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John R. Roggenkamp

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Nakano e.f.

**A CLINICAL EVALUATION
OF
THE ALPHA "D" PROGRESSIVE ADDITION LENS**

**RESEARCH ADVISOR
JOHN R. ROGGENKAMP, D.D.**

**SUBMITTED BY
MARK E. NAKANO
RONALD L. BENNER**

MARCH 27, 1986

**IN
PARTIAL FULFILLMENT
FOR THE DEGREE
DOCTOR OF OPTOMETRY**

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Abstract

A randomly selected clinic population (n=18) of emmetropes and contact lens wearing presbyopes was fit with the Alpha"D" progressive addition lens. Subjects were asked to wear the lens for three weeks then respond to a questionnaire assessing adaptation, visual acuity, visual comfort, and acceptability of the Alpha"D" lens.

Subjects reported early adaptation, minor symptomatology, and an overall feeling of visual comfort with the lens. Distortion was reported as a problem as well as difficulty when utilized for desk work. Subject preference between the Alpha"D" lens and previous lens forms (bifocals, half eyes, and progressive addition lenses) was mixed, finding 50% preferring the Alpha"D" lens over their original form.

Key Words

Alpha"D", Contact Lenses, Emmetropia, Multifocals, Presbyopia, Progressive Addition Lenses, Varilux.

Introduction

Current demographic trends show an increase in the average age of the population. During the past decade the population between the ages 25-44, has increased approximately 32%. Projections for the year 2000, show another 41% increase over 1985 levels and a 35% increase in the 45-65 age group.¹ This increase of the middle and older aged populations will create a number of demands on the practicing optometrist. The older population will require increased care due to a higher risk of disease and a greater need for ophthalmic correction. This population brings with them several new considerations: a larger number of emmetropes and contact lens wearers as well as a greater concern for cosmetic appearance. This creates a dual problem: correcting presbyopia in a population not accustomed to wearing spectacles and creating forms of correction which are cosmetically appealing.

This has motivated the optical industry to design ophthalmic corrections which compensate for loss of accommodative flexibility while being cosmetically appealing.² Current designs include invisible or blended bifocals, progressive addition lenses (PAL), and bifocal contact lenses. The blended bifocal is an alternative to the visible segmented bifocal. The only advantage to this lens is the cosmetic appearance.³ Another option is the PAL, which is a no-line bifocal with a transition corridor linking the distance area with the near area. This lens is gaining increased acceptance amongst practitioners and patients. The bifocal contact lens presents itself as a viable option for some presbyopic patients. This form of correction is still under investigation and currently is experiencing limited success. All offer differences in ways of correction, cosmetic appearance, and cost.

Long time contact lens wearers are reluctant to give up their contact lenses as presbyopia approaches. For some contact lens wearers there is the option of the bifocal contact lens, and for others there is the anisometric or monovision fit.

Weidt and Burton state that when fitting a patient with monovision, central stereoscopic vision is compromised, and this method may cause a problem where critical stereoacuity is needed.⁴ Heath et al. studied the effects of monovision and suppression behavior. They found that in order to have 100% suppression at near, monocular adds of +2.00 to +2.50 are required, regardless of the minimum amount of plus necessary to satisfy the patient's individual needs. Heath et al. also noted a decrease in stereopsis below 50 minutes of arc, when a maximum plus lens was used.⁵ Maltzman et al. fit 53 patients with bifocal contact lenses and found that 93.5% (49/53) were unsuccessful. They also stated their number one alternative was to utilize spectacle reading glasses for patients without refractive error or patients corrected with contact lenses.⁶

Current forms of spectacle lens for near correction are the segmented bifocals (ST-25,28,35, & Executive), segmented trifocals (ST 7H28, & Executive), half-eye, full field readers, and progressive addition lenses. The segmented bifocal is made for a specific working distance, creating a limitation of usable range as add powers increase. Another problem with the segmented bifocal is the sharp demarcation between the distance and the near area, causing an image "jump", except for the executive bifocal. The segmented trifocal increases the range of usefulness with an intermediate power while reducing the problem of image "jump". Both the bifocal and the trifocal have very visible demarcations between the distance and near zones.

The appearance of conventional multifocal lenses causes many patients to reject a needed near lens prescription. There are several alternatives to this cosmetic problem. One alternative is the blended bifocal. This lens is cosmetically appealing, but functionally less acceptable due to the central and peripheral distortions. Another alternative for the presbyopic patient is the utilization of half-eye and full-field

readers. These are functionally more acceptable, but are infrequently selected as a result of being cosmetically unappealing and often bothersome when they must be removed and replaced frequently. The progressive addition lens(PAL) is a viable option for most patients dissatisfied with conventional multifocal lenses.

