



AOTA Critically Appraised Topics and Papers Series

**Driving and Community Mobility
for Older Adults**

**A product of the American Occupational Therapy Association's
Evidence-Based Literature Review Project*

CRITICALLY APPRAISED PAPER (CAP)

Focused Question

What is the evidence for the effect of modifications of the infrastructure of the physical environment (e.g., roadways, signage, and lighting) on the driving ability, performance, and safety of the older adult?

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Kline, D. W., Buck, K., Sell, Y., Bolan, T. L., & Dewar, R. E. (1999). Older observers' tolerance of optical blur: Age differences in the identification of defocused text signs. *Human Factors, 41*, 356–364.

PROBLEM STATEMENT (JUSTIFICATION OF THE NEED FOR THE STUDY)

State the problem the authors are investigating in this study.

Prior research indicates that as humans age there is a progressive decline in their ability to resolve high-spatial frequency details. However, it is also possible that those with poorer vision may be more resistant to optical blur.

RESEARCH OBJECTIVE(S)

List study objectives.

The authors investigated whether the ability to identify defocused (i.e., optically blurred) text in either daytime or nighttime conditions. The results of such a study could be used to decide whether or not modifications to the infrastructure (particularly signage and lighting) should be considered.

DESIGN TYPE:

Randomized Controlled Trial

Level of Evidence:

Level I

Limitations (appropriateness of study design):

Was the study design type appropriate for the knowledge level about this topic? *If no, explain.*

Yes

No

SAMPLE SELECTION

How were subjects selected to participate? Please describe.

Convenience—volunteers

Inclusion Criteria

In Experiment #1, there were 24 participants. All were licensed drivers. There were 12 in the Younger Group, with mean age of 24.3 (range was from 21 to 29). There were 12 in the Older Group, with mean age of 62.0 (range was from 55 to 71).
In Experiment #2, there were also 24 participants, none of whom had taken part in Experiment #1. All were licensed drivers. There were 12 in the Younger Group, with mean age of 21.0 (range was from 17 to 26). There were 12 in the Older Group, with mean age of 70.8 (range was from 58 to 78).

Exclusion Criteria

NR

NR = Not reported.

Sample Selection Biases: *If yes, explain.*

Volunteers/Referrals

Yes Participants were “community” resident volunteers.

No

Attention

Yes In Experiment #1 there was no practice imagery.
In Experiment #2 participants were given practice sign to familiarize them with the legibility task

No

Others (list and explain):

SAMPLE CHARACTERISTICS

$N = 24$ in both Experiment #1 and Experiment #2.

% Dropouts

#/(%) Male

#/(%) Female

Ethnicity

Disease/disability diagnosis

Check appropriate group:

<20/study group	20–50/study group <input checked="" type="checkbox"/>	51–100/study group	101–149/study group	150–200/study group
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Sample Characteristics Bias: If no, explain.

If there is more than one study group, was there a similarity between the groups?

Yes In both Experiment #1 and Experiment #2 there were two groups of participants—a Younger Group and an Older Group. The two groups in both experiments were given the Wechsler Adult Intelligence Scale (WAIS) Vocabulary Subtest—the mean scores of the Younger and Older groups were not significantly different in either Experiment.

No

Were the reasons for the dropouts reported?

Yes

No

INTERVENTION(S)—Included are only those interventions relevant to answering the evidence-based question.

Authors used a phoropter to achieve optimal refraction for each eye of all participants with following results—for participants in the Younger Group, binocular acuity was improved from an average of 1.0 arcmin (range 0.7 to 1.4) to 0.9 arcmin (range 0.7 to 1.2); for participants in the Older group, binocular acuity was improved from average of 1.2 arcmin (range 1.0 to 1.6) to 1.1 arcmin (range 1.0 to 1.4). Authors then used the phoropter to optically blur the vision of the participants and induce acuity levels of 20/40 and 20/30.

Participants viewed 2 sets of signs from the 1988 *Manual on Uniform Traffic Control Devices* (MUTCD) signs—6 black-on-yellow warning signs and 6 black-on-white regulatory signs. Signs from the 2 groups were matched for similarity of message length (number of words) and letter height.

Design (Experiment #1): Authors investigated 3 acuity levels (Optimal, 20/30, 20/40) and 2 luminance levels (daylight—65 cd/m²; nighttime—10 cd/m²) within each Age by Gender subgroup—older participants needed more spherical defocus to degrade their acuity.

