

Attribution Theory and Collisions at Intersections

Technology Transfer Activities

by

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TECHNOLOGY TRANSFER ACTIVITIES

1 Summary of Research Study and Findings

This research investigated the application of attribution theory to assume the opposing drivers' cognitive behavior and performance at a highway intersection. This phenomenon was evaluated by utilizing the second Strategic Highway Research Program (SHRP-2) and National Highway Traffic Safety Administration (NHTSA) data sources. Additionally, the study employed a simulation model to investigate various scenarios.

- From the analysis of the fatal road crash data, it was observed that the age group of 25-34 years old was the most common victim. Middle-aged (25-54 years old) people died more in road accidents than younger (20 or fewer years old) and elderly drivers (65 or more).
- From the comparison of the younger and elderly drivers, it was found that the younger driver (age 20 years or less) had lower fatal collisions than the elderly driver (age 65 or more). The governing reason might be that younger drivers have better perception and attentional demand than older drivers.
- The number of fatal accidents entailed by younger drivers decreases over the year, increasing for elderly drivers.
- It was demonstrated that the number of crashes at the intersection, which involved at least one younger and one elderly driver, was significant. These types of collisions increased from 2011 and peaked in 2017 in the USA.
- This study examined how different age groups' attribution affects driving. Simulation models with younger and elderly drivers were developed to relate the driving attribution on intersections' collisions. From simulations, it was observed that there is a high possibility of collisions when an elderly driver is turning left. In this study, the combination of an elderly driver turning left and the younger driver going straight resulted in 18 collisions. In the case of elderly drivers turning left and default drivers going straight, 17 crashes were observed.
- Rear-end and lane-changing types of crashes were observed while simulating younger and elderly driver behavior at an intersection. So, it can be concluded that driving attribution is more likely to result in rear-end and lane-changing collisions at unsignalized intersections.

2 Outputs

At this time, we have accomplished the goals of this research project. We are planning to disseminate this research activity through a conference presentation and journal article shortly. We have outlined below our plan to disseminate the results of this research project.

2.1 Accomplished Outputs

C²M² Report

Mwakalonge, Judith L.; Gurcan Gomert; Samia Akter; and Saidi Siuhi (2021). *Attribution Theory and Collisions at Intersections*. Center for Connected Multimodal Mobility (C²M²) Tier 1 University Transportation Center (UTC), USDOT.

Journal Article under Review

The team is addressing reviews comments on one journal article titled "Attribution Theory in Traffic Safety" and will resubmit for journal publication.

Conference Article Presentation

Akter, S., Mwakalonge, J.L., Siuhi, S., Mamun, M.H. "Attribution Theory in Traffic Safety", Transportation Research Board Annual Meeting, January 5-15, 2021.

2.2 Future Output

Peer-Reviewed Journal Article

Currently, we are writing three journal articles based on the work we have done so far in this project. These papers will focus on the safety and operational behavior associated with attribution theory.

Conference Poster and Podium Presentation

For any additional work, we plan to present our research at the TRB annual meeting and the UTC conference as well as other conferences, e.g., the Road Safety Simulation conference.

3 Outcomes

The research has produced two important outcomes, which are outlined below:

3.1 Literature Review based Outcome

This research investigated the application of the attribution theory to predict the opposing drivers' cognitive behaviors and performance at highway intersections. This investigation was evaluated by utilizing the Transportation Research Board (TRB), Second Strategic Highway Research Program (SHRP-2), and National Highway Traffic Safety Administration (NHTSA) data sources. From the analysis of the fatal road crash data, it was observed that the driver's age group of 25-34 years old was the most common victim. From the comparison of the younger and elderly drivers, it was found that the younger driver contributed fewer fatal collisions than the elderly driver.

3.2 Simulation-based Outcome

We utilized simulation modeling to investigate the effects of attribution theory under different driving scenarios. From the simulation of the younger and elderly drivers, it was observed that there is a high possibility of collisions when elderly drivers turn left at an intersection. Rear-end and lane-changing crash types were the most observed from the simulation. The key findings confirm elderly and younger drivers have different driving behaviors that could be ascribed to their attribution. These results can assist transportation agencies in developing training and design strategies to better accommodate elderly drivers due to their declined physical and cognitive abilities.

4 Impacts

We hope this research will improve the safety knowledge of the public. We anticipate that this research will have impacts on the safety and awareness programs related to young and older drivers as follows:

- (i) *Transportation safety researchers:* In both crash databases and the simulation environment, this study differences in crash involvement between young and older drivers. This research adds to the body of knowledge and for other researchers to address this study's shortcomings.
- (ii) *Transportation professionals:* From all analysis, it is evident that driving attribution is different between young drivers and older drivers. Transportation professionals can utilize these differences to target safety programs to specific age groups.