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Abstract

Seventeen presbyopic subjects with a need of an occupational lens for intermediate distance tasks were selected from the Pacific University faculty and staff for fitting with the Varilux progressive addition lens (PAL) and an experimental PAL manufactured by Essilor Corporation. Subjects wore each set of lenses for a period of three weeks and responded to a questionnaire assessing adaptability, visual comfort, visual acuity, and effectiveness at intermediate tasks. Subjects were then given both sets of lenses for one week. When finished they were asked to make a choice of which lenses they preferred for occupational and recreational tasks. The results indicate that the experimental lens is not significantly better than the Varilux for occupational or recreational use.

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A COMPARISON OF A NEW OCCUPATIONAL PROGRESSIVE LENS VERSUS THE VARILUX FOR OCCUPATIONAL USE

BY

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ABSTRACT

Seventeen presbyopic subjects with a need of an occupational lens for intermediate distance tasks were selected from the Pacific University faculty and staff for fitting with the Varilux progressive addition lens (PAL) and an experimental PAL manufactured by Essilor Corporation. Subjects wore each set of lenses for a period of three weeks and responded to a questionnaire assessing adaptability, visual comfort, visual acuity, and effectiveness at intermediate tasks. Subjects were then given both sets of lenses for one week. When finished they were asked to make a choice of which lenses they preferred for occupational and recreational tasks. The results indicate that the experimental lens is not significantly better than the Varilux for occupational or recreational use.

KEY WORDS

Intermediate task, Presbyopia, Progressive addition lenses, Varilux.

INTRODUCTION

With the increasing use of visual display terminals (VDT's), large numbers of presbyopic individuals are encountering limitations with traditional occupational lenses. One limitation with segmented designs such as the straight top multifocal, is image jump caused by an abrupt change in lens power at the segment's edge. This transition line can produce blurred or doubled images. Monocentric lenses such as the Executive style multifocal avoid this problem by having a common optical center for all lens powers. Increased lens thickness, weight, and manufacturing difficulties due to increased breakage during the generation process and chipping at the segment line, makes monocentric designs less desirable. The visibility of transition lines is often cosmetically unacceptable to the wearer of segmented designs.

Single vision lenses are often prescribed for occupational use. Although this design does not have image jump or visible lines the single vision lens is limited by depth of field and the wearer's accommodative amplitude. Only PAL's solve the problems of image jump, transition line blur, diplopia, decreased range of clear vision, and cosmetic appearance.

The first PAL introduced commercially was the Varilux 1 in 1951.[1] Since that time, many manufacturers have introduced various PAL designs. Every PAL lens has three common elements, a distance portion, near portion, and a progression zone between the far and near zone power.[2] Most lens designs alter one of these elements to improve specific qualities of a lens. Qualities of interest are the width of the transition zone, and aberrations remaining in peripheral areas of the lens. A major design change instituted by Essilor Corporation in the Varilux involved introduction of aspheric curves on the front surface as opposed to aspheric back surface designs more predominant in today's PAL market. This change produced a smoother transition zone with less distortion. This change also produced less consistency in peripheral distance portions as well as a narrower usable near field.[3]

Until recently, lens designs have not completely fulfilled occupational needs. Manufacturers are now developing lenses specifically for intermediate distance use. The Essilor experimental lens is similar to Varilux, but design changes have been made to make it more suitable for intermediate distance use. These changes include widening of the intermediate distance zone as well as slowing the rate of progression from distance to near powers. The purpose of this study was to determine whether this new experimental occupational lens was subjectively more acceptable for intermediate range tasks as compared to Varilux. The hypothesis of this study is that with the wider intermediate zone as well as a slower power change in that zone the experimental lens will be superior to Varilux for specific occupational tasks.

PROCEDURES

Seventeen presbyopic individuals were selected from the faculty and staff at Pacific University to assess clinical acceptance of a new experimental PAL. The criteria for subject participation (based on lens availability) was a distance sphere correction of +3.00 to -4.00 diopters, up to -2.50 diopters of cylinder, and presbyopic correction needs of +.75 to +2.50. Patients were required to have good binocularity and be free of serious ocular and systemic disease.

Subjects were allowed to select a frame of their choice restricted only to frame sizes that would accommodate a 75mm blank. After frame selection , the distance monocular pupillary distance was measured with a corneal reflection pupilometer. The vertical major reference point was measured from the center of the pupil to the lower edge of the lens. The subjects returned for dispensing of the spectacles and instructions on PAL use. Instructions included: directing the head towards the the material of interest, limiting eye movements during reading and use of the variable transition zone to maximize clarity. Adaptation period was discussed so subjects would be more aware of possible visual disturbances. Frame adjustments included: setting the distance major reference points at the center of the pupils, vertex distance set to approximately 12mm, and pantoscopic angle set at approximately 10mm. Any other adjustments made were to improve visual comfort in distance gaze and mechanical comfort for all frame bearing areas.

