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

TRAFFIC TECH
Technology Transfer Series

NHTSA

DOT HS 813 180

November 2021

Older Driver Performance Across Six Naturalistic Studies

Background

In 2018 some 52.4 million people, 16% of the U.S. population, were 65 or older. By 2030 all baby boomers will be over age 65, expanding the size of the older population to about 1 in 5 residents. Many older Americans depend on driving to maintain their mobility, independence, and health. In addition, older adults in much of the country have few transportation options beyond driving.

In 2018 some 45.2 million licensed drivers – 20% of the total – were over 65. Per *Highway Statistics 2018* (FHWA, 2021),

- 93% of people 65 to 69 were licensed, as were
- 91% of those 70 to 74,
- 87% of those 75 to 79,
- 81% of those 80 to 84, and
- 62% of those 85 and older.

While age itself does not determine whether someone is safe to drive, age can change physical and cognitive abilities, and consequently, driver behaviors. In 2018 there were 7,316 older drivers involved in fatal crashes, 14% of all drivers in fatal crashes (NCSA, 2020). The challenge is to balance older adults' mobility with their safety, and the safety of all road users.

NHTSA Combined Data

In an effort to explore relationships among age-related changes and driver performance and behaviors, *Older Driver Performance Across Six Naturalistic Studies* (Staplin et al., 2021) aggregated and analyzed data collected from six NHTSA-sponsored studies completed over the previous decade.

Each of these earlier studies had a sample size between 20 and 60 participants, and each included the same measures of clinical functioning, driver performance, and driving exposure (how much and under what conditions participants drove), with exposure data collection lasting up to one month. These attributes provided a potential for data synthesis. Combining data sets from the individual studies could provide greater statistical power to identify relationships among driver functional status, driver performance, and driving exposure. Measures used in the studies are described in Staplin et al. (2021).

Data collected for the NHTSA combined studies included

- clinical measures of participants' functional (including cognitive) status,
- scores on a formal evaluation of driver performance, and
- measures of driving exposure collected using instrumentation installed in participants' vehicles.

Analyses of clinical measures and driver performance focused on how age-related functional changes affected drivers' ability to control their vehicles and respond appropriately to other traffic. Analyses of on-road performance and naturalistic driving data explored whether participants with poorer driving skills were more likely to limit their overall driving, avoid potentially difficult driving conditions, or otherwise self-regulate appropriately.

Analyses of the NHTSA combined data set yielded only a few, "weak" correlations, which, at best, accounted for only 10% of the variance. Most of these were between scores on one of the functional status measures and driver age, with the strongest correlation only 0.33. Among the "weak" correlations involving functional status measures, performance, and exposure, the nature of the correlations was consistent with expectations, with poorer functional scores associated with lower maximum average trip speed, and/or worse behind-the-wheel performance as indicated by higher error scores.

The weak associations between functional status and road test scores in the NHTSA data set could have been due to the measurement protocol. Although widely regarded as the "gold standard" for assessing driver performance, a certified driver rehabilitation specialist (CDRS) evaluation is by its nature subjective, with between-evaluator differences likely. Though the same driver test was used throughout, it was applied by three different CDRSs across studies, and any differences in coding across these evaluators would increase the variability in driving demands from one evaluation to another due to differences in traffic conditions, even with the same evaluator and route.

The NHTSA data set had some additional limitations.

- Data were collected only in Virginia and the Carolinas,
- Sample size was still relatively small, and
- Naturalistic observations of driver behavior were obtained over relatively short intervals.

SHRP2 Older Driver Data

During the same timeframe as the NHTSA studies, the Naturalistic Driving Study undertaken as part of the second Strategic Highway Research Program (SHRP2) enrolled 1,045 drivers 60 and older, whose cars were instrumented for 1 to 2 years. SHRP2 participants underwent the same functional testing as those in the NHTSA studies.

The SHRP2 sample was more robust than the NHTSA data set for several reasons.

- Participants came from sites across the country;
- It included more than 1,000 drivers 60 and older; and
- Observation periods lasted 1 to 2 years.

SHRP2 data, given their longer data collection period, could have revealed more reliable associations between functional status and measures of exposure, had such associations existed. Findings of stronger associations in the SHRP2 data would have suggested that the lack of stronger relationships between functional status and driving exposure in the NHTSA combined data set could be attributed to small samples or shorter data collection intervals.

However, results of the SHRP2 analysis also showed weak relationships between functional status and driving exposure, reinforcing the results of the NHTSA combined data analysis. The interpretation of this finding is consistent with the conclusion expressed in previous NHTSA research: healthy older adults' functional ability has little influence on their choices about how much and under what conditions to drive. These findings suggest that decisions about when, where, and how often to drive primarily reflect older adults' habits and mobility needs, rather than fitness level.

While the SHRP2 lacked a measure that could be compared to the driver performance in the NHTSA combined data set, it did provide crash and near crash data. Analyses of these data showed how drivers' vehicle control responses in crash and near-crash situations were related to differences in their functional abilities.

The time from the instant a driver *could* perceive a threat until it was apparent that the driver *had* perceived the threat and understood the need for a control movement was termed "Latency 1." This was followed by "Latency 2," the interval beginning with the driver's control movement and ending at the time of impact or closest proximity to the other object or vehicle. Drivers with no serious cognitive impairment were expected to have briefer Latency 1 measures, on average, than those with serious cognitive impairment. However, the findings showed that this difference was only significant at the 0.10 level but not at the 0.05 level of significance.

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Research has shown reduced scanning among older drivers as compared to other drivers, which could make them more vulnerable to conflicts arising in their periphery, and explain their overrepresentation in angle crashes, as at intersections or when merging. Analysis based only on crashes/near crashes resulting from conflicts originating in the periphery showed an average Latency 1 interval for the drivers with serious cognitive impairment that was statistically (p=0.019) longer—by a full three-tenths of a second.

The SHRP2 analysis results confirmed observations of older driver behavior/habits demonstrated in the smaller studies sponsored by NHTSA and others. They extend beyond those findings to support researchers' models of how age-related functional changes (particularly cognition) may affect driver performance. The exploratory analysis of SHRP2 response latency data specific to precipitating events originating in the periphery highlights the need to frame research questions precisely in future studies seeking to understand how the capabilities and limitations of normally aging adults may influence the crash avoidance behaviors of these drivers.

The full report can be found at

Staplin, L., Lococo, K. H., Mastromatto, T., & Sifrit, K. J. (2021, November). *Older Driver Performance Across Six Naturalistic Studies* (Report No. DOT HS 813 181). National Highway Traffic Safety Administration.

For information on programs shown effective in improving older driver safety, see

Venkatraman, V., Richard, C. M., & Magee, K. (2021, July). *Countermeasures that work: A highway safety countermeasures guide for State Highway Safety Offices, 10th edition, 2020* (Report No. DOT HS 813 097). National Highway Traffic Safety Administration.

References

Federal Highway Administration. (2021, March 25). Highway Statistics 2018 (Web page and portal). www.fhwa.dot.gov/policyinformation/statistics/2018/

National Center for Statistics and Analysis. (2020, April). *Older population: 2018 data* (Traffic Safety Facts. Report No. DOT HS 812 928). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812928

Suggested APA format citation for this publication:

Staplin, L., Lococo, K. H., Mastromatto, T., & Sifrit, K. J. (2021, November). *Older Driver Performance Across Six Naturalistic Studies* (Traffic Safety Facts. Report No. DOT HS 813 180). National Highway Traffic Safety Administration.

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15344-110221-v3a