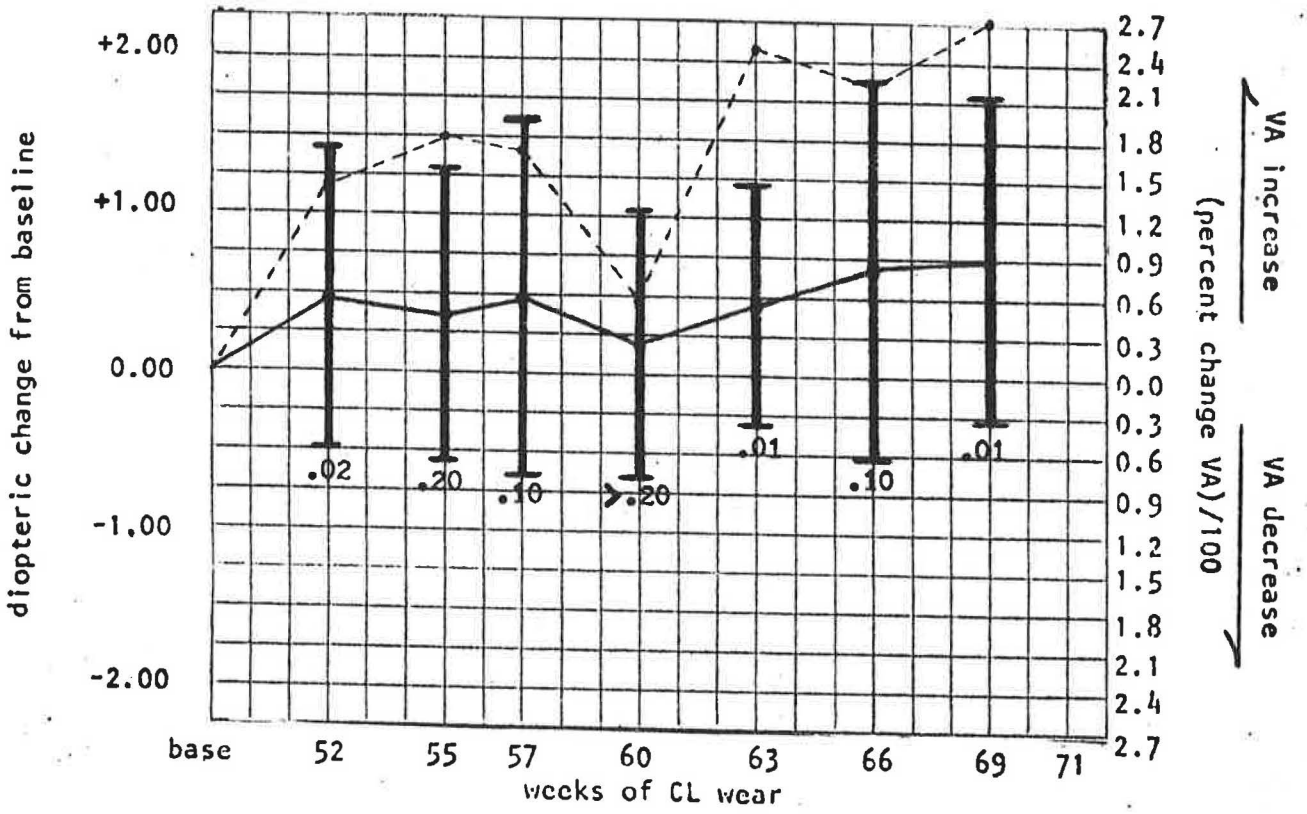
variable graphed: PERCENT CHANGE IN VISUAL ACUITY



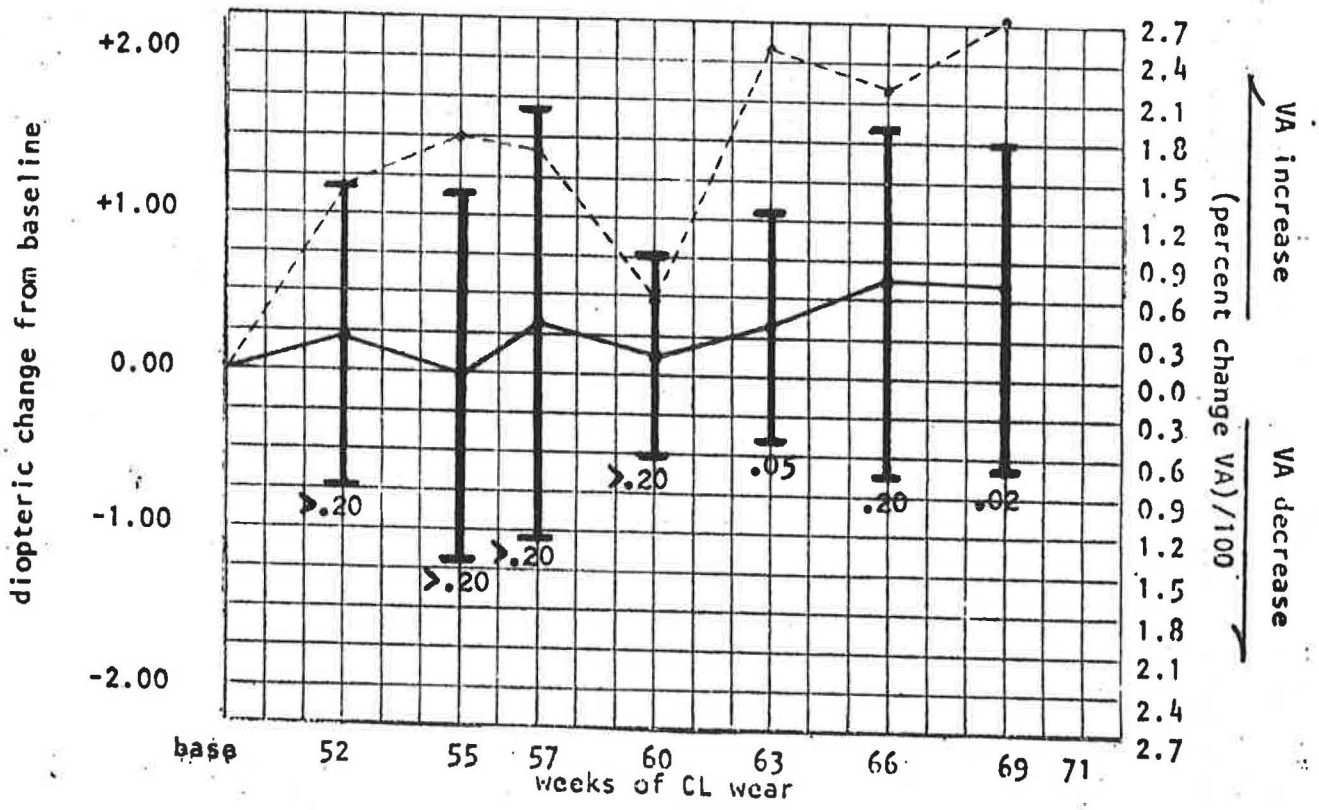
variable graphed: KERATOMETER POWER NEAREST MERIDIANS 90 & 180



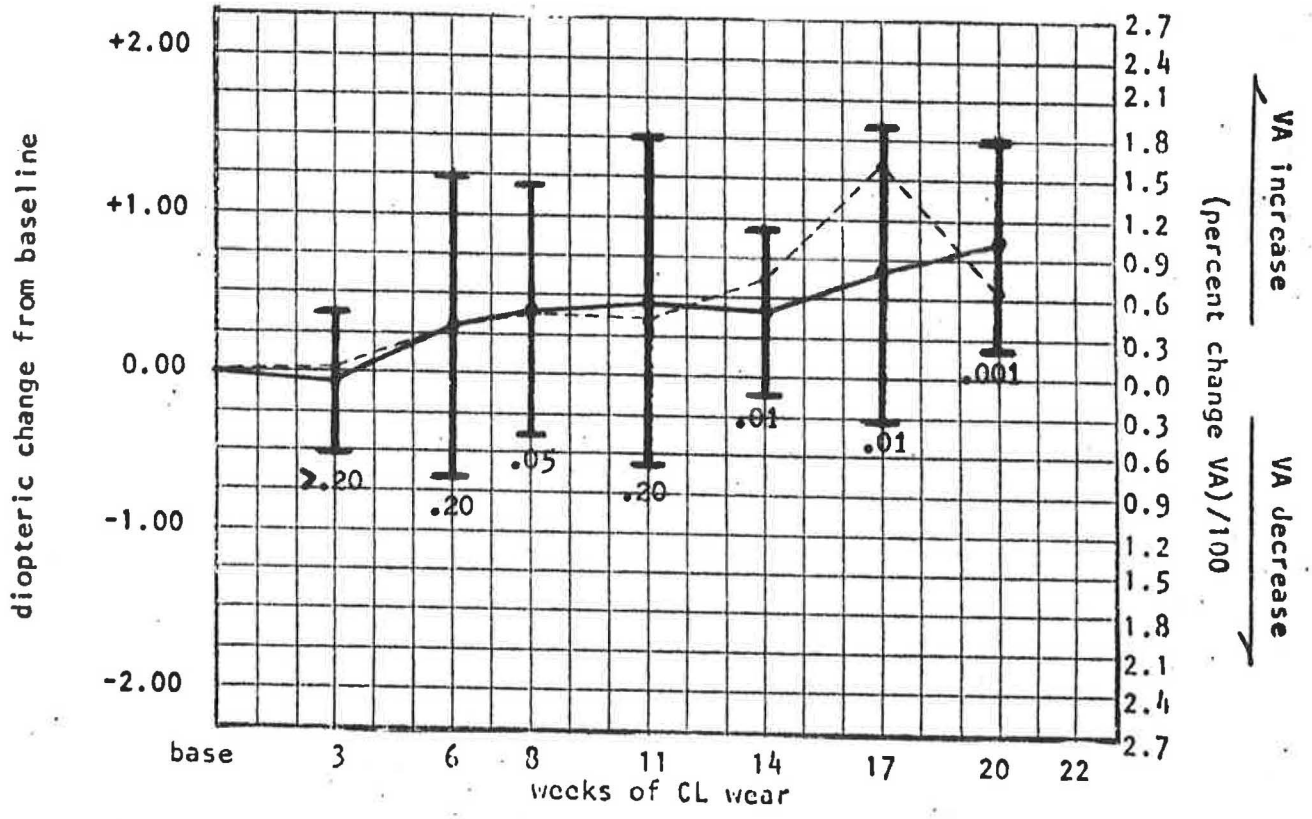
variable graphed:CHANGE IN 7A, MERIDIAN NEAREST 90



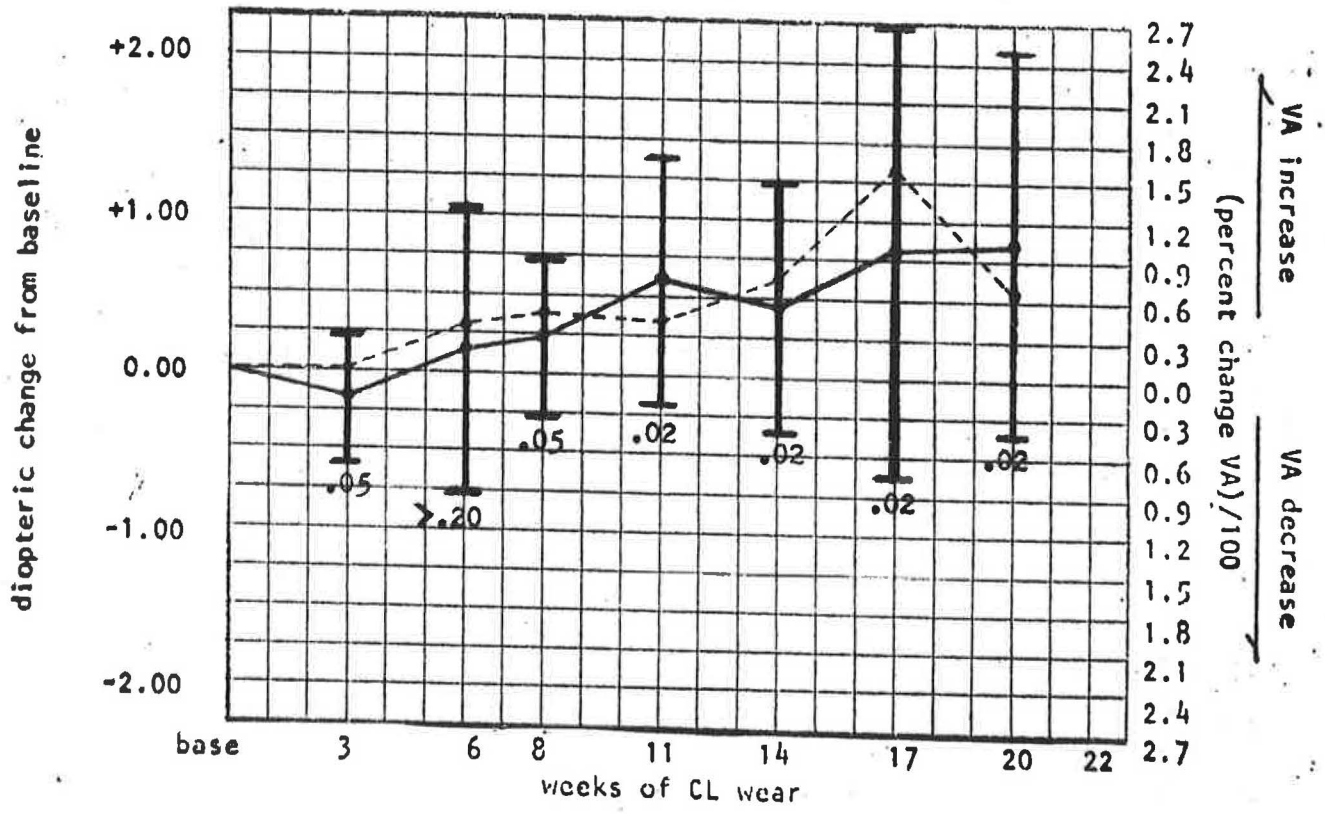
variable graphed:CHANGE IN 7A, MERIDIAN NEAREST 180



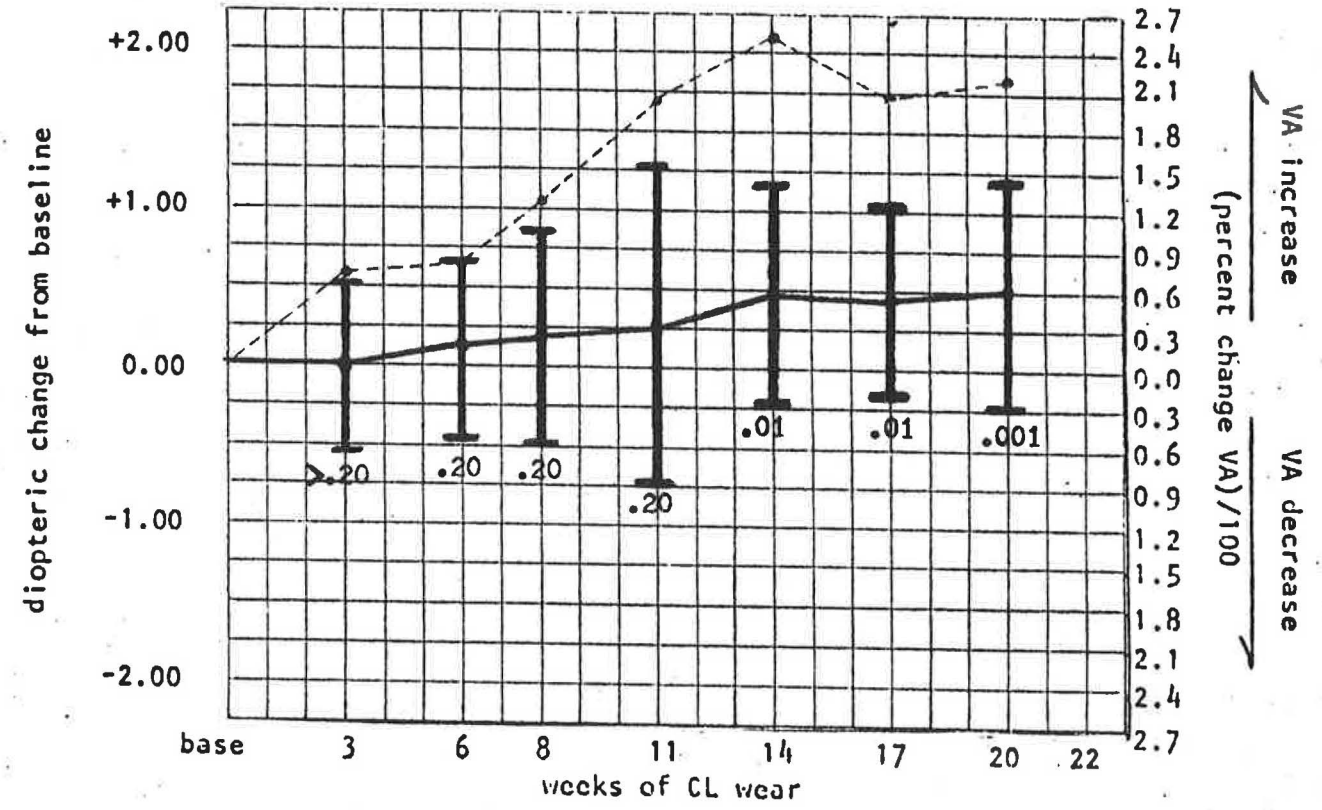
variable graphed: CHANGE IN 7A, MERIDIAN NEAREST 90



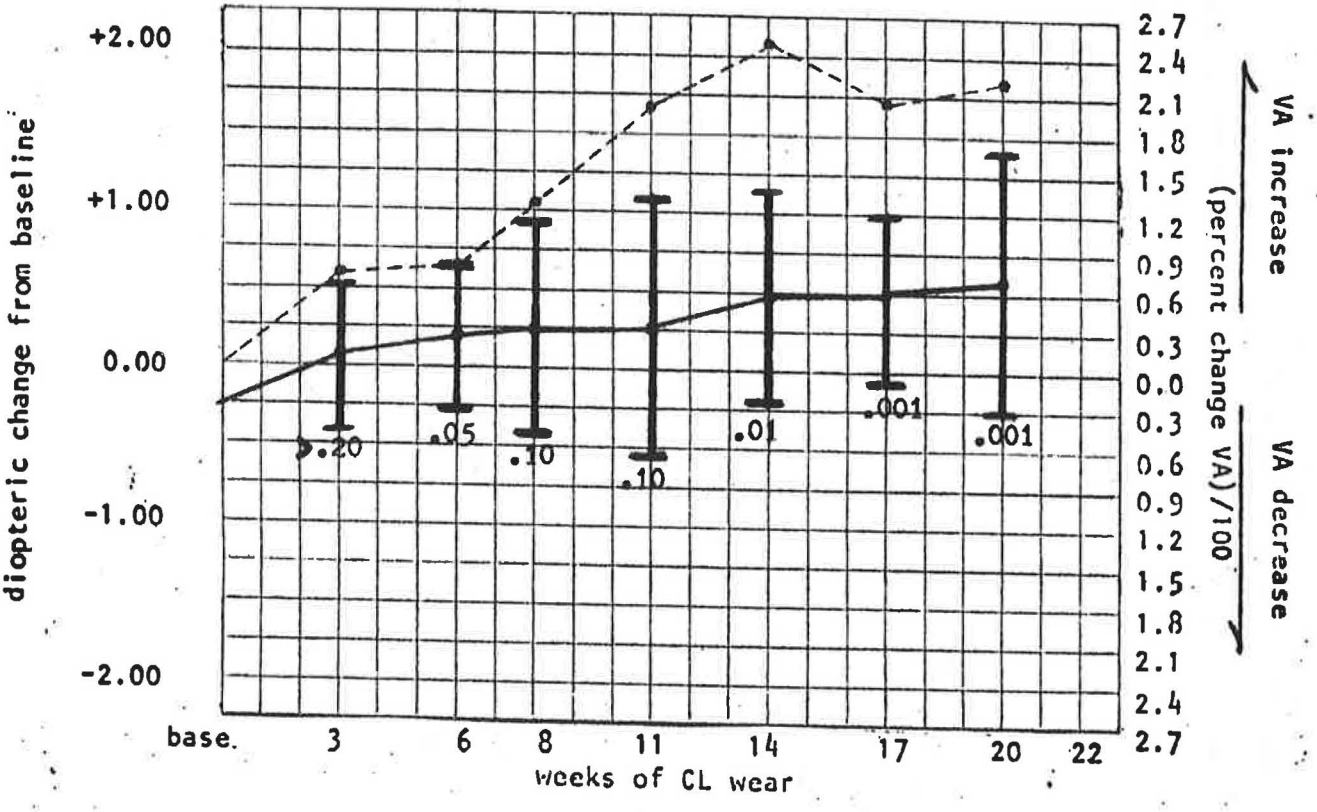
variable graphed: CHANGE IN 7A, MERIDIAN NEAREST 180



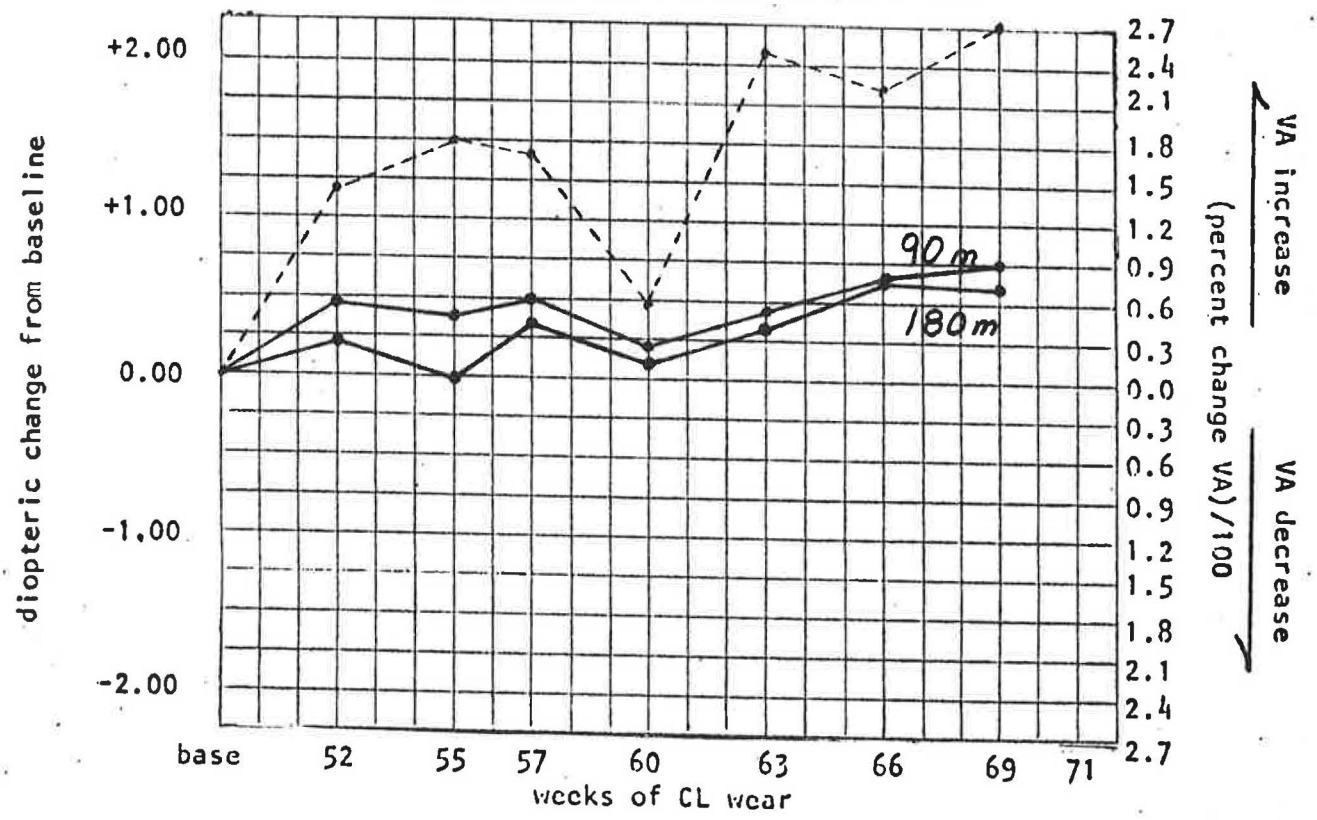
variable graphed: CHANGE IN 7A, MERIDIAN NEAREST 90



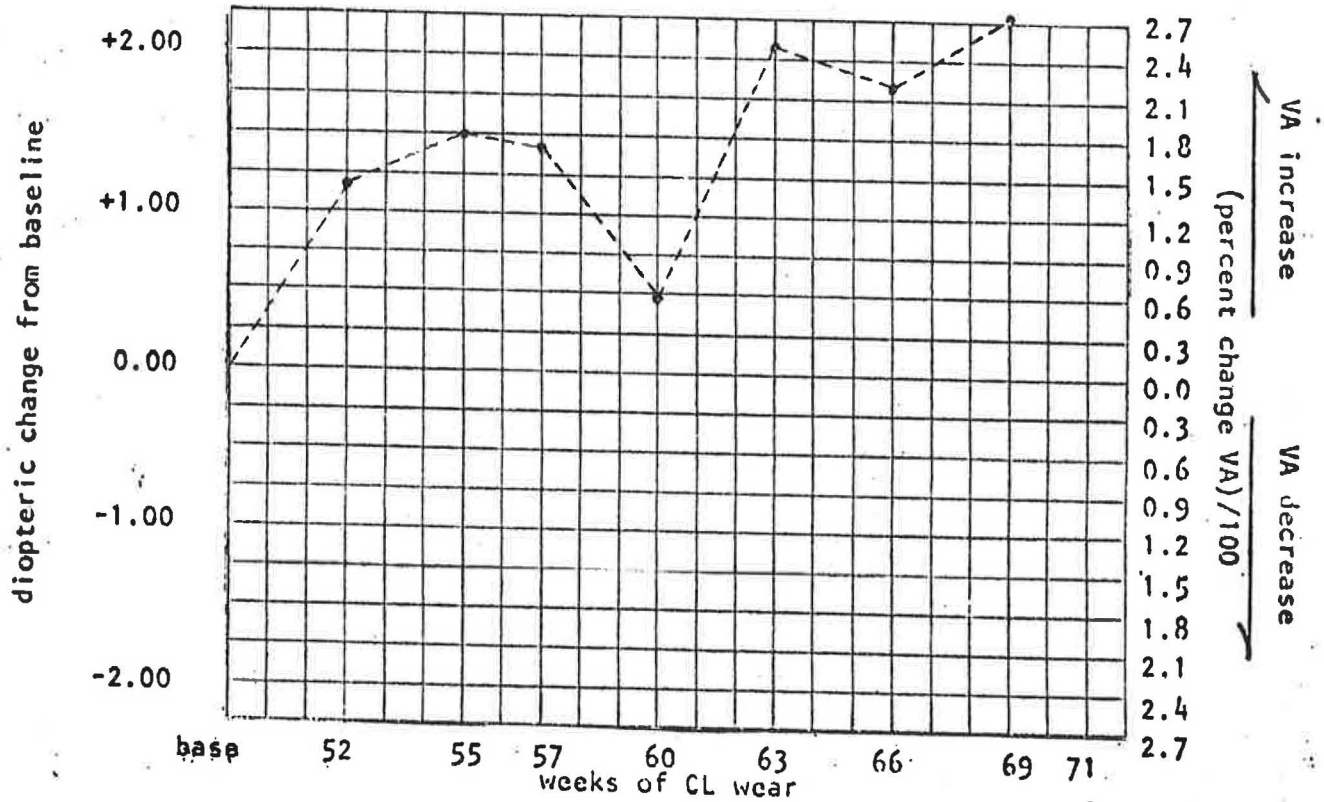
variable graphed: CHANGE IN 7A, MERIDIAN NEAREST 180



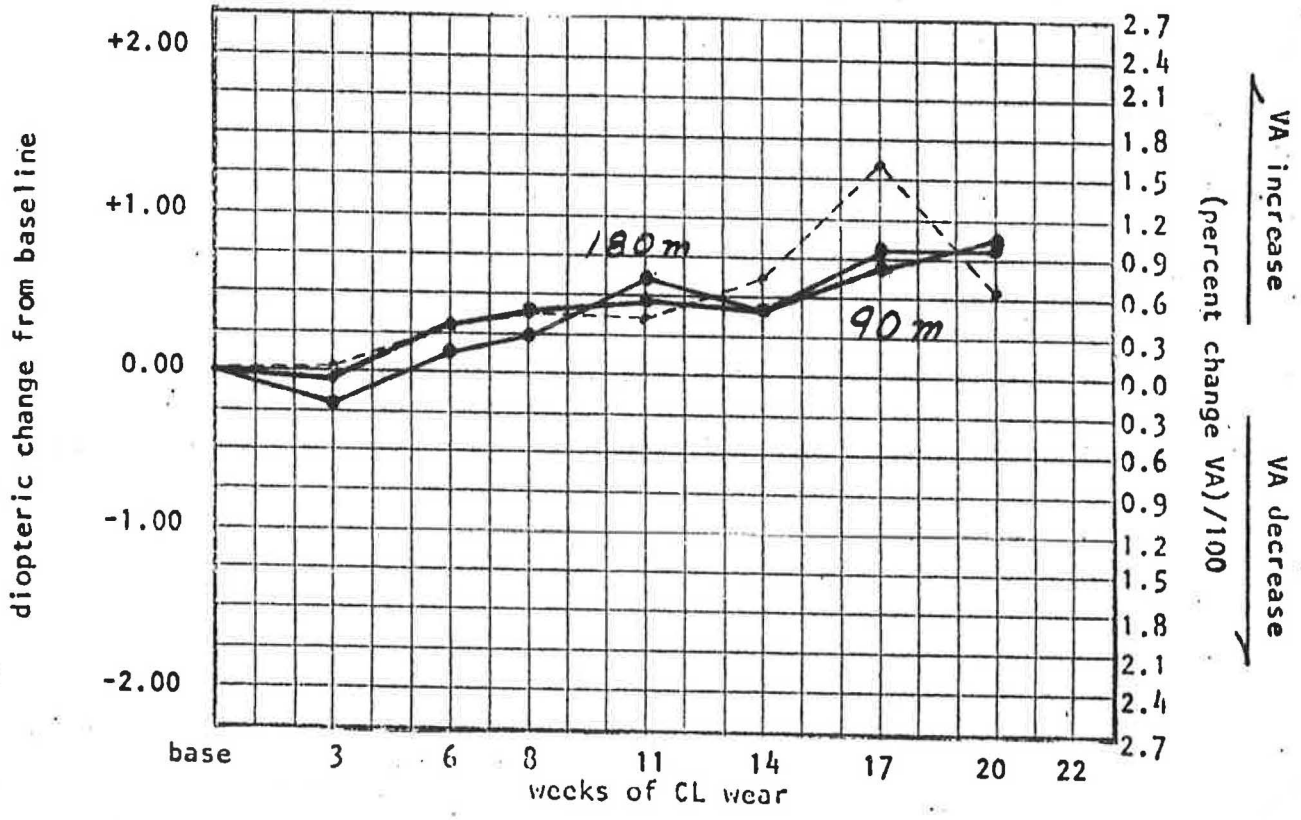
variable graphed: CHANGE IN 7A MERIDIANS NEAREST 90 & 180



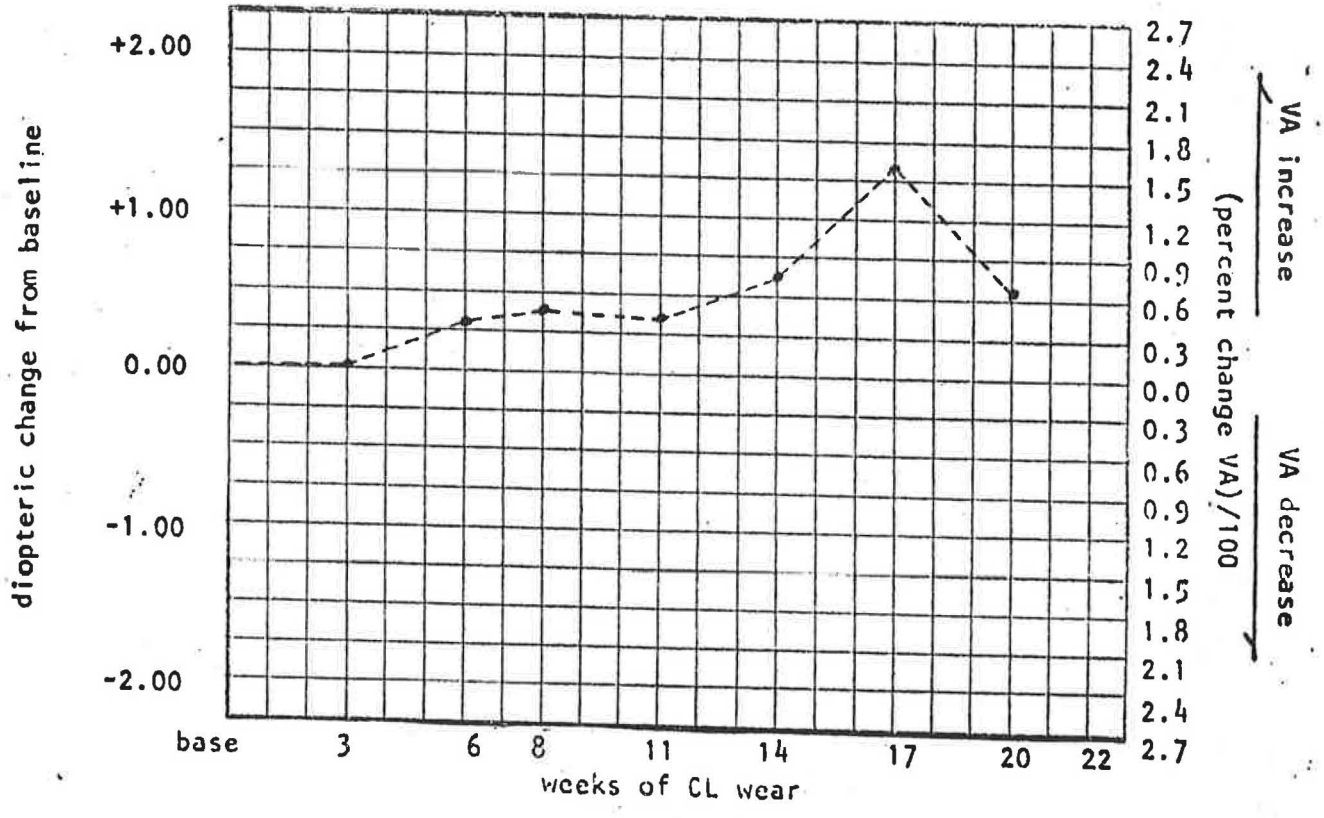
variable graphed:



