



Results and Implications of the AOTA Older Driver Evidence Based Literature Review

Wendy Stav, PhD, OTR/L
University of Florida
National Older Driver Research & Training Center

Elin Schold Davis, OTR/L, CDRS
American Occupational Therapy Association
Coordinator – Older Driver Initiative

*Marian Arbesman, PhD, OTR/L - Contributor
President – ArbesIdeas, Inc.*



Outline

- AOTA Older Driver Initiative
- Evidence-Based Practice?
- Methodology
- Results and Implications

AOTA Older Driver Initiative

- Consensus Conference and subsequent Older Driver Expert Panel
- Increase capacity
 - Education for practitioners and students (on-line course, Ed Module, articles and resources)
- Microsite & Database of experts
www.aota.org/olderdriver
- Evidence Based Literature Review

How do you know that
what you do and
how you do it really works?

Holm, 2000

Why Evidence-Based Practice?

- All delivery systems expect increased accountability from their service providers, including occupational therapy practitioners”

Fawcett & Strickland, 1998

What is Evidence-Based Practice (EBP)?

- “Evidence-based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence-based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research”

Sackett et al, 1996

Elements of Questions

o Type of Evidence

- Descriptive
- Assessment
- Intervention Effectiveness

Descriptive Question

- o What attributes and outcomes typify particular client populations and their daily lives and occupational performance?

Description Question Examples

- What are the effects of visual impairment and age on driving?
- Does driving safety of individuals with Parkinson's differ from those without Parkinson's?

Assessment Question

- What are the most reliable and valid methods for assessing occupational performance in specific clinical populations?

Assessment Question Examples

- What is the most reliable/valid/feasible method for assessing the driving ability and performance of an older adult?
- Is "X" a reliable/valid/feasible method for assessing changes in driving ability and performance of an older adult with diabetes?

Intervention Effectiveness Questions

- Which occupational therapy interventions are most effective in achieving desired outcomes with specific types of clients?

Development of Focused Questions – Public Health Model

- **Haddon Matrix**
- Used in injury prevention
- Injuries are the result of the interaction of:
 - Person (Driver)
 - Agent (Vehicle)
 - Physical Environment (Infrastructure)
 - Social Environment (Policy and Com Mob)

Evidence-Based Intervention Question -Person

- What is the evidence for the effect of interventions to address cognitive and visual function, motor function, driving skills intervention, 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.

Evidence-Based Intervention Question - Community Mobility

- o What is the evidence for the effect of policy and community mobility programs (e.g., alternative transportation, walkable communities, education, pedestrian programs) on the participation of the older adult?

Evidence-Based Intervention Question - Car

- o What is the evidence for the effect of automobile-related modifications on the driving ability, performance and safety of the older adult? This would include changes by the industry that enhance or hinder the driving ability, performance and safety of the older adult.

Evidence-Based Intervention Question- Infrastructure

- What is the evidence for the effect of modifications of the infrastructure of the physical environment (e.g., roadways, signage, lighting) on the driving ability, performance and safety of the older adult?

Writers for Evidence-Based Questions

- Person
 - Linda Hunt, PhD, OTR
- Policy and Community Mobility
 - Wendy Stav, PhD, OTR/L
- Car
 - Joseph Pellerito, Jr., MS, OTR
- Infrastructure
 - Paula Bohr, PhD, OTR/L, FAOTA
 - Kathleen Harder, PhD

Steps for the review

- Development of question
- Development of search terms
- Review of a variety of databases
- Evaluation of individual abstracts
- Evaluation of individual articles

Steps in the review - Deliverables

- Preparation of Critically Appraised Papers (CAPs)
- Preparation of Critically Appraised Topics (CATs)
- Preparation of Narrative Summary for AJOT
- Preparation of Practice Guideline

Sources for Evidence-Based Information

- Looking within occupational therapy
- Looking outside of occupational therapy
- Example – where would you look for evidence regarding treatment for elderly and dementia?
- Selecting databases
- Selecting search terms
- Review of reference lists

Databases

- Medline
- PsychInfo
- CINAHL
- SocioFile
- TRISonline
- AGELINE
- Ergonomics Abstracts

