

RESEARCH REVIEW

• UNIVERSITY OF MICHIGAN TRANSPORTATION RESEARCH INSTITUTE • JANUARY–MARCH 2006 • VOLUME 37, NUMBER 1 •



on page 1:

Talking to Passengers Can Be as Dangerous as Using a Cell Phone

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UMTRI RESEARCH REVIEW

• UNIVERSITY OF MICHIGAN TRANSPORTATION RESEARCH INSTITUTE • JANUARY–MARCH 2006 • VOLUME 37, NUMBER 1 •

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Talking to Passengers Can Be as Dangerous as Using a Cell Phone

Researchers Examine Secondary Driver Behaviors

UMTRI researchers have discovered that talking to passengers may be just as dangerous for drivers as talking on a cell phone. A recent study shows that drivers who have conversations with passengers exhibit similar levels of driving performance as motorists who use cell phones. The study found no statistical difference in terms of drivers keeping in the correct lane or in steering behavior when talking on a cell phone or conversing with a passenger. And perhaps more interestingly, they found few broad or consistent differences in driving performance between driving with or without secondary behaviors generally.

The study was conducted by Jim Sayer and Joel Devonshire, of the Human Factors Division, and Carol Flannagan of the Biosciences Division. They analyzed video data from thirty-six drivers to determine the frequency and conditions under which drivers engage in secondary behaviors, and explored the relationship these behaviors might have with driving performance. The video footage had been collected as part of an earlier road departure crash warning (RDCW) field operational test (FOT) that represents 82,773 miles (133,290 km) of naturalistic driving data. (For more information, see “Road Departure Crash Warning Field Operational Test” in volume 35, number 2 of UMTRI Research Review, www.umtri.umich.edu/library/pdf/rr35_2.pdf.)

The researchers coded a selection of 1,440 five-second video clips of the drivers’ faces for the occurrence of specific

secondary behaviors and the frequency and duration of glances away from the forward scene. They then used the corresponding performance data from the instrumented vehicles to calculate variability of steering angle, mean and variability of lane position, mean and variability of throttle position, and variability of speed. Finally, the researchers

with passengers was the most common (15 percent of the clips), followed by grooming (6.5 percent), cell phone use (5 percent) and eating and drinking (2 percent).

“The use of cellular telephones while driving receives a lot of attention in the popular press, probably because their popularity and widespread use is



UMTRI / SHERINAH ERINGTON

UMTRI researchers analyzed video data to determine the frequency and conditions under which drivers engage in secondary behaviors, and how these behaviors might affect driving performance.

examined contextual factors such as road type, road curvature, and road condition (e.g., wet vs. dry).

Drivers were observed engaged in secondary behaviors in approximately 34 percent of the clips. Conversation

relatively new,” Sayer says. “But the results of our study show that many of the other behaviors that drivers engage in, such as eating, drinking, grooming and having conversations with passengers,

continued...

A screen-shot from the RDCW video coding application



are potentially just as detrimental to driving performance.”

In general, secondary behaviors are neither equal in frequency of occurrence nor in their effect on driving performance. While all of the non-driving behaviors were associated with more erratic steering behavior, the researchers found that other measures of driving performance, such as lane position, speed fluctuation, use of the accelerator pedal and glance behavior (checking mirrors, looking out the side windows, etc.), showed mixed results.

For example, cell phone use did not affect speed variation, although frequency and duration of glances away from the road in front of a driver was lowest when using a cell phone—which could negatively affect scanning the roadway environment. Eating and drinking had little effect on driving performance, except for modest increases in steering variance and glance frequency, as well as more frequent braking. They found a similar pattern for grooming behaviors. However, conversations with passengers showed higher variability in steering angle, increased deviation in lane position, and greater distances from the center of the lane.

Of the total video clips examined in the study, younger drivers and women were most likely to engage in secondary tasks. Younger drivers (age 30 and younger) engaged in secondary behaviors the most often (in 42 percent of the clips) and older drivers the least often (20 percent). Fifty-five percent of the observed cell phone usage was for younger drivers. In general, women engaged in secondary tasks 54 percent of the time, most commonly conversing with passengers (59 percent). Men had higher rates of cell phone use (nearly 54 percent) and grooming behaviors

(such as scratching their nose, running fingers through their hair, or checking their tie; at just below 54 percent) than women.

