EXPECTATIONS AND UNDERSTANDING OF ADVANCED DRIVER ASSISTANCE SYSTEMS AMONG DRIVERS, PEDESTRIANS, BICYCLISTS, AND PUBLIC TRANSIT RIDERS

INTRODUCTION

Vehicle technology has progressed significantly over the past 20 years to the point where automated systems can now take on different aspects of a vehicle's control. Because of their complexity, it is important that drivers understand their systems, their role and their function. Unfortunately, many studies have revealed that drivers have a poor understanding of vehicle technology. While drivers play a central role in the effective and appropriate use of these technologies, these systems do not affect only drivers of such vehicles. Other road users, such as bicyclists and pedestrians, must interact with these vehicles safely and, as such, it is important to examine their perceptions, understanding and expectations concerning these systems.

The current project, based on a cooperative research program between the AAA Foundation for Traffic Safety and the SAFER-SIM University Transportation Center, sought to examine the perceptions, understanding and expectations of other road users, including bicyclists and pedestrians, related to current advanced driver assistance systems (ADAS), such as Adaptive Cruise Control (ACC) and Lane Keeping Assist (LKA), as well as more highly automated future technologies. Specifically, it addressed the following questions:

1. Do drivers and other road users differ in their perceptions and understanding of ADAS technology?
2. Do drivers and other road users differ in trust and expectations of ADAS technology in specific use cases?
3. Do drivers and other road users differ in their outlook of the future of automated vehicle technology?

KEY FINDINGS

The results revealed differences across different road users in terms of their understanding, expectations, behaviors, trust, and perceptions of risk. Importantly, differences in perceived expectations and trust did not always accompany associated differences in perceived risk and behavioral responses. In some cases, non-drivers could be exposed to greater risk due to false expectations about the technology or through willful perseverance of normal behavior. More specifically:

- Although the accuracy of respondents' understanding of the systems was modest at best (ranging from 50% to 60% accurate), bicyclists in the current sample exhibited a stronger understanding of ACC and LKA than other road users, including drivers.

ABOUT

Founded in 1947, the AAA Foundation for Traffic Safety in Washington, D.C., is a nonprofit, publicly supported charitable research and educational organization dedicated to saving lives by preventing traffic crashes and reducing injuries when crashes occur. Funding for this research was provided by voluntary contributions from AAA/CAA and their affiliated motor clubs, individual members, AAA-affiliated insurance companies, and other organizations or sources.

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VIEW REPORT

Key Findings (cont.)

- In spite of this superior knowledge of the capabilities and behavior of the system, bicyclists were less likely to report that they would make any changes in their own actions to increase their safety (e.g., move to the right, wait until vehicle passed).
- In the pedestrian scenario, the pedestrian road-user group was more likely to believe (falsely) that the vehicle would accurately detect a pedestrian and were less likely to believe that the vehicle would continue without adjustment compared to other road-user groups.
- Non-drivers demonstrated lower trust in the vehicle technology than drivers. However, the groups did not differ in their appraisals of risk.
- In both the bicyclist and pedestrian scenarios, drivers indicated that they would trust their driving skills much more than the technology.
- The different road-user groups tended to indicate that the presence of vehicle technology increased crash risk and this increase was largest for the driver group (likely due to their increased confidence (trust) in their driving skills). All groups tended to trust the manual driver more than the vehicle under control of automation.
- Drivers tended to exhibit more optimism about the future progression of capabilities of the technologies compared to the other road users.

IMPLICATIONS

Collectively, the current results highlight some important outcomes, especially concerning the mismatch of user expectations of the technologies and their behaviors in different use cases. In some cases, non-drivers could be exposed to greater risk due to false expectations of the technology (in the case of pedestrians) or through willful perseverance of normal behavior (in the case of bicyclists). Moreover, there were patterns of responses that were indicative of some disconnect between perceived levels of trust and perceived risk, as well as with potential compensatory behaviors.

The current outcomes underscore the need to better understand all road users' expectations of new vehicle technology and their behaviors—not just those of drivers. While some research has found that direct experience can increase people's expectations of automation technology, more work is needed to understand how different sources of information influence user's understanding of technology. It follows that individualized or targeted approaches might be appropriate for different road-user groups.

METHODOLOGY

The survey was created in Qualtrics and designed to be administered via computer or mobile device. The survey included questions related to a variety of demographic items, road-use habits, and access to vehicles and technology, as well as respondents' general understanding of ACC and LKA systems and their function. Two different scenarios were presented in which a vehicle equipped with advanced technologies interacted with other road users. One scenario involved a vehicle-bicycle interaction and the other involved a vehicle-pedestrian interaction. Several questions followed each scenario regarding expectations of system behavior, trust, perceived safety, and responsibility for avoiding crashes. Additionally, respondents were asked to indicate how they would act in such a scenario, whether as the driver or as the other road user. In the final block, respondents were asked to project how the capabilities of the systems would progress in the future.

After quality assurance, a final set of 1,531 people responded to the online survey solicitation. Overall, respondents ranged in age from 18 to 91 (Mean = 39.6 yrs, SD = 17.7) and varied somewhat by gender balance, licensure, and vehicle access.

For the later analyses, road-user type was defined based on the participants' response to the question "On a normal weekday, what is your primary way to get places? If you routinely use more than one of the options below, pick the one that you spend the most time using." Respondents were thus classified as drivers, bicyclists, pedestrians, public transit riders. Additional categories of motorcyclists and scooter/moped riders were too small to include in subsequent analyses.

REFERENCE

Horrey, W. J., Benson, A., Guo, Z., Afifah, F., Hamann, C., & Santiago, K. (2021). *Expectations and Understanding of Advanced Driver Assistance Systems among Drivers, Pedestrians, Bicyclists, and Public Transit Riders* (Technical Report). Washington, D.C.: AAA Foundation for Traffic Safety.