Monocular versus Binocular Visual Acuity as Measures of Vision Impairment and Predictors of Visual Disability

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Purpose. To examine the relationship between monocular and binocular visual acuities as predictors of visual disability in a population-based sample of individuals 65 years of age and older.

Methods. Two thousand five hundred twenty community-dwelling residents of Salisbury, Maryland, between the ages of 65 and 84 years of age were recruited for the study. Corrected visual acuity was measured monocularly and binocularly using ETDRS charts. Reading speed, face discrimination, and self-reported difficulty with visual tasks were also determined.

Results. Binocular acuity is predicted with reasonable accuracy by acuity in the better eye alone, but not by the widely used American Medical Association (AMA) weighted-average algorithm. The AMA algorithm significantly underestimates binocular acuity when the interocular acuity difference exceeds one line. Monocular acuity and binocular acuity were significantly better predictors of reading speed than the AMA weighted score or a recently proposed Functional Vision Score (FVS). Monocular acuity in the better eye, binocular acuity, and the AMA and FVS algorithms were equally good predictors of self-reported vision disability. None of the acuity measures were good predictors of face recognition ability.

Conclusions. The binocular acuities of older individuals can be inferred from measures of monocular acuity. There is little evidence for binocular inhibition when the monocular acuities in the two eyes are unequal, as opposed to the widely used AMA algorithm for computing binocular visual impairment. For tasks that are strongly associated with visual acuity, such as reading, this association can be captured from measures of monocular acuity and does not require separate assessment of binocular acuity. (Invest Ophthalmol Vis Sci. 2000;41:3327–3334)

Sensory impairment is typically defined at the organ level, whereas disability is defined at the level of the entire individual. Therefore, to study the relationship between vision impairment and physical disability, one must decide how to accommodate the contributions of both eyes. The World Health Organization (WHO) has written widely used manuals on the classification of diseases, impairments, and disabilities,¹ but these offer little help. Although these manuals acknowledge that the degree of impairment may be different for the two eyes of an individual, they make no recommendation for the synthesis of monocular vision losses.

Many clinical investigators, see, for example, Tinetti et al.² and Mangione et al.,³ and governmental agencies rely on an algorithm developed in 1955 for the American Academy of Ophthalmology⁴ and subsequently adopted in 1958 by the Committee on Medical Rating of Physical Impairment of the American Medical Association.⁵ According to this algorithm, visual impairment of the individual is derived from vision impairment measured separately for the two eyes by the following formula:

\[
\text{Impairment of visual system} = \frac{3 \times \text{better eye value} + \text{worse eye value}}{4}
\]

The terms “better eye value” and “worse eye value” are specified in tables based on combinations of near and distance visual acuity, visual fields, and ocular motility. In the absence of visual field or motility data, the basic formula has been applied to visual acuity data alone. The algorithm for deriving “values” from acuity is not specified, but generally follows a logMAR (log10[minimum angle of resolution]) scale. As a modification of the AMA algorithm, Colenbrander developed the Functional Acuity Score (FVS)⁶:

\[
\text{FVS} = 2 \times \text{binocular score} + \text{right eye score} + \text{left eye score}
\]

The score for each component is derived from a table that follows a logMAR scale. In contrast to the two combination rules, which take both eyes into account, the US Social Security Administration adopted new regulations in 1997 for the determination of disability benefits based solely on the visual function of the better-seeing eye.⁷

Neither the AMA guidelines, the FVS, nor the Social Security regulations provide any justification for their respective...
algorithms. One consequence of the AMA and better-eye rules is that binocular vision would never be better than monocular vision in the better eye. However, laboratory studies of binocular versus monocular visual acuity based on small samples of young normal adults with equal acuities in the two eyes have shown a 10% to 12% advantage for binocular viewing under high luminance, high contrast conditions.\(^8\)\(^-\)\(^10\) The AMA and better-eye algorithms do not allow for this “binocular summation.” One laboratory study demonstrated that reduced luminance or contrast can increase the summation to as much as 50%.\(^10\) Many older adults have reduced retinal illuminance caused by senile miosis and nuclear sclerosis. In addition, some may experience reduced retinal contrast due to light scatter from early cataract. Therefore, we might expect binocular summation to be greater in older subjects than in young normal subjects. Indeed, one study of 16 older adults (mean age, 62.5 years) showed a 30% improvement in binocular compared with monocular acuity.\(^11\)

