Introduction matters: Manipulating trust in automation and reliance in automated driving

Abstract:

Trust in automation is a key determinant for the adoption of automated systems and their appropriate use. Therefore, it constitutes an essential research area for the introduction of automated vehicles to road traffic. In this study, we investigated the influence of trust promoting (Trust promoted group) and trust lowering (Trust lowered group) introductory information on reported trust, reliance behavior and take-over performance. Forty participants encountered three situations in a 17-min highway drive in a conditionally automated vehicle (SAE Level 3). Situation 1 and Situation 3 were non-critical situations where a take-over was optional. Situation 2 represented a critical situation where a take-over was necessary to avoid a collision. A non-driving-related task (NDRT) was presented between the situations to record the allocation of visual attention. Participants reporting a higher trust level spent less time looking at the road or instrument cluster and more time looking at the NDRT. The manipulation of introductory information resulted in medium differences in reported trust and influenced participants’ reliance behavior. Participants of
the Trust promoted group looked less at the road or instrument cluster and more at the NDRT. The odds of participants of the Trust promoted group to overrule the automated driving system in the non-critical situations were 3.65 times (Situation 1) to 5 times (Situation 3) higher. In Situation 2, the Trust promoted group's mean take-over time was extended by 1154~ms and the mean minimum time-to-collision was 933~ms shorter. Six participants from the Trust promoted group compared to no participant of the Trust lowered group collided with the obstacle. The results demonstrate that the individual trust level influences how much drivers monitor the environment while performing an NDRT. Introductory information influences this trust level, reliance on an automated driving system, and if a critical take-over situation can be successfully solved.

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