Vigilance Decrement and Passive Fatigue Caused by Monotony in Automated Driving

Abstract:
Besides resource depletion caused by being actively engaged in a task, there are several signs that passive monitoring, monotony and passive fatigue can also induce vigilance decrement. Partially automated driving represents such a passive situation as the driver's only task is to monitor the system. In this work, we investigate the decrement of vigilance during a partially automated highway drive in a driving simulator. Indicators used to assess the vigilance state was a reaction time task, passive fatigue was measured by eye tracking and a mind wandering questionnaire. 20 participants drove in a driving simulator for 42.5 min on a sixlane highway with partial automation activated. We found no significant effects of time-on-task on the reaction times, but significant effects on eye tracking parameters (blink frequency, blink duration, pupil diameter) and increased mind wandering. The results show that fatigue can occur without active task engagement, but future studies have to clarify the consequences in terms of reactions to critical events.

Intellectual Contribution:
Discipline-based Research