Hazard Perception Training for Young Drivers

Anuj K. Pradhan, PhD
University of Michigan Transportation Research Institute
Outline

• The Young Driver issue
• Identified risk factors
  • Hazard Perception
• Age differences in hazard perception
• Hazard Perception Training
  • Simulation evaluation
  • Field evaluation
  • Duration of effects
• Translation
• Questions
Young Drivers

- Motor Vehicle Crashes are the leading cause of death for teenagers in the United States

- Youth 15-20 years old
  - 9% of U.S. population (2007)
  - 6% of driving population
  - But, 19% of fatalities in US in 2007 related to young drivers


- Annual cost for Teen injuries = $14 billion (CDC, 2010)
Passenger vehicle fatal crash involvements per 100 million miles traveled by driver age, 2008

- Per mile driven, 16 to 19 year old drivers are four times more likely than older drivers to crash.
- The fatal crash rate per mile driven is nearly twice as high for 16-17 yr-olds as it is for 18-19 yr-olds.

IIHS.org, FARS 2010
Teenage motor vehicle deaths by gender, 1975-2010

- 3,115 teenagers ages 13-19 died in motor vehicle crashes in 2010.
Background

• Originally, because of the gross overrepresentation of novice drivers in crashes:

• To understand the differences between novice and experienced drivers, we questioned:

  • What makes a novice driver so different from an experienced driver with respect to driving behavior and skills?

  • How does age or experience contribute to safe driving behavior?
Back story

• Evidence from studies using surveys, police reports, crash databases about peculiarities for novice driver crashes. (e.g. McKnight & McKnight)

• Could not establish causality or discriminate between cohorts for specific behavioral differences

• Experimental studies (driving simulator) examined difference in vehicle handling and kinematics. (Fisher et al)

• Found differences but failed to offer deeper insights into behavior
Back story

• Classic Eye-tracking studies looked at scanning patterns finding some differences in gross gaze behavior between driver groups. (Mourant & Rockwell)

• We decided to build on the simulator & eye tracking lines of research.
  • Eye movements in controlled environments for specific driving behaviors and situations.
  • Repurposed an eye tracking system and integrated that into the UMass driving simulator.
Hazard Perception in young drivers

• Simulator experiment to observe differences in specific eye movement behaviors of different levels of age & experience

• Specifically measuring hazard perception behavior.. ability to anticipate and predict risks

• Designed driving scenarios that had latent risks or risky scenarios

  • 3 groups:

    • 24 Novice drivers (16-17)

    • 24 experienced drivers (19-29)

    • 24 older drivers (60-75)
Hazard Perception in young drivers

- Large overall differences in hazard perception behavior between groups
  - Novices - 26%
  - Experienced - 40%
  - Older - 70%
- Novice drivers poor at anticipating hazards

Hazard Perception
Can Young Drivers be Trained

- Can an intervention, in the form of training, be designed to improve hazard anticipation
- Can training be imparted via technology as opposed to classroom
- Designed PC-based risk perception training.
- Top down schematics.
- Error based learning

RAPT - Risk Awareness and Perception Training
Hazard Perception - Training

- Simulator and field studies to test effects of RAPT training
- Randomized controlled trials to test for training effects between trained and untrained cohorts
- Eye movements of drivers used as hazard perception dependent measures
Hazard Perception - Training

Crosswalk - RAPT training

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Hazard Perception - Training

Crosswalk - untrained novice

**Hazard Perception - Training**

- Significant Pre-test to Post-test improvement in training program. (32.4% to 80.6%)

- Hazard anticipation behaviors improved post-training

- Simulato

  - Significantly improved performance
  - 52% recognition vs 28%, for all scenarios
  - 52% vs. 29% in Near Transfer Scenarios
  - 53% vs 27% in Far Transfer Scenarios

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Hazard Perception - Training

• Field study

• Significantly overall better glance behavior in trained drivers compared to untrained. (36.6% to 62.1%)

• 36.8% improved glance behavior in Near Transfer Scenarios

• 20.1% improvement in Far Transfer Scenarios

Hazard Perception - Training

- Training improved hazard perception abilities of novices
- Near transfer and far transfer of training
- In simulator & in field
- Effects persisted across time, up to one year after training
- Basis for other risk perception training programs. Netherlands, Connecticut, Arbella Foundation, State Farm
- NHTSA large scale deployment underway to study impact on crash rates (5000 young drivers)
Questions

anujkp@umich.edu