2-4-1983

Supplemental vision screening tests: The mean values for an adult population

Tricia M. Brenner
Pacific University

Scott L. Nehring
Pacific University

David A. Wolf
Pacific University

Recommended Citation
https://commons.pacificu.edu/opt/643

This Thesis is brought to you for free and open access by the Theses, Dissertations and Capstone Projects at CommonKnowledge. It has been accepted for inclusion in College of Optometry by an authorized administrator of CommonKnowledge. For more information, please contact CommonKnowledge@pacificu.edu.
Supplemental vision screening tests: The mean values for an adult population

Abstract
The adult population has been neglected as to the standardization and quantification of supplemental screening tests. A population of subjects ages 18 to 35 was tested with specific instructions for seven optometric tests: accommodative rock, prism rock, Groffman Visual Tracing Test modified for ten feet, Groffman Visual Tracing Test, Stern Fixation Test, Percon Saccadic Fixation Test and the Pierce Saccade Test. A statistical analysis was performed and the means are presented. These means can be used in patient evaluation decisions by the optometric profession.

Degree Type
Thesis

Rights
Terms of use for work posted in CommonKnowledge.

This thesis is available at CommonKnowledge: https://commons.pacificu.edu/opt/643
Copyright and terms of use

If you have downloaded this document directly from the web or from CommonKnowledge, see the “Rights” section on the previous page for the terms of use.

If you have received this document through an interlibrary loan/document delivery service, the following terms of use apply:

Copyright in this work is held by the author(s). You may download or print any portion of this document for personal use only, or for any use that is allowed by fair use (Title 17, §107 U.S.C.). Except for personal or fair use, you or your borrowing library may not reproduce, remix, republish, post, transmit, or distribute this document, or any portion thereof, without the permission of the copyright owner. [Note: If this document is licensed under a Creative Commons license (see “Rights” on the previous page) which allows broader usage rights, your use is governed by the terms of that license.]

Inquiries regarding further use of these materials should be addressed to: CommonKnowledge Rights, Pacific University Library, 2043 College Way, Forest Grove, OR 97116, (503) 352-7209. Email inquiries may be directed to: copyright@pacificu.edu

This thesis is available at CommonKnowledge: https://commons.pacificu.edu/opt/643
SUPPLEMENTAL VISION SCREENING TESTS

THE MEAN VALUES FOR AN ADULT POPULATION

TRICIA M. BRENNER
SCOTT L. NEHRING
DAVID A. WOLF

NORMAN S. STERN O.D., Ph.D.

ADVISOR

FEBRUARY 4, 1983

PACIFIC UNIVERSITY COLLEGE OF OPTOMETRY
FOREST GROVE, OREGON
SUPPLEMENTAL VISION SCREENING TESTS

THE MEAN VALUES FOR AN ADULT POPULATION

BY

TRICIA M. BRENNER  SCOTT L. NEHRING  DAVID A. WOLF

ACCEPTED BY THE FACULTY OF THE COLLEGE OF OPTOMETRY, PACIFIC UNIVERSITY, IN PARTIAL FULFILLMENT OF THE DOCTOR OF OPTOMETRY DEGREE.

MIDTERM GRADE  FINAL GRADE

NORMAN S. STERN O.D., PH.D
THESIS ADVISOR
TABLE OF CONTENTS

Acknowledgements.................................................i
Abstract..........................................................ii
Introduction.........................................................1
Methods..............................................................2
Results...............................................................5
Discussion..........................................................18
Appendices..........................................................21
Bibliography.........................................................47
ACKNOWLEDGEMENTS

Our special thanks to Dr. Norm Stern for his help and guidance.

Thanks also to Dr. Paul Kohl for his assistance in data collection, Lynda Horesky for the typing, Alice Hoskins for the printing and Sam Ashenberner for computer assistance.

We would like to extend our appreciation to Pacific University for their financial assistance.