In addition, the researchers examined contextual factors, such as road type, road curvature, and road condition. Previous studies—conducted in driving simulators or on controlled roads or test tracks, rather than during natural driving conditions—suggest that driving performance suffers when drivers engage in secondary behaviors.

However, in this study, drivers appeared to perform differently when taking part in different tasks, and appeared to engage selectively in secondary behaviors according to traffic/roadway conditions. One possible explanation is that, in naturalistic conditions,

when drivers can freely choose whether to engage in secondary tasks, they tend to perform them only when they perceive the traffic environment as less challenging and not requiring as much of their driving skills.

“Until now, no published data has examined the effects of secondary tasks on driving performance measures under naturalistic conditions—drivers using instrumented vehicles in their daily lives—and few have examined the relative frequency with which these second-

ary behaviors even occur,” Sayer says. “Nonetheless, there is a growing public concern with driver distraction, including state and local laws that impose penalties for engaging in distracting behaviors while driving. But our study showed relatively little effect of secondary behavior on basic driving performance measures.”

For a related story on secondary driving behaviors, see “UMTRI Research at Driving Assessment 2005” in volume 36, number 2 of *UMTRI Research Review* (www.umtri.umich.edu/library/pdf/rr36_2.pdf). **RR**

Eating and drinking had little effect on driving performance, except for modest increases in steering variance and glance frequency, as well as more frequent braking.



UMTRI / SHERIANN ERMINGTON

UMTRI at TRB

Many UMTRI staff members participated in technical sessions and committee meetings at the 85th annual meeting of the Transportation Research Board on January 22–26 in Washington, D.C. To kick off the event, UMTRI also hosted an evening reception for UMTRI sponsors and friends on January 22 at the Omni Shoreham Hotel.

Ray Bingham, research associate professor in the Social and Behavioral Analysis Division, attended a meeting of the Alcohol, Other Drugs, and Transportation Committee.

David Eby, head of the Social and Behavioral Analysis Division, presented “Effect of Mobilization Campaign on Statewide Nighttime Safety Belt Use” at the session Nighttime Safety Belt Enforcement: Means for Reducing Alcohol-Related and Unrestrained Fatalities.

Mike Flannagan, research associate professor, attended the New Frontiers in Visibility Technology workshop.

Tim Gordon, head of UMTRI’s Engineering Research Division, attended the Vehicle-Highway Automation Committee meeting.

Steve Karamibas, senior research associate in the Engineering Research Division, and George Chang of The Transtec Group taught the workshop Profile Viewing and Analysis. Steve attended the Surface Properties—Vehicle Interaction Committee meeting, and presented “The 2005 ACPA Profiler Repeatability Experiment” at the Portland Cement Concrete Pavement Construction Committee meeting.

Lidia Kostyniuk, research scientist in the Social and Behavioral Analysis Division, attended a meeting of the Traveler Behavior and Values Committee.

Lisa Molnar presented “Self-Screening of Older Drivers: Evaluation Challenges and Issues” at the Human Factors workshop.

Jean Shope, research professor in the Social and Behavioral Analysis Division, attended two committee meetings: Alcohol, Other Drugs, and Transportation; and Operation Education and Regulation.



UMTRI / JULIA DANIEL

UMTRI staff and supporters enjoy refreshments at UMTRI’s reception at TRB.

Mike Hagan, chief engineer in the Engineering Research Division, and X.P. Huang of the Federal Highway Administration.

Better Headlights Can Save Lives

On average, a pedestrian is killed in a traffic crash every 113 minutes in the United States. In 2004, nearly 4,700 pedestrians (including bicyclists) were killed along U.S. roads—over 3,000 of them at night—and another 68,000 pedestrians were injured in traffic crashes¹. John Sullivan, assistant research scientist in UMTRI’s Human Factors Division, says, “Nationally, the risk of a pedestrian being killed is more than four times as high when it’s dark than when it’s light.”

