

Framing Automation of Driving Tasks: Effects on Risk Perception and Consumers' Current Understanding of Different Levels of Vehicle Automation across Four European Countries

Ilse Harms, RDW, The Netherlands, *iharms@rdw.nl*, **Martijn Teuchies**, Vias institute, Belgium,
Ellen Boudry, Vias institute, Belgium, **Wouter Van den Berghe**, Vias institute, Belgium

Keywords: framing, risk perception, ADAS, automated driving, autonomous driving

1. Introduction

In recent years concern has grown about the understanding of consumers of the capabilities and limitations of on-road vehicle automation (e.g. Schram, 2019; Dixon, 2020; Singer & Jenness, 2020). An important factor contributing to the confusion appears to be the overstatement of the capabilities of vehicle automation in advertisements, media headlines and social media. This results in a gap between the perceived possibilities of automation and the actual capabilities, also known as *autonowashing* (Dixon, 2020). Mismatches between users' expectations of vehicle automation and how they actually function translates into flawed mental models of how to use the system safely. The aim of the current study was to provide insight in whether the framing of advanced driver assistance systems (ADAS) would affect consumers' willingness to take more risks in traffic and to compare their understanding of vehicle automation across four European countries.

2. Method

The study was based on an online questionnaire which included an embedded video. 3,000 people from four European countries completed the questionnaire: 1,200 from The Netherlands, and 600 from Belgium, Germany and France each. Approximately half of the participants identified as female and the other half as male. Participants were between 20 and 60 years old ($M = 39.8$) and had been driving a car for on average 19 years. Both the questionnaire as well as the video were in the language of participants' country of residence. The entire questionnaire, including watching the video, required approximately 15 minutes to complete. The questionnaire included questions regarding participants' interests, such as technology and cars; background, such as their car use; knowledge and perception of ADAS; willingness to take risks in traffic; education on ADAS in their own vehicle; interest in ADAS in a new vehicle; education on self-driving cars; and views on vehicle automation.

To study the effects of framing ADAS on willingness to take risks, the survey respondents were divided into two groups: one group was shown a video where the increased comfort resulting from ADAS was stressed ('comfort condition'), and a second group which saw a video with the same content but where the importance of staying responsible and in control was emphasised ('responsible condition'). For the

ADAS terminology and definitions the ADAS Dictionary has been used (ADAS Alliance, 2021). The questions on risk perception were derived from Singer and Jenness (2020).

3. Results

Respondents in the 'comfort condition' showed a higher willingness to engage in risky behaviour compared to respondents in the 'responsible condition' when asked about driving a car with the ADAS shown in the video. The differences were strongest and statistically significant ($p < 0.001$) for the following behaviours: driving longer than six hours straight, driving when feeling sleepy, driving after drinking alcohol, driving with shoulder or back pain, calling with a mobile phone, texting, and eating while driving. Female respondents were more susceptible to framing than male respondents. Risk appetite was also higher in the Netherlands and France compared to Germany and Belgium. Interestingly, despite the differences between both conditions, on average respondents reported being less likely to engage in the most risky behaviours compared to driving a regular car.

Additionally, the willingness to take risks depending on the level of automation was compared. Four context were used: ADAS in the 'responsible condition', ADAS in the 'comfort condition', 'semi-automated cars' and 'fully automated cars' ('semi-automated' and 'fully automated' were defined in the survey). The main results are shown in Figure 1. As can be seen, respondents are willing to take more risks when the perceived level of automation increases.

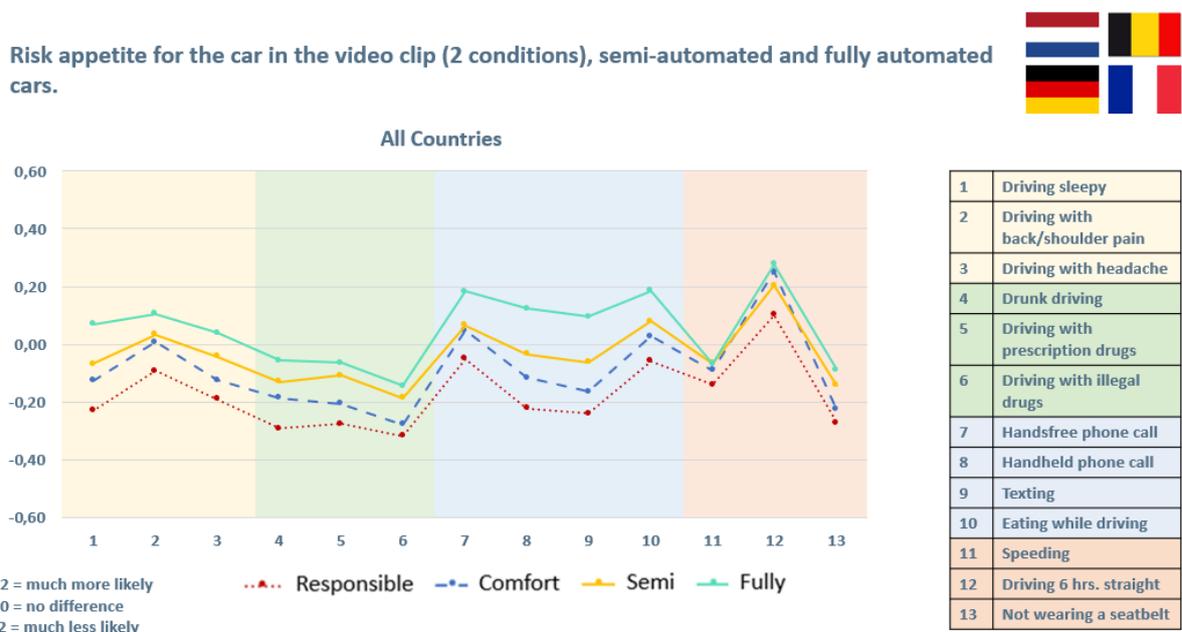


Figure 1 – Risk appetite for 13 risky behaviours depending on the level of automation of the vehicle (ADAS in either the 'responsible' or the 'comfort condition' from the video clips, semi-automated and fully automated)

Other interesting findings from the study are:

- Current knowledge of and understanding of ADAS is low.

- Respondents with ADAS in their car became knowledgeable about its use and effects mainly by the salesperson (33%), by testing it themselves (33%) or from reading the manual (28%).
- Participants' views on vehicle automation and their self-expected risk perception revealed a lack of trust in vehicle automation, regardless of its level.
- For a vehicle to be defined as self-driving, only 45% of the participants required the vehicle to be able to drive to one's destination without a single human intervention.
- Most respondents thought that several car manufacturers already sell self-driving cars to consumers. Only 8% correctly stated that self-driving cars are not available on this market.

4. Discussion and conclusion

The study revealed a clear effect of framing. Participants exposed to the 'comfort' frame indicated a tendency for higher risk taking behaviour compared to participants in the 'responsible' frame. These findings are in line with American results (Singer & Jenness, 2020). Respondents who are already somewhat familiar with ADAS and/or are interested in cars, seem to be less susceptible to the framing of ADAS. Regional differences found may be related to vehicles' age: in Belgium and Germany the car fleet is younger, hence more drivers are familiar with ADAS, making them less susceptible to framing.

Overall, consumers appear to have a limited understanding of the potential of systems for assisted driving (ADAS), and of the differences between assisted, automated and autonomous driving. Nearly similar to earlier findings (Schram, 2019), only 8% stated correctly that self-driving vehicles are currently not for sale on the consumer market by any of the suggested brands.

With the current EU obligation requiring specific ADAS to be present on new cars and with automated driving features around the corner, education of the general public on this matter is of great importance. Using a frame that appeals to the correct role of the human driver - from being an assisted driver to merely being a passenger - helps consumers build more correct mental models of vehicle automation. A well-calibrated mental model is a prerequisite for the safe use of these systems on the road.

References

- ADAS Alliance (2021). *The ADAS Dictionary*. <https://www.adasalliantie.nl/en>, consulted on 16/08/2021
- Dixon, L. (2020). Autonowashing: The Greenwashing of Vehicle Automation. *Transportation Research Interdisciplinary Perspectives*, 5, 100113. doi: [10.1016/j.trip.2020.100113](https://doi.org/10.1016/j.trip.2020.100113)
- Schram, R. (2019). Euro NCAP's first step to assess automated driving systems. Paper number 19-0292. *26th International Technical Conference on the Enhanced Safety of Vehicles (ESV): Technology: Enabling a Safer Tomorrow, Eindhoven, Netherlands*.
- Singer, J., & Jenness, J. W. (2020). *Impact of Information on Consumer Understanding of a Partially Automated Driving System*. Washington, DC: AAA Foundation for Traffic Safety.