Kleinstei n described the similarities and differences of three PAL's (Varilux-2, Younger 10/30,Ultravue). In general, the PAL has no visible segment line(cosmetically appealing), has a transition zone linking the distance and near areas of the lens (eliminating image jump), and has unusable areas in the lens. The unusable area is result of the aspheric front surface in the Varilux-2 lens, and the aspheric back surface on the other types. This distortion is a result of off-axis induced cylinder power. Other differences include the length of the transition zone, the width of the distance and near areas, base curve availability, and fitting methodology.⁷

These positive and negative characteristics are dependent on the lens design. Studies by Brooks⁸ and Schultz⁹ have indicated special consideration should be given to the visual demands of the patient and motivation for higher success. Essilor International has developed a number of lenses suitable for various occupations and avocations. Their first lens design was the Varilux-1, which experienced limited acceptance due to it's narrow corridor, peripheral distortion, and optical aberrations. The Varilux-2 lens with a wider transition corridor, decreased peripheral distortion and decreased optical aberrations followed the first lens and has demonstrated high acceptance in studies by House¹⁰, Schultz⁹, Spaulding¹¹, Borish, et. al.¹², and Tsujimura¹³.

Essilor recently developed a lens form that could be utilized by the contact lens wearing or emmetropic presbyope. The new lens design (Alpha "S") came in the form of a plano distance area combined with a variable transition zone(6-12mm.) dependent on the dioptric near value, and a wider near zone than the Varilux-2. This lens was designed for the individuals who needed a larger field or who used their

near vision for prolonged periods of time. The short transition zone is nominally designed for static conditions. Ness and Mc Bride, clinically evaluated the acceptance of the Alpha "S". They found that 45% of the 20 randomly selected subjects accepted the Alpha "S" over half-eye or bifocal readers.¹⁴

In order to give the contact lens wearing or emmetropic presbyope more mobility when wearing a near compensatory lens, Essilor developed the Alpha "D". The Alpha "D" is also designed with a plano distance area for the emmetropic or contact lens wearing presbyope.

The transition zone is described as smooth and the total effective near power is available at 12 millimeters below the distance optical center. The total near powers available are +1.00 to +2.00 diopters in quarter diopter increments^H. The near width of the Alpha "D" is wider than the Varilux-2, and equal to the Alpha "S", and the decentration from the distance optical center to the near center is 2.5 millimeters. The gradual transition of near power allows for decreased peripheral distortion, hence a more comfortable lens when changing from near to distance vision.

Purpose

The purpose of this study is to clinically evaluate the acceptability of the Alpha "D" lens, when worn by contact lens wearing or emmetropic presbyopes. The criterion of previous near spectacle lens wear was used in selection of the population, so that we could evaluate the acceptability based on some previous experience with near point lenses. It is our hypothesis that the new design of the Alpha "D" will allow patients more mobility and visual comfort while wearing these progressive addition lenses.

Methods

To assess clinical acceptance 18 subjects were fit with the Alpha"D" lens. All of the subjects were selected from the general clinic population of Pacific University College of Optometry. The criteria for subject participation was emmetropic or contact lens wearing presbyopia along with previous near spectacle lens wear. Utilization of this criterion found 5 emmetropes and 13 contact lens wearers. The subject population included 12 men and 6 women, and their ages ranged from 27 to 64. Occupational data as well as other background information can be found in Table 1. All of the subjects have worn previous near point lenses including segmented multifocals, half-eye readers, and/or progressive addition lenses. Table 1 shows which types of lenses have been worn previously and what lens was preferred by the subject.

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Insert Table 1 Here
.....

The subjects were allowed to select a frame of their choice and were only restricted to frame sizes that allowed the lenses to be fit. After frame selection, the near pupillary distance (PD) was measured at a simulated 40 centimeters using a Silor pupilometer. To fit for the appropriate near pupillary distance, the monocular distance PD was calculated from the measured near monocular PD plus 2.5 millimeters. The vertical major reference point was measured from the center of the pupil to the lowest portion of the frame plus 1 millimeter. The subjects returned for dispensing of the spectacles and were instructed on the use of a progressive addition lens. The instructions pertaining to the utilization of progressive addition lenses included: directing the head towards the material of interest, limitations of eye