Sullivan and Mike Flannagan, research associate professor in UMTRI’s Human Factors Division, are studying how light levels affect accident risk to help determine the best ways to improve automobile headlamps. They found that in combination, darkness and speed multiply the risk of pedestrian fatalities by seven times on high-speed, limited-access roadways; by five times on major urban roads; and by three times on slower local roads.

New automotive lighting technologies, including high-intensity-discharge headlamps and adaptive front-lighting systems, can help improve nighttime pedestrian safety. Flannagan says drivers

continued...

¹ *Traffic Safety Facts 2004—Pedestrians*. National Highway Traffic Safety Administration, National Center for Statistics and Analysis, Washington, D.C. Report No. DOT HS 809 913. 2005.

UMTRI BRIEFS

“overdrive” the headlamps in many of today’s vehicles. “The critical safety need in low-beam lighting is seeing distance,” he says. “Every day experience as well as our formal analyses of crash data reveal that today’s drivers routinely overdrive their headlight beam pattern at night. The maximum safe speed with today’s average low beams is only about 45 miles per hour. Our studies indicate there is a major safety problem that headlights could address.”

Xenon headlamps, also called high-intensity-discharge (HID) headlamps, could provide safer seeing distances at night. Based on a gas discharge process, HID headlamps use an arc instead of a filament as the light source and produce more light than traditional headlamps. The result is increased light on the road and therefore enhanced road-way vision.

Flannagan says an earlier UMTRI study revealed that HID headlamps provided 45 percent more light for seeing critical objects on the road, while producing 25 percent less glare. The wider beam coverage also provides

better lighting on road shoulders where pedestrians and bicyclists are commonly found.

Nearly 120 vehicle models equipped with HID headlamps were sold in North America in the 2005 model year, up 21 percent from 2004.

Adaptive (or active) front-lighting systems (AFS) are another area of emerging technology. AFS can provide optimal illumination in various driving conditions by automatically modifying the beam pattern of the headlamps in response to various speeds, weather conditions, and road situations. For example, the headlamps automatically move to the right or left as the steering wheel is turned. This helps illuminate the road farther ahead, allowing the driver more time to adjust and steer or brake as needed.

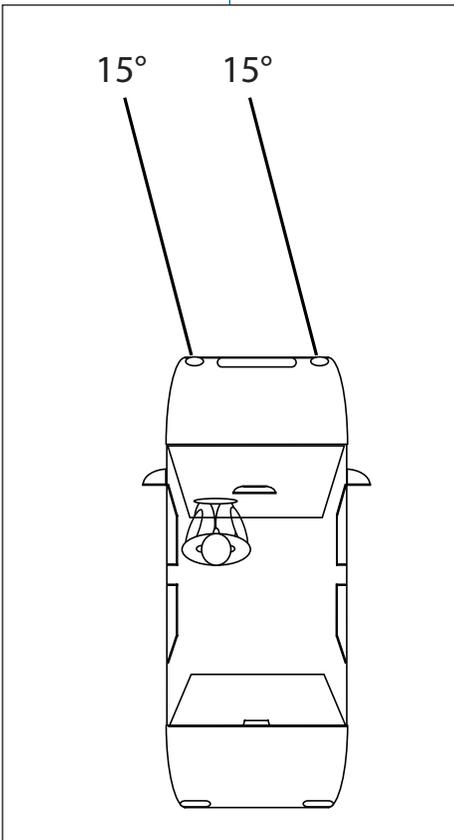
Such improvements in headlighting technology, combined with lower-speed driving at night, will hopefully reduce pedestrian fatalities during nighttime driving.

For more information, please contact John Sullivan at jsully@umich.edu or Mike Flannagan at mjf@umich.edu.

At left: Adaptive headlights automatically modify the headlight beam pattern in response to various conditions. For example, they move left if the steering wheel is turned to the left.



HID headlights can provide safer seeing distances.



