



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 TOPIC (CAT)

Focused Question #1

What is the evidence for the effect of interventions to address cognitive and visual function, motor function, driving skills, self-regulation/self-awareness, and the role of passengers and family involvement in the driving ability, performance, and safety of the older adult? Intervention approaches include adaptation, remediation, prevention, and maintenance.

.....

Clinical Scenario:

Safe driving requires that an individual's skills are at the appropriate levels to interact with an environment that is changing and unpredictable. For older adults, the occupation of driving and community mobility may be impaired by the aging process, disease process, or injury. According to the *Occupational Therapy Practice Framework: Domain and Process* (American Occupational Therapy Association [AOTA], 2002), occupational therapists focus on clients' performance skills (cognitive, visual, and motor), performance patterns (self-regulation/self-awareness), context or contexts (role of passengers and family involvement), and activity demands (adaptive devices and strategies) to develop interventions for driving and community mobility.

To achieve this goal, occupational therapy practitioners need the developing body of knowledge to guide the process or interventions related to the domain of driving and community mobility. These evidence-based findings include information for occupational therapy interventions or referrals to services that may enhance clients' driving skills. Older adults' abilities to drive or maintain community mobility may depend on occupational therapy practitioners' abilities to utilize evidence-based interventions that focus on visual, cognitive, and motor functions and on client and family educational programs.

Older adults rely on driving to maintain independence in community mobility. Driving requires skills in vision, motor function, cognition, and speed of processing information, which may all be affected by aging, medical conditions, or the lack of engaging in activities that require these skills. Because occupational therapists and occupational therapy assistants have major roles in providing interventions or referrals to services that may enhance clients' driving skills and safely maintain older adults' community mobility, it is important to understand the available evidence for specific visual, cognitive, motor, and educational programs. Included in client education is information related to the effect of passengers in a car with the older adult driver.

In addition, the evidence related to the role of passengers driving in the car with an older adult as well as specific medical interventions that may affect driving need to be considered by occupational therapy practitioners working in the area of older adult driving and community mobility as practitioners, researchers, or educators. All of the evidence needs to be considered by those working in the area of older adult driving as practitioners, researchers, or educators.

Summary of Key Findings:

Summary of Levels I, II, and III

Visual, Cognitive, and Motor

- There is mixed evidence concerning the efficacy of Useful Field of View (UFOV) for older adult driving performance. A Level I study by Ball, Beard, Roenker, Miller, and Griggs (1988) and a Level III study pilot study by Mazer, Sofer, Korner-Bitensky, and Gelinas (2001) with participants with stroke indicate significant improvements with the use of UFOV. A Level I study by Mazer et al. (2003) compared UFOV training with computerized visuoperceptual training for those with stroke and found no difference between groups. There was, however, an almost twofold increase (52.4% vs. 28.6%) in the rate of success on the on-road driving evaluation after UFOV training for participants with right-sided lesions, indicating that a positive effect of UFOV training may be specific to lesion area.
- There is limited evidence for the effect of Dynavision, with 1 Level III study evaluating older adults with a history of stroke trained on a Dynavision (Klavora et al., 1995). Results reported better performance on divided attention and selected attention tasks after training, with no improvement on speed of processing. In addition, 60% of participants earned a rating of “safe to resume driving” or to receive on-road driving lessons during behind-the-wheel assessments as compared to a previously reported success rate (without Dynavision) of 24%.
- There is moderate evidence from a Level I study (Ostrow, Shafran, & McPherson, 1992) that a home exercise program can improve selected driving skills. Older drivers participating in a home exercise program of range-of-motion and stretching exercises for the back and upper body (as compared to instruction in car for driving skills) improved on shoulder flexibility and trunk rotation and on the driving skill of observing (e.g., lane changes, mirrors).
- Older adult drivers of commercial vehicles exposed to a visual search and scanning training program had better monitoring performance as measured by visual search. In addition, performance on mirror checks, turn execution, and overall driving ability were better for participant in the visual search and scanning training program (Llaneras, Swezey, Brock, Rogers, & Coot, 1998; Level I).

