International Co-operation on Theories and Concepts in Traffic Safety

A Study of Influence of Passengers on the Older Adults' Driving Behavior

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- Introduction, including research aim and objectives

In Japan, the ratio of accidents involving the older adults is increasing year by year, and will increase to around 30% of all accidents. The reasons for that include 80.6% due to delayed detection and 10.0% due to errors in judgment, etc. It is believed that the decline in the physical and cognitive functions of the older adults leads to violations and accidents. Therefore, various measures have been proposed to reduce accidents involving older adult drivers. The government recommends that "passengers call out to older adult drivers to point out dangerous spots," but the presence of passengers may cause them to lose focus on driving.
Many studies on concentration related to multitasking while driving have been conducted on young people. Haghzare et al. investigate the differences in eye movements of older drivers in automated and non-automated vehicles. In Japan, Matsuura demonstrated the influence of passengers in automobile accidents through observational surveys and statistical analysis of accidents, and found that accidents were more likely to occur when there were no passengers and when there were two passengers, and less likely to occur when there was only one passenger. However, the influence of passengers on the older adults has not been clarified.
Therefore, in this study, we decided to compare driving behavior with and without a passenger and to investigate the influence on driving, which is a multitasking activity.
Therefore, the purpose of this study is to investigate the influence of the presence of passengers on the daily driving behavior of older adult drivers, and to identify the use of driving evaluation by passengers and issues to be addressed.

- Research methodology

A drive recorder and an internal camera were installed in a car owned by the subjects for one month between June and December 2023 to record their daily driving. In those videos, whether the subjects checked their surroundings when turning right and left and passing through crosswalks was recorded by head or eye movements. Specifically, the number of head or eye movements was counted. If the driver checked safety by moving both the head and eyes, it was recorded as a "head movement," and if the driver checked safety by moving only the eyes without moving the head, it was recorded as an "eye movement. The subjects were 10 drivers (all male, mean age 74.9 years, S.D. 2.66 years) whose driving was recorded both with and without a passenger. All passengers were family members. In order to eliminate the influence of tension caused by the installation of the device and bias due to subjects' driving tendencies, data recorded in the latter half of the study period were extracted for 50 minutes per subject for driving without a passenger and for 30 minutes per subject for driving with a passenger, and used for analysis.

- Results

Table 1 shows a comparison of the number of safety checks made when turning right and left and passing through a pedestrian crossing, depending on the presence or absence of a passenger. The "average" of the number of times means "the average number of times observed per intersection or pedestrian crossing. First, when turning left, the driver with a passenger in the vehicle moved his/her head (or both head and eyes) more often to check for safety than the driver with a passenger in the vehicle. On the other hand, when turning right, the driver tended to move only his/her eyes to check for safety more often when there was no passenger in the vehicle, and also when passing through the crosswalk of Ignore No. 1, the driver checked for safety more often when there was a passenger in the vehicle. Although the average number of head movements to check for safety was higher when there was no passenger, Figure 2 show that the 25th percentile, 50th percentile, and 75th percentile of the average number of head movements to check for safety were all smaller when there was no passenger. In other words, the driver tended to move his/her head and eyes more carefully when making a left turn than when making a left turn when there was a passenger in the car. The fact that the number of safety checks by eye movements decreased when a passenger was present indicates that the driver was checking safety more extensively by moving his/her head rather than only by eye movement, and it can be said that the driver was more careful when a passenger was present.

- Discussions

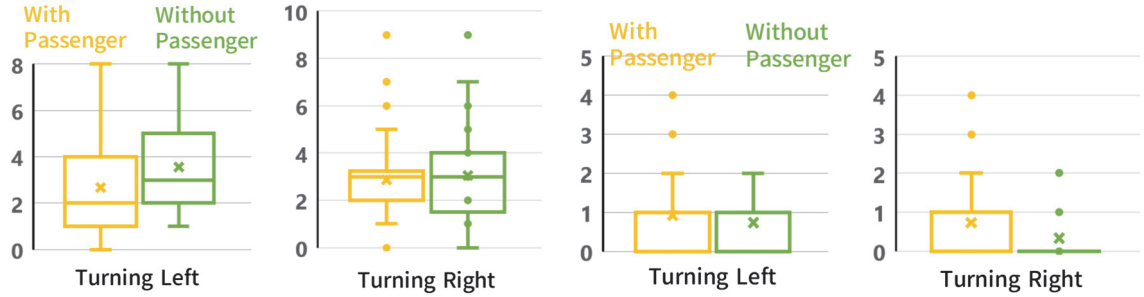
The presence of a passenger was found to increase the number of safety checks accompanied by body movements. In this study, there were no cases in which a passenger gave attention to or called out to the subject about driving, but the presence of a passenger itself can be considered to have an influence on safety confirmation. In the future, we will increase the number of samples and conduct a more detailed analysis using speed data to determine whether the safety confirmation behavior was due to the increased safety awareness caused by the presence of passengers or whether it was a compensatory action for the loss of concentration due to conversation with passengers. This analysis is expected to contribute to the proposal of specific safety improvement measures.

Figure-1 Example of drive recorder video

Table-1 Average (and standard deviation) of the number of checking during driving with and without a passenger

	Turning Left			Turning Right			Pedestrian Crossing		
Passengers	Without (N=95)	With (N=23)		Without (N=74)	With (N=21)		Without (N=73)	With(N=21)	
Head movement	2.7 (1.8)	3.6 (2.0)	**	2.9 (1.7)	3.0 (2.1)		0.6 (0.9)	0.3 (0.6)	*
Eye Movement	0.9 (1.0)	0.7 (0.9)		0.7 (1.0)	0.3 (0.7)	*	0.6 (0.8)	0.5 (0.8)	
Number of movements	3.6 (1.8)	4.3 (1.7)	*	3.6 (1.9)	3.4 (2.0)		1.2 (1.1)	0.7 (1.0)	**

**: 5% statistically significant, *: 10% statistically significant



Head Movement Eye Movement

Figure-2 Frequency distribution of head and eye movements

References

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