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OFFICE OF TRANSPORTATION SYSTEM MANAGEMENT

TECHNICAL SUMMARY

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PROJECT COST:

\$218,660



Eye-tracking glasses monitored whether drivers fixated their attention on speed enforcement methods.

Speed Cameras Not a Driver Distraction in Work Zones

What Was the Need?

Driver behavior in work zones is a major concern for MnDOT and other transportation agencies. More than 100 road construction workers are killed in U.S. work zones each year, and there were more than 87,000 crashes in work zones nationwide in 2010. While work zone speed limits are imposed to protect worker safety, many drivers exceed those speed limits. Past research has found minimal speed reduction when only posting speed limit signs.

Police enforcement in conjunction with speed limits is currently the main method of reducing work zone driver speeds in Minnesota. While this practice is effective, reducing speeds by approximately 10 to 15 mph, it is not practical to staff every work zone with law enforcement officers.

As an alternative, some states have implemented automated speed enforcement cameras in work zones. While these devices are not currently permitted in Minnesota, some groups have expressed interest in the possibility of implementing them in the state. There have been studies related to the effectiveness of ASE on driver speeds, but these studies have not evaluated how ASE cameras affect where and for how long drivers direct their attention.

What Was Our Goal?

The goal of this project was to conduct a human factors study to investigate the impact of ASE, police enforcement and ASE with dynamic speed display signs on driver speeds and attention in work zones.

What Did We Do?

Researchers first conducted a literature review on work zone safety and the effectiveness of work zone crash countermeasures, including ASE.

Researchers used the HumanFIRST Portable Driving Environment Simulator at the University of Minnesota to replicate work zones on U.S. Highway 169 between Jordan and Belle Plaine, Minnesota. The study included 20 participants from each of three age groups (18-30, 41-53 and 63-77) who drove the simulated route four times each. Each time, the work zone included a different form of speed enforcement, presented in random order: police enforcement, ASE cameras, ASE cameras with dynamic speed display signs and a control with no enforcement.

During the test, participants wore glasses that tracked their eye movements to determine how much attention they allocated to various areas of interest, such as their speedometer, workers or signs.

The simulation included a lead vehicle that participants were instructed to follow and another vehicle that overtook the driver after about one minute. Researchers instructed participants to maintain a close but safe following distance to this vehicle, but to obey the 55 mph speed limit. However, the overtaking vehicle's speed varied from 40 to

This research found that automated speed enforcement cameras in work zones are not a source of driver distraction. It also revealed differences in work zone driving behavior: Older drivers were least able to follow another vehicle closely, while younger drivers were least likely to monitor their speed carefully.

“A lot of different parties have different thoughts about the use of ASE. MnDOT doesn’t have a stance on the issue, but we wanted to collect and share facts to inform any discussion that occurs in Minnesota.”

—**Ken Johnson**,
Work Zone, Pavement
Marking and Traffic
Devices Engineer, MnDOT
Office of Traffic, Safety
and Technology

“There’s been some suggestion that ASE would make drivers fixate on speed and pay less attention to the road, which could increase rear-end collisions. Drivers in this test, however, were not preoccupied by their speedometer.”

—**Nichole Morris**,
Research Associate,
HumanFIRST Laboratory,
University of Minnesota

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The HumanFIRST Portable Driving Environment Simulator modeled a nine-mile stretch of roadway with work zones. Participants drove the route four times, with a different simulated method of speed enforcement each time.

70 mph. This simulated the travel speed disruptions that are experienced in real-world work zones as well as the pressure drivers can feel to match other drivers’ speeds, even when they exceed the speed limit.

Participants were also given a secondary task involving searching for and pressing specific buttons on an in-vehicle screen to simulate common driving distractions like operating a radio. This task was voluntary, and drivers chose when and how many times to perform it.

What Did We Learn?

The eye movement detection test demonstrated that ASE did not prove to be a source of distraction by causing drivers to pay too much attention to their speedometer or look for enforcement vehicles or other potential fixations.

Differences in driver behavior based on the type of enforcement were generally fairly small and not statistically significant. Driver age, however, had a significant impact on the test subject’s performance and behavior during the test. Older drivers were slow to respond to the lead vehicle’s speed changes and less able to stay with the lead vehicle. They also did not engage with the secondary task much, suggesting that they were devoting all of their cognitive resources to driving.

Conversely, younger drivers were best at keeping pace with the lead vehicle, although they did not monitor their own speed as closely. They also engaged with the secondary task the most. This distraction did not impact their performance, but the test did not include any sudden shifts in speed that would have been much more likely to cause problems to a distracted driver.

Most research identified by the literature review suggests that ASE is effective at reducing speeds and speed differentials in work zones. It is a controversial tool, although at least one survey found that a majority of Minnesota drivers would support its use in work zones.

What’s Next?

MnDOT has taken no stance on whether ASE is advisable and practical for implementation in Minnesota. However, the information from the literature review and the test results will be shared with stakeholders, including contractors, legislators and MnDOT management, so that any future discussions can be informed by the most accurate information possible.

This Technical Summary pertains to Report 2016-06, “Examining the Impact of ASE (Automated Speed Enforcement) in Work Zones on Driver Attention,” published January 2016. The full report can be accessed at mndot.gov/research/TS/2016/201606.pdf.