UMTRI / BRANDON SCIOETILE

UMTRI / BRANDON SCIOETILE

Transportation Knowledge Networks: A Management Strategy for the 21st Century

Despite the wealth of information on the Internet, transportation professionals still report that they face an overwhelming volume of information and have difficulty locating and retrieving many technical reports, even those in digital form.

“The transportation sector needs to do more to transform its libraries to meet the demands of the information age.”

TRB Special Report 284, Transportation Knowledge Networks: A Management Strategy for the 21st Century examines how transportation information should be managed and provided. The report provides strategic advice to the federal government and the states regarding a sustainable administrative structure and funding mechanism for meeting the information service needs of the transportation sector in the twenty-first century. The report identifies the core services that need to be provided, how those services should be provided, and funding options to support those services.

The report is available at <http://trb.org/publications/sr/sr284.pdf>.

At right: Transportation professionals face an overwhelming volume of information, in print and online.

Teens and Alcohol Hazardous alcohol use by young adults extends beyond the campus

Despite recent media attention given to drinking among the college crowd, UMTRI researchers found that at-risk alcohol use is neither unique to, nor necessarily the highest among, individuals who complete college. Results of the study were published in the December, 2005 issue of *Alcoholism: Clinical & Experimental Research*. The article was coauthored by C. Raymond Bingham, research associate professor in UMTRI's Social and Behavioral Analysis (SBA) Division; Jean Shope, SBA research professor and associate director of UMTRI; and Xianli Tang, a graduate student in University of Michigan School of Public Health at the time of the study.

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UMTRI BRIEFS



UMTRI / SHERIWAH ERINGTON

“Alcohol use can begin as early as childhood, but typically begins during the teen years, and increases steadily from adolescence into young adulthood, where it reaches its highest lifetime level,” says Bingham.

“Although college is typically known for frequent partying and alcohol consumption, individuals who do not attend college also on average experience their highest lifetime levels of alcohol consumption when they are young adults,” says Bingham. “Contributing factors likely include increased numbers of peers who have legal access to alcohol, reaching age 21 and being able to legally purchase alcohol for one’s self, increased autonomy and individuation from parents, a process of exploration and experimentation that is typical of late adolescent and early young-adult psychosocial development, and the lack of adult roles and responsibilities, such as marriage and parenting, that might moderate alcohol use.”

It would be incorrect, therefore, to assume that young adults who do not attend college are at a lower alcohol-related risk than college undergraduates, he added.

To further explore patterns of alcohol use during early adulthood, Bingham and his colleagues accessed data gathered in a larger prevention study in which participants (n=1,987) were originally recruited in the fifth or sixth grade. Participants were asked about their alcohol use by survey in the twelfth grade and again by telephone around 24 years of age. None of the young adults in the analyses had ever been married or had children. Three groups were formed based on completed education when the participants were surveyed at age 24: high school or less, post-secondary education without a four-year college degree, and completed four-year college degree or more.

The study found that alcohol-related risk is not only a concern in populations of college students. “Noncollege attending/graduating young adults experience levels of risk that equal those of their college-graduating age mates,” said Bingham.

Male college graduates experienced the greatest increase in at-risk drinking from twelfth grade to young adulthood; however, their at-risk alcohol use at age 24 did not differ markedly from the young men in the other education groups. “Men and women who completed college showed the greatest increases in the frequency of drunkenness

and heavy episodic drinking from twelfth grade to young adulthood,” Bingham remarks. “This increase was especially remarkable for men who completed college, who went from having the lowest frequencies of drunkenness and heavy episodic drinking among men in twelfth grade to having the highest rates of all groups of men and women in young adulthood. Women who completed college increased their frequencies of drunkenness and heavy episodic drinking more than other women, but rather than surpassing the other groups, by age 24, these women had merely caught up with their same-sex peers who had completed less formal education.”

Men and women who did not complete any formal education beyond high school had the highest levels of alcohol consumption, drunkenness, and heavy episodic drinking in twelfth grade, which continued into young adulthood. However, from twelfth grade to young adulthood, all groups of men and women showed a typical increase in their average alcohol consumption, with men increasing more than women. “Men had consistently higher levels of all alcohol risk measures than women,” Bingham reports. “Men also showed greater increases in alcohol consumption than women. These findings are common in the literature, and are not unique to this study.”

