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Computer Training Program Improves Teen Drivers' Attention to the Road

Research indicates that when completing in-vehicle tasks such as looking at a road map, teen drivers are much more likely than are experienced drivers to look away from the road for long periods. Other studies indicate that glances away from the road that last longer than 2 seconds increase crash risk. The combined findings suggest that teens have an elevated risk due to visual distraction. Simply training drivers never to look inside the vehicle could be unsafe because some tasks, such as glances at gauges and mirrors might actually serve to decrease crash risk. In addition, given the large number of devices in modern vehicles, e.g., radio/entertainment systems, and cellular phones, it would be naive to think that drivers could completely ignore distraction when driving. Training that teaches novice drivers to distribute their attention safely may be a useful countermeasure for crashes resulting from visual distraction. The current effort included three studies that developed and evaluated the Forward Concentration and Attention Learning (FOCAL) training program. The first study developed and tested the effectiveness of the FOCAL training program using a computer, while the second and third studies tested the impact of FOCAL on performance in real traffic and in a high-fidelity driving simulator.

Study 1, Part 1

The first objective of Study 1 was to develop a computer program that required individuals to switch attention between a "driving" task and an "in-vehicle" task. Both tasks required significant visual attention. This effort led to the development of the Attention Maintenance Assessment Program (AMAP). The primary goal of AMAP was to find the same differences in glance patterns between novice and experienced drivers that were found in earlier research.

AMAP. This program presented two tasks when participants viewed the screen and recorded how long they looked at each task. The computer screen was split in half. The task displayed at the top half was to search a video recording of a drive and identify potential roadway hazards. The other task displayed on the bottom half of the computer screen required drivers to determine if a set of streets was on a map. The program displayed only one task at a time, and participants toggled between the tasks to complete them. The tasks were difficult: searching for streets on the map required thorough scanning, but if participants glanced at the map too long, they would miss road hazards in the video, which continued to play in the blacked out portion of the screen. The experimenter told participants that each task was important to make sure that they tried to complete them successfully. A group of novice and experienced drivers completed AMAP. The results indicated that AMAP successfully distinguished the two groups, with novice drivers looking at the map task longer than the experienced drivers did. These findings led to the second part of Study 1 – the development and evaluation of FOCAL.

What is FOCAL? FOCAL is a training program designed to teach drivers how to reduce their eye in-vehicle glances to less than 2 seconds while performing a task such as tuning the radio. The goal of the training program was to help novice drivers develop an internal clock that experienced drivers seem to build over time. FOCAL used the same platform as the AMAP task, with added criteria for completing the training. After completing AMAP as a pre-test, individuals who received FOCAL training completed five sequential stages, with each having a more difficult objective than the previous. The stages included:

1. Watch a replay of a "drive" from AMAP to show how much information "drivers" missed when looking away from the video.
2. Repeat AMAP task with added objective: When participants toggled to the map task, the map would be displayed for 3 seconds, after which the computer automatically changed the screen view to the driving task. The participant searched for roadway hazards and, at the end of each trial, identified streets they saw on the map. Participants repeated a trial a second time if they failed to identify the roads that were on the map.
3. Repeat AMAP task with an added audible tone: Participants controlled toggling between tasks, but an audible tone sounded if they glanced at the map screen for longer than 3 seconds. Trials repeated a second time if the participant failed to identify the roads that were on the map or looked at the map longer than 3 seconds.