Further thanks goes to all who participated as subjects.
ABSTRACT

The adult population has been neglected as to the standardization and quantification of supplemental screening tests. A population of subjects ages 18 to 35 was tested with specific instructions for seven optometric tests: accommodative rock, prism rock, Groffman Visual Tracing Test modified for ten feet, Groffman Visual Tracing Test, Stern Fixation Test, Percon Saccadic Fixation Test and the Pierce Saccade Test. A statistical analysis was performed and the means are presented. These means can be used in patient evaluation decisions by the optometric profession.
INTRODUCTION

Vision screenings are an integral part of vision care and are used in: schools, sports, industry and by the department of motor vehicles. The majority of published literature on vision screenings deals with the screening of school children. In an article from the California Optometric Association it was stated that vision is the most important sense modality for learning in sighted children. However, epidemiological studies of vision disorders among school children indicates that roughly 15% of the children entering first grade have clinically significant vision abnormalities. Currently four types of vision screening techniques are utilized. Listed in order of the percentage of correct referrals these include: The Modified Clinical Technique, Massachusetts Vision Test, stereoscopic instruments and Snellen acuity. Supplemental screening tests are needed because there is more to vision than achieving a certain visual acuity level.

Sherman states that visual acuity is only one of the visual skills necessary in sports. Others include binocular skills such as stereopsis, oculomotor accuracy and peripheral vision awareness. Eye-body skills including eye-hand coordination and body image, perceptual speed and visualization are also important. Unfortunately, many athletic teams rely solely on Snellen acuity testing during annual physical examinations from team physicians to as-
sess their players visual skills. The visual skills that sports vision care evaluates are the same as those that need to be assessed with general binocular dysfunctions. Identical visual abilities are evaluated using various test methods depending on the examiner (See Appendix A). Even when the same test is administered the testing conditions also vary.

The review of the literature revealed a lack of standard supplemental tests and specified testing conditions which has led to the need for means and norms. Optometry does have some standardized supplemental tests which cater to the grade school population ignoring a vast number of people. The purpose of this study was to standardize selected screening test conditions and to generate means for an adult population ages 18 to 35.

METHODS

Each subject filled out a case history (See Appendix B). Habitual Rx was worn for testing and binocularity determined with minimum passing criterion set at 500 arc seconds.

DST Charts (Appendix C)

Target charts were developed which consist of random lower case letters only. The letters have a single space between each other and each line is double spaced. Numbers are excluded and there is no repetition of letters. The
letters were typed by Alpha Micro AM-1041 Computer with a NEC Spinwriter 5520. Four charts were designed, two for testing (Form A & B) and two for training (Form C & D).

Accommodative Rock (Appendix D)

The DST chart A was held at 40 centimeters; rock was maintained for one minute with a ± 2.00 diopter flipper. We developed instructions for administration of the test. The complete form can be found in Appendix D. The examiner recorded errors and the number of flips at the end of 30 and 60 seconds on the recording form. For each error the subject was penalized one flip. Any subject who became diplopic during the rock was stopped and their data eliminated.

Prism Rock (Appendix E)

The required equipment was the DST chart B and an 8° base out-base in flipper. The test was administered with the instructions we developed. The complete instructions can be found in Appendix E. The examiner recorded errors and the number of flips at the end of 30 and 60 seconds on the recording form. For each error the subject was penalized one flip. Any subject who remained diplopic during the test was stopped and their data eliminated.

Groffman Visual Tracing Test Modified for 10 feet (Appendix F)

Form A was enlarged to 172.5 cm measuring from the
beginning of the tracing on top to the end of the tracing on the bottom. This measurement maintains the same angular subtense of the tracing form following the assumption that the test distance at near is 40 centimeters. The instructions and scoring procedure which accompany the near test were followed.

**Groffman Visual Tracing Test** (Appendix G)

The subjects were given form A and followed the instructions and scoring that accompany the test.

**Stern Fixation Test** (Appendix H)

Test form 2 was used along with the test's standard instructions. The test distance was specified at 40 cm. Scoring was done as indicated by the test format.

**Percy Saccadic Fixation Test** (Appendix I)

Test Form FL-1 was used with the test's standard instructions. Scoring was done as indicated by the test format.

**Pierce Saccade Test** (Appendix J)

Test forms I, II, and III were used along with the standard instructions which accompany the test. Scoring was done cumulatively as indicated by the test.
RESULTS

Statistical analysis of the data are listed below.

Histograms for the subject population and each test follow.

