



**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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Guerrier, J. H., & Fu, S-H. (2002). *Elder roadway user program test sections and effectiveness study* (Final Report Task 4, Project 669535, contract # BB-901). Miami, FL: University of Miami.

**PROBLEM STATEMENT (JUSTIFICATION OF THE NEED FOR THE STUDY)**

State the problem the authors are investigating in this study.

The performance of older drivers and roadway users is of particular importance to Florida, as that state has a higher percentage of seniors per capita than any other state. With the baby boomers now approaching retirement age, these numbers are expected to balloon in Florida in the next two decades. The study was conducted to evaluate the effectiveness of the Clearview, Highway C, and Highway D fonts.

**RESEARCH OBJECTIVE(S)**

List study objectives.

The goal of this study was to evaluate the legibility of the Clearview font for older drivers. Specifically, the authors looked at the font as used on street signs and on the advance signs for those streets.

**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**

Aged 65 or older, with a valid driver's license

**Exclusion Criteria**

N/A

Sample Selection Biases: *If yes, explain.*

Volunteers/Referrals

Yes

No

Attention

Yes

No

Others (list and explain):

Participants were respondents to newspaper ads and flyers posted throughout the community. Some participants were also solicited by researchers directly.

## SAMPLE CHARACTERISTICS

N = 37

% Dropouts	<input type="text" value="N/A"/>		
#/(%) Male	<input type="text" value="N/A"/>	#/(%) Female	<input type="text" value="N/A"/>
Ethnicity	<input type="text" value="N/A"/>		
Disease/disability diagnosis	<input type="text" value="NR"/>		

NR = Not reported.

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

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

The purpose of this study was to assess the effect on legibility distance for older drivers of the Clearview font when used on street-name signs. Advance street-name signs as well as ground-mounted street-name signs were studied. Three fonts were used on the signs: Clearview, Highway Series C, and Highway Series D. The authors note that Highway Series D is rarely used on ground-mounted street signs. Therefore, the ground-mounted signs used only the Series C and Clearview fonts, while the advance signs used all 3 fonts.

Six sign locations were used for the experiment. There were 3 advance signs and 3 ground-mounted signs. For each advance sign location, 3 signs were produced, 1 with each font. These signs used 8-inch uppercase lettering. These signs were placed on the medians of 4-lane arterials, with a speed limit of 30 mph. For each of the ground-mounted sign locations, only 2 signs were printed, 1 with the Clearview font and 1 with the Series C font. These signs used 6-inch letters. These signs were placed on the side of 2-lane roadways, presumably with the same speed limit. All the signs were faced with an unspecified 3M retroreflective sheeting. Although 5 of the 6 sign locations were novel, there was already a ground-mounted sign at 1 of the locations. This sign did not have retroreflective sheeting, and used 4-inch lettering.

Before participating in the on-road portion of the study, participants took a battery of cognitive and perceptual evaluations. Participants were asked to drive on several roads at the Opa-Locka airport in Miami-Dade. The car used in this study was a 1994 Toyota Tercel, which was fitted with a distance-measuring instrument that registered the distance between a given sign and the vehicle's location. The headlamps were set to the high-beams for the duration of the experiment. All drives took place after sunset.

A driving instructor sat in the passenger seat and provided the participant with directions through the course, while a research assistant in the back seat recorded the distance to the sign when the participant read the street name aloud. The driving instructor pointed out the signs of interest to the participants well before the words on the sign were legible to ensure that the participant knew to which signs they should be attending. Each participant encountered each sign location only once, and the font used at each sign location was randomized across participants.

*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

N/A

Timing

Yes

No

Site

Yes

No

Use of different therapists to provide intervention

Yes

No

N/A

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

Name of measure:

Legibility Distance

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

The distance from either the advance warning or ground-mounted street sign at which the participant was able to read the name of the street

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?

Each participant encountered each of the 6 signs once.

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

Yes

No

NR

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

Yes

No

NR

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.

