MARYLAND DEPARTMENT OF TRANSPORTATION

STATE HIGHWAY ADMINISTRATION

RESEARCH SUMMARY

Potential Effects of Composition and Structure of Dynamic Message Sign Messages on Driver Behavior and Their Decision to Use Freeway Incident Traffic Management (FITM) Routes

WHAT WAS THE NEED?

Dynamic Message Signs (DMS) are used for traffic and incident management and travel time information. While DMS are designed to provide important information, some argue that they may distract drivers and cause them to reduce speed which, may increase crash risks. Several studies have examined the effectiveness of DMS and travelers' response using surveys or available technologies (e.g. Bluetooth sensors, traffic detectors). However, drivers respond to DMS messages differently and their reaction to the displayed messages will affect the usefulness of these signs.

WHAT WAS THE GOAL?

The goal of this study was to examine the effect of DMS message content, type, length, composition, and structure on drivers' behavior and to develop a framework for DMS usage based on best practices.

WHAT DID THE RESEARCH TEAM DO?

The research team reviewed the literature and current practices in the U.S. and in other countries, to provide a comprehensive comparison of content, type, length of message, and standards of DMS and their effect on driver behavior.

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The research team also investigated the potential route choice and compliance behavior using a driving simulator and survey questionnaires. The diversion rate, a measure of the ability of a displayed message(s) to divert traffic in a given direction, for different message types was also investigated. A 155-square-mile (400-km2) road network in Maryland was simulated and different scenarios were considered. A total of 390 simulation runs were conducted by 65 participants from diverse socioeconomic backgrounds.

WHAT WAS THE OUTCOME?

Single-phase messages (i.e. a single message on one screen) were always preferable to two-phase messages (i.e. the screen will change every few seconds to display two different messages), because motorists understand the messages faster. For example, two-three units of information (a unit of information is generally one to three words of text on one line) on a DMS led to an increase in overall speed while six – seven units of information led to a decrease in speed while approaching and passing a DMS). A route diversion analysis, a route choice analysis, and a compliance analysis identified the different DMS that have a high likelihood of influencing these behaviors. Lane closure and delay information with advisory messages were found to be the most influential DMS regarding diversion. Color-coded DMS and DMS with "avoid route" advice were the top contributors to route choice decisions and DMS compliance. The pre/post simulation surveys and driving simulation results confirm the findings of the effectiveness of the color blind-friendly, color-coded DMS over the others.

HOW WILL SHA USE THE RESULTS?

The results of this research indicate that more complex message structures (i.e. more than a single phase) have negative impacts on driver behavior and vehicle operating speeds. MDOT SHA will use the results of this study to develop simpler, but effective message structures. These results will also influence the method by which DMS messages are structured for FITM plan implementation and detours around roadway events that cause non-recurring congestion along highway corridors in Maryland.

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