Databases

- ❑ Compendix
- ❑ Evidence-Based Medicine Reviews - Cochrane Database of Systematic Reviews, Cochrane Controlled Trials Register, and DARE--the Database of Abstracts of Reviews of Effectiveness
- ❑ SAE – Society for Automotive Engineers

Levels of Evidence

- Level I – Systematic reviews, meta-analyses, randomized controlled trials
- Level II – Two group, non randomized studies (e.g. cohort, case-control)
- Level III – One group, non-randomized (e.g., before-after, pretest and posttest)

Levels of Evidence

- Level IV – Non-experimental descriptive studies (case series, case report, single subject design)
- Level V – Expert opinion, including narrative literature reviews and consensus statement

- Qualitative studies are reviewed using a qualitative CAP

Hierarchies of Evidence

Studies at the higher levels of evidence are:

- Least vulnerable to bias
- More generalizable
- Outcomes are more likely to be attributed to the intervention being studied

Statistics for Review

- Reviewed approximately 13,000 abstracts and citations
- Total - 56 articles/studies
- Level I - 26 articles
- Level II - 22 articles
- Level III - 8 articles

Statistics for Review

- Person (Vision/cognition) - 18 articles
- Policy and Community Mobility - 8 articles
- Infrastructure - 8 studies (one included 3 parts)
- Car - 22 articles

Evidence Based Literature Review: Results and Implications

- Results from each of the four questions
- Implications of the results
 - Practice
 - Education
 - Research

Question 1 – The Person

- What is the evidence for the effect of interventions to address cognitive and visual function, motor function, driving skills intervention, self-regulation/ self-awareness, and the role of passengers and family involvement in the driving ability, performance and safety of the older adult?

The Person – Results

- Medical Interventions
- Sagberg (2005)
 - Examined medical conditions, identified diagnoses with higher odds of at-fault crashes
 - Non-medicated diabetes (OR=3.08)
 - History of myocardial infarction (OR=1.77)
 - Using glasses while driving (OR=1.26)
 - Myopia (OR=1.22)

The Person – Results

- Medical Interventions
 - Owsley et al. (2002)
 - Cataract surgery reduced crash rate by half
 - Schmidt et al. (1991)
 - Medication Piracetam improved performance
 - Riedel et al. (1998)
 - Medication Piracetam improved postural stability while driving

The Person – Results

- Visual, Cognitive & Motor Interventions
 - Ball et al. (1988)
 - Training on UFOV improved localization performance for middle aged and older drivers
 - Mazer et al (2001)
 - Post stroke participants improved UFOV performance after training on UFOV
 - Mazer et al (2003)
 - Compared UFOV vs. traditional OT intervention on post stroke participants
 - All improved in driving, but no difference between groups

2/3/06 ICADI

AOTA Older Driver Evidence Based Literature Review

33

The Person – Results

- Visual, Cognitive & Motor Interventions
 - Roenker et al (2003)
 - Compared training on UFOV, simulator and control group
 - Simulator group improved most initially
 - UFOV & control had improvements at 18 mos.
 - Ostrow et al (1992)
 - Range of motion exercise program improved flexibility and vehicle handling
 - No difference in days or miles driven
 - Llaneras et al (1998)
 - Navigational system resulted in fewer errors and better driving performance

2/3/06 ICADI

AOTA Older Driver Evidence Based Literature Review

34

Slide 33

wbs1 need to look closer at this study, couldn't understand explanation of results from AJOT summary
wstav, 12/15/2005

The Person – Results

o Educational Programs

- Vollrathm et al (2001)
 - o Presence of passengers decreases crash risk
- Hing et al (2003)
 - o Drivers 75+ more likely to crash with two or more passengers
 - o At night, two or more passengers increased safety

The Person – Results

o Educational Programs

- Janke (1994)
 - o Classroom instruction increased crashes and decreased citations
- Jacobs et al (1997)
 - o Simulation training improved performance vs. video training
- Ker et al (2003)
 - o Post license education did not prevent crashes or injuries

The Person – Results

- Educational Programs
 - Owsley (2001)
 - Educational program lessened exposure to high risk situations
 - Yee (1992)
 - Self assessment improved attitudes
 - Eby et al (2003)
 - Self assessment improved awareness of aging effects

Practice Implications

- Because there are Drugs and surgeries that may impact driving and safety, it is important for occupational therapists and physicians to collaborate.
- Cognitive remediation programs and exercise strategies that have been correlated to driving should be explored.

