# Traffic Safety Facts

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# Evaluation of PC-Based Novice Driver Risk Awareness

It is well known that new drivers have a greatly increased risk of a motor vehicle crash. In response to this problem, States enacted graduated driver licensing laws over the last decade, and the legislation is linked with reduced crash rates during the first six months of solo driving. However, crash rates per vehicle mile traveled in the first months post-licensure are still significantly higher than other age groups. Research indicates that these crashes frequently result from poor hazard perception or attention maintenance. Thus, this five-study project, completed by the Human Performance Lab at the University of Massachusetts at Amherst, had two goals: testing the efficacy of hazard perception training for young drivers, and assessing differences between young and experienced drivers' attention maintenance. The hazard perception studies were based on prior work that showed training novice drivers to recognize potentially risky scenarios (e.g., a truck obstructing the view of a pedestrian who might enter a crosswalk) significantly improved scanning for hazards.

The training procedure was similar across the first four studies. First, researchers showed drivers schematics and/or pictures of potentially risky driving scenes and asked them to indicate places that deserved relatively constant monitoring and where sudden risks could occur. The experimenters provided feedback to the drivers regarding the correct locations and reasons why certain situations were hazardous. The drivers' behavior was assessed in various conditions using either simulators or actual vehicles to answer questions about the efficacy of training young drivers to improve their risk perception.

*Experiment 1: Will the effects of training remain after several days?* The first study assessed hazard detection accuracy of trained relative to untrained young drivers three to five days after training sessions. The researchers also tested "near-" and "far-transfer" scenarios to assess the extent to which the training would generalize novel scenarios. Near-transfer scenarios were driving situations analogous to training scenes (e.g., hidden driveway on the left during training and post-test). Far-transfer scenarios were not introduced during training.
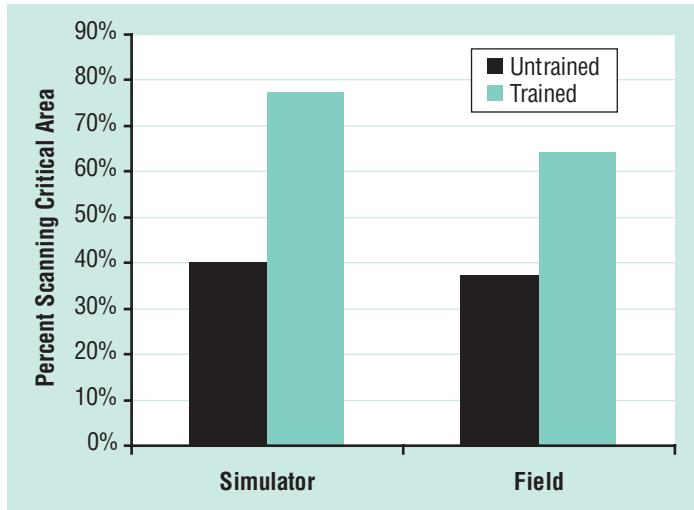
The researchers evaluated the training program with a driving simulator and an eye-tracker – a device that monitors and records eye movements. There were predetermined "critical regions" for each post-training scenario. If the eye-tracker indicated that drivers looked in these regions, participants were counted as having detected the potential hazards. Trained novice drivers were nearly twice as likely (51.8% detection) as their untrained counterparts (28.8% detection) to recognize hazards in near-transfer scenarios several days after training. The results also indicate that trained drivers were more accurate than untrained drivers in detecting hazards in far-transfer scenarios (53.1% versus 27.1%).

*Experiment 2: Will training extend to the actual roadway?* The studies that showed a benefit to hazard perception training were evaluated with a driving simulator. Training would be of little value if the behavior did not transfer to an actual motor vehicle. Therefore, the researchers assessed the effects of training on young drivers' ability to detect hazards on actual roadways. The training program used in Experiment 1 was modified to include photographs in addition to plan views. As with the earlier studies, the researchers reported that across all scenarios trained young drivers were nearly two times more likely than untrained young drivers to detect potential roadway risks (60.6% trained versus 31.8% untrained). Further, trained drivers were significantly more accurate at perceiving potential risks in far transfer scenarios than were untrained drivers.