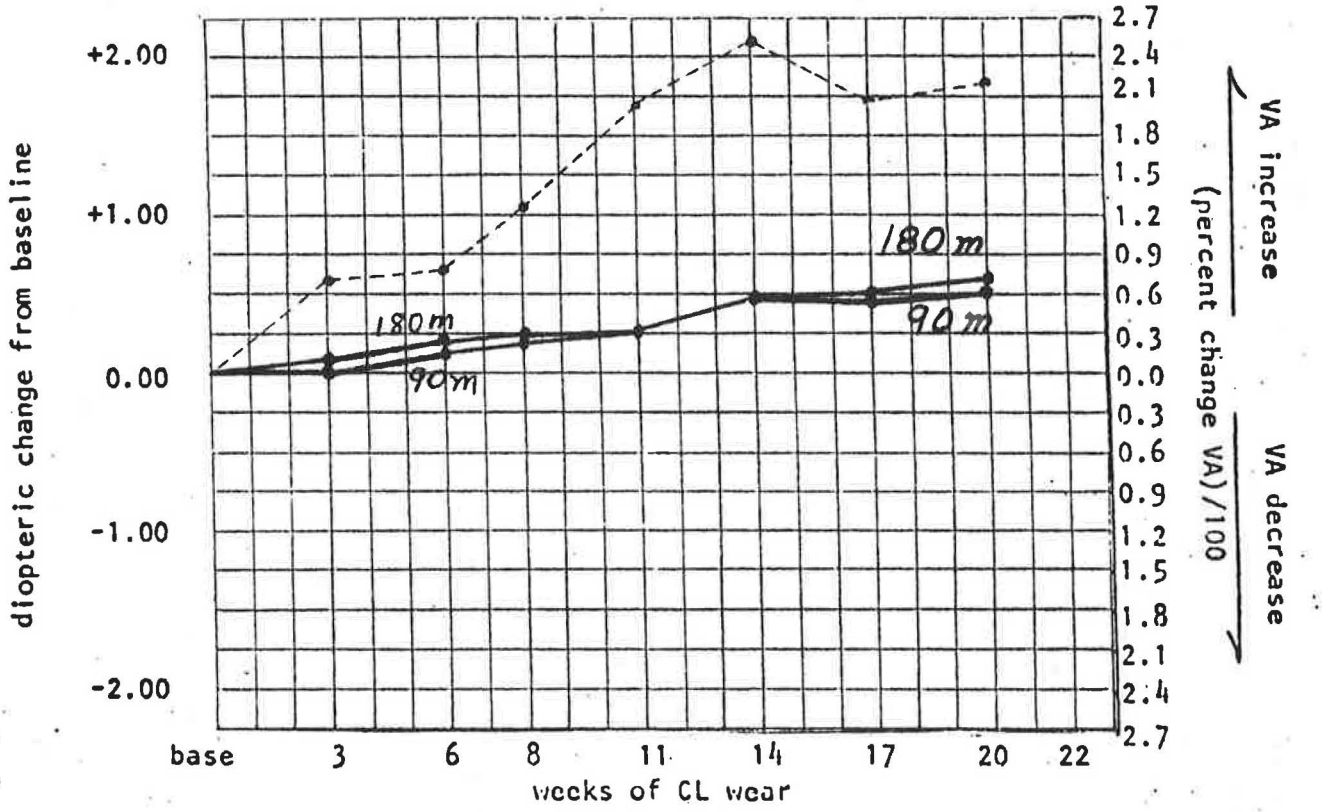
variable graphed: CHANGE IN 7A MERIDIANS NEAREST 90 & 180



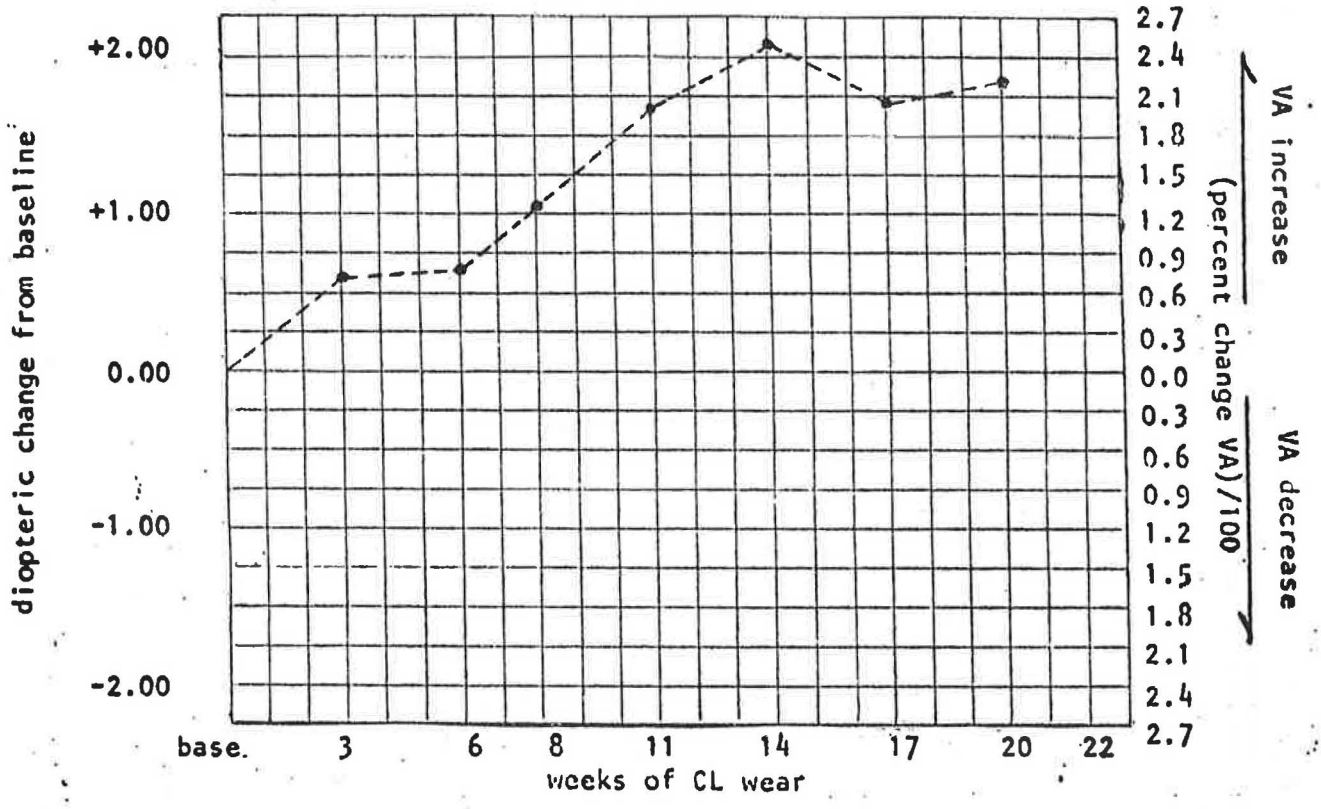
variable graphed:



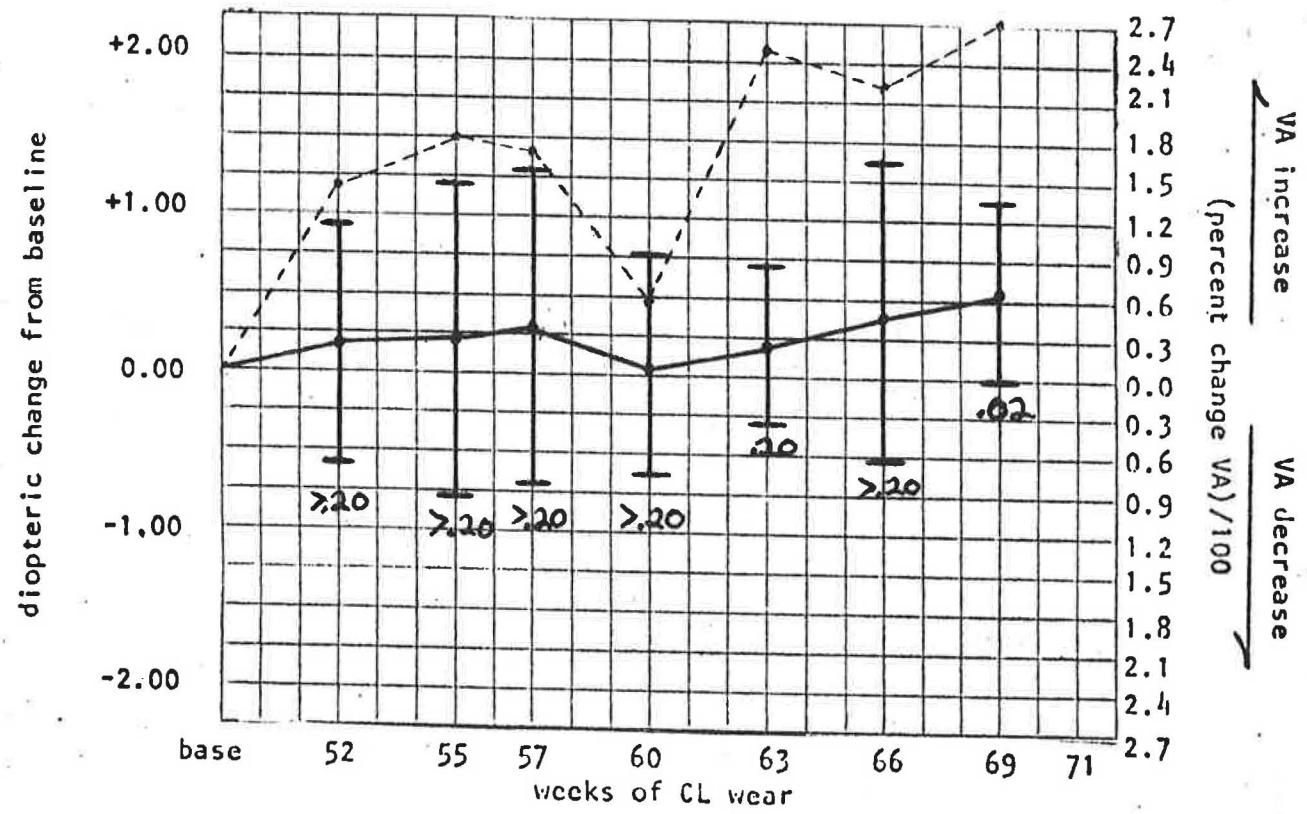
variable graphed: CHANGE IN 7A MERIDIANS NEAREST 90 & 180



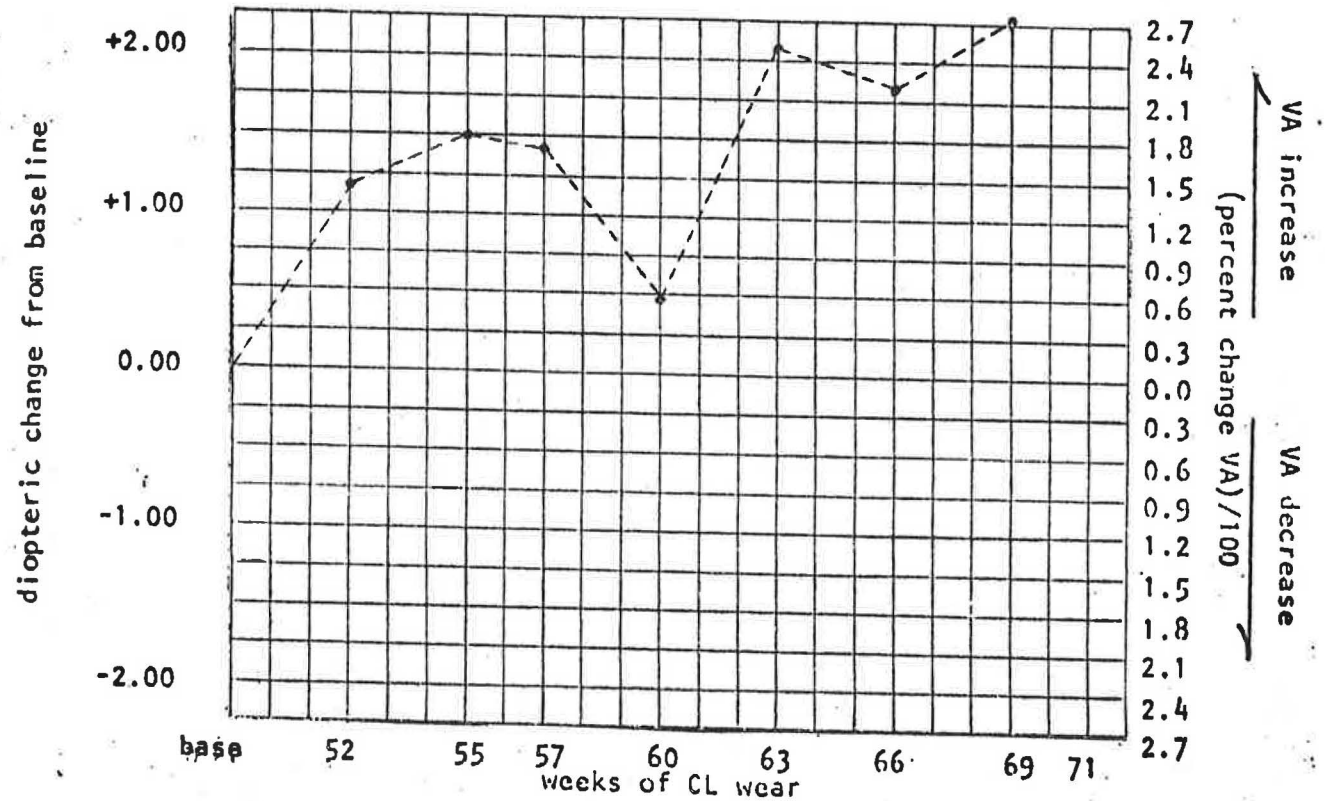
variable graphed:



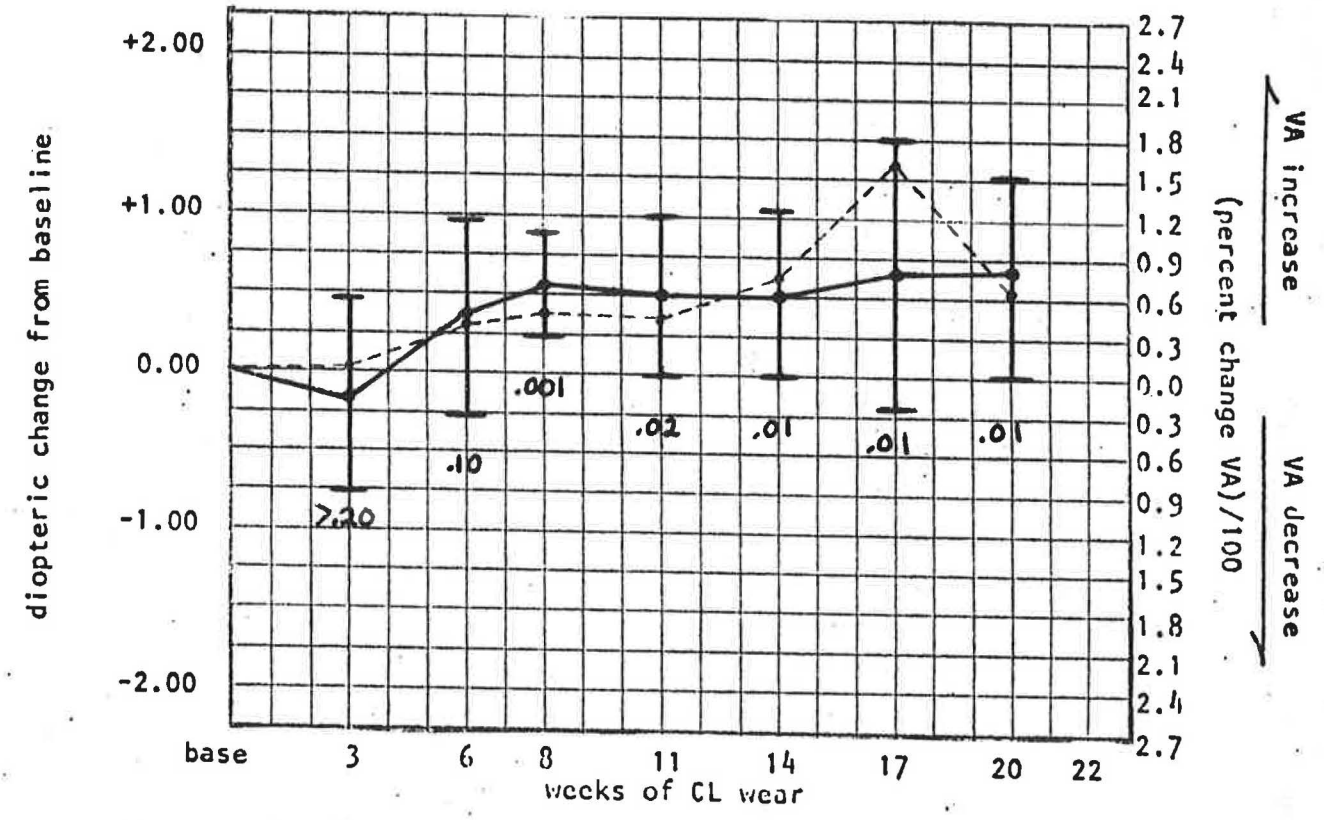
variable graphed: 7A MONOCULAR SPHERE



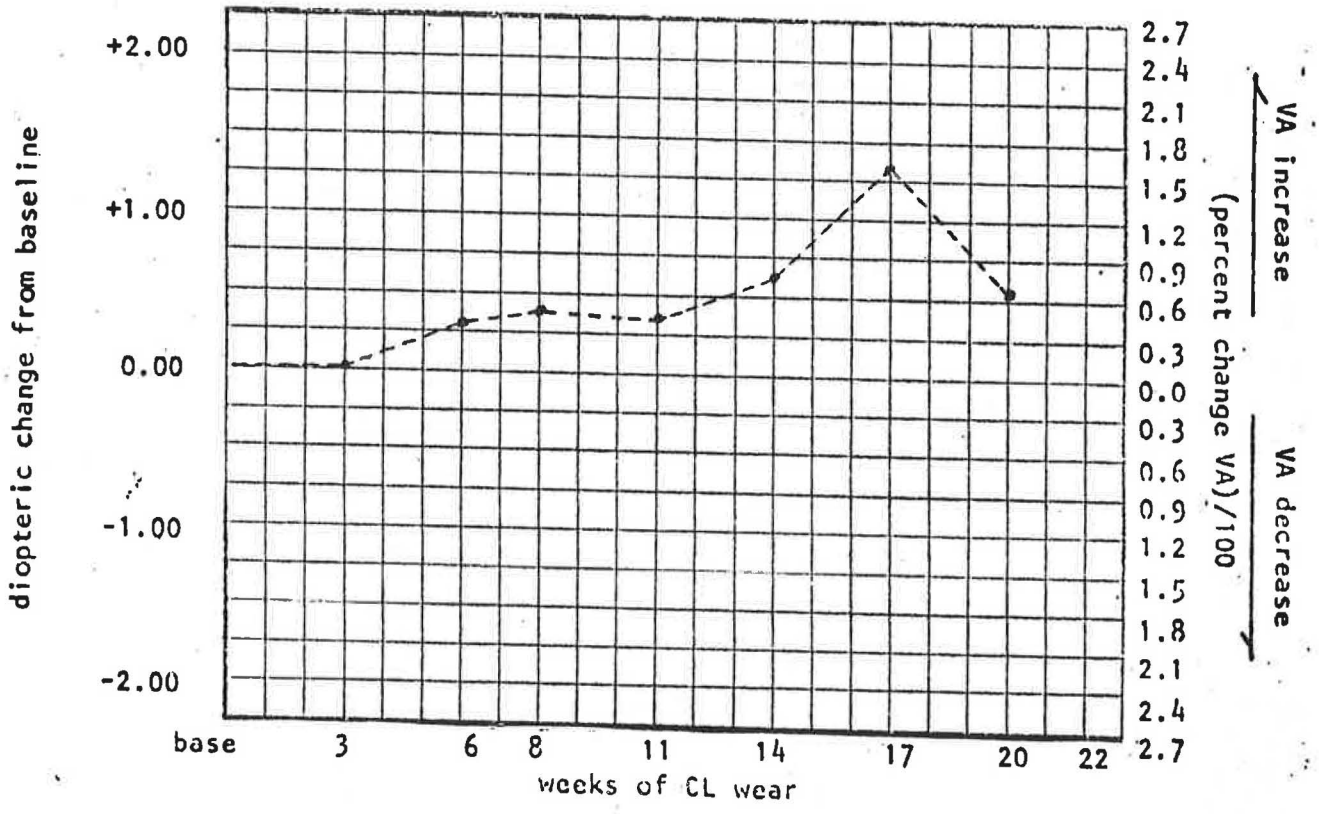
variable graphed:



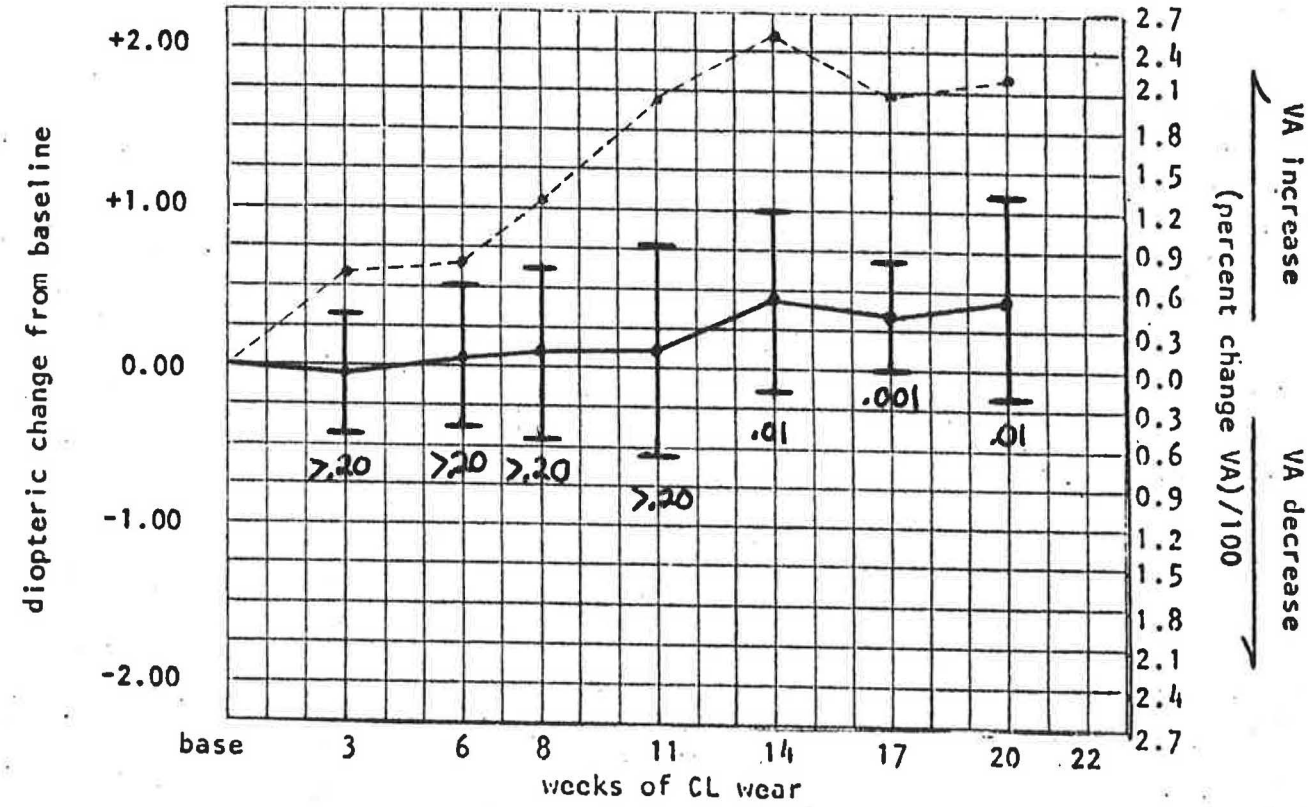
variable graphed: 7A MONOCULAR SPHERE



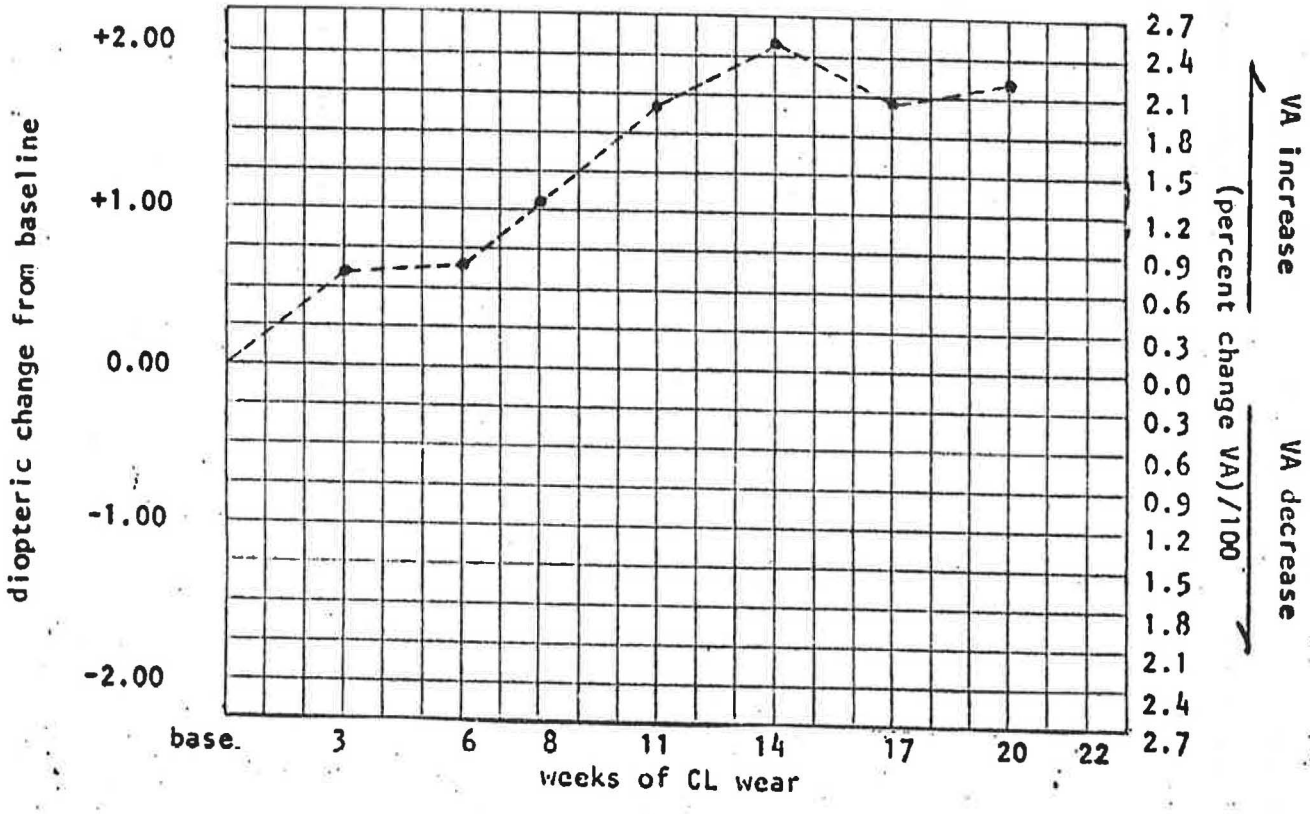
variable graphed:



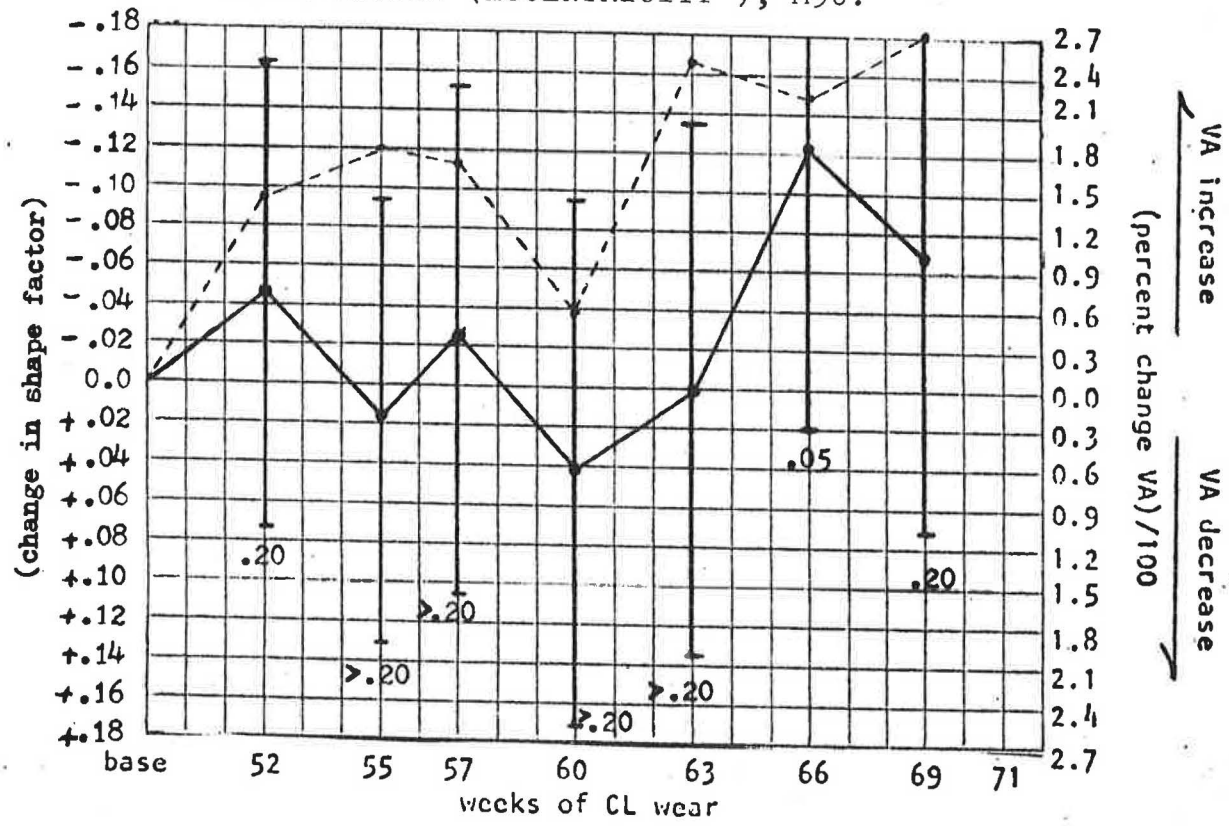
variable graphed: 7A MONOCULAR SPHERE



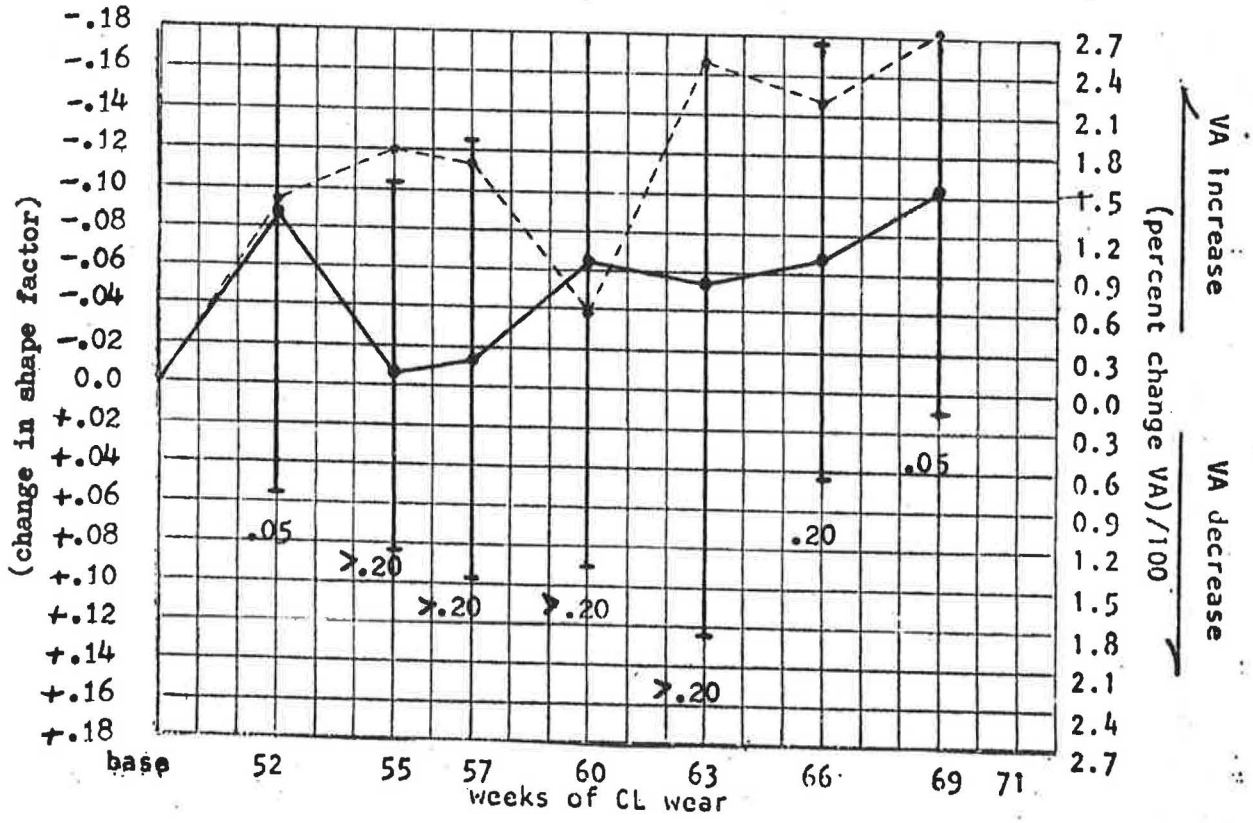
variable graphed:



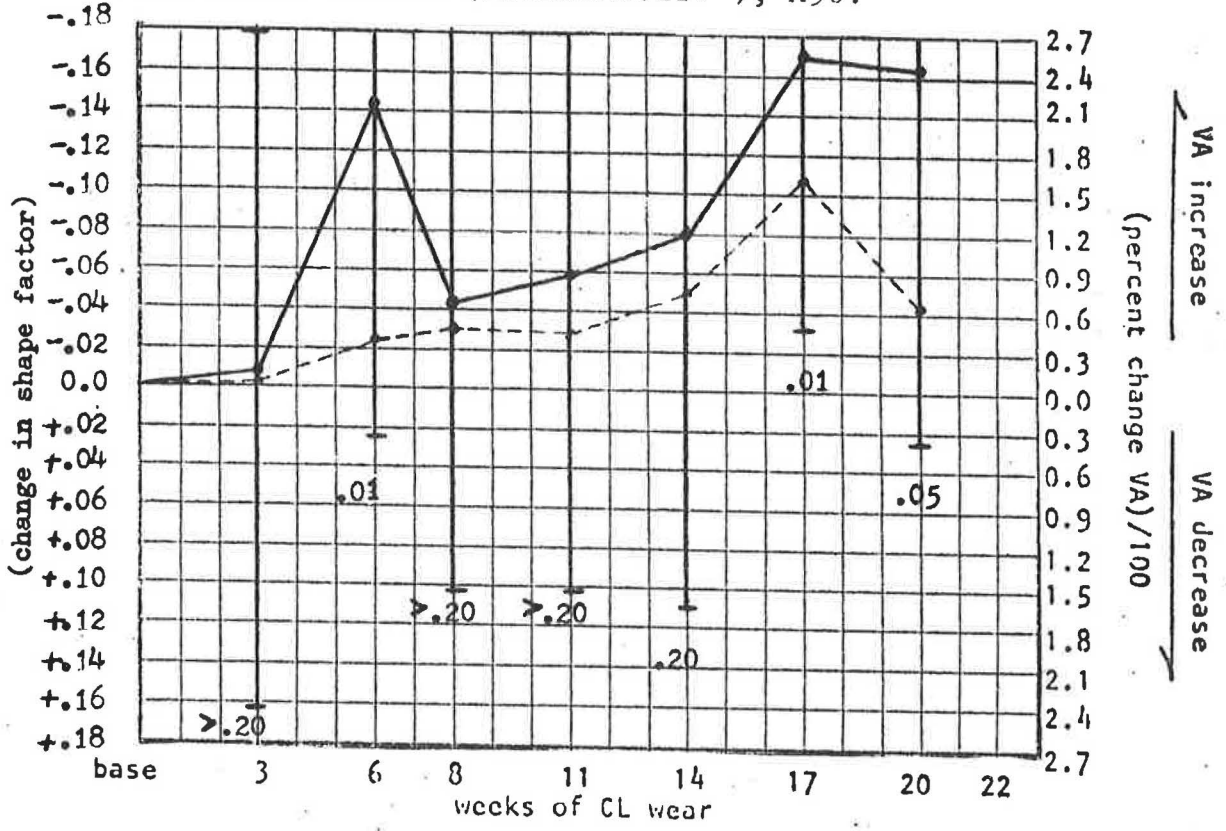
variable graphed: PEK SHAPE FACTOR (ECCENTRICITY^2), M90.