Conversely, numerous studies of contrast sensitivity have shown that when the sensitivities of the two eyes differ, binocular sensitivity may be worse than the sensitivity of the better eye. The AMA algorithm incorporates this form of “binocular inhibition,” but its applicability to visual acuity data is uncertain. Normal subjects show modest binocular acuity summation even when the target to one eye is reduced in contrast.\(^8\) Cataract patients with unequal cataract densities in the two eyes show neither summation nor inhibition for high contrast letters\(^12\) and inhibition for low contrast letters.\(^11\)

Previous epidemiologic studies of vision impairment have generally measured monocular acuities,\(^13\)\(^-\)\(^14\) whereas studies of physical disability have typically obtained a subjective assessment of visual function based on reported difficulty seeing with both eyes (e.g., the Massachusetts Health Care Panel Study\(^15\) and EPESE Study\(^16\)). The Salisbury Eye Evaluation (SEE) was initiated in 1992 as a multidisciplinary study of eye disease, vision impairment, and physical disability in older Americans. In the SEE project, visual acuity was measured monocularly and binocularly. In addition, self-report and performance-based measures were obtained for a variety of visual tasks under natural binocular viewing conditions. This provides an opportunity to determine how binocular acuity is related to monocular acuity and how both are related to difficulty with visual tasks.

**METHODS**

**Subjects**

A complete description of the study population and recruitment procedures has been published previously.\(^17\) Briefly, a sample of individuals living in the Salisbury, Maryland, metropolitan area 65 to 84 years of age was drawn from the Salisbury Eye Evaluation (SEE) Medicare eligibility lists. This sample included 100% of the identified African-American residents and an age-stratified random sample of 58% of identified white residents. After informed consent was obtained (in accordance with the Declaration of Helsinki) using forms approved by the institutional human experimentation committee, a 2-hour in-home interview was administered to each participant followed by a 4- to 5-hour clinic examination. To be eligible for the study, the participant could not be institutionalized and had to score 18 or greater on the Folstein Mini-Mental State Examination.\(^18\) Two thousand five hundred twenty participants completed the home interview and clinic examination. Testing took place between September 16, 1993, and September 26, 1995.

The overall participation rate was 65%, excluding the ineligibles. Approximately half of those who refused (refusals) agreed to answer a brief subset of the home questionnaire.\(^19\) Those refusing were somewhat older, more likely to be female, and less likely to have completed high school than those who participated. Refusals were also more likely to report difficulty with activities of daily living than participants. There were no significant differences between participants and refusals by race or self-assessed vision status.

**Visual Acuity Tests**

As part of an extensive psychophysical test battery, visual acuity was evaluated with the Lighthouse ETDRS distance charts transilluminated with the Lighthouse Chart Illuminator (Lighthouse International, New York, NY) to a level of approximately 130 (candela) cd/m\(^2\). Acuity was tested at 3 m. If the participant was unable to read the largest letters on the chart, test distance was reduced to 1.5 m and testing repeated. This procedure was repeated until an acuity measure was obtained or the participant failed at a distance of 1 m. Only five participants failed to read any letters with either eye. A strict forced-choice testing procedure was used: The participant was required to guess even if the letters appeared illegible until at least four of five letters on a row were named incorrectly.

Acuity was measured binocularly then monocularly (right eye followed by left eye) with the participant’s habitual refractive correction. If the acuity was worse than 20/30 with either eye, then a complete subjective refraction was performed using autorefractor findings as the starting point. If acuity improved more than one line (≥0.1 logMAR) after subjective refraction, then binocular acuity was remeasured using the new refraction worn in a trial frame. Acuity measurements for the binocular, right eye, and left eye conditions were made with different versions of the ETDRS chart.

