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**Experimental Procedures To Determine
Efficacy Of Refractive Error Change Induced By Lenses**

by

Gilbert G. Narro

**A thesis submitted to the faculty of the
College of Optometry
Pacific University
Forest Grove, Oregon
in partial fulfillment of requirements
for the degree of
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Signature Page

Experimental Procedures To Determine Efficacy Of Refractive Error Change Induced By Lenses

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Biography

The author graduated from the University of California at San Diego with a Bachelor of Arts in Animal Physiology with a minor in Health Care/Social Issues on June 1987. He attended Pacific University College of Optometry from August 1988 to May 1992.

He was awarded a commission in the United States Air Force and has been assigned to March Air Force base in Riverside, California.

Abstract

There is no empirical evidence, only case studies and personal opinions that have shown a refractive error can be altered by changing lens prescriptions. The applied use of specified sources and cited methods to determine a prescription criterion will help determine if refractive error is changed in a myopic patient with the use of specific lenses.

There have been few recent studies in the literature that addresses the issue of myopia control and or reduction in terms of actual clinical trials. A paper written by Lance Anderson that did address this subject involved the whole concept of myopia including its etiology, correction, and possible progression. This paper is an excellent source for people who want to get the latest information on myopia; however it does not involve any patients.

One of the few recent studies done which did involve patients took place in 1989 involving increasing the acuity without increasing the myopia in school aged myopic children who ranged from 9 - 11 years in age. This study, performed in Finland, showed that their criterion (involving bifocals only) did not affect acuity.⁹

In another study done in 1981; Steven Greenspan's final conclusion states that myopic progression may be influenced by bifocals.¹²

Still other practitioners employed yoked prisms to control myopia. the use of prisms, it is contended, act much in the same way as spherical lenses (for example - base out and base up act like plus lenses and base down and base out act like minus lenses.

The use of prisms and in some cases prisms combined with bifocals were recommended by several practitioners who have employed these techniques in order to reduce or control myopia with various amounts of success^{20, 21, 22, 23}

In doing research for this study it was found that there were no clear cut consensus on whether lens therapy of any kind wither improved, stabilized, or deteriorated the myopic condition. This study will employ a specific lens therapy criterion in order to look further into the matter of clinically managing myopia.

Since it is impossible, at this time, to control myopia at a genetic level; it should however, be managed at the first sign of its appearance.⁵ This premise can be another study in itself. the study about to be undertaken is concerned with controlling myopia or possible decreasing the amount of myopia; although any significant change in any value measured (i.e. - phoria, axil length, etc.) will be noted. the target group will be young adults who attend undergraduate/graduate school who have high near work tasks.

The myopic remediation will be attempted with the use of yoked prisms, bifocals (to relax accommodation), and spherical lenses.

In order to begin this study, a complete 21-point analytical exam is done. This battery provides the necessary data from which an appropriate lens prescription can be derived.⁶

At this point, a few words on using yoked prisms will be made. Yoked prisms are used for a specific purpose, mainly an alteration of behavior.¹ As light enters the base and the degree is based on the power of the prism. As an example, when base left prism is placed before the eyes, light is bent to the left an object viewed is shifted to the right. In a sense, the primary influence of yoked prisms is to effect a movement of the eyes in the direction of the apex of the prism.¹ According to Kraskin, low powered yoked prisms are very potent,¹ which can affect the patient's physiology.⁵ Prisms can be used to help the patient but they must be monitored closely.¹

POPULATION:

The population to be used for the study will be described as follows: the ages will be between nineteen (19) - thirty (30) years old; this age group will encompass the majority of the undergraduate and graduate school population.

Due to the nature of the study, no subjects shall have previously diagnosed binocular disorders. No subjects shall be accepted if they are taking topical or systemic medications; or have a systemic or ocular condition that may limit visual functions (i.e. diabetes, steroids, cycloplegic/mydiatics, antihistamines, etc.)

The number of subjects will be at least fifteen. The subjects shall have at least 1.00 diopter of myopia as long as they are corrected to 20/20 without the aid of cylinder.

Only spectacles will be allowed to correct vision, no contact lenses of any kind shall be worn for the duration of the study.

MATERIALS:

The materials needed for the study shall include a refracting lane with all the equipment needed to perform a 21 point eye examination.

In order to determine if the study has any effect on the axial length of the globe, an a-Scan will be needed; such an instrument can be found at Pacific University College of Optometry.

Finally, as a prescription changes, or is changed, new lenses are required. a lens manufacturing company will be needed to fill this capacity; also it is hoped that they may also provide lenses. In return, they will be acknowledged in the study.

PRESCREENING:

The first item that needs to be addressed is: did the subject meet the above criteria? If potential subject does not meet the above criterion, that subject shall be excused. If the criterion is met, then a complete history is to be taken. This is done so that future studies may be able to determine some correlation. The history shall include, but not be limited to: sex; family ocular history, onset of myopia, success with previous corrections, have bifocals been previously prescribed, etc. any other relevant history must be included for possible future use.

TESTING: (Initial)

After previous preliminary procedures are completed; a first exam is done. (Subjects wearing contact lenses of any kind should discontinue use for at least three (3) days.) A 21 point exam shall be performed; the endpoint of the 7a shall be a spherical refraction to first 20/20. Included is a near spherical to 20/20.

After the exam, the prescription should be verified with a trial frame. Finally, an A-Scan shall be performed with all variables recorded along with a hard copy of results.

CONSECUTIVE TESTING:

Every three (3) weeks for a total wear time of twelve (12) - thirteen (13) weeks.

The following procedures shall be performed: 21 point exam; spherical Rx to 20/20; near subjective to 20/20; any change indicated by the prescription criterion will be ordered; verify with trial frame.

FINAL TESTING:

The final exam will be performed like the initial exam. any subjective impressions of the test subject's experience shall be recorded.

ANALYSIS OF DATA:

First, any change in the 7a should be plotted on a graph and the outcome analyzed.

Any statistics will include a written subjects test.

Normative analysis shall also be employed to look for any change in the analysis profile.

OEP shall be used to look for any change in the typing.

PRESCRIPTION CRITERION:

With the advise of Sam Horner,²⁰ the following prescription criterion shall be followed: First a value called the "K" function needs to be calculated. This function can be found by taking a gradient AC/A using 13A, 13B and 15B values. The average of these three (3) is the "K" fraction. If the "K" value is 3^{1D} or less, use 3^{\wedge} base down; if the person is exophoric - use 2^{\wedge} base up.

If the person's AC/A is greater than 3^{1D} , the #19 and #20 shall be compared. If #19 and #20 are low, a $+1.00^D$ add shall be given.

Also, if a person's myopia is progressive, a bifocal is warranted. If the myopia is not progressive, and the #19 and #20 are within normal limits, single vision spherical lenses are used.

If the AC/A is greater than 3^{1D} and a bifocal is not indicated, then the subject shall be prescribed the spherical correction to first 20/20.

The choice of prescription shall be noted on the record and changes made as appropriate.

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