*Experiment 3: Will the modified training program obtain similar results when evaluated with a simulator?* Now that one has established that training does generalize to the field, one would like to know that the absolute size of the effects obtained in the field and on the simulator were identical. But, because different training programs were used in Experiments 1 (simulator) and 2 (field), the results from these two experiments cannot be compared. Thus, in Experiment 3, the training procedure and evaluation scenarios used were identical to Experiment 2, but the effectiveness of the training program was evaluated with a simulator. Again, the findings indicate that trained participants more accurately perceived risks than untrained participants (77.4% versus 40%), and the results of the simulator assessment were similar to the evaluation completed in the field. Figure 1 shows a comparison of the overall training effects associated with Experiments 2 (field) and 3 (simulator).

**Figure 1. Percent Scanning Critical Region in Simulator and Field Studies as a Function of Training.**



*Experiment 4: Will training that uses a low-cost simulator improve risk perception?* The researchers devised a new training program that was hoped would bring novice drivers closer to criterion performance. Participants in the training group were first exposed to the methods described in Experiments 1 through 3, and then they were trained further with a low-cost driving simulator (different from the one being used to evaluate the effects of training in Experiments 1 – 3 and in this experiment). During simulator training, the participants drove through scenarios repeatedly until they made head movements toward the area that contained the risk. Researchers assessed the training program with a high-fidelity simulator. The assessment again included near-transfer scenarios (situations present during training) and far-transfer scenarios (situations not present during training). Overall, the training group recognized significantly more risks (72.4%) than the control group (46.9%). Further research is needed to determine whether the simulator training offers a benefit beyond the training program used in Experiments 1 through 3.

*Summary: Experiments 1-4.* The findings indicate that training effects are evident with several days between training and evaluation, that the effects extend to the field and to scenarios different than those presented in training, and that the results are similar whether evaluated in the field or on a driving simulator.

*Experiment 5: Are young drivers more likely than experienced drivers to divert attention away from the forward roadway?* The 100-car naturalistic driving study found that glances away from the forward roadway lasting longer than 2 seconds were related to increased near-crash risk.[1] In the fifth study, participants completed several in-vehicle tasks, such as searching for a road on a map, and one outside-of-vehicle task – searching a roadside sign for the presence of a particular letter. Several seconds of focused, visual attention were needed to complete the tasks. Participants completed the tasks while driving a simulator and wearing eye-tracking equipment. Young drivers were significantly more likely than older drivers to look away from the road when completing the in-vehicle tasks. One measure showing this difference was the percent of scenarios in which the maximum glance duration was greater than 2 seconds. Among the young driver group, 56.7 percent of the maximum glances were greater than 2 seconds compared to 20 percent for the older participant group.

*Limitations.* First, the sample sizes of the research projects were small and may not represent the population of young drivers. Second, participants in hazard perception Experiments 3 and 4 ranged in age from 18 to 21, an age range with different crash patterns than 16- to 17-year-old drivers. The benefits of hazard detection training were consistent across studies. Future research is needed to determine whether these findings can reduce crashes or crash risk.

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[1] Klauer, S. G., Dingus, T. A., Neale, V. L., Sudweeks, J. D., & Ramsey, D. J. (2006). *The Impact of Driver Inattention On Near-Crash/Crash Risk: An Analysis Using the 100-Car Naturalistic Driving Study Data.* Washington, DC: National Highway Traffic Safety Administration.

## How to Order

Download a copy of **Evaluation of PC-Based Novice Driver Risk Awareness** (100 pages) from NHTSA.dot.gov or write to the Office of Behavioral Safety Research, NHTSA, NTI130, 1200 New Jersey Avenue SE., Washington, DC 20590, fax 202-366-7096. Ian Reagan was the Contracting Officer's Technical Representative for this project.