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Approaches to the Assessment of Entry-Level Motorcycle Training: An Expert Panel Discussion

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Motorcycle registrations have increased 84% from approximately 3.9 million in 1998 to 7.1 million in 2007 (National Highway Traffic Safety Association [NHTSA], 2009). There has also been a consistent increase in motorcycle fatalities over this same period that cannot be solely explained by the increase in exposure. The Motorcycle Safety Foundation (2009) suggests that motorcycle training is one way to reduce motorcycle crashes. In addition, the importance of motorcycle training to motorcycle safety is evident through the funds set aside by Congress in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) under section 2010. One aspect of these funds was to help States increase their motorcycle training.

Entry-level motorcycle courses include both classroom instruction and hands-on practice with a motorcycle. In the classroom, students learn several different aspects of riding a motorcycle. They learn about the different kinds of motorcycles, their controls, how they operate, and the importance of protective gear. They also learn how to create a strategy for dealing with normal as well as critical traffic situations. The hands-on training covers the basics of motorcycle operation, straight-line riding, turning, shifting, stopping, cornering, maximum braking, and swerving.

While basic rider courses teach important skills, the effectiveness of training as a safety countermeasure to reduce motorcycle crashes is unclear. Studies conducted in the United States and abroad to evaluate rider training have found mixed evidence for the effect of rider training on motorcycle crashes. Billheimer's (1998) matched-pair analysis of trained and untrained motorcycle riders is the only study conducted in the United States that has found a reduction in crashes among trained riders during the first 6 months following training. Among novice riders who rode less than 500 miles on a motorcycle prior to training, the trained riders had a lower 6-month crash rate of .39 per 100,000 miles than untrained riders who had a 6-month crash rate of .85 per 100,000 miles. These differences were not evident after 6 months or among riders who rode more than 500 miles prior to training.

Internationally, there have been a number of studies that have attempted to evaluate rider training. The Federation of European Motorcyclists (1997) reviewed 16 academic research papers that looked at the relationship between rider training and rider crashes from 1979 to 1996. Of the 16 studies, 8 concluded that "training did not reduce the likelihood of the rider being involved in an accident, 7 said the effect was positive, and 1 was neutral" (p. 11).

Therefore it is still unclear as to what extent rider training reduces crash involvement. There are several important issues to consider when evaluating rider training to allow for any firm conclusions on the relationship between rider training and crashes. A methodologically strong study should consider:

- **Consistency Across Training Programs:** Many programs differ across States, cities and even sites. An evaluation of rider training should be designed to minimize this inconsistency to better isolate the impact of rider training on crashes.
- **Self-Selection Bias:** One difficulty with comparing trained riders to untrained riders is that the trained riders may be more safety-conscious and thus result in a study comparing two different populations. Ideally a random assignment of riders to the

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trained or untrained group would minimize the self-selection bias. However, random assignment is not always feasible.

- **Population Demographics:** Trained and untrained riders should be similar in characteristics such as age, gender, exposure, experience, and type of bike to allow for more conclusive evidence on the effect of rider training on rider crashes.
- **Adequate Sample Size:** A study should have enough participants to make comparisons that are statistically meaningful.
- **Controlling Level of Exposure During Study Period:** The act of taking a rider training course may increase a rider's exposure as a result of taking the course. The California Motorcycle Safety Program survey found novice motorcyclists rode twice as much after taking a course as they did before they took the course (Billheimer, 1998).

Because these issues can make evaluating entry-level rider training difficult, NHTSA sponsored an expert panel of motorcycle safety researchers and training specialists to determine the feasibility of conducting a study to evaluate the effectiveness of entry-level rider training on reducing motorcycle crashes. The expert panel was conducted by Windwalker Corporation and Highway Safety Services.