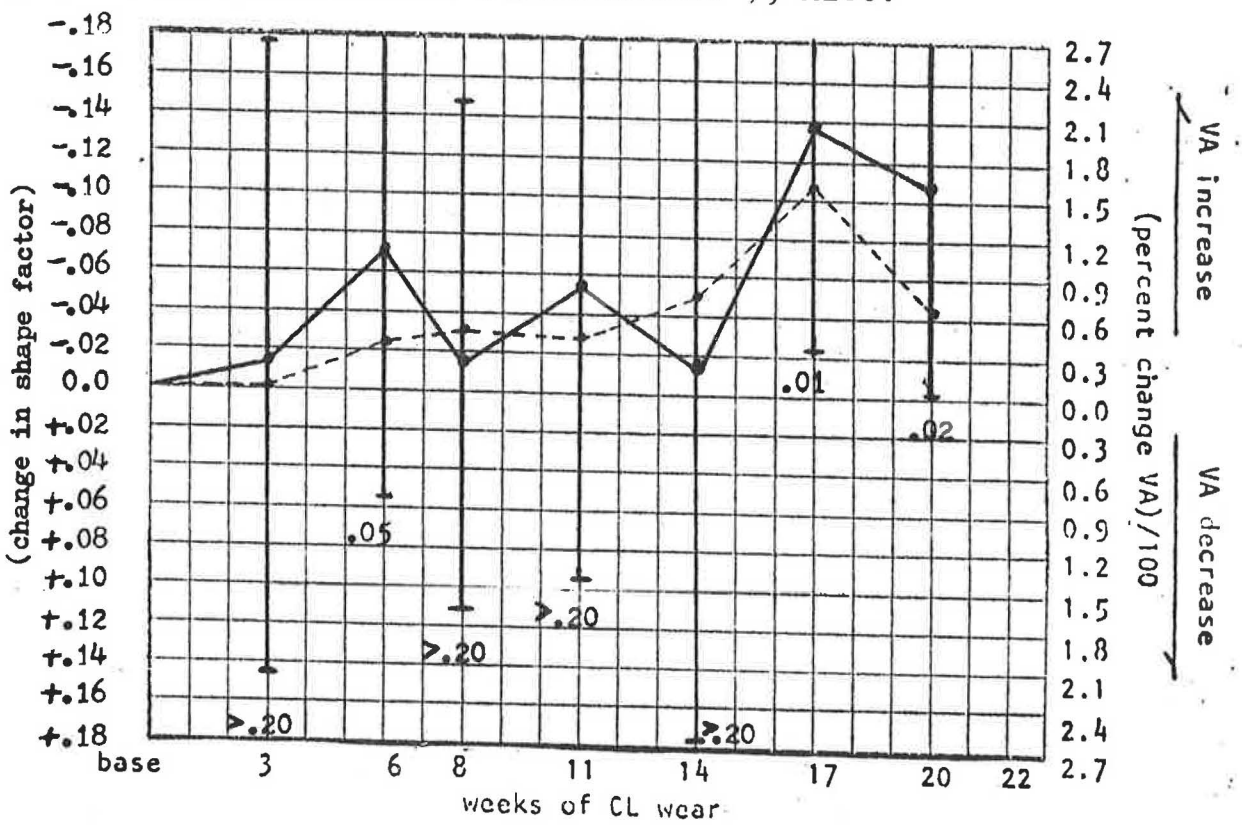
variable graphed: PEK SHAPE FACTOR (ECCENTRICITY^2), M180



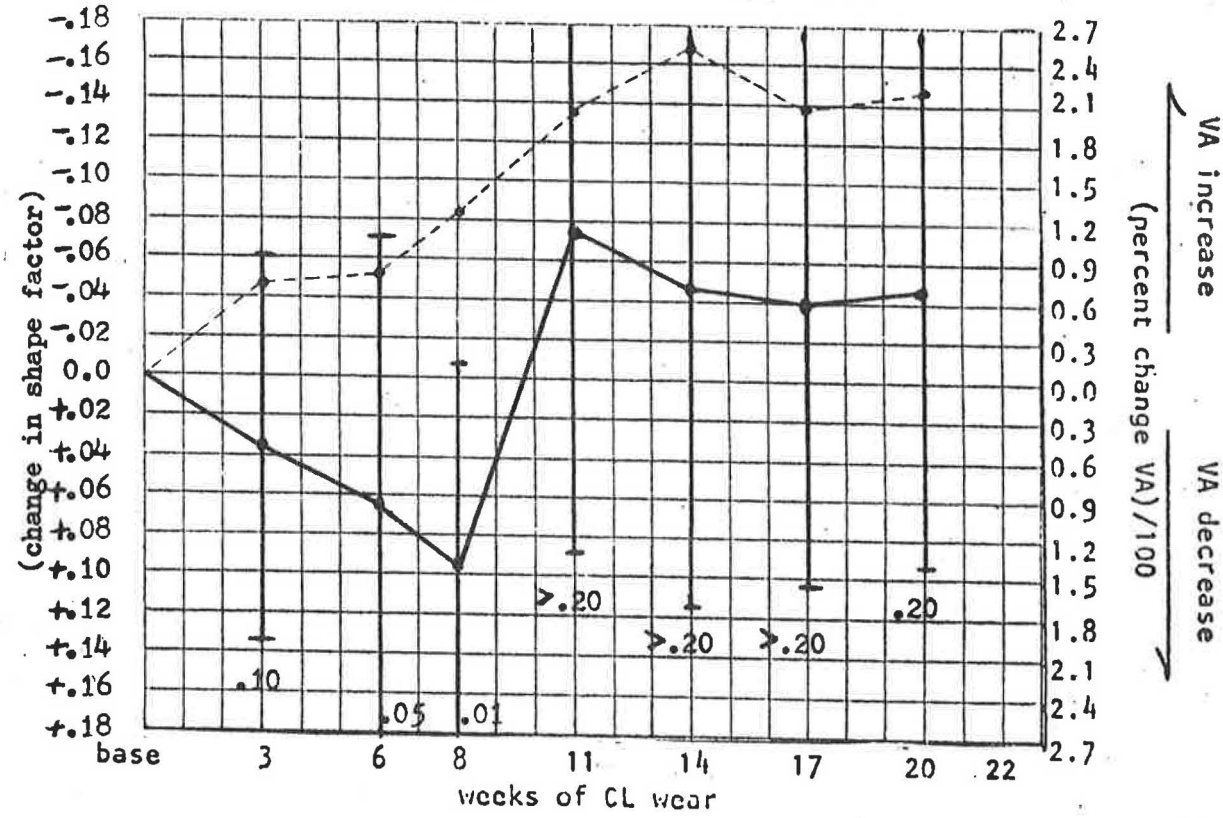
variable graphed: PEK SHAPE FACTOR (ECCENTRICITY^2), M90.



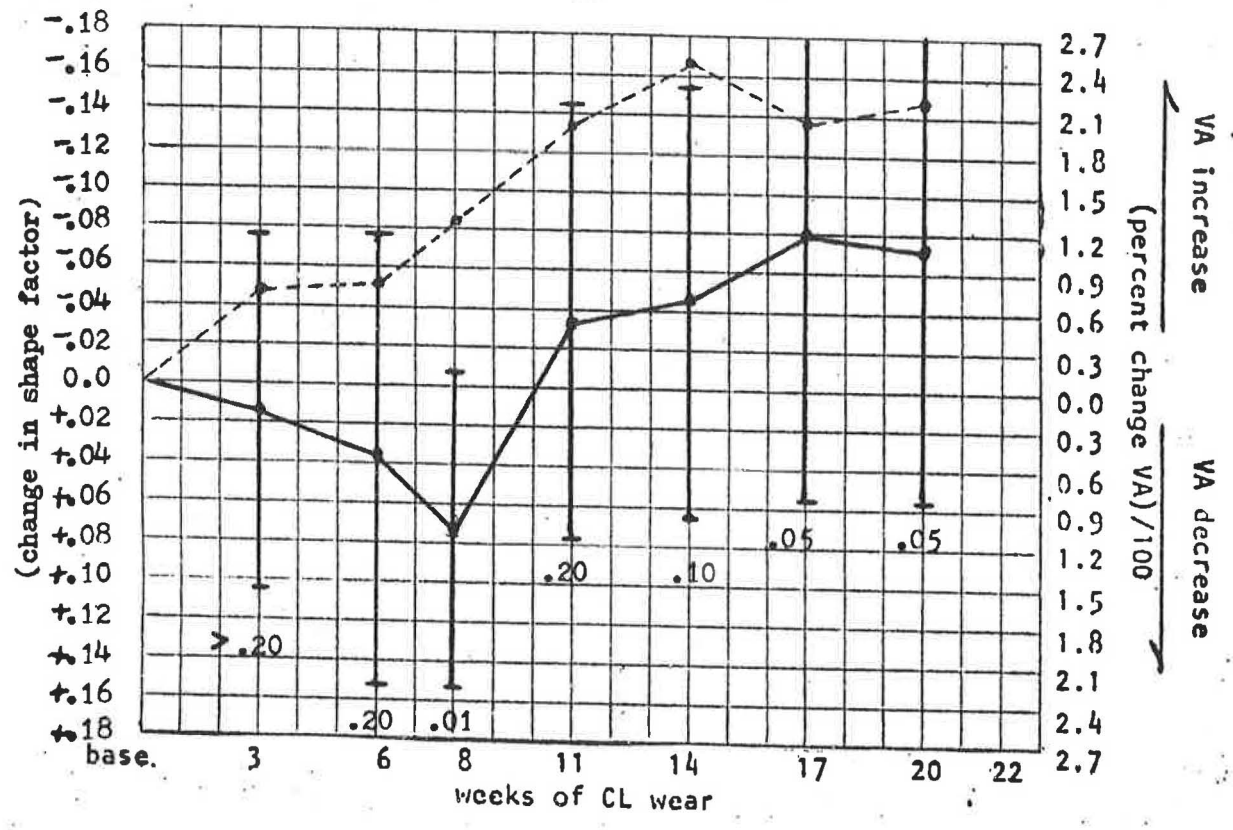
variable graphed: PEK SHAPE FACTOR (ECCENTRICITY^2), M180.



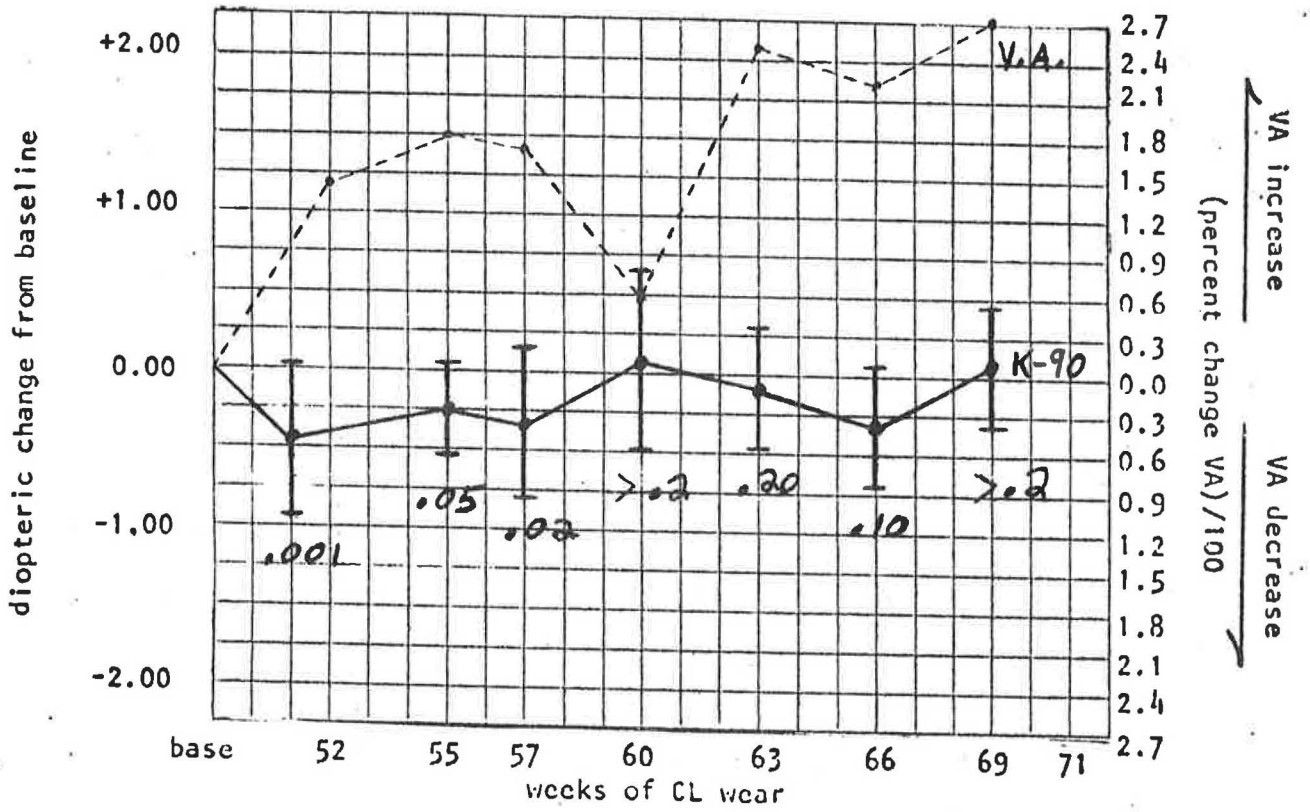
variable graphed: PEK SHAPE FACTOR (ECCENTRICITY^2), M90.



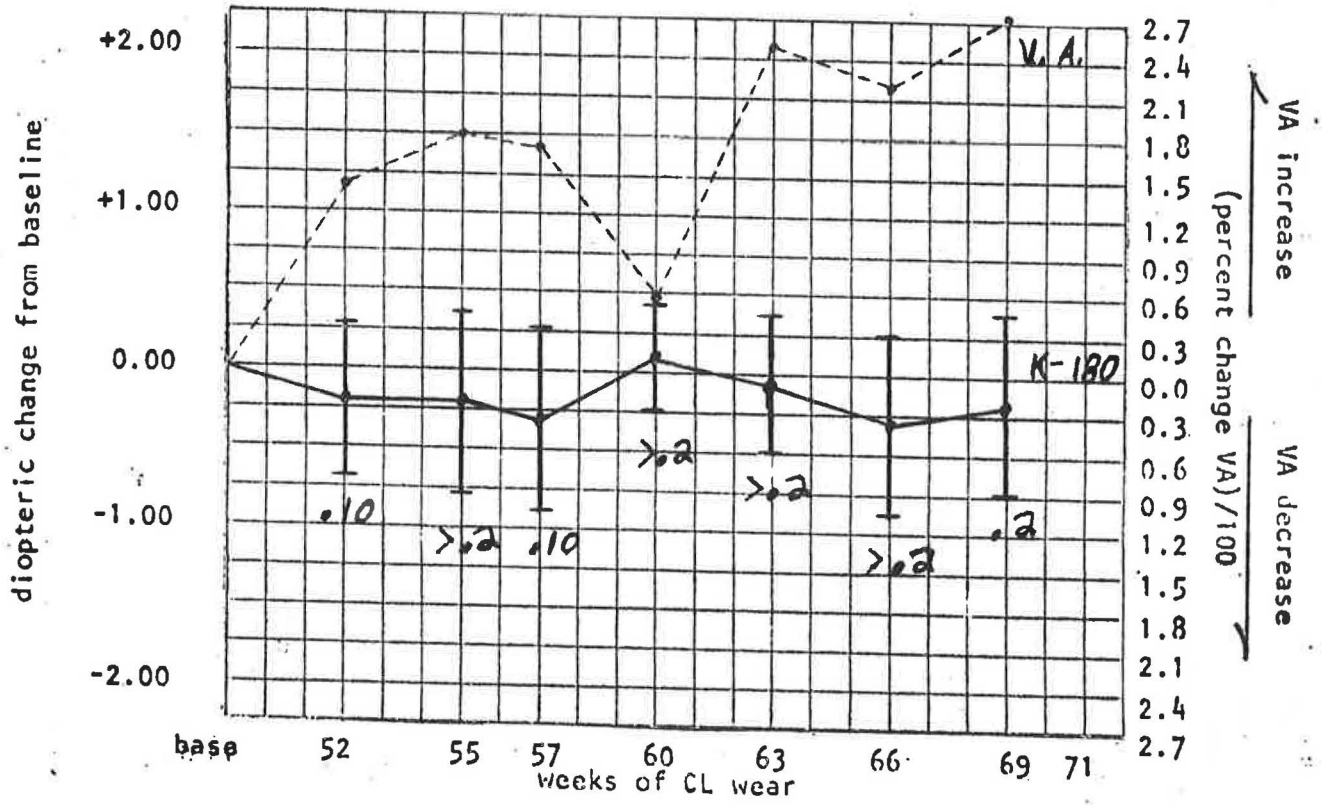
variable graphed: PEK SHAPE FACTOR (ECCENTRICITY^2), M180.



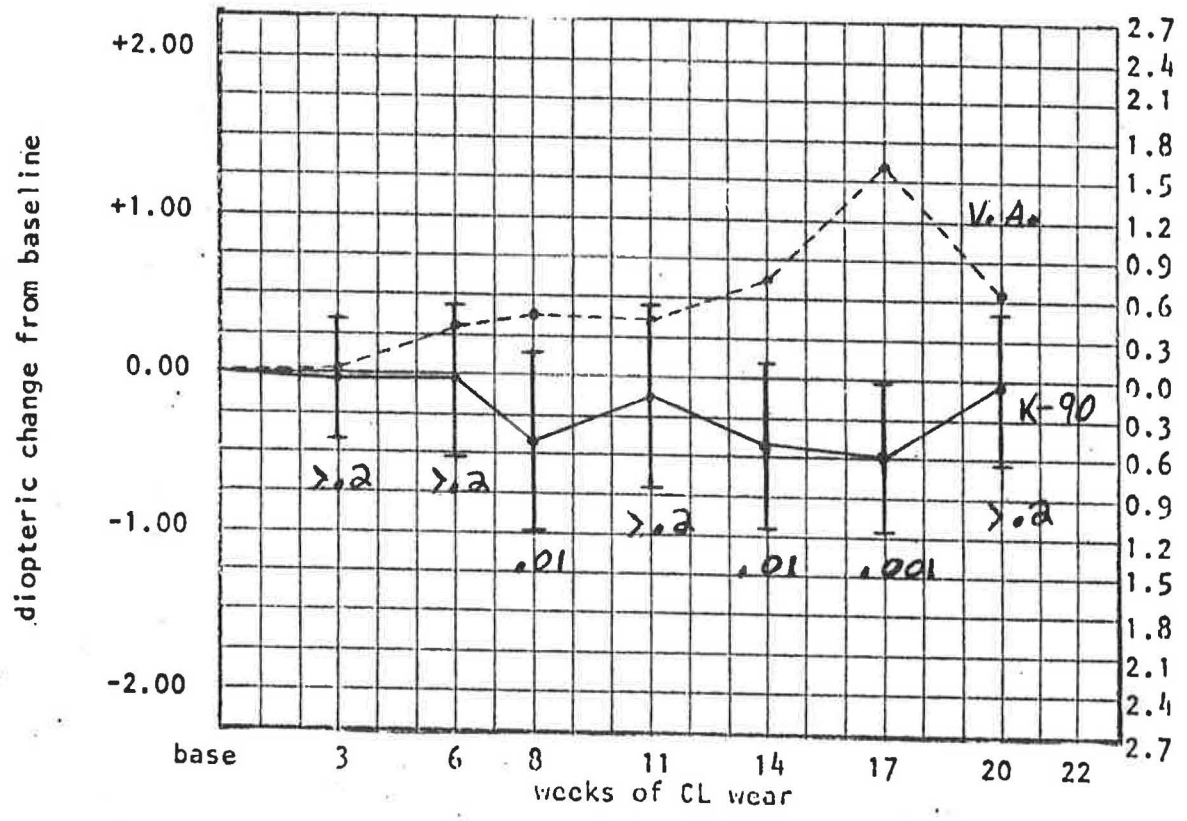
variable graphed: KERATOMETER POWER NEAREST MERIDIAN 90



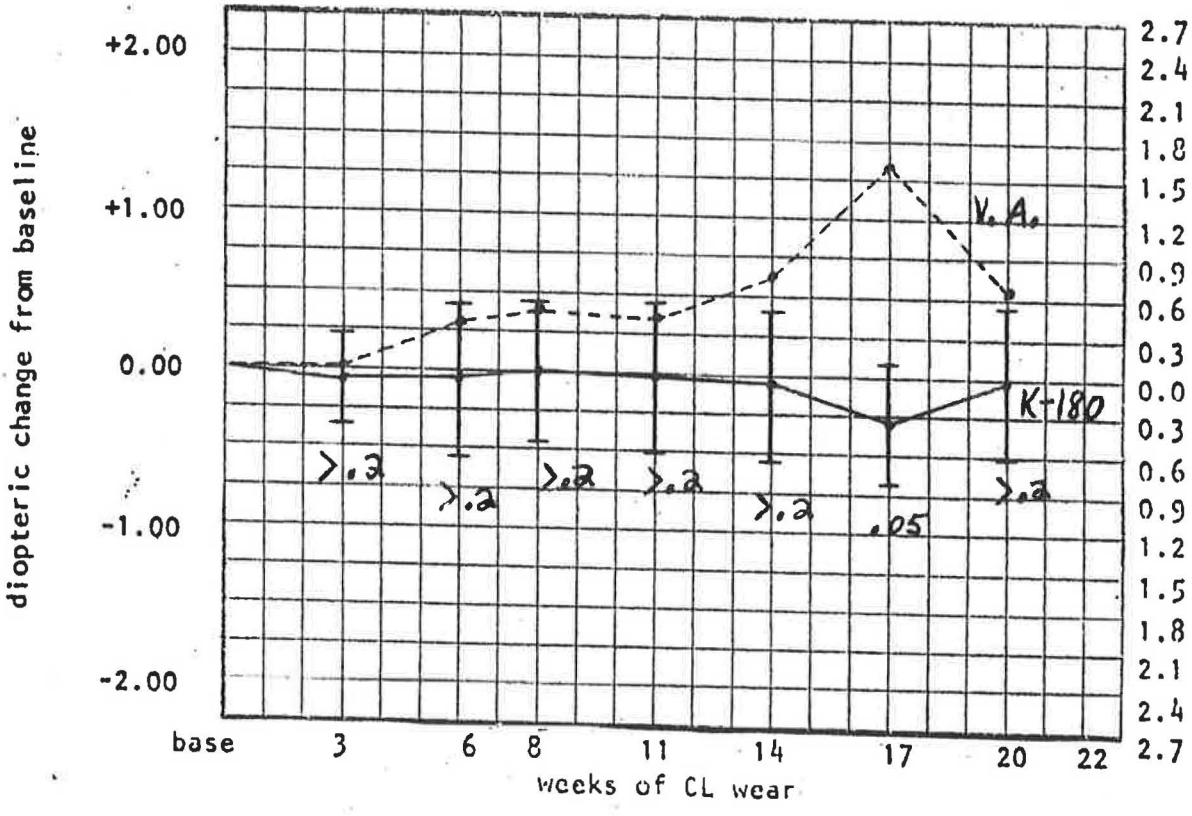
variable graphed: KERATOMETER POWER NEAREST MERIDIAN 180



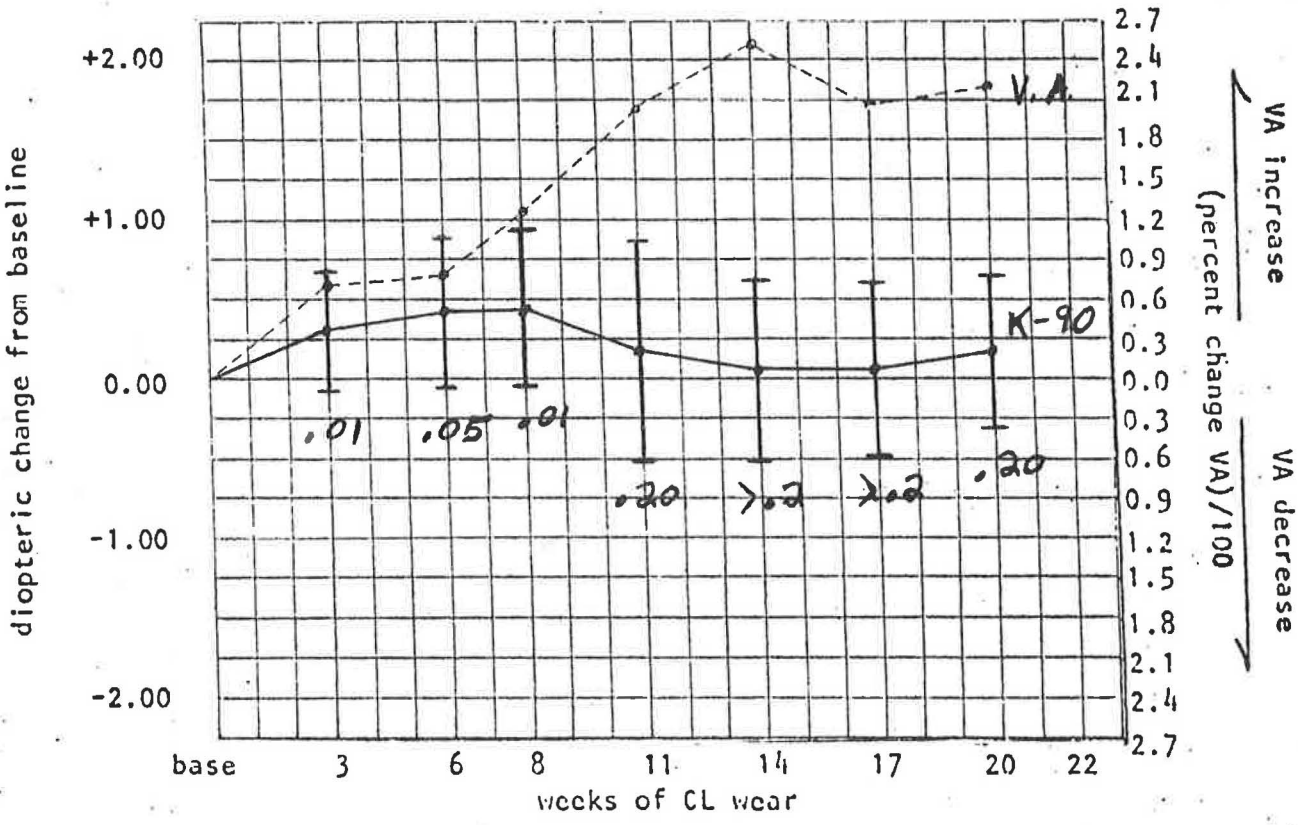
variable graphed: KERATOMETER POWER NEAREST MERIDIAN 90



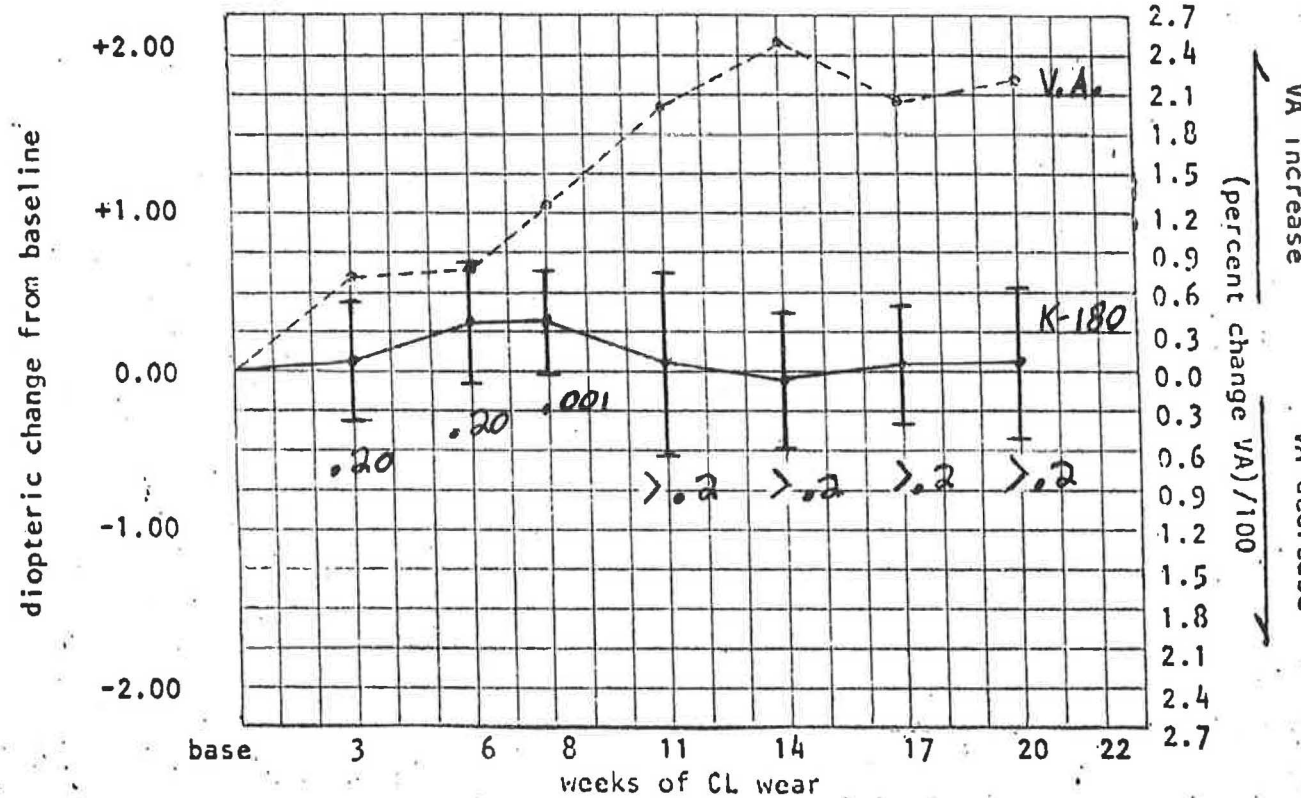
variable graphed: KERATOMETER POWER NEAREST MERIDIAN 180



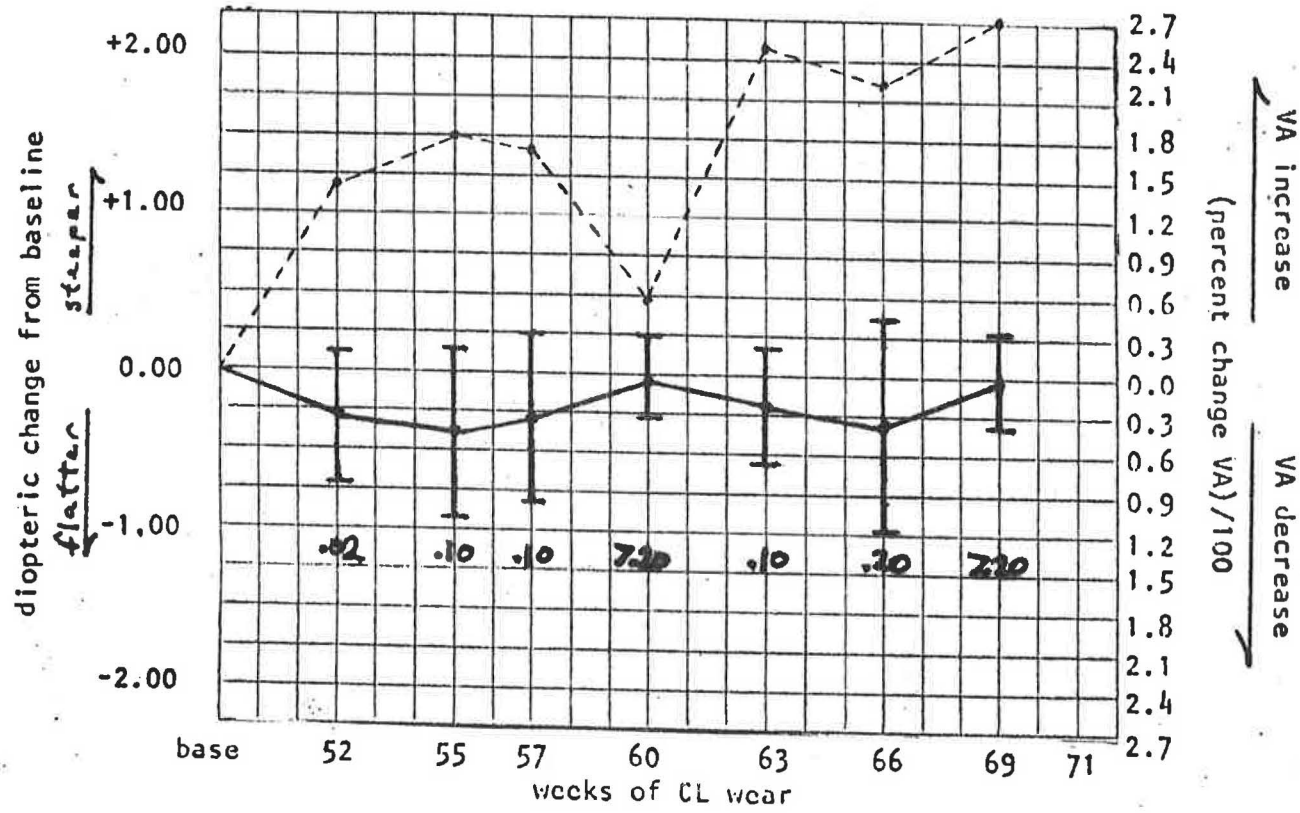
variable graphed: KERATOMETER POWER NEAREST MERIDIAN 90



