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The effect of monovision contact lenses on reading speed and comprehension and a comparison of fitting the near add on the dominant versus non-dominant eye

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Abstract
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Degree Type
Thesis

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THE EFFECT OF MONOVISION CONTACT LENSES ON READING SPEED AND COMPREHENSION AND A COMPARISON OF FITTING THE NEAR ADD ON THE DOMINANT VERSUS NON-DOMINANT EYE

By

HELEN FATHALI-DASHTI
GABRIELLA TORANO
KEN DODGE

A thesis submitted to the faculty of the
College of Optometry
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Forest Grove, Oregon
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Advisors:
Patrick Caroline, C.O.T., F.A.A.O.
Bradley Coffey, O.D., F.A.A.O.
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* Patrick Caroline for providing direction and insight throughout this project

* Launa Kind for providing us with a list of possible subjects

* Our subjects for their time and patience throughout the testing

* Our friends and family who helped and supported us along the way
Biography of Authors

**Helen Fathali-Dashti**

Helen was born in Tehran, Iran and was raised in Saratoga, California. She completed her undergraduate work at the University of California, San Diego with a bachelor's degree in political science and minor in philosophy. Prior to her admission to Pacific University College of Optometry, Helen worked in the research lab of Dr. Kenneth Polse at the University of California, Berkeley College of Optometry. Her research project examined the effect of contact lens on the cornea. She also worked at the practice of Dr. Bradford Murray, a behavioral optometrist in San Jose, California. Helen has been involved in both academic and extracurricular activities during her time at Pacific University. She has held the position of student liaison of the American Academy of Optometry and was the treasurer of Amigos Eyecare, a non-profit organization that provides free vision care to those in need. She has excelled academically and is a member of the Beta Sigma Kappa International Optometric Honor Society. She has recently been recognized in both *Who's Who Among Students in American Universities and Colleges* and *Who's Who in the 21st Century*. Upon graduation, Helen will join her husband, Dr. Shervin Dashti, in Cleveland, Ohio where she will practice optometry and pursue her interest in contact lenses and behavioral optometry. She and her husband plan to devote time to medical humanitarian work around the world.

**Gabriella Torano**

Gabriella Torano is originally from Nelson, British Columbia. She graduated from The University of British Columbia with a B.S. in Biology. Ultimately, she plans to return to Western Canada to become a partner of a private optometric practice.

**Ken Dodge**

Ken Dodge is from Cold Spring and Richmond, Minnesota. He has studied at Rocori High School, Saint Cloud State University, and Pacific University. After receiving his Doctor of Optometry degree in 2001, his plans are to return to Minnesota and to practice primary care optometry. Ken's interests include travel, numerous sports, movies, poetry, children, religion, and culture.
Abstract

Monovision has been a successful correction modality for over 30 years. While there has been considerable interest in the area, there are little data regarding the effect of monovision contact lenses on eye movements used specifically during the two-dimensional, high contrast task of reading. This study examined the effects of monovision on reading speed and comprehension and whether the preferred eye, corrected for far versus near, affected reading performance for 8 presbyopic subjects. These subjects were carefully screened to meet normal visual function criteria. The subjects wore three different combinations of lenses, and measurements related to their eye movements were recorded using the Ober-2-Visagraph while reading a passage. Monovision contact lenses were found to have no significant effect on reading speed and comprehension in this small group of presbyopes. Likewise, there appeared to be no effect on reading performance related to whether the preferred eye was corrected for far versus near. However, specific research parameters for future studies aimed at determining the effect of monovision on reading speed and comprehension have been proposed.