<table>
<thead>
<tr>
<th>Test</th>
<th>Number of Subjects</th>
<th>Range</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accommodative Rock * Flips</td>
<td>0-30 sec.</td>
<td>51</td>
<td>6-36</td>
<td>17</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>30-60 sec.</td>
<td>51</td>
<td>3-33</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>(1/2 cycle) 0-60 sec.</td>
<td>51</td>
<td>10-69</td>
<td>32</td>
<td>13</td>
</tr>
<tr>
<td>Prism Rock + Flips (1/2 cycle)</td>
<td>0-30 sec.</td>
<td>95</td>
<td>1-33</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>30-60 sec.</td>
<td>95</td>
<td>2-35</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>(1/2 cycle) 0-60 sec.</td>
<td>95</td>
<td>3-63</td>
<td>25</td>
<td>12</td>
</tr>
<tr>
<td>Groffman Far</td>
<td>48</td>
<td>9-49</td>
<td>33</td>
<td>10</td>
<td>28, 38, 40, 35</td>
</tr>
<tr>
<td>Groffman Near</td>
<td>73</td>
<td>9-50</td>
<td>37</td>
<td>9</td>
<td>42, 46</td>
</tr>
<tr>
<td>Stern Fixation</td>
<td>82</td>
<td>36-82</td>
<td>55</td>
<td>9</td>
<td>50</td>
</tr>
<tr>
<td>Percon Test</td>
<td>79</td>
<td>4-13</td>
<td>8</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Pierce Saccade</td>
<td>79</td>
<td>30-74</td>
<td>47</td>
<td>10</td>
<td>39, 49</td>
</tr>
</tbody>
</table>

* Five additional subjects were unable to sustain the task without becoming diplopic.

+ Twenty additional subjects were unable to fuse the 8 Base In - 8 Base Out demand.
Number = 51
Mean = 17
Standard Deviation = 6

Figure 1. Accommodative rock at 40 cm using a ± 2.00 D. flipper and DST Chart A for 0-30 seconds. Subjects ranged in age from 18-35 years.
Figure 2. Accommodative rock at 40 cm using a ±2.00 D. flipper and DST Chart A for 30-60 seconds. Subjects ranged in age from 18-35 years.
Number = 51
Mean = 32
Standard Deviation = 13

Figure 3. Accommodative rock at 40 cm using a ± 2.00 D. flipper and DST Chart A for 0-60 seconds. Subjects ranged in age from 18-35 years.
Figure 4. Prism rock at 40 cm using an 8° base in-base out flipper and DST Chart B for 0-30 seconds. Subjects range in age from 18-35 years.

Number = 95
Mean = 14
Standard Deviation = 7
Figure 5. Prism rock at 40 cm using an 8° base in-base out flipper and DST Chart B for 30-60 seconds. Subjects ranged in age from 18-35 years.

Number = 95
Mean = 11
Standard Deviation = 7
Number = 95
Mean = 25
Standard Deviation = 12

Figure 6. Prism rock at 40 cm using an 8\textdegree base in-base out flipper and DST Chart B for 0-60 seconds. Subjects ranged in age from 18-35 years.
Number = 48
Mean = 32
Standard Deviation = 10

Figure 7. Groffman Visual Tracing scores from the test modified for 10 feet. Subjects ranged in age from 18-35 years.
Number = 73
Mean = 37
Standard Deviation = 9

Figure 8. Groffman Visual Tracing Test Form A scores at 40 cm. Subjects ranged in age from 18-35 years.
Number = 82
Mean = 55
Standard Deviation = 9

Figure 9. Stern Fixation Test Form 2 scores at 40 cm. Subjects ranged in age from 18-35 years.
Figure 10. Percon Saccadic Fixation Test Form
FL-1 scores at 40 cm. Subjects ranged in age from 18-35 years.
Figure 11. Pierce Saccade Test Forms I, II, III scores at 40 cm. Subjects ranged in age from 18-35 years.

Number = 79
Mean = 47
Standard Deviation = 10
Figure 12. Distribution of subject population ranging in age from 18-35 years.
Discussion

There is a need for standardization and means for an adult population in the area of supplemental vision screening tests. The supplemental tests included are intended only to be a sample of what tests could be utilized in a vision screening. Our research assessed the areas of accommodation, convergence-divergence and eye movements.

The PST charts were designed to decrease confusion caused by current target charts from the inclusion of numbers and both upper and lower case letters. Four charts were produced so that training could be done and the practice effect would not alter post-testing results.

