

# Analysis of Accident Risk Factors among Elderly Drivers Based on Relationships among Lifestyle and Health Awareness, Driving Experience, ADAS Necessity, and Driving Aptitude Assessments Results

- (50) Study on Driver Characteristics for Delaying Driving Cessation -

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**KEY WORDS:** Human engineering, Elderly person, Driver characteristics, Driving aptitude assessments, Safety needs [C2]

Previous studies by the authors investigated factors influencing older drivers' motivation to participate in driving aptitude assessments, safe-driving educational programs, and the use of Advanced Driver Assistance Systems (ADAS). These studies identified safety needs in daily life and awareness of others as important determinants of participation and utilization. Furthermore, it was confirmed that safety-oriented attitudes among older drivers significantly promote the use of driving aptitude assessments and safe-driving learning programs.

The present study aimed to identify accident risk factors among older drivers by examining the relationships among lifestyle and health awareness, driving experience, ADAS necessity, and driving aptitude assessment results. Data from two surveys conducted approximately one year apart were integrated for analysis. The sample consisted of 327 active drivers (193 males and 134 females) with a mean age of 72.7 years (SD = 6.44). All participants possessed a valid driver's license, had more than one year of driving experience, and drove at least several times per month.

Survey I (December 2023) measured frailty, daily-life safety awareness, social awareness, driving experience, and perceived ADAS necessity. Survey II (March 2025) assessed safety behavior, health-related activities, security awareness, medical consultation behavior, and driving experience. Driving aptitude assessments included estimated grip strength, cognitive performance measured by the Trail Making Test (TMT-A/B), visual function, and hazard perception. Exploratory factor analyses were conducted to identify latent factors, followed by correlation analyses using factor scores. Grip strength, TMT-B, and Hazard Perception (HP), which demonstrated relatively high measurement reliability in online assessments, were included in the analyses.

Factor analysis of Survey I identified six factors: near-accident experience, basic driving skill, safe-driving skill, daily-life safety orientation, physical frailty, and social awareness. ADAS necessity was represented by three dimensions: collision avoidance support, driving assistance, and lane-keeping assistance. Survey II yielded six factors: safe-driving behavior, daily-life safety orientation, near-accident experience, health maintenance activities, crime-prevention awareness, and medical consultation behavior.

Significant positive correlations were observed among daily-life safety orientation, safe-driving behavior, and near-accident-related factors, indicating that safety attitudes in everyday life are reflected in driving behavior. Physical frailty was associated with health maintenance activities, while safety orientation and social awareness were related to crime-prevention awareness, suggesting that safety-related attitudes constitute a broader personal characteristic extending beyond driving contexts (Table 1).

ADAS necessity showed positive relationships with safety orientation, crime-prevention awareness, and social awareness, while demonstrating a negative relationship with basic driving skill. These findings suggest that individuals with a stronger safety orientation recognize greater benefits from ADAS, whereas drivers who are confident in their driving ability perceive less need for technological support. Grip strength was positively associated with basic driving skill and negatively related to frailty. Higher TMT-B scores, indicating reduced cognitive performance, were associated with frailty and stronger safety orientation. Hazard perception showed a significant positive relationship with basic driving skill (Table 2).

Overall, the findings indicate that accident risk among older drivers cannot be explained solely by driving skills. Physical function, cognitive ability, safety awareness, and attitudes toward ADAS are all important contributing factors. Therefore, comprehensive assessment and support programs incorporating these multidimensional factors may help reduce accident risk and prolong safe driving among older adults.

Table 1 Correlations among factors related to safety, health, and driving experience in Surveys I and II

| Survey conducted in March 2025 | Survey conducted in December 2023 |                   |                     |               |              |                |
|--------------------------------|-----------------------------------|-------------------|---------------------|---------------|--------------|----------------|
|                                | Physical Frailty                  | Daily Life Safety | Awareness of Others | Basic Driving | Safe Driving | Near-Accidents |
| Daily Life Safety              | -.246 **                          | -.548 **          | .302 **             | -.231 **      | -.038        | .065           |
| Health Maintenance             | .330 **                           | .053              | .060                | .152 **       | .211 **      | -.188 **       |
| Medical Care-Seeking           | .041                              | -.156 **          | -.012               | -.013         | -.195 **     | .225 **        |
| Crime Prevention               | -.075                             | .419 **           | .374 **             | -.116 *       | .005         | .122 *         |
| Safe Driving                   | .127 *                            | .091              | -.064               | .026          | .433 **      | -.435 **       |
| Near-Accidents                 | -.181 **                          | .094 *            | .330 **             | -.169 **      | -.292 **     | .461 **        |

\*\*  $p < .01$ , \*  $p < .05$

Note. Gray-shaded cells indicate correlation coefficients between factors based on identical or similar measurement items in the 2023 and 2025 surveys.

Table 2 Correlations among factors related to safety, health, driving experience, ADAS necessity, and driving aptitude assessments

| Life and driving                 | Necessity of ADAS   |          |                   |                     | Measurement of body and cognitive function |         |         |
|----------------------------------|---------------------|----------|-------------------|---------------------|--------------------------------------------|---------|---------|
|                                  | Collision Avoidance | Driving  | Automated Driving | Second order factor | Grip strength (NN Est.)                    | TMT-B   | HP      |
| urvey conducted in December 2023 |                     |          |                   |                     |                                            |         |         |
| Physical Frailty                 | .071                | .074     | .081              | .079                | -.112 *                                    | .175 ** | -.072   |
| Daily Life Safety                | .252 **             | .289 **  | .269 **           | .294 **             | -.138 *                                    | .147 ** | -.107 * |
| Awareness of Others              | .347 **             | .330 **  | .288 **           | .357 **             | -.147 **                                   | -.030   | -.024   |
| Basic Driving                    | -.206 **            | -.250 ** | -.141 *           | -.232 **            | .327 **                                    | -.038   | .135 *  |
| Safe Driving                     | -.059               | -.075    | -.110 *           | -.081               | -.010                                      | .020    | -.026   |
| Near-Accidents                   | .120 *              | .104 *   | .169 **           | .132 *              | .035                                       | -.085   | .095 *  |
| urvey conducted in March 2025    |                     |          |                   |                     |                                            |         |         |
| Daily Life Safety                | .200 **             | .249 **  | .205 **           | .241 **             | -.185 **                                   | .025    | -.030   |
| Health Maintenance               | .021                | .110 *   | .044              | .071                | -.051                                      | .068    | -.067   |
| Medical Care-Seeking             | -.070               | -.125 *  | -.029             | -.091 *             | .078                                       | -.030   | .039    |
| Crime Prevention                 | .181 **             | .240 **  | .215 **           | .231 **             | -.137 *                                    | -.049   | -.026   |
| Safe Driving                     | .018                | .066     | .008              | .038                | -.027                                      | -.008   | -.073   |
| Near-Accidents                   | .091 *              | .067     | .115 *            | .091 *              | -.034                                      | -.084   | .107 *  |

\*\*  $p < .01$ , \*  $p < .05$ , +  $p < .10$