Key Words

Monovision, Presbyopia, Reading Speed, Reading Comprehension, Visagraph
Introduction

At a time when presbyopic patients comprise a large proportion of the US population, vision correction options for this group continue to attract attention. In 2000, 28% of the US population (76 million), qualified as baby boomers born between 1946 and 1964 \(^1\). With baby boomers aging, the number of presbyopes in the US is expected to double every 5 years until 2010 \(^1\). Although visual compromises are inherent in all presbyopic spectacle and contact lens corrections, contact lenses do offer certain advantages over spectacle correction. Some advantages of contact lenses include lack of fogging in temperature or humidity extremes, lack of visual difficulties frequently experienced with glasses while walking and using stairways, no slipping off easily during vigorous activities, and aesthetics \(^2\). Various contact lens options for presbyopia are presently available and used by clinicians. Among them are simultaneous vision contact lenses, translating bifocals and monovision \(^3\). In 1998, the most popular method to correct presbyopia with contact lenses was with monovision, which comprised approximately 80% of all presbyopic corrections \(^4\). This technique has met with success for over 30 years \(^4\). Monovision is a method whereby one eye is corrected for distance while the fellow eye is corrected for near vision \(^5\). According to an extensive literature review of 42 articles, 95% of patients compensated by monovision contact lenses are fit with the distance lens over the preferred eye \(^1\). In that same literature review, monovision compensation of presbyopia was reported to have a mean success rate of 76%, which increased to 81% when contact lens related failures were accounted for \(^1\). Success was defined by a patient’s ability to tolerate contact lenses and visually adapt to monovision compensation. In past years, it was reported that the best way to correct presbyopic
patients was to fit distance contact lenses with single vision spectacles for near. The recommendation was a result of previous research suggesting that monovision contact lenses led to a number of disadvantages such as reduced depth perception, an increased esophoric shift in the distance, blurred visual acuity, reduced contrast sensitivity, and detriment when performing near tasks. However, current studies have found near stereoacuity to be reduced by less than 50 seconds of arc, esophoric shifts less than 0.6 prism diopters, and high satisfaction with vision at all working distances. While contrast sensitivity was reduced by 42% with monovision, and task performance was reduced by 2-6%, the degree of performance loss was insufficient to create significant dissatisfaction in most cases overall, especially if patients are asked to adapt to the lenses over a period of at least 8 weeks. While there has been considerable interest in the area, there are little data regarding the effect of monovision contact lenses on reading and how eye preference influences the success of this modality. In a study conducted by Sheedy and Harris, the success of monovision was assessed by having patients perform occupational-type near point tasks for trials of 2 minutes in duration. Among those tasks were pointers and straws, card filing, and finding letters in a paragraph of random nonsense words. Though some occupational tasks have been studied, there is a lack of research in the area of monovision and its effect on eye movements used specifically during the two-dimensional, high contrast task of reading. It would be advantageous to study the effects of this modality on reading, for it could help us determine whether disrupting patients' binocularity will be likely to affect reading performance in patients' occupational, academic, and recreational lives. This study examined the effects of
monovision on reading speed and comprehension, and whether eye preference should be considered when fitting presbyopic patients to optimize reading performance.

**Method**

**Subjects**

This investigation involved eight subjects that were selected from the general population of Forest Grove, Oregon who met the following criteria based on a comprehensive vision exam administered by the researchers:

1. No history of having worn monovision correction
2. No medical pathology (systemic or ocular) that could cause refractive instability, contact lens complications, or reading difficulties
3. Demonstration of 8th grade reading level as determined by reading a Visagraph passage and answering a subsequent set of questions
4. Snellen best-corrected visual acuity of at least 20/30 was required for distance and near in either eye with no more that one line of difference between the eyes
5. No strabismus at near or far, and phorias less than 10 p.d of esophoria or exophoria at far and no greater that 5 p.d of esophoria or 15 p.d of exophoria at near
6. Stereoacuity of 200 sec arc or better using the Titmus circles test at 40 cm
7. Normal ocular motilities
8. Normal visual field using the finger-counting confrontation method
9. NPC break and recovery within 40 cm

10. Normal pupil symmetry and reactivity

11. No astigmatism greater than 1.25 diopters

12. No anisometropia greater than one diopter

13. Net PRA of greater than zero to 20/20 at 40 cm

After completion of the study, a complimentary one-year supply of monovision contact lenses was dispensed, which served as the incentive for participation.

