



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.

LaMotte, J., Ridder, W., III, Yeung, K., & De Land, P. (2000). Effect of aftermarket automobile window tinting films on driver vision. *Human Factors*, 42(2), 327–336.

PROBLEM STATEMENT (JUSTIFICATION OF THE NEED FOR THE STUDY)

State the problem the authors are investigating in this study.

There are few current studies of the effects of darkened windows on a driver's vision despite concern by law enforcement officials. Laws vary greatly on aftermarket tinting of the side and rear windows.

RESEARCH OBJECTIVE(S)

List study objectives.

Determine the level of automobile aftermarket window tint that causes a significant reduction of vision for automobile drivers

DESIGN TYPE:

Mixed Factors, Nonrandomized

Level of Evidence:

II

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

20/20 corrected vision

Exclusion Criteria

Ocular pathology

Sample Selection Biases: *If yes, explain.*

Volunteers/Referrals

Yes

No

Attention

Yes

No

Others (list and explain):

SAMPLE CHARACTERISTICS

Age group: $N = 10$ (20–29); $N = 10$ (60–69)

$N = 20$

% Dropouts

#/(%) Male

#/(%) Female

Ethnicity

Disease/disability diagnosis

NR = Not reported.

Check appropriate group:

<20/study group	20–50/study group ✓	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 They were all chosen to represent the upper and lower age groups of Southern California drivers.

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.

Contrast sensitivity was measured for gratings at each of six different spatial frequencies (.5, 1, 2, 4, 8, and 12 cycles per degree). Tinted windows of the side window: factory tint without aftermarket film for control with 82% transmittance; medium tints of aftermarket film with 57%, and dark tints of aftermarket film (18%).

Add groups if necessary

Group 1

Brief Description	divided by two age groups as described above, received all forms of intervention
Setting	institutional
Who Delivered?	NR
Frequency?	duration of testing lasted until there were a total of 11 reversals of the staircase tracked at each spatial frequency
Duration?	duration of testing lasted until there were a total of 11 reversals of the staircase tracked at each spatial frequency

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:

Measurement of contrast sensitivity

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

Tested through side windows with varying levels of window tint

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?

Throughout experiment

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.

For younger drivers, car windows with 57% transmittance did not significantly reduce contrast sensitivity, but darker tints of 18% reduced contrast sensitivity at higher spatial frequencies. The mean difference in contrast sensitivity between the control tint and the dark tint was significant ($p = .014$) as was the comparison the medium and dark tints ($p = .0042$). The statistical contrast comparing the control and medium tints was not significant $p = .06$.

For older drivers, a tint of 57% significantly reduced middle to high spatial frequency contrast sensitivity. The significant tint x spatial frequency interaction effect reflects the observation that the effect of tint on contrast sensitivity varies with spatial frequency.

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.

The state limit of 55% transmittance would seem to be appropriate for younger drivers; however, further examination of the standard may be necessary with regard to older drivers. It seems the 57% transmittance tint that is currently legal in most states could significantly reduce the vision of older drivers but not have a significant effect on younger drivers. The study showed that dark tints (18% transmittance) would have detrimental effects on the driver's vision regardless of age. And the results also support the position that anything darker than 55% would negatively effect driving.

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.

If results were not statistically significant, describe the trends of these results and their implications for practice.

Implications of this study suggest that there should be further guidelines on aftermarket window tinting for safety of driving, especially for older adults. Practitioners should note that certain levels of tinting significantly affect drivers' performance (depending on age) and these results should be taken into consideration if that client is deciding on window tinting options. These results further suggest that anyone with ocular pathology may have increased difficulty using window tinting, but further research is necessary in that realm.

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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