The accommodative and prism rock tests were recorded over two time periods, 0-30 seconds and 30-60 seconds and the total score being the sum of the two. Any one or all three scores could be used to compare an individual's performance on each test. Our intention in recording after 30 seconds and then after another 30 seconds was to make it possible to see if an individual's performance changes over the period of time tested. The mean values for both tests show a slight decrease during the 30-60 second interval as compared to the 0-30 second time period. Some individual subjects, however, were able to maintain while others were able to increase their performance during the second time interval.

The Groffman Visual Tracing Test was expanded to a
greater distance because of the need to evaluate pursuit performance at far. The test was scored in the same manner as the Groffman Visual Tracing Test at near, however, the two means cannot be compared directly because they are different tests. The lower mean score at the 10 foot distance was possibly a result of the eyes traversing a larger physical target. This was expected since increased time taken for each tracing results in a lower score.

The near Groffman Visual Tracing Test for our adult population shows a greater mean score than for Groffman's 12 years and over score of 32. Our instructions mandated that the test be done at 40 centimeters since the accompanying instructions do not indicate a specific test distance. As a result our test and Groffman's scoring may not be comparable.

Stern normed his Fixation Test (Test 2) for children 9 through 12 years old (See Appendix H). Our mean of 55 is significantly lower showing that performance on this test has not peaked by age 12.

The Percon Saccadic Fixation Test was previously normed according to grade levels one through six, (See Appendix I). Grade six showed the highest performance level of 10 seconds while our adult population obtained a mean value of 2 seconds faster.

The Pierce Saccade Test was standardized and normed
on school age children and the values are taken from the
graph in Appendix J. The graph shows a plateau at approx­
imately 53 seconds for ages fourteen and above. Our popula¬
tion value of 47 which indicates that performance does not
plateau at age 14.

Our study is not without limitations; our population
included predominantly optometry students and the sample
size was small leading to large standard deviations. The
means are restricted to the conditions we set forth which
include the standard instructions.

In conjunction with behavioral observation the means
found for these supplemental tests can be of benefit by
providing a basis for patient evaluation when the stand­
ardized conditions are followed.
Methods Used to Test Various Visual Skills

<table>
<thead>
<tr>
<th>TEST</th>
<th>Getz</th>
<th>Sherman</th>
<th>PUCO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ACUITY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>static</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>dynamic</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>ACCOMMODATION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ 1.50 rock</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ 2.00 rock</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>EYE MOVEMENTS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>head skills</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Groffman</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stern Fixation</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Wayne</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>BINOCULARITY</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cover test</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Brock string</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>North 4-dot</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Randot</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>6° rock</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8° rock</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Keystone</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>COLOR VISION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>TACHISTOSCOPE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>VISUAL MOTOR</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wayne</td>
<td>*</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td><strong>VISUALIZATION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>X</td>
<td></td>
<td>*</td>
</tr>
</tbody>
</table>

* tests not specified
DST VISION SCREENING

NAME __________________________ AGE __________ DATE __________________

CASE HISTORY (circle or fill-in required information)

1. Student Optometry student Non-student

2. Do you wear glasses or contact lenses?
   A. YES
      1. How old are they? __________________
      2. Are they satisfactory? YES NO
      3. When used? NEAR FAR FULL-TIME
      4. During sports? YES NO
   B. NO
   C. Is your correction being worn for the following tests? YES NO

3. Have you ever had vision training? YES NO
   If yes, was it within the last year? YES NO

4. Have you ever had an eye injury or eye surgery? YES NO
   If yes, explain: ____________________________________________________________

******************************************************************************

Randot Stereogram: 500 arc seconds (Fly or top half of geometric figures)

PASS  FAIL
© 1983 Tricia M. Brenner, Scott L. Nehring, David A. Wolf
ACCOMMODATIVE ROCK RECORDING FORM

Materials: DST chart held at 40 cm. and $\pm$ 2.00 flippers.

Set up:
1. Habitual Rx must be worn.
2. Binocularity must be determined using Randot Stereogram. Criterion: must discern 500 seconds of arc.
3. Rock shall be maintained for 1 minute and recorded at 30 and 60 seconds.
4. On the recording sheet x-out incorrect responses and slash (/) after 30 and 60 seconds.
5. The test will be done OU.
6. If subject is or becomes diplopic during testing please note on the recording form with a "D" at the point where diplopia occurred.

