Use of Video Feedback in Rural Teen Driving: An Intervention Study

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ABSTRACT

Teen drivers are at high risk for car crashes, especially during their first years of licensure. Providing novice teen drivers and their parents with a means of identifying their risky driving maneuvers may help them learn from their mistakes, thereby reducing their crash propensity. During the initial phase of learning, adult or parental supervision often provides such guidance. However, once teens obtain their license, adult supervision is no longer mandated, and teens are left to themselves to continue the learning process. This study is the first of its type to enhance this continued learning process using an event-triggered video device. By pairing this new technology with parental feedback in the form of a weekly video review and graphical report card, we extend parents' ability to teach their teens even after they begin driving independently.

Twenty-six 16- to 17-year-old drivers were recruited from a small rural high school in Tiffin, Iowa. The district covers a 162 square mile radius, in which nearly all driving occurs on rural highways and gravel roads. Prior to induction into the study, the subjects' driving experience ranged from three months to one year.

Each participant's vehicle was equipped with an event-triggered video recording system made by DriveCam. This system is a palm-sized device that integrates two video cameras (forward and interior view), a two-axis accelerometer, and a wireless transmitter. Video data is continuously buffered 24 hours/day, but the system only writes to internal memory when a 0.55 g lateral or 0.50 g longitudinal threshold is exceeded. All data are automatically downloaded from the device via secure wireless network whenever the participant parks in the high school parking lot. Once downloaded, encrypted data are sent to the laboratory for coding.

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The first nine weeks established a within-subject baseline; no parental or system trigger feedback was given during this time. After the nine-week baseline, feedback was provided to the participant in the form of a blinking LED light whenever the acceleration threshold was exceeded. In addition, teens and parents were sent a weekly graphical summary of events relative to the study peer group that included video of safety-relevant events. The feedback intervention lasted for nine months. After ten months and over 30,000 miles of driving, preliminary findings suggest that combining this emerging technology with parental weekly review of safety-relevant incidents resulted in a significant decrease in events for the more at-risk teen drivers. The baseline data revealed that the participants were divided into two groups: one with a low frequency of events and the other with a high frequency of events. The intervention resulted in a significant reduction in the number of safety-relevant events. In the first nine weeks of the intervention, the drivers reduced their rate of safety-relevant events from an average of 8.6 events per 1,000 miles during baseline to 3.6 events per 1,000 miles. As a group, they cut their safety-relevant events by a little over half in the first nine weeks (58% reduction). The group further reduced its rate of events to 2.1 per 1,000 miles in the following nine weeks (weeks 10 through 18), achieving a 76% reduction rate from the baseline. This drop from 8.6 to 2.1 events per 1,000 miles driven was statistically significant ($t=4.15$, $p<.0007$). The participants averaged 2.0 to 2.5 safety-relevant events per 1,000 miles for the final two nine-week periods. A similar reduction pattern emerged for the incidents, including near-crashes and crashes ($t=4.34$, $p<.0003$).

Of interest is whether the reduction in safety-relevant events during the first nine weeks of intervention was the same for all drivers. The two driver groups reacted differently to the intervention. The 18 low-frequency drivers did not change their behavior significantly, essentially demonstrating a floor effect, maintaining an average of approximately 2.0 safety-relevant events per 1,000 miles driven throughout the baseline and the entire intervention phase. However, the seven high-frequency drivers showed a dramatic 72% reduction, dropping from an average of 23.4 to 6.4 safety-relevant events per 1,000 miles in the first nine weeks of the intervention. After an additional nine weeks of the feedback intervention, the seven high-frequency drivers further dropped their safety-relevant events by 89% from the baseline, averaging 2.6 events per 1,000 miles. They have maintained an average of 3.0 events per 1,000 miles throughout the remaining weeks of the intervention, slightly above the other group. The interaction between driver group and phase was significant ($F(4,92)=37$, $p <.0001$).

A similar pattern emerges for the incidents (including near-crashes and crashes), where the seven high-frequency drivers benefited the most from the intervention, dropping their higher incident rates to almost the level of their low-frequency peers after 18 weeks of intervention. The interaction between driver group and phase was significant, $F(4,92)=24.09$, $p <.0001$. The two most frequent incident types were improper turning or curve negotiation and abrupt braking.

Key words: driving instruction—teen driving—video feedback