

Traffic Safety Facts

Traffic Tech – Technology Transfer Series

Effects of Alcohol on Motorcycle Riding Skills

Preliminary estimates indicate that there were 4,810 motorcyclist deaths in 2006, an increase of 5.1 percent from 2005. Motorcyclist deaths have increased for the ninth consecutive year and now represent 11.3 percent of all traffic fatalities in the United States. Moreover, the number of motorcyclist fatalities has more than doubled since 1997.

One factor that continues to be associated with motorcyclist fatalities is alcohol. In 2005, a higher percentage of motorcycle operators had blood alcohol concentrations (BACs) of .08 grams per deciliter or higher than any other type of motor vehicle driver. Twenty-seven percent of motorcycle operators were at .08 or higher versus 22 percent for passenger car operators, and 21 percent for light-truck operators.

Despite the relevance of alcohol to motorcycle safety, only limited information on the impairing effects of alcohol on motorcycle operator performance is available. To address this issue, NHTSA sponsored a research study to assess the impairing effects of alcohol (up to the current per se limit of .08 BAC), on rider performance involving a broad set of basic motorcycle riding skills.

Methods

Twenty-four male participants age 21 to 50 (*MEAN*=32 years) completed three test days for this experiment. All participants had a minimum of five years of riding experience (*MEAN*=14.97 years), drank alcohol at least once a week, and had no history of medical or psychological problems (i.e., alcohol dependence) that would preclude them from participating in the study. The study design consisted of a balanced incomplete block design (BIBD), where participants were randomly assigned to one of four possible conditions. Participants in each condition experienced three out of four possible levels of alcohol presentation (.00, .02, .05, and .08) and completed one level per test day.

A motorcycle test course was developed in conjunction with two certified motorcycle coach instructors from

the Minnesota Motorcycle Safety Center based on standard exercises within the Motorcycle Safety Foundation (MSF) training program, including the MSF Basic Rider Course and the Experienced Rider Course. The test course was designed to include specific “task scenarios” from these training programs that tested performance of riding skills deemed relevant to the safe control of motorcycles. The resulting set of task scenarios that comprised the test course included weaving (slalom) around pylons, hazard avoidance, curve negotiation, and emergency stops. The test motorcycle was an instrumented 2000 Honda Shadow VT1100 equipped with outriggers and sensor equipment for data collection.

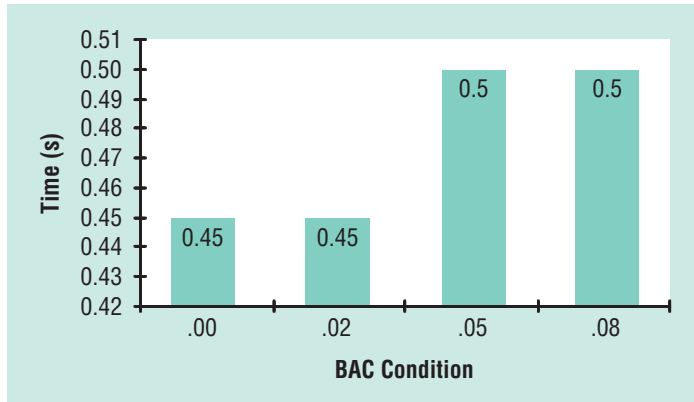


Data was collected for two sober baseline rides and two tests rides each day at one of four conditions (BACs of .00, .02, .05 or .08). Data was also collected for a set of subjective measures that evaluated mental workload for the riding tasks and the riders’ perceived levels of intoxication and impairment.

Results

The results showed that performance for several dependent measures of riding performance were impaired at different BAC levels.

In the offset weave (slalom) task, participants missed or hit more pylons and had smaller passing distances around the pylons in the .08 condition compared to the other alcohol and .00 conditions. In the hazard avoidance task where a warning was provided 1.5 seconds from the hazard, participants had slower reaction times in both the .08 g/dL and .05 g/dL conditions compared to the .00 and .02 conditions.



Effect of BAC condition on reaction time in the near-distance (1.5 seconds) hazard avoidance task.

In the hazard avoidance task where a warning was provided 2.5 sec from the hazard, participants in the .08 and .05 conditions passed at a closer distance to the obstacle than in the .00 or .02 conditions. For both hazard tasks, riders turned in the wrong direction more often in the .08 condition as compared to the other conditions.

In the curve circuit task, although not significant, participants in all alcohol conditions tended to have faster maximum speeds and increased variability in speed in the circuit compared to the .00 condition. Participants in the .08 condition were also more likely to cross outside the curve circuit boundaries than participants in other conditions.

Despite these differences, the effect sizes (η^2) calculated for the significant main effect of alcohol on all the tasks was modest, ranging from 2 to 8 percent.

Participants reported requiring more effort to ride and complete the tasks in the .08 condition when com-

pared to the .00 condition. Their levels of subjective intoxication also increased significantly with increasing BAC levels. Participants reported their perceived level of performance impairment was higher for the .05 and .08 conditions compared to the .00 and .02 conditions. Participants in the .05 and .08 conditions also reported they would be less willing to ride a motorcycle for any reason.

Discussion

This study demonstrates changes were obtained in operator control and rider perception that are indicative of alcohol impairment. Most of the impairing effects on riding performance and perception were evident at the per se alcohol limit of .08 BAC; however, some of these same impairing effects were evident in the lower .05 condition.

Given that this study used experienced riders performing highly practiced tasks on a closed course at low to moderate BAC levels, it is not surprising that the effects of alcohol on motorcycle control and rider perception were modest. The effects of alcohol were most pronounced when task demand was higher (offset weave), time pressure was higher (hazard avoidance for near obstacles), and tolerances were constrained (circuit track). Larger impairments may be expected with less experience riders, on less familiar roads, with more complex and novel tasks at higher alcohol doses.

In summary, study findings indicate that even for experienced riders alcohol has a deleterious effect on performance involving basic riding skills on a closed course. Other on-road efforts that can assess rider crash risk and impairment at different BAC levels are needed to increase our understanding of the contribution of alcohol to motorcycle crashes.

How to Order: To order *Effects of Alcohol on Motorcycle Riding Skills*, write to the Office of Behavioral Safety Research, NHTSA, NTI-130, 1200 New Jersey Avenue SE., Washington, DC 20590, fax 202-366-7096, or download from www.nhtsa.dot.gov. Marvin Levy, Ph.D., was the contract manager.



U.S. Department of Transportation
**National Highway Traffic Safety
Administration**

1200 New Jersey Avenue SE., NTI-130
Washington, DC 20590

TRAFFIC TECH is a publication to disseminate information about traffic safety programs, including evaluations, innovative programs, and new publications. Feel free to copy it as you wish. If you would like to receive a copy, contact Patricia Ellison-Potter, Ph.D., Editor, fax 202-366-7096, e-mail: traffic.tech@dot.gov.