Instructions:
1. "CAN YOU READ THE LETTERS?"
2. "THE PURPOSE OF THIS TEST IS TO SEE HOW MANY TIMES YOU CAN FLIP THE LENSES WHILE CLEARING THE LETTERS ON THE CHART. I WANT YOU TO CALL OFF THE LETTERS BEGINNING FROM LEFT TO RIGHT, WHEN YOU ARE DONE WITH ONE ROW GO TO THE NEXT. I WANT YOU TO LOOK THROUGH THE LENSES CLEAR THE FIRST LETTER AND CALL IT OUT, THEN FLIP THE LENSES AND WHEN YOU CLEAR THE NEXT, CALL IT OFF AND FLIP AGAIN. DO YOU UNDERSTAND THE INSTRUCTIONS?"
3. (A demonstration should now be done on each subject) Allow them to look through the $+2.00$ and clear a letter in the bottom row, then flip to $-2.00$ and clear the next letter.
4. "TRY TO FLIP THE LENSES AS RAPIDLY AS POSSIBLE, IF YOU CALL OUT A LETTER INCORRECTLY DO NOT GO BACK AND CORRECT IT JUST PROCEED TO THE NEXT LETTER. CONTINUE FLIPPING THE LENSES UNTIL YOU ARE TOLD TO STOP."
5. Start with the $+2.00$ in front of the subject's eyes and look at the first letter when you say "go".

NAME ___________________  AGE _______  DATE _______
PRISM ROCK RECORDING FORM

Materials: DST chart held at 40 cm. and 8° flippers.

Set up:
1. Habitual Rx must be worn.
2. Binocularity must be determined using Randot Stereogram. Criterion: must discern 500 seconds of arc.
3. Rock shall be maintained for 1 minute and recorded at 30 and 60 seconds.
4. On the recording sheet x-out incorrect responses and slash (/) after 30 and 60 seconds.
5. The test will be done OU.
6. If the subject at any time during testing is unable to fuse, mark the recording form with a "D" at that point.

Instructions:
1. "CAN YOU READ THE LETTERS?"
2. "THE PURPOSE OF THIS TEST IS TO SEE HOW MANY TIMES YOU CAN FLIP THE LENSES WHILE KEEPING THE LETTERS SINGLE AND CLEAR. WHEN THE LETTERS ARE SINGLE AND CLEAR CALL OFF THE FIRST LETTER, FLIP THE LENS AND WHEN THE LETTERS BECOME SINGLE AND CLEAR AGAIN CALL OUT THE SECOND LETTER. DO YOU UNDERSTAND THE INSTRUCTIONS?"
3. (A demonstration should now be done on each subject) Allow them to look through the 8° base out and make the first letter on the bottom row clear and single, flip the lens and clear the next letter.
4. "TRY TO FLIP THE LENSES AS RAPIDLY AS POSSIBLE, IF YOU CALL OUT A LETTER INCORRECTLY DO NOT GO BACK AND CORRECT IT, JUST PROCEED TO THE NEXT LETTER. CONTINUE FLIPPING THE LENSES UNTIL YOU ARE TOLD TO STOP."
5. Start with the 8° base out and look at the first letter on the chart when you say "go".

NAME ______________________ AGE __________ DATE __________

_____________________________ tk l p s n e r t v u j c l p q b e x h y w i r v a m p k h s f j
_____________________________ v x s o i m b f d e p r w s e o v d a c n s x u l y k n p a h e b
_____________________________ h z j b t c y a q n i a l o a k t u f e b j m y e z w u f i s j o
e p m w d x i e j f b t k z m e c a v p r k a u b p o l v r t e f
_____________________________ t k l p s n f r t v u j c l p q f e x h y w i r v a m p k h s o g
e w k p m t r z c m f u w s i d p k c h e l x w o g b n r p h j m
_____________________________ s r a o w f j b e g u m d c e r f o t p j f a c d g s w k i b o
_____________________________ f w t l r c a z k b o i y z u l v o c r a e o g m u c t j p d f e
c e d b m t c p j e u b r m h o j u b h p c v f s y h k p m a j l
_____________________________ x b z t f j n v b o r l n p v z w f i n j r k w h t o e o c t k f p
t v w s l p r z a k e w j o n t s z c m f y a s b p j l n a w l o
_____________________________ v h a r l m k h s f o e d p m c r v n i k o p l t e s p j x r i f
_____________________________ o m p a c f s y v t k l e h o f x z y b m i k e r d o c n v z e v
_____________________________ s w j i y n l q t k j f n i a l f d w p t j x c v m k s g e r i p
d g y r h j k s p o m d v c x q w e t r a y k p n a c v r f k w o
_____________________________ a s d f g i o l k j u y t r e s q m c n b z x o k v f i o v e u n
GROFFMAN VISUAL TRACING TEST

Materials: Groffman Visual Tracing Test: Form A, modified for 10 feet.