Educational

- Older adults respond positively to programs stressing self-awareness of driving skills (Eby, Molnar, Shope, Vivoda, & Fordyce, 2003; Level III; Stalvey & Owsley, 2003; Level II). In addition, these programs may result in increased perception of vision impairments and a better understanding of the impact of vision impairment on driving (Eby et al., 2003; Level III). These programs did not appear to be effective, however, in altering perceived threat of crash involvement, perceived barriers to self-regulation, and perceived regulatory self-efficacy (Stalvey & Owsley, 2003; Level I).

<ul style="list-style-type: none"> • There is good evidence that driver education programs have no effect on crashes and fatalities in older adults. They do, however, appear to result in fewer traffic citations (Janke, 1994; Level II; Ker, Roberts, Renton, & Bunn, 2003; Level I). • There is limited evidence from a Level I study (Jacobs et al., 1997) that older adults receiving training in a driving simulator had better on-road performance than those watching driving education videos. This study also found no relationship between performance on the clinical evaluation of driving skills (e.g., coordination, braking time, traffic symbol knowledge) and on-road driving performance.
<p>Passengers</p> <ul style="list-style-type: none"> • There is mixed evidence from 2 Level II studies for the effect of passengers driving with older adults. While 1 study (Vollrath, Meilinger, & Kruger, 2002; Level II) found a protective effect for passengers driving with those older than age 50 in the other study (Hing, Stamatiadis, & Aultman-Hall, 2003; Level II) drivers with two or more passengers were more likely to be involved in crashes on roads with curves and grades. Passengers were protective for crashes, however, when driving under similar road conditions at night.
<p>Medical Interventions</p> <ul style="list-style-type: none"> • Those receiving cataract surgery were reported to have half the crash rate of those electing not to have the surgery, when controlling for race, visual acuity, and contrast sensitivity (Owsley et al., 2002; Level II). It also was noted that study participants receiving surgical treatments for cataracts continued to self-limit their driving after the surgery. • There is good evidence from 2 Level I studies (Reidel, Peters, Van Boxtel, & O'Hanlon, 1998; Schmidt, Brendemuhl, Engels, Schenk, & Ludemann, 1991) that taking Piracetam (Nootripil, a cognitive enhancer) for 4–6 weeks can improve driving performance and reduce sway in older adult participants.

Summary of Levels IV and V

Not included in review.

Contributions of Qualitative Studies:

Not included in review.

Bottom Line for Occupational Therapy Practice:

<p>The results of the evidence-based literature review indicate that occupational therapy practitioners should consider the use of visual, cognitive, motor, and educational interventions when working with the older adult on driving and community mobility issues. These interventions should be considered on the basis of individual needs for a client, and occupational therapy practitioners should be mindful of the limits of the effect of a given intervention. Awareness of risk, for example, may not translate into better or safer performance by an older adult. In addition, results in one area may not generalize to another area. For example, while the results of the review indicate that the older adult driver may have a better understanding of the impact of vision impairments on driving following an educational program stressing self-awareness, a similar result may not take place for the perceived effect of crash involvement.</p>
--

In another example, the evidence on the role of passengers is mixed, and occupational therapy practitioners should discuss with the client the potential positive and negative impact of passengers driving in the car. Occupational therapy practitioners also need to verify all medical therapies used by the older adult, such as pharmaceutical treatments and cataract surgery prior to making a decision that someone can no longer drive or continue to drive. Occupational therapy practitioners must work closely with physicians to determine the best outcome for a client's community mobility. Occupational therapy practitioners also should take note of the results of the Owsley et al. (2002) study that, even though vision improved by the intervention of cataract surgery, driving exposure declined in a highly similar pattern during the first two years of follow-up.

