

Human driver reaction to L3 vehicles in mixed traffic

A driving simulator experiment on the motorway

Motivation

- In the near future, L3 functions (SAE, 2018) will be introduced on the motorway resulting in mixed traffic encounters.
- To date, most human drivers lack experience with L3 vehicles. So, it is unclear how these vehicles will affect traffic safety.
- Further, it is unclear whether and how these vehicles will be labelled in mixed traffic (cf. Schieben et al., 2018).

Are human drivers able to distinguish L3 vehicles from human-driven vehicles?
How safe do human drivers feel in encounters with L3 vehicles on the motorway?

Method

Participants

- $N = 51$ drivers (22 ♀), 20 – 71 yrs ($M = 34$ yrs, $SD = 15$ yrs)

Four scenarios on the motorway (within-subject factor)

- Mixed traffic scenarios selected based on structured interviews with experts ($n = 9$) from the industry & academia

Scenario	Picture	Driving behaviour	
Motorway access (S01)		Automated (A) 1: min. 2.0s THW behind EGO	Human-driven (H) 1: lane change to the left lane
		A2: min. 1.8s THW behind EGO	H2: accelerates
Target merges (S02)		A1: starts overtaking at 2.0s THW behind truck	H1: starts overtaking at 1.2s THW behind truck
		A2: starts overtaking at 1.8s THW behind truck	H2: starts overtaking at 1.0s THW behind truck
Overtaking (S03)		A1: min. 2.0s THW behind EGO	H1: min. 1.0s THW behind EGO
		A2: min. 1.8s THW behind EGO	H2: accelerates
Speed limit (S04)		A1: 80 km/h at sign, 2.0 m/s ² deceleration	H1: 85 km/h, 125 m past sign
		A2: 80 km/h at sign, 2.5 m/s ² deceleration	H2: 90 km/h, 125 m past sign

Research Design

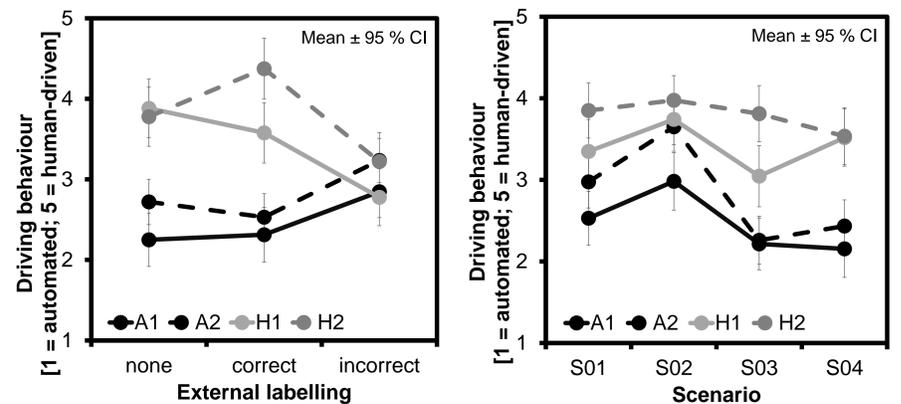
- 3 x 4 x 4 mixed design

External labelling (between-subject)	Driving behaviour (within-subject)			
	A1	A2	H1	H2
No labelling	1x	1x	1x	1x
Correct	1x	1x	1x	1x
Incorrect	1x	1x	1x	1x

Results

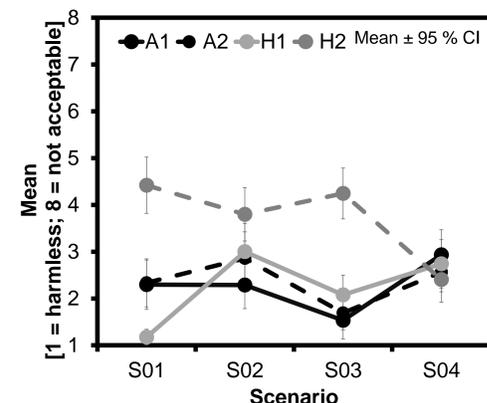
Perceived driving mode

- Interaction effects between scenario & driving behavior, and between driving behavior & external labelling



Perceived safety

- Interaction effect between scenario & driving behavior



Conclusion

- Human drivers identified L3 vehicles due to their behaviour. To avoid confusion, labelling should refer to *current* driving mode!
- Encounters with L3 vehicles were perceived as safe as encounters with human drivers.