SUBJECT	SEX	AGE	OCCUPATION	ADD	DESIGN USED	DESIGNS TRIED	PREFERENCE
RB	M	45	INSURANCE	1.00	HALF EYE	ALPHA S & BIFOCAL	HALF EYE
SC	M	46	PROFESSOR	1.25	HALF EYE	BIFOCAL	HALF EYE
DC	F	54	BANK OFFICER	1.75	ALPHA S	HALF EYE & BIFOCAL	BIFOCAL
BD	F	43	PROFESSOR	1.25	NONE	BIFOCAL & VARILUX	ALPHA D
FD	M	50	NURSE	2.00	ALPHA S	BIFOCAL & HALF EYE	ALPHA D
DF	M	53	RETAILER	1.75	HALF EYE	BIFOCAL	ALPHA D
EE	M	45	CIVIL ENGINEER	1.00	ALPHA S	BIFOCAL & HALF EYE	ALPHA S
EG	F	37	ADMINISTRATOR	1.00	ALPHA S	HALF EYE & BIFOCAL	ALPHA D
RJ	M	47	LIBRARIAN	2.00	BIFOCAL	HALF EYE	BIFOCAL
DL	M	51	TV TECH	1.50	BIFOCAL	---	ALPHA D
BL	M	55	PROFESSOR	1.75	HALF EYE	---	HALF EYE
YL	F	45	CLERICAL	1.25	ALPHA S	HALF EYE	ALPHA D
MN	M	27	STUDENT	1.00	BIFOCAL	---	ALPHA D
LO	F	46	SECRETARY	1.25	BIFOCAL	ALPHA S & VARILUX	BIFOCAL
GP	F	64	RETIRED	1.50	HALF EYE	ALPHA S & VARILUX	ALPHA D
MR	F	48	SECRETARY	1.00	HALF EYE	ALPHA S	ALPHA S
RR	M	50	ADMINISTRATOR	2.00	HALF EYE	ALPHA S & BIFOCAL	ALPHA D
DY	M	61	PROFESSOR	2.00	BIFOCAL	---	BIFOCAL

TABLE 1. SUBJECT DATA

movements when reading, and use of the variable transition zone to maximize clarity. The adaptation period was also discussed, so the subjects would be aware of possible visual disturbances they might encounter. Frame adjustments made included; setting the distance cross markings at the center of the pupils, vertex distance (~12mm), pantoscopic angle (~10°), along with appropriate adjustments for maximum comfort. The subjects were instructed to wear only the Alpha"D" spectacles for 3 weeks, and were told to return if their frame needed adjustments, or to call if they had any problems or questions.

After 3 weeks of use, a questionnaire pertaining to their experience with the Alpha"D" lens was completed. (See Appendix "A")

Results

The 18 subjects were administered a questionnaire assessing their reaction towards adaptation, symptomatology, acceptance of the Alpha"D" lens. A general overview of lens performance found subjects experiencing some inconveniences, while fulfilling most of their needs. The amount of wearing time was variable, and the majority of the subjects wore the lenses less than 50% of the time. This can be attributed to the clear distance vision sustained by the emmetropic and contact lens wearing subjects. The lens was worn by 8(44%) less than 25% of the time, and 8(44%) less than 50% of the time. The visual comfort of the lens was rated high with 14 of 18 subjects agreeing. Those individuals who did not feel the lens was visually comfortable reported distortion as a dislike.

The adaptation period for the majority of the subjects was rapid. The responses of the subjects are as follows: 7(39%) adapted in less than one day, 5(28%) felt

adaptation took less than one week , 4(22%) adapted to the lens in two weeks, and 2(11%) did not adapt to the lens. The adaptation period was shorter for those individuals who had previously worn half eye or Alpha"S" readers. Those who preferred standard bifocal lenses had a tendency toward prolonged adaptation or did not adapt to the new lens (Figure 1). No relationship between the adaptation period and the power of the add was indicated by the data. There was no correlation between the amount of time the lens was worn each day and the adaptation period.

.....
Insert Figure 1 Here
.....

The subjects were asked to rate the Alpha"D" lens with respect to visual acuity and visual comfort for tasks requiring varied working distances. The results are tabulated in Table 2.

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Insert Table 2 Here
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The Alpha"D" lens was rated high in the areas of visual acuity and visual comfort when used for reading material and computer terminals. The majority of the population reported performance and visual acuity as acceptable when utilized for desk work.

