

STUDY: Crash Avoidance Warning System Human-Machine Interface (HMI) Research STERLING IRB ID: DATE OF IRB REVIEW:

Under the Paperwork Reduction Act, a Federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a current valid OMB Control number. The OMB Control Number for this information collection is **2127-NEW (expiration date: MM/DD/YYYY)**.

The National Highway Traffic Safety Administration (NHTSA) has proposed to perform research involving collecting information from the public as part of a multi-year effort to learn about human-machine interface (HMI) characteristics for systems designed to aid drivers in avoiding vehicle crashes. This research will examine refining the HMI for a crash avoidance warning system. It will also support NHTSA in understanding the potential safety impacts of the crash avoidance warning system HMI characteristics, potential rulemaking, and NHTSA's vehicle safety efforts.

The average amount of time to complete the survey is 15 minutes. All responses to this collection of information are voluntary. If you have comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden send them to Information Collection Clearance Officer, National Highway Traffic Safety Administration, 1200 New Jersey Ave, S.E., Washington, DC, 20590.

**Post-drive Questionnaire: Crash Avoidance Warning System
Human-Machine Interface (HMI) Research**

Experimenter will respond to these yes/no questions:

1. Visual Signal:

- a. Did the system alert/warning use a visual signal? Yes / No
- b. *Definition:* A visual signal refers to an illuminated symbol or text presented by the system to inform you of a condition.

2. Auditory Signal:

- a. Did the system alert/warning use an auditory signal? Yes / No
- b. *Definition:* An auditory signal refers to a beep or tone presented by the system to alert you.

3. Haptic Signal:

- a. Did the system alert/warning use a haptic (tactile) signal? Yes / No
- b. *Definition:* A haptic signal refers to a vibration presented by the system to notify you.

Conditional Sections: Only the sections that were answered "Yes" to the above questions will be provided to the participants to complete.

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Crash avoidance systems can have alerts inform a driver of a possible danger and can have warning that inform a driver of an imminent danger. The questions below apply to the particular systems you drove with today, and alerts or warning associated with that system. Answer the following questions thinking about the crash avoidance technology that you just experienced. For each question, please respond using the rating of a scale of 1 to 7, in which 1 = Strongly Disagree and 7 = Strongly Agree.

(1) Visual Signal Evaluation

Definition: A visual signal refers to an illuminated symbol or text presented by the system to inform you of a condition.

Detection

1. The visual signal quickly captured my attention.

Understanding

2. The visual signal was easy to understand.

Action

3. The visual signal prompted me to take timely action (e.g., braking, steering) to avoid a potential crash or lane departure.

Acceptability

4. The design of the visual signal was acceptable.
5. The design of the visual signal aligned with my expectations.
6. The visual signal did not cause unnecessary distraction.
7. The physical location of the visual signal was intuitive.

Optional Comments:

If you have any additional comments about the visual signal (for example, issues regarding frequency or placement), please describe them below.

(2) Auditory Signal Evaluation

Definition: An auditory signal refers to a beep or tone presented by the system to alert you.

Detection

1. The auditory signal quickly captured my attention.

Understanding

2. The auditory signal was easy to understand.

Action

3. The auditory signal prompted me to take timely action (e.g., braking, steering) to avoid a potential crash or lane departure.

Acceptability

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4. The design of the auditory signal was acceptable.
5. The design of the auditory signal aligned with my expectations.
6. The auditory signal did not cause unnecessary distraction.
7. The auditory signal that did not cause unnecessary discomfort.
8. The volume of the auditory signal was appropriate (Scale: Not too loud or too soft).

Optional Comments:

Please share any additional observations regarding the auditory signal (e.g., clarity, timing, or volume issues).

(3) Haptic Signal Evaluation

Definition: A haptic signal refers to a vibration presented by the system to notify you.

Detection

1. The haptic signal quickly captured my attention.

Understanding

2. The haptic signal was easy to understand.

Action

3. The haptic signal prompted me to take timely action (e.g., braking, steering) to avoid a potential crash or lane departure.

Acceptability

4. The design of the haptic signal was acceptable.
5. The design of the haptic signal aligned with my expectations.
6. The haptic signal did not cause unnecessary distraction.
7. The haptic signal that did not cause unnecessary discomfort.

Optional Comments:

If you have any further comments regarding the haptic signal, please note them here.

(4) Overall System Evaluation

Regardless of which signal modalities were present (i.e., visual, auditory, haptic), please consider your overall experience with the crash avoidance alert/warning system and indicate your level of agreement with each statement:

Perceived Safety & Confidence

1. The system increased my overall sense of safety during my drive.
2. I felt confident in the system's ability to alert/warn me to potential hazards.

Overall Experience

3. The design and performance of the system were satisfactory.
4. The system enhanced my overall awareness of driving hazards.

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5. The system provided clear and actionable information during my drive.
6. The system did not provide unnecessary alert/warnings at inappropriate times.

Effectiveness & Reliability

7. I would be comfortable relying on this system in diverse driving conditions.
8. The overall design of the combined alert/warning signals (visual, auditory, and/or haptic) was intuitive.
9. The overall design of the combined alert/warning signals (visual, auditory, and/or haptic) was acceptable.

Optional Comments:

Please share any additional thoughts or suggestions regarding the overall performance of the system.

1	2	3	4	5	6	7
☐	☐	☐	☐	☐	☐	☐
Strongly Disagree	Moderately Disagree	Somewhat Disagree	Neither Disagree nor Agree	Somewhat Agree	Moderately Agree	Strongly Agree