The Person – Practice Implications

- Therapists need to think more broadly and explore more options beyond the task of driving itself to improve performance and safety
 - Medications
 - Surgeries
 - Cognitive remediation (UFOV)
 - Exercise programs
 - Navigational systems
 - Traveling with passengers
 - Educational programs
 - Self assessment

The Person – Education Implications

- Educational curricula should include exposure to the realm of the previously described intervention possibilities
- Continuing competency efforts should include discovery of older driver resources and tools.



The Person – Research Implications

- While these (18) person intervention studies revealed promising results, future research needs larger sample sizes and control groups.



Question 2 – Policy and Community Mobility

- What is the evidence for the effect of policy and community mobility programs on the participation of the older adult?

Policy and Comm Mobility – Results

- Policy - License renewal procedures
 - Shipp (1998)
 - Vision testing enhances traffic safety and reduces economic burden
 - Outcome variable FARS
 - Grabowski et al. (2004)
 - Lower fatality rates for persons
 - 85+ with in-person renewal
 - 65 – 74 with vision testing
 - Outcome variable FARS

2/3/06 ICADI

AOTA Older Driver Evidence Based Literature Review

43

Policy and Comm Mobility – Results

- Policy - License renewal procedures
 - Blomqvist et al (1996)
 - Compared Finland and Sweden age-based medical licensure program
 - Strict and lenient licensing policies yielded similar crash and fatality rates
 - Finland had notably increased fatalities among unprotected road users

2/3/06 ICADI

AOTA Older Driver Evidence Based Literature Review

44

Policy and Comm Mobility – Results

- Policy – License restriction
 - Marshall et al (2002)
 - Examined restricted driving and licensure
 - Drivers with restrictions
 - Less likely to be involved in crashes
 - Lower violation rates

Policy and Comm Mobility – Results

- Community Mobility
 - Brown (1972)
 - Examined elder mobility needs after a implementing a transportation program
 - Ridership decreased throughout study
 - Participants preferred bus over taxi and door to door “special bus”

Policy and Comm Mobility – Results

o Community Mobility

- Freund (2002)
- Examined use and effectiveness of Independent Transportation Network – included merchant participation
- Rides increased to participating merchant stores
- Study design did not reveal cost or program effectiveness

Policy and Comm Mobility – Implications

o Practice

- Increase roles for occupational therapy at the clinical and agency level
- Access to transportation supports community engagement

o Education

- Should include advocacy and collaboration with transportation stakeholders and policy makers

o Research

- Next step- examining engagement and quality of life outcomes.



Question 3 – The Infrastructure

- What is the evidence for the effect of modifications of the infrastructure of the physical environment on the driving ability, performance and safety of the older adult?



Infrastructure – Results

- Signage
 - Ho et al (2001)
 - Older adults slower and less accurate in sign fixation, particularly with clutter
 - Kline et al (1999)
 - Familiar signs recognizable with lower acuity
 - Guerrier & Fu (2002)
 - Larger text, advanced signage and 6 inch lane markers improve visibility

Infrastructure – Results

o Signage

- Carlson (2001)
 - o Clearview font better night driving among older drivers
- Chrysler et al (2002)
 - o No increase in reading time with Clearview at night
 - o Retroreflective coating improves legibility on orange signs

Infrastructure - Results

o Staplin (2001)

o Intersections

- 90 degree angles
- Wider lanes
- Channelization with retroreflective markings
- Clear markings
- Unobstructed view
- Left turn lanes with offset
- Clear signage
- Advance signage
- Protected left turns
- Traffic controls with increase luminance and back plate

Infrastructure – Results

o Staplin (cont)

- Interchanges
 - o Detectable signage
 - Mixed case, more open spaces, smaller intercharacter spacing
 - o Clear lane markings
 - o Increased illumination
- Curvature/ Passing Zones
 - o Pavement markings
 - o Advance signage

Infrastructure – Results

o Staplin (cont)

- Construction
 - o Advanced warning of lane closure
 - o Changeable message machines
 - o Reduced speed
 - o Channelizing devices

Infrastructure – Implications

- Practice
 - Thorough knowledge of roadways used in practice
 - Opportunity for occupational therapy in advocacy and community planning
- Education
 - Impact of the physical environment on performance
- Research
 - Apply human factors' results to performance studies

Question 4 – The Vehicle

- What is the evidence for the effect of automobile – related modifications on the driving ability, performance and safety of the older adult?

