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Pilot Tests of a Seat Belt Gearshift Delay on the Belt Use of Commercial Fleet Drivers

Wearing a seat belt has been shown effective in avoiding or reducing serious injury due to traffic crashes. While belt use rates in the United States increased from under 60% in 1994 to 83% in 2008, a substantial number of drivers still drive unbelted. Current efforts to increase seat belt use focus primarily on high-visibility enforcement campaigns, public education, and seat belt reminder systems. NHTSA investigated a novel engineering approach using a gearshift delay to increase belt use among commercial drivers in the United States and Canada.

A car with automatic transmission cannot shift into gear if the vehicle senses that the brake lights are not lit, meaning that the driver must have a foot on the brake pedal. This safety feature was designed to prevent vehicles from accelerating unintentionally after being placed into *drive* or *reverse*. For this study, a relatively simple change to the software code allowed the system to make an additional check before the vehicle can be placed into drive. Specifically, at the same time as the brake light check occurs, the vehicle's computers checked to see if the driver was belted. If the driver was not belted, a gearshift-seat belt delay system prevented the driver from shifting out of *park* for several seconds.

The timing of the reminder system was designed to prompt drivers before they started driving to avoid the possibility of stimulus overload as they negotiated their way into traffic, a trip segment associated with high cognitive demand. This timing should allow most drivers sufficient time to buckle up, thereby avoiding the prompt. It also had the safety benefit of prompting unbuckled drivers before they placed their vehicles in motion.

Method

The seat belt-gearshift system was tested with a fleet of 60 U.S. and 60 Canadian vehicles from a variety of government agencies and the private sector. Vehicles were instrumented with the gearshift-seat belt delay system and data loggers to record seat belt use. Belt use was monitored across three phases: Baseline-1, Intervention, and Baseline-2. Each phase lasted several weeks and the delay was active only during the intervention. Half of each fleet was randomly assigned to receive a fixed (8-second) or variable (8-second average, 4- to 19-second range) gearshift delay.

Results

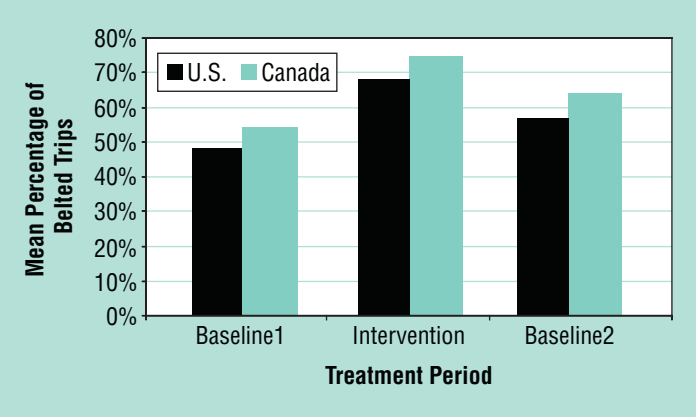
As expected, seat belt use increased during the intervention phase when the gearshift delay was active. In both fleets, belt use was significantly higher during the intervention period relative to Baseline-1. There were no differences in belt use between delay types (fixed versus variable). Table 1 shows average belt use, with standard deviations in parentheses, for the three study phases. Belt use at the intervention phase increased an average of 20 percentage points for the treatment groups. Belt use appeared to decline during Baseline-2, but the drop was not statistically significant. In three of the four groups, belt use remained higher than at the beginning of the study.

Table 1. Percent of Belted Trips per Day, by Country and Study Phase

	Baseline-1	Intervention	Baseline-2
United States			
% Belted Trips			
Fixed	41.7(28.2)	69.9(27.1)	61.6(33.9)
Variable	54.4(27.9)	64.8(29.9)	51.9(31.4)
Canada			
% Belted Trips			
Fixed	51.92(33.75)	72.4(23.38)	61.0(31.4)
Variable	55.88(26.98)	76. 6(17.40)	67.4(22.6)

Figure 1 presents these results in graphic format. In the United States and Canada, belt use increased significantly when drivers were faced with experiencing the gearshift delay when they did not buckle up.

Figure 1. Seat Belt Use by Treatment Period and Country



Unintended Belt Removal

An example of an unintended behavioral adaptation would be if drivers removed their seat belts more during the intervention phase than during the first baseline. The data logger, however, recorded very few instances of drivers removing their seat belts during trips. During the Baseline-1 and Intervention periods, seat belt removal averaged less than 1% for the United States group. Canadian commercial drivers removed their belts slightly more often than U. S. drivers, but removal rates were still very low, ranging from 4.2% to 1.6%, across the different conditions of the study. These percentages clearly indicate that the intervention phase was not associated with a higher removal rate than the baseline periods; drivers who buckled initially tended to remain buckled.

Commercial Drivers' Reactions

The study ended with a focus group asking commercial drivers for their feedback about the gearshift delay systems. Topics of interest included perceived system effectiveness, ability to bypass, usefulness for teenage drivers, annoyance, and acceptance. While focus groups do not produce representative data, most drivers indicated that the system increased their belt use, although a few drivers reported that the system decreased or did not alter their seat belt use. All but one driver felt the device would be something that parents would want for teenage drivers. Most drivers reported that the system was annoying because it required them to wear their seat belts when moving the vehicle on-site, such as at loading docks, or while parking, or on very short trips. Several drivers thought it would be useful to have a device that only required seat belt use when they traveled over a certain speed. In general, drivers felt the system was acceptable for long trips.

Conclusions

There was a clear increase in seat belt use—an average of 20 percentage points—when the gearshift interlock was active for both groups of commercial drivers. Further, drivers who buckled during the intervention period were no more likely to remove their seat belts than those who buckled during the first baseline. The range of effects varied across drivers and across the treatment periods. Drivers' seat belt usage ranged from no response during treatment, to dramatic increases during the treatment period only, to maintenance of the change after the gearshift delay was inactivated.

All but one driver felt the device would be useful to increase the seat belt use of teenage drivers. Teen drivers may be an appealing target population for this technology, as this population buckles less frequently and crashes more often than older drivers. Parents may view such a system as an attractive means of ensuring their children are buckled. Some States' graduated driver licensing laws have consequences for teen drivers who drive unbuckled during the initial licensure phases, but these laws are difficult to enforce.

Vehicle fleet owners may also favor a gearshift delay to ensure a higher degree of employee compliance with their companies' seat belt use policies. Many fleet owners realize that injury reductions result from increased compliance with seat belt policies. This study indicates that the gearshift delay increased such compliance and was acceptable.

The technology may also have potential in combination with current "enhanced" visual and auditory seat belt reminders, which have been linked with a significant increase in seat belt use (NHTSA, 2007).

How to Order

Download a copy of *Pilot Tests of a Seat Belt Gearshift Delay on the Belt Use of Commercial Fleet Drivers* (49 pages) from www.nhtsa.gov or write to the Office of Behavioral Safety Research, NHTSA, NTI-130, 1200 New Jersey Avenue SE., Washington, DC 20590, fax 202-366-7394.

Reference: NHTSA. (2007). *The Effectiveness of Enhanced Seat Belt Reminder Systems.* DOT HS 810 844. Washington, DC: National Highway Traffic Safety Administration.

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