Project No.	Project Title	
2021-01-031	Behavioral adaptation in partially autonomous vehicle	
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Abstract

Partially automated vehicles are expected to enter our lives in the next decade and offer a safer, more efficient, and faster way to travel than conventional vehicles. However, automatization of the driving process raises challenges at many levels: regulatory and technological challenges, ethical dilemmas and human aspects. Understanding the automated driving process from the human point of view has become an important research object in recent years, as the human factor has an essential role in travel safety. One of those issues is the subject of behavioral adaptation, i.e., the driver's behavioral changes as a result of adopting the autonomous vehicle and integrating it into his daily routine. Contributing factors to these behavioral changes are increased confidence in the vehicle, changes in risk perception, and decreased need to intervene in the driving task.

Many studies have examined how drivers behave in an autonomous vehicle for the first time and a relatively short length. These drivers did not have the time to adapt their behavior to the technology and examine the best way in their opinion to conduct within the vehicle. Therefore, it will be essential to study driver behavior over multiple drives to understand behavioral changes better. This study aims to understand how drivers change their behavior as a function of exposure to autonomous vehicles both by time and number, how their risk perception will change over time, and the relation between these changes.

In a within-subjects pilot study conducted at the Human Performance Evaluation Lab, four participants drove four times each in a fixed simulator in a total of twelve different scenarios over three weeks (n=4). The subjects drove in each scenario twice while connected to an eye-tracking system, using a three-match game as a secondary task. Results show that, in general, the participants drove more carefully in the second drive of each scenario in terms of velocity (SD and absolute value) as well as in terms of driving wheel's SD. This fact may hint that as time progresses, drivers adapt their behavior to partially automated driving and better assess their abilities in this type of driving. Although there was no indication of any change in risk perception over time, Subjects' mental workload seems to decrease among almost all drivers. However, the mental workload increased at the fourth drive for an unknown reason. Results may also indicate a positive correlation between risk perception and trust in automation, hinting that subjects tend to judge the automation system more positively after riskier scenarios, but more research is needed to establish this observation. This pilot provides preliminary evidence of behavioral adaptation drivers undergo when dealing with partially autonomous vehicles, to be investigated more extensively in the future.

Keywords: partially autonomous vehicle, behavioral adaptation, risk perception, mental workload,