### **Advance Signs**

An unspecified analysis was performed on the legibility distance data for each of the advance street sign locations. This analysis was highly significant ( $p = <0.001$ ) and showed that the Curtiss road sign was legible from a greater distance than the Bennett road sign, which was legible at a significantly greater distance than the Musick Road sign. These results are not surprising because the curvature of the respective roadways and ambient lighting conditions at each of these sign locations were reported as being substantially different.

An ANOVA was also performed to examine the differences in legibility distance for each of the three font types used. Unfortunately again, the independent variables (or specific nature of the ANOVA) were not defined. This analysis revealed a significant difference ( $p = 0.01$ ) in the legibility distance for the 3 fonts, with the Clearview font displaying the greatest mean legibility distance (198 ft.) The Series D font had a mean distance of 178 ft, and the Series C font had a mean distance of 151 ft. The difference between the Clearview and Series D fonts was not statistically significant at  $p = 0.05$ , but the difference between the Clearview and Series C fonts was ( $p = 0.004$ ).

### **Ground-Mounted Signs**

A nonspecific analysis of variance was performed on the legibility distance data for each of the ground-mounted street sign locations. This analysis was highly significant ( $p < 0.001$ ) and showed that the Wright Road sign was legible from a greater distance than the Ely Road sign, and this was significant at  $p = 0.002$ . The Wright road sign was also legible at a significantly greater distance than the Langley Road sign ( $p = 0.02$ ). There was no significant difference between the Ely and Langley signs. Once again, the ambient lighting conditions at each of these sign locations were reported as being substantially different, which likely contributed to the differences.

For 2 of the ground-mounted signs, only the Clearview and Series C fonts were assessed. For 1 sign location, however, there was an existing sign with smaller lettering that was not printed on retroreflective sheeting. Because it occurred at only 1 intersection, this sign was not included in the analyses. Unfortunately again, the independent variables, or specific nature of the ANOVA, were not defined. This analysis revealed no significant difference in the legibility distance for the 2 fonts, with the Clearview font having a larger mean legibility distance (110 ft) than Series C (99 ft).

### **Cognitive and Perceptual Measures**

A hierarchical regression was performed to determine whether a participant's age, score on the Snellen test, or score on a test of divided attention could be used to predict that participant's mean legibility distance. This regression showed that while age was not a significant predictor of a participant's mean legibility distance for both advance and ground-mounted signs, both the score on the divided attention task (advance,  $R = .48$ ,  $p = 0.004$ ; ground-mounted  $R = .43$ ,  $p = 0.04$ ) and on the Snellen chart (numbers not reported) were significant predictors of this measure.

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  The statistical methods employed may or may not have been appropriate. There are no indications of the variables used in some of the analyses and no ANOVA tables are provided.

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

Yes

No  see above

## CONCLUSIONS

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

The authors conclude that, for the advance street signs, the Clearview font outperforms the Highway series C and series D fonts. They go on to say that substantial improvements in legibility distance may be realized for all age groups if the Clearview font is used on advance street name signs. The Clearview font did not, however, have a positive impact on the legibility distance for the ground-mounted signs when compared to the performance of the Series C font. The authors suggest that there may have been too many confounding factors (differences in ambient lighting) in this study to effectively answer this question. A call is made for further study of the Clearview font under more controlled conditions.

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.

One aspect of the experimental design that makes this study unique in comparison to assessments of Clearview found in the literature is that the participants used their high-beam headlights. In other studies, the low beams have been used. Unfortunately this makes direct comparisons between the results of this and other studies somewhat suspect. The rationale for using high- rather than low-beams was not specified, and it seems somewhat unlikely that drivers in the real world would use their high-beams on roads where the speed limit did not exceed 30 mph.

As the authors noted, there were many uncontrolled variables in this experimental setting, some of which likely affected the results as demonstrated by the comparisons of the results at different sign locations. Any future investigations like this should be mindful of potential confounds and attempt to eliminate them from the design.

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.

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