The distribution of lenses was done randomly with Varilux and the experimental lens equally represented at first dispensing. Each subject was released for a period of three weeks with instructions to wear the lenses for all tasks. Emphasis was placed on not substituting other spectacles for occupational tasks during this period. If subjects were uncomfortable using

the lenses during recreational tasks, they were allowed to substitute their own lenses during these tasks only. A questionnaire was administered at the end of the three week trial period which assessed the subjective performance of the first pair of lenses. These lenses were returned and the second pair was dispensed with the same instructions. After another three week period the same questionnaire was administered. Both pair of lenses were then returned to the patient with instructions to experiment for one week and make a final choice determining which set of lenses was best suited for specific home and occupational tasks. The last visit involved a third questionnaire asking the subject to assess which lenses were more comfortable and effective for specific tasks. Subjects were asked to make an overall choice of which lens they preferred at this time. Copies of consent and questionnaire forms can be found in Appendix D.

RESULTS AND DISCUSSION

Of seventeen subjects entering, eight completed the study. Subjects were dropped due to unavailability of specific lens powers and delays in frame supply. The subject population included four females and four males 37 to 61 years of age. Occupational and other background information is found in Appendix A.

Final lens preference was determined by the third questionaire. Four of the eight subjects selected the Varilux lens as best for occupational use. Three selected the experimental, while one subject had no preference. Some reasons for Varilux preference were, not as much distortion when walking, less eyestrain, less distortion in peripheral areas, and larger clear distance field. Refer to figure 1 for a distribution of lens choice by add power .

(Insert Figure 1)

With hobbies or general home tasks, five subjects chose the Varilux while two chose the experimental lens design. One had no preference. Refer to figure 2 for distribution lens choice by add power.

(Insert Figure 2)

To determine overall preference subjects were asked, "If there were no other choices which pair of glasses would you purchase?" Six selected the Varilux, one selected the experimental and one subject had no preference. With the exception of two, subjects found the Varilux serviced most of their needs better than the experimental lens. Refer to figure 3 for distribution lens choice by add power.

(Insert Figure 3)

The majority of subjects adapted to either set of lenses within one day. All subjects adapted to Varilux within one week. With the experimental lens, one subject took two weeks, while one did not adapt at all.

There was no statistically significant difference in symptomology between the two lenses. The experimental lenses data did show slightly more difficulty with intermediate tasks, desk work, walking, and distortion. A summary of symptoms can be found in Appendixes B and C.

Subjects were asked to rate each lens in five areas of lens use: distance viewing, arms length tasks, computer terminal use, desk work, and reading materials. In these five areas there appears to be no significant difference between the lenses with respect to width of clear vision, clarity / sharpness, and visual comfort.

CONCLUSION

Although the sample size of the study does not lend itself to statistical analysis, the data does not indicate the experimental lens to be better for specific occupational tasks. Subjects did not feel that there were large differences in symptomology, or effectiveness in area of use but they unquestionably indicated a preference for Varilux if asked to choose between lenses.

To help patients become successful with Varilux, the fitting process and informative session at dispensing of the lenses cannot be ignored. Although most practitioners are aware of this, it has been our experience that properly informing the patient about adaptation periods combined with proper fitting technique can drastically increase success. Using the described procedures nearly all of our patients (88%) adapted in less than one week.

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(Appendix A) SUBJECT SUMMARY TABLE

SUBJECT	AGE	SEX	OCCUPATION	TASKS	SEQUENCE	OVERALL CHOICE	MULTIFOCAL HISTORY
B.F.	42	F	MARKETING/RESEAR	VDT / DESKWORK	VARILUX / EXPER	VARILUX	PAL
A.S.	51	F	SWITCHBOARD	SWITCHBOARD	VARILUX / EXPER	EXPERIMENTAL	NONE
J.C.	44	M	CHEMISTRY	VDT / DESKWORK	EXPER / VARILUX	VARILUX	STRAIGHT TOP
C.O.	37	M	ACCOUNTING	VDT / DESKWORK	VARILUX / EXPER	VARILUX	SINGLE VISION
D.R.	61	M	ADMINISTRATIVE	VDT / DESKWORK	EXPER / VARILUX	VARILUX	HALF EYE
J.R.	50	M	ADMINISTRATIVE	VDT / DESKWORK	EXPER / VARILUX	VARILUX	PAL
B.S.	54	F	CLERICAL	VDT / TYPEWRITER	EXPER / VARILUX	VARILUX	STRAIGHT TOP
P.R.	60	F	STUDENT	VDT	EXPER / VARILUX	NO RESPONSE	PAL

