

1. Introduction

A verbal input function is being installed on car navigation and other on-vehicle information equipment. Although some evaluation methods for the safety of verbal interaction during driving are found among studies related to portable telephones, no conclusive method has yet been established.

2. Outline of the Present Evaluation Method

The present method evaluates safety with the reaction time for taking necessary action upon recognizing changes in surrounding conditions. Actually, two sets of two vertically arranged LEDs are provided on the left and right in front of the driver's seat (**Fig. 1**) and either one of the four LEDs lights up at intervals of several seconds. The subject of the test judges the position of the lit LED, whether upper or lower, and answers by using the upper or lower switch. The subject's reaction time is then analyzed for evaluation.

3. Experiment

Verbal interaction with on-vehicle equipment is simulated using memory tasks in the verbally answering output voice mode. Reaction times are compared depending on the presence of verbal interaction. Four male subjects in their thirties drive the actual vehicle in the test on a road within their own premises. Two different types of memory tasks are prepared for them.

4. Results

Fig. 2 shows the distribution of reaction time by subject. The upper diagram shows the result while driving only. The lower diagram shows a case when verbal interaction is carried on while driving. It has been verified that carrying on verbal interaction causes : (1) An increase in the average reaction time, and (2) An increase in the ratio of delayed reaction trial. We confirmed that the data can be used as indexes. **Fig. 3** represents the summary of the results from the four subjects. The upper diagram shows the

average reaction time and the lower diagram the ratio of delayed reaction trial. Since the former presents no significant difference at 5% while the latter shows a significant difference at 5%, it is understood that it is better to use the ratio of delayed reaction trial of the latter case for the evaluation index.

5. Conclusion

We have clarified that we can evaluate the effect of verbal interaction while driving using the delayed reaction trial ratio¹⁾. In the future, we intend to evaluate actual verbal interaction and verify the effectiveness of the index, simultaneously studying how to effect verbal interaction more safely.

Reference

- 1) Kojima, S. and three co-authors: "Development of an Evaluation Method for Verbal Interface while Driving", Society of Automobile Engineers Lecture Meeting Proc. No. 91-99(1999), 17-20 (Report received on Jan. 31, 2000)

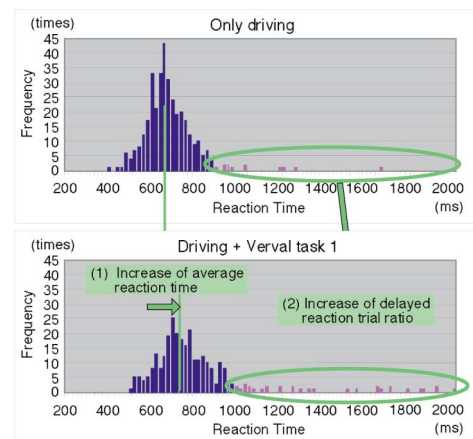


Fig. 2 Variation of reaction time distribution.

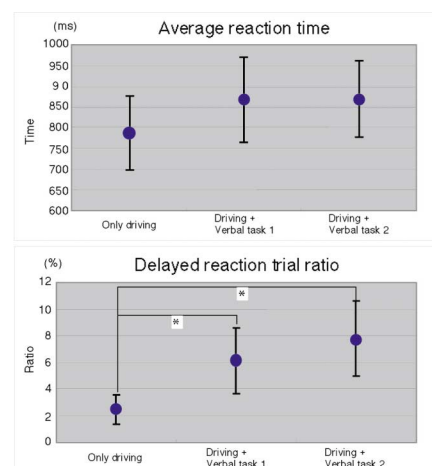


Fig. 3 Comparison of average reaction time and delayed reaction trial ratio (N=4). *:p<0.05
R&D Review of Toyota CRDL Vol. 35 No. 2 (2000. 6)
Copyright (C) 2000 Toyota Central R&D Labs., Inc.

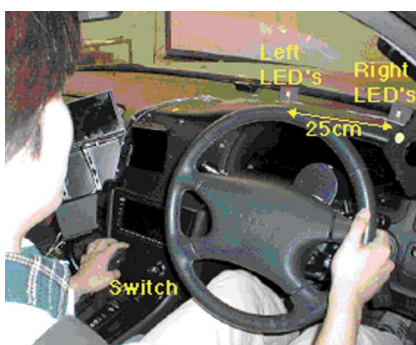


Fig. 1 Experimental apparatus.