

Objective Evaluation of Habituation using Psychomotor Vigilance Task: Comparison of Younger and older for Self-Driving

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Autonomous car technology, such as self-driving trucks is one of attracting technology that contributes to solving issues facing the logistics industry (e.g. driver shortages and aging). Self-driving trucks, the lead truck is operated by driver while the other trucks maintain a certain distance from the lead truck. The system is equipped with a communication function that shares data among all trucks in the formation, and the information from the lead truck is used as data to guide the following trucks.

However, the distance between trucks are set short to reduce air resistance and improve fuel efficiency. The previous study on objective evaluation to measure multiple physiological parameters non-invasively, the lead driver suggested that he / she is nervous during the first run and gradually becomes acclimated after multiple runs (Yuda E, et al. 2021).

Accordingly, in this study, we objectively evaluated difference in habituation to simple task between younger and older subjects using psychomotor vigilance task (PVT) in order to evaluate the task burden.

The 12 subjects, 6 healthy younger (1 female, 20 ± 0.4 yo) and 6 healthy older (3 females, 73 ± 4 yo), performed PVT for 1 min in the morning and 2nd test for 1 min the following week. Reaction time (RT), minor lapse (RT ≥ 500 ms), major lapse, and flying start (FS) were compared. During this experiment, subjects wore a wristband pulse wave sensor on their left arm to measure photoplethysmography (PPG) pulse wave signals, and Peak-to-Peak Interval (PPI) was calculated from the PPG data.

Comparing the mean PPI values and PVT indices at the 1st and 2nd test of the experiment, there were no significant differences for any indices in younger groups, but there were significant differences in older groups for RT and Minor lapse ($P < 0.005$ for each). These results suggest that the older group was more responsive to stimuli after repeated trials.

Table 1. PVT comparison of younger and older at 1 st and 2nd (Paired Samples T-Test)

PVT Index		Younger	<i>P</i>	Older (age > 65 yo)	<i>P</i>
RTs	1st	340.2 \pm 46.0	0.27	639.1 \pm 156.8	0.0049
	2ed	309.5 \pm 18.5		398.0 \pm 55.0	
MnLps	1st	0.3 \pm 0.5	0.17	4.3 \pm 2.1	0.0032
	2ed	0		1.2 \pm 1.1	
MjLps	1st	0.2 \pm 0.4	0.36	1.2 \pm 1.1	0.058
	2ed	0		0	
FSt	1st	0.2 \pm 0.4	0.36	0.3 \pm 0.5	0.36
	2ed	0		0.2 \pm 0.4	