Summary Report

Human Factors

The Human Factors Research Program addresses human performance-related issues that affect highway system design. Current human factors research thrusts are in the areas of Highway Safety and Intelligent Transportation Systems (ITS).

FHWA is placing special emphasis on the U.S. trend toward increasing numbers of older drivers and implications of this trend on highway safety and ITS design. Human factors research products include highway system design guidelines and handbooks based upon empirical human performance data collected in the laboratory and in controlled, on-the-road tests.

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TRAFFIC OPERATIONS CONTROL FOR OLDER DRIVERS AND PEDESTRIANS

Older drivers appear to have a disproportionate number of accidents at intersections, particularly where they are performing left-turn maneuvers. Previous studies have investigated the roles of useful field of vision (UFOV), attention-related deficits, and changes in visual search as contributing factors in older driver intersection accidents. Research has shown wide variations in older driver and pedestrian performance. The purpose of this investigation was to determine which intersection operational characteristics could be altered to accommodate age-related changes. Two key driver issues were examined in order to identify the specific older driver problems and then to make recommendations for changes to current standards.

Left-Turn Signalization Comprehension Study

Method

The purpose of this study was to determine how well older drivers understand the various configurations of "protected" (the driver has right of way to make the left turn) and "permitted" (the left-turn vehicle must yield to oncoming traffic) left-turn signals that are currently in use. These included the ***Manual on Uniform Traffic Control Devices*** (MUTCD) standard protected and permitted left-turn arrangements with a 4-lens vertical stack, a 5-lens vertical stack, and a 5-lens doghouse arrangement. The permitted configurations used in Delaware (flashing red arrow), Michigan (flashing red ball), and Washington State (flashing yellow ball), and a standard 3-lens configuration were all used.

This paper-and-pencil test used two illustrations per signal arrangement, including the intersection. The first illustration was used to depict the initial lighting signal configuration, the second illustration indicated the same intersection with a changed light sequence (see figure 1). Subjects were asked to fill in the blanks from the choices presented regarding what the drivers in each of the lanes should do. Choices included: (1) stop or remain stopped; (2) proceed straight; (3) proceed straight or turn right; (4) turn left when there is a large enough gap in oncoming traffic; (5) turn left without stopping because you have the right of way; (6) stop, but turn left when there is a large enough gap in oncoming traffic; and (7) stop, but turn right when there is a large enough gap in oncoming traffic. Some of the scenes had separate left-turn signals, while others had shared signals. MUTCD regulatory sign Rl0-12 [Left Turn Yield on Green (ball)] was added to some scenes depicting several of the permitted left-turn configurations.

Younger (under age 65, n=121) and older (over age 65, n=126) licensed drivers participated in this study. Subjects were tested in Maryland, New York State, and Virginia.

Results

Researchers found that older drivers do not understand the protected/permitted left-turn signalizations as well as younger drivers do. More importantly, neither group had a full understanding of left-turn signalization. Given this fact, researchers concluded that it would be inappropriate to specifically target countermeasures for older driver problems with signalization. They recommended that efforts be directed toward improving the comprehension levels of the entire driving population for intersection signalization.

Traffic Signal Responses and Stopping Behavior of Older Drivers

Method

A controlled field study was conducted using an instrumented vehicle to investigate the decision-reaction times and decelerations of younger and older drivers. Subjects drove on a closed course at 48 km/h (30 mi/h) where they encountered three experimenter-controlled traffic signals. They drove this "loop" two times. Subjects had been instructed to behave as they normally would (stop or go through). On the third loop, subjects were asked to drive **32 km/h (20** mi/h) and to stop if the light turned from green to yellow. On the fourth and fifth loops, the experimenter asked the subject to resume driving 48 km/h (30 mi/h), but to stop if the light changed from green to yellow.

Results

There were no significant differences between younger and older drivers in this study. The decision-reaction times were comparable, and similar numbers of drivers in both groups stopped on the yellow phase in the first two loops. Decelerations of younger and older drivers were also comparable when drivers were stopping for a traffic signal. Based on these findings, the investigators determined that it is not necessary to change yellow signal phase timing in order to accommodate older drivers.

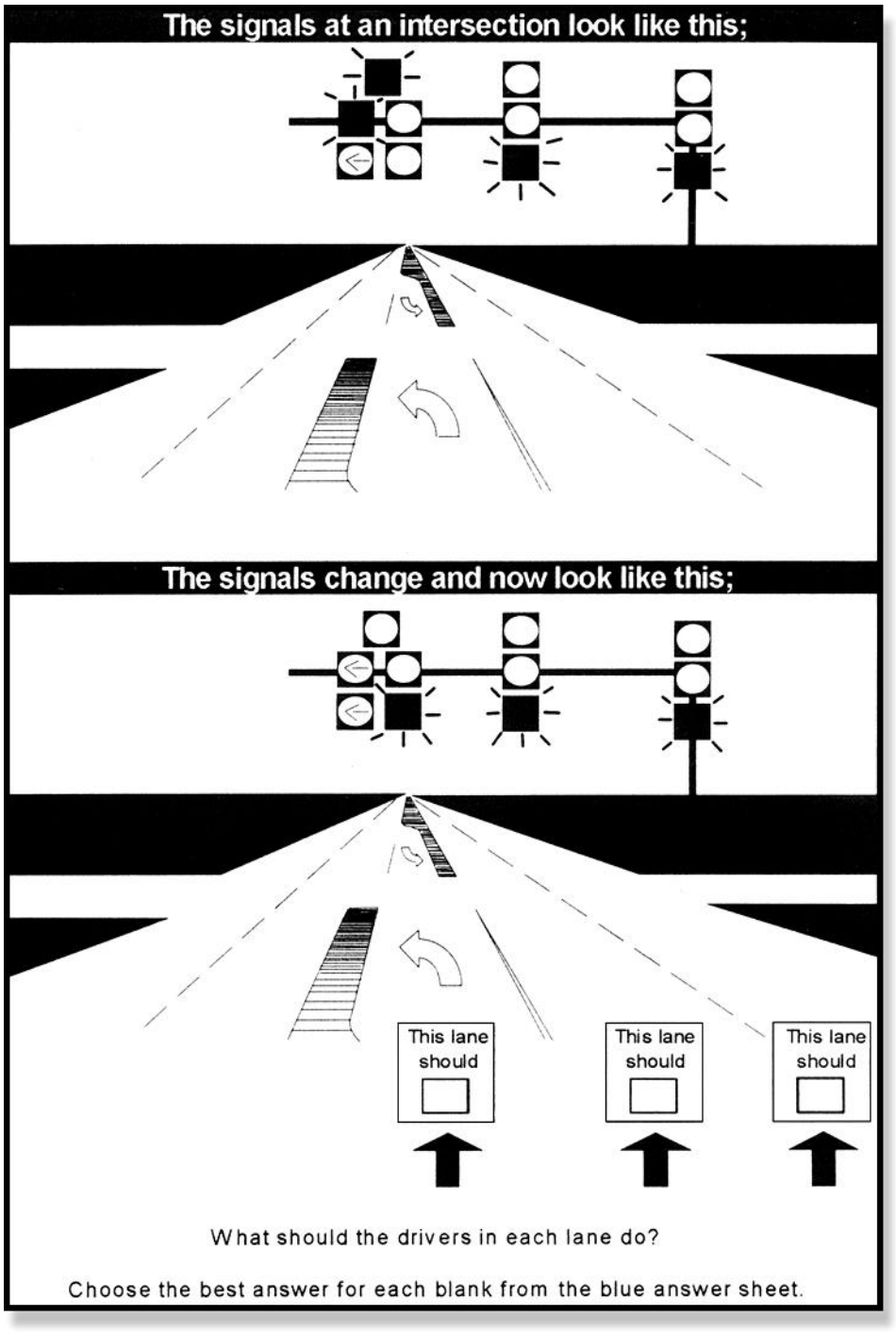

Figure 1. Sample page from questionnaire.

For More Information

A full report on this subject is available from the FHWA R&D Report Center, phone no. 301-577-0818.

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This research was conducted by the the Center for Applied Research. For more information, contact Howard Bissell, HSR-30, phone number 703 285-2428.

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