Set up:
1. Habitual Rx must be worn.
2. Binocularity must be determined using Randot Stereogram. Criterion: must discern 500 seconds of arc.

Instructions:
The instructions which accompany the test are followed.
1. Examiner hands the demonstration card to the subjects and says, "THIS IS A TEST TO SEE HOW QUICKLY AND ACCURATELY YOU CAN FOLLOW A LINE USING ONLY YOUR EYES. LOOK AT THE LINE THAT STARTS AT THE LETTER "A". FOLLOW IT WITH YOUR EYES. WHEN IT REACHES ANOTHER LINE (point to the first intersection), FOLLOW IT STRAIGHT AHEAD AND DO NOT TURN OFF ONTO A LINE WHICH CROSSES THE LINE YOU ARE TRAVELING ON. DO YOU UNDERSTAND?" When this is understood, continue.
2. "NOW WE ARE GOING TO TRACE 5 MORE LINES. YOUR SCORE WILL DEPEND ON ACCURACY AND SPEED, SO WORK QUICKLY, BUT TRY NOT TO MAKE A MISTAKE."
3. Scoring: If number reached is incorrect- score "0". If number reached is correct record the time and read from Table 1 to translate into points.

<table>
<thead>
<tr>
<th>Letter</th>
<th>Number Reached</th>
<th>Seconds</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Visual Tracing Test

## Record Form

<table>
<thead>
<tr>
<th>NAME</th>
<th>DATE</th>
<th>AGE</th>
<th>FORM</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>LETTER</th>
<th>NUMBER REACHED</th>
<th>SECONDS ELAPSED</th>
<th>POINTS</th>
<th>SCORING SCALE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SECONDS ELAPSED</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>BELOW 16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16-20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21-25</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26-30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31-35</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>36-40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>41-45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>46-50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50-60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>OVER 60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

| TOTAL NUMBER OF POINTS | |
|------------------------| |

<table>
<thead>
<tr>
<th>RATING</th>
</tr>
</thead>
</table>

COMPLETE THE FOLLOWING LIST IMMEDIATELY AFTER ADMINISTRATION OF THE TEST

1. ATTEMPTED TO USE FINGER
2. EXCESSIVE HEAD MOVEMENT
3. IMPROPER DISTANCE FROM PAPER
4. UNUSUAL HEAD POSTURE
5. UNUSUAL BODY POSTURE
6. UNUSUAL FACIAL EXPRESSION
7. UNUSUAL VERBAL COMMENTS
8. UNUSUAL BODY MOVEMENT
9. OTHER

GROFFMAN 1968 BY KEYSSTONE VIEW FOR USE WITH VISUAL TRACING TEST CARDS (FORMS H, J, K AND V9310)
Groffman Visual Tracing Test (Groffman, 1969)


Procedure: Examiner hands the demonstration card to the student and says "This is a test to see how quickly and accurately you can follow a line using only your eyes. Look at the line that starts at the letter "A". Follow it with your eyes. When it reaches another line (point to the first intersection), follow it straight ahead and do not turn off onto a line which crosses the line you are traveling on. Do you understand?" When this is understood, continue. "Now we are going to trace 5 more lines. Your score will depend on accuracy and speed, so work quickly, but try not to make a mistake." Place the test card before the patient and time each letter individually. Caution: If the patient attempts to use his finger to trace the line, stop and start the test again. The patient should not handle the test card.

Scoring: If number reached is incorrect - score "0". If number reached is correct, record the time and read from table 1 below to translate into points.

Total all the points for the five letters and record as "score/score for age from table 2." Correct answers: Form A and B: A-3, B-4, C-1, D-5, and E-2.

