Automated vehicle Services for People with disabilities – Involved Responsive Engineering (ASPIRE Center)

Quarterly Progress Report #3

Grant Number:	69A3552047140
Topic:	Implications of Accessible Automated Vehicles and Mobility Services for People with Disabilities
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Report Date:	4/29/2021
Report Period:	1/1-3/31/2021
Prepared for:	University Transportation Centers Program, Office of the Assistant Secretary for Research & Technology, U.S Department of Transportation

1. Accomplishments

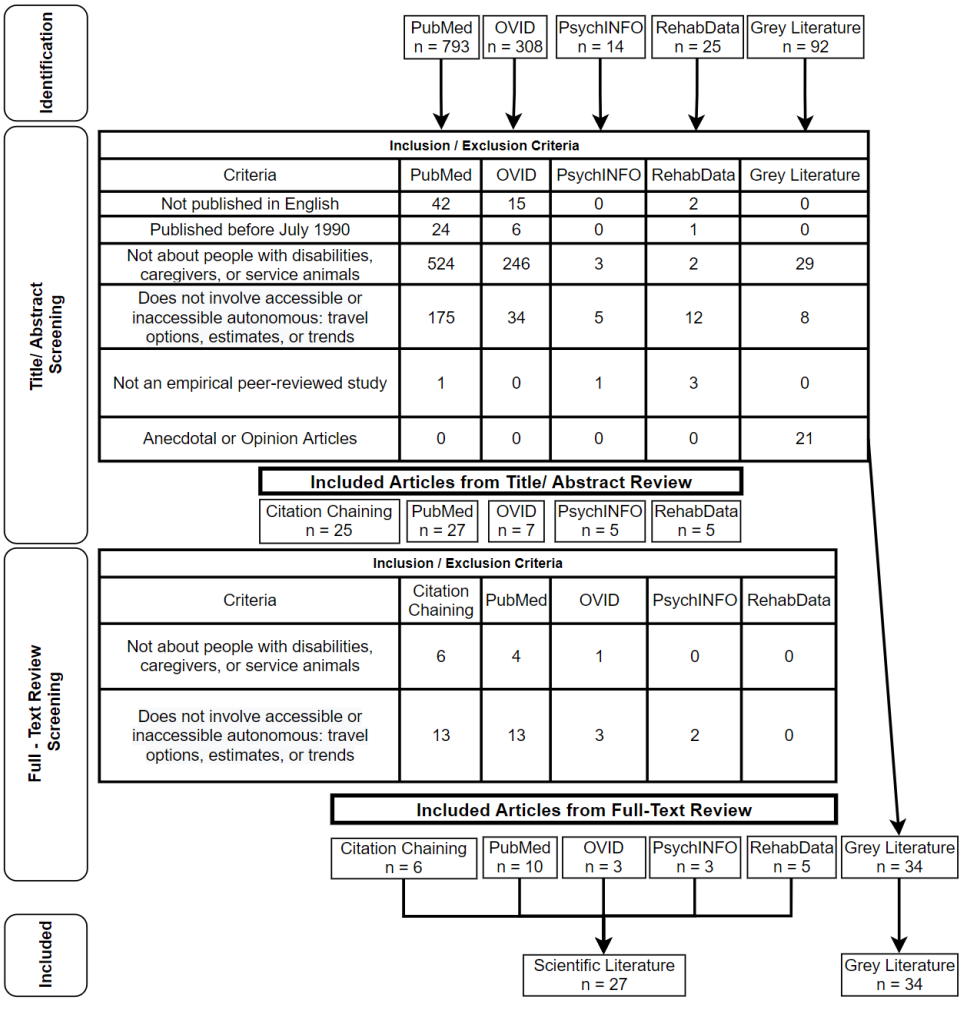
Aim 1: Systematic Review: We will conduct a comprehensive review of the literature to more clearly understand the current trends and implications for future travel related to accessible automated vehicles and services.

- **Specific Objectives:**

  1. Comprehensive review of the grey and scientific literature
  2. Summarize research gaps and implications for policy and knowledge translation to inform future work.

- **Major Activities:**

This quarter we successfully completed the Systematic Review (Aim 1) phase of the grant. The work has been summarized below using a PRISMA Flow Diagram that displays the inclusion and exclusion of articles at each stage of the review.



PRISMA Flow Diagram

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

Summary of literature findings

The grey (n=34) and scientific literature (n=27) highlighted opportunities and barriers to accessible automated vehicles (AVs) and services. Older adults were more represented than other groups including people with disabilities (PwD) in the scientific literature. PwD are a diverse group. Accessible and usable design solutions for AVs will therefore need to be tailored to each group's needs, circumstances, and preferences.