Design (Experiment #2): Authors used 2 sets of signs—1 a set of standard traffic signs from Experiment #1, the other a set of novel signs (matched for sign size, shape, and color as well as word length, height number, and placement). Also, authors again investigated 3 acuity levels (Optimal, 20/30, 20/40), but used only 1 luminance level (daylight, 65 cd/m²) within each Age by Gender subgroup.

Add groups if necessary.

Group 1

Brief Description	
Setting	
Who Delivered?	
Frequency?	
Duration?	

Intervention Biases: *Explain, if needed.*

Contamination

Yes

No

Co-intervention

Yes

No

Timing

Yes

No

Site

Yes

No

Use of different therapists to provide intervention

Yes

No

MEASURES AND OUTCOMES—Included are measures relevant to answering the focused question.

Name of measure:

Acuity

Outcome(s) measured (what was measured?):

Amount of spherical defocus (in diopters)

Is the measure reliable (as reported in article)?

Yes

No

NR

Is the measure valid (as reported in article)?

Yes

No

NR

How frequently was the measure used for each group in the study?

Measure used for all participants

Name of measure:

Legibility

Outcome(s) measured (what was measured?):

Legibility threshold (with size of signs starting “too small to be identified,” then increased in 7% increments until participants could correctly “guess” what was on sign)

Is the measure reliable (as reported in article)?

Yes

No

NR

Is the measure valid (as reported in article)?

Yes

No

NR

How frequently was the measure used for each group in the study?

Measure was used for all participants in both Experiment #1 and Experiment #2.

Measurement Biases

Were the evaluators blinded to treatment status? *If no, explain.*

Yes

No

Recall or memory bias? *If yes, explain.*

Yes

No

Others (list and explain):

Limitations (appropriateness of outcomes and measures) If no, explain.

Did the measures adequately measure the outcome(s)?

Yes

No

RESULTS

List results of outcomes relevant to answering the focused question.

Include statistical significance where appropriate ($p < 0.05$).

Include effect size if reported.

Acuity (Experiment #1 and Experiment #2)

Differences in mean correction required for both older and younger participants not significantly different in either Experiment #1 or Experiment #2.

Legibility (Experiment #1)

- Legibility was better in daylight conditions than in nighttime conditions ($p < 0.05$).
- There was an Age by Acuity interaction ($p < 0.05$), with older participants having better acuity scores with blurred vision at the 20/30 acuity level.

Legibility (Experiment #1)

- Legibility was better for standard signs than novel signs ($p < 0.05$).
- There was an Age by Acuity interaction ($p < 0.05$), with older participants having better acuity scores than younger participants with blurred vision at the 20/40 acuity level, and younger participants having better acuity scores at the optimal acuity level.

Was this study adequately powered (large enough to show a difference)? *If no, explain.*

Yes

No

Were appropriate analytic methods used? *If no, explain.*

Yes

No

Were statistics appropriately reported (in written or table format)? *If no, explain.*

Yes

No

CONCLUSIONS

State the authors' conclusions that are applicable to answering the evidence-based question.

Legibility thresholds are lower for older participants than younger participants. Also, familiar (standard) signs have lower thresholds than unfamiliar signs.

Were the conclusions appropriate for the Study Design (Level of Evidence)? *If no, explain.*

Yes

No

Were the conclusions appropriate for the statistical results? *If no, explain.*

Yes

No

Were the conclusions appropriate given the study limitation and biases? *If no, explain.*

Yes

No

IMPLICATIONS FOR OCCUPATIONAL THERAPY

This section provides guidance about clinical practice, program development, and other implications of the study findings as they relate to the focused question.

The authors suggest that there is an age-related compensatory ability that may allow older drivers to recognize familiar road signs even though their acuity may have declined.

It should be noted that optically blurring a sign that does not physically change size is *not* the same as physically increasing the distance between an observer and a sign. The results of this study need to be repeated in a field study before the suggestion that the older driver will have an age-related compensatory ability when driving in the real world.

This work is based on the evidence-based literature review completed by Paula C. Bohr, Ph.D., OTR/L, FAOTA and Kathleen A. Harder, PhD.

CAP Worksheet adapted from: Critical Review Form – Quantitative Studies ©Law, M., Stewart, D., Pollack, N., Letts, L., Bosch, J., & Westmorland, M., 1998, McMaster University. Used with permission.

For more information about the Evidence-Based Literature Review Project, contact the American Occupational Therapy Association, 301-652-6611, x 2052.



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