<table>
<thead>
<tr>
<th>Seconds Elapsed</th>
<th>Number of Points</th>
<th>Age</th>
<th>Mean Score</th>
<th>S.D.</th>
</tr>
</thead>
<tbody>
<tr>
<td>below 16</td>
<td>10</td>
<td>7</td>
<td>10</td>
<td>3.5</td>
</tr>
<tr>
<td>16-20</td>
<td>9</td>
<td>8</td>
<td>17</td>
<td>3.0</td>
</tr>
<tr>
<td>21-25</td>
<td>8</td>
<td>9</td>
<td>22</td>
<td>2.0</td>
</tr>
<tr>
<td>26-30</td>
<td>7</td>
<td>10</td>
<td>26</td>
<td>2.5</td>
</tr>
<tr>
<td>31-35</td>
<td>6</td>
<td>11</td>
<td>28</td>
<td>3.0</td>
</tr>
<tr>
<td>36-40</td>
<td>5</td>
<td>12 &amp; over</td>
<td>32</td>
<td>4.0</td>
</tr>
<tr>
<td>41-45</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46-50</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50-60</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>over 60</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Demonstration Card

A B C D E

1 2 3 4 5
Instructions:
1. "When I say Go, I want you to read each letter out loud as fast and as accurately as you can. Read them in the same order as you would sentences." You may not point with your finger at the letters.
2. Show the example card and have the child read all of the letters. Let the child hold the test at any distance they desire. When the child has finished reading the example card, ask him if there are any questions, if not say "Ready...GO".
3. Start timing as soon as you say GO and continue until they have read the last letter.
4. Mark each error on the above copy of the test by drawing a line through it. Each skipped letter is an error, and if a whole line is skipped, mark a check by it and count each letter in that line as an error.

Scoring:
Record the total time in seconds to complete the test:
Record double the total of all the errors on the test: ADD

Add the time and errors together for the Score:

Name ________________________________ Sex: M F
Age ______ Birthdate ____________ Grade in school ____________
Wearing glasses during test: Yes No Date of last eye exam ______
Have glasses ever been prescribed in the past: Yes No
Reading level: ______ on grade level, ______ months above grade level, ______ months below grade level

c 1979 Norman Stern, O.D., Ph.D.: Pacific University
Stern Fixation Test  Form 2 (grades 4 and above)  
© 1979  
Norman Stern OU, PhD
### STERN FIXATION TEST

**MEANS BY AGE: TEST 2**

<table>
<thead>
<tr>
<th>AGE</th>
<th>N</th>
<th>MEAN</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>-9</td>
<td>4</td>
<td>131</td>
<td>30.52</td>
</tr>
<tr>
<td>ON 9</td>
<td>8</td>
<td>110</td>
<td>18.35</td>
</tr>
<tr>
<td>+9</td>
<td>12</td>
<td>85.75</td>
<td>13.26</td>
</tr>
<tr>
<td>-10</td>
<td>9</td>
<td>109</td>
<td>20.43</td>
</tr>
<tr>
<td>ON 10</td>
<td>18</td>
<td>95.5</td>
<td>17.86</td>
</tr>
<tr>
<td>+10</td>
<td>18</td>
<td>84.89</td>
<td>16.35</td>
</tr>
<tr>
<td>-11</td>
<td>11</td>
<td>100.73</td>
<td>18.56</td>
</tr>
<tr>
<td>ON 11</td>
<td>12</td>
<td>100.25</td>
<td>22.68</td>
</tr>
<tr>
<td>+11</td>
<td>18</td>
<td>79.89</td>
<td>13.66</td>
</tr>
<tr>
<td>-12</td>
<td>9</td>
<td>97.67</td>
<td>19.95</td>
</tr>
<tr>
<td>ON 12</td>
<td>12</td>
<td>86.17</td>
<td>16.11</td>
</tr>
<tr>
<td>+12</td>
<td>12</td>
<td>75.42</td>
<td>11.59</td>
</tr>
</tbody>
</table>
Saccadic Fixation Test

Materials: Letters card (FL-1) and number (FN-1)

Procedure: Student holds card (FL-1) and reads the first and last letter of each line while tester times and records errors. The same procedure is followed for card (FN-1). If letters are not known, only FN-1 card is used. Reading distance is not controlled nor is head movement. However, this may be recorded as (H.M. - head movement) or finger used (F- finger).

Record: Score number correct /20; and the time plus one second per letter or number missed over the norm for age.