Ten participants were unable to identify letters because of illiteracy and the Lea Symbols Chart was substituted. The Lea Symbols Chart has the same layout at the ETDRS chart but uses four pictorial optotypes instead of letters.\(^20\)

**Performance-Based Tests**

Reading performance was tested with a computer-controlled video display. Short passages of text were displayed for up to 15 seconds and the participants read aloud. Four print sizes were tested ranging from 0.13\(^\circ\) (about the size of small print on medicine bottles) to 0.53\(^\circ\) (about the size of a small newspaper headline). Each print size was tested twice, in random order. Face discrimination was measured with a four-alternative forced-choice paradigm. Sixteen faces (eight male, eight female) were digitized in each of four poses. The faces subtended 2.5\(^\circ\) (horizontal, ear to ear) by 3.2\(^\circ\) (vertical, chin to forehead). Three different poses of one individual and a fourth pose of another individual were displayed on a monochrome monitor. The participant had to choose the odd image. Fifteen trials were presented in random order.

**Self-Reported Visual Disability**

Visual disability was assessed with the Activities of Daily Vision Scale, or ADVS.\(^3\) The ADVS is a 22-item questionnaire that...
assesses difficulty performing a range of vision tasks that were judged to be important to cataract patients. Trained interviewers administered the ADVS as originally published, excluding one question on the use of bus service, which is not available in Salisbury. For each item, it was determined whether the participant had done the activity within the past 3 months, and if not, this was because of vision problems. Activities that were not done recently for reasons unrelated to vision were not scored. The remaining items were scored according to level of difficulty (1 = unable to do because of vision problems; 2 = extreme difficulty; 3 = moderate difficulty; 4 = a little difficulty; and 5 = no difficulty).

Data Analysis

Visual acuity was scored as the total number of letters read correctly and converted to logMAR (log_{10} minimum angle resolvable) according to the method recommended by Bailey et al.21 Briefly, each correctly identified letter reduced the logMAR acuity by 0.02. Participants who failed to read any letters were arbitrarily assigned an acuity of 1.7 logMAR (20/1000), 0.2 logMAR worse than the lowest acuity measured. The relationship between monocular and binocular acuity was evaluated with scatter plots and regression analyses. The analyses were repeated after exclusion of the five participants with unmeasurable acuities, and the results did not change.

For the reading test, the number of correctly read words was counted and converted to reading rate in words per minute. Reading data were analyzed separately for each letter size. Participants who could not read text of any size were excluded from the analyses of reading performance. Reading data were missing for 211 participants (8%), either because they could not read (87) or because of equipment malfunction (124). Among those who could not read, 55 (62%) had acuities of 20/40 or better and were presumed to be illiterate. The relationships between visual acuity and reading rate were similar for all letter sizes, and only the data for newsprint-sized text was counted and converted to reading rate in words per minute.

Separate linear regression analyses were used to determine the association between acuity and reading or face recognition. Both analyses were adjusted for age, race, gender, years of education, and Mini-Mental score. Residuals were evaluated for evidence of nonlinearity, and, where appropriate, linear spline regressions were also performed.22

The ADVS scores were highly skewed; therefore, it was felt to be inappropriate to use continuous linear regression. Instead, logistic regression analyses were performed to determine the association between acuity and dichotomized ADVS score. Regression models for each of the binocular and monocular acuity algorithms were compared by means of their receiver-operating characteristic (ROC). As it is used here, the ROC provides a metric for determining each algorithm's ability to classify individuals with regard to their dichotomized ADVS scores.23 At any acuity level, the regression model predicts whether each participant will fall above or below the cutoff. The prediction can be compared with actual data to determine proportion of participants correctly predicted to fall below the cutoff, or sensitivity, and the proportion of participants incorrectly predicted to fall below the cutoff, or false-positive rate, as a function of acuity. Separate analyses were conducted with ADVS score dichotomized at the median, 25th percentile, and 10th percentile. Because the results were similar for all three dichotomization schemes we will only present results for the case where participants were classified as falling above or below the 10th percentile in ADVS score (70.8). Each model was adjusted for age, race, gender, years of education, and Mini-Mental score. All statistical analyses were performed with SAS (SAS Institute, Cary, NC).

RESULTS

The median best-corrected binocular acuity of this sample of 2520 older participants is −0.02 logMAR (20/19) with 4.8% of the sample having acuities worse than 0.3 logMAR (20/40). The median monocular acuity in the better-seeing eye is 0.00 logMAR (20/20), and the median worse-eye acuity is 0.12 logMAR (20/26). The prevalence of visual impairment in this population is somewhat lower than that reported for earlier population-based studies. For a further discussion of how visual acuity varies according to demographic factors and how these acuity data compare with other population-based studies see Rubin et al.24

Figure 1 (left) compares binocular acuity to the AMA-recommended weighted average of monocular acuities. If the AMA weighted average accurately predicted binocular acuity, the data would be expected to cluster along the diagonal line. However, most of the points are below the diagonal, indicating that the AMA weighting predicts worse binocular acuity than what is actually measured.