The majority experienced few symptoms overall, but some individuals experienced some problems during wear. Headaches, eye strain, and discomfort were infrequently reported as problems. Distortion was a considerable problem for 25% and a noticeable problem of over 60% of the subjects. Difficulty with desk work

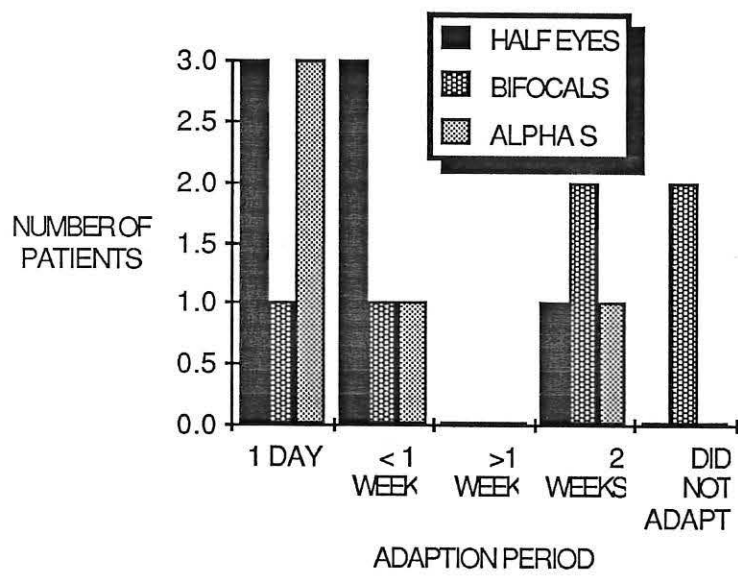


Figure 1. Adaptation time for patients shown according to previous lens wear

	EXCELLENT		ACCEPTABLE		POOR	
	ACUITY	COMFORT	ACUITY	COMFORT	ACUITY	COMFORT
READING MATERIAL	9	8	8	7	0	1
DESK WORK	4	4	12	9	1	3
DISTANCE VIEWING	8	6	6	7	3	3
COMPUTER TERMINAL	8	8	4	4	2	2

TABLE 2. VISUAL ACUITY AND COMFORT RATED BY TASK.

was also reported by 60% of the population. Those subjects who noticed difficulty in walking, felt the problem was moderate to considerable as a whole. Over 50% of the subjects felt they experienced some form of habit change while wearing the Alpha"D" lens. Results can be seen in Figure 2.

.....

Insert Figure 2 Here

.....

The responses were mixed when subjects were asked to choose between lens forms. When asked to select a lens for their working environment, 7 chose Alpha"D", 9 chose previous lens forms (5 half eye, 3 bifocal, and 1 Alpha"S") , and 2 had no preference between the Alpha"D" and their previous lens (Figure 3). The lens designs that were selected for recreational use are as

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Insert Figure 3 Here

Insert Figure 4 Here

.....

follows: 7 subjects chose Alpha"D", 1 did not respond, and 10 selected their previous lens form (5 half eye, 4 bifocal, 1 Alpha"S") (see Figure 4). The subjects were then asked to select a lens of their preference based on their overall experience. Response to the question revealed 9 selected the Alpha"D", and 9 chose another form (5 half eye, 4 bifocal, 1 Alpha"S") (see Figure 5). A breakdown of the nine subjects who selected the Alpha"D" shows that 3 were

.....

Insert Figure 5 Here

.....

previous bifocal wearers, 3 half eye users, and 3 alpha"S" wearers. While the preference for the Alpha"D" was only 50%, several important comments were made

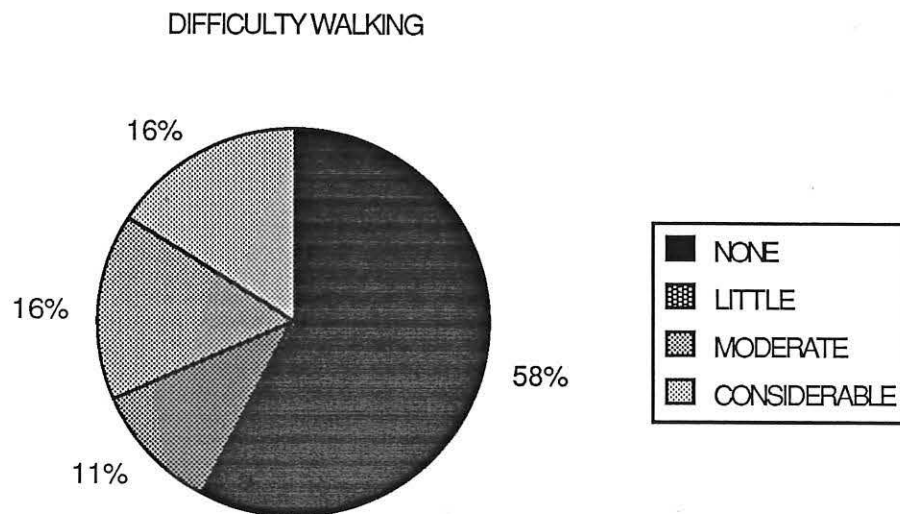


Figure 2a. Reported patient symptoms during Alpha "D" wear.