The Vehicle – Results

- Navigation Systems
 - Allen et al (1991)
 - Navigation system to divert from traffic congestion used 50% of the time, more so by middle aged drivers than older
 - Dingus et al (1997)
 - Older drivers had decreased performance and more errors when using navigation system
 - Older drivers benefit from turn by turn directions delivered through multisensory channels
 - Kostyniuk et al (1997)
 - Older drivers less likely to use navigation system
 - Able to understand directions but felt information was presented too far in advance

The Vehicle – Results

- Navigation Systems
 - Liu (2001)
 - Multimodality display decreased misses
 - Visual display alone was less safe
 - McKnight & McKnight (1992)
 - Older drivers failed to anticipate turns and had higher glance duration
 - Pohlmann & Trainkle (1994)
 - Older and younger drivers had significantly more lane deviations and were a higher crash risk when using the navigation system

The Vehicle – Results

- Window Visibility
 - Burns et al (1999)
 - Optimal driving conditions - Front window tinting did not affect older drivers
 - 35% visible light transmittance – Driving was impaired
 - Freedman et al (1993)
 - Rear window tinting below 70% light transmittance impaired driving performance
 - LaMotte et al (2000)
 - After market tinting, medium and darker, decreased contrast sensitivity for 60-69

The Vehicle – Results

- Window Visibility
 - Sayer et al (1999)
 - Hydrophobic window treatments did not improve perception of distance from target
 - Schumann et al (1997)
 - Windshield rake angle and dashboard reflectance impact visual performance

The Vehicle – Results

- Visual Enhancement Systems
 - Caird et al (2001)
 - Visual enhancement systems effective during hazardous conditions, but not daytime driving
 - Gish et al (1999)
 - Detection of targets was higher with visual enhancement system
 - Older drivers more cautious
- Heads up displays
 - Mollenhauer et al (1995)
 - More correct turns with heads up display
 - No difference in mental workload
 - Wolffsohn et al (1997)
 - Heads up display increased cognitive demands
 - Increase in response time

The Vehicle – Results

- Offensive Driving Systems
 - De Waard et al (1999)
 - Speeding violations decreased
 - Feedback system was helpful in vehicle positioning
 - Acceptance by older adults
 - Dingus et al (1997)
 - Headway maintenance and collision warning system increased following distance for older adults

The Vehicle – Results

- Offensive Driving Systems
 - Fancher et al (1998)
 - Older drivers use adapted cruise control more than younger drivers, setting longer headways
 - Accepted by older adults
 - Tan & Lerner (1995)
 - Older adults prefer auditory warnings
- Vehicle Control
 - Laux (1991)
 - Older adults slower in locating vehicle controls and displays - particularly those they do not use everyday

The Vehicle – Implications

- Practice
 - Intervention for visual scanning, longer IT when front & side windows tinted
- Education
 - There is a role of technology and vehicle design that impacts performance
- Research
 - Need for continuous ongoing cycle of research to keep up with the evolving technology
 - Attending conferences for the latest trends and outcomes
 - AOTA CAP and CATS



Summary

- Learning curve applying the literature to practice
 - Literature comes from outside the profession
 - We need more research to generalize results to patient care
- From the OT perspective, we don't know if this evidence will achieve the goals of quality of life and participation

Thank you

- National Highway Transportation Safety Administration (NHTSA)
- Centers For Disease Control and Prevention (CDC)
- University of Florida National Older Driver Research & Training Centers
- AOTA Evidence Based Practice Project

Reports can be found on-line

www.aota.org

Older driver CATs and CAPs
www.aota.org/olderdriver