Virtual driving assessment predicts risk of crashing for newly licensed teen drivers

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New research published by the journal *Pediatrics* found that driving skills measured at the time of licensure on a virtual driving assessment (VDA), which exposes drivers to common serious crash scenarios, helps

predict crash risk in newly licensed young drivers.

This study, conducted by the Center for Injury Research and Prevention (CIRP) at Children's Hospital of Philadelphia (CHOP) with colleagues at the University of Pennsylvania and the University of Michigan, brings the research community one step closer to identifying which skill deficits put young new drivers at higher risk for crashes. With this cutting-edge information, more personalized interventions can be developed to improve the driving skills that prevent crashes.

While drivers between the ages of 15 and 20 only make up about 5% of all drivers on the road, they are involved in approximately 12% of all vehicle crashes and 8.5% of fatal crashes. The time of greatest crash risk is in the months right after these young drivers receive their license, largely due to deficits in driving skills.

However, many of these newly licensed drivers do avoid crashes. The challenge for policymakers, clinicians, and families has been identifying which drivers are at increased risk of crashing during the learning phase before they drive on their own. Early identification of at-risk drivers offers the opportunity to intervene with training and other resources known to help prevent crashes, making the roads safer for everyone.

Over the past two decades, CIRP researchers have systematically determined the primary reason for novice driver crashes—inadequate driving skills, such as speed management—and conducted studies that informed the development and validation of a self-guided VDA that measures performance of these driving skills in common serious crash scenarios that cannot be evaluated with on-road testing. The VDA utilizes the Ready-Assess platform developed by Diagnostic Driving, Inc., an AI-driven virtual driving assessment that provides the driver with the insights and tools to improve.

In this study, researchers examined the ability of the VDA, delivered at the time of the licensing road test, to predict crash risk in the first year after obtaining licensure in the state of Ohio. Using a unique study design, the results of the VDA were linked to police-reported crash records for the first year after obtaining a license.

"Our previous research showed that performance on the VDA predicted actual on-road driving performance, as measured by failure on the licensing road test. This new study went further to determine whether VDA performance could identify unsafe driving performance predictive of future crash risk," said lead study author Elizabeth Walshe, Ph.D., a cognitive neuroscientist and clinical researcher who directs the Neuroscience of Driving team at CIRP.

"We found that drivers categorized by their performance as having major issues with dangerous behavior were at higher risk of crashing than average new drivers."

The researchers analyzed a unique integrated dataset of individual results of VDA performance, collected in the Ohio Bureau of Motor Vehicles before the licensing road test, linked to licensing and police-reported crash records in 16,914 first-time newly licensed drivers under the age of 25. Data were collected from applicants who completed the VDA between July 2017 and December 2019 on the day they passed the on-road licensing examination in Ohio. Researchers examined crash records up to mid-March 2020.

With the outcome of time-to-first crash after licensure, a Cox proportional hazard model was used to estimate the risk of crash as a function of VDA performance. The study found that the best performing novice drivers, described as having "No Issues" based on their pattern of driving performance on the VDA, had a 10% lower than average crash risk. However, users of the VDA who had "Major Issues with Dangerous

Behavior" had an 11% higher than average crash risk. These results held when adjusting for a variety of variables such as age, sex, and socio-economic status.

"These findings are incredibly important because they provide us with quantitative evidence that we can approach young driver safety in a new way—by predicting crash risk and aiming resources to those who need them most," said Flaura Winston, MD, Ph.D., co-scientific director of CIRP at CHOP and co-author of the study. "By providing this information before licensure, we can direct resources to those most at risk, and potentially prevent crashes from occurring when these teens first drive on their own."

"Our mission is to enable teens to safely assume the roles and responsibilities that come with transitioning to adulthood, and learning to drive is a major step in that direction," said study co-author Dan Romer, Ph.D., research director of the Annenberg Public Policy Center of the University of Pennsylvania and a partner with Winston and Walshe at CHOP to develop and test the VDA for teens. "Having an assessment that furthers this goal is an important achievement that we hope will lead to fewer injuries for teens as they first hit the road."

Michael Elliott, Ph.D., professor of Biostatistics at the University of Michigan School of Public Health and research professor at the Institute for Social Research at U-M and study co-author, said the VDA is designed to take drivers through a variety of low to high risk, uniquely realistic virtual driving scenarios that can determine where skills are weakest. The driving behaviors are tracked in real time using several dozen measures.

"We know young novice drivers are at higher risk of crashing than more experienced drivers," Elliott said. "The novel VDA tool uses information about their behaviors, such as virtual braking, accelerating, steering, and

crashing. That risk profile has now been shown to be predictive of their crash behavior during their first couple of years on the road. What's crucial to note is that most of these behaviors are amenable with additional driving training."

Dr. Winston is an inventor of a VDA. CHOP has licensed this VDA technology to Diagnostic Driving, for use on its Ready-Assess platform. Dr. Winston also has an ownership interest in Diagnostic Driving.

More information: Elizabeth Walshe et al, Driving Skills at Licensure Predict Time to First Crash in Newly Licensed Young Drivers, *Pediatrics* (2023). DOI: 10.1542/peds.2022-060817

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