These downward trends in driving exposure in these older adults mirror those from national surveys of elderly drivers and suggest that the amount of driving an older person does may not rebound even when functional impairments are partially reversed as was the case in this study. Exploring why elderly individuals' driving participation declines and the impact of that decline on daily activities and occupations should be considered before proposing interventions to increase driving exposure. Occupational therapists must have detailed dialogues with clients to decide if the older client will be able to utilize self-driving options or should consider other options for driving and community mobility.

Review Process:

Procedures for the selection and appraisal of articles

Inclusion Criteria:

- Peer-reviewed journals from 1980 to 2004.
- Evidence-based reviews (e.g., Cochrane Database of Systematic Reviews).
- Published reports (e.g., Transportation Review Board).
- Study included older adults.

Exclusion Criteria:

- Level IV and Level V studies.
- Dissertations.
- Conference proceedings.

Search Strategy

Categories	Key Search Terms
Patient/Client Population	Elderly, Older Driver, Aging
Intervention	Automobile Driver Examination, Driving Behavior, Automobile Driving, Motor Vehicles, Vehicle Operation, Vision Tests, Driving Behavior, Driver Education, Traffic Safety, Traffic Accidents
Comparison	Filter developed by McMaster; research study terms
Outcomes	Not included in search

Databases and Sites Searched
MEDLINE, AGELINE, TRIS Online, Ergonomics Abstracts, PsycINFO, SocioFile
Hand searching of bibliographies of selected articles

Quality Control/Peer-Review Process:

- Coordinator of project developed search terms in consultation with authors of each question and advisory group.
- A medical research librarian conducted all searches to confirm and improve search strategies.
- Medical librarian and coordinator of project discussed the searches and findings to ensure that key articles or areas of research had not been overlooked.
- Either the question author or the coordinator of the project completed the CAP worksheet for each article that met the inclusion criteria. The coordinator of the project and the author then reviewed the article and the completed CAP to look for unanswered questions and discrepancies in interpretation of the results and to ensure that the implications were clear.
- The CAT was written by the author of the question. It was then reviewed by the coordinator of the project, by an expert in the area of occupational therapy and older adult driving, and by AOTA staff.

Results of Search:

Summary of Study Designs of Articles Selected for Appraisal

Level of Evidence	Study Design/Methodology of Selected Articles	No. of Articles Selected
I	Systematic reviews, meta-analysis, randomized controlled trials	10
II	Two groups, nonrandomized studies (e.g., cohort, case-control)	6
III	One group, nonrandomized (e.g., before and after, pretest and posttest)	3
IV	Descriptive studies that include analysis of outcomes (e.g., single-subject design, case series)	0
V	Case reports and expert opinion, which include narrative literature reviews and consensus statements	0
	Qualitative studies	0
		TOTAL = 19

Limitations of the Studies Appraised:

Levels I, II, and III

Limitations of the studies incorporated into the review may include lack of randomization, lack of control group, small sample size, and use of self-report measures. In several studies, a learning effect may have taken place, as the use of an assessment measure as an intervention may limit the true effect of the intervention. In several Level II studies based on large databases, the authors were not able to control for factors that may have affected the results of the studies. In 1 Level II study, the use of police-reported crashes as an outcome may have provided a limited picture of total crashes. Also, it is difficult to understand the impact of individual interventions in studies incorporating more than one intervention at a time.

Levels IV and V

Not included in review.

Articles Selected for Appraisal

Ashman, R. D., Bishu, R. R., Foster, B. G., & McCoy, P. T. (1994). Countermeasures to improve the driving performance of older drivers. *Educational Gerontology*, 20, 567–577.

Ball, K. K., Beard, B. L., Roenker, D. L., Miller, R. L., & Griggs, D. S. (1988). Age and visual search: Expanding the useful field of view. *Journal of the Optical Society of America*, 5, 2210–2219.

Eby, D. W., Molnar, L. J., Shope, J. T., Vivoda, J. M., & Fordyce, T. A. (2003). Improving older driver knowledge and self-awareness through self-assessment: The driving decisions workbook. *Journal of Safety Research*, 34, 371–381.