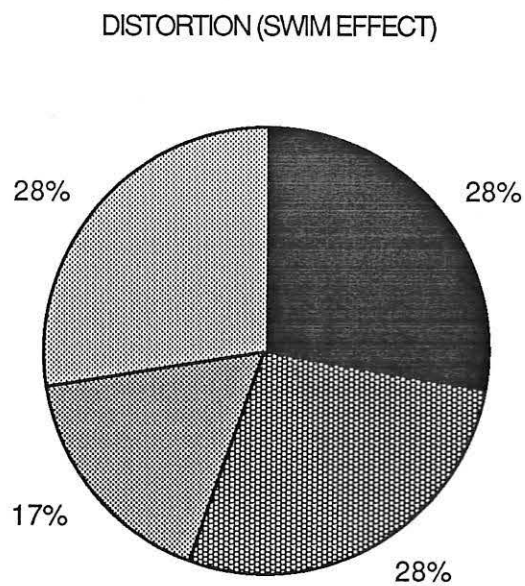


Figure 2b.

DIFFICULTY WITH DESK WORK

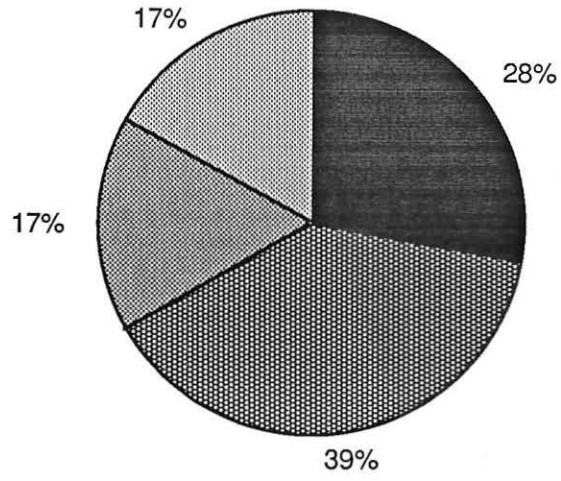


Figure 2c.

DISCOMFORT

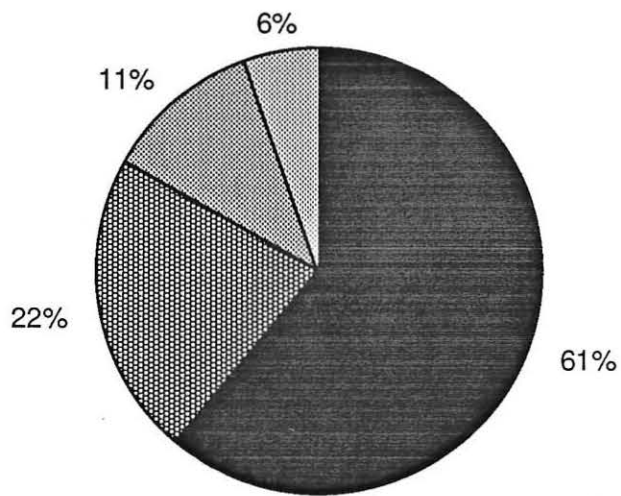


Figure 2d.

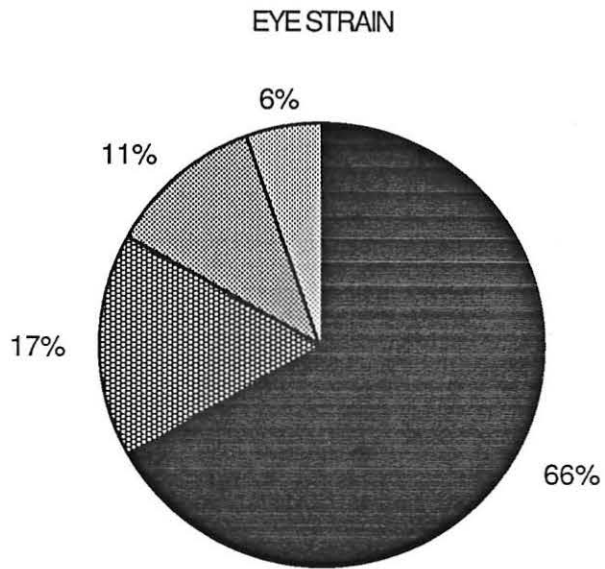


Figure 2e.

