

STRIDE

Southeastern Transportation Research,
Innovation, Development and Education Center

Technology Transfer Final Report

STRIDE Project A3

University of Florida and University of Alabama at Birmingham's Phase 2 Demonstration Study:

Developing a Model to Support Transportation System Decisions
considering the Experiences of Drivers of all Age Groups with
Autonomous Vehicle Technology

Sherrilene Classen, Ph.D.

University of Florida

May 2022

DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented herein. This document is disseminated in the interest of information exchange. The report is funded, partially or entirely, by a grant from the U.S. Department of Transportation's University Transportation Centers Program. However, the U.S. Government assumes no liability for the contents or use thereof.

ACKNOWLEDGEMENT OF SPONSORSHIP AND STAKEHOLDERS

This work was sponsored by a contract from the Southeastern Transportation Research, Innovation, Development and Education Center (STRIDE), a Regional University Transportation Center sponsored by a grant from the U.S. Department of Transportation's University Transportation Centers Program.

1. Project Overview

The first phase of this project assessed older drivers' (>65 years old; N=104) perceptions of autonomous vehicles (AVs) before and after riding in an autonomous shuttle and driving simulator operating in autonomous mode (STRIDE Project D2). The current study (i.e., Phase II), used the same method to expose 106 younger and middle-aged drivers (18-64 years old) to AV technology (shuttle and simulator). The order of exposure to AV technology was randomly assigned for each participant. Participants completed the Autonomous Vehicle User Perception Survey before and after being exposed to AV technology. The first task was to determine if the order of AV exposure influenced younger and middle-aged drivers' perceptions of AVs. The results suggest that regardless of the order of exposure, scores on the AVUPS increased after cumulative exposure to AV technology.

For the second task, data collected in this study were grouped with older drivers' data from Phase I. The primary purpose of this project was to assess drivers' (N=210; 18-91 years old) perceptions of AVs to better understand the impact of age and sex on users' *intention to use, perceived barriers, well-being, and acceptance* of AVs. Participants' demographics (age, sex, education, race/ethnicity, marital status, employment), order of AV exposure, and characteristics (technology readiness and perceived ease of use) were used as variables to predict *intention to use, perceived barriers, well-being, and acceptance* of AVs. We hypothesized that age, sex, education, technology readiness, and perceived ease of use would be associated with *intention to use, perceived barriers, well-being, and acceptance* of AVs after being exposed to AV technology.

Our findings generally support the hypotheses, but also indicated both the autonomous shuttle and the simulator programmed to run in autonomous mode, were feasible modes for collecting data in a valid and reliable way. Interestingly, neither age nor sex impacted drivers' perceptions of AVs.

The main finding suggests that drivers' *intention to use, perceived barriers, well-being, and acceptance* of AVs increased after being exposed to AV technology. In conclusion, drivers across the lifespan need to be exposed to AVs if they are to accept and adopt this emerging technology— and their readiness to try new technology is a strong predictor of their perceptions of AVs.

2. Research Goals

This project's objectives were portioned into two tasks which included: a) assessing the order effects of AV exposure on younger and middle-aged drivers perceptions of AVs (exposure to driving simulator first vs. exposure to autonomous shuttle first); and b) assessing drivers' (N=210; 18-91 years old) perceptions of AVs, after being exposed to AV technology, to better understand the impact of demographics (e.g., age and sex) and characteristics (e.g., technology readiness) on their *intention to use, perceived barriers, well-being, and acceptance* of AVs. For the two tasks, this study used a randomized crossover design to randomize the order of exposure to autonomous vehicles and to control for order effect.

3. Findings

Using the validated AVUPS, we explored the perceptions of 210 drivers in Florida before and after being exposed to an autonomous shuttle and driving simulator operating in autonomous mode. The order of exposure to AV technology did not have an effect, although cumulative exposure to AV technology positively influenced their perceptions (*intention to use, perceived barriers, well-being, and acceptance*) of AVs. Drivers' optimism towards technology and perceived ease of use of AVs, prior to exposure to AV technology, were significant predictors for their *intention to use, barriers, well-being, and acceptance* of AVs. Interestingly, age and sex were not associated with drivers' perceptions of AVs.