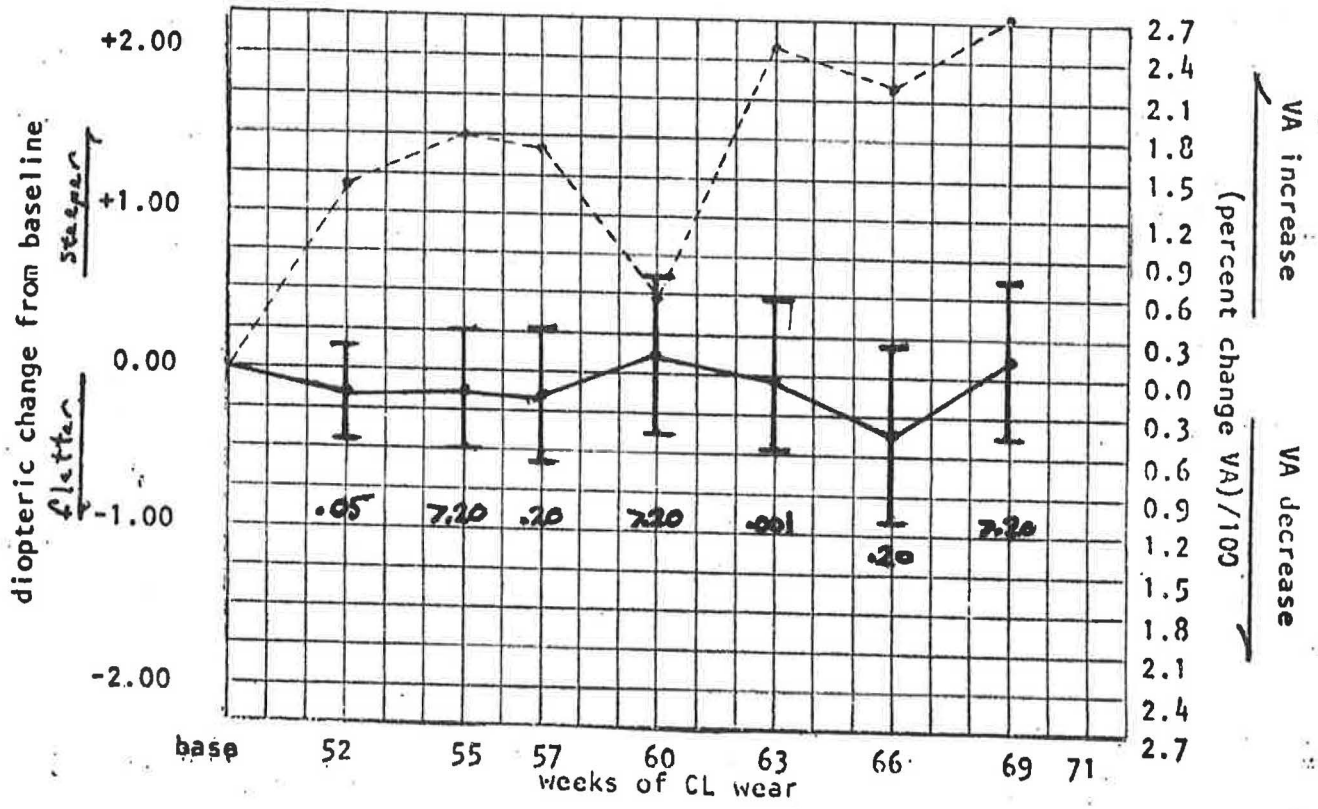
variable graphed: KERATOMETER POWER NEAREST MERIDIAN 180



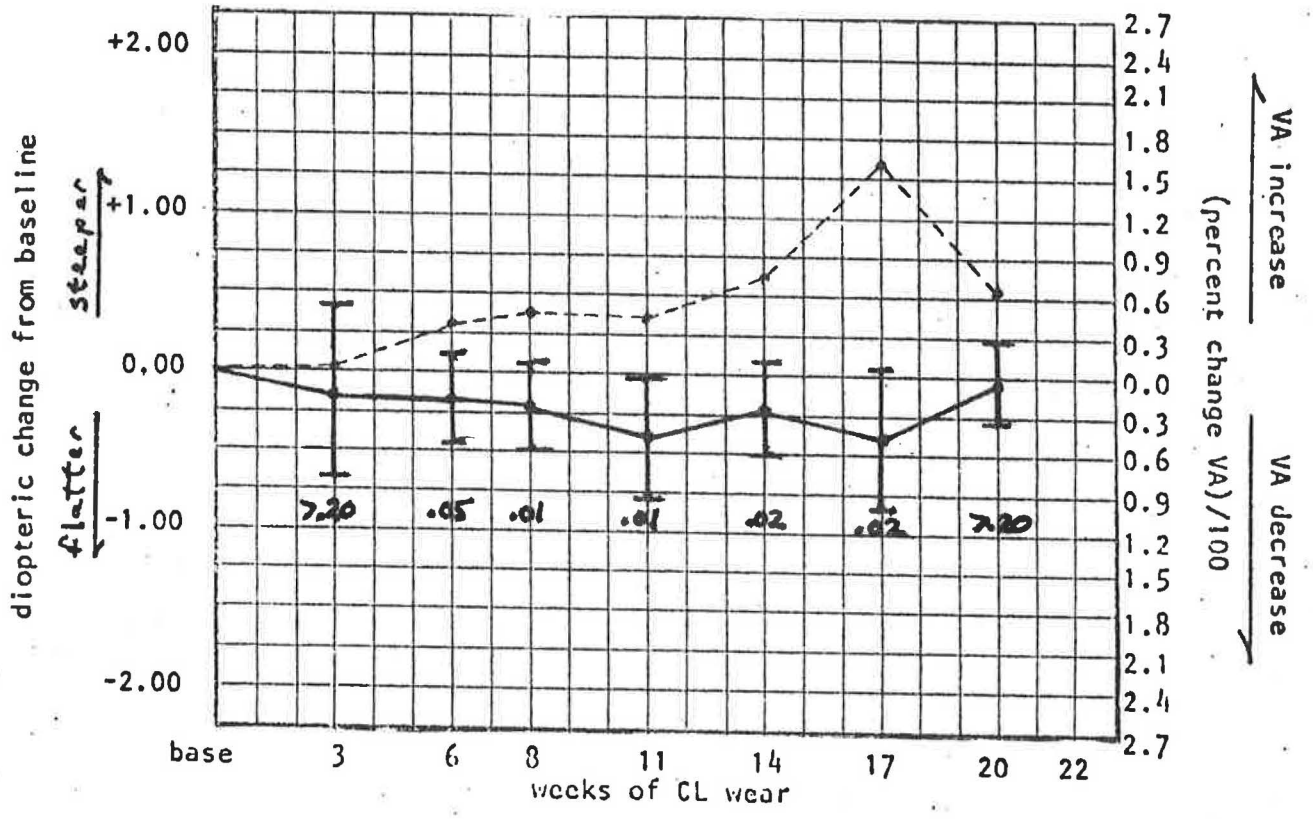
variable graphed: PEK POWER NEAREST 180



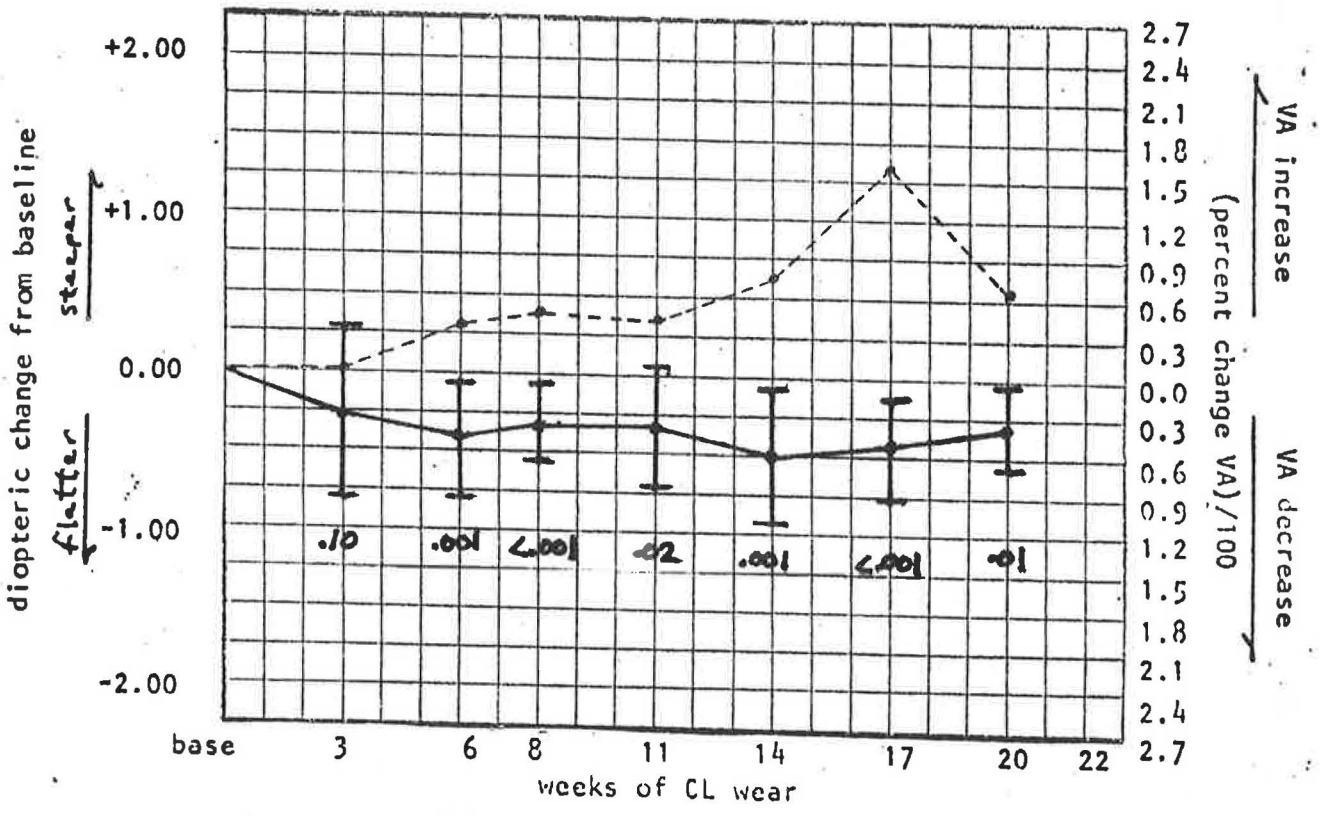
variable graphed: PEK POWER NEAREST 90



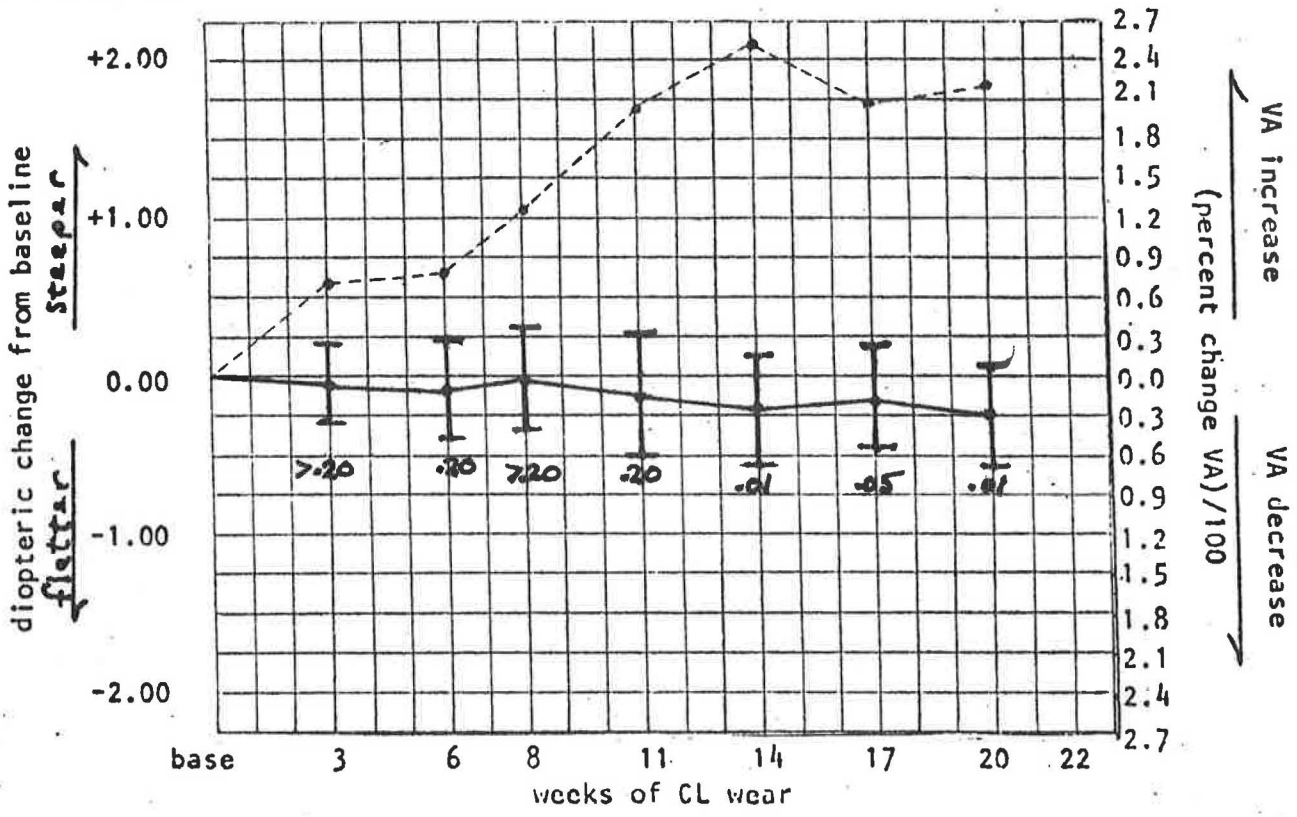
variable graphed: PEK POWER NEAREST 180



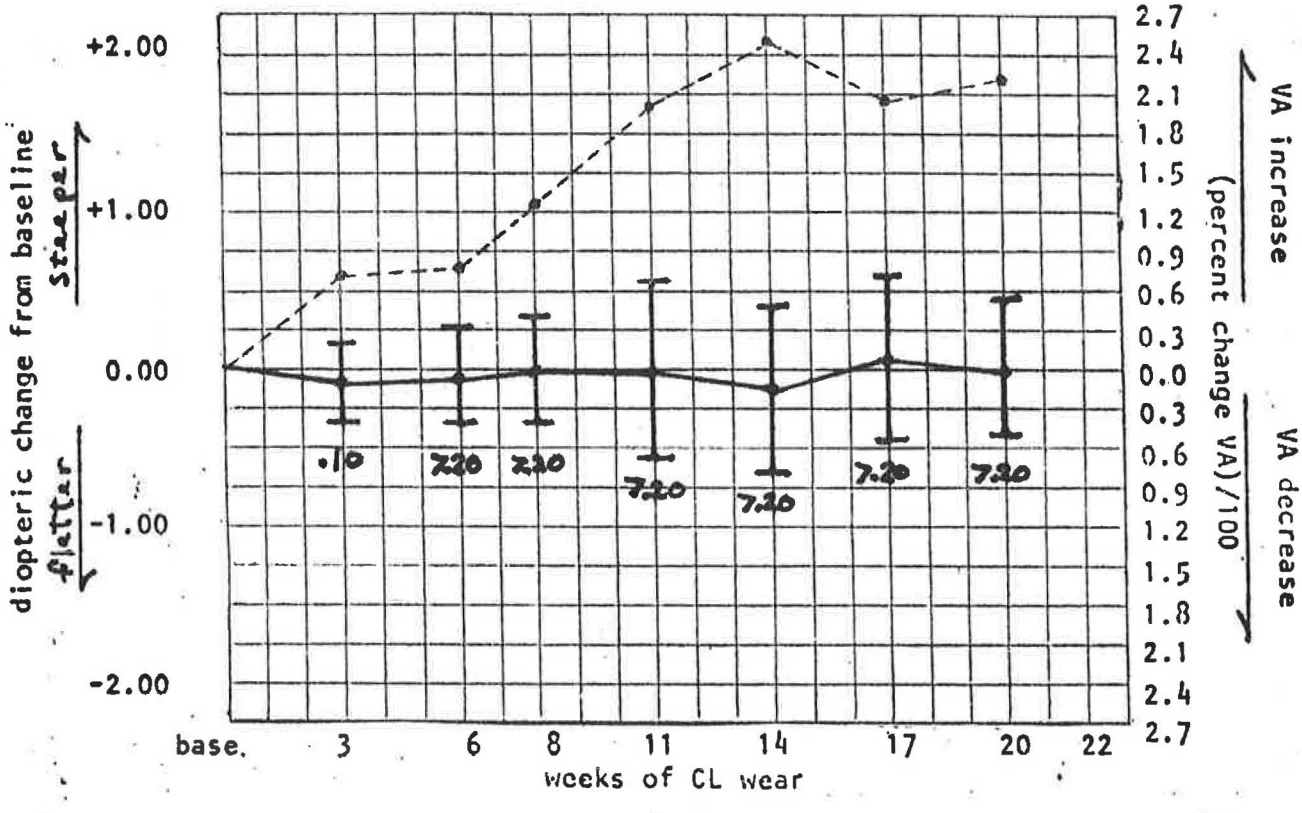
variable graphed: PEK POWER NEAREST 90



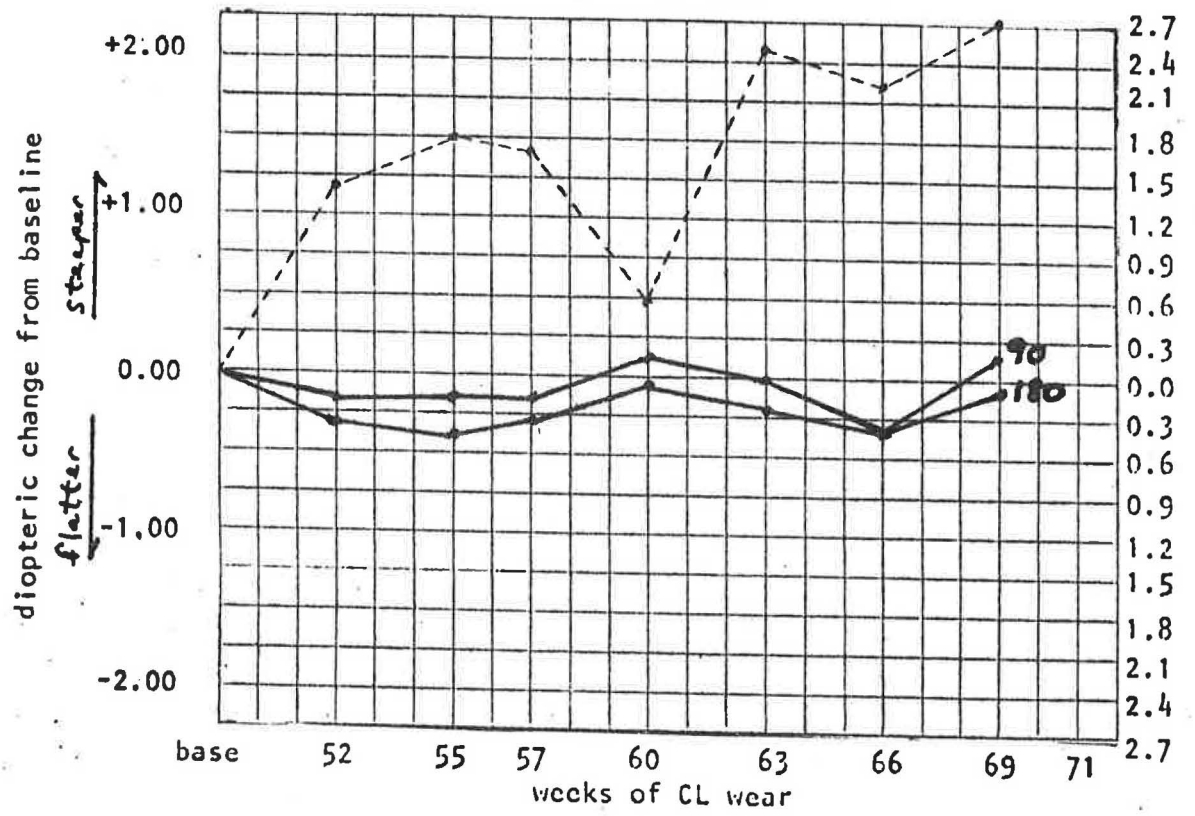
variable graphed: PEK POWER NEAREST 180



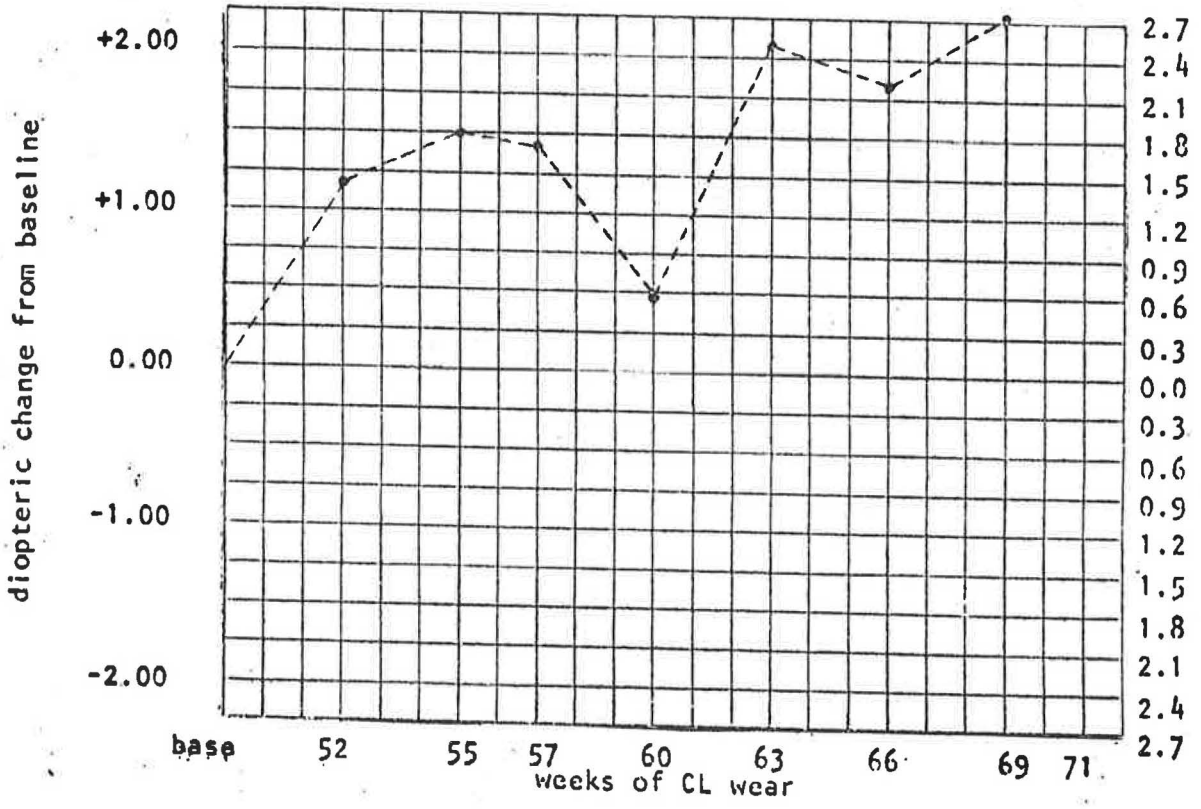
variable graphed: PEK POWER NEAREST 90



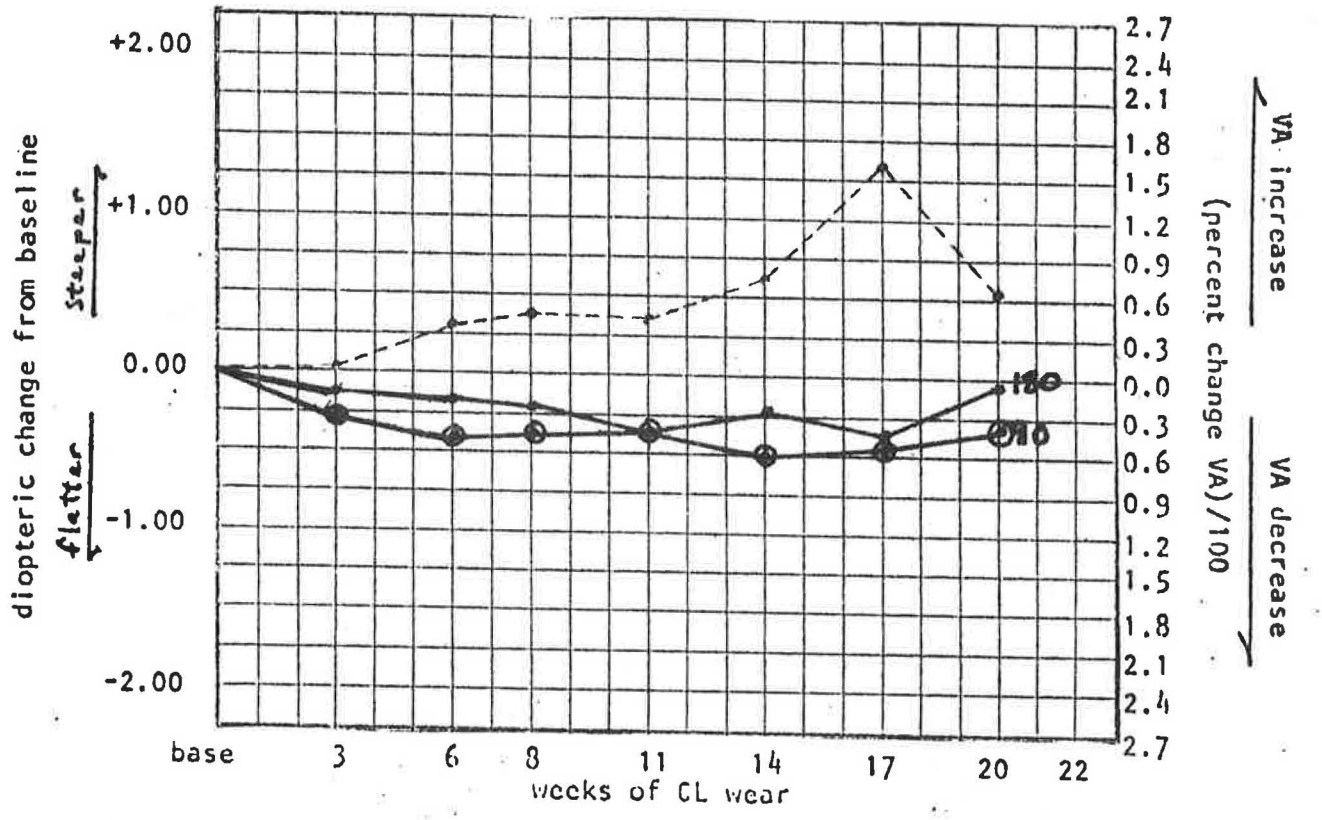
variable graphed: PEK POWER NEAREST 90 AND 180



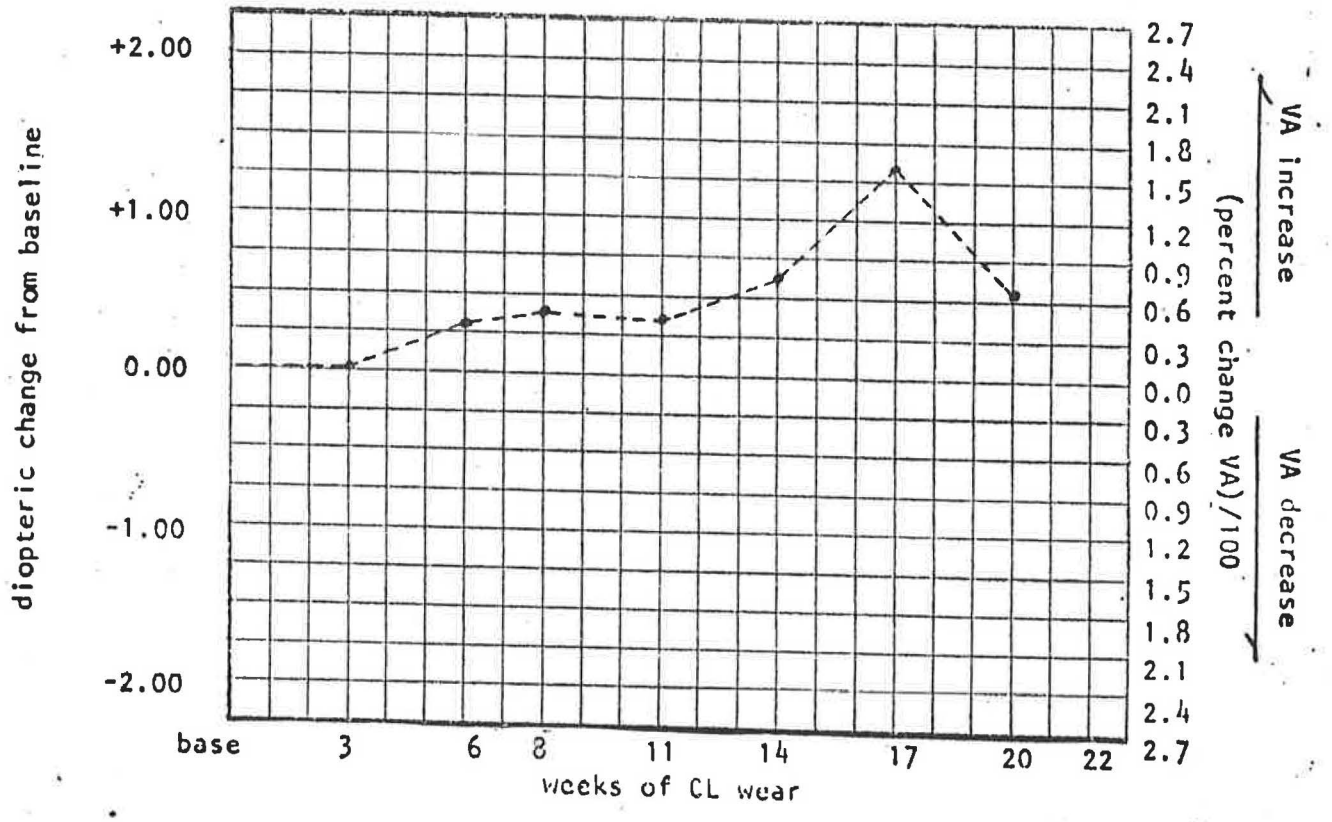
variable graphed:



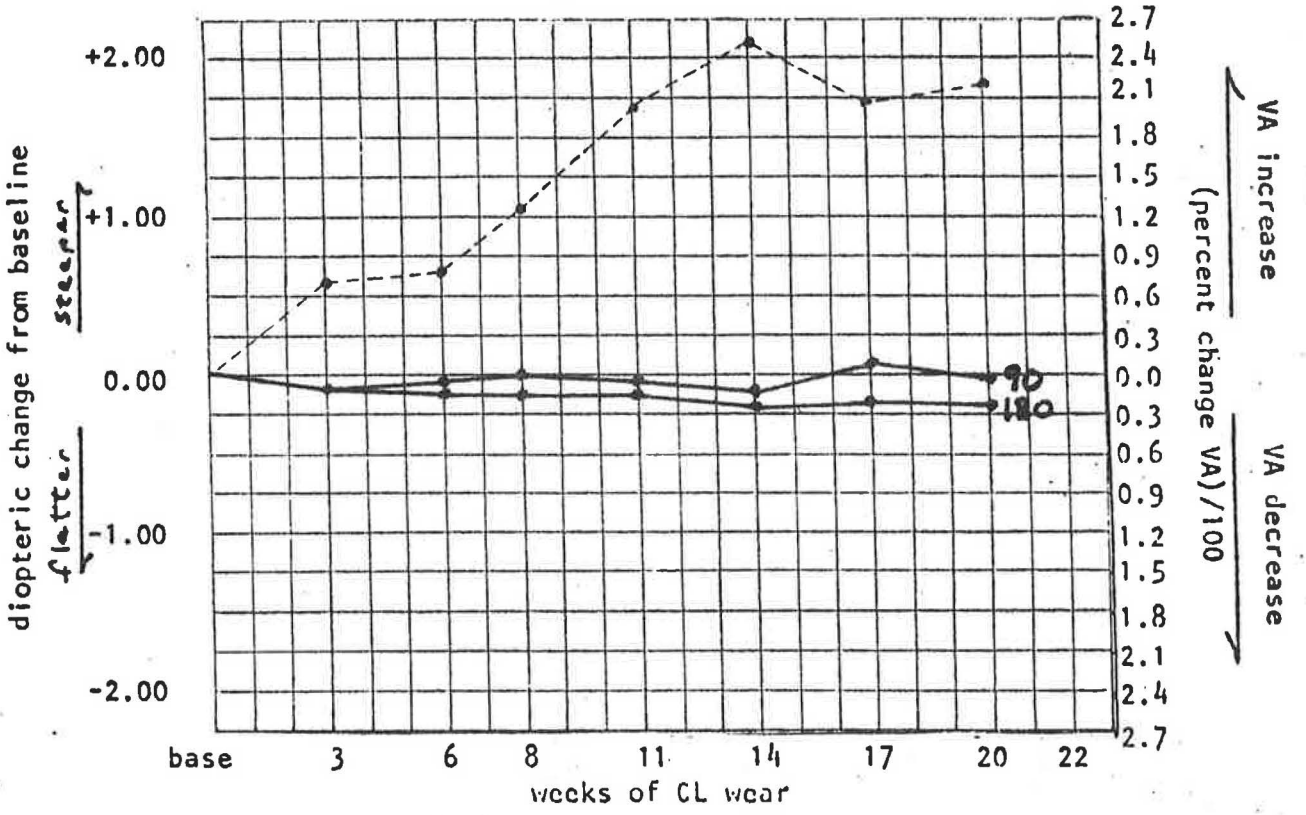
variable graphed: PEK POWER NEAREST 90 AND 180



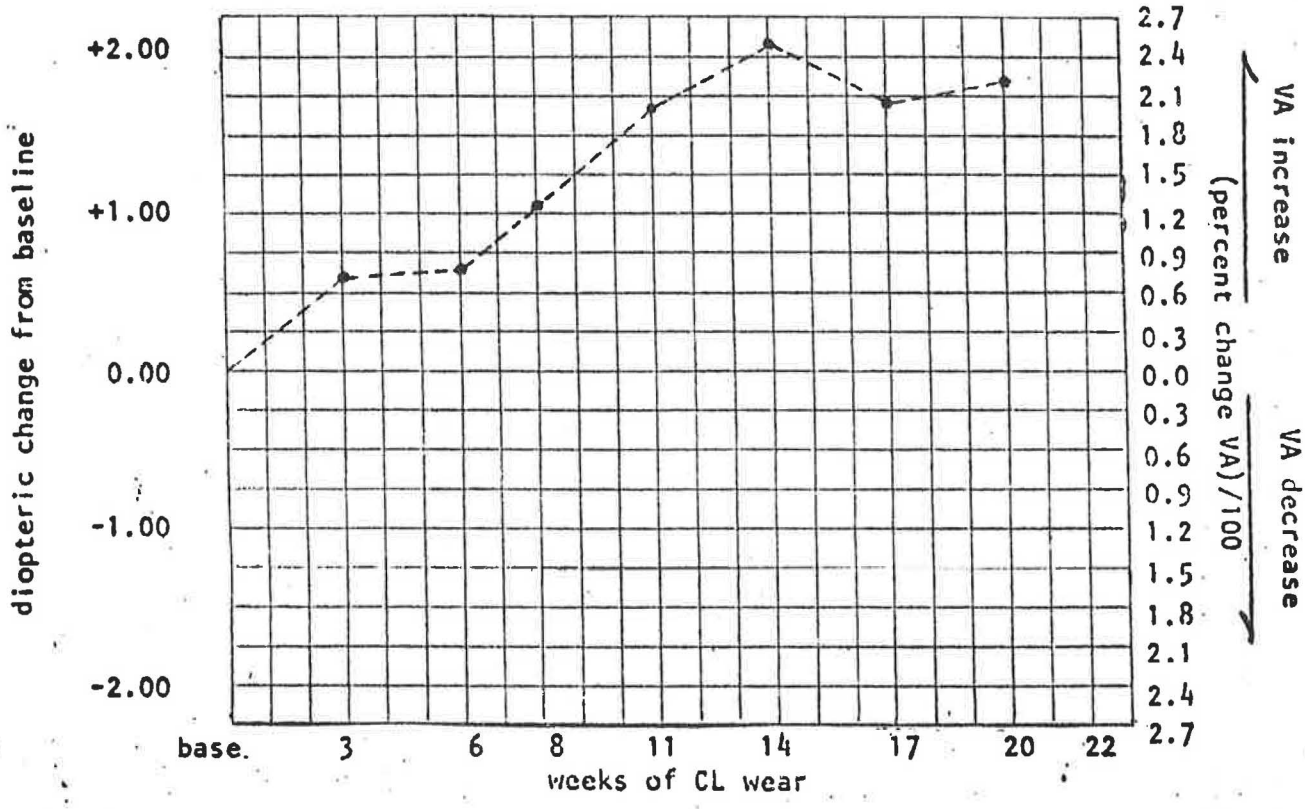
variable graphed:



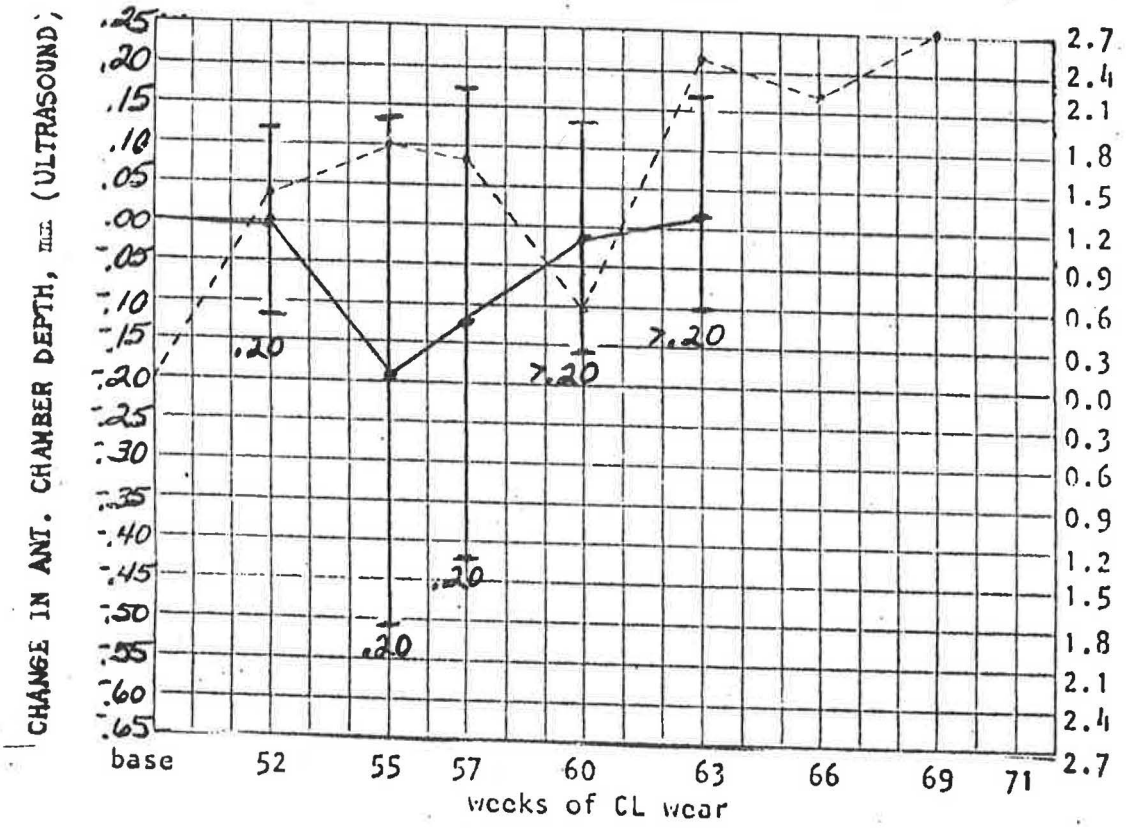
variable graphed: PEK POWER NEAREST 90 AND 180



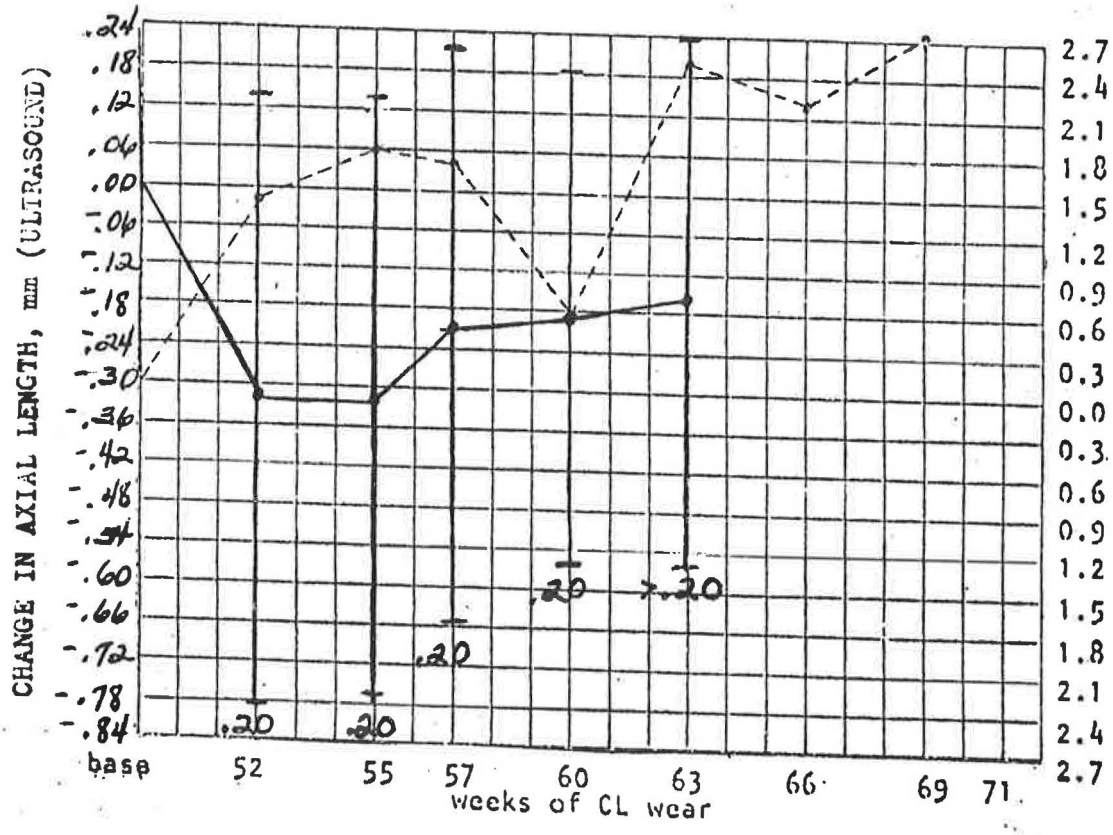
variable graphed:



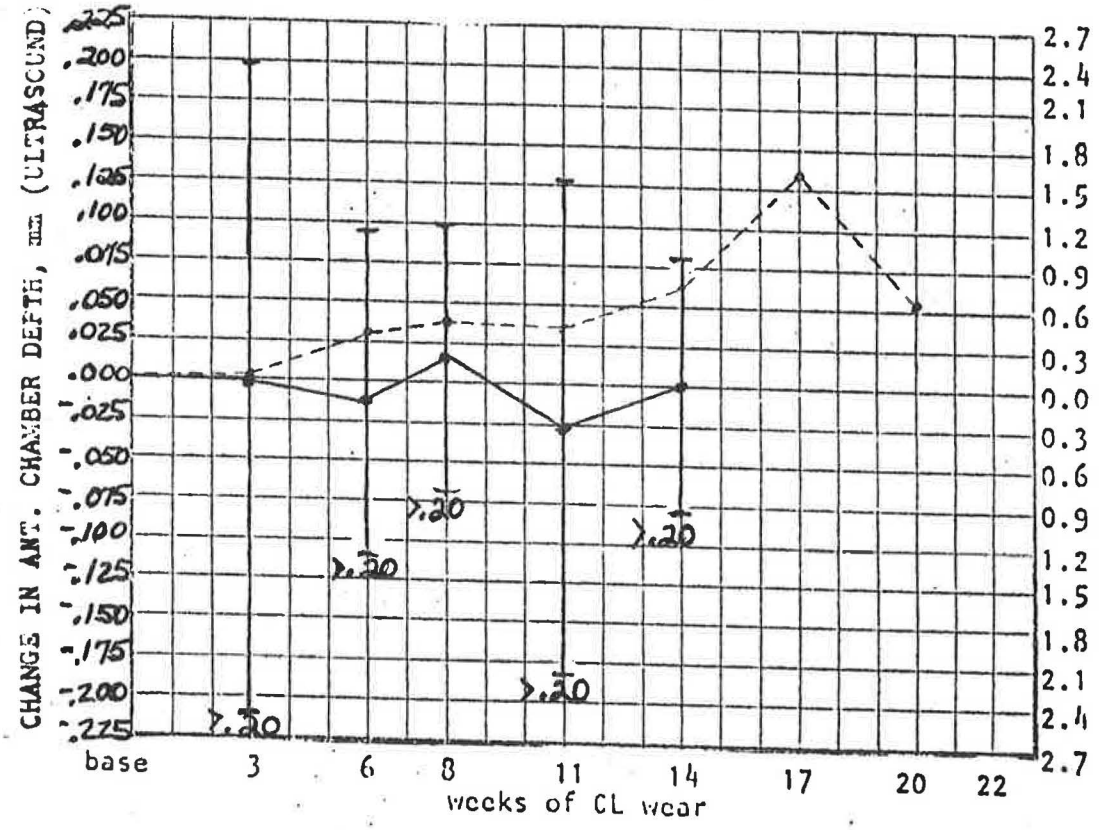
variable graphed: ANTERIOR CHAMBER DEPTH (ULTRASOUND)



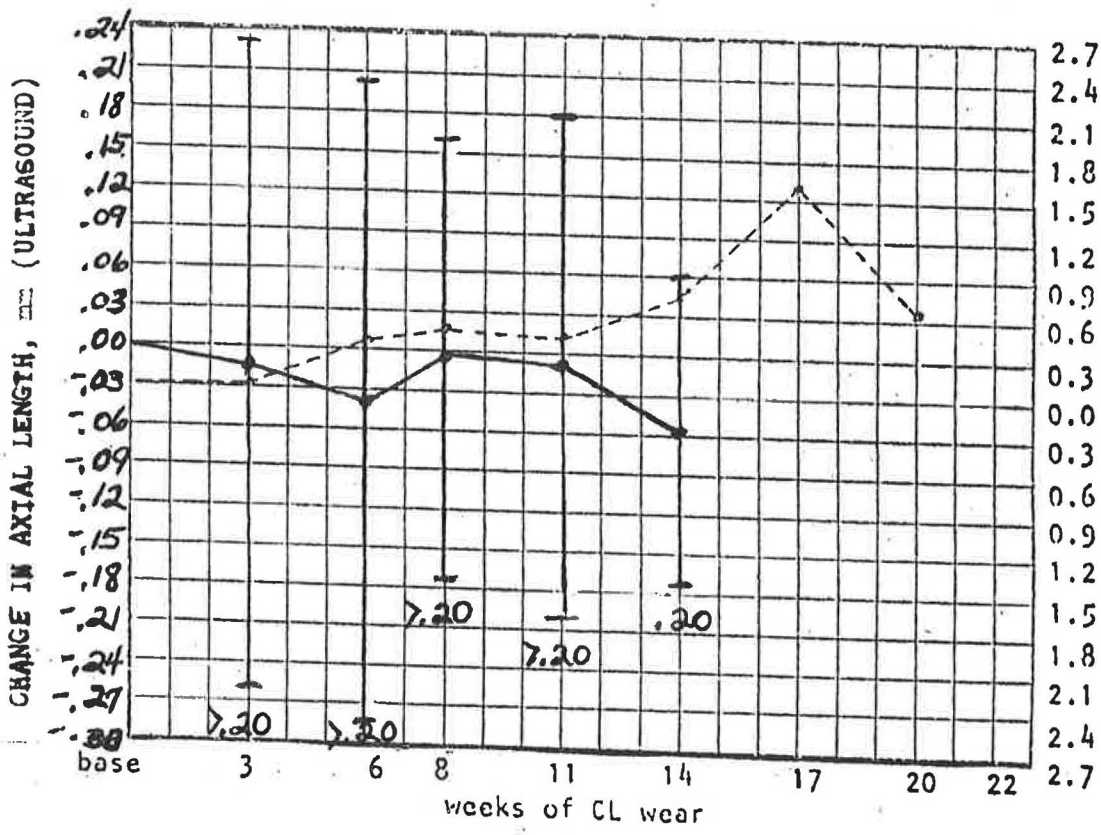
variable graphed: AXIAL LENGTH (ULTRASOUND)



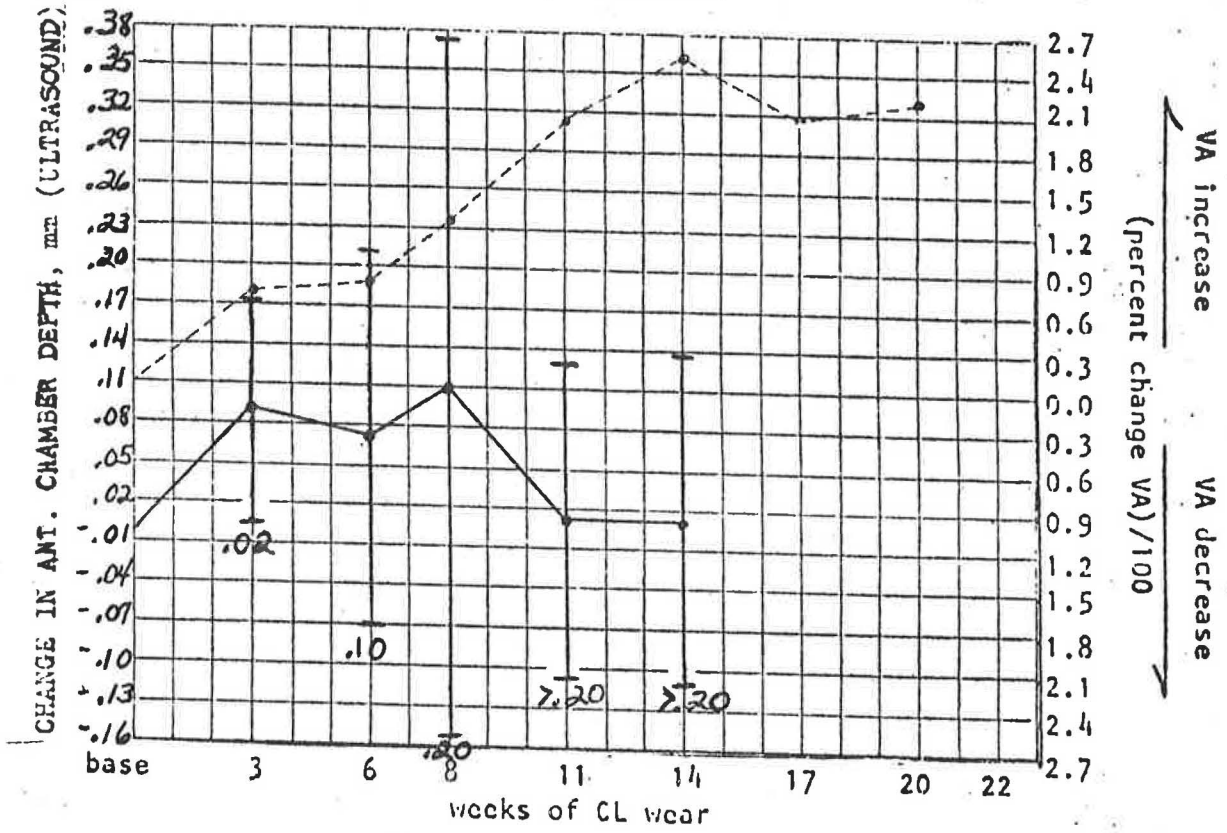
variable graphed: ANTERIOR CHAMBER DEPTH (ULTRASOUND)



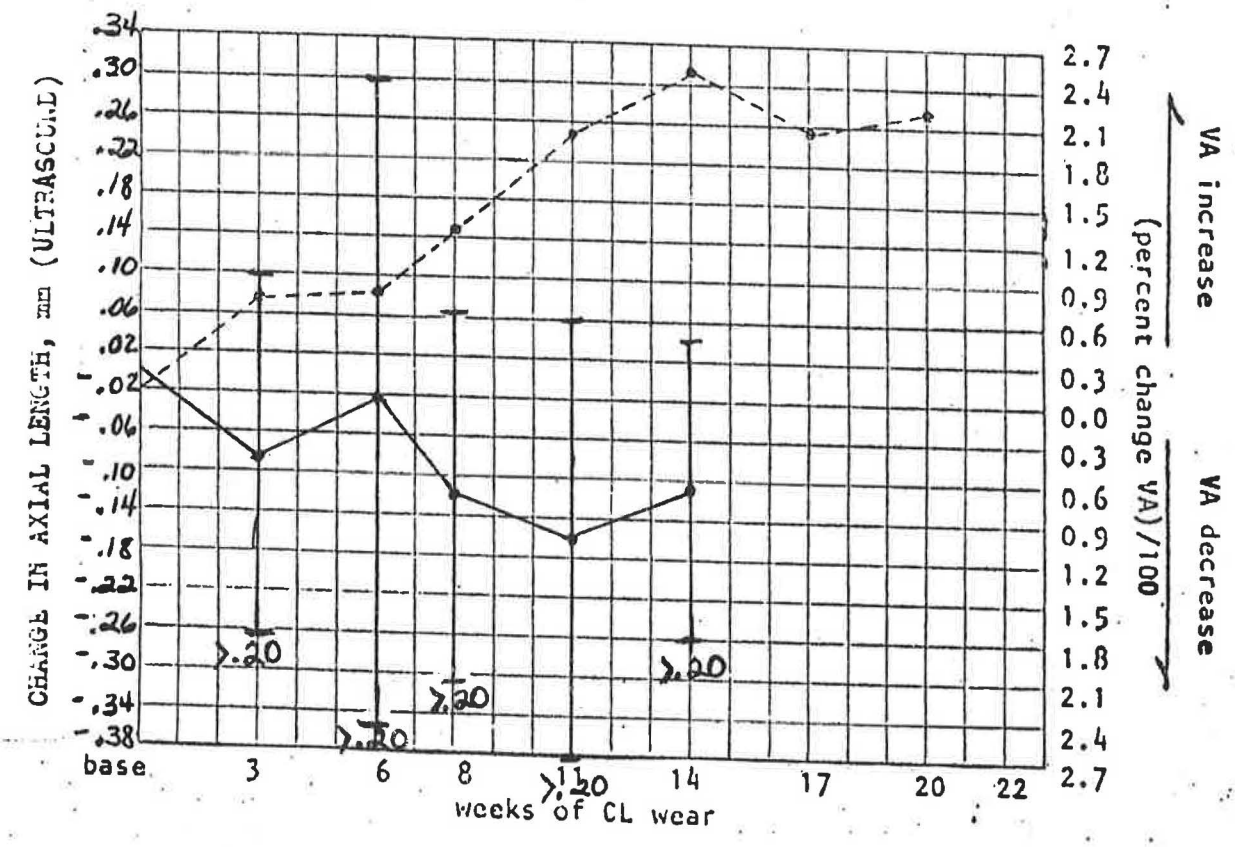
variable graphed: ULTRASOUND AXIAL LENGTH



variable graphed: ANTERIOR CHAMBER DEPTH (ULTRASOUND)

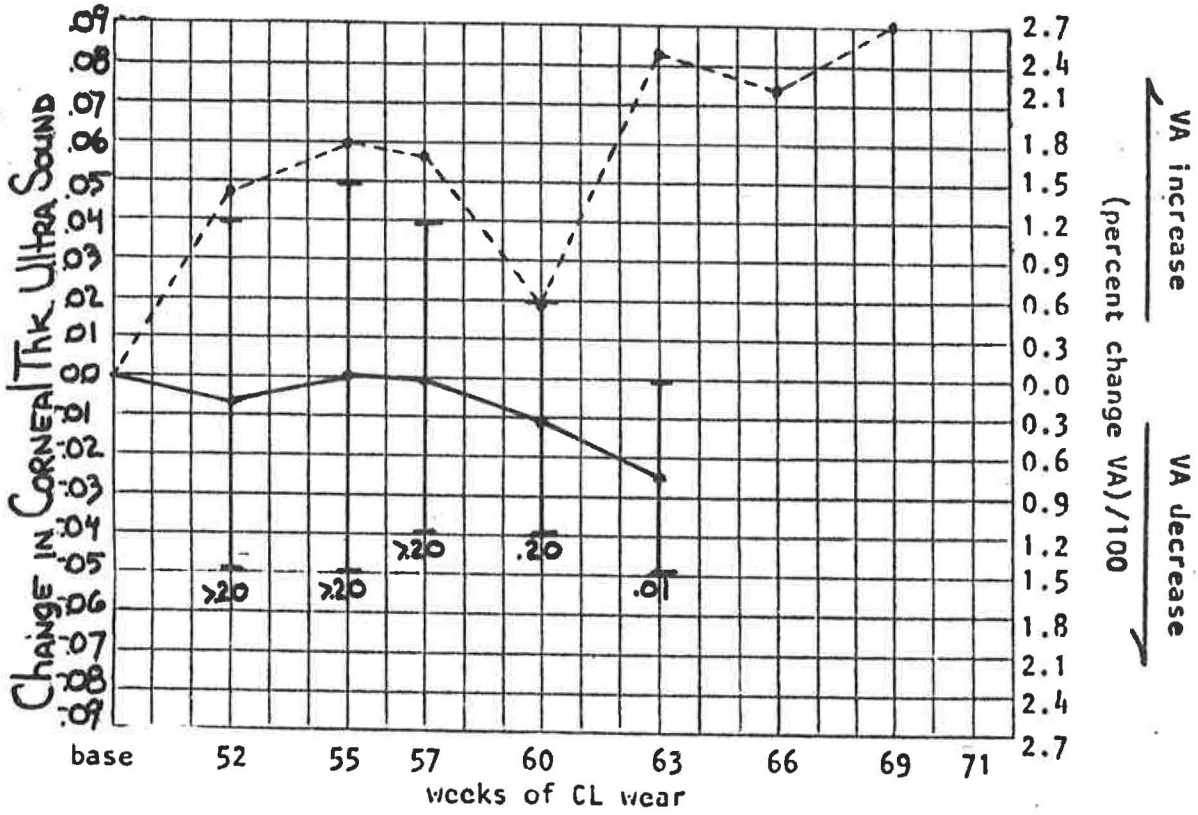


variable graphed: AXIAL LENGTH (ULTRASOUND)

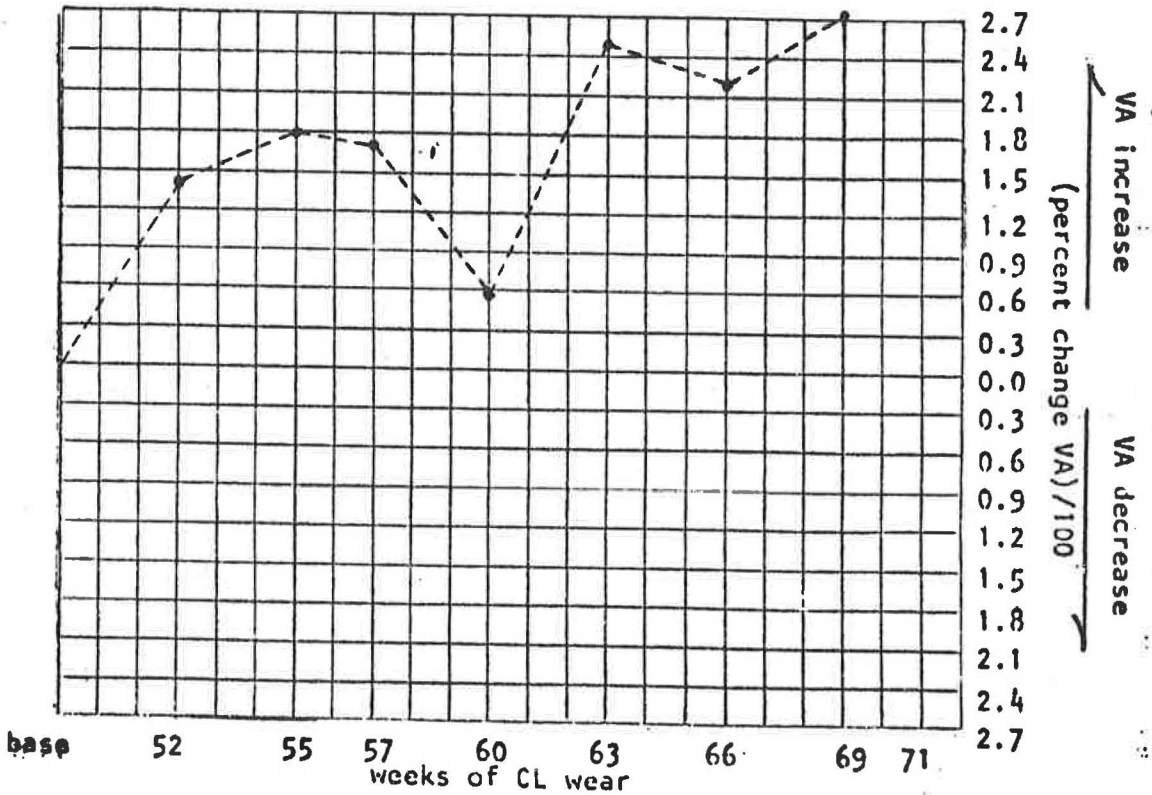


Project 1
Orthokeratology Group

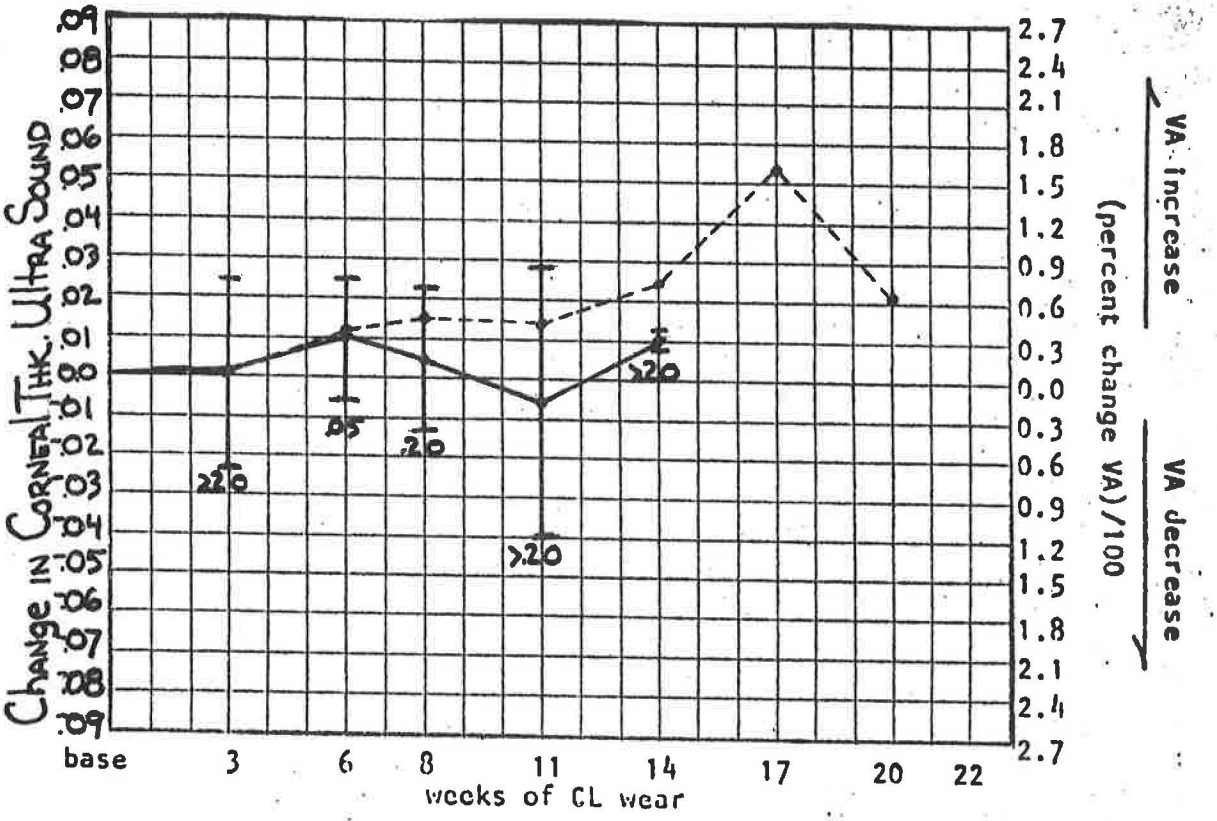
variable graphed: CORNEAL THICKNESS (ULTRASOUND)



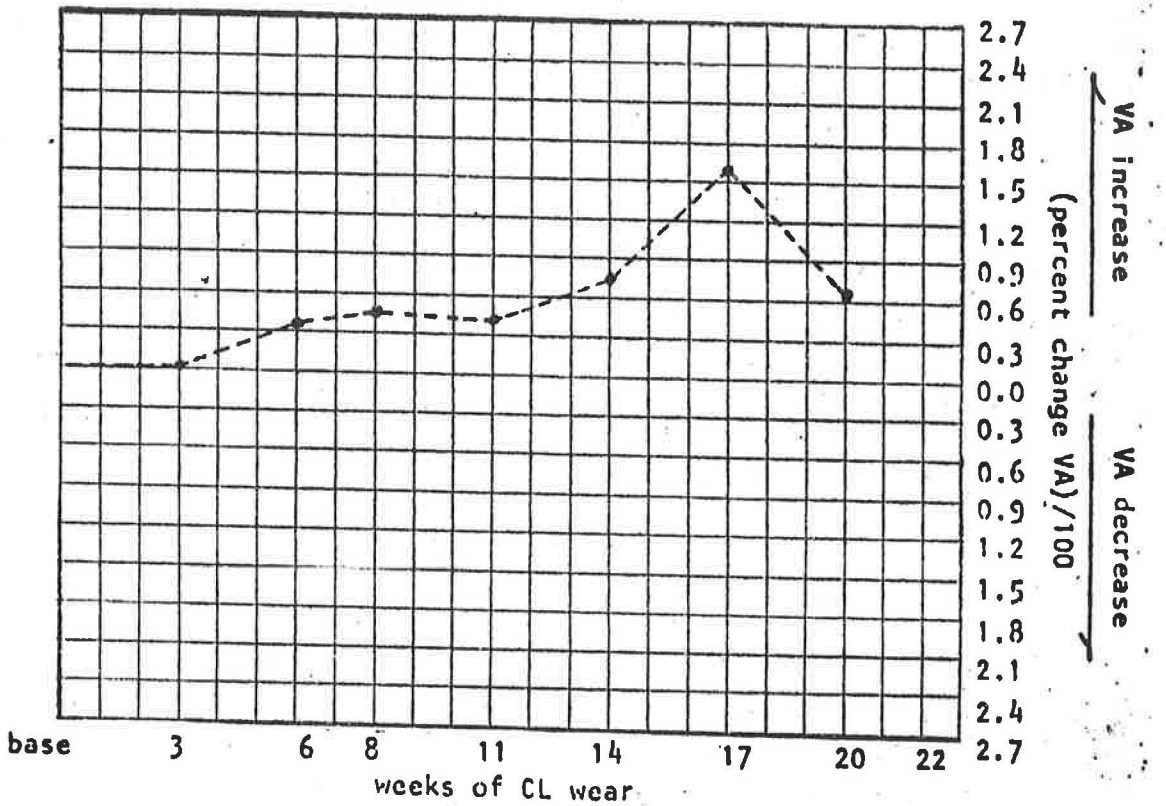
variable graphed:



variable graphed: CORNEAL THICKNESS (ULTRASOUND)

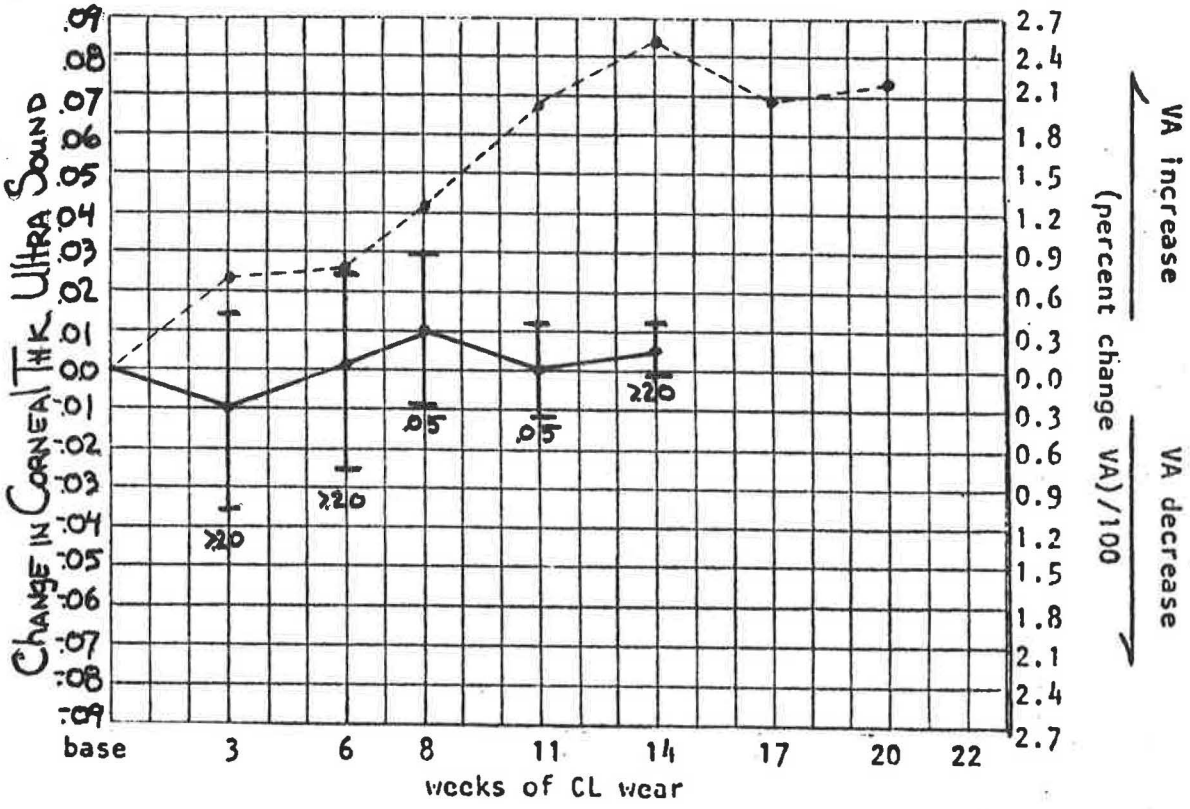


variable graphed:

