U.S. Department of Transportation
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TRAFFIC TECH
Technology Transfer Series

NHTSA

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Teen Driver Monitoring Technology

Background

Data show that crash rates during teens' pre-licensing, adult-supervised driving practice are low, then increase about tenfold when young drivers begin to drive independently. In-vehicle technologies aim to continue this low-risk interval once teens begin driving on their own by providing feedback to drivers as well as to parents. Some of these devices provide feedback through video recording triggered by sensors indicating potentially unsafe driving while other devices provide feedback based just on sensors. Previous studies have shown that monitoring devices of both types reduce teens' unsafe driving behaviors, particularly when parents were informed of their teens' risky driving behavior. However, some parents have reported being hesitant to install monitoring devices, particularly those that include video, due to concerns about teens' privacy and deterioration of trust.

Objectives

While some of these technologies have shown success in reducing risky driving behaviors such as hard turning and abrupt braking, as well as speeding and seat belt nonuse, several unanswered questions remain. Two related studies collected and analyzed data from newly licensed teen drivers to address the following research questions:

1. Do technology-based interventions reduce unsafe driving behaviors of newly licensed teen drivers when compared to a control group without intervention?
2. Does including video with the intervention produce a larger effect than a similar, non-video intervention?
3. Do the effects of technology-based interventions vary across newly licensed teens of different ages and previous driving experience?

Method

The first study recruited newly licensed drivers and their parents from a rural site in eastern Iowa and from a suburban site, Montgomery County, Maryland. The final analyses considered data from 60 teen drivers (32 rural and 28 suburban). Teens were randomly assigned to one of three conditions: video feedback (21 participants), non-video feedback (19 participants), or a control group with no feedback (20 participants).

The second study recruited newly licensed drivers and their parents from eastern Iowa in three participant groups. The final analyses considered data from 90 drivers in three groups: Drivers 14.5 to 15.5 years old receiving special minors' licenses for travel to and from school activities (32 participants), drivers 16 and older who had previously held minor's licenses (30 participants), and drivers 16 and older who had not previously held a license (28 participants). Drivers in each group were randomly assigned to either video feedback or no feedback with the groups evenly split between treatment (feedback) and control (no feedback).

Technicians installed an event-triggered video data recorder in each teen's vehicle. When an event exceeded predetermined positive or negative acceleration thresholds, the system captured the eight seconds before and four seconds after the event. Coders classified each 12-second video segment as either:

- An unsafe driving event that warranted feedback;
- An appropriate response; or
- An invalid event (e.g., hitting a pothole).

Video event recorder

Both studies began with four weeks of baseline data collection when all teens drove without feedback. This was followed by an intervention phase of four 4-week segments during which participants (teens and parents) assigned to the intervention conditions received feedback on the teen's triggered events. The control group continued to drive without feedback. The second study also contained a four-week follow-up with no feedback for any of the participants. Analysts calculated the unsafe driving events per 1,000 miles for each teen for each of the four week segments.

Teens received real-time feedback from LEDs on the event recorders that flashed immediately after an event was triggered. Parents received feedback through weekly reports that described each unsafe driving event triggered that week as well as seat belt use for the driver. For participants with video feedback, parents also received a CD containing the teen's unsafe driving videos for the week as well as reports of unsafe behavior observed by the coders such as driver cell phone use, failing to stop for traffic signs or signals, and unbelted passengers. For the control group, neither teens nor parents received any feedback.

Results

Data recorders captured 5,675 events in the first study, of which 3,332 or 58.7% indicated unsafe driving with either an unsafe event or behavior. The second study captured 6,671 events of which 5,448 or 81.7% indicated unsafe driving. The following table summarizes the event coding.

