

T. SATO, M. AKAMATSU. How elderly driver's behavior changes with aging? Field experiments and analysis of driving behavior while approaching intersections. *Gerontechnology* 2010; 9(2):327; doi:10.4017/gt.2010.09.02.179.00

Purpose The number of elderly people has been increasing annually, as has the number of elderly drivers who drive their own passenger vehicle in their daily lives. It is thus important to develop advanced driver assistance systems that promote safe driving of elderly drivers. Various research activities focusing on comparing physical and cognitive functions between young and elderly drivers have been conducted in order to investigate the influences of age-related functional declines on the driving of the elderly. The aim of this study is to clarify how elderly drivers decelerate when approaching intersections based on an analysis of how driving behavior changes with aging. We compared the elderly drivers' behavior determined in one year with that determined five years later. **Method** Field experiments using AIST instrumented vehicles¹ were conducted twice, in 2002 or 2003 (called '1st experiments') and in 2007 or 2008 (called '2nd experiments'). AIST instrumented vehicles were equipped with various sensors and recorder systems to detect the vehicle driving status (velocity, acceleration, distances to a leading vehicle, etc.) and to measure the driving behavior (steering, accelerating, braking, etc.). The position of the driver's right foot (covering the accelerator or brake pedal without pressing) was detected by laser sensors fitted above the pedal surfaces. Six elderly drivers participated in the experiments. The ages ranged from 65 to 70 years old in the first experiments and from 70 to 74 years old in the second experiments. Each participant made 40 recorded trips (made once a day) in the first experiments and 30 trips (made twice a day) in the second experiments. Two driving routes with several left and right turns were selected, and one route included an intersection with a traffic light and a designated lane for a right turn where two participants made the right turn, and another route had an intersection with a stop sign where the other four participants drove in the trials. After all measured drives, the participants were asked a feeling of age-related physical and cognitive changes. **Results & Discussion** The remaining distances when covering the brake pedal while approaching the intersection with a traffic light were shorter in the second experiments than in the first experiments (*Figure 1a*). These tendencies are found both when the participants drove with a leading vehicle that travels straight toward the target intersection and when they drove without the preceding vehicle. The onset location when covering the brake pedal while approaching an intersection with a stop sign became further in the second experiments compared to those in the first experiments (*Figure 1b*). The results of the questionnaire on the concerns about the age-related changes suggest that the participants feel the changes in precise driving and the ability to assess traffic conditions. The consciousness about the changes in the ability to assess traffic conditions may lead to dependence on traffic flow toward the intersection with a traffic light, and this attitude may delay the onset of driver deceleration. The feelings of difficulties in operating a vehicle precisely may lead to early preparation for stopping at an intersection with a stop sign. These findings contribute to improved presentation timings of route guidance systems when making turns and the timings of crossing collision-prevention warnings at non-traffic signal intersections.

References

1. Akamatsu M, Sakaguchi Y, Okuwa M. Modeling of driving behaviour when approaching an intersection based on measured behavioural data on an actual road. Proceedings of HFES 47th annual meeting, 2003; pp 1895-1899

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Address: AIST, Japan;

E: toshihisa-sato@aist.go.jp

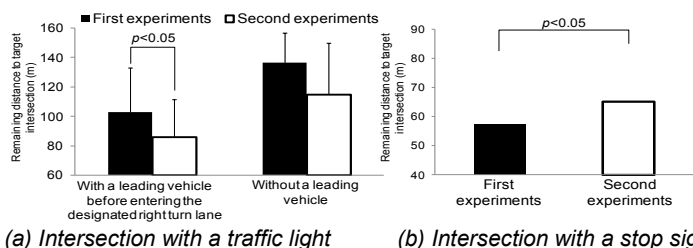


Figure 1 Average remaining distance at the onset of covering the brake pedal