Older Driver Education and Training for Automated Driving Systems

Michael Manser, Ph.D.
Texas A&M Transportation Institute

Texas Transportation Safety Conference - October 9, 2018
AV Adoption

States with Enacted Autonomous Vehicle Legislation

LEGEND
Enacted
Executive Order

Texas A&M Transportation Institute
In 2016, 94% of serious crashes on the roadway were attributed to human error, including errors tied to distraction, impairment, and drowsiness.


$37,461 \times .94 = 35,213$ lives.

$37,461 \times .50 = 17,606$ lives.

$
But wait...
The Bad (Parasuraman, 2000)

- Increased workload
- Loss of situational awareness
- Failure to control vehicle
- Loss of skill

Automated Driving
Project Questions

What methods of automated driving system education and training are preferred by younger and older drivers?

What methods of education and training are more effective?

How can we detect behavioral and physiological markers of successful training for these age cohorts?
Preferred Education and Training

Do consumers believe it is reasonable to require training for new vehicles with ADS?

79% agreed that it is reasonable to require training for new vehicles with AV technologies.

Focus groups (N= 20, young [avg. = 27.7], n = 11, older [avg. = 60] n = 9)
Preferred Education and Training

What are the concerns about required education and training?

<table>
<thead>
<tr>
<th>Concern</th>
<th>Total Frequency</th>
<th>Younger</th>
<th>Older</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer “Buy In”</td>
<td>13</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Effective Training</td>
<td>8</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Training is too generic</td>
<td>8</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Time Consuming</td>
<td>9</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Relevant to all Consumers</td>
<td>8</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Unknowledgeable Trainers</td>
<td>7</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Remarkable consistency between younger and older driver concerns about education and training – no differences.
Preferred Education and Training

What training methods do younger drivers desire?

Training Preferences for Younger Drivers

144 comments.
Preferred Education and Training

What training methods do older drivers desire?

Training Preferences for Older Drivers

- Classroom Setting
- Online videos + Discount
- DMV
- Insurance Training
- In Person explanation
- Offer Options
- Training at Popular Locations
- Test Drive Training
- Hands-On Demo of Features
- Training During Purchase
- Hands-On Demo of Features
- Test Drive Training
- Training at Popular Locations
- Offer Options
- Insurance Training
- DMV
- Classroom Setting
Research Hypotheses

What type of education and training is best for ADS for older drivers?
To what degree does it help learning?

Demonstration-Based Training (Provides practice, neural pathway development)

Video-Based Training

Instructor Led

High-Tech

Control Condition

Video-based
Driving Scenario

How does system understanding inform performance (e.g., engagement and disengagement time)

Negative effects from high workload (i.e., carry over effects)?

<table>
<thead>
<tr>
<th>Drive 1</th>
<th>Drive 2</th>
<th>Drive 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>AV1</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>AV2</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>AV3</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>AV4</td>
</tr>
<tr>
<td>M</td>
<td>AV1</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>AV2</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>AV3</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>AV4</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mean Time Headway (Manual Drive)
Education and training reduces mental workload. Video and demonstration training have a different effect on females versus males.
Questions?

Michael Manser, Ph.D.
Texas A&M Transportation Institute

m-manser@tti.tamu.edu
“Our fleet has self-driven more than 3 million miles, mostly on city streets. It took our team just 7 months to reach our third million miles. By comparison, it took about 6 years to hit our first million. This builds on 1 billion miles we drove in simulation in 2016 alone.” https://waymo.com/ontheroad/
Standard Deviation of Steering (Manual Drive)

http://www.pfsweb.com/blog/self-driving-vehicles-will-they-affect-ecommerce/