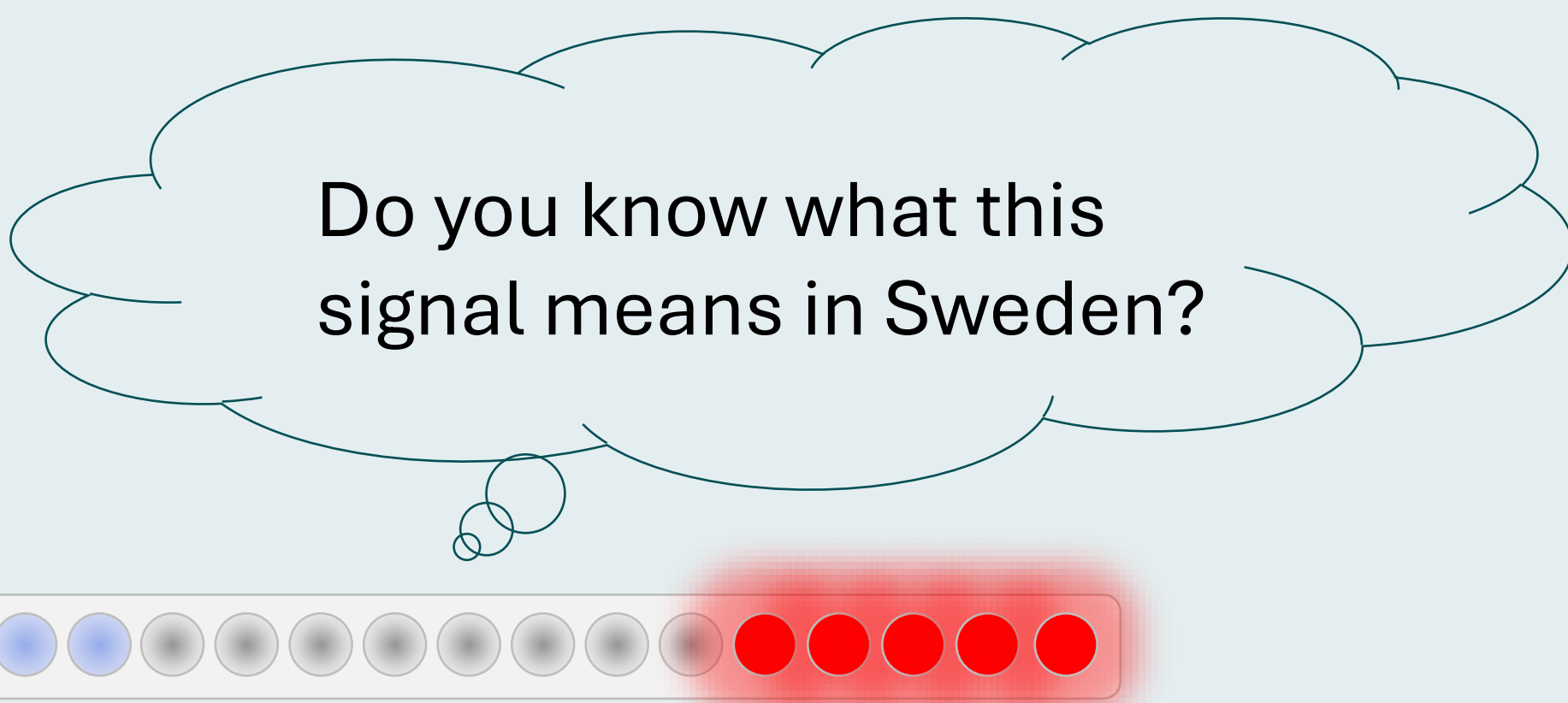


Reducing Ambiguity in Emergency Vehicle Interaction: Strengthening Communication with LED Displays

Kajsa Weibull, Researcher, VTI
Elinor Lundgren, Student, Linköping university
Björn Lidestam, Senior researcher, VTI
Magnus Nylin, Researcher, VTI



INTRODUCTION

Emergency lights signal urgency, but may not tell drivers what they are expected to do (Weibull et al., 2024).

LED text displays could provide situation-specific instructions, but are not currently permitted for operational use in Sweden.

The aim of this study was to explore if LED displays can help drivers respond appropriately in interaction with emergency vehicles.

METHOD

An online survey was conducted to evaluate LED display designs in four use cases. The scenarios were decided through interviews with emergency vehicle operators.



Fig 1. – Images from pullover – stop, roadside accident, take next exit, and emergency driving scenarios

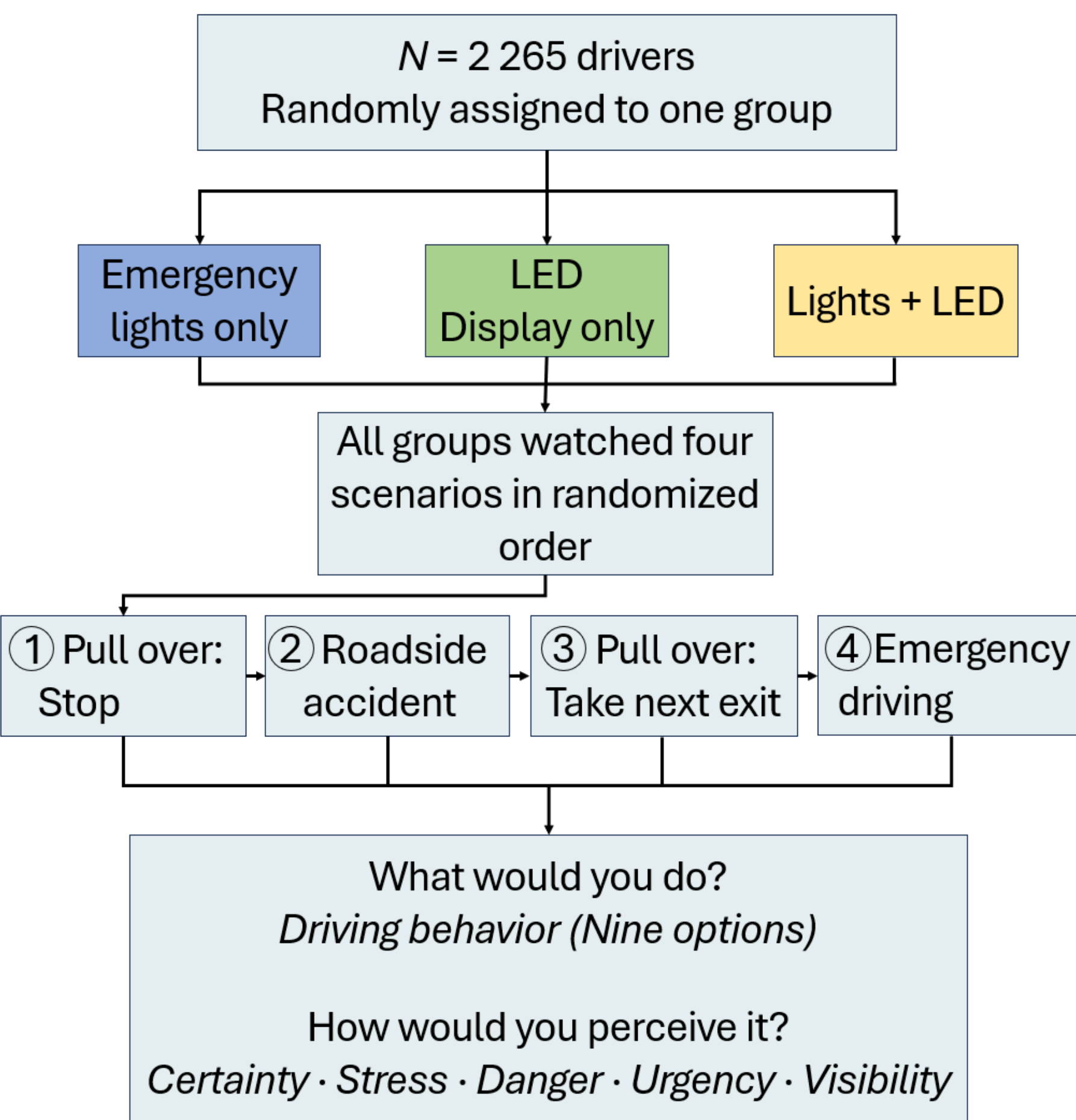


Fig 2. – Respondents grouping for the main study. The behaviors were inspired by Ledin (2022).

RESULTS

$n_{resp.} = 2,265$ (74% men, 25% women, 1% did not say), on average 60 years old (SD = 13.4).

Communication conditions were compared with current emergency vehicle lighting as the baseline. OR > 1 = behavior more likely; OR < 1 = behavior less likely. Error bars show 95% CIs. * = $p < .05$; ** = $p < .01$; *** = $p < .001$

1 Pull over: Stop signal “STOPP”

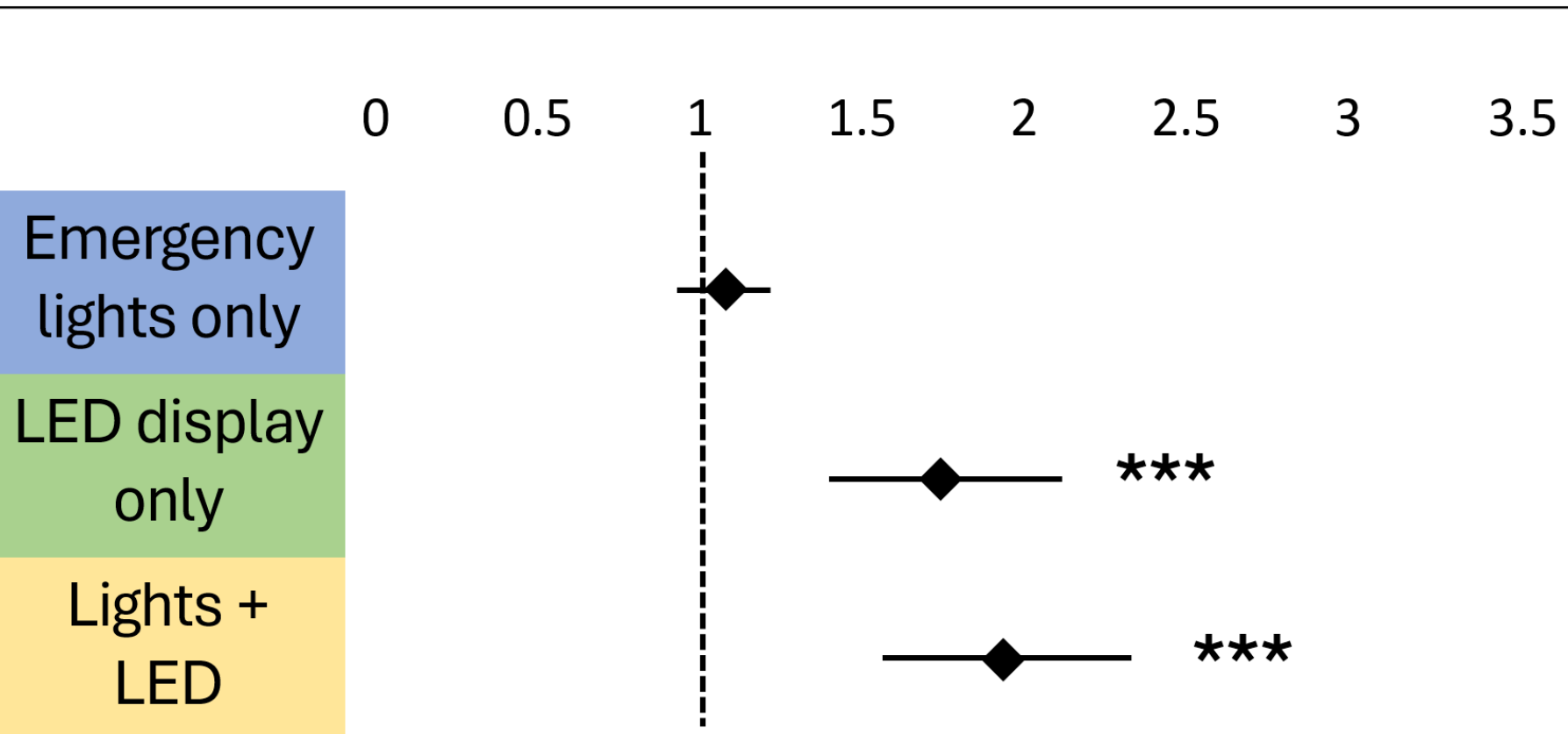


Fig. 3. – Desired behavior: Stop in scenario 1.

2 Roadside accident “Olycka: Sänk farten”

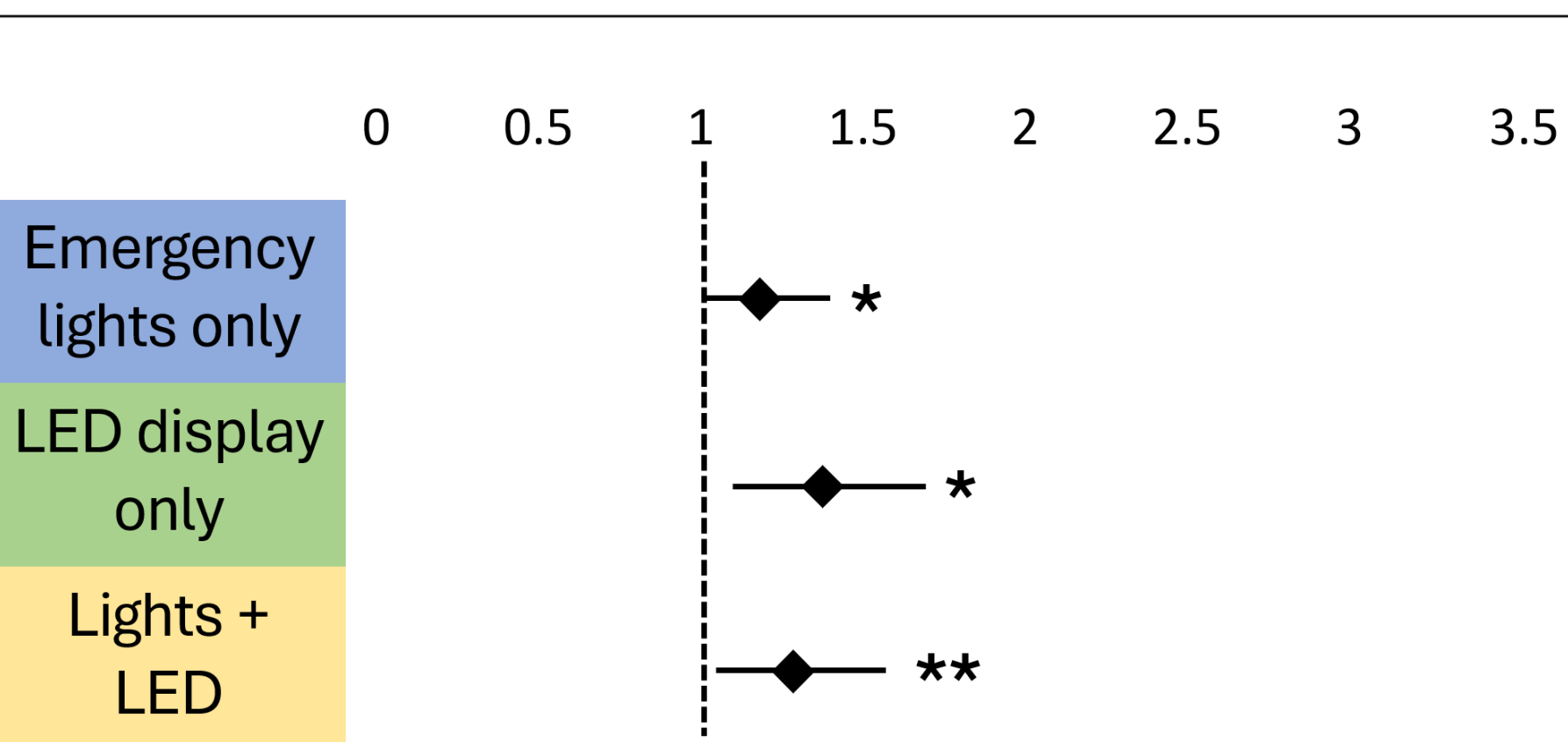


Fig. 4 – Desired behavior: Reduce speed in scenario 2.

3 Pull over: Take next exit “TA NÄSTA AVFART”

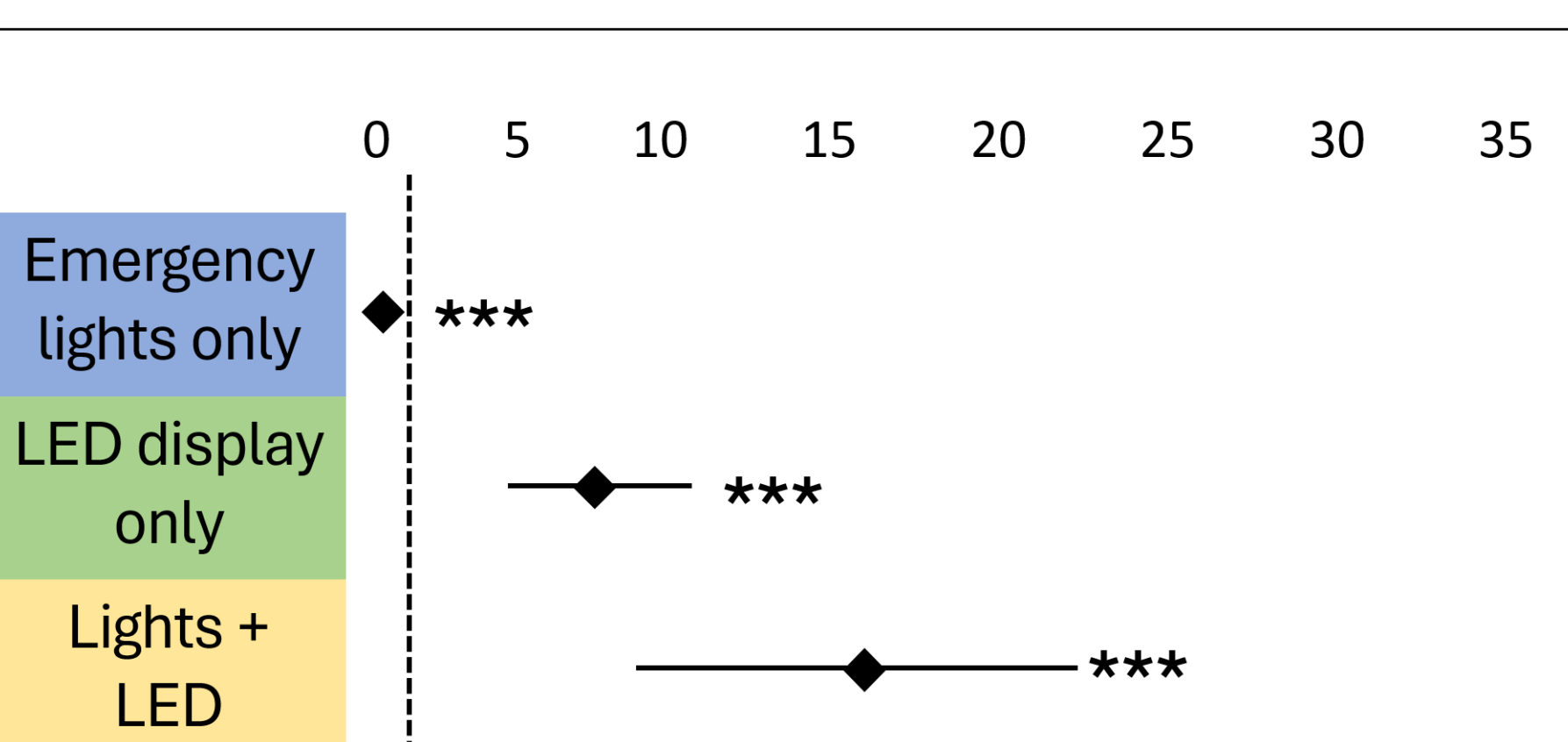


Fig 5. – Desired behavior: Take the next exit in scenario 3.

4 Emergency driving “HÅLL FARTEN”