The results emphasize that all young adults—whether or not they attend college—are generally at high alcohol-related risk, and research, program development, and interventions are needed. This represents a considerable challenge: While college students tend to be fairly homogeneous and easy to find on college campuses, young adults who do not attend college are much more diverse and harder to isolate. They follow a large number of distinct developmental and lifestyle pathways. They may be working in any number of fields or attending a wide variety of educational programs. Bingham says, “This diversity makes this group harder to recruit into studies and more difficult to maintain in samples. It also increases the challenge of designing studies that can yield clear results that are not clouded by this group’s heterogeneity.”

For other UMTRI research on young adults, especially driving behavior, see volume 33, number 4 of *UMTRI Research Review*, www.umtri.umich.edu/library/pdf/rr33_4.pdf. **RR**



Jean Shope Appointed UMTRI's Associate Director

Jean Shope, research professor and former head of the Social and Behavioral Analysis Division, was appointed as UMTRI's associate director in early March 2006. In this new position, she will help UMTRI's research faculty develop and enhance UMTRI's academic mission within the University of Michigan. She says, "I am pleased to serve in this new position. My major goal is to assist faculty in their research, scholarly, and teaching pursuits. I plan to facilitate involvement of students in UMTRI's research. We have fabulous opportunities for student experiences and training."

As one of the University's distinguished research faculty, Shope has an acute appreciation of UMTRI's research programs and divisions. She recently helped establish UMTRI's Doctoral Studies Program (see volume 36, number 4 of UMTRI Research Review, www.umtri.umich.edu/library/pdf/rr36_4.pdf) and has also nurtured collaborative relationships in several schools and colleges throughout the University.

In her new role, Shope will help ensure that UMTRI's research and teaching contributions develop to meet the long-term challenge of our strategic intent:

To be the leader in transportation systems research integrating vehicles, people, and infrastructure to achieve a highway transportation system where:

- Fatalities and injuries are eliminated.
- People and goods flow efficiently.
- Reliance on non-renewable energy is reduced. **RR**

Most UMTRI reports are available in full text online. See the website address at the end of the citation. Please contact the UMTRI library at (734) 764-2171 or umtridocs@umich.edu to inquire about the availability of other publications listed here.

Journal Articles

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The research documented in this article was sponsored by TRW Automotive and the Transportation Research Board Committee on Safety Data, Analysis, and Evaluation.

Reed, M.P.; Ebert-Hamilton, S.M.; Schneider, L.W. 2005. "Development of ATD Installation Procedures Based on Rear-Seat Occupant Postures." *Stapp Car Crash Journal*. Vol. 49 (Nov. 2005) p. 381–421. Report No. SAE 2005-22-0018.

The research documented in this article was sponsored by the National Highway Traffic Safety Administration.

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The research documented in this report was sponsored by the Alliance of Automobile Manufacturers.

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The research documented in this report was sponsored by the Alliance of Automobile Manufacturers.

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The research documented in this report was sponsored by the Alliance of Automobile Manufacturers.

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The research documented in this report was sponsored by the American Concrete Pavement Association.

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The research documented in this report was sponsored by the Federal Motor Carrier Safety Administration.

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CONFERENCES & EVENTS

**Fiftieth Anniversary of the Interstate System
Black Tie Dinner**
June 29, Washington, D.C.
www.artba.org/50th/GD

Sixteenth World Congress on Ergonomics
July 10–14, Maastricht, the Netherlands
www.iea2006.org

Urban Transport 2006
July 12–14, Prague, Czech Republic
www.wessex.ac.uk/conferences/2006/urban06

**National Transportation
Management Conference**
July 23–28, Park City, Utah
<http://transportation.org/aashto/calendar.nsf>

**Vision in Vehicles Eleventh
International Conference**
July 27–30, Dublin, Ireland
www.lboro.ac.uk/research/esri/applied-vision/projects/visioninvehicles/viv11.html