4. Performance Metrics

Metric	# Completed
OUTPUTS	
Product(s): Number of new or improved tools, technologies, products, methods, practices, and processes created or improved	1
Technical Report: Number of client-based technical reports published	STRIDE Final Report
OUTCOMES	
Body of Knowledge: Number of trainings for transportation professionals	6
Professionals Trained: Number of professionals participating in trainings (<i>Students NOT included</i>)	238 (plus 184 YouTube views)
IMPACTS	
Stakeholders: Number of stakeholders you met with to encourage adoption or implementation of product(s)	4
Adoption/Implementation: Number of incidences outputs of research have been implemented or adopted	0

5. Products

Continuing Education Courses in Autonomous Vehicles for Occupational Therapy Professionals

Two courses were produced and are available on-line. These products are a result of work on both STRIDE Project D2 and A3.

- Classen, S. Autonomous & Connected Vehicles (ACV): Introduction to the Health Care Professional. 2020. <https://ot.php.ufl.edu/category/online-education/ceu-courses/dr-classen-courses/>
- Classen, S. Older Adults' Perceptions of Autonomous Vehicle Technology. 2020. See, <https://ot.php.ufl.edu/category/online-education/ceu-courses/dr-classen-courses/>

6. Who benefits/will benefit from your products?

- Our products and findings will be useful for healthcare professionals seeking alternative mobility options for the transportation disadvantaged. For example, people who cannot drive due to transient conditions (i.e., mydrasis after vision testing) or who want to supplement driving with autonomous shared services, such as the autonomous shuttle.
- Information from our products will inform engineers, city planners, and policy makers to enhance deployment of AV technologies.
- This information can be used by industry and developers of the autonomous shuttle to ensure that America with Disabilities and Rehabilitation Acts compliance standards are being met for persons across the mobility and ability spectrum.
- The general public can learn about a broader understanding of facilitators and barriers of accepting and adopting AV technology.

7. Body of Knowledge & Professionals Trained

- 1) Results from Phase I and updates for this project were presented at the TRB ARTS 2021 Conference on July 13, 2021. (57 attendees).
- 2) A presentation entitled “Users’ Perceptions and Attitudes toward Autonomous Vehicle Technologies after Simulation Exposure – A Study across the Lifespan” was delivered at the 8th Road Safety and Simulation 2022 Conference at Athens, Greece, June 8-10, 2022. Dr. Classen, Dr. Mason, Hwangbo from University of Florida, and Dr. Sisiopiku, McKinney, Dr. Yang from University of Alabama Birmingham contributed to this presentation preparation, and Dr. Sisiopiku will present on behalf of the team. (32 attendees)
- 3) Dr. Classen and Dr. Mason presented “Demonstration Study: Older Driver Experiences with Autonomous Vehicles” at a STRIDE webinar on May 26th, 2021.
<https://www.youtube.com/watch?v=HW-dTDK00Uc> (51 attendees, 122 YouTube views)
- 4) Dr. Classen, Dr. Sisiopiku, and Dr. Yang presented “What do Drivers Really Think about Autonomous Vehicles? Quantifying Drivers’ Perceptions Before and After Exposure to Autonomous Vehicle Technology” at a STRIDE webinar on May 18, 2022. <https://youtu.be/SBXti9kycM8> (98 attendees, 62 YouTube views)