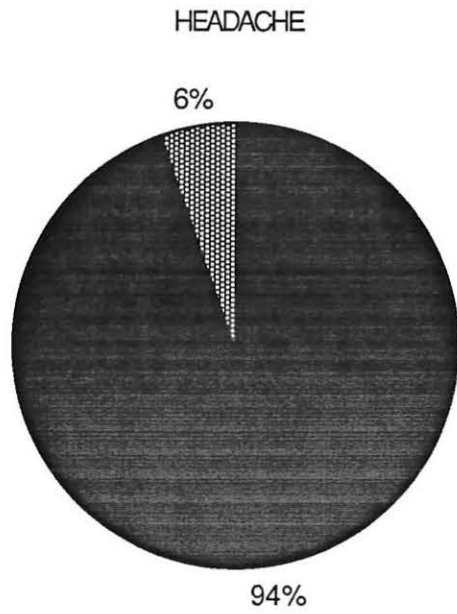


Figure 2f.

HABIT CHANGE DUE TO GLASSES

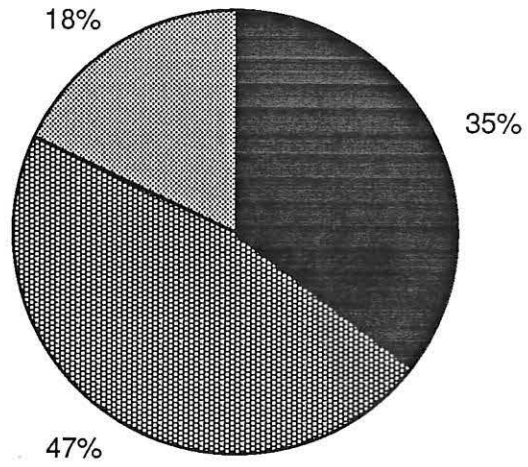


Figure 2g.

DIFFICULTY WITH SUSTAINED READING

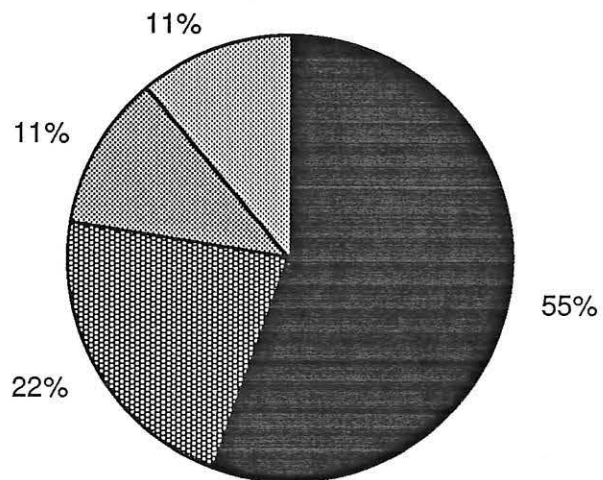


Figure 2h.

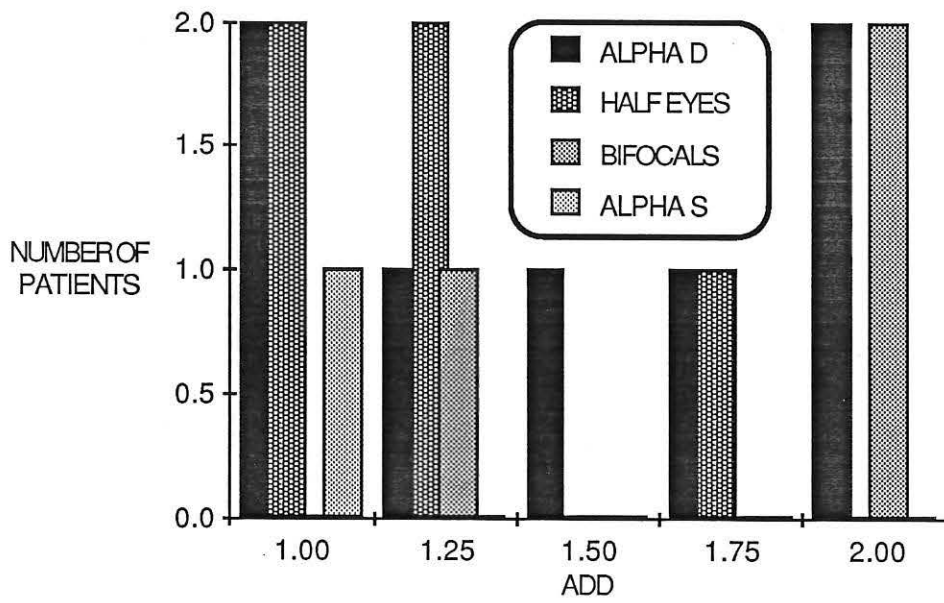


Figure 3. Lens of choice for occupational use.