Instrumentation

Reading speed and comprehension were tested six times on the eight subjects using an Ober-2 Visagraph. This instrument records and analyzes eye movements using infrared sensors that are held in place by a pair of goggles the subject wears during the reading task. These sensors work by comparing the relative intensities of reflected infrared light from near the limbus of the subject’s eye. Because the sclera reflects more infrared light than the cornea, a rise in the intensity of the reflected light from the nasal limbus accompanied by the decrease in intensity from the temporal limbus reveals an outward eye movement, and vice versa. The Ober-2 Visagraph software processes this information. After each reading passage, there are ten standardized true/false questions to assess reading comprehension. The resulting computerized report includes the standardized scores for reading speed, fixations, regressions, span of recognition, fixation duration, and comprehension (see Appendix A for a sample Visagraph printout).
Protocol

The add power for each subject was determined by a forced-choice near subjective between the patient’s associated cross cylinder add power and NRA/PRA midpoint. This method resulted in a range of add powers from +1.00D to +2.25D. Eye preference for each subject was tested using the hole-in-hand test, performed five times. This test is performed by asking the patient to fully extend their arms with their palms facing the eye chart and to cross their hands such that they were sighting a distant target (an isolated letter on a Snellen chart) through one small opening above the subject’s thumbs. After the subject reported they could see the target through the hole, the examiner occluded the right eye and asked if the subject could still see the target through the hole. If they could, the examiner recorded the response as a “left-eye preference” response. If they did not, the examiner recorded the response as “right-eye preference”. After performing this test five separate times, the eye that tested as preferred three or more times was recorded as the subject’s preferred eye. Five subjects had right-eye preference and three had left-eye preference.

The same eye preference test was administered at near, with the subject lifting his/her hands midway between him/herself and the examiner, using the examiner’s eye as a near target at a distance of 50 to 70 centimeters. One subject (#4) had right-eye preference at far and showed left-eye preference at near. For the purpose of this study, the distance eye preference test was used, so he was recorded as having right-eye preference (see Appendix B for subject recording form).
The first two Visagraph tests were performed with the subject’s habitual near point lenses, using passages 76 and 77, and served to familiarize the subjects with the test. The following four tests (78 through 82) were administered such that four subjects performed a test wearing distance contact lenses with readers before each of the monovision tests and the other half performed the tests wearing monovision first. Four of the subjects (two from each subset) wore the preferred eye at near monovision modality first and the non-preferred-eye-at-near modality second, and the other four subjects did the opposite. The reading selections used for the four Visagraph assessments were altered, such that the order of the reading selections used was exactly reversed from that of one other subject. These testing protocols required that the number of subjects tested be 8, or a multiple of 8, and they minimized resultant error that could be caused by test order.

Results

All data from the study were subjected to non-parametric analysis using the Friedman test due to the small sample size. The reading lens condition (two monovision conditions and reading spectacles over distance contact lenses) was the independent variable and each Visagraph variable was dependent. Data are reported as percentages for ease of understanding and can be seen in the following pages as tables and figures. The reading speed data collected in this study vary considerably, and the measured effects of monovision on reading speed are mixed (see Table 1 and Figure 1). Monovision with the preferred eye at near showed an average percent increase in reading speed of 1.96 (±0.140) with a standard deviation of 13.97, compared to each subject's average score on the two trials with distance contact lenses and readers. Monovision with the preferred eye
at far showed an average percent decrease in reading speed of 0.93 (±11.8). Overall, the subjects' reading speed scores with monovision were 0.54% faster than with distance contact lenses with readers, but the standard deviation was still very high, 13.41%. There were no significant differences between conditions. The effects of monovision fits on reading speed may vary depending on the individual. Of the eight subjects in this study, four (exactly half) read faster with monovision than with distance contact lenses with readers, and four read slower. The average comprehension score with distance contact lenses with readers was 86.9%, compared to 87.5% with monovision with the preferred eye at near and 82.5% with monovision with the preferred eye at far (see Table 2 and Figure 2). Again, there were no significant differences between conditions. Comprehension scores were higher for four of the eight subjects with monovision with the preferred eye at near than with readers, were lower for three, and were the same for one subject. With the preferred eye at far, three subjects scored higher than, three scored lower than, and two scored the same as with readers.