(Appendix B) EXPERIMENTAL						
ADAPTATION PERIOD	1 Day	< 1 week	> 1 week	2 weeks	3 Weeks	Didn't Adapt
	5	1	-	1	-	1
SYMPTOMS	1 NONE	2	3	4	5 SEVERE	
Discomfort	5	2	1	-	-	
Eye Strain	5	3	-	-	-	
Headache	7	-	1	-	-	
Difficulty Walking	5	2	-	-	1	
Distortion (Swim)	2	3	1	1	1	
Difficulty w / Sustained Reading	6	1	1	-	-	
Difficulty w / Desk Work	4	3	1	-	-	
Difficulty w / Sustained Intermediate Tasks	5	1	1	1	-	
% OF TIME GLASSES WORN	< 25%	25%-50%	50%-75%	75%-100%	100%	
	-	-	2	2	4	
CLARITY AND SHARPNESS	1 GOOD	2	3	4	5 POOR	
Reading Material	4	2	2	-	-	
Desk Work	4	3	1	-	-	
Computer Terminal	4	3	-	-	-	
Arms Length Tasks	6	-	1	1	-	
Distance	4	3	-	-	1	
VISUAL COMFORT	1 GOOD	2	3	4	5 POOR	
Reading Material	5	1	2	-	-	
Desk Work	6	1	1	-	-	
Computer Terminal	4	1	1	-	1	
Arms Length Tasks	6	-	1	-	1	
Distance	6	-	1	-	1	
WIDTH OF CLEAR VISION	1 GOOD	2	3	4	5 POOR	
Reading Material	5	2	1	-	-	
Desk Work	7	-	1	-	-	
Computer Terminal	4	1	1	-	1	
Arms Length Tasks	6	-	-	1	1	
Distance	4	2	1	-	5	

(Appendix C) VARILUX						
ADAPTATION PERIOD	1 Day	< 1 week	> 1 week	2 weeks	3 Weeks	Didn't Adapt
	5	3	-	-	-	-
SYMPTOMS	1 NONE	2	3	4	5 SEVERE	
Discomfort	6	1	-	-	-	
Eye Strain	5	3	-	-	-	
Headache	6	-	2	-	-	
Difficulty Walking	5	1	2	-	-	
Distortion (Swim)	4	2	1	-	5	
Difficulty w / Sustained Reading	5	2	1	-	-	
Difficulty w / Desk Work	7	-	1	-	-	
Difficulty w / Sustained Intermediate Tasks	5	3	-	-	-	
% OF TIME GLASSES WORN	< 25%	25%-50%	50%-75%	75%-100%	100%	
	-	1	1	3	3	
CLARITY AND SHARPNESS	1 GOOD	2	3	4	5 POOR	
Reading Material	6	2	-	-	-	
Desk Work	6	1	-	-	-	
Computer Terminal	5	2	-	-	-	
Arms Length Tasks	5	1	1	-	-	
Distance	4	2	-	-	1	
VISUAL COMFORT	1 GOOD	2	3	4	5 POOR	
Reading Material	4	3	-	-	1	
Desk Work	6	1	-	-	1	
Computer Terminal	4	2	1	-	-	
Arms Length Tasks	5	1	2	-	-	
Distance	5	1	-	1	1	
WIDTH OF CLEAR VISION	1 GOOD	2	3	4	5 POOR	
Reading Material	4	3	-	1	-	
Desk Work	5	2	1	-	-	
Computer Terminal	4	1	2	-	-	
Arms Length Tasks	6	-	2	-	-	
Distance	4	3	1	-	-	

(Appendix D) Informed Consent and Questionnaire Forms

Informed Consent Form

1. Institution
   Pacific University College of Optometry

   A. Title of Project
      A Comparison of a New Occupational Progressive lens versus the Varilux for occupational use.

   B. Principle Investigators:

Forrest Messerschmidt	357-3253 (Home)
Chris White	359-4594 (Home)

   C. Advisor:

John R Poggenkamp, O.D.	357-6151 (Office) ext. 2440
	640-3310 (Home)

   E. Date: 1987

2. Description of Project
   This project is designed to clinically compare in an occupational setting the Varilux progressive lens to a new progressive lens designed specifically for occupational use. You will be asked to wear the Varilux for 3 weeks and then the new progressive for another 3 weeks. During the seventh week you will be allowed to wear either of the spectacles based on which of the two is the most comfortable and functional.

