

# Quantitative Analysis of Pedal Operation by Elderly Drivers in Actual Driving Conditions

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In order to collect fundamental data for preventing accidents caused by pedal misapplication of the elderly drivers, we measure the pedal operation in actual driving scenes on the same instrumented vehicle. There were 24 participants for the experiment, of which 13 were men and 11 women, aged 66 to 86 years old. They are a part of the participants of DAHLIA, a database of driving and human characteristics of elderly drivers constructed by Nagoya University Center of Innovation (COI).

We use motion capture system and on-dash cams, and analyze the foot movement and the heel position, in the various driving scenes such as stopped, backed up and parked. The figure 1 shows the distance from the center of the brake pedal to the center of the right instep when the brake pedal is depressed and stopping pattern for each participants in each stopping position. The figure 2 shows the brake and gas pedal layout and foot shape scaled to the distance from the brake pedal. The stopping patterns were 12 combinations of heel status (fix, shift), stopping position (straight, slope, and backward parking), and support cushion (with, without).

The results of the analysis of variance (ANOVA) using these factors significant main effects were found.(heel status ( $F(1,107) = 24.17, p < 0.01$ ), stopping position ( $F(2,107) = 5.850, p < 0.01$ ), support cushion  $F(1,107) = 9.00, p < 0.01$ ).

The results of the post hoc test using these factors showed that the brake pedal position was significantly larger distance from the center of the brake pedal for heel fix group compared to heel shift group, significantly larger for back parking compared to normal stopping/slope stopping in terms of stopping position, and significantly smaller for back parking with support cushion compared to no support cushion.

Furthermore, we confirmed that the distance of foot travel from gas to brake pedal was significantly smaller the heel fix group than the heel shift group at the slope stop.

The relationship between body size and heel fix/shift, heel fix group was also significantly higher in height than heel shift group.

With regard to the position of the right foot during driving, we believe it is necessary to discuss the optimal driving style, taking into account the brake pedal changeover speed and the speed at which the brake pedal is depressed, since a system that generates strong brake fluid pressure in response to the brake pedal operation speed is widely used in recent vehicles.

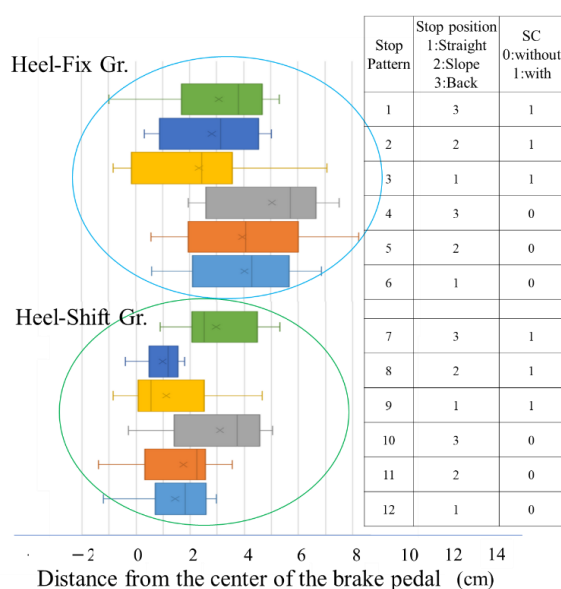


Fig. 1 Distance from the center of the brake pedal

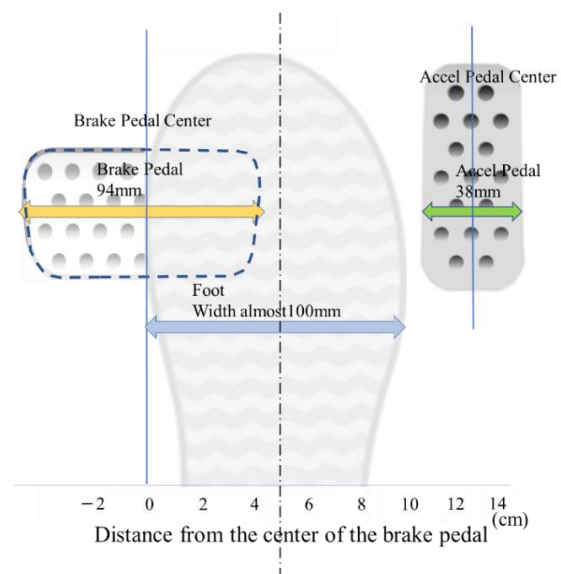


Fig.2 Brake and Gas pedal layout