Other Visagraph data including eye movement measurements of duration of fixation, number of fixations, span of recognition, and number of regressions also showed no significant differences between any of the three conditions tested (see Tables 3-6 and Figures 4-6). Roughly the same number of subjects' scores increased as decreased for duration of fixation, number of fixations, span of recognition, and number of regressions.
<table>
<thead>
<tr>
<th>Subject</th>
<th>Distance CL with Readers</th>
<th>Distance CL with Readers</th>
<th>Monovision with Dominant Eye Fit For Near</th>
<th>Monovision with Dominant Eye Fit For Far</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Trial #1</td>
<td>Trial #2</td>
<td>Eye Fit For Near</td>
<td>Eye Fit For Far</td>
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<td>180</td>
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<td>175</td>
<td>225</td>
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<td>Subject 6</td>
<td>157</td>
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<td>233</td>
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<tr>
<td>Subject 7</td>
<td>370</td>
<td>357</td>
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<td>356</td>
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<td>Subject 8</td>
<td>176</td>
<td>206</td>
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<td>150</td>
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<td>Average</td>
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<td>223.88</td>
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<td>57.07</td>
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Table 2

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<td>Subject 3</td>
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<td>8</td>
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<tr>
<td>Subject 8</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>8</td>
</tr>
</tbody>
</table>

| Average  | 8.88                             | 8.5                              | 8.75                                     | 8.25                                     |
| STD      | 0.78                             | 0.87                             | 0.97                                     | 1.09                                     |
Table 3  Number of Regressions (in words)

<table>
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<th>Distance CL with Readers Trial #1</th>
<th>Distance CL with Readers Trial #2</th>
<th>Monovision with Dominant Eye Fit For Near</th>
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<td>Subject 3</td>
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<td>11</td>
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<td>Subject 7</td>
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<td>3</td>
<td>6</td>
<td>6</td>
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<tr>
<td>Subject 8</td>
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<td>15</td>
<td>17</td>
<td>17</td>
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<tr>
<td>Average</td>
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<td>13.75</td>
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<tr>
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<td>6.61</td>
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<td>Monovision with Dominant</td>
<td>Monovision with Dominant</td>
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<td>--------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td></td>
<td>Trial #1</td>
<td>Trial #2</td>
<td>Eye Fit for Near</td>
<td>Eye Fit for Far</td>
</tr>
<tr>
<td>Subject 1</td>
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<td>0.3</td>
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<td>0.29</td>
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<tr>
<td>Subject 2</td>
<td>0.25</td>
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Table 5  Number of Fixations (in words)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Distance CL with Readers Trial #1</th>
<th>Distance CL with Readers Trial #2</th>
<th>Monovision with Dominant Eye Fit For Near</th>
<th>Monovision with Dominant Eye Fit For Far</th>
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<tbody>
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<td>Subject 1</td>
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<tr>
<td>Subject 8</td>
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</table>
# Table 6