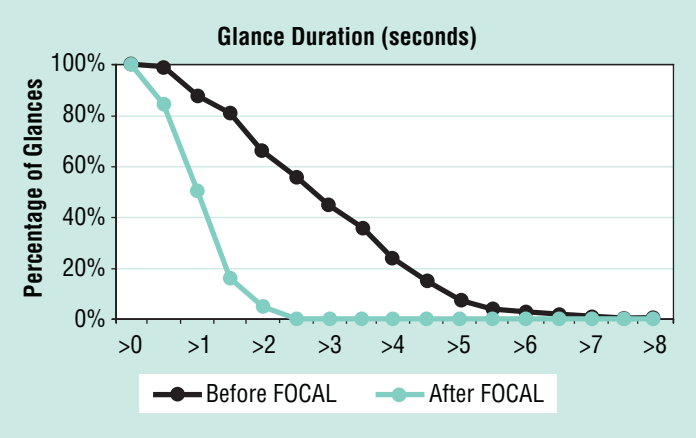
4. Repeat Stage 1, but reduce map display duration to 2 seconds instead of 3 seconds. Trials repeated a second time if the participant failed to identify the roads that were on the map.

5. Repeat Stage 3, but map display and audible tone timing from 3 seconds to 2. Trials repeated a second time if the participant missed a street on the map or looked at the map longer than 3 seconds.

Study 1, Part 2: FOCAL Computer-Based Evaluation

In Part 2, 16- to 18-year-old teens were randomly assigned to FOCAL or placebo training groups, completed AMAP, completed their assigned training program, and then completed AMAP as a post-training test. Results indicated that FOCAL-trained participants showed significant reductions in long eye glances. The figure below shows how successful FOCAL training was at reducing long in-vehicle glances in the post-training test relative to the pre-training test.

Figure 1. Distribution of Glance Durations Before and After FOCAL Training



Study 2: Field Evaluation of FOCAL

Study 2 extended the findings from a desktop computer environment by conducting a field experiment to determine if the effects of FOCAL extended to actual roads. Approximately 40 newly licensed teen drivers completed the study. Half the teens completed FOCAL training, and the other teens completed placebo training. After training, the experimenter fitted the participants with eye-trackers, devices that record where and for how long the drivers looked. Participants then completed a drive on local roads. The vehicles had dual brakes, and a driving instructor rode in the front passenger seat to ensure safety. An experimenter rode in the back of the vehicle and prompted the teens to complete various in-vehicle tasks. Some of the tasks were driving related, e.g., activating hazard lights, and others were not, e.g., searching for a CD. Measures from the eye tracker data indicated that the FOCAL training reduced the young drivers' propensity to look away from the forward roadway. Specifically, the FOCAL trained group had a significantly lower proportion of tasks with glances that were greater than the 2.0- and 2.5-second thresholds.

Study 3: Simulator Evaluation of FOCAL

Study 3 repeated the Study 2 protocol in a simulator. Although many consider field experiments a gold standard, there were several reasons for completing this third evaluation. Driving simulators are safer and offer much more experimental control than field tests on open roads, and they are more realistic than desktop computers. The results of the evaluation showed that, as in Study 2, the FOCAL trained group had significantly shorter in-vehicle eye glances than the placebo trained group. For example, 42% of the in-vehicle tasks completed by the placebo group had glances greater than 3 seconds, compared to 18.3% for the FOCAL participants. The magnitude of the differences between the FOCAL and placebo groups was greater in the simulator evaluation than the field test.

Discussion

This series of studies developed and tested a PC-based training countermeasure to reduce inattention to the forward roadway among young, newly licensed drivers. The results from these studies strongly suggest that young drivers could benefit from PC-based training that addresses attention maintenance skills. To address limitations of the current effort, future research will evaluate if the effects of such training persist after several weeks. Future research will also assess if drivers with differing levels of driving experience (e.g., intermediate, older drivers) benefit from similar training. Ultimately, research will need to determine if this countermeasure reduces crashes and fatalities associated with distraction.

How to Order

To order the final technical report titled *Field and Simulator Evaluation of a PC-Based Attention Maintenance Training Program* (72 pages), prepared by Dunlap and Associates, Inc., write to the Office of Behavioral Safety Research, NHTSA, NTI-132, 1200 New Jersey Avenue SE., Washington, DC 20590, fax 202-366-7394, or download from www.nhtsa.gov. Ian Reagan was the Contracting Officer's Technical Representative for this project.

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