Expert Panel

On April 3 and 4, 2008, an expert panel met to discuss how to measure the effectiveness of motorcycle training programs. The experts who assembled for the April workshop were challenged to identify measures of training effectiveness. The group consisted of motorcycle training experts and training evaluation experts from industry, government, and academia. Their discussions focused on using existing databases to evaluate motorcycle training, identifying the characteristics of a safe rider, and identifying where better systematic measurement processes can be developed, fielded, and validated.

Windwalker Corporation hosted the expert panel of motorcycle safety professionals at its company headquarters in McLean, Virginia. The facilitators were John Brock from Windwalker, and Brett Robinson and Allen Robinson, both from Highway Safety Services. They used a consensus-building approach[2] in their facilitation of the meeting. The expert panel participants were:

- John Billheimer, Ph.D., independent consultant;
- Steve Garrets, Team Oregon;
- Narelle Haworth, Ph.D., Queensland University of Technology (attending through a remote connection);
- Andy Krajewski, M.S., program director, Driver Programs, Maryland Motor Vehicle Administration;
- Larry Lonero, Northport Associates, Ontario, Canada;
- Dan Mayhew, M.A., senior vice president, Traffic Injury Research Foundation;
- Ray Ochs, Ed.D., director of training systems, Motorcycle Safety Foundation;
- Bob Reichenberg, independent consultant/ Streetmasters Motorcycle Workshops; and
- Peter T. Savolainen, Ph.D., assistant professor, Transportation Research Group, Wayne State University.

Panel Discussions

The panelists agreed that there were a number of limitations of motorcycle training. For instance, instructors tend to teach to the test, thereby meeting minimum standards. In addition, a test cannot measure beyond what is taught, thereby excluding questions that would call for the application of judgment and knowledge learned from the training. Most important, the industry may only have a record of students who successfully completed entry-level motorcycle training courses but have no record of the influence of training outside the training program.

In light of the annual increases in motorcycle fatalities, the extent to which motorcycle fatalities can be prevented through rider training is important to explore. The panel easily identified that an evaluation of rider training should compare trained and untrained riders. The more challenging issue was identifying how to measure the differences between these two groups. The panel discussed whether crash investigations can identify what errors are committed by trained and untrained riders, respectively. The panel also raised the possibility of specifically being able to track new riders, both those who have completed a recognized training program and those who had not over time.

At the early stage of the panel discussion, members continued to struggle with what criteria they should apply to rider training for evaluation. The panel decided the best approach would be to define the characteristics of a

[2] Therefore, the use of word "consensus" will often be used instead of "agreement" throughout this paper.

safe rider and then use these characteristics to develop an initial list of study and measurement approaches. Table 1 shows the initial characteristics of a safe rider identified by the expert panel.

Table 1
Panel's Initial Identification of the Characteristics of a Safe Rider

Knows street strategy
Wears protective equipment
Does not ride impaired
Can perceive risk; is aware of, can assess, and can manage risks
Knows rules of the road
Proficient skill set (basic skills, hazard response)
Is licensed
Aware of expectations of others (practices defensive driving)
Understands importance of speed limits and why they are set

The panel also discussed possible study designs to evaluate rider training. Most panelists agreed that a study should include a control group with comparisons between the two groups occurring a minimum of 6 months after training. Panelists also believed that a 5-year study would be useful to determine at what point between a basic riding course and an advanced course a rider becomes skillful. It was important that these studies provide information on:

- Hazard awareness and reaction;
- Passenger characteristics and risks;
- Resisting peer pressure;
- Limits on ability; and
- Awareness of the importance of protective equipment, environment interface, and bike/body perception.

Another approach the panelists agreed would be useful is the use of a centralized system that tracks motorcycle riders with regard to training, licensing, and crash history.[3] This approach would provide information on each rider's overall crash history and crashes per registered vehicle. It would also provide information on number of violations and citations in any vehicle. Lastly, important information could be gained through tracking repeat offenders to identify if they took basic rider training and at what school they received training.

After the panel met through the morning of the first day, it was broken into two working groups. The challenge before the two groups was to establish operational definitions of the qualities of a safe rider and the perceived obstacles to safe riding. Each group met for two hours, summarized its outcomes, and presented its findings back to the entire panel.