3. Description of Risks
   Normal clinical procedures will be used for measuring and fitting the occupational spectacles. You may experience some period of adaptation common to any new pair of spectacles. Risks during the adaptation and from the procedures used are minimal. Since these lenses are experimental replacement lenses may not be available following the completion of the study.

4. Description of Benefits
   You will be able to keep both pair of spectacles at the conclusion of the study free of charge. Additionally all the examination fees pertaining to this study will be waived.

5. Compensation and Medical Care
   If you are injured in this experiment it is possible that you will not receive compensation or

medical care from Pacific University, the experimenters or any organization associated with the experiment. All reasonable care will be used to prevent injury however.

6. Alternatives Advantageous to Subjects
   You may prefer to wear your regular prescription if the provided spectacles bother you.

7. Offer to Answer Any Inquiries
   The experimenters will be happy to answer any questions that you may have at any time during the course of the study. If you are not satisfied with the answer you receive please call Dr. James Peterson at 357-0442.

8. Freedom to withdraw
   You are free to withdraw your consent and to discontinue participation in this project or activity at any time without prejudice to you.

I have read the above and understand the above. I am 18 years or older.

Printed Name_____

Signed_____Date_____

Address_____Phone_____

City_____State_____Zip_____

Name and address of a person not living with you who will always know your address

_____

_____

PATIENT HISTORY QUESTIONNAIRE

NAME:_____DATE:_____

1) What type of reading glasses do you presently wear?

_____

2) Nature of employment? _____

3) At work do you have any special **near** vision needs (i.e. fine print, working with small parts, rulers etc.)?_____

4) At work do you have special **intermediate** vision needs (i.e. typewriter, VDT, sheet music, etc.)?

_____

5) At home do you have any hobbies or avocations with special **near** vision needs (i.e. sewing, model making, etc.)? _____

6) At home do you have hobbies or avocations with special **intermediate** vision needs (i.e. sheet music, home VDT, etc.)?_____

NAME: _____ DATE: _____

PATIENT QUESTIONNAIRE

The purpose of this questionnaire is to assess the comfort and effectiveness of the pair of glasses which you have been wearing for the past three weeks. Please relate your responses only to the glasses you have most recently worn.

1) Was this your first or second pair of glasses in the study? (First) / (Second)

2) Were the glasses comfortable initially?

   a) Frame comfort? (Yes) / (No)

   b) Visual comfort (Yes) / (No)

3) How long was your adaptation period ? Check one.

___ one day

___ less than one week

___ more than one week

___ two weeks

___ three weeks

___ did not adapt

4) SYMPTOMS:

Rate on a scale of 1-5 with 1 indicating no problems and 5 indicating severe problems.

a) Discomfort ____

b) Eye Strain ____

c) Headache ____

d) Difficulty walking ____

e) Distortion (Swim) ____

f) Difficulty with sustained reading ____

g) Difficulty with desk work ____

h) Difficulty with sustained intermediate tasks ____

i) Describe any other problems

---

5) Choose one of the following statements

a) I have no trouble with the glasses and they nicely fill my needs.

b) The glasses fill most of my needs, but there is a slight inconvenience.

c) I have some problems with the glasses, but I need them for certain things so I use them when necessary.

d) I do not think the glasses do a good job and I use them rarely.

e) I could not use the glasses and had to give them up.

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

____ less than 25%

____ 25%-50%

____ 50%-75%

____ 75%-100%

____ all the time

7) Please rate the clarity and sharpness of your vision for the following working distances on a scale of 1-5 with 1 indicating excellent and 5 as very poor.

Reading material ____

Deskwork ____

Computer terminal ____

Arm's length tasks (music, etc) ____

Distance viewing ____

8) Please rate Visual Comfort for the following working distances on a scale of 1-5 with with 1 indicating very comfortable and 5 as very uncomfortable.

Reading material ____

Deskwork ____

Computer terminal ____

Arm's length tasks (music, etc) ____

Distance viewing ____

9) Please rate width of clear vision for the following working distances on a scale of 1-5 with 1 indicating more than sufficient and 5 as much less than needed.

Reading material ____

Deskwork ____

Computer terminal ____

Arm's length tasks (music, etc) ____

Distance viewing ____

NAME:_____ DATE:_____

PATIENT QUESTIONNAIRE #3

The purpose of this questionnaire is to assess which pair of glasses is more comfortable and effective for a specific task.

1) Over this last wearing period, which pair of glasses did you wear the most?

Pair One Pair Two

Comments_____

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

Pair One Pair Two

Comments_____

3) Which pair of glasses were best suited to your occupational needs?

Pair One Pair Two

Why_____

4) If you had no other choices, which pair of glasses would you purchase?

Pair One Pair Two

Why_____