

Examining Senior Drivers Adaptation to Mixed-Level Automated Vehicles: Focus Group Findings

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Motivation

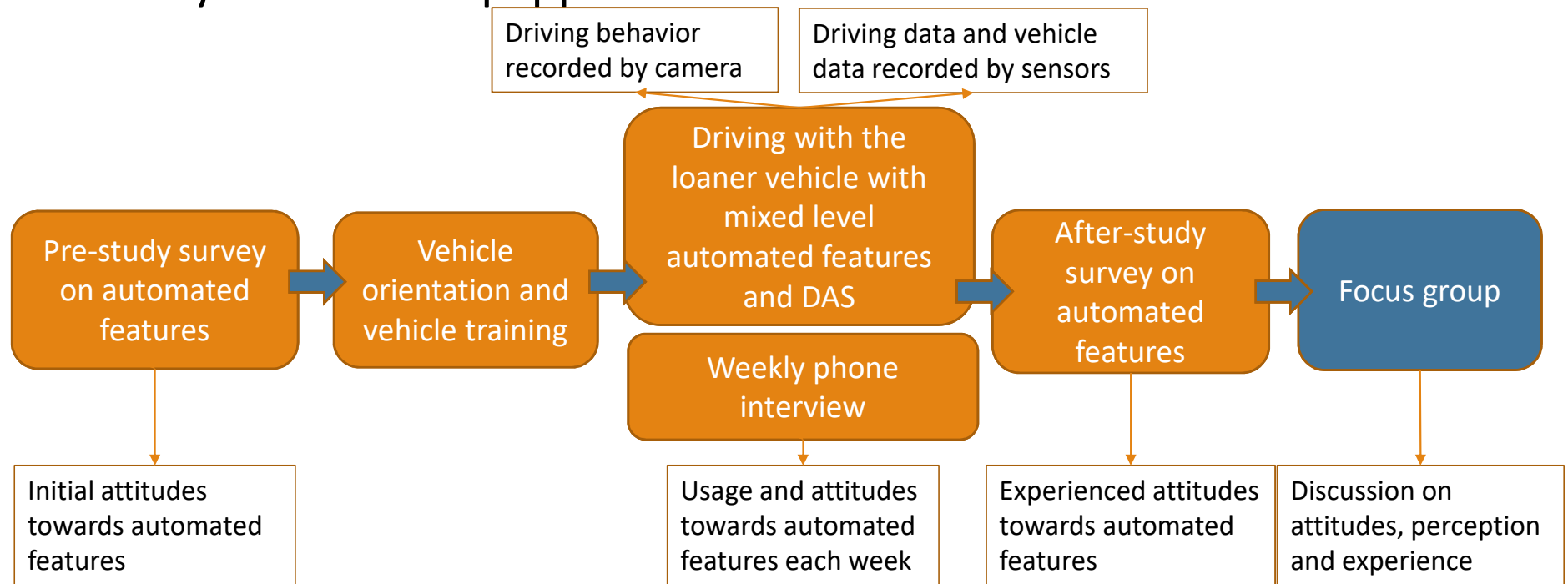
- **Age-Related Declines** - visual, cognitive, and psychomotor functional abilities
- **Advanced/Automated Technology** - Recent advances have potential to assist senior drivers by compensating for such declines
- **User Acceptance** - However, realizing full benefits of these technologies depends on the degree to which seniors *accept* them and the degree of facility with which they use them
- **Differential Acceptance** - Seniors may accept new technologies differently and may take longer to adapt to new technologies

Objective





Examine how senior drivers accept and adapt to vehicles with automated features based on actual use

Study Method-Procedure Overview


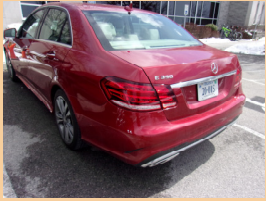

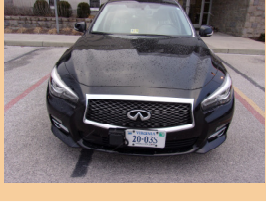
18 participants (70-79) drove study vehicles with mixed-level automated vehicle systems and equipped with DAS for six weeks



Advanced Vehicle Features

		What it does?
Adaptive Cruise Control		Keeps a set speed or a set following distance relative to a leading vehicle
Lane Keep Assist		Steers back into the lane when detect drifting out of the it
Lane Departure Alert		Sends alert when detect drift
Blind Spot Warning		Indication that vehicles are located in the blind spot; warning if collision is imminent

Study Vehicle Fleet

Brands	Vehicle	Blind Spot Warning	Lane Departure Alert	Adaptive Cruise Control	Lane Keep Assist
Audi		On automatically, can adjust brightness	Have to activate (40+ mph), steering, visual, and vibration	On automatically with cruise control, also automatic low-speed ACC	Have to activate (40+ mph) - visual, vibration, steering
Mercedes		On automatically	On automatically (37+ mph), visual and vibration		On automatically if cruise control is on (37+ mph) -visual, vibration and steering (and directional braking)
Volvo		On automatically	On automatically (30+ mph)		On automatically (30+ mph) – visual
Infiniti		On automatically, can adjust brightness	On automatically, chimes and visual		Have to activate- chime, visual and steering input- can be set to high/low intervention

Focus Group

Location: Virginia Tech Transportation Institute, Blacksburg, VA

Length: Three sessions, each session lasted 90 minutes

Experimenters: One facilitator, two observers

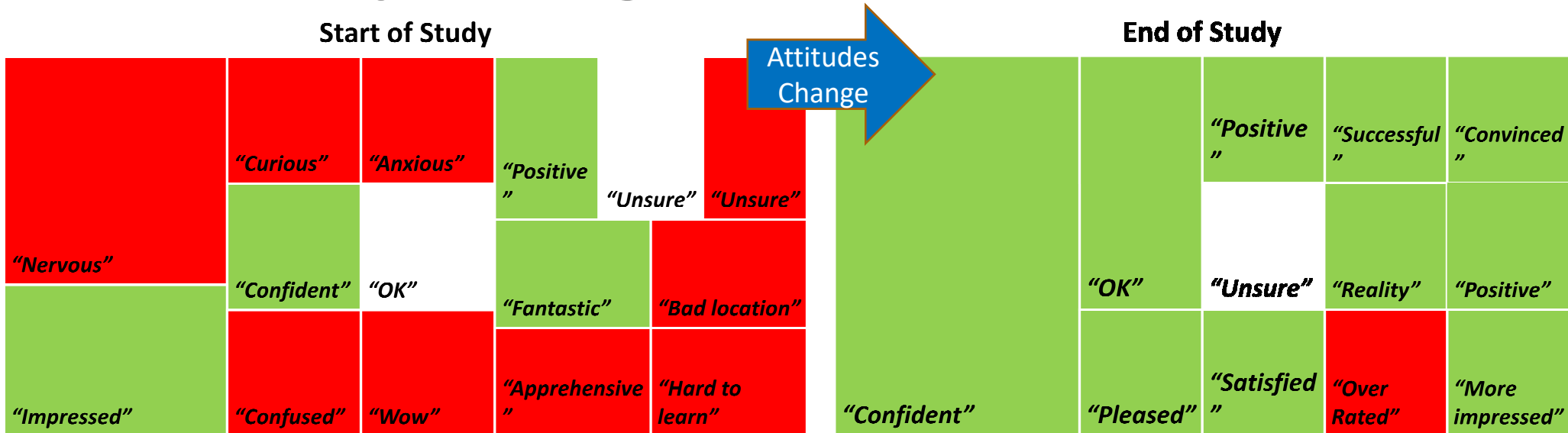
Participants: Six participants per session



Focus Group Probe Topics and Questions

Topics	Probe Questions
Attitudes	Q1. <i>What one word describes how you felt about the advanced features in your vehicle when you began the study? What one word describes how you feel about the advanced features in your vehicle now, at the end of the study?</i>
	Q2. <i>What caused your feelings to change or remain the same?</i>
Perception	Q3. <i>What would make you feel more comfortable with these features?</i>
Feature Likes/Dislikes	Q4. <i>What is one thing you liked best about these features? What is one thing you liked least about the features?</i>
Safety	Q5. <i>Suppose a friend is considering purchasing a car with these features and they ask you if you think if they improve driving safety or not. What would you say?</i>

Focus Group Findings - Attitudes



- Negative initial attitudes towards the advanced features
e.g. "Nervous", "confused" and "anxious"
- Positive post attitudes towards the advanced features
e.g. "Positive" and "Confident"

Focus Group Findings - Attitudes

- Usage experience improved attitude
“I think practice made the awkward just go away”

- Reading manual improved attitude
“The manual I have outlined the limitations very clearly, so all of that made me feel ... better about the system”



Focus Group Findings - Perception

- Better training

- Content

- Operating each system including non safety features (radio, GPS)

- Trainer

- Car dealer; family member or friends

- Method

- Re-orientation session after week or two into driving



- More intuitive control

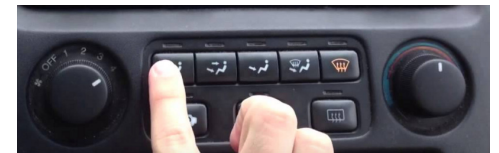
- Intuitive placement of the control

- "I think the display could be much more intuitive"*

- Touchscreen

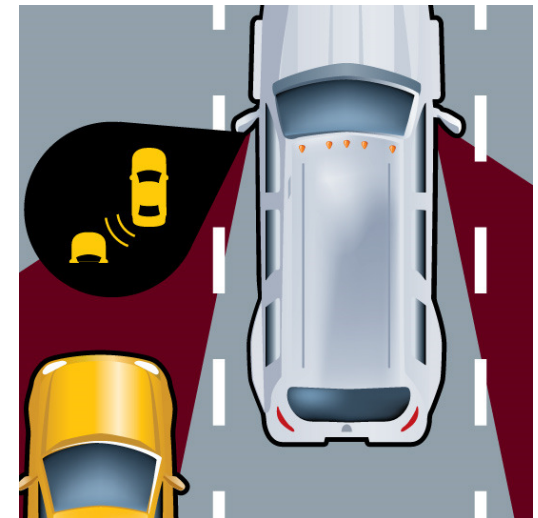
- "So the screen was not a dedicated screen to control"*

- "when you were touching the screen, it didn't always recognize you were touching the screen"*



Focus Group Findings – Feature Likes/Dislikes

- Liked **best** blind spot alert
 - **Improves visibility**
“that mirror (blind spot alert) told you there was something there you need to see”
 - **Increases confidence**
“It did increase my confidence in driving. In traffic, I’d like to have that.”
 - **Least intrusive**
“It is the least intrusive on everything else. It’s there, it doesn’t hurt anything.”



Focus Group Findings - Feature Likes/Dislikes

- Liked **least** lane keeping assist
 - **Trust issue**
“I felt like I couldn’t trust it” “Cause sometimes worked, sometimes didn’t”
 - **Too many limitations**
“It didn’t work well in bad weather”
“The limitations of that system made it something that I wouldn’t want to have”
“if it doesn’t have that painted line, it won’t see anything”



Focus Group Findings - Safety

YES

"You will love the blind sport alert"	"Mostly it is a good backup"	"Learn about 1 feature at a time"	"Yes, but still be responsible"	"Yes and learn how to use"	"Safer"
"I'm still in control"	"It definitely helps me feel safer"	"See if settings stay when car is turned off"	"These features help but don't rely on it."	"Go for it"	"Have limitations, not self-driving"
"Sure get it you will love it"	"Yes, but there is a learning curve"	"Features will 'assist' you"	"These safety features definitely help with..."	"Be sure to get lane keeping features"	"Be sure to get blind spot alerts"
"Learn first then buy"	"Safety is increased"	"Yes, blind spot at any cost"	"Makes changing lanes safer"	"I feel the vehicle safety features improve..."	"The features support good driving (safe)"

MAYBE

"Not all of the controls are for everyo..."	"Don't get distracted by it"	"Consider the cost"	"Have salesperson ride with you..."	"Use only features that you like"
"Must study it and pay attention"	"Don't get complacent"	"Do not become dependent on them"	"Not for tight spots (bank)"	"Yes - if features are used"
				"Make sure controls are accessible"

NO

"Wait for the pull"	"Lane control isn't necessary"
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Most agreed that the features improve safety

- Learning how to use first
- Do not become over dependent on them

"Learn first then buy"
 "Don't get complacent"

Summary of Focus Group Findings

	Findings	Sample Response
1	Negative initial attitudes towards the advanced features	<i>"Anxious" "Nervous" "Unsure"</i>
2	Positive post attitudes towards the advanced features	<i>"Confident" "Satisfied" "Convinced"</i>
3	Usage experience improved attitude	<i>"I think practice made the awkward just go away"</i>
4	Reading manual improved attitude	<i>"The manual I have outlined the limitations very clearly, so all of that made me feel ... better about the system"</i>
5	Expected better training	<i>"I would appreciate being able to go back and have somebody to ride with me, not just explain it, see how I am using it to the best advantage of how I drive"</i>

Summary of Focus Group Findings

	Findings	Sample Response
6	Expected more intuitive control	<p>-Placement of the control <i>"I think display could be much more intuitive"</i></p> <p>-Touchscreen <i>"So the screen was not a dedicated screen to control"</i></p>
7	Liked best blind spot alert	<i>"It did increase my confidence in driving, in traffic. I'd like to have that"</i>
8	Like least lane keeping assist	<i>"I couldn't trust it" "Sometimes worked, sometimes didn't"</i>
9	Agreed that the features improve the safety	<p>-Learning how to use first <i>"Yes, there is a learning curve"</i></p> <p>-Do not become over dependent on them <i>"Don't get complacent"</i></p>

Next Steps

- **Survey Data Analysis** - before & after as well as weekly survey data
- **Driving Data Comparison** –
 - **Compare to Subjective Data** – Examine how seniors' driving behaviors changed over time in comparison with the subjective data
 - **Compare to SHRP 2 Data** – compare driving behaviors with SHRP 2 baselines, which serves as a control group

Thank you.

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