**Screening and Assessment Tools Determining Fitness-to-Drive of Older Adults**

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**Question:** What is the evidence supporting the use of clinical assessments (vision, cognition, physical function) and performance-based assessments (simulated and on-the-road) for determining driving safety/competence and driving cessation for older adults.

- Predictive or Concurrent Validity
- Studies from 1995 to present.
- Outcomes:
  - Behind-the-Wheel Driving Assessment,
  - Crashes,
  - Driving Cessation

**Process**

- Citations reviewed from all searches by
  - One student and faculty member
- 128 abstracts reviewed by one student and faculty member.
  - Team met and discussed all abstracts
  - Three students completed CAP for two manuscripts.
- 80 full manuscripts reviewed by one student and faculty member.
  - Several recent studies added
- Final number of studies included = 59

**Number of studies for 3 outcomes**

<table>
<thead>
<tr>
<th></th>
<th>Crashes</th>
<th>On Road Assessment</th>
<th>Cessation of driving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meta Analysis – 2</td>
<td>1</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Systematic Review</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Randomized Control</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>trial: Prospective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>study; two group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-randomized</td>
<td>1</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>controlled trial:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retrospective, time</td>
<td>7</td>
<td>43</td>
<td>4</td>
</tr>
<tr>
<td>series, case control,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cohort/ cross sectional study</td>
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</tbody>
</table>

**Level 1 Evidence:**

**2 Meta Analysis; 2 Systematic Reviews**

- Mathias & Lucas, 2009 - 21 studies
  - Outcome: driver assessment on road, simulator, driver problems
  - Attention most frequently assessed, then cognition, perception, memory
  - All who failed, did poorly on cognition
  - Variation on how test was compared to outcomes
- Clay et al. 2005 – 8 studies only on UFOV
  - Outcome: driver assessment on road, simulator, crash
  - Poor UFOV scores – poor driving performance

**Level 1 Evidence:**

**2 Systematic Reviews**

- Martin, Marottoli, & O’Neil, 2009, Cochrane Review – no studies met criteria
  - Focused on Stroke
  - Different measures for different outcomes (on road vs. cessation
  - Trails A& B and Rey-Osterreith complex figure
  - MVPT – not predictive,
  - UFOV for visual perception
14 Studies Focused on a Single Tool or Battery of Tools

- **Driving Simulation** – 2 studies studied driving simulation alone; 3 others used simulation in addition to usual vision, cognition, motor.
- **Battery** - ADReS, SDSA or NorSDSA
- **Individual Tool** – AMPS, 4C’s, Driving Decision Workbook, DriveAble, Attention Network Test, Adelaide Self Efficacy, DriveSafe, DriveAware, Road Law & Road Craft, Melbourne Slide Test, New South Wales Visual Recognition Slide Test

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**Most Studies Used Multiple Assessments**

<table>
<thead>
<tr>
<th>Cognition</th>
<th>Perception</th>
<th>Vision</th>
<th>Physical/Motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 42</td>
<td>N = 31</td>
<td>N = 23</td>
<td>N = 21</td>
</tr>
<tr>
<td>Trail Making A &amp; B</td>
<td>UFOV</td>
<td>Acuity</td>
<td>Rapid Pace Walk</td>
</tr>
<tr>
<td>MMSE</td>
<td>Visual attention</td>
<td>Contrast Sensitivity</td>
<td>Manual muscle test</td>
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<tr>
<td>Digit Symbol</td>
<td>MVPT</td>
<td>Visual Fields</td>
<td></td>
</tr>
<tr>
<td>Block Design</td>
<td>Visual neglect</td>
<td>Depth perception</td>
<td>Finger tapping</td>
</tr>
<tr>
<td>Clock Drawing</td>
<td>Grip strength</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rey-Osterrieth Figure</td>
<td></td>
<td>Reaction time</td>
<td></td>
</tr>
<tr>
<td>Maze Tests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letter/number cancellation</td>
<td></td>
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</tbody>
</table>

Note: 3 studies also compared performance in a driving simulator. Some assessment tools overlap in cognitive/perceptual/visual abilities.

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**Results: Key Concepts**

1. No single tool
2. Tools most researched
3. Different outcome, different measures
4. Diagnostic Dependent
5. Sophistication of measurement
6. Move from single tool to “battery”
7. Driving simulation

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**Results: Key Concepts**

1. No evidence for a single tool will be the one & only for either screening or assessment.
2. Tools most frequently researched
   - Commonly tools used in research:
     - MMSE – 13
     - Trail Making A and B – 19
     - Useful Field of View – 17
     - Contrast Sensitivity - 9
     - Acuity - 11

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**Results: Key Concepts**

2. Tools most researched
   - MMSE – Useful for identifying moderate or severe dementia, should not drive.
   - Trail Making A and B – Trails B is related to outcomes.
   - Useful Field of View – Significant research; subtest 2 related to outcomes; Some inconsistent
   - Contrast Sensitivity – Clear evidence for crashes with poor Contrast Sensitivity
   - Acuity – Not related to outcomes.

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**Results: Key Concepts**

3. Different outcome, different measures
   - Cessation versus BTW versus crashes.
   - Measures are not used consistently.
   - Need to be diligent in reviewing how assessment tools results were measured against outcomes.
   - All BTW assessments are not alike.
Results: Key Concepts

4. Diagnostic Dependent - Strong research groups for specific diagnostic groups.
   - Classen & colleagues – Parkinson’s Disease
   - UFOV 2 & Rapid Pace Walk
   - Uc, Rizzo, & colleagues – Neurological conditions
   - Trails A, Complex figure, Block design
   - Akinwuntan & colleagues – Stroke
   - Visual field, Rey figure, lesion location
   - Carr & colleagues – Dementia
   - Interview, clock drawing, Trails A or Snellgrove maze

Results: Key Concepts

5. Sophistication of measurement
   - Early studies – 1995 – 2005 used correlations
   - Moved into regression studies
   - Most recent research recognized the need for
     - Receiving Operating Curves – ROC
     - Looking at “area under the curve”
     - Sensitivity – the proportion who are unfit to drive that are correctly identified as unfit by the test.
     - Specificity – the proportion who are truly fit to drive that are correctly identified as fit by the test.

Results: Key Concepts

6. Move from single tool to “battery”
   - Recognition that one tool cannot measure all components.
   - Different components are important for different diagnostic
   - Research needs to demonstrate the groups of tools that meet the measurement outcome.

Results: Key Concepts

7. Driving simulation
   - No conclusive evidence for assessment
     - Some beginning evidence
     - Wide variety of driving simulators
     - Even with same model, different scenarios
     - Problem with simulation sickness

Implications for Practice

- Therapists have an array of tools that might be used in areas of vision, cognition, and motor.
  - Clinical judgment needed.
  - Careful of tools with no independent evidence.
- Consider the older driver, particularly the medically-at-risk driver’s condition.
  - Determine what should be assessed.

Implications for Research

- Much more needs to be done!
- Diagnostic categories
- Groups of assessment tools
- Sensitivity/Specificity
- How a tool works as for screening versus assessment.
Implications for Education

- Assessment tools for vision, cognition, motor, perception may be same for the IADL driving.
  - Apply the tool to the IADL of Driving and community mobility
  - Example: AMPS
- Teach the appropriate use of screening and assessment tools.
- Marketing versus evidence.

Thank you!

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ROADI
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