



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.

Allen, R. W., Stein, A. C., Rosenthal, T. J., Ziedman, D., Torres, J. F., Halati, A. (1991). A human factors study of driver reaction to in-vehicle navigation systems. *SAE Technical Paper Series*, Paper No. 911680, pp. 83–102.

PROBLEM STATEMENT (JUSTIFICATION OF THE NEED FOR THE STUDY)

State the problem the authors are investigating in this study.

- Traffic congestion is an increasing concern, and the use of in-vehicle navigation systems could potentially improve traffic flow by assisting motorists in avoiding or diverting around traffic congestion.
- Research has been done on in-vehicle electronic systems that might distract drivers from the driving task, but this study focuses on how driver behavior associated with in-vehicle navigation systems affects system performance, rather than issues associated with driver distraction.

RESEARCH OBJECTIVE(S)

List study objectives.

The objective was to determine whether navigation systems can encourage drivers to take alternate routes, and divert early to avoid congestion, thus minimizing trip delays and improving overall traffic flow.

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—as volunteers

Inclusion Criteria

- Both male and female
- Commercial and noncommercial drivers
- Drivers familiar and not familiar with the Garden Grove Freeway route

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 = 277

% Dropouts	<input type="text" value="NR"/>		
#/(%) Male	<input type="text" value="157"/>	#/(%) Female	<input type="text" value="120"/>
Ethnicity	<input type="text" value="NR"/>		
Disease/disability diagnosis	<input type="text" value="NR"/>		

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
-----------------	---	--------------------	---------------------	---------------------

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.

Add groups if necessary.

Groups 1–5: Received one of four navigational tools: static navigation system, dynamic map system, advanced map system, or route guidance system. The fifth group was a control.

Brief Description	Navigational tools were not described in the study. The control group did not have any form of navigational tool. All groups encountered each driving congestion scenario (i.e., freeflow, moderate (11-min delay), heavy (18-min delay), and heavy (30-min delay) traffic). The subject would view a scenario and make a diversion decision. If the subject diverts then he/she must select an alternate route.
Setting	Laboratory simulator
Who Delivered?	NR
Frequency?	All
Duration?	NR

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:

Prequestionnaire

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

The questionnaire gathered data regarding subjects' general background, commuting patterns, and opinions about commuting.

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?

Once

Name of measure:

Postquestionnaire

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

The questionnaire gathered data regarding subjects' past diversion behavior, factors important in congestion avoidance, acceptable delay times under various scenarios, and human factor issues of the various navigation system.

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?

Once after the simulation testing was over

Name of measure:

Response to traffic congestion scenarios

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

Whether the subject chose to divert from the freeway or not

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?

When each scenario was presented

Measurement Biases

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

Yes

No

NR

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 The questionnaires used in this study did not clearly show how they related to the performance of the specific navigational systems and whether they were valid or reliable measures for obtaining the information of interest. The decision to divert was, however, an appropriate measure.

RESULTS

List results of outcomes relevant to answering the focused question.

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

Include effect size if reported.

Values of significance were not calculated. Fifty percent of the drivers diverted by the time the speed was decreasing as traffic transitioned from free flow to the queue caused by congestion. Older drivers were least likely to divert. Middle-aged subjects were most likely to divert. Under clear/night and rain/day conditions, 50% of the subjects would divert if the travel delay reached 18 minutes. Drivers would be more likely to tolerate delays during commuting than during pleasure trips. Congestion was considered the most important followed by travel time, and distance was considered the least important in selecting an alternate route.

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 more advanced systems had influence on route diversion decisions. Better systems encourage drivers to divert sooner and encourage more drivers to divert. In-vehicle navigation systems provide advantages to drivers with congestion information and route diversion guidance. Though some environmental conditions will influence drivers' decisions to divert, there were still a great percentage of drivers diverting with the route guidance information.

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 The researchers reported that advanced systems provided “significant influence” on route diversion decisions; however, they did not report levels of significance or provide documentation of how that information is significant.

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.

Readers should be extremely cautious when using this information as evidenced-based research supporting the use of in-vehicle navigational systems. The lack of details of the experiment reported in the article, such as the specifics of each navigational system, and the lack of significance weaken the validity/reliability of any results found. The information obtained from this study has very little application to clinicians, other than that the systems encourage diversion decisions.

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.



Copyright 2007 American Occupational Therapy Association, Inc. All rights reserved.
For personal or educational use only. All other uses require permission from AOTA.
Contact: copyright@aota.org