## Span of Recognition (in words)

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<tr>
<th>Subject</th>
<th>Distance CL with Readers</th>
<th>Distance CL with Readers</th>
<th>Monovision with Dominant</th>
<th>Monovision with Dominant</th>
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</thead>
<tbody>
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<td>Trial #1</td>
<td>Trial #2</td>
<td>Eye Fit For Near</td>
<td>Eye Fit For Far</td>
</tr>
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<td>1.04</td>
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<td>Subject 2</td>
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<td>0.88</td>
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<tr>
<td>Subject 4</td>
<td>0.68</td>
<td>0.85</td>
<td>0.78</td>
<td>0.75</td>
</tr>
<tr>
<td>Subject 5</td>
<td>1.15</td>
<td>1.08</td>
<td>0.76</td>
<td>1.04</td>
</tr>
<tr>
<td>Subject 6</td>
<td>0.71</td>
<td>1.02</td>
<td>1.05</td>
<td>1.05</td>
</tr>
<tr>
<td>Subject 7</td>
<td>1.67</td>
<td>1.85</td>
<td>2</td>
<td>1.72</td>
</tr>
<tr>
<td>Subject 8</td>
<td>0.77</td>
<td>0.92</td>
<td>0.92</td>
<td>0.75</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>0.97</td>
<td>1.02</td>
<td>1.02</td>
<td>1.02</td>
</tr>
<tr>
<td><strong>STD</strong></td>
<td>0.3</td>
<td>0.34</td>
<td>0.39</td>
<td>0.29</td>
</tr>
</tbody>
</table>
Fig 1. Reading speed of eight subjects with different modalities and an average for the eight subjects.
Fig 2. Reading comprehension of eight subjects with different modalities and an average for the eight subjects.
Fig 3. Number of regressions of eight subjects with different modalities and an average for the eight subjects.
Fig 4. Duration of fixation of eight subjects with different modalities and an average for the eight subjects.
Fig 5. Number of fixations of eight subjects with different modalities and an average for the eight subjects.
Fig 6. Span of recognition of eight subjects with different modalities and an average for the eight subjects.
Discussion

Monovision, the concept of correcting one eye for distance and the other for near, is a successful correction modality in presbyopes. With the growing baby boomer presbyope population, there has been a great deal of interest in monovision correction. Despite the increased interest in monovision, there is currently little known about the effect of monovision contact lenses on eye movements used specifically during two-dimensional, high contrast tasks such as reading. The large presbyope population in the US is engaged in many occupational and leisure activities that require reading. In this study, we set out to examine the effects of monovision on reading speed and comprehension, and to determine if the preferred eye, corrected for far versus near, affects reading performance.

Our results showed no significant difference between monovision and distance contact lens correction with reading glasses, in regard to reading speed and comprehension. In addition, the two correction modalities displayed no significant difference in eye movement measurements such as duration of fixation, number of fixations, span of recognition and number of regressions. Moreover, no difference was seen in monovision correction when the preferred eye was corrected for far versus near. We must however, consider the limitations of this study. The small sample size made meaningful statistical analysis of our data difficult. In this study, the contact lens adaptation time in our subjects was limited to 10 minutes before Visagraph testing. Monovision has an adaptation period of 7 to 10 days, and the lack of contact lens adaptation may be a confounding factor in our results. In our study, only one Visagraph test was recorded with each reading
condition. Our results would have been less variable if three or more readings were taken in each condition.

It would be beneficial to conduct further research on the effects of monovision on reading speed, comprehension and eye movements due to its growing use as a contact lens or refractive surgery modality for management of presbyopia. We suggest future experiments include a larger sample size (minimum of 20 subjects), increased adaptation time of each lens combination to one week, and 3-5 Visagraph studies at each visit. Other variables that may also be worth monitoring are age, sex, psychological factors and occupational characteristics of the subjects.
References


10. Lecture Notes, Optometry 716, Theory and practice of specialty contact lenses, Pacific University College of Optometry, Forest Grove, Oregon 2000.
### Reading Profile Visagraph version 3.1

<table>
<thead>
<tr>
<th>Grade/Goal</th>
<th>Left</th>
<th>Right</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixations/100 words</td>
<td>106</td>
<td>108</td>
</tr>
<tr>
<td>Regressions/100 words</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>Av. Span of Recognition (words)</td>
<td>0.94</td>
<td>0.93</td>
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<tr>
<td>Av. Duration of Fixation (sec)</td>
<td>0.26</td>
<td>0.25</td>
</tr>
<tr>
<td>Rate with Comprehension (words/min)</td>
<td>216</td>
<td></td>
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<tr>
<td>Relative Efficiency</td>
<td>1.80</td>
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<tr>
<td>Grade Level Equivalent</td>
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<tr>
<td>Directional Attack</td>
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<tr>
<td>Rate adj. for Rereading (words/min)</td>
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<td></td>
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<tr>
<td>Comprehension Questions Correct</td>
<td>90%</td>
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<tr>
<td>Cross Correlation</td>
<td>0.985</td>
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</tbody>
</table>

