Technological advancements reduce stress on driver, research shows

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Photo: Melanie Gonick/MIT

Ford Motor Company and the Massachusetts Institute of Technology (MIT) New England University Transportation Center (NEUTC) today revealed results from a nine-month advanced research project that shows drivers are less stressed when using selected new technological advancements in the car. This study is an extension of an ongoing alliance between Ford and MIT to improve driver focus, wellness and safety through the integration of vehicle technology.

“Ford’s collaboration with MIT and NEUTC is an important pathway to the future of transportation,” said Joe Coughlin, director of MIT’s New England University Transportation Center. “This study, which yielded significant results, showed ways we can use new technology to improve well-being and performance behind the wheel.”

Photo: Melanie Gonick/MITThe study monitored drivers as they performed perceived “high-stress” tasks such as parallel parking and backing out of parking spaces with restricted visibility. The results showed a reduction in both self-reported stress levels and objective physiological measures used to monitor driver stress load. These findings were strongest in the parallel parking study, where use of Ford Motor Company’s Active Park Assist feature in the Lincoln MKS helped to significantly reduce stress on drivers compared to the manual operation of performing the same task. When backing out of parking spaces with Cross-Traffic Alert, drivers were more likely to appropriately stop and yield to an approaching vehicle than when the Cross-Traffic Alert system was unavailable.

Reversing stress

Today’s consumers are seeking every edge they can in the pursuit of a healthier and happier life, yet record levels of stress are being reported. According to the Gallup-Healthways Well-Being Index, people in their late thirties to mid-fifties are actually reporting the lowest state of well-being over their lifetime. Just as stress builds up incrementally throughout the day, taking proactive steps to decrease stress is important to counterbalance and maintain overall well-being.

“The fact is that middle-aged Americans are at the highest point of stress and unfortunately at the lowest point of well-being in their entire life span,” said Coughlin. “The volume, velocity and the complexity of today’s lifestyle is causing individuals to report an increase in stress and a decrease in enjoyment behind the wheel.”

For the past seven years, Ford has been actively collaborating with MIT’s New England University Transportation Center to understand the correlation between stressors and driving performance and identify technological advancements that both mitigate stress and create a more

enjoyable experience. The conceptual framework for this work, released in a white paper last year, can be found at agelab.mit.edu/system/files/fi … /Driver_Wellness.pdf .

“As an industry leader at the forefront of vehicle safety and security, Ford is investing in research to reduce driver stress, increase driver focus and ultimately renew the positive experience of driving and riding in an automobile,” said Andy Sarkisian, global product planning and strategy manager, Ford Motor Company. “Since 2004, Ford has been committed to implementing technological innovations that continue to further the democratization of technology so every driver has access to affordable, convenient, intuitive features.”

Research results

The research objective of this study was to measure and monitor physiological changes in heart rate during and following the completion of driving challenges, including parallel parking and backing out of a concealed parking space. Using biometric results as well as self-perception evaluations, the research measured the impact of new parking technologies on stress levels. A white paper describing the results of two experiments will be released today by the New England University Transportation Center at MIT: agelab.mit.edu/system/files/fi … echnology_and_driver _stress.pdf .

In the study of Ford’s Active Park Assist system, data were collected from 42 subjects equally distributed between males and females across three age groups — drivers in their twenties, forties and sixties. Prior to testing, each of the subjects was given an in-depth briefing and demonstration of both the technology at the focus of the study as well as related systems. They then gained experience with the systems prior to the defined assessment period. For example, in the parallel parking study, subjects were given three practice opportunities to both manually

parallel park and use Ford's Active Park Assist feature to grow accustomed to the technology and experience parking the Lincoln MKS.

Photo: Melanie Gonick/MIT

Following this introduction, each of the test drivers was monitored using heart rate as an objective method of assessing driver workload and stress on the road. In addition, a subjective measure was monitored by asking subjects to rate their perceived stress level at the completion of each driving maneuver. Detailed evaluations of their experience and impressions of the technology were also collected at the end of the experiment.

"The test subjects averaged a more than 12 beats per minute lower heart rate when using the Active Park Assist system compared to manually parallel parking the vehicle in what was a highly statistically significant decrease," said Bryan Reimer, associate director of research, New England University Transportation Center at MIT. "The substantial changes in the objective physiological markers of driver stress, coupled with changes in perceived stress, suggest that the driver's well-being can be increased through this technology."

Data from the initial 10-second anticipatory period prior to initiating the functional maneuvering of parking also had relevant results. During this period, there was a moderate but highly significant difference in heart rate depending on whether the driver was about to use Active Park Assist or park manually.

During the evaluation trials when drivers were anticipating engaging in a manual parking exercise, mean heart rate was 75.9 beats per minute. During the evaluation trials when drivers were anticipating parking using Active Park Assist, heart rate was 72.5, or 3.4 beats per minute lower. This indicates that prior to the physical work involved in maneuvering the steering wheel to manually park, the anticipation alone associated with undertaking the task was more stressful than when drivers were anticipating parking with Active Park Assist.

This difference is particularly notable in that it was observed in individuals who had only had the opportunity to develop experience and trust in this technology for a relatively limited period of time.

“An important aspect of this collaborative research has been Ford’s willingness to support the collection of data on where the implementation of these new technologies might further be improved,” said Bruce Mehler, research scientist at New England University Transportation Center at MIT and a study collaborator. “While more than 76 percent of the participants indicated that the Active Park Assist system made it easier for them to parallel park, developing a better understanding of the participants’ other responses can provide important insight into how further gains in technology adoption and stress reduction can be obtained.”

“These research findings are important because they provide evidence that, in real-world situations, drivers can adjust to new technology when it is designed with the user in mind, and presented in a helpful manner,”

said Dev Kochhar, technical expert at Ford Research & Advanced Engineering.

A second experiment focused on Ford's Cross-Traffic Alert technology. Using a methodology similar to the parallel parking study, drivers were given an opportunity to experience backing out of a blinded parking spot with and without Cross-Traffic Alert. The most notable finding was that at one point in the experiment, all drivers who received a traffic alert warning from the technology stopped and yielded to an approaching vehicle, while only 71 percent of the drivers backing out without the aid of the technology appropriately stopped.

"A meaningful take-away from this work is how objective measurement techniques, such as heart rate monitoring with a high level of sensitivity to changes in stress, can deepen our understanding of the extent to which individuals trust and are comfortable working with new technologies," said Reimer. "This represents an important step in enhancing the design of future technology, improving safety, minimizing stress and contributing to well-being."

Problem-free parallel parking

A recent study conducted online by Harris Interactive on behalf of Ford Motor Company showed that parallel parking remains one of the more difficult and potentially stressful driving situations, with 31 percent of U.S. drivers actively avoiding parallel parking whenever possible.

Among female drivers, 43 percent rate their parallel parking ability as "fair" or "poor" compared with 21 percent of male drivers. Ford's Active Park Assist, available on select 2010 and 2011 Ford, Lincoln and Mercury vehicles, takes the anxiety out of parallel parking because it quickly identifies a parking spot and can steer the vehicle into the space with little driver assistance.

“The work we’ve done in partnership with New England University Transportation Center at MIT — along with our own work — has led us to develop breakthrough technologies,” said Kochhar. “The Lincoln MKS flagship sedan features the latest in-vehicle technology like Active Park Assist and BLIS (Blind Spot Information System) with Cross-Traffic Alert designed to actively mitigate stress levels while creating a safer and more secure driving experience.”

Advanced technologies, like Ford’s Active Park Assist parallel parking aid, help integrate Lincoln MKS into owners’ lifestyles. This technology employs an ultrasonic-based sensing system, as opposed to video camera-reliant competitive offerings, making parallel parking a breeze. Active Park Assist activates at the touch of a button, locates an adequate parking spot, detects the edges of adjacent objects to calculate an optimized angle, and then steers the Lincoln MKS into the spot while coaching the driver through conventional throttle and braking inputs.

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