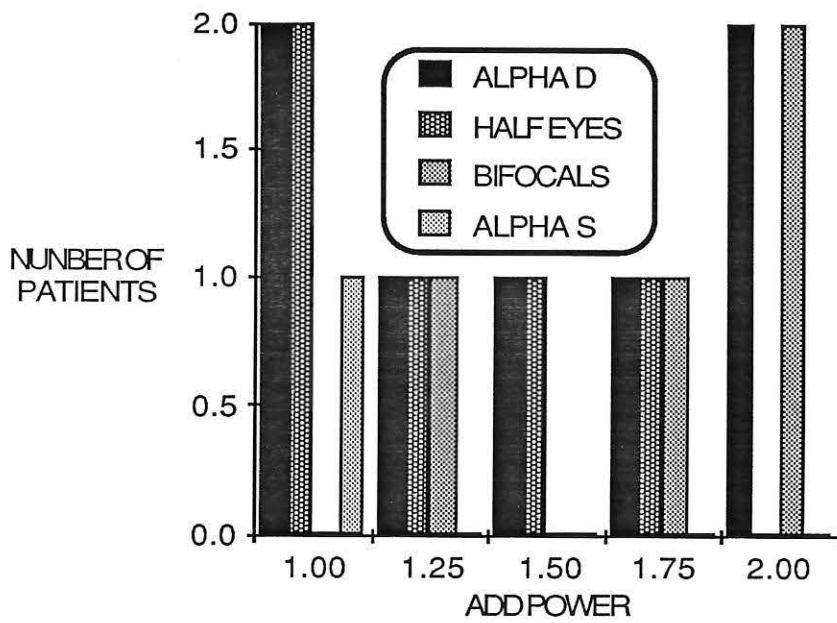


Figure 4. Lens choice for recreational use.

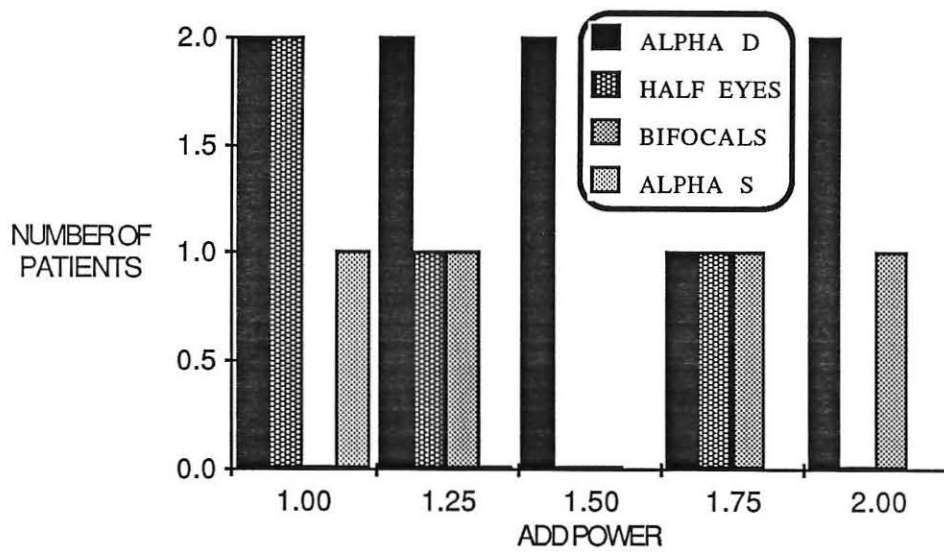


Figure 5. Overall lens preference.

concerning their selection. The subjects felt that each lens has positive attributes for various tasks, but prior experience and comfort with their previous lenses caused them to select their original form of lenses. Another factor that influenced selection was the ability of some subject's previous lenses to outperform the Alpha"D" in at least one area. The superior performance in the desk work area was enough to warrant a choice over the Alpha"D". Another comment made was that the Alpha"D" would have been the lens of choice, but some subjects felt their previous lenses were satisfactory. Reasons given for rejection of the Alpha"D" were the large amount of distortion present when doing desk work, and movement difficulty while wearing the lens. One subject felt the Alpha"D" lenses were fine, but selected the previous pair because of the weight difference. Another subject found that he had to look down too far to achieve adequate reading power.

Conclusion

The acceptability of the Alpha"D" lens was found to be 50% when our forced choice criterion was used.