- **Countable lines in text**: 10
- **Lines found**: 11
- **Saccades in Return Sweeps**: 21
- **Anomalies (Fix/Regr/Both)**: 2/0/3

### Subject information

- **Name**: [Redacted]
- **Grade**: 0
- **Filename**: MOB-79-0.rec
- **Class**: [Redacted]
- **Born**: [Redacted]
- **Sex**: [Redacted]
- **School**: [Redacted]
- **Examiner**: [Redacted]

### Text information

- **Filename**: C:\VISA\TEXTS\amer_eng\T-7-79.TXT
- **Title**: Elias Howe 7-79
- **Answers**: YYNYNYYNNYNN
- **Norms used**: TAYLOR.NOR
- **Correct answers**: 9

### Countable part statistics

- **No of lines**: 10
- **No of words**: 99
- **Av. word length**: 4.7

### Recording information

- **Total recording time**: 31.62
- **Duration Standard Deviation**: 105 ms
- **Countable time**: 27.52
- **No. Saccade Start Differences**: 3
- **Artifact time right eye**: 0.30 (1%)
- **Events with Multiple Regressions**: 0
- **Artifact time left eye**: 0.30 (1%)
- **Mean Regressions in Multiple Events**: [Redacted]
- **Lines found**: 11
- **Lines partially reread (> 30%)**: 0
- **Lines completely reread**: 1
- **Comment**: readers 1 +0.75 OD +0.50 OS
Appendix B

Pacific University College of Optometry
Research Project Record - Monovision, eye dominance, & Reading Speed and Comp.
Lead Researchers: Helen Fathali-Dashti, Gabriella Torano, and Ken Dodge
Advisors: Patrick Caroline, COT, and Bradley Coffey, OD

Date: ____________________________ Subject Number: __________
Subject Name: ____________________________
Subject Phone #: ____________________________

CLs dispensed: #1 OD _______ date: __________
                OS _______ date: __________

#2
    OD _______ date: __________
    OS _______ date: __________

#3 choice
    OD _______ date: __________
    OS _______ date: __________

Order of reading passages: Visit #1: 76,77 with habitual lenses
                          Visit #2: _____ with MV fit (1st/2nd)
                          _____ with dist & readers
                          Visit #3: _____ with MV fit (1st/2nd)
                          _____ with dist & readers

CL Hx:

Medical and Eye Hx:

Dry Eye Hx:

Near Blur?:

How currently treated?:

LEEx:

Allergies/sensitivities:

Lensometry OD Add
    OS Add

DVA OD 20/ NVA (through Dx lenses) OD 20/
    OS 20/ OS 20/
    OU 20/ OU 20/

CT: CT':

EOMs: NPC:

VF: to FC Stereo:

Pupils: E RRA APD

Dist eye dominance: ________
Near eye dominance: ________
Handedness: __________
Dx retinoscopy: OD
   OS
MSBVA w/JCC: OD   VA 20/
   OS   VA 20/
Dx Vertical phoria:  Dx Horizontal phoria:
Assoc X-cyl (gross): OD
   OS
Dx Equivalent Spheres of MSBVA above (calc): OD   DVA 20/
   OS
NRA: PRA   NRA/PRA midpoint (calc):
Nr Vertical phoria: Nr Horizontal phoria:
Trial Frame subjective near lens (circle): Assoc X-cyl / NRA/PRA midpt / other
NVA with Add: OD
   OS
   K's
   OD
   OU
   OS
SLE: OD
   OS
   L/L
   Conj
   Sclera
   Iris
   Lens
   AC
   Cornea (NaFl)
Direct Ophth: OD
   OS
   Media
   Bckgd
   Disk
   BVs
   Mac
Dist CL fits (Cooper Preference) OD
   OS
   BC chosen
   Dia chosen
   Coverage
   Centration
   Movement
   Sph over-ref
   Resultant Dist Rx (calc)
   Resultant Near Rx (calc)
   OD Signature

Insertion & Removal Training
Cleaning/soaking/disinfection Solution System Given:
Pacific University College of Optometry

A. Title of Project: The effect of monovision contact lenses on reading speed and comprehension and a comparison of fitting the near add on the dominant versus non-dominant eye.

