

Development of Driver Education System for Calibrating Older Drivers' Self-Assessment

Motoki Shino ¹⁾ Shuto Inouchi ¹⁾ Hiroshi Yoshitake ¹⁾ Ryota Fujita ²⁾ Hiroto Kato ²⁾

1) Institute of Science Tokyo
2-12-1 Ookayama, Meguro, Tokyo, 152-8550, Japan

2) Mitsubishi Precision Co., Ltd.
345 Kamimachiya, Kamakura, Kanagawa, 247-8505, Japan

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As the population of older drivers continues to grow, preventing their traffic accidents has become an urgent societal issue. Although aging inevitably declines cognitive and physical abilities, older drivers can maintain safe driving practices if they accurately assess their own capabilities. However, they frequently exhibit a tendency to overestimate their driving skills. Previous studies proposed simulator-based safety education methods to correct this overestimation, but these conventional approaches required the constant intervention of an instructor. To improve the efficiency and accessibility of such education, this study developed an instructor-less, self-directed driver education system and evaluated its effectiveness on older drivers' self-assessment and on-road driving behavior.

To enable older drivers to independently correct their overestimation, we systematized the previously established educational processes into a single-screen driving simulator system (Fig.1). A key novelty of this system is the introduction of dialogue elements for an on-screen agent, which guides users through attention tasks and reflection sessions without human assistance. Furthermore, the system incorporates a critical procedure requiring participants to review and explicitly approve their own driving records. This step was designed to prevent them from attributing near-miss experiences to the simulator's artificial environment, encouraging objective self-reflection. To validate the system, an experiment was conducted with 51 routinely driving older adults. On the first day, participants drove an on-road course and completed a safety awareness questionnaire. On the second day, they engaged with the simulator education, completing a self-evaluation questionnaire before and after the intervention. Finally, they drove the identical on-road course again to assess behavioral changes.

The results demonstrated that 89.1% of the participants who initially overestimated their abilities successfully corrected their overestimation after the intervention. As depicted in Fig.2, the self-evaluation scores decreased significantly, providing evidence that this instructor-less system effectively calibrates self-assessment. Moreover, regarding on-road driving behavior at unsignalized intersections with blind corners, the starting point for the safety confirmation process shifted significantly earlier after receiving the education, as shown in Fig.3. This indicates a tangible and practical improvement in safe driving practices.

The impact of this education on driving behavior was further analyzed regarding self-assessment calibration and safety awareness. Participants were categorized based on their degree of overestimation correction. The analysis revealed that the group with a larger degree of correction exhibited a significantly greater improvement in the starting position for safety confirmation compared to the smaller correction group. Additionally, older drivers whose anxiety regarding accidents increased due to the education showed a stronger tendency to improve their driving behavior. This suggests that the intervention not only recalibrated their self-estimation but also encouraged driving more carefully. In conclusion, the developed self-directed education system effectively corrects older drivers' overestimation and enhances their safety awareness, synergistically contributing to concrete improvements in actual on-road driving behavior.

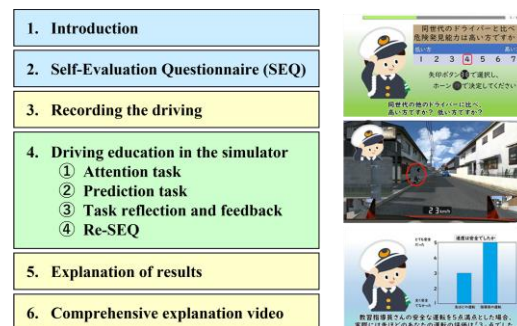


Fig.1 Overview of the driving education system implemented in a single-screen simulator

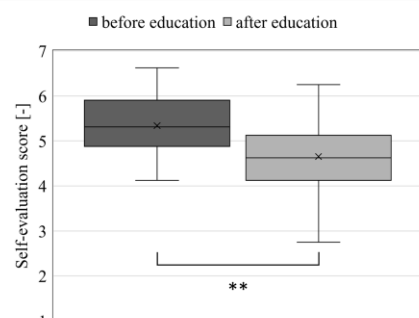


Fig.2 Change in self-evaluation score through education (** $p < 0.01$)

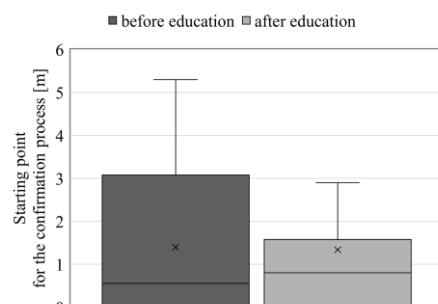


Fig.3 Comparison of starting point for the confirmation process before and after education