Hing, J. Y. C., Stamatiadis, N., & Aultman-Hall, L. (2003). Evaluating the impact of passengers on the safety of older drivers. *Journal of Safety Research*, 34, 343–351.

Jacobs, K., Jennings, L., Forman, M., Benjamin, J., DiPanfilo, K., & LaPlante, M. (1997). The use of participation-oriented education in the rehabilitation of driving skills in older adults. *Work*, 8, 281–291.

Janke, M. K. (1994). Mature driver improvement program in California. *Transportation Research Record*, 1438, 77–83.

Ker, K., Roberts, I., Renton, F., & Bunn, F. (2003). Post-license driver education for the prevention of road traffic crashes. *Cochrane Database of Systematic Reviews*. CD0003734.

Klavora, P., Gaskovski, P., Martin, K., Forsyth, R. D., Heslegrave, R. J., Young, M., et al. (1995). The effects of dynavision rehabilitation on behind-the-wheel driving ability and selected psychomotor abilities of persons after stroke. *American Journal of Occupational Therapy*, 49, 534–542.

- Llaneras, R. E., Swezey, R. W., Brock, J. F., Rogers, W. C., & Coot, H. P. (1998). Enhancing the safe driving performance of older commercial vehicle drivers. *International Journal of Industrial Ergonomics*, 22, 217–245.
- Mazer, B. L., Sofer, S., Korner-Bitensky, N., Gelinas, I., Hanley, J., & Wood-Dauphinee, S. (2003). Effectiveness of a visual attention retraining program on the driving performance of clients with stroke. *Archives of Physical Medicine and Rehabilitation*, 84, 541–550.
- Mazer, B. L., Sofer, S., Korner-Bitensky, N., & Gelinas, I. (2001). Use of the UFOV to evaluate and retrain visual attention skills in clients with stroke: A pilot study. *American Journal of Occupational Therapy*, 55, 552–557.
- Ostrow, A. C., Shafron, P., & McPherson, K. (1992). The effects of a joint range-of-motion physical fitness training program on the automatic driving skills of older adults. *Journal of Safety Research*, 23, 207–219.
- Owsley, C., McGwin, G. Jr., Sloane, M., Wells, J., Stalvey, V. T., & Gauthreaux, S. (2002). Impact of cataract surgery on motor vehicle crash involvement by older adults. *Journal of the American Medical Association* 7, 841–849.
- Riedel, W. J., Peters, M. L., Van Boxtel, M. P. J., & O'Hanlon, J. F. (1998). The influence of Piracetam on actual driving behavior of elderly subjects. *Human Psychopharmacology*, 13, 108–114.
- Roenker, L. L., Cissell, G. M., Ball, K. K., Wadley, V. G., & Edwards, J. D. (2003). Speed-of-processing and driving simulator training result in improved driving performance. *Human Factors*, 45, 218–233.
- Schmidt, U., Brendemuhl, D., Engels, K., Schenk N., & Ludemann, E. (1991). Piracetam in elderly motorists. *Pharmacopsychiatry*, 24, 121–126.
- Stalvey, B. T., & Owsley, C. (2003). The development and efficacy of a theory-based educational curriculum to promote self-regulation among high-risk older drivers. *Health Promotion Practice*, 4(2), 109–119.
- Vollrath, M., Meilinger, T., & Kruger, H. (2002). How the presence of passengers influences the risk of a collision with another vehicle. *Accident Analysis and Prevention*, 34, 649–654.
- Yee, D., & Melichar, J. F. (1992). Accident prevention through driving skills assessment and interventions for older drivers: A programme (EDRS 371–127; CE 066–474). San Francisco: San Francisco State University.

References

American Journal of Occupational Therapy (2002). Occupational therapy practice framework: Domain and process. *American Journal of Occupational Therapy*, 56, 609–639.

This work is based on the evidence-based literature review completed in February 2006 by Linda A. Hunt, PhD, OTR/L and Marian Arbesman, PhD, OTR/L

CAT format adapted from a template provided by Dr. Annie McCluskey and freely available for use on the OT-CATS website (<http://otcats.com>)

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