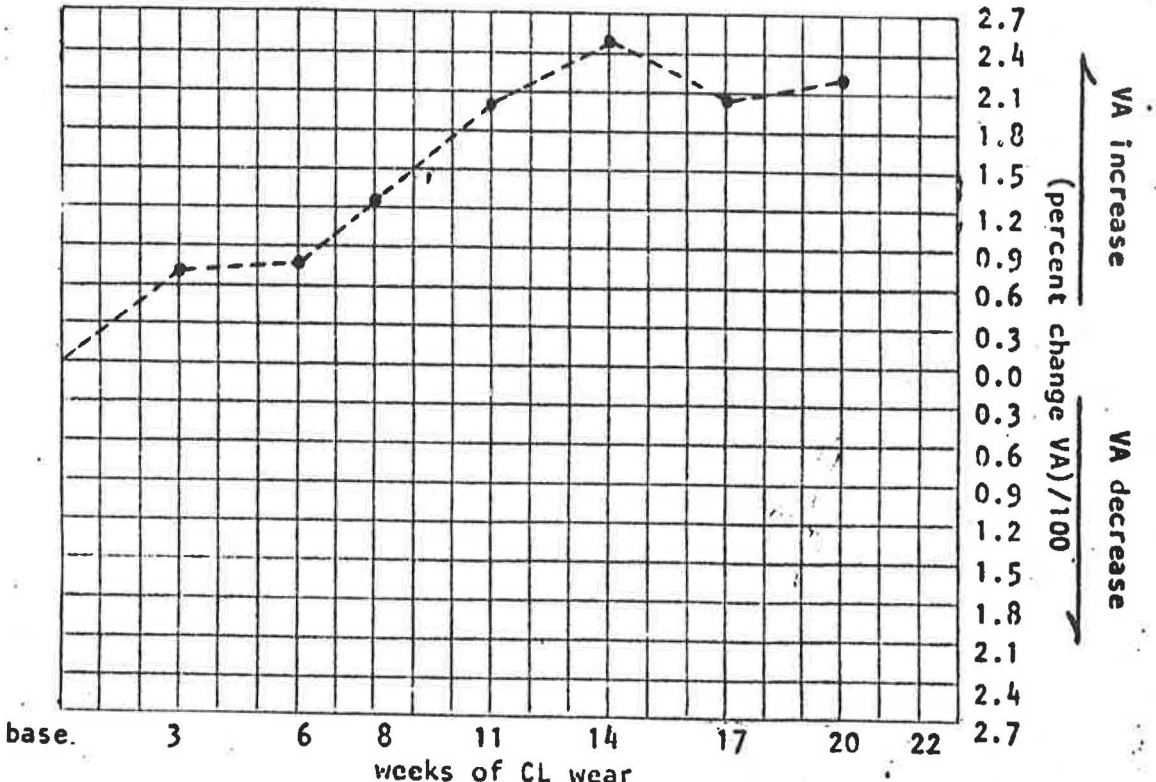


Project II
Orthokeratology Group

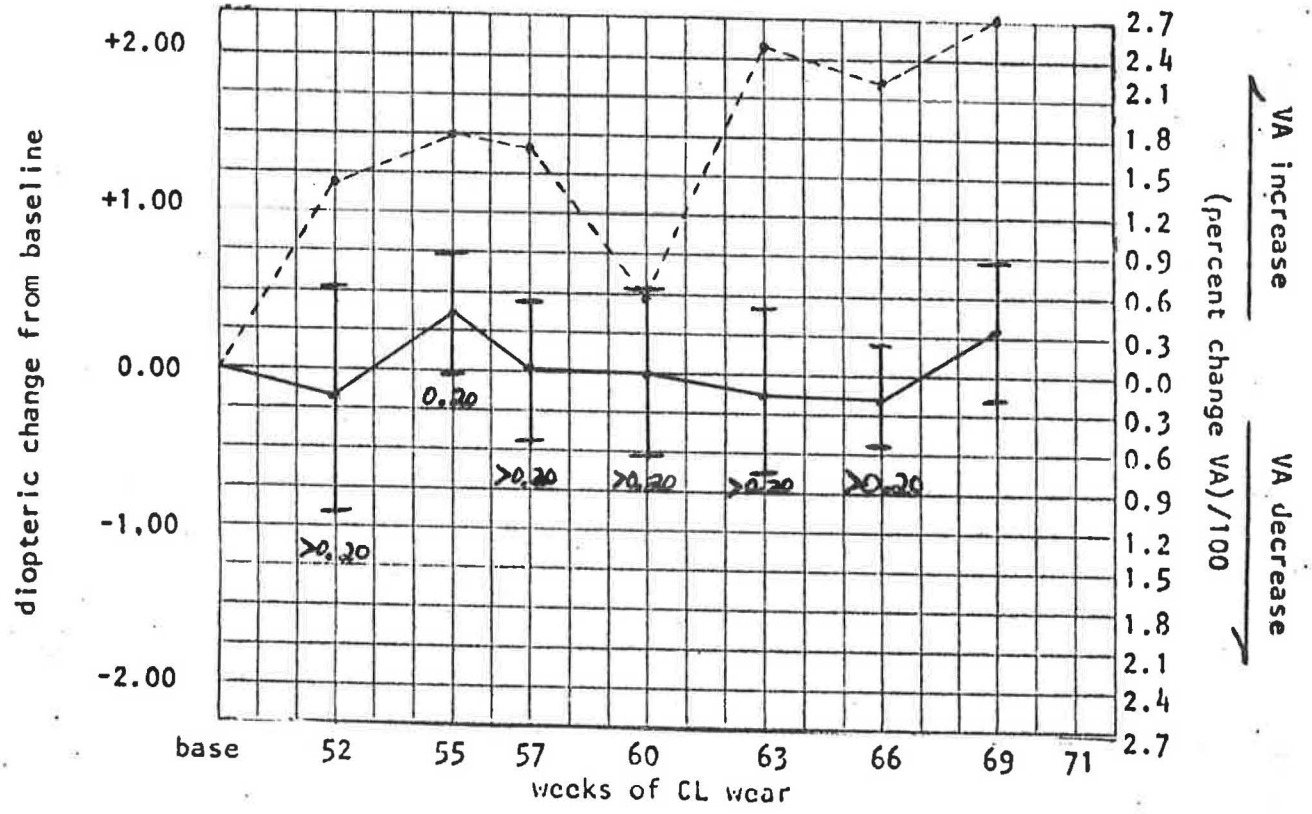
variable graphed: CORNEAL THICKNESS (ULTRASOUND)



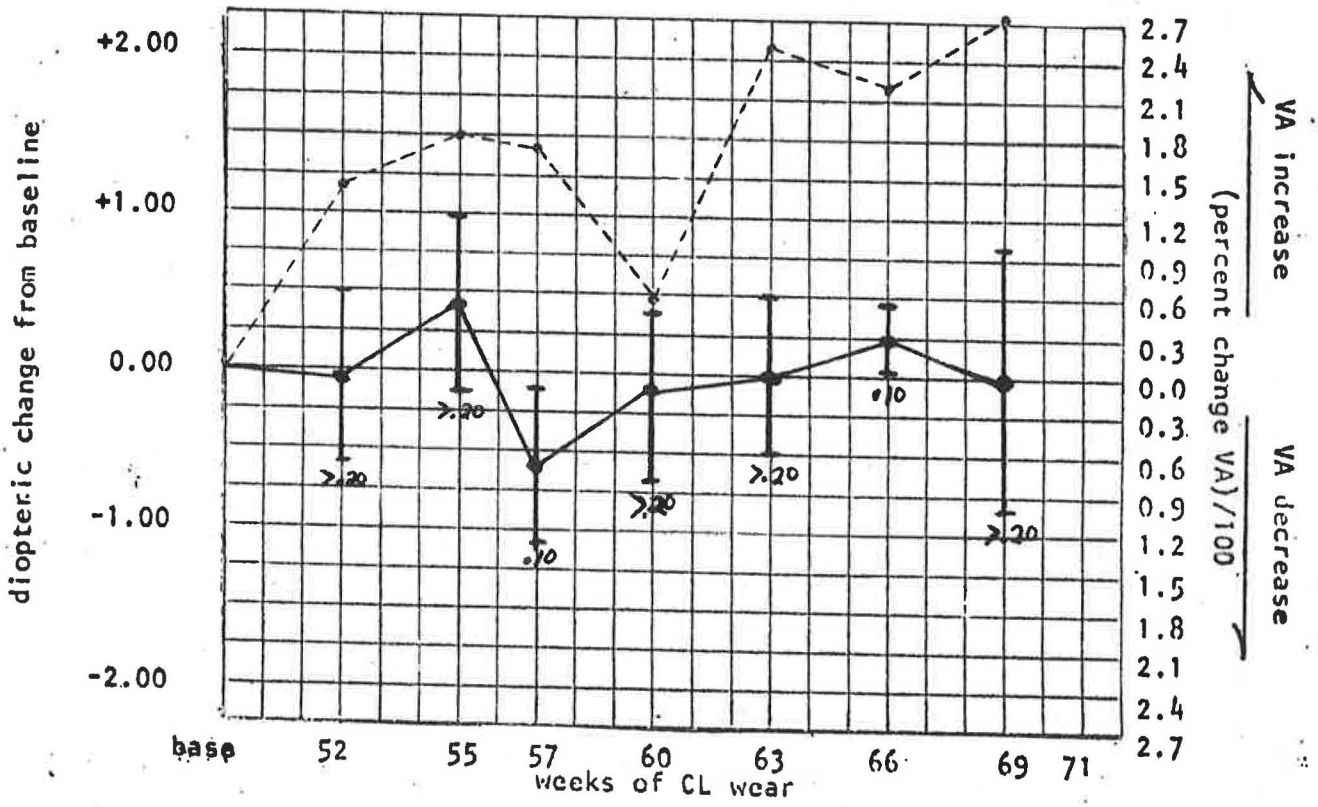
variable graphed:



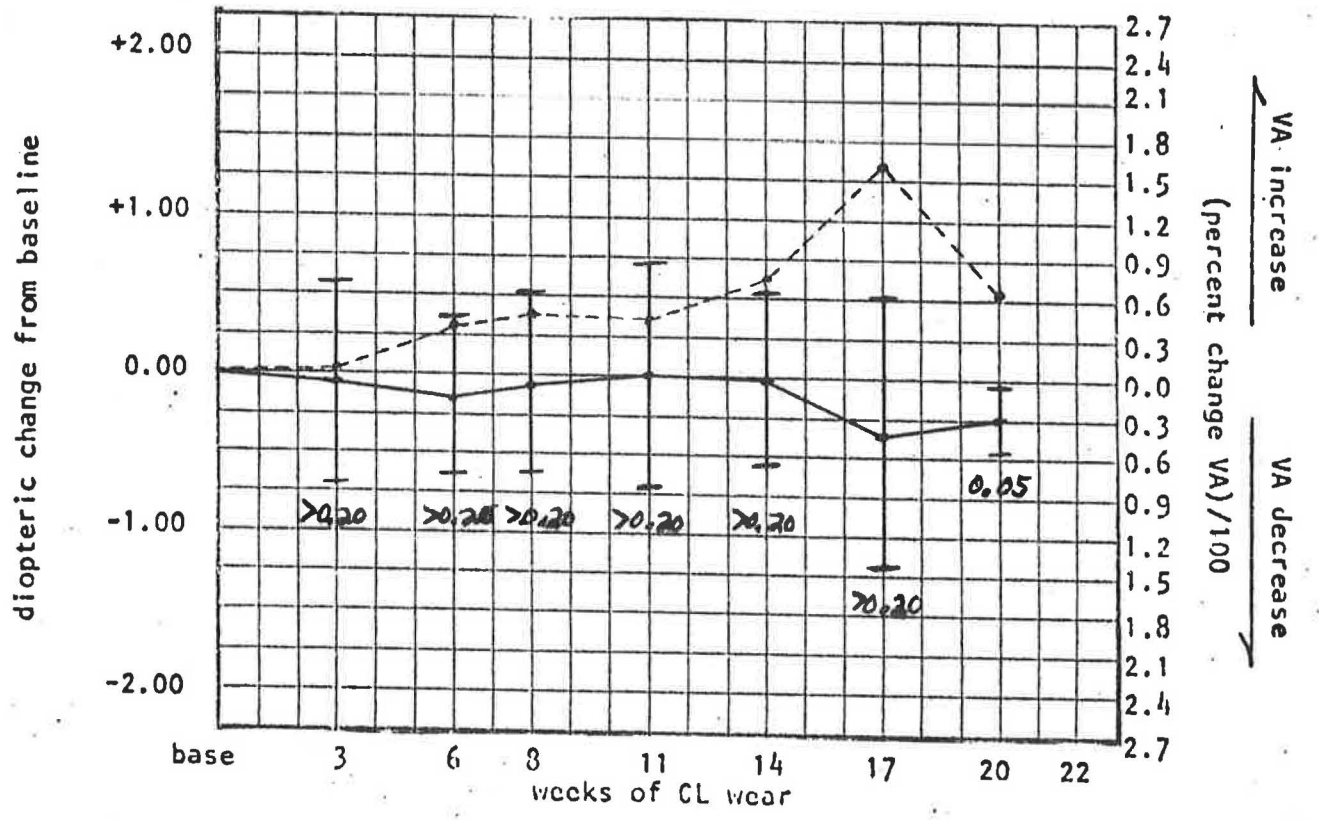
variable graphed: CROSS-CYLINDER AT NEAR (14B)



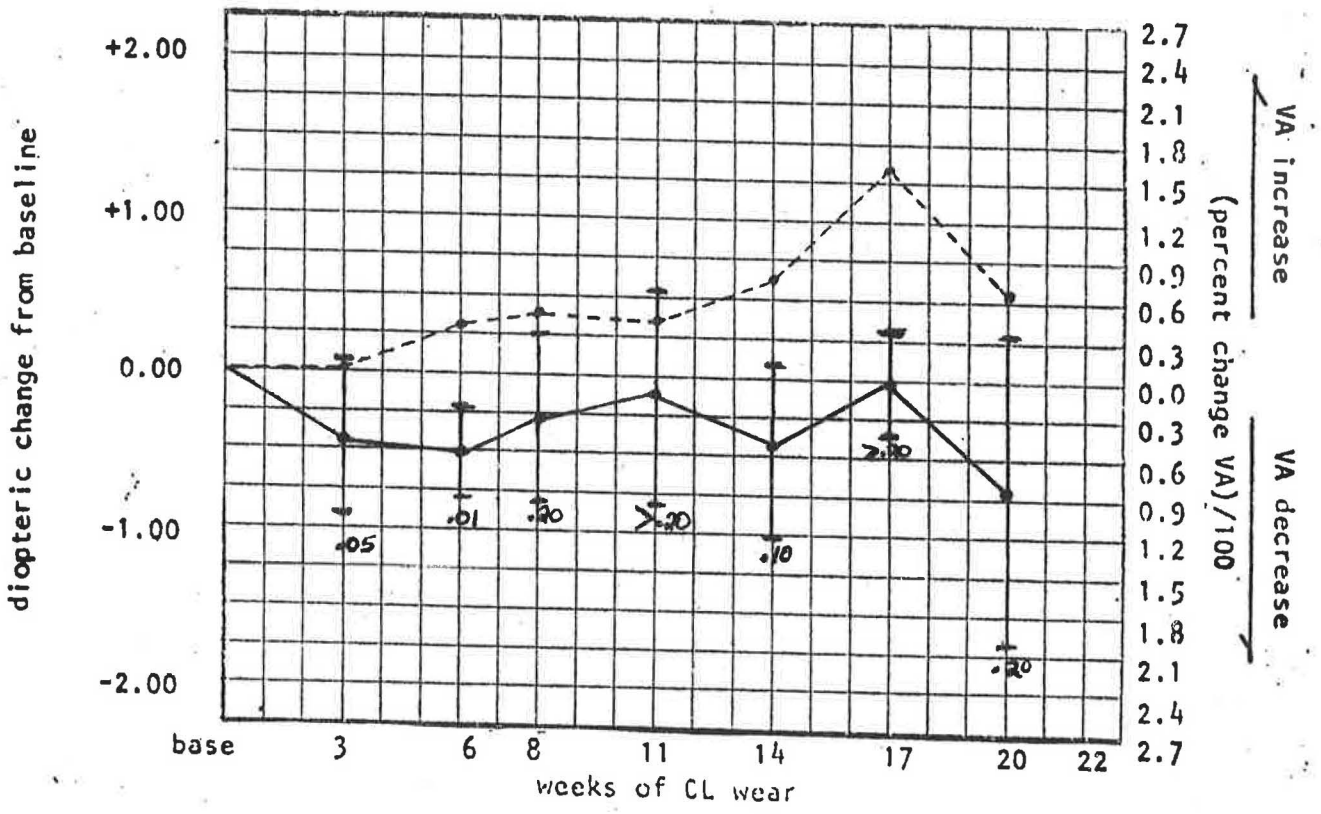
variable graphed: NEGATIVE RELATIVE ACCOMMODATION-RECOVERY (21R)



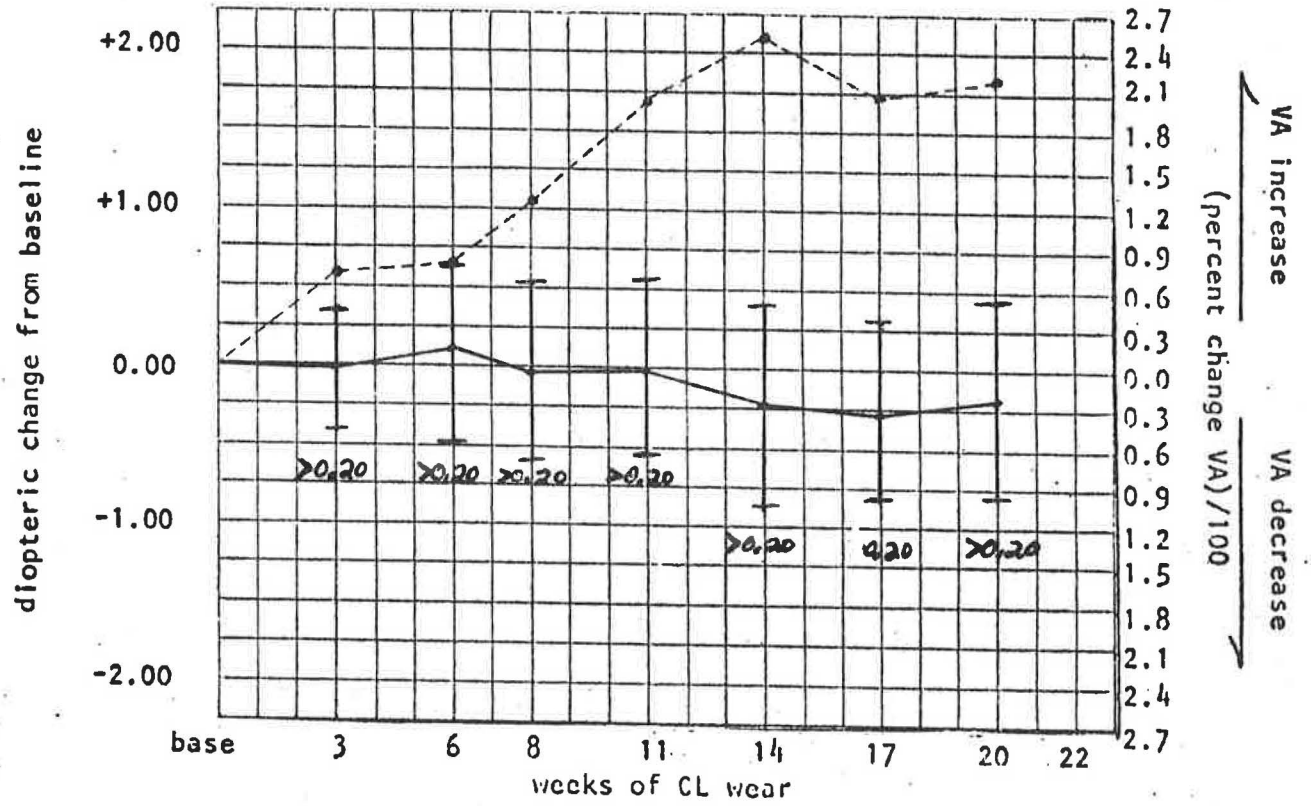
variable graphed: CROSS-CYLINDER AT NEAR (14B)



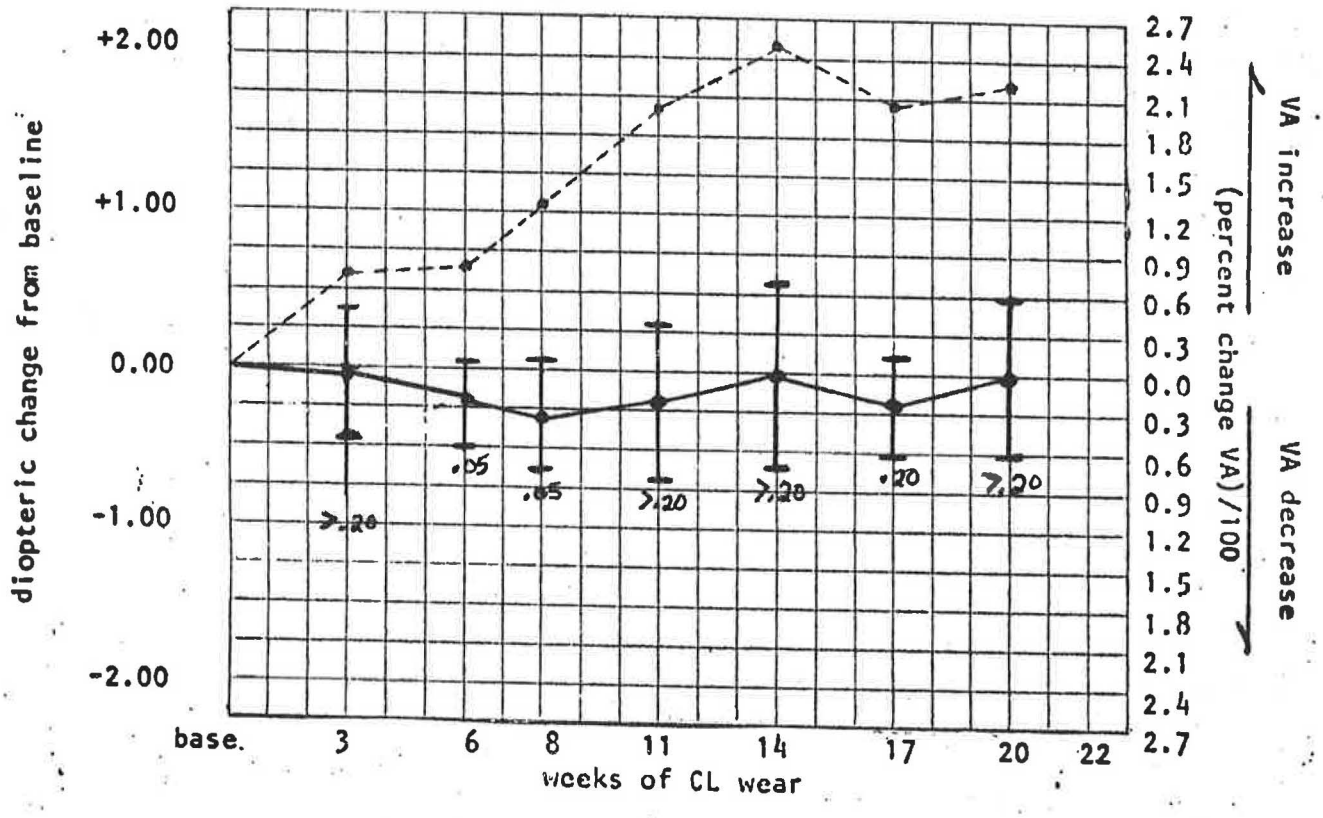
variable graphed: NEGATIVE RELATIVE ACCOMMODATION-RECOVERY (21R)



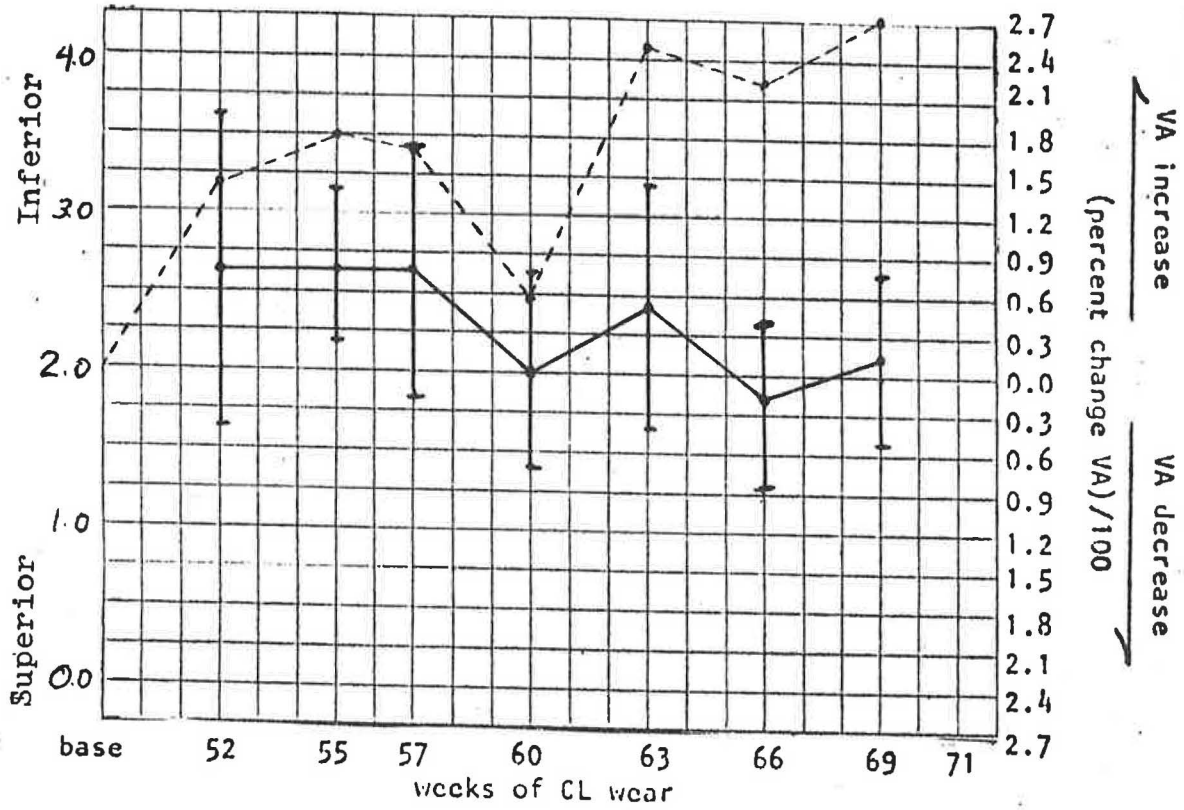
variable graphed: CROSS-CYLINDER AT NEAR (14B)



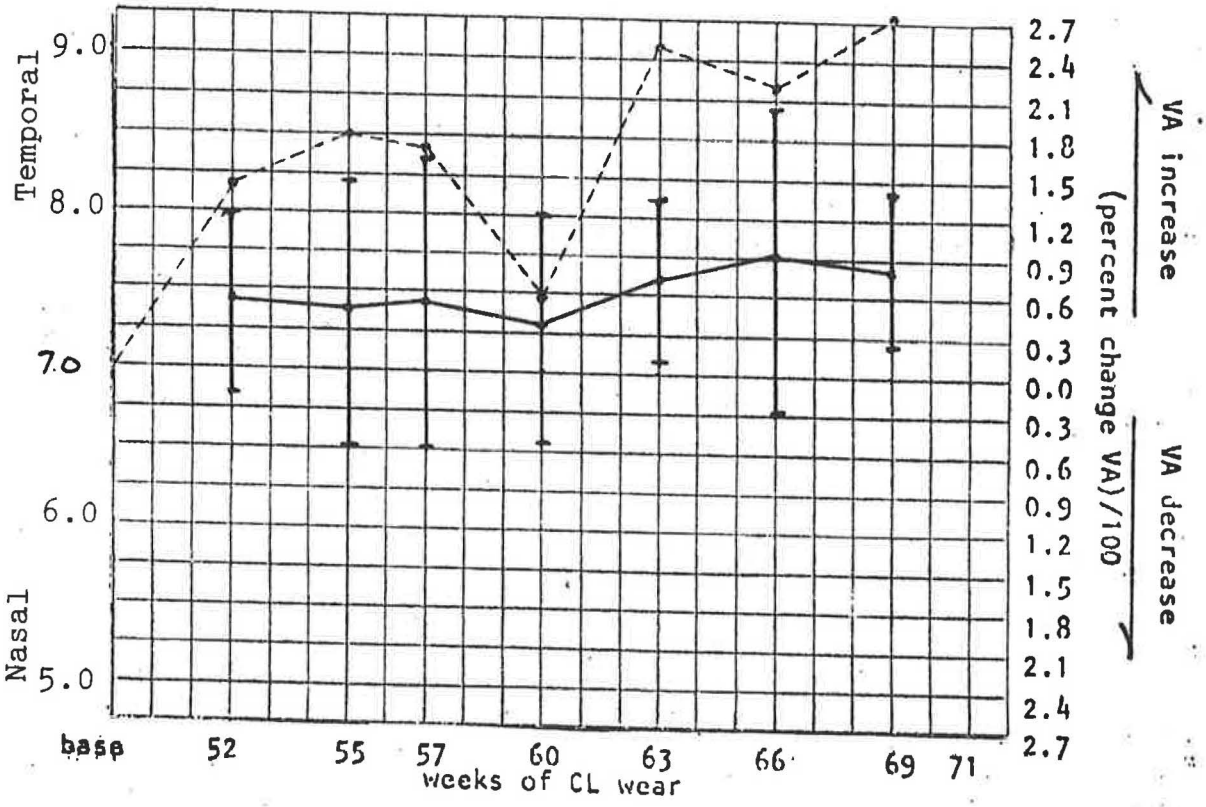
variable graphed: NEGATIVE RELATIVE ACCOMMODATION-RECOVERY (21R)



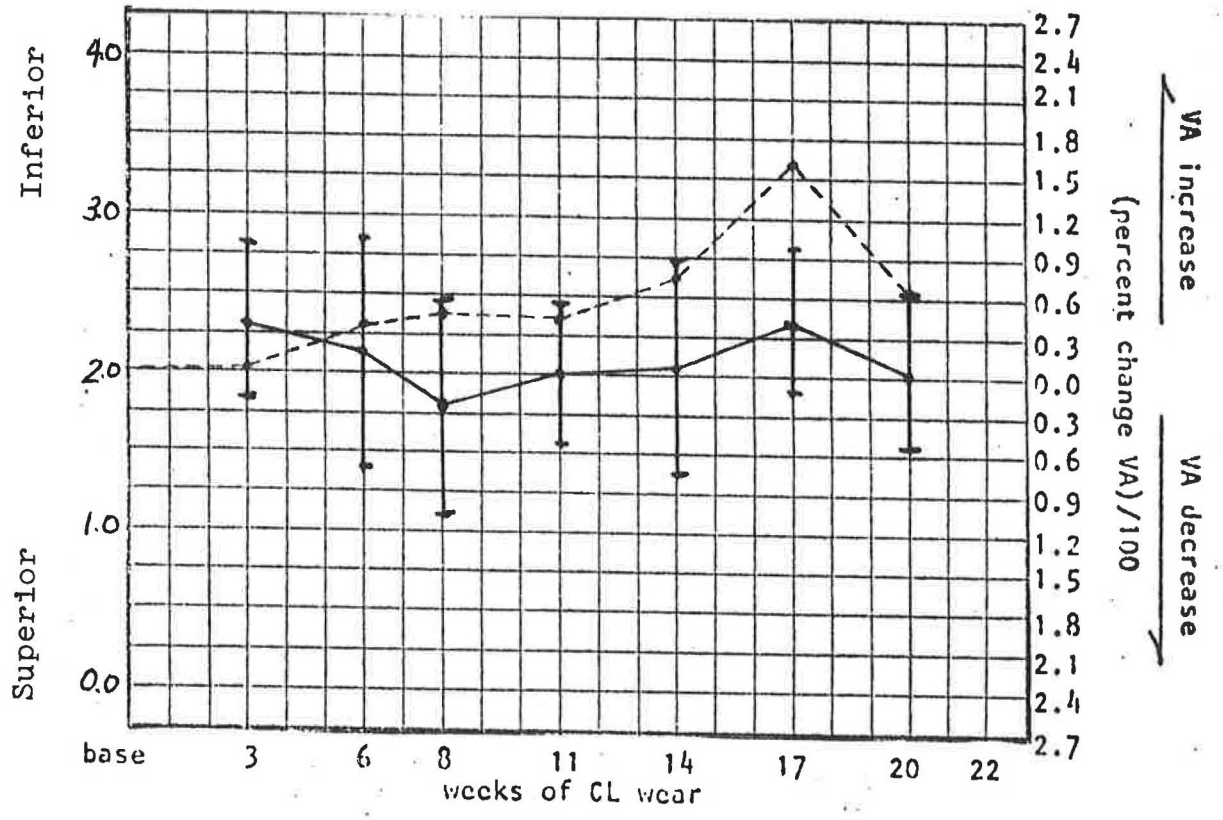
variable graphed: CL VERTICAL POSITION



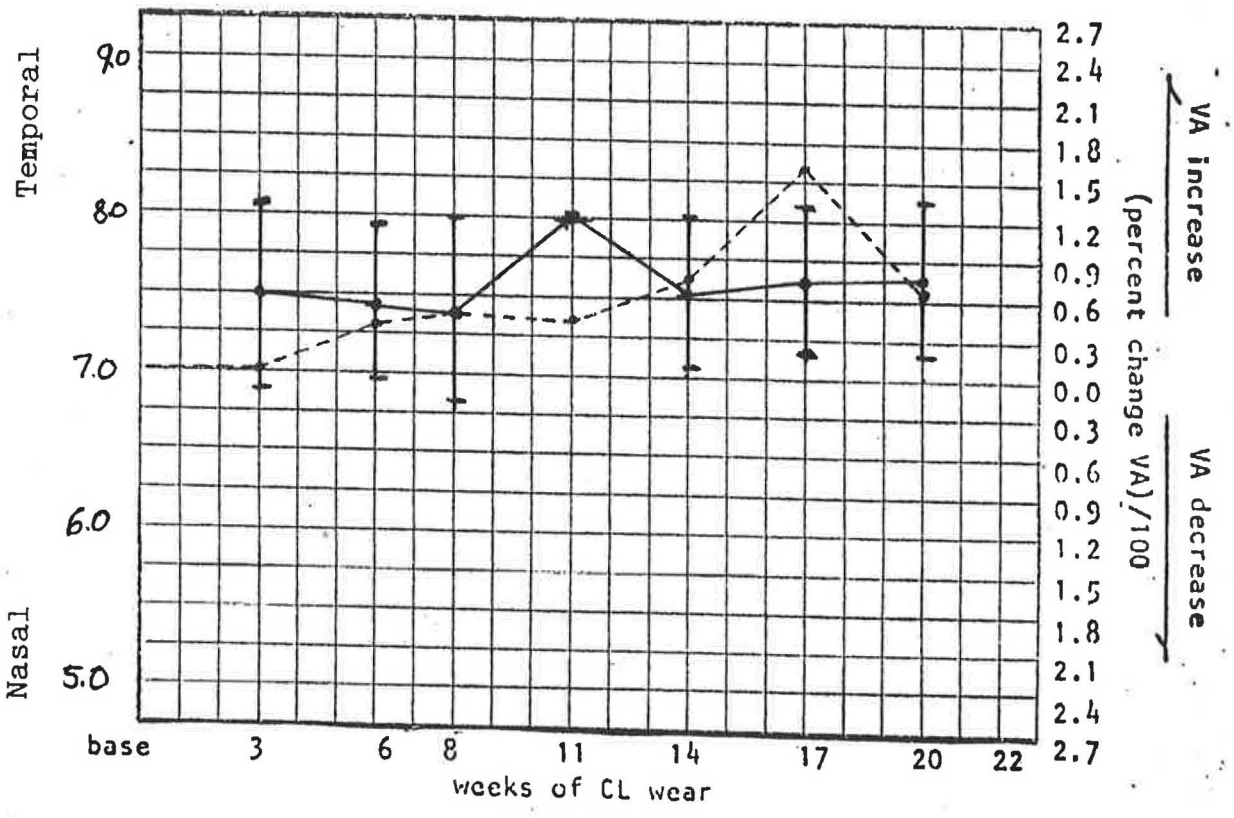
variable graphed: CL HORIZONTAL POSITION