Figure 1 (right) shows the discrepancy between predicted acuity, based on the AMA algorithm, and observed binocular acuity in terms of number of ETDRS lines. This discrepancy is plotted against the interocular acuity difference for each participant. For participants with similar acuities in the two eyes (i.e., interocular difference of 1.0 ETDRS line or less), the discrepancy averages only 0.4 lines. However, for participants with dissimilar acuities in the two eyes, the discrepancy increases at a rate of one line of discrepancy per five lines of interocular acuity difference. Thus, the greater the difference between eyes, the worse the algorithm predicts actual acuity.

Figure 2 (left) compares binocular acuity to acuity in the best eye alone. The data cluster along the diagonal line, indicating good agreement between the best-eye prediction and the observed binocular measurement. The discrepancy between binocular acuity and best-eye acuity, shown in Figure 2 (right), averages less than 0.2 ETDRS lines (1 letter), well within the test–retest variability.25–28 For 85% of participants (2170), the discrepancy between binocular and best-eye acuity is less than one ETDRS line (5 letters). There is a small but statistically significant change in the discrepancy with increasing interocular acuity difference (0.2 lines of discrepancy per five lines of interocular difference). This trend is examined in greater detail below.

The distribution of the difference in monocular acuities between the two eyes is shown in Figure 3. The median interocular difference is 0.09 logMAR, or 0.9 lines on the ETDRS acuity chart. Eleven percent of the population have an interocular acuity difference of three or more lines.
It was hypothesized that binocular summation would occur when the monocular acuities of the two eyes were nearly equivalent but that there would be binocular inhibition when the acuities of the two eyes were dissimilar. In keeping with previous terminology we refer to the difference between logMAR acuity in the better eye and binocular logMAR acuity as "binocular gain." Positive gains indicate summation and negative gains indicate inhibition. Incidentally, binocular gain is the same as the discrepancy between binocular acuity and acuity in the better eye, as shown in the right panel of Figure 2.

Binocular gain was independent of the underlying monocular acuities in the better- or worse-seeing eye, but varied with the interocular acuity difference. Figure 4 shows the distribution of binocular gain grouped according to the similarity of monocular acuities in the two eyes. Among participants with similar acuities in the two eyes, 38% show one line or more binocular summation, whereas only 10% show one line or more inhibition. The average summation for the group is 0.03, or approximately 1.5 letters. Although the amount of binocular gain is statistically significant ($t = 18.5, P < 0.0001$), the gain is of
Regression analyses showed a significant association between binocular acuity and both of the visual performance measures: reading newsprint and recognizing faces. Inspection of residuals indicated that the relationship between acuity and reading was nonlinear. Therefore, linear spline regressions were performed with inflections at acuities of 0.00 logMAR (20/20) and 0.47 logMAR (20/60). The regression coefficients are shown in Table 1. After adjustment for age, race, gender, cognitive status, and years of education, a one-line loss of binocular acuity predicted an 8.9 (±1.9) words/min decline in reading rate for acuities up to 20/20 and 32.4 (±1.5) words/min decline for acuities between 20/20 and 20/60. For acuities worse than 20/60 there was little additional change in reading rate. The regression model accounted for 50% of the variance in reading rate and the independent contribution of binocular acuity to the association (additional 18% of the variance accounted for) was statistically significant ($P < 0.001$).

ROC analysis was used to determine the association between acuity and ADVS score. The area under the ROC is the metric for comparing algorithms. If the algorithm is a perfect classifier the sensitivity will be 1, the false-positive rate will be 0, and the area under the ROC will equal 1.0. If the algorithm performs at chance the sensitivity will be equivalent to the false-positive rate and the area under the ROC will equal 0.5. The ROC area was 0.78 for baseline variables plus binocular acuity.

