



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 automobile-related modifications on the driving ability, performance, and safety of the older adult? Modifications include changes by the industry that enhance or hinder the driving ability, performance, and safety of the older adult.

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Freedman, M., Zador, P., & Staplin, L. (1993). Effects of reduced transmittance film on automobile rear window visibility. *Human Factors*, 35(3), 535–50.

PROBLEM STATEMENT (JUSTIFICATION OF THE NEED FOR THE STUDY)

Although federal standards exist for the necessary degree of transparency for driver visibility, individual state laws and regulations have set various minimum transmittance levels for the window glass of vehicles on the road. Window tinting manufacturers and distributors are petitioning for lower levels of transmittance to be acceptable for side and rear windows. The lack of directly applicable research on the safety consequences of reduced transmittance was the justification for this research.

State the problem the authors are investigating in this study.

Does reduced transmittance of automobile windows degrade visibility of the low- and medium-contrast hazards likely to be found in the roadway to the rear of passenger cars?

RESEARCH OBJECTIVE(S)

List study objectives.

To examine the ability of older and younger drivers to detect low- and medium-contrast hazards when tinting has been applied to rear windows of an automobile.

DESIGN TYPE:

Mixed Factors, Randomized

Level of Evidence:

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.

Controlled/Purposive—deliberate selection of individuals: subjects were chosen based on age out of a previous pool of subjects

Inclusion Criteria

- Valid driver’s license
- 20/40 or better visual acuity

Exclusion Criteria

NR

NR = Not reported.

Sample Selection Biases: If yes, explain.

Volunteers/Referrals

Yes

No

Attention

Yes

No

Others (list and explain):

SAMPLE CHARACTERISTICS

N = 48

Age groups: 18–55 N = 24; 56–74 N = 12; 75–90 N = 12

% 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

No

Were the reasons for the dropouts reported?

Yes

No

NR

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

Group3 1–3 broken down by age groups described above.

Add groups if necessary.

Group 1

Brief Description	Each group received the intervention described above
Setting	Laboratory setting in a driving simulator
Who Delivered?	NR
Frequency?	One session lasted about 2 hours; 50 target trials and 50 distractor trials were completed
Duration?	One session lasted about 2 hours

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

NR

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

Name of measure:

Measure of target detection

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

The subject had to detect the object, have correct location identification, but not necessarily have a correct target identification.

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?

During every trial (there were 50 target trials and 50 distractor trials randomly ordered)

Name of measure:

Measure of recognition by the subject's verbal response

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

For full recognition the subject had to detect the object, have correct location identification of the object, and correctly identify the target.

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?

During every trial (there were 50 target trials and 50 distractor trials randomly ordered)

Name of measure:

Measure of response

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

Response time was calculated by a push of a response button

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?

For all 50 trials

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.

Detection probability increases with transmittance and contrast but decreases with age. Detection of a passenger car was 100% for all age groups and was not analyzed further. Specifically for each target, performance generally decreases with increasing age and with decreasing transmittance and contrast. Decline in detection probability with lower transmittance is greater for older adults than younger. Increased subject age and darker tinting together yield reduced detection probability. Decrements in detection probability caused by reduced transmittance are greater for lower contrast targets than for higher contrast targets and are greater for older subjects than for younger subjects.

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 Experimenters stated their reasoning for use of log linear models over the ANOVA for data analysis

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.

Safety of backing maneuvers may be significantly reduced for all drivers in cars with tinting that decrease rear window transmittance to a level of 53% or less. Older adults may have an increase in risk of not detecting low-contrast objects with reduced transmittance windows below 70%. Since real world situations were simplified in the laboratory, the results may underestimate actual failures of detection. Furthermore, age-related deficits may have been underestimated for detection due to this sample having a higher level of low-contrast sensitivity than a more randomly sampled broader population.

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 Since the study was based on probability and the sample size was small, the researchers stated the potential conclusions and not definitive ones.

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.

This study supported the position that window tinting for cars with less than the current 70% standard is potentially hazardous to drivers. Practitioners should keep this in mind if recommendations are being made for the safest/most appropriate car with regards to level of tinted rear windows, especially for older drivers. Also, since lower contrast levels were associated with decreased detection performance for older drivers, compensatory methods may want to be considered for nighttime driving tasks in order to improve safety.

This work is based on the evidence-based literature review completed by Joseph M. Pellerito, Jr, MS, OTR with contributions from Stacey Schepens, OTR.

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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