B. Principal Investigators: Ken Dodge 357-1899, Helen Fathali-Dashti 359-3932, and Gabriella Torano 359-3932.

C. Advisors: Patrick Caroline, COT and Bradley Coffey, OD

D. Location: Pacific University College of Optometry

E. Dates: October, 1999 through April, 2000

F. Description of Project:

Monovision contact lens prescriptions, fitting one eye to see clearly at far and the other at near, are a common treatment for patients who are losing or who have lost the ability to change the focus of their eyes for things up close. Monovision’s effects on reading speed and comprehension are poorly understood and a rationale for choosing the non-dominant versus the dominant eye for near for avid readers has not been defined in the optometric literature.

Fifteen to thirty subjects will be selected to undergo standard eye and vision testing to determine their visual and ocular status. Fluorescein will be applied to each of the subjects’ eyes to help the experimenters detect eye infections or dry eye, which can be contraindications for contact lenses. Subjects will then undergo standard refractive tests and be fit with contact lenses. Reading speed and comprehension will then be tested under four conditions: 1) with the subject’s habitual lenses, 2) with distance contact lenses and reading glasses, 3) with monovision contact lenses, and 4) with a second pair of monovision contact lenses. The subjects will wear each of the monovision contact lens fits daily (4-10 hours per day) for 5-9 days before the reading tests to allow adaptation to the lenses.

G. Description of Risks: The only known risks are associated with the location where the study is being conducted, putting on the glasses, handling of confidential information, the diagnostic use of fluorescein strips, possible contact lens complications, and accidents that may occur while adapting to the monovision lenses. To reduce these risks, the area in which the study is being conducted will be well maintained, the experimenters will assist the subjects in putting on the glasses, all name-identifiable data will be kept confidential by the experimenters, and the fluorescein testing and contact lens fitting will be conducted under the supervision of licensed eye/vision practitioners. The subjects are strongly advised not to wear their monovision lenses while driving, or while participating in other potentially dangerous vision-dependent activities.

H. Description of Benefits: Results of this study will help patients and doctors predict the effects of monovision contact lens fits on reading speed and comprehension and may suggest which eye should be corrected to focus at near for avid readers who choose to wear monovision contact lenses.

I. Alternatives Advantageous to Subjects: Not applicable.

J. Confidentiality: Records of this project will be maintained in a confidential manner and no name-identifiable information will be released.
K. Compensation and Medical Care: If you are injured in this experiment and it is not the fault of Pacific University, the experimenters, or any organization associated with the experiment, you should not expect to receive compensation or medical care from Pacific University, the experimenters, or any organization associated with the experiment.

L. Offer to Answer Inquiries: The experimenters will be happy to answer any questions you may have at any time during the course of the study. If you are not satisfied with the answers you receive, please call Karl Citek at Pacific University. During your participation in the project, you are not a Pacific University clinic patient or client and all questions should be directed to the researchers and/or the faculty advisor who will be solely responsible for any treatment (except in an emergency). You will not be receiving complete eye, vision, or health care as a result of participation in this project; therefore, you will need to maintain your regular program of eye, vision, and health care.

M. Freedom to Withdraw: You are free to withdraw your consent and to discontinue participation in this project at any time without prejudice or consequences to you.

I have read and understand the above.

Printed name of subject

Subject’s signature

Address

City/State

Zip

Phone

Date

Name and address or phone number of a person not currently living with you who will always know how to locate you