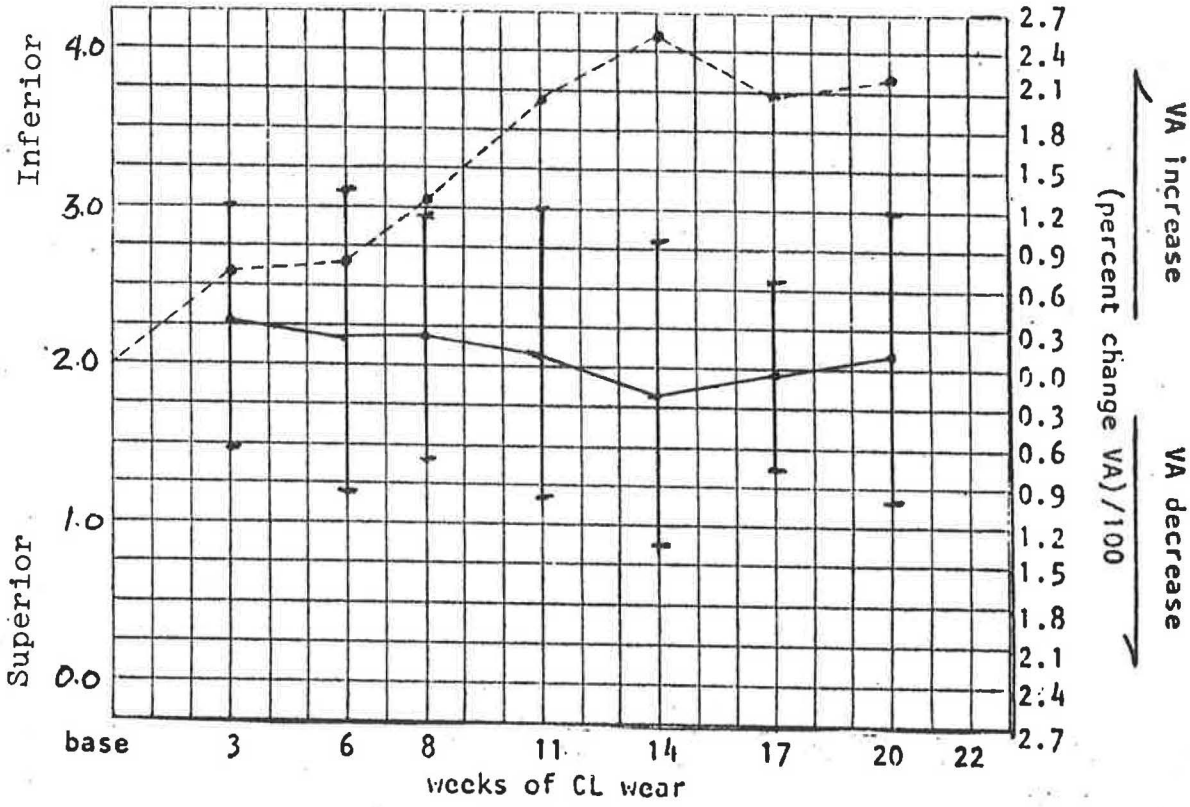
variable graphed: CL VERTICAL POSITION



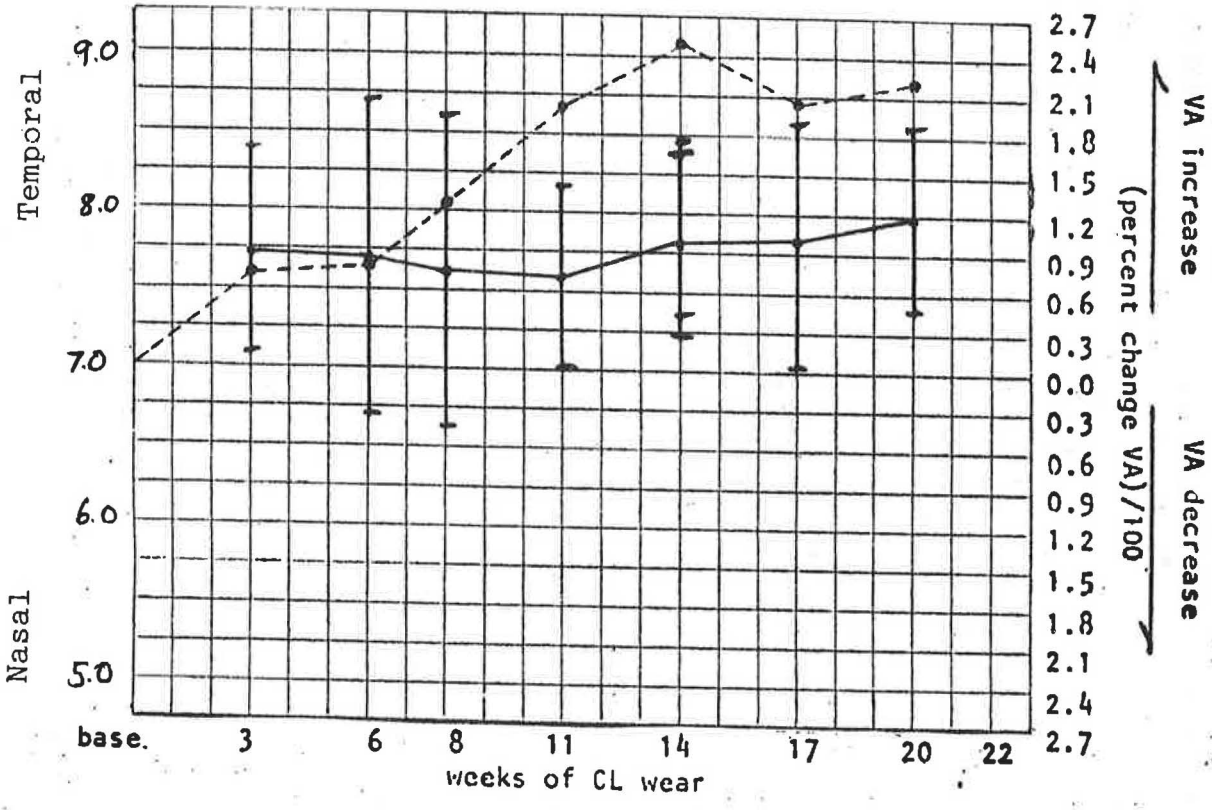
variable graphed: CL HORIZONTAL POSITION



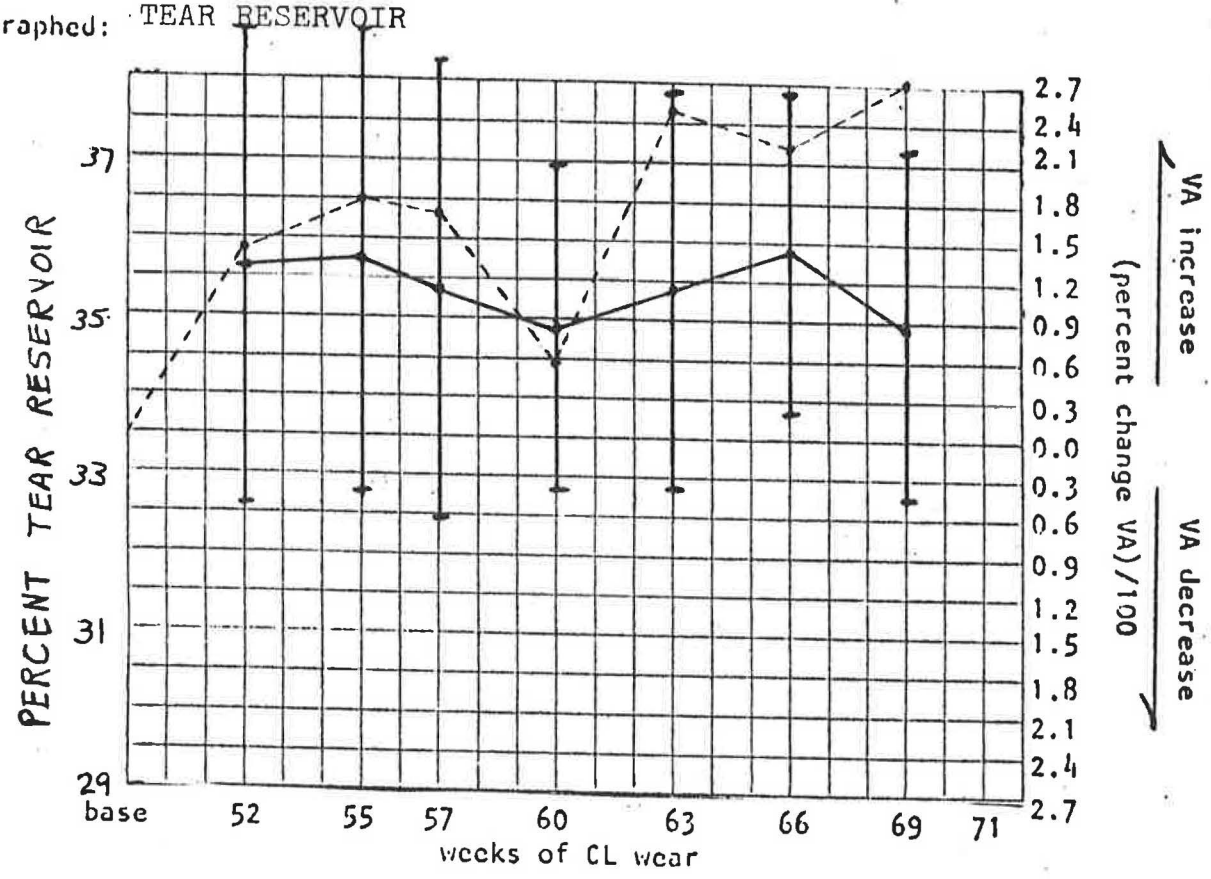
variable graphed: CL VERTICAL POSITION



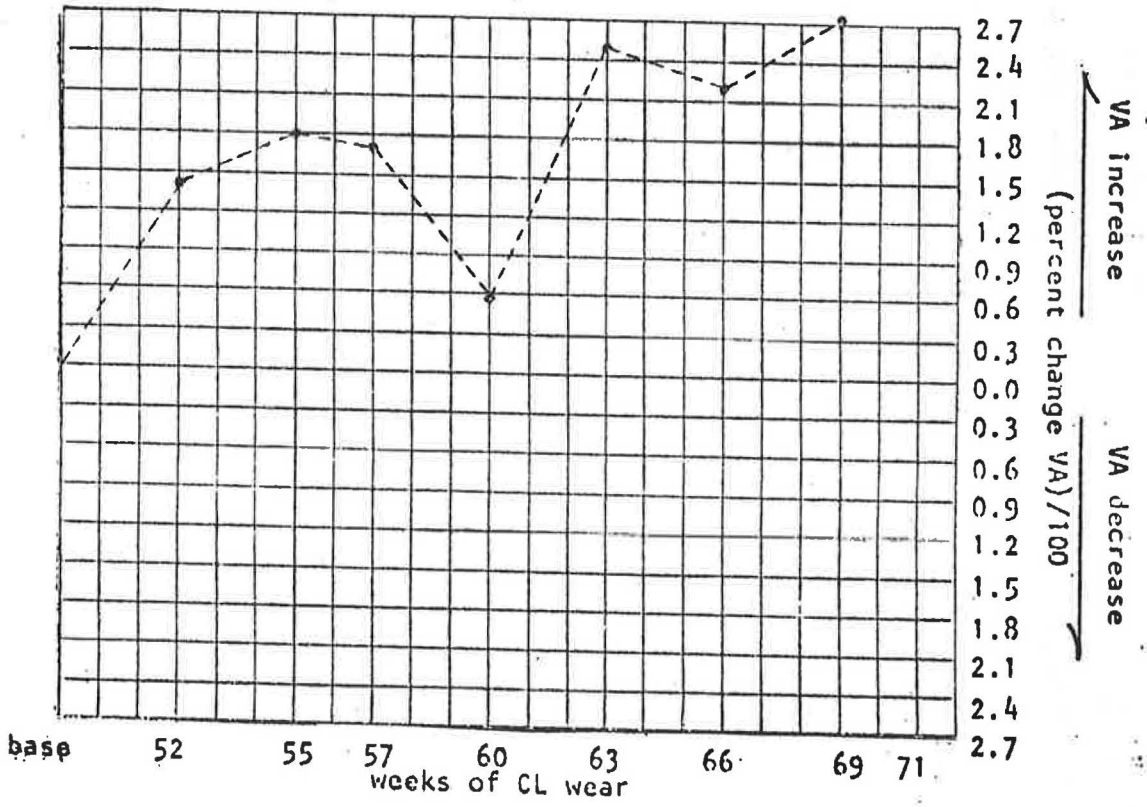
variable graphed: CL HORIZONTAL POSITION



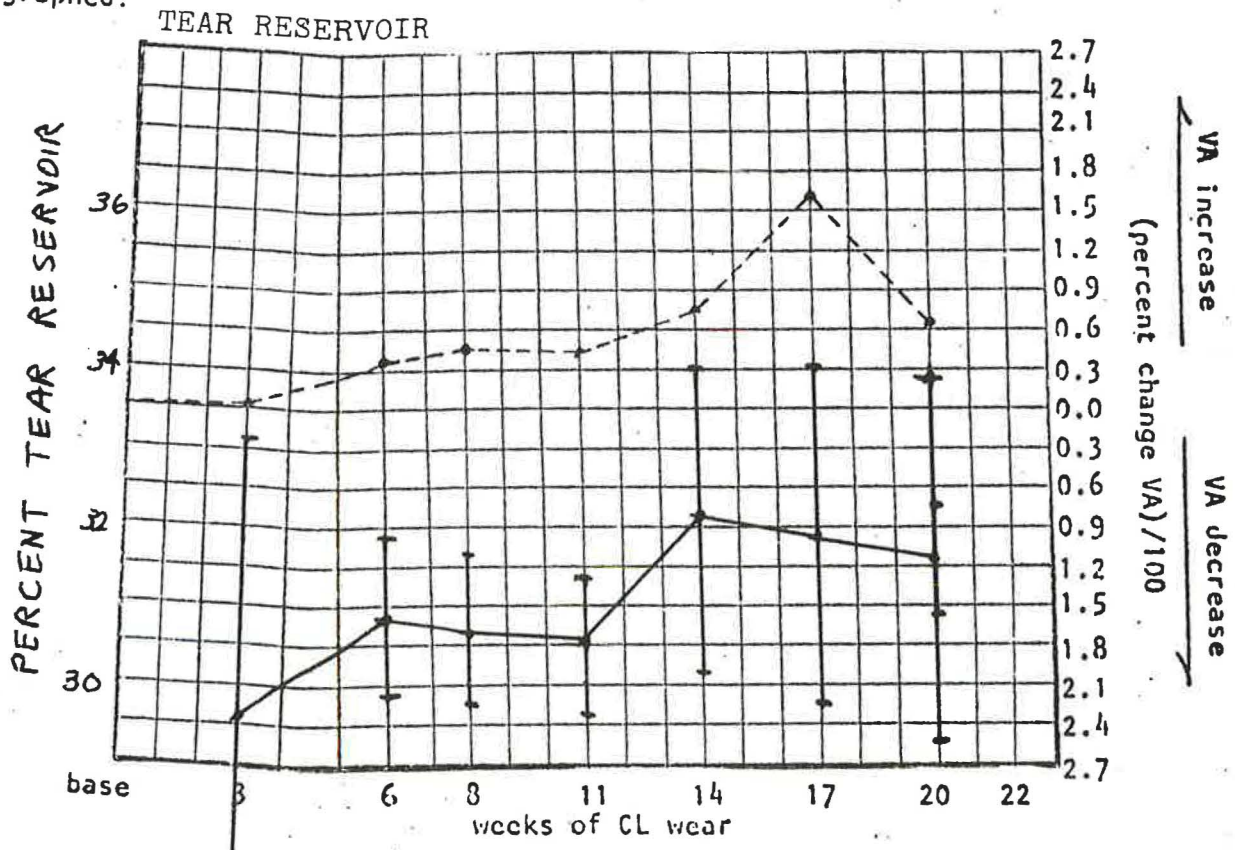
variable graphed: TEAR RESERVOIR



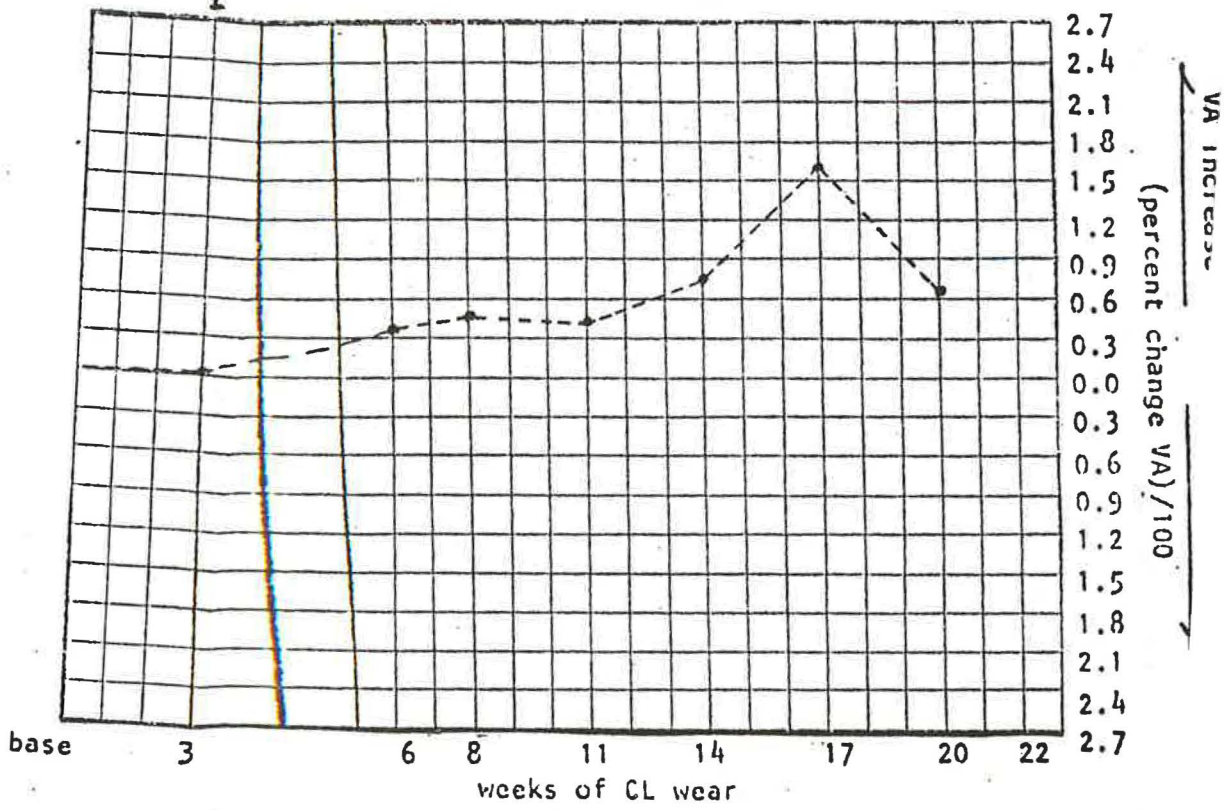
variable graphed:



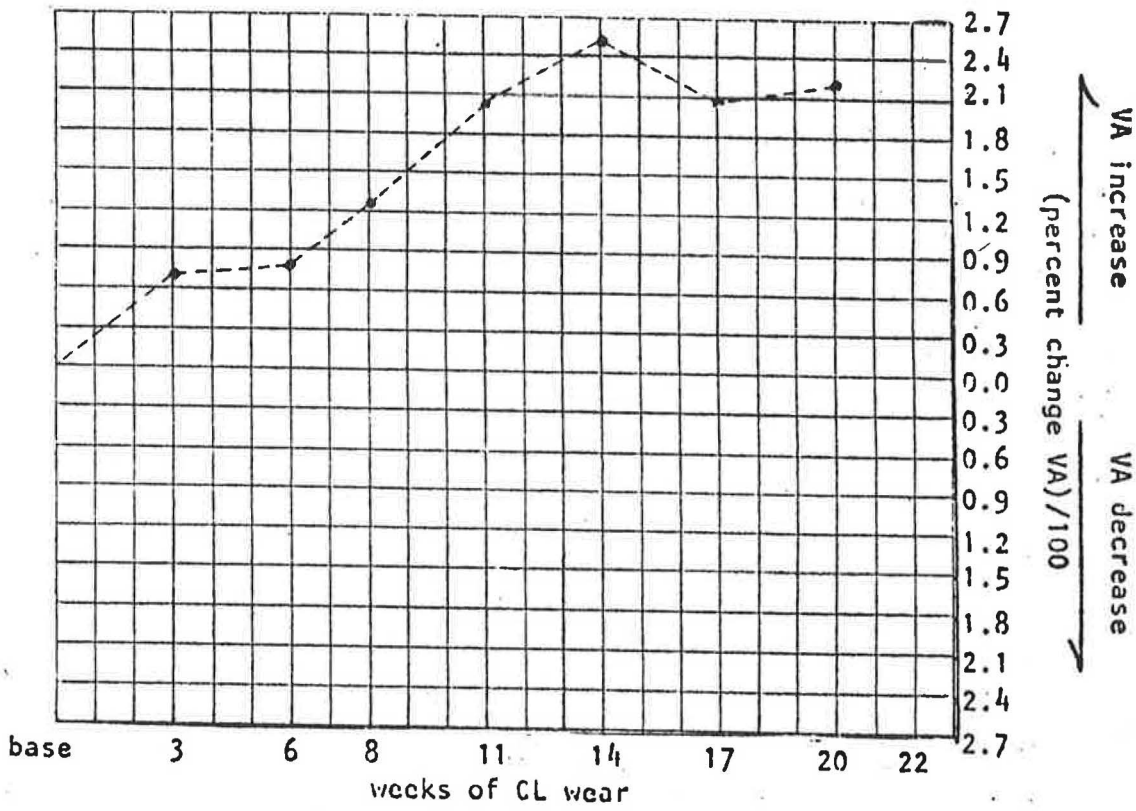
variable graphed:



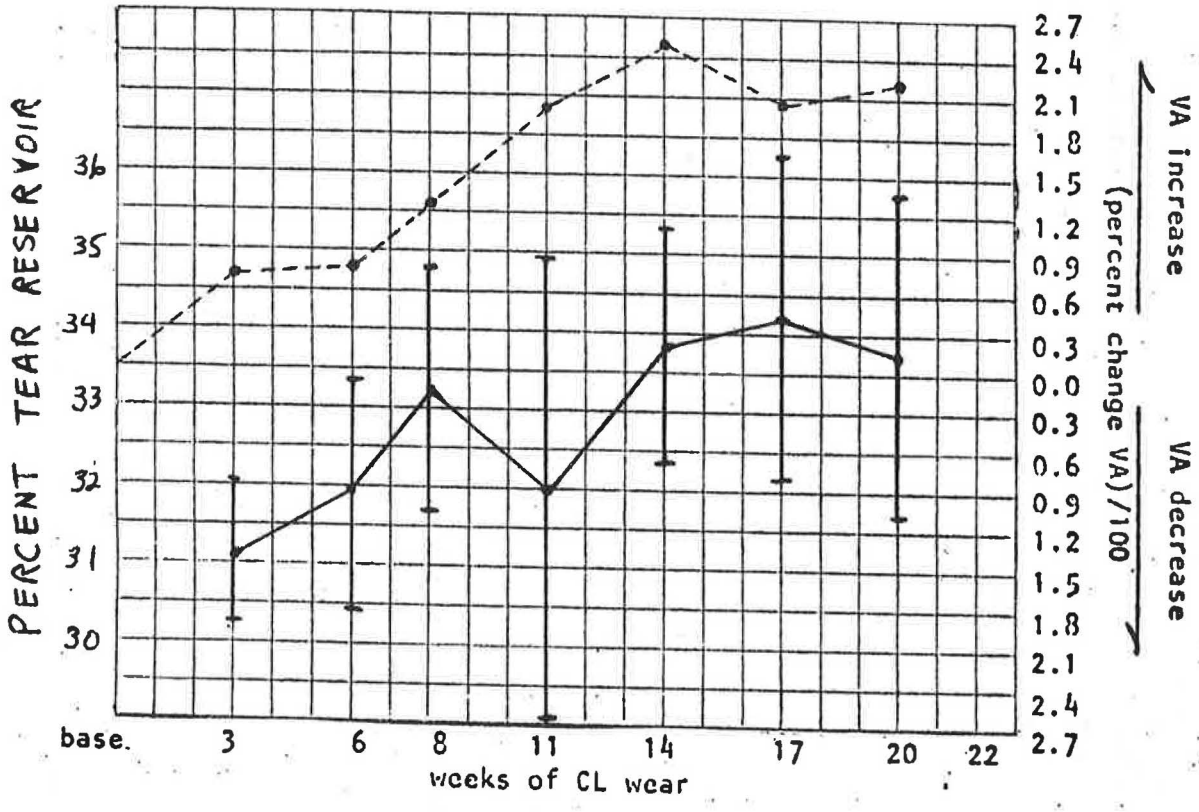
variable graphed:



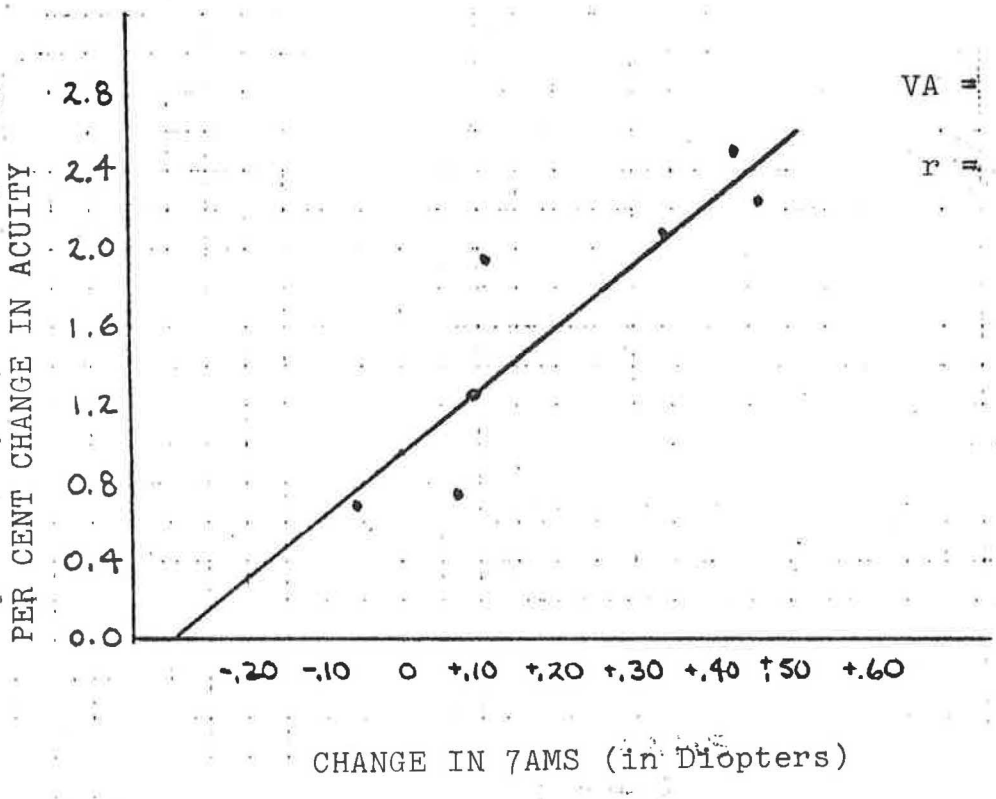
variable graphed:



variable graphed: TEAR RESERVOIR



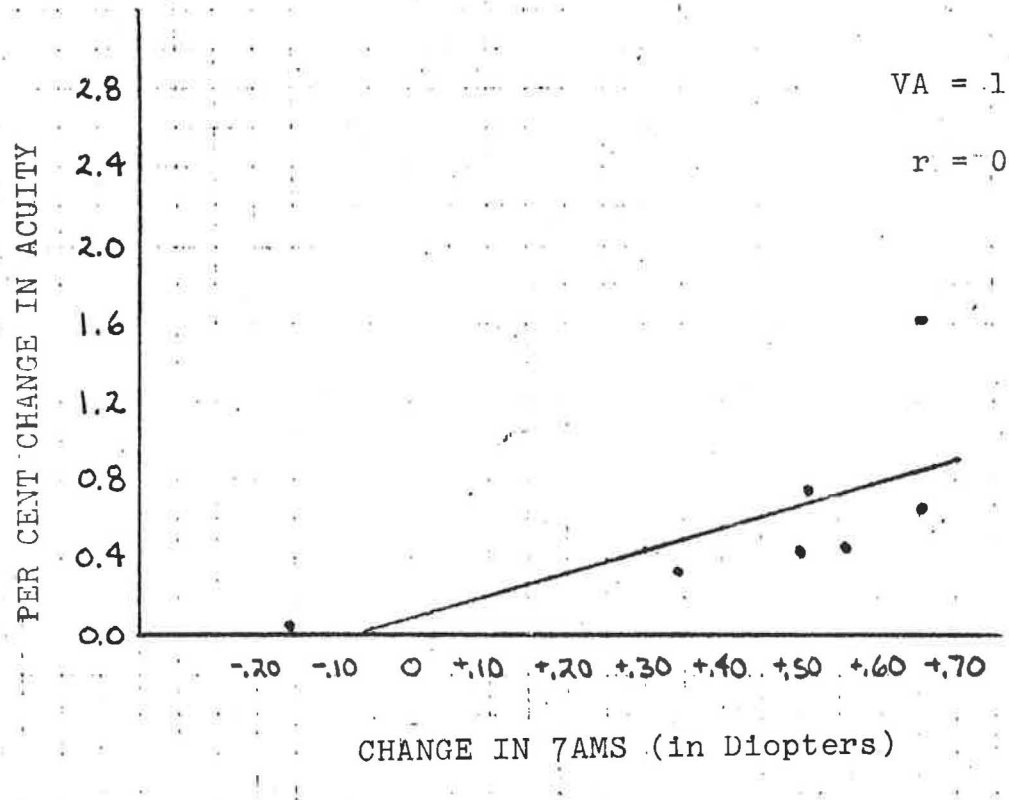
PROJECT II ORTHOKERATOLOGY



VA = 3.21(7AMS) + 0.97

r = 0.89

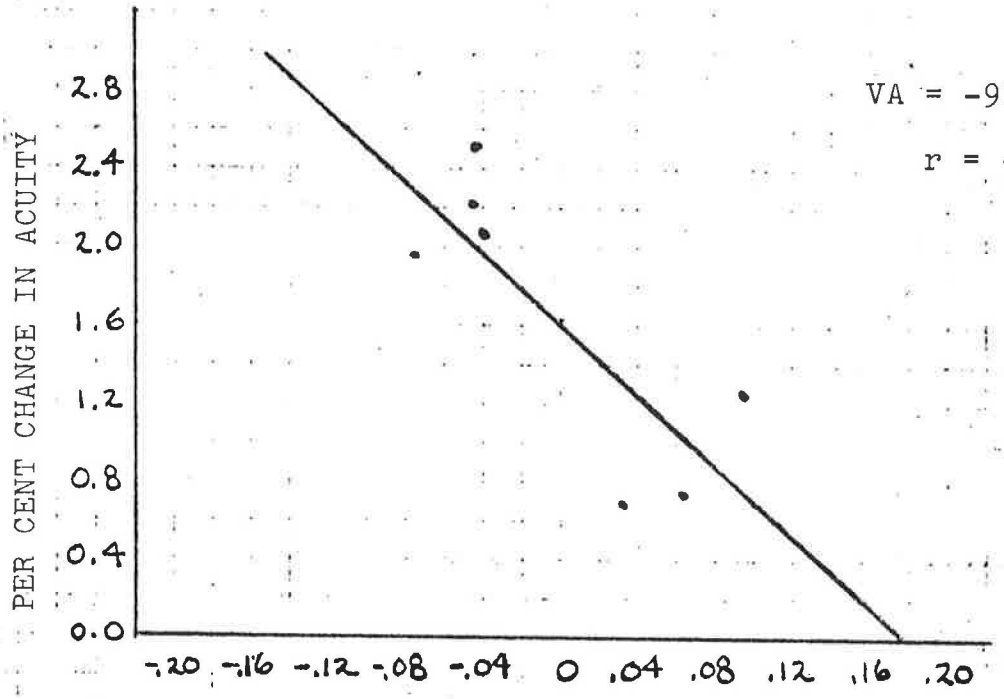
PROJECT II CONTROL



VA = 1.19(7AMS) + 0.08

r = 0.68

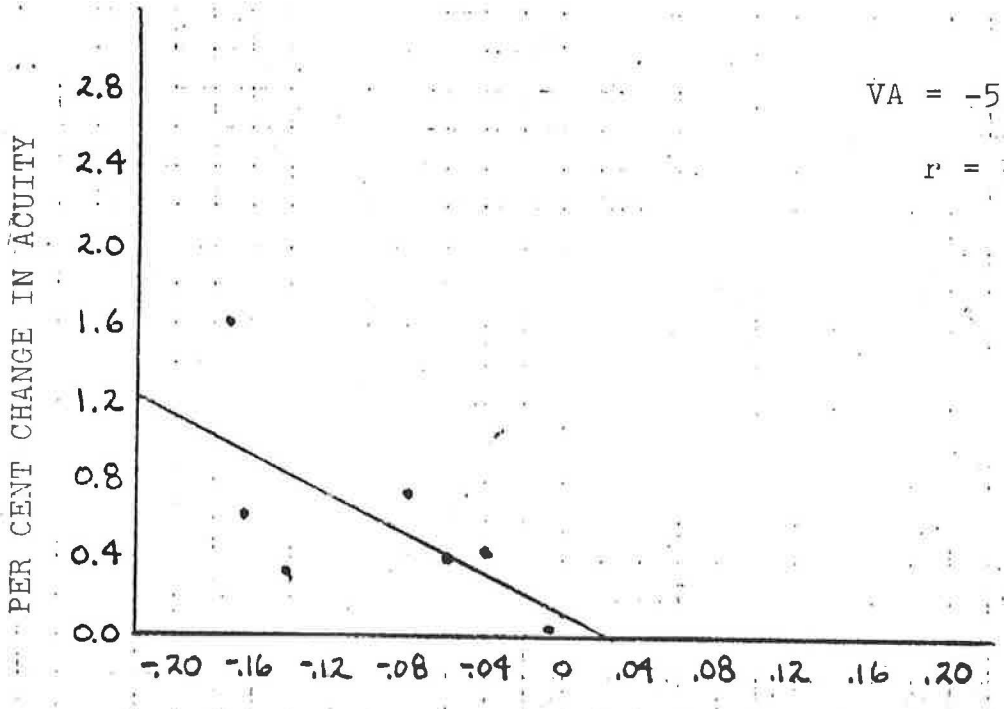
PROJECT II ORTHOKERATOLOGY



$VA = -9.22(e^2) + 1.62$

$r = -0.82$

PROJECT II CONTROL



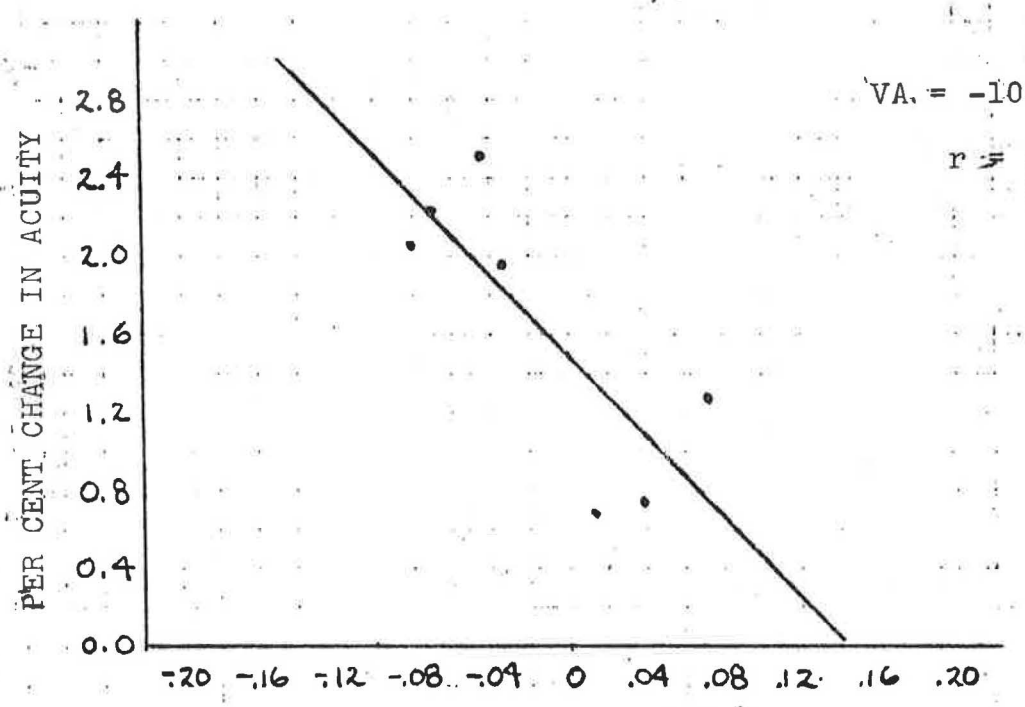
$VA = -5.09(e^2) + 0.12$

$r = -0.66$

PROJECT II ORTHOKERATOLOGY

$VA. = -10.12(e^2) + 1.48$

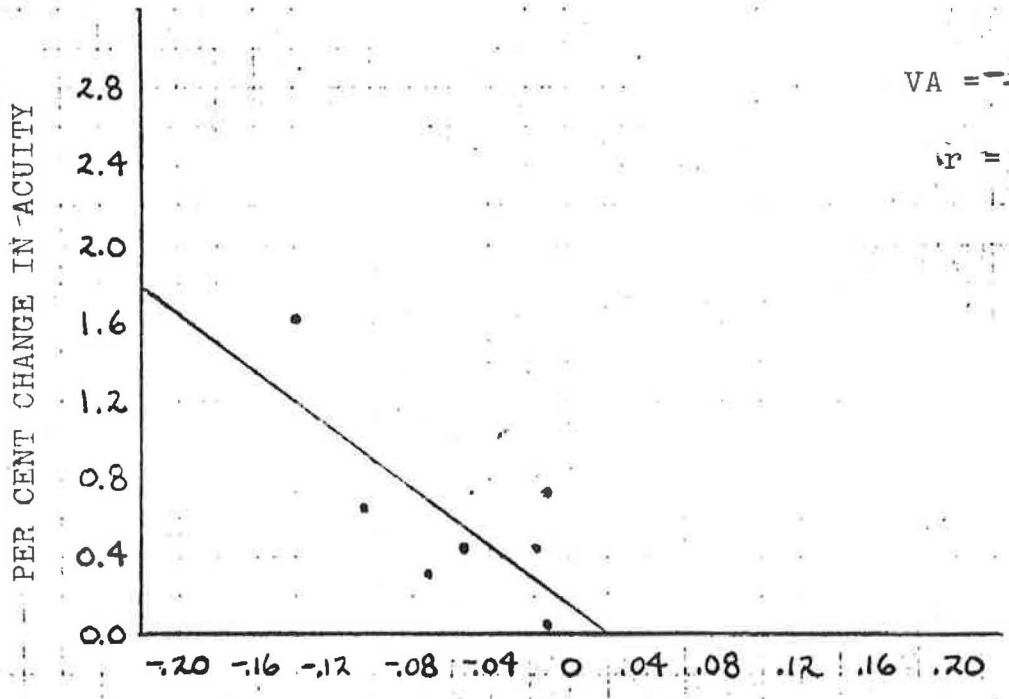
$r = -0.80$



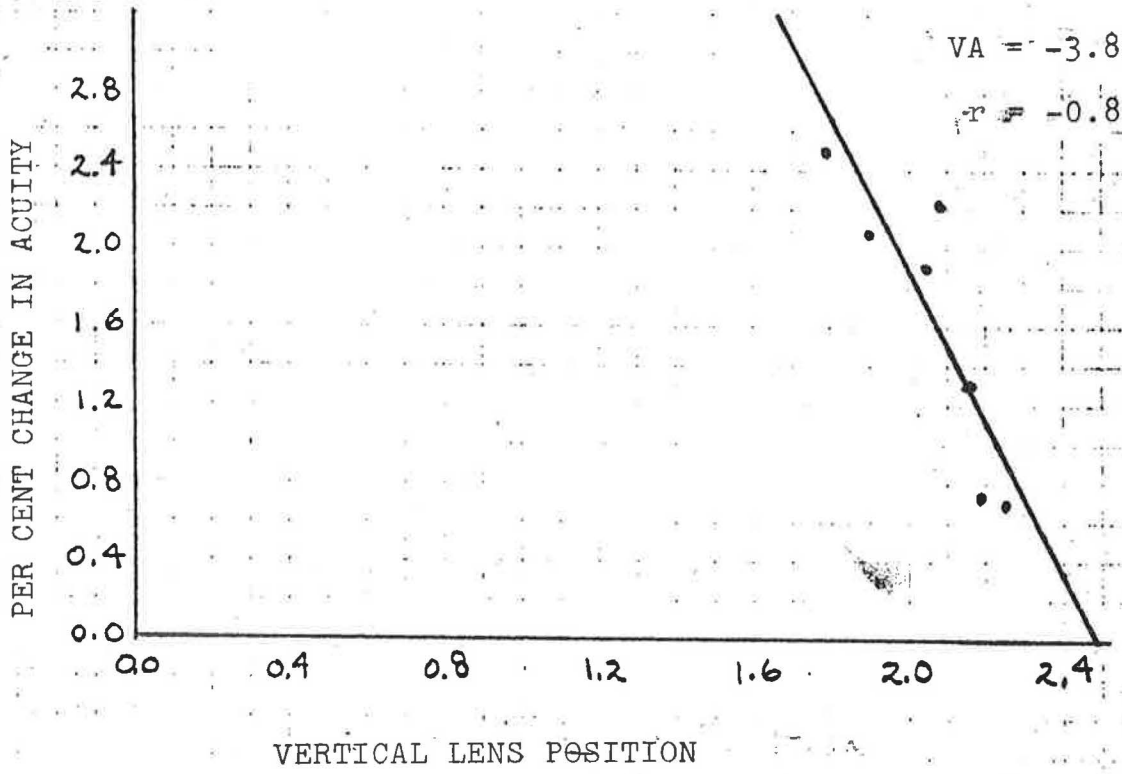
PROJECT II CONTROL

$VA = -7.29(e^2) + 0.168$

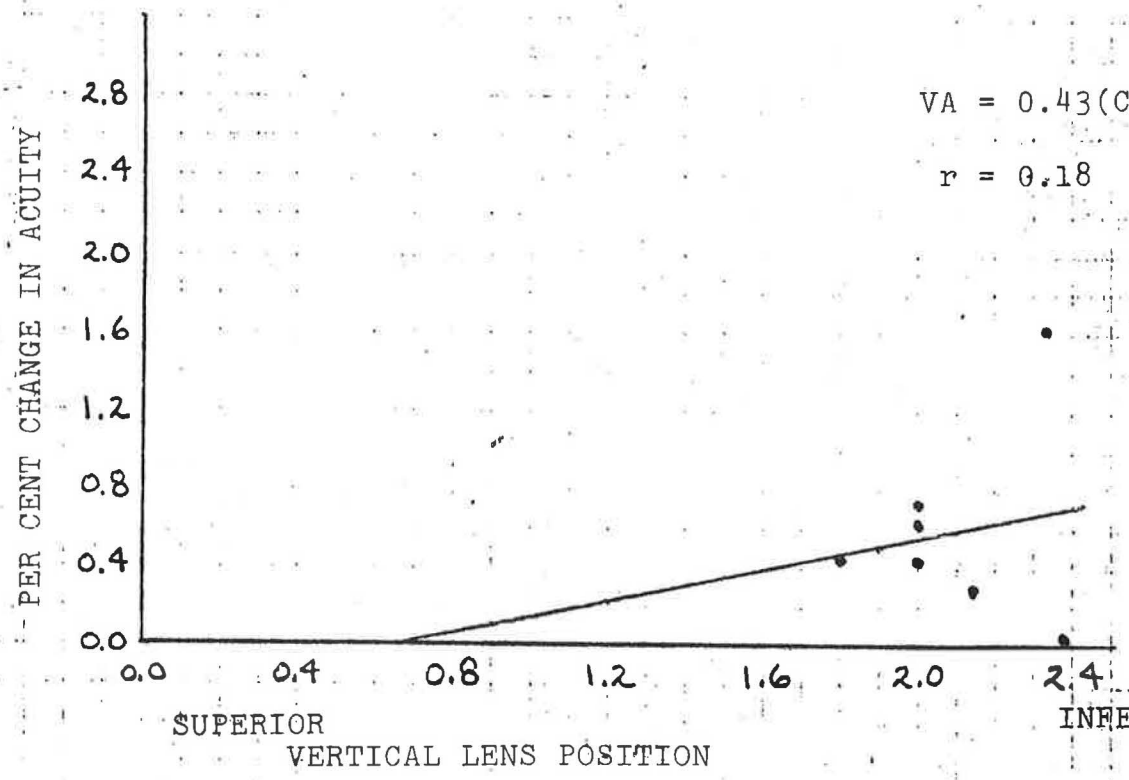
$r = -0.71$



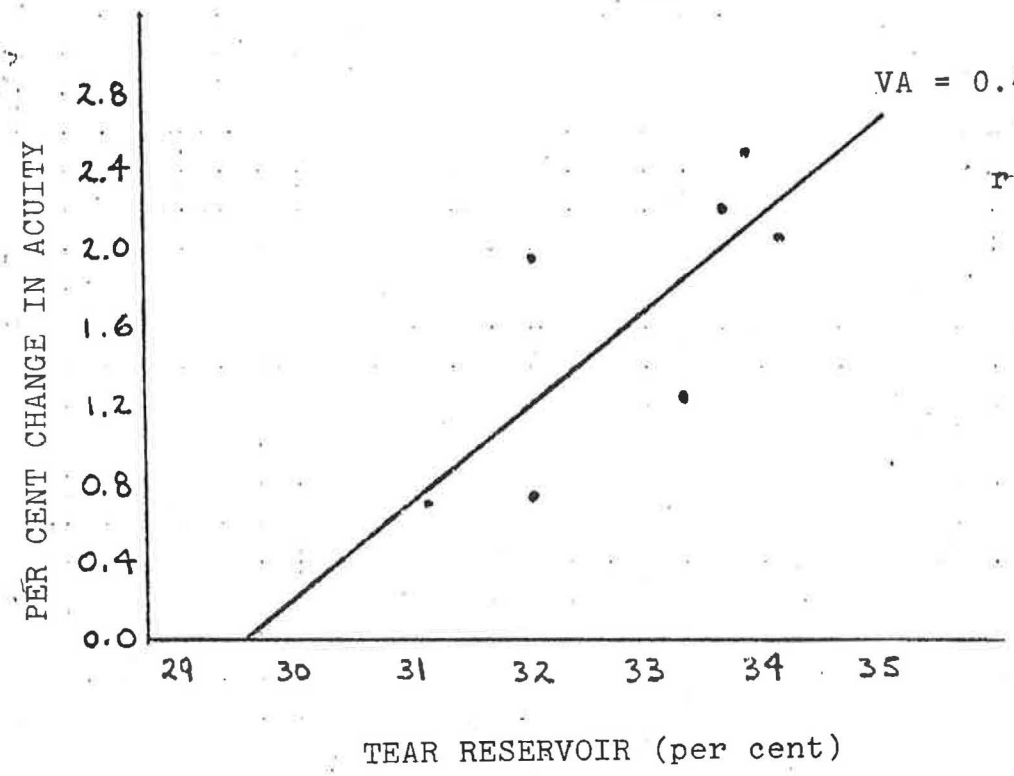
PROJECT II ORTHOKERATOLOGY



PROJECT II CONTROL



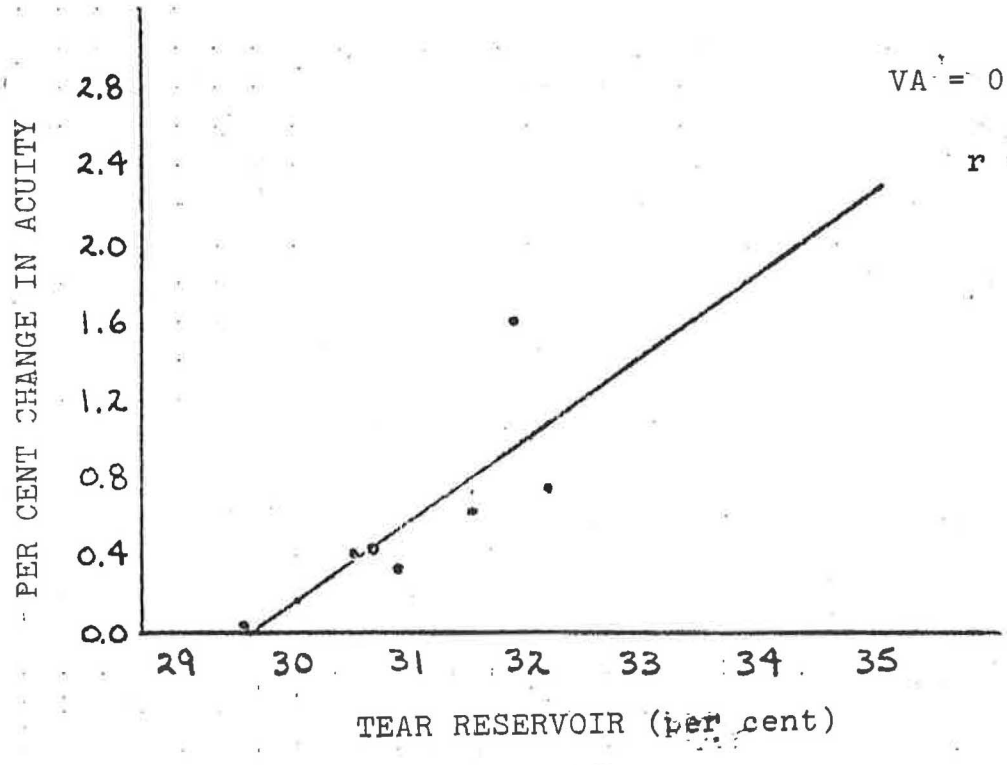
PROJECT II ORTHOKERATOLOGY



$VA = 0.48(\%TR) - 14.13$

$r = 0.76$

PROJECT II CONTROL



$VA = 0.42(\%TR) - 12.44$

$r = -0.76$

APPENDIX E

BIOMICROSCOPY RESULTS

Overall Incidence of Each Grade Level Reported Between January and November, 1977. (in per cent of total observations)

Category	Grade Levels						
	0	0.5	1.0	1.5	2.0	3.0	4.0
Corneal Edema	82.3	11.9	4.0	0.6	0.8	---	0.4
Fluorescein Retention	64.0	5.6	13.3	---	13.9	2.8	9.2
Conjunctival Injection	44.0	26.7	26.5	2.2		0.2	---
Perilimbal Injection	42.0	34.7	20.9	2.4		---	---

	0 to 5	6 to 10	11 to 14	15 +	(sec.)
Tear Break-Up Time	1.6	17.1	7.7	73.6	

CATEGORY	INCIDENCE OF GRADE LEVEL DURING ALL VISITS BETWEEN JANUARY AND NOVEMBER, 1977, (IN PER CENT OF TOTAL OBSERVATIONS MADE ON CORNEAS)					
	GRADE					
	0	1	1.5	2	3	4
CORNEAL EDEMA	82.3	15.9	--	1.4	0.0	0.4
FLUORESCEIN RETENTION	67.8	15.5	2.0	11.9	2.6	0.2
CONJUNCTIVAL INJECTION	44.4	53.2	--	2.2	0.2	0.0
PERILIMBAL INJECTION	42.0	55.6	--	2.4	0.0	0.0

	0 to 5	6 to 10	11 to 14	15 +
BREAK-UP TIME	1.6	17.1	7.7	73.6

BIOMICROSCOPY RESULTS

The following tables tally the number of patients in each respective group who, at one time or another, developed a certain grade level and the num- of occurances of each grade level in each respective group. The third column represents the per cent occurance of each grade level within each experimental group. Data is taken from visits between January and November, 1977.

Key:

Pts. = number of patients who developed the grade level

#Occur. = number of occurances of the grade level

%Freq. = per cent occurance of the grade level in the group

A. CORNEAL EDEMA

Grade	Pts.	#Occur.	%Freq.	Pts.	#Occur.	%Freq.	Pts.	#Occur.	%Freq.
0.0	10	138	83.2	10	109	82.6	12	170	82.5
0.25	1	2	1.2	3	2	1.5	1	3	1.5
0.5	6	12	7.2	6	17	12.9	6	24	11.7
0.75 - 1.0	4	8	4.8	3	4	3.0	3	6	2.9
1.5	1	2	1.2	-	-	-	1	1	0.5
2.0	1	2	1.2	-	-	-	1	2	1.0
3.0	-	-	-	-	-	-	-	-	-
4.0	1	2	1.2	-	-	-	-	-	-
5.0	-	-	-	-	-	-	-	-	-
		166	100.0		132	100.0		206	100.0

	Project I Orthokeratology			Project II Control			Project II Orthokeratology		
B. FLUORESCEIN RETENTION									
Grade	Pts	#Occur.	%Freq.	Pts.	#Occur.	%Freq.	Pts.	#Occur.	%Freq.
0.0	10	114	68.7	10	81	61.4	12	147	71.4
0.5	2	9	5.4	2	7	5.3	4	10	4.9
1.0	8	20	12.0	7	17	12.9	9	15	7.3
1.5	2	2	1.2	1	3	2.3	2	5	2.4
2.0	5	14	8.4	8	23	17.4	6	23	11.1
3.0	3	7	4.2	-	-	-	2	6	2.9
4.0	-	-	-	1	1	0.7	-	-	-
5.0	-	-	-	-	-	-	-	-	-
6.0	-	-	-	-	-	-	-	-	-
7.0	-	-	-	-	-	-	-	-	-
		166	99.9		132	100.0		206	100.0
C. CONJUNCTIVAL INJECTION									
0.0	7	49	29.5	9	62	47.0	10	115	55.8
0.25-0.50	8	47	28.3	6	30	22.7	10	57	27.7
0.75-1.00	10	60	36.1	6	39	29.5	7	33	16.0
1.25-1.50	3	8	4.8	1	1	0.8	-	-	-
2.0	1	2	1.2	-	-	-	-	-	-
3.0	-	-	-	-	-	-	1	1	0.5
4.0	-	-	-	-	-	-	-	-	-
5.0	-	-	-	-	-	-	-	-	-
6.0	-	-	-	-	-	-	-	-	-
7.0	-	-	-	-	-	-	-	-	-
		166	99.9		132	100.0		206	100.0

	Project I Orthokeratology			Project II Control			Project II Orthokeratology		
D. PERILIMBAL INJECTION									
Grade	Pts.	#Occur.	%Freq.	Pts.	#Occur.	%Freq.	Pts.	#Occur.	%Freq.
0.00	7	53	32.0	9	67	50.7	7	82	39.8
0.25	1	6	3.6	2	10	7.6	2	10	4.9
0.50	9	54	32.5	7	28	21.2	11	74	35.9
0.75	1	2	1.2	-	-	-	1	2	1.0
1.0	9	43	25.9	7	24	18.2	8	36	17.4
1.5	1	3	1.8	-	-	-	-	-	-
2.0	4	5	3.0	1	3	2.3	1	2	1.0
3.0	-	-	-	-	-	-	-	-	-
4.0	-	-	-	-	-	-	-	-	-
		166	100.0		132	100.0		206	100.0
E. TEAR BREAK-UP TIME									
15++	10	136	81.9	10	94	71.2	12	137	66.5
13-14	1	2	1.2	2	2	1.5	3	6	2.9
10-12	5	19	11.4	8	20	15.2	10	46	22.3
7-9	5	8	4.8	3	9	6.8	5	9	4.4
4-6	1	1	0.6	1	7	5.3	2	7	3.4
0-3	-	-	-	-	-	-	1	1	0.5
		166	99.9		132	100.0		206	100.0

INCIDENCE OF BIOMICROSCOPY GRADE LEVELS IN PROJECT II PATIENTS FROM JANUARY TO NOVEMBER, 1977.

Key:

pts. = number of patients developing a grade level at one time or another
occa. = number of reported cases of that grade level
% occur. = per cent occurance per group of that grade level; = # occa. divided by total number of observations made on that specific group.

	GROUPS					
	CONTACT LENS CONTROL			ORTHOKERATOLOGY		
GRADE	# pts.	#occa.	%occur.	# pts.	#occa.	%occur.
EDEMA						
0.0	10	109	82.6	12	170	82.5
1.0	8	23	17.4	7	33	16.1
2.0	0	0	0.0	1	3	1.5
3.0	0	0	0.0	0	0	0.0
4.0	0	0	0.0	0	0	0.0
5.0	0	0	0.0	0	0	0.0
		132	100.0		206	100.0
FLUORESCEIN RETENTION						
0.0	10	81	61.4	12	147	71.4
1.0	7	24	18.2	10	25	12.2
1.5	1	3	2.3	2	5	2.4
2.0	8	23	17.4	6	23	11.1
3.0	0	0	0.0	2	6	2.9
4.0	1	1	0.7	0	0	0.0
		132	100.0		206	100.0

GRADE	CONTACT LENS CONTROL			ORTHOKERATOLOGY		
CONJUNCTIVAL INJECTION	# pts.	# occa.	%occur.	# pts.	#occa.	%occur.
0.0	9	62	47.0	10	115	55.8
1.0	7	69	52.2	10	90	43.7
2.0	0	0	0.0	0	0	0.0
3.0	0	0	0.0	1	1	0.5
4.0	0	0	0.0	0	0	0.0
		132	100.0		206	100.0
PERILIMBAL INJECTION						
0.0	9	67	50.7	7	82	39.8
1.0	9	62	47.0	11	122	59.2
2.0	1	3	2.3	1	2	1.0
3.0	0	0	0.0	0	0	0.0
4.0	0	0	0.0	0	0	0.0
		132	100.0		206	100.0
BREAK-UP TIME (sec.)						
15	10	136	81.9	12	137	66.5
13 - 14	2	2	1.5	3	6	2.9
10 - 12	8	20	15.2	10	46	22.3
7 - 9	3	9	6.8	5	9	4.4
4 - 6	1	7	5.3	2	7	3.4
1 - 3	0	0	0.0	1	1	0.5
		166	99.9		206	100.0

INCIDENCE OF GRADE LEVELS (IN PER CENT)
FOR EACH RESPECTIVE GROUP

CATEGORY	GRADE					
	0	1	1.5	2	3	4
CORNEAL EDEMA						
Total Observed	82.3	15.9	---	1.4	0.0	0.4
Control Gp.	82.6	17.4	---	0.0	0.0	0.0
Ortho-K Gp.	82.5	16.1	---	1.5	0.0	0.0
FLUORESCEIN RETENTION						
Total Observed	67.8	15.5	2.0	11.9	2.6	0.2
Control Gp.	61.4	18.2	2.3	17.4	0.0	0.7
Ortho-K Gp.	71.4	12.2	2.4	11.1	2.9	0.0
CONJUNCTIVAL INJECTION						
Total Observed	44.4	53.2	---	2.2	0.2	0.0
Control Gp.	47.0	52.2	---	0.8	0.0	0.0
Ortho-K Gp.	55.8	43.7	---	0.0	0.5	0.0
PERILIMBAL INJECTION						
Total Observed	42.0	55.6	---	2.4	0.0	0.0
Control Gp.	50.7	47.0	---	2.3	0.0	0.0
Ortho-K Gp.	39.8	59.2	---	1.0	0.0	0.0

BREAK -UP TIME	0 to 6	7 to 9	10 to 14	15 plus
Control Gp.	5.3	6.8	16.7	71.2
Ortho-K Gp.	3.9	4.4	25.2	66.5

BIOMICROSCOPY RESULTS

Patients Only Showing Low Grade Levels

Category	Project I Orthokeratology (Total 10)	Project II Control (Total 10)	Project II Orthokeratology (Total 12)
Corneal Edema			
Grade 0	2	2	5
0 to 0.5	6	6	9
Fluorescein Retention			
Grade 0	2	2	2
Conjunctival Injection			
Grade 0	0	3	2
0 to 0.5	0	3	5
0 to 1.0	6	10	11
Perilimbal Injection			
Grade 0	1	1	1
0 to 0.5	1	3	4
0 to 1.0	6	9	11
Tear Break-Up Time			
15 sec.	3	1	2

MEAN CYLINDER VALUES - FIRST AND LAST SESSION

(in Diopters)

(All With-the-Rule)

Group	7 A	PEK	Keratometry
Project I Orthokeratology			
Start	0.0139 ± 0.465	0.424 ± 0.354	0.490 ± 0.395
Finish	0.1110 ± 0.430	0.533 ± 0.419	0.570 ± 0.445
Project II Control			
Start	0.132 ± 0.617	0.536 ± 0.521	0.586 ± 0.665
Finish	0.025 ± 0.584	0.513 ± 0.513	0.412 ± 0.585
Project II Orthokeratology			
Start	0.130 ± 0.469	0.539 ± 0.514	0.477 ± 0.611
Finish	0.156 ± 0.300	0.708 ± 0.555	0.500 ± 0.558

MEAN MERIDIAN OF 7A NEAREST 180

(in degrees)

Group	Baseline	Range High	Range Low
Project I Orthokeratology	1.40 ± 12.19	4.30 ± 22.12 Week 55	179.16 ± 23.08 Week 52
Project II Control	4.05 ± 17.70	4.50 ± 11.41 Week 11	170.25 ± 22.36 Week 17
Project II Orthokeratology	2.00 ± 10.16	5.00 ± 12.25 Week 3	177.22 ± 16.28 Week 17
MEAN MERIDIAN OF PEK NEAREST 180			
Project I Orthokeratology	176.95 ± 18.48	2.10 ± 2.72 Week 69	171.25 ± 15.75 Week 66
Project II Control	178.20 ± 20.00	10.00 ± 19.00 Week 11	170.71 ± 20.17 Week 14
Project II Orthokeratology	3.45 ± 14.17	3.45 ± 14.17 Week 1	171.73 ± 12.75 Week 3
MEAN MERIDIAN OF KERATOMETRY NEAREST 180			
Project I Orthokeratology	1.30 ± 3.72	3.83 ± 9.21 Week 69	173.11 ± 14.86 Week 60
Project II Control	3.38 ± 11.92	3.60 ± 12.55 Week 3	177.50 ± 7.07 Week 11
Project II Orthokeratology	177.54 ± 8.60	2.58 ± 10.42 Week 3	177.54 ± 8.60 Week 1

CONTACT LENS POSITION

Group	RANGE	
	Most Nasalward	Most Temporalward
Project I Orthokeratology	7.30 ± 0.67 Week 60	7.71 ± 0.95 Week 66
Project II Control	7.40 ± 0.63 Week 8	8.00 ± 0.00 Week 11
Project II Orthokeratology	7.55 ± 0.60 Week 11	7.95 ± 0.65 Week 20

CONTACT LENS POSITION

MEAN VERTICAL POSITIONING

Group	Baseline	Week 14 (60)	Week 20 (66)
Project I Orthokeratology	2.64 ± 0.99	1.85 ± 0.38	2.09 ± 0.54
Project II Control	2.39 ± 0.50	2.07 ± 0.70	2.00 ± 0.52
Project II Orthokeratology	2.25 ± 0.79	1.78 ± 0.92	2.09 ± 0.81

MEAN HORIZONTAL POSITIONING

Project I Orthokeratology	7.41 ± 0.62	7.30 ± 0.67	7.71 ± 0.95
Project II Control	7.50 ± 0.62	-----	-----
Project II Orthokeratology	7.71 ± 0.55	-----	7.95 ± 0.65

PROJECT I ORTHOKERATOLOGY

n	X VARIABLE	Y VARIABLE	CORRELATION COEFFICIENT	PER CENT VARIANCE	t-VALUE	SIGNIFICANCE LEVEL (df = n-2)
7	VA	CL Position (V)	0.062		0.1383	> 0.20
7	VA	CL Position (H)	0.899	80.75	4.579	0.01
7	VA	Tear Reservoir	-0.030	0.09	-0.067	> 0.20
7	VA	e^2 at 90	-0.560	31.39	-1.513	0.20
7	VA	e^2 at 180	-0.201	4.06	-0.406	> 0.20
5	VA	Axial Length (US)	0.135	1.82	0.236	0.10
7	VA	7AMS	0.774	59.94	2.735	0.05
7	VA	Keratometry at 90	0.019	0.03	0.042	> 0.20
7	VA	Keratometry at 180	0.437	19.07	1.085	> 0.20

PROJECT II CONTROL

n	X VARIABLE	Y VARIABLE	CORRELATION COEFFICIENT	PER CENT VARIANCE ($r^2(100)$)	t-VALUE	SIGNIFICANCE LEVEL (df = n-2)
7	VA	CL Position (V)	0.179	3.20	0.407	> 0.20
7	VA	CL Position (H)	0.197	3.87	0.448	> 0.20
7	VA	Tear Reservoir	0.764	58.40	2.649	0.05
7	VA	e^2 at 90	-0.662	43.88	-1.977	0.20
7	VA	e^2 at 180	-0.714	51.06	-2.284	0.10
5	VA	Axial Length (US)	-0.544	29.61	-1.123	> 0.20
7	VA	7AMS	0.680	46.21	2.073	0.10
7	VA	Keratometry at 90	0.733	53.71	2.408	0.10
7	VA	Keratometry at 180	0.710	50.45	2.256	0.10

PROJECT II ORTHOKERATOLOGY

n	X VARIABLE	Y VARIABLE	CORRELATION COEFFICIENT	PER CENT VARIANCE	t-VALUE	SIGNIFICANCE LEVEL (df = n-2)
7	VA	CL Position (V)	-0.866	74.94	-3.867	0.02
7	VA	CL Position (H)	0.404	16.34	0.988	> 0.20
7	VA	Tear Reservoir	0.760	57.72	2.613	0.05
7	VA	e^2 at 90	-0.819	67.16	-3.198	0.05
7	VA	e^2 at 180	-0.795	63.25	-2.933	0.05
5	VA	Axial Length (US)	-0.630	39.70	-1.405	> 0.20
7	VA	7AMS	0.886	78.44	4.265	0.01
7	VA	Keratometry at 90	0.733	53.67	2.407	0.10
7	VA	Keratometry at 180	0.666	44.42	1.999	0.20

REFERENCES

1. May, Charles H., and Grant, Stuart, "Orthokeratology-Control of Refractive Error Through Contact Lenses," Journal of the American Optometric Association, 42 (13), p. 1277-1283, Dec., 1971.

2. Orthokeratology, Vol. I, 1972, International Orthokeratology Section of the National Eye Research Foundation, 1972.

3. Orthokeratology, Vol. II, 1974, International Orthokeratology Section of the National Eye Research Foundation, 1974.

4. Nolan, Joseph A., "Myopia Control With Contact Lenses," Contacto, 11 (4), p. 24-27, 1967.

5. Nolan, Joseph A., "Orthokeratology," Journal of the American Optometric Association, 42 (4), p. 355-360, 1971.

6. Nolan, Joseph A., "Myopia Control and Correction," Contacto, 14 (2), p. 1277-1283, 1971.

7. Ziff, Sanford L., "Orthokeratology," Journal of the American Optometric Association, 47 (3), p. 376, 1976.

8. Kerns, Ronald L., "Research in Orthokeratology, Part I: Introduction and Background," Journal of the American Optometric Association, 47 (8), p. 1047-1051, Aug., 1976.

9. Kerns, Ronald L., "Research in Orthokeratology, Part II: Experimental Design, Protocol, and Methods," Journal of the American Optometric Association, 47 (10), p. 1275-1285, Oct., 1976.

10. Kerns, Ronald L., "Research in Orthokeratology, Part III: Results and Observations," Journal of the American Optometric Association, 47 (12), p. 1505-1515, Dec., 1976.

11. Kerns, Ronald L., "Research in Orthokeratology, Part IV: Results and Observations," Journal of the American Optometric Association, 48 (2), p. 227-238, Feb., 1977.

12. Kerns, Ronald L., "Research in Orthokeratology, Part V: Results and Observations, Recovery Aspects," Journal of the American Optometric Association, 48 (3), p. 345-359, March, 1977.

13. Tabb, Roger , unpublished notes and consultation, 1976.

14. Coon, Lynn J., unpublished notes, 1976.

15. Mandell, R.B., and St. Helen, R., "Mathematical Model of the Corneal Contour," British Journal of Physiological Optics, 26 (3), p. 183-197, 1972.

16. Townsley, M.G., "The Graphic Presentation of Corneal Curvature," Contacto, 18 (14), p. 24-32, 1974.

17. Mandell, Robert B., Chapter 3 - "Corneal Topography," Contact Lens Practice, Springfield, 1974.

18. Bibby, Malcom M., "Computer-Assisted Photokeratoscopy and Contact Lens Design," The Optician, reprint, Vol. 171, p. 37-44, March 5, 1976.

19. Nolan, J.A., "Orthokeratology and the Keratoscope," Optometrist's Exchange, p. 3-5, May, 1976.

20. Alsbirk, P.H., "Optical Pachometry of the Anterior Chamber," Acta Ophthalmologica, 52 (5), p. 747-758.

21. Lowe, R.F., "New Instruments for Measuring Anterior Chamber Depth and Corneal Thickness," American Journal of Ophthalmology, 62, p. 7-11, 1969.

22. Alsbirk, P.H., see reference 20.

23. Ehlers, N., and Hansen, F. K., "On the Optical Measurement of Corneal Thickness," Acta Ophthalmologica, 49 (1), p. 65-81.

24. Giglio, Ernest J., and Ludlam, William M., "Ultrasound-A Diagnostic Tool for the Examination of the Eye," American Journal of Optometry and Archives of the American Academy of Optometry, Nov., 1966.

25. Giglio, Ernest J., Ludlam, William M., and Wittenberg, Sidney, "Improvements in the Measurement of Intraocular Distance Using Ultrasound," Journal of the Acoustical Society of America, 44 (5), p. 1359-1364, Nov., 1968.

26. Giglio, Ernest J., and Ludlam, William M., "A Hand-Held Probe for Acoustic Coupling in Ultrasonic Intraocular Distance Measurements of Young Children," American Journal of Optometry and Archives of the American Academy of Optometry, (12), Dec., 1971.

27. Ludlam, William M., Witterberg, Sidney, and Rosenthal, Jesse, "Measurements of the Ocular Dioptric Elements Utilizing Photographic Methods," American Journal of Optometry and Archives of the American Academy of Optometry, 42 (7), p. 394-416, 1965.

28. Francis, J. L., "Some Measurements on Myopic Eyes," Transactions of the International Ophthalmic Optical Congress, 1961, Hafner Publishing Co., p. 405-416, 1962.

29. Grolman, Bernard, "A Status Report Prepared for the International Tonometer Standards Committee," Paris, May 26, 1974.

30. Grolman, Bernard, see reference 29.

31. Rubin, Leroy, Optometry Handbook, Butterworth Publishers, p. 4, 1975.