To increase the acceptability of the Alpha"D" lens the appropriate frame measurements and adjustments must be made in order to ensure the effectiveness of the lens. Patients should be selected by the practitioner based on the patient's experience with multifocals, type of occupation and avocations, and motivation. The patient who is fashion minded or for whom cosmetic appearance plays an important role will appreciate this lens. Comments by two subjects indicated they would have selected this lens over the segmented bifocal for cosmetic reasons. Thorough evaluation of the potential progressive addition lens patient must be done.

The Alpha"D" lens should not be discontinued based on the acceptability by

subjects in this study. The population studied was selected at random, while the typical application of a progressive addition lens would be best determined by careful screening of patients. This will allow the Alpha"D" lens to be utilized by a population that will accept them. It is our feeling that given proper patient selection by the practitioner the Alpha"D" will be accepted at higher levels than demonstrated in this study. With all of the above in mind, it is our impression that the Alpha"D" presents itself as a viable option for emmetropic or contact lens wearing presbyopes, especially for those individuals with little or no prior spectacle needs.

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APPENDIX A

PATIENT QUESTIONNAIRE

THE PURPOSE OF THIS QUESTIONNAIRE IS TO ASSESS THE COMFORT AND EFFECTIVENESS OF THE LENSES YOU HAVE BEEN WEARING FOR THE PAST THREE WEEKS. PLEASE RELATE YOUR RESPONSES ONLY TO THE NEW LENSES YOU HAVE BEEN WEARING, UNLESS OTHERWISE STATED. IF YOU HAVE ANY QUESTIONS, PLEASE FEEL FREE TO ASK. ALSO FEEL FREE TO MAKE ANY COMMENTS YOU MAY HAVE ON THE BACK OF THIS QUESTIONNAIRE.

1) Which of the following forms of reading glasses have you previously worn?

(mark all that apply) ___ halfeye, ___ bifocal, ___ varilux,

___ executive, ___ alpha S

2) Of the above, which did you wear previous to our new lens

(Alpha- D)? _____

3) Were the new reading glasses comfortable:

Visual comfort? Y N _____

Frame comfort? Y N _____

4) How long was your adaption period? [select one]

___ (a) one day

___ (b) less than one week

___ (c) more than one week

___ (D) two weeks

___ (E) I did not adapt to these lenes

5) Do you feel you are reasonably well adapted to these reading lenses?

Y N _____

6) Symptoms you have experienced: [check you choice]

	none	little	moderate	considerable
a) Discomfort.....	___	___	___	___
b) Eye Strain.....	___	___	___	___
c) Headache.....	___	___	___	___
d) Difficulty walking.....	___	___	___	___
e) Distortion:	___	___	___	___
(swim effect)				
f) Difficulty with sustained reading	___	___	___	___
g) Difficulty with desk work	___	___	___	___
h) Habit changed due to glasses	___	___	___	___

Describe changes: _____

7) Choose one of the following statements.

- a) I have no trouble with the lenses, and they nicely fill my needs.
- b) The lenses fill most of my needs, but there is some slight inconvenience.
- c) I have some problems with the lenses, but I need them for certain things so I use them when necessary.
- d) I don't think they do a very good job, and I use them very rarely.
- e) I could not use them and had to give them up.

8) What percentage of your waking hours did you wear the glasses?

___ 0-25% ___ 50% ___ 75% ___ 90-100%

9) Please rate visual acuity for the the following working distances by checking the appropriate response category: (visual acuity= clarity)

	Excellent	Acceptable	Poor
a) Reading material	_____	_____	_____
b) Desk work	_____	_____	_____
c) Long-distance viewing	_____	_____	_____
d) Instrument panel (computer terminal)	_____	_____	_____

10) Please rate visual comfort for the following working distances by checking the appropriate response category:

	Excellent	Acceptable	Poor
a) Reading material	_____	_____	_____
b) Desk work	_____	_____	_____
c) Long-distance viewing	_____	_____	_____
d) Instrument panel (computer terminal)	_____	_____	_____

THE PURPOSE OF THIS SECTION IS TO COMPARE THE COMFORT AND EFFECTIVENESS OF THE ALPHA-D WITH YOUR PREVIOUS PAIR OF GLASSES.(BIFOCAL/HALF-EYE/ALPHA-S)

1) Which pair of glasses did you like best?

Bifocal/Half-eye/Alpha-S

Alpha-D

Comments: _____

2) Which pair of glasses were best suited to your work environment?

Bifocal/Half-eye/Alpha-S

Alpha-D

Comments: _____

3) Which pair of glasses were best suited to your hobbies or general home activities?

Bifocal/Half-eye/Alpha-S

Alpha -D

Comments: _____

4) If given a choice, which pair of glasses would you prefer?

Bifocal/Half-eye/Alpha-S

Alpha -D

Why?: _____

5) What is your current occupation? _____