Scoring:

<table>
<thead>
<tr>
<th>Grade</th>
<th>FL-1</th>
<th>FN-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>23 seconds</td>
<td>18.5 seconds</td>
</tr>
<tr>
<td>2</td>
<td>17 seconds</td>
<td>15 seconds</td>
</tr>
<tr>
<td>3</td>
<td>14 seconds</td>
<td>13 seconds</td>
</tr>
<tr>
<td>4</td>
<td>13 seconds</td>
<td>12 seconds</td>
</tr>
<tr>
<td>5</td>
<td>12 seconds</td>
<td>11 seconds</td>
</tr>
<tr>
<td>6</td>
<td>10 seconds</td>
<td>9 seconds</td>
</tr>
</tbody>
</table>

PerCon, Inc.
<table>
<thead>
<tr>
<th>X</th>
<th>A</th>
<th>Z</th>
<th>W</th>
<th>S</th>
<th>X</th>
<th>E</th>
<th>D</th>
<th>C</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>B</td>
<td>Y</td>
<td>H</td>
<td>N</td>
<td>U</td>
<td>J</td>
<td>M</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>O</td>
<td>L</td>
<td>P</td>
<td>O</td>
<td>I</td>
<td>U</td>
<td>Y</td>
<td>T</td>
<td>I</td>
</tr>
<tr>
<td>O</td>
<td>W</td>
<td>Q</td>
<td>A</td>
<td>S</td>
<td>D</td>
<td>F</td>
<td>G</td>
<td>H</td>
<td>S</td>
</tr>
<tr>
<td>B</td>
<td>L</td>
<td>Z</td>
<td>X</td>
<td>C</td>
<td>V</td>
<td>B</td>
<td>N</td>
<td>M</td>
<td>D</td>
</tr>
<tr>
<td>R</td>
<td>J</td>
<td>H</td>
<td>G</td>
<td>F</td>
<td>D</td>
<td>S</td>
<td>A</td>
<td>Y</td>
<td>A</td>
</tr>
<tr>
<td>E</td>
<td>M</td>
<td>S</td>
<td>W</td>
<td>Q</td>
<td>Z</td>
<td>C</td>
<td>N</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Q</td>
<td>D</td>
<td>A</td>
<td>Q</td>
<td>E</td>
<td>T</td>
<td>U</td>
<td>O</td>
<td>P</td>
<td>V</td>
</tr>
<tr>
<td>E</td>
<td>R</td>
<td>W</td>
<td>A</td>
<td>S</td>
<td>F</td>
<td>H</td>
<td>K</td>
<td>N</td>
<td>J</td>
</tr>
<tr>
<td>T</td>
<td>R</td>
<td>E</td>
<td>V</td>
<td>N</td>
<td>A</td>
<td>U</td>
<td>Q</td>
<td>R</td>
<td>A</td>
</tr>
</tbody>
</table>
The Pierce Saccade Test

Instructions: I want you to call out all the letters on this card as rapidly and as accurately as possible in the manner indicated. Point to the upper left hand number, then the upper right hand number, then the second left hand number, the second right hand number, etc. If the patient proceeds directly down one column, stop him, correct him and repeat the instructions. Ask if the patient understands what he is to do and if he is ready. Then tell him, "ready, start", and begin timing him. Stop the timer when he has completed calling out all of the numbers. Record the time in seconds under the column indicated for Test I, II and III.
PIERCE SACCADE TEST

<table>
<thead>
<tr>
<th>Patient</th>
<th>Examiner</th>
<th>Patient</th>
<th>Examiner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Date</td>
<td>Age</td>
<td>Date</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Number of Omission Errors</th>
<th>Number of Addition Errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Time: 
Total Errors: 
Age Equivalents: 
Performance 
Accuracy 

Observations: 
- Exaggerated head movements
- Slight head movement
- Used finger as a guide
- Abnormal working distance
Norm Values of the Pierce Saccade Test
REFERENCES


ADDITIONAL REFERENCES


"Preschool and School Age Vision Screening Program." School Vision Committee, San Diego County Optometric Society.


"Vision Screening and Subsequent Vision Care of the Preschool and School Child: A Proposal." Prepared by the Committee on Visual Problems of Children and Youth, Harold L. Friedenberg, O.D. Chairman. AOA.