Future research in diverse disability groups should include more participatory action design and engineering studies and higher quality, prospective experimental studies to evaluate outcomes of accessible AV technology. Studies will need to address not only the vehicles and their features but also the entire travel journey. A community of practice built upon stakeholder engagement will accelerate the development and deployment of accessible AVs and services in an inclusive manner, which will be beneficial to the plurality of stakeholders and sensitive and responsive to the needs of PwD.

There is a clear need for guidance on accessible design and for planning and policy surrounding AV technology and infrastructure. Research gaps and implications for policy and knowledge translation have been outlined below:

Research gaps (themes)

- Transportation trends and socio-demographic factors
- Accessibility and usability of AVs and services
- Outcomes of AV use
- Research to inform policy or knowledge translation.

Key policy implications

- Universal design and participatory action design and engineering principles should be part of the development of AVs, AV services, and the built environment.
- Inclusive of PwD and other important stakeholders, including transportation service experts, adaptive driving instructors, travel companions, caregivers, and others.
- Policy surrounding payment for services, including benefits, state and federal coverage, and voucher systems, is needed, especially given the potential impact AVs could have on medical, employment, and education outcomes.
- Policy will need to be developed on driver licensing requirements for AVs that does not unnecessarily exclude specific groups of PwD.
- Policy will likely be informed by research on how AV use affects physical or mental health, social determinants of health, and society at large.

Aim 2: **<u>Understand the needs of Users and Providers</u>:** We will conduct surveys, focus groups, and journey mapping of stakeholders, including individuals with disabilities, their travel companions and/or caregivers, designers, medical providers, and mobility service experts (e.g., vehicle manufacturers and modifiers, as well as adaptive driving training instructors). The survey will be refined using pilot surveys, focus groups and journey mapping and then distributed broadly to all key stakeholders.

- **Specific Objectives:**

  1. Draft survey questions
  2. Draft an interview script for focus group & journey mapping
  3. Develop IRB

- **Major Activities:**
  In parallel to Aim 1, we drafted some of the survey questions and an interview guide for the focus group & journey mapping. These are currently being updated based on the research gaps identified in the systematic review and feedback received from our advisory board members.

  Survey development: A Voice of the Consumer-Provider REDCap survey is currently under development as the survey questions are being finalized. The goal is to gather feedback from all stakeholders to 1) Assess current accessible and non-accessible transportation use trends and perceptions 2) Understand the requirements for accessible automated vehicles and mobility services 3) Determine the impact that accessible automated vehicles could have on travel and community participation.

  Journey Mapping: The below "complete trip" representation will be used to drive discussions among the consumer group (individual with disabilities).

  Example questions:

  - What challenges or difficulties do you experience in this phase of the trip?
  - What would make it easier for you to do what you need to do in these phases?
  - What level of assistance is needed in each of these phases?
  - How does the origin or destination impact these travel processes?
  - What steps do you take if the transportation method you planned doesn't work out?

  Focus Group: This will involve collecting participant views around Autonomous Vehicles and Transportation Systems.

  Example questions:

  - In what ways do you see automated vehicles being able to eliminate some of your current issues with transportation?
  - What are your perceived barriers to using automated transportation?
  - How do you feel about safety and autonomous vehicles in relation to Level 2 & Level 5?
  - What would be needed to make them fully accessible?

- In what ways do you see automated vehicles being able to extend your access to places outside of the home if they were fully accessible and were easy for you to schedule/setup rides)?

2. Changes/Problems

a. Actual Problems or delays and actions to resolve them

Nothing to Report.

b. Anticipated Problems/Issues

Nothing to Report.

3. Collaborations

We have been continuously engaging with advisory board members in Aim 1 and Aim 2 activities during the quarter. A board meeting was recently organized to present results from the systematic review and plans for the next phase of the project.

We have collaborated with some of the board members on UTC supplement projects/grants. Over the quarter, Dr. Cooper and team have participated/presented in the below virtual events:

- Oakland Transportation Management Association- Oakland for All 2021
- Third Annual National Mobility Summit of US DOT University Transportation Centers, Innovating Mobility for All- Poster Session

4. Education and Workforce Development

In this quarter, we continued to engage PhD students in the literature review activities (Aim 1).

5. Performance metrics

In response to the call for papers, a manuscript was submitted to “Special Issue of Neuroscience Letters on Neurological and Cognitive Rehabilitation: New Contributions from Engineering”. This has received a favorable review, and we are currently revising and resubmitting.