After the presentations, panel members voted on all the various ideas that had been developed throughout the day. Those ideas with the most votes served as the focus for the second day of the working group. Each panelist had 10 votes that could be distributed across the various listed options under three categories: the characteristics of a safe rider, feasible evaluation approaches, and independent variables for measurement.

Strong consensus emerged from the panel that a definition of a safe rider should include a mastery of basic skills. The panel acknowledged that a safe rider has mastered the prerequisite *basic skills*, but to *maintain* safe riding habits, *proficient skills* are required. For instance, a rider could ride a motorcycle with basic skills, but this does not automatically mean he is a safe rider. The panel agreed that there were no objective definitions of basic and proficient skills. The panel reached consensus on the following characteristics of a safe rider:

- Conducts an aggressive visual search that includes risk perception, hazard recognition, and hazard response;
- Has fewer crashes;
- Wears personal protective gear for conspicuity, comfort, and protection;
- Manages space and time through visibility, space cushions, escape routes, and lane position;
- Incurs fewer injuries;
- Avoids impairments such as alcohol, drugs, fatigue, distraction, weather extremes (too hot, too cold); and
- Demonstrates proficient operating skills.

The panel's consensus results on feasible evaluation approaches and which independent variables are important to measure are shown in Tables 2 and 3.

[3] Maryland received a 2009 Promise Grant to link several different databases to create a centralized system. By linking training data from rider education courses to Maryland's Motor Vehicle Association data systems, the crash and citation history of trained and untrained riders can be compared.

Table 2
Feasible Evaluation Approaches

Tracking/evaluation (there is a perceived need to track individual students)
Observational instrumentation
Street strategies as a foundation for real-life riding
Need for control groups
Experience in mileage ridden/driving: qualitative and quantitative
Quasi experimental design
Experimental design
Why people enroll in training should be gathered as a control variable. There will be different reasons for different riders, but an "effective" evaluation would identify commonality factors.

Table 3
Independent Variables for Measurement

Age
Gender
Income
Rural vs. urban
Motorcycle type
Citations/crashes
Purpose of riding: commuting or recreational

Summary

Throughout the expert panel meeting, there was continued deliberation about basic skills versus the skills needed to ride safely. Once the panel members defined the characteristics of a safe rider, they were able to discuss possible evaluation approaches that would evaluate the extent to which entry-level motorcycle rider training produces a safe rider. The panel reached consensus on the feasible evaluation approaches and important independent variables.

The panel's major study recommendations were:

- **Use a State-centralized database for a longitudinal study**. Analyze the database for key indicators linking riders to various training programs and experiences. Develop a process that can extract the meaningful data.
- **Conduct a questionnaire/survey study**. Query riders, police officers, DMV examiners, motorcycle clubs, and associations about their experiences and attitudes.
- **Run a controlled study with volunteers**. Cameras, eye-trackers, and other sensors have reached a level of miniaturization that instrumented motorcycles could be used with volunteers. NHTSA has developed sound protocols for this kind of data collection and those protocols and lessons learned could be applied to a motorcycle study.
- **Study the relationship between impaired riding and training levels**. A study of the frequency of impaired riding (alcohol or drug abuse, fatigue) with trained riders and non-trained riders could reveal the degree to which attitude changes are occurring in the training process.
- **Study the relationship between motorcycle and car/truck driving records**. The panel also recommended that a study be undertaken to establish the relationship (if any) between an individual's truck and car driving records and motorcycle riding records.

Conclusions

There were remarkably few disagreements among the panel members. All agreed that the problems of motorcycle safety are real. All agreed that data supporting any rider training program are neither strong nor plentiful. There was also universal agreement that the development of rider training effectiveness measures would not only provide a feedback loop to current rider training institutions, but also lead to motorcycle safety improvements. The group strongly supports further research along the lines described in this report.

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