**International Forum on Traffic Records and
Highway Information Systems**
July 30–August 3, Palm Desert, California
www.atsip.org

ITE 2006 Annual Meeting and Exhibit
August 6–9, Milwaukee, Wisconsin
www.ite.org/annualmeeting/

**International Conference on
Asphalt Pavements**
August 12–17, Québec City, Canada
www.asphalt.org

National Conference on Access Management
August 13–16, Park City, Utah
www.accessmanagement.gov

**International Symposium on Advanced
Vehicle Control (AVEC 2006)**
August 20–24, Taipei, Taiwan
<http://avec06.pme.nthu.edu.tw>

International Baltic Roads Conference
August 28–30, Kuresaare, Estonia
www.balticroads.org

**International Level
Highway/Railroad Crossing Symposium**
September 10–14, Montreal, Canada
<http://levelcrossing2006.com>

**American Traffic Safety Services Association
Mid-Year Meeting**
September 13–16, Arlington, Virginia
<http://atssa.browsermedia.com/meetevents/midyear>

GHSA Annual Meeting
September 16–20, Oklahoma City, Oklahoma
www.statehighwaysafety.org/html/meetings/annual/2006

**ITSC 2006: International IEEE Conference
on Intelligent Transportation Systems**
September 17–20, Toronto, Canada
www.itsc2006.org

**Transportation Association of Canada
Annual Conference and Exhibition**
September 17–20, Charlottetown, PEI, Canada
www.tac-atc.ca/english/annualconference/annualconference.cfm 

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Transportation Tidbits

- January 3 is a popular day for automotive history. On this day in 1899, an editorial in *The New York Times* made the first known reference to the word “automobile.”
 - In 1921, the Studebaker Corporation announced that it would no longer build farm wagons, instead it would build only cars. Studebaker began as a horse-drawn wagon shop in 1852 and became the world’s biggest manufacturer of horse-drawn carriages and carts. By 1902 it produced electric automobiles and by 1904, gasoline-powered cars. Production of Studebaker automobiles ended in 1963 in the U.S. and in 1966 in Canada.
 - On January 3, 1926, General Motors introduced the Pontiac brand name. The new Pontiac line was the descendant of the Oakland Motor Car Company, acquired by General Motors in 1909.
- Walter Chrysler, a General Motors executive who had pioneered all-steel bodies (instead of wood) in automobiles, introduced his first motorcar on January 5, 1924. After his departure from GM in 1920, Chrysler had breathed new life into the failing Maxwell Motor Company. The first Chrysler-built Maxwell was displayed in New York City’s Commodore Hotel, where it drew admiring crowds. In 1925, the Maxwell Motor Company was renamed the Chrysler Corporation.
- On February 5, 1952, the first “Don’t Walk” sign was installed in New York City in response to the growing awareness of pedestrian fatalities on the increasingly crowded Manhattan streets.
- The one-millionth Jeep rolled off the assembly line on March 19, 1952. The Jeep was born in 1939, when the American Bantam Car Company submitted its original design for an all-terrain troop transport vehicle to the U.S. Armed Forces. The Jeep featured four-wheel drive, masked fender-mount headlights, and a rifle rack under the dash. The Army loved Bantam’s design, but the development contract was awarded to the Willys-Overland Company for its superior production capabilities. Bantam wound up fulfilling a government contract for 3,000 vehicles during the war; but the Jeep, as designed by Willys-Overland, would become the primary troop transport of the U.S. Army. Mass production of the Willys Jeep began after the U.S. declaration of war in 1941. The name Jeep reportedly derived from the Army’s request that car manufacturers develop a general purpose, or GP, vehicle. “Gee Pee” then turned to “Jeep.”
- On February 25, 1979, Christie’s Ltd., the London-based auction firm, held its first collector car auction in Los Angeles. M.L. Bud Cohn purchased a 1936 Mercedes-Benz 500K roadster for \$400,000.

SOURCE: This Day in Automotive History, www.historychannel.com/tidh



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