Table 2 compares the strength of the association between the three outcome measures and each of the binocular and monocular acuity combination rules. All of the combination rules are equivalent when there is no interocular acuity difference. Because one half of the observers have less than a one-line difference in acuities between the two eyes, one would expect little difference among the algorithms when they are applied to the entire data set. This was indeed the case, as shown in the left half of Table 2. As a stronger test of differences between combination rules, the regression models were refit to the subset of data for participants with more than three lines of interocular acuity difference ($n = 261$). The summary statistics are listed in the right half of Table 2. For reading speed, binocular acuity and monocular acuity accounted for 65% and 63% of the variance, whereas the AMA and FVS algorithms accounted for only 49% and 52%, respectively. For face recognition and ADVS score the four models still yield nearly equivalent results.

**Discussion**

The results illustrated in Figure 2 demonstrate that binocular visual acuity can be closely predicted by the monocular acuity

![Image](image-url)
of the better eye. There is no support in our data for the widely used AMA weighted-average algorithm as a predictor of binocular acuity. When the acuities in the two eyes are similar, the AMA algorithm is equivalent to the better-eye acuity; however, as the acuities of the two eyes diverge, the AMA algorithm seriously underestimates the measured binocular acuity, as shown in Figure 1.

Based on previous studies with small groups of subjects it was expected that our participants with similar acuities in the two eyes would show binocular summation (i.e., the binocular acuity would be better than the monocular acuity in the better eye). Figure 4 shows that there is a small binocular summation, 0.03 logMAR units or 1.5 letters on average for the group with less than a one-line acuity difference between the two eyes. Although the binocular summation is statistically significant ($t = 18.5; P < 0.0001$), it is about half that reported in previous studies$^{8,12}$ and of doubtful clinical significance. All the participants in the present study were 65 years of age and older. The previous studies included younger and older subjects. However, age itself is unlikely to explain the discrepancy because one of the previous studies$^{12}$ compared binocular summation for younger (21 ± 2 years) and older (66 ± 6 years) subjects and found that the summation for the older group was somewhat greater than for the younger group.

It was hypothesized that binocular summation would be greater in the present study than in previous studies with younger observers because summation is enhanced under conditions of reduced retinal illuminance or contrast,$^{10}$ both of which are common in the elderly, even among those without frank eye disease. Weale$^{29}$ has estimated that there is an overall two- to threefold reduction in retinal illumination from 20 to 60 years of age, mostly caused by increased lenticular absorption and pupillary miosis. Age-related increases in intraocular light scatter reduce retinal image contrast.$^{30-32}$ Given these ocular changes and resultant loss in illumination and contrast at the retina, we expected to see greater binocular summation in participants with equal vision in the two eyes. The absence of such an effect may indicate that the age-related loss of retinal illumination and contrast is small compared with that required for a change in binocular summation. On the other hand, previous studies of binocular contrast$^{33}$ and luminance summation$^{34}$ have shown a decrease rather than an increase in summation with advancing age.

Our results also show less than a one letter difference, on average, between monocular and binocular acuities for participants with unequal acuities in the two eyes. Equal numbers showed binocular inhibition and binocular summation. Previous data on individuals with unequal monocular acuities have been equivocal. One study of unilateral cataract patients showed minimal binocular inhibition, averaging 0.05 logMAR (2.5 letters)$^{35}$ one study showed minimal summation (also averaging approximately 0.05 logMAR)$^{36}$ and two studies showed neither inhibition nor summation.$^{11,12}$ A detailed study of four subjects with normal vision in whom the contrast of the targets presented to one eye was reduced showed no binocular inhibition.$^{38}$ Thus, there is little consistent evidence for significant binocular inhibition.

This study also demonstrates that the influence of visual acuity on the performance of everyday tasks can be accounted for by monocular acuity in the better eye. Considering all

### Table 1. Regression Coefficients (±1 SE) for Reading and Face Recognition

<table>
<thead>
<tr>
<th>Predictors</th>
<th>All Participants</th>
<th>Participants with Interocular Acuity Difference (n = 261)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reading$^1$</td>
<td>Face Recognition$^1$</td>
</tr>
<tr>
<td>Binocular acuity ≤ 20/20</td>
<td>−8.9 (1.9)</td>
<td>−9.8 (6.5)</td>
</tr>
<tr>
<td>20/20 &lt; binocular acuity ≤ 20/60</td>
<td>−52.4 (1.5)</td>
<td>−35.6 (2.8)</td>
</tr>
<tr>
<td>Binocular acuity &gt; 20/60</td>
<td>−5.9 (7.9)</td>
<td>−14.5 (11.3)</td>
</tr>
<tr>
<td>Binocular acuity ≤ 20/60</td>
<td>−0.52 (0.04)</td>
<td>−0.54 (0.11)</td>
</tr>
<tr>
<td>Binocular acuity &gt; 20/60</td>
<td>−0.50 (0.11)</td>
<td>−0.22 (0.24)</td>
</tr>
<tr>
<td>Variance accounted for ($r^2$)</td>
<td>0.50</td>
<td>0.65</td>
</tr>
</tbody>
</table>

$^1$ Change in words/minute per line of acuity loss.

$^2$ Change in number correct (of 15 possible) per line of acuity loss.

### Table 2. Predictive Ability of Monocular and Binocular Acuity Measures

<table>
<thead>
<tr>
<th>Predictors</th>
<th>All Participants</th>
<th>Participants with Interocular Acuity Difference (n = 261)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reading$^1$</td>
<td>Face Recognition$^1$</td>
</tr>
<tr>
<td>Baseline only$^5$</td>
<td>0.32</td>
<td>0.30</td>
</tr>
<tr>
<td>Baseline + binocular acuity</td>
<td>0.50</td>
<td>0.36</td>
</tr>
<tr>
<td>Baseline + acuity in better eye</td>
<td>0.48</td>
<td>0.39</td>
</tr>
<tr>
<td>Baseline + AMA weighted acuity</td>
<td>0.47</td>
<td>0.36</td>
</tr>
<tr>
<td>Baseline + FVS</td>
<td>0.48</td>
<td>0.37</td>
</tr>
</tbody>
</table>

$^1$ Variance accounted for ($r^2$).

$^2$ Area under ROC.

$^5$ Age, race, gender, years of education, and cognitive status.
participants in the study, monocular acuity in the better eye was as good a predictor of performance as binocular acuity or algorithms based on weighted sums of monocular acuities. However, the various algorithms are differentiated only for people with significant discrepancies between the acuities in the two eyes. For the subset of participants with interocular acuity differences greater than three lines, monocular acuity was equivalent to binocular acuity and both were as good or better predictors of performance than the weighted monocular acuity algorithms.

In comparing the various algorithms, all analyses were based on best-corrected visual acuities. One might expect everyday visual function to be more closely associated with habitual acuity than with corrected acuity. However, a recently published study by Wang et al. in this journal showed that best-corrected acuity was a better predictor of self-rated health than was habitual acuity. When we reanalyzed the present data using habitual binocular acuity, the variance accounted for changed by no more than 1% compared with analyses based on habitual acuity.

One implication of this study concerns the expected benefit of second-eye cataract surgery. If binocular acuity, self-reported visual function, and performance are controlled by acuity in the better-seeing eye, then second-eye surgery should have little effect on acuity, visual function, or performance. However, results from a prospective study of 613 patients undergoing cataract surgery showed similar improvement in subjective visual function for first-eye and second-eye surgeries. The results of two smaller studies may help explain the apparent paradox. The first study showed significant changes in reading speed, face recognition, mobility performance, and perceived visual disability after second-eye surgery. In the second study there was a marked decrease in reported symptoms, and all patients reported that their vision had improved after second surgery. Although statistically significant, the acuity differences in both studies were small and comparable to the average difference between monocular and binocular acuities reported in the present study. The authors attribute much of the subjective improvement to gains in contrast sensitivity, binocularity, and other visual factors that may not be captured by tests of acuity alone. Therefore, although the gains in binocular acuity after second-eye cataract surgery may be modest, the effect of such surgery on overall visual ability can be substantial. It is important to consider that visual acuity is certainly not the only or perhaps even the best predictor of function. We11 and others42 have shown that contrast sensitivity is an important predictor of self-reported difficulty with daily visual activities among the elderly.

In summary, the widely used AMA algorithm does not provide an accurate method for predicting binocular visual function when the acuities in the two eyes are dissimilar. If a measure of binocular acuity is not available, it may be inferred from acuity in the better-seeing eye. For tasks that are strongly associated with visual acuity, such as reading, this association can be captured by monocular acuity in the better-seeing eye rather than the weighted average of acuities in the two eyes.

References