Summary of Events by Event Type

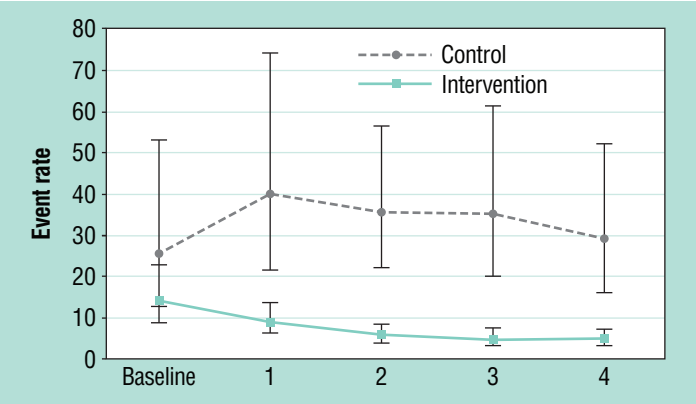
	Study 1		Study 2	
	Events	Percent	Events	Percent
Unsafe event including crash and near-crash	2,542	44.8%	5,233	78.5%
Invalid event with unsafe behavior	790	13.9%	215	3.2%
Appropriate response	69	1.2%	60	0.9%
Other invalid events	2,274	40.1%	1,163	17.4%
Total	**5,675**	**100%**	**6,671**	**100%**

Study 1

Relative to the baseline phase (first 4-week segment), the event rate for teens receiving feedback decreased over time. The average event rate during intervention segment 1 was lower than the baseline rate ($p < 0.05$), and segments 2, 3, and 4 were significantly lower than the rates during baseline and segment 1 ($p < 0.01$).

During the intervention phase, teens receiving feedback had significantly fewer unsafe driving events than those in the control condition with an average of 6.1 unsafe events per 1000 miles driven versus 35.3 ($p<0.01$). Event rates for the video and non-video feedback groups did not differ significantly.

Unsafe Driving Events per 1,000 Miles With and Without Feedback (Error Bars Indicate 95% Confidence Intervals)



Study 2

The event rate for teens receiving feedback significantly decreased relative to the baseline for the two groups of drivers 16 and older ($p<0.05$), but there was not a significant difference for the group with the special minor's license. During the intervention phase, teens receiving feedback had significantly fewer unsafe driving events than those in the control condition across all three participant groups.

Unsafe Driving Events per 1,000 Miles With and Without Feedback for Three Participant Groups

Participant Group	Event Rate (Intervention)	Event Rate (Control)	P-Value for Difference
School	6.4	35.4	<0.01
Inexperienced	11.3	45.7	<0.01
Experienced	8.4	20.3	<0.05

Discussion

These studies indicate that the effects of providing feedback were robust; teen drivers who were provided with feedback about their unsafe driving behaviors reduced their rates of unsafe driving events compared to those who did not receive feedback. The first study found that both video and non-video feedback interventions reduced unsafe driving behaviors to a similar degree for two diverse groups of newly licensed teen drivers. This finding suggests that video feedback is not necessary to reduce unsafe driving and could address some of the concerns among parents about privacy and trust. The second study found that young drivers who received video-based feedback, regardless of their age or level of driving experience, had lowers rates of unsafe driving events than did those who did not receive feedback.

A number of considerations may limit the generalizability of these findings to the wider population of teen drivers. Teens willing to have data collection devices installed in their vehicles may not represent all newly licensed teen drivers. Similarly, not all parents are willing to have such a device installed in their teen's vehicle. Finally, nearly all the teens in these studies obtained licenses as soon as they were eligible. Many teens opt to wait until they are older to begin driving.

Conclusion

These studies found that feedback interventions reduced unsafe driving behaviors among teens compared to those without feedback under a variety of conditions. Teens receiving feedback had rates of unsafe driving ranging from 1/6 to 1/3 times the rates of those without feedback.

How to Order

Download the final reports *Video and Non-Video Feedback Interventions for Teen Drivers* (Report No. DOT HS 812 291) prepared by Westat, Inc., and the University of Iowa and *Age Versus Experience: Evaluation of a Video Feedback Intervention for Newly Licensed Teen Drivers,* prepared by the University of Iowa, at www.nhtsa.gov.

U.S. Department of Transportation
National Highway Traffic Safety Administration
1200 New Jersey Avenue SE., NPD-320
Washington, DC 20590

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