8. Stakeholder Engagement

MEETING DETAILS		NARRATIVE DESCRIPTION
STRIDE rep.	<i>Dr. Mason</i>	<i>Justin Mason has been in constant communication with the City of Gainesville, I-Street, and Transdev to plan and organize data collection. Stakeholders have been providing us with updates related to the autonomous shuttle and their COVID-19 policies.</i>
Date of Activity	<i>Throughout project (bi-weekly)</i>	
Type of Activity	<i>other - please describe</i>	
Location	<i>Online Zoom Weekly Meeting</i>	
Stakeholder(s)	<i>Derrick Breun, VP of Operations at Transdev, Jesus Gomez, City of Gainesville, I-Street</i>	
STRIDE rep.	<i>Dr. Hwangbo</i>	<i>Seung Woo Hwangbo has been in constant communication with Transdev to schedule shuttle rides for participants.</i>
Date of Activity	<i>Throughout project (weekly)</i>	
Type of Activity	<i>other - please describe</i>	
Location	<i>In-Person Meeting (100 SW 1 Ave, Gainesville, FL 32601), Phone, Email</i>	
Stakeholder(s)	<i>Derrick Breun, VP of Operations at Transdev, Elisha Ghosn, Jason Perez, Michelle, Transdev</i>	
STRIDE rep.	<i>Dr. Mason</i>	<i>Justin Mason participated in the Safe Mobility for Life Transitioning from Driving Team Meeting and presented on the</i>
Date of Activity	<i>7/22/2021</i>	
Type of Activity	<i>demonstration</i>	

Location	<i>Safe Mobility for Life Transitioning from Driving Team Meeting</i>	<i>update of the AV survey and the phase II outreach. The agenda was titled, "Transportation survey and FL shuttle deployments".</i>
Stakeholder(s)	<i>Sheri Coven from Cambridge Systematics, Inc.</i>	
STRIDE rep.	<i>Dr. Mason</i>	<i>Justin Mason was invited, participated, and presented in the Florida/Ohio/Texas Transportation Consortium Meeting on the topic of the Impact of Technology on Disabled, Vulnerable, and Elder Road Users.</i>
Date of Activity	<i>9/15/2021</i>	
Type of Activity	<i>demonstration</i>	
Location	<i>Florida/Ohio/Texas Transportation Consortium Meeting: Impact of Technology on Disabled, Vulnerable, and Elder Road Users</i>	
Stakeholder(s)	<i>Cynthia Jones from Ohio Department of Transportation</i>	

9. Adoption/Implementation

The FDOT, Office of Safety, has funded a new project, using the survey developed with this STRIDE funding—to enhance the survey (Phase 1) and extend it to adults (i.e., 50+ years old) (Phase 2) who are using a variety of autonomous mobility services, including: ride hailing services, ride sharing services, taxis, shuttles, and buses. FDOT (Classen) Phase I Total Award: \$203,947. FDOT (Classen) Phase II Total Award: \$269,442. Barriers and facilitators pertaining to older drivers’ perceptions on the use of autonomous vehicle technology informs engineers, city planners, policy makers and health care professionals.

10. Broader Impacts

Accessibility Improvements to Autonomous Shuttle

The autonomous shuttles were manufactured in France and were thus designed based on their accessibility guidelines and policies. Transdev, City of Gainesville, and EasyMile met weekly with our research team to discuss shuttle operations. Based on our feedback and those of our participants, they updated shuttle ramps and attachments (wheelchair securements) to serve participants with assistive mobility devices (i.e., walkers, canes, wheelchairs). Two of the shuttles have been remediated to be ADA compliant.

Information Dissemination

The University of Florida’s Institute for Driving, Activity, Participation, and Technology (I-DAPT) is one of the national leaders in understanding users’ adoption and acceptance practices related to autonomous and connected vehicles. As a result of our unique collaboration with the TREND lab at UAB, we will be able to disseminate information so that: a) industry partners and policy makers may benefit from learning about perceptions of drivers across the life span and their intention to use AVs, and b) the general public can be benefitted from a broader understanding of facilitators and barriers of accepting and adopting AV technology, especially for serving older adults’ and those with mobility needs.