S. LEE, E. NOH, S. KIM, J. HONG, T. LEE. ***A relation model for eye-hand coordination and driving workload for older drivers.*** *Gerontechnology 2016;15(suppl):111s*; doi:10.4017/gt.2016.15.s.779.00 **Purpose** The physical and cognitive resources of older drivers are needed to perform primary task of driving and various in-car tasks. Drivers use the steering wheel to control lane position and heading, as well as the accelerator, brake and the gear shift. When drivers adjust the instrument panel and reach for an object in the vehicle, they can't pay attention to driving, and an additional driving workload arises from this driver distraction. Since manual demands of an in-vehicle task cannot be treated in isolation and can create additional visual load, eye-hand coordination is necessary for most manual inputs to the instrument panel. Furthermore, diversification of in-vehicle function and complexity of present in-vehicle interfaces, including display and controls, may intensify confusion of the driver. There are many studies related to driving workload that focus on the shape and method of controls or GUI (Graphic User Interface) and layout of the display. However, studies that focus on eye and hand movements by location of display and controls are still insufficient. Therefore, the purpose of this paper is to suggest the best combination of display and control, and deduce a eye-hand coordination model focusing on location of display and controls. **Method** First, components of eye-hand coordination are defined as following 4 factors: (i) distance between display and control (CD), (ii) distance between steering wheel and control (BC), (iii) distance between fixation point and display (AD), and (iv) perceived plain of eye-hand coordination consisting of fixation point, control start point, display and control (ABCD). The performance time for a secondary task and driving workload by NASA-TLX were measured in 25 experimenters. The experimental condition was comprised of the six combinations: location of the display (cluster, centerfasia) and the location of control (steering wheel, centerfasia, console). **Results & Discussion** The results of the statistical analysis indicate that the best combination was a condition where the display is located in cluster and control in the steering wheel ($p<0.05$). Also, driving workload and performance time according to location of display and control were statistically different ($p<0.05$). In addition, there is a positive correlation between eye-hand coordination components and driving workload and performance time. That is, the higher a measure of eye-hand coordination components is, the more the driving workload and performance time increases. Through this, eight regression equations predicting driving workload and performance time were deduced. The best explanation power was reached with the physical demand (PD) model: ($Y(PD)=9.386+0.236*AD+0.006*BC*CD+0.624*BC$). The explanation power was 64%, the highest influential regression coefficient. The equations of predicting effort, performance inhibition and time showed a similar tendency. The regression model can be used as a comparative evaluation of in-vehicle interior by distance measurement without experiment. Therefore, even if you are not an expert, you can still measure and compare driving workload easily and simply. This study can be used as basic research for the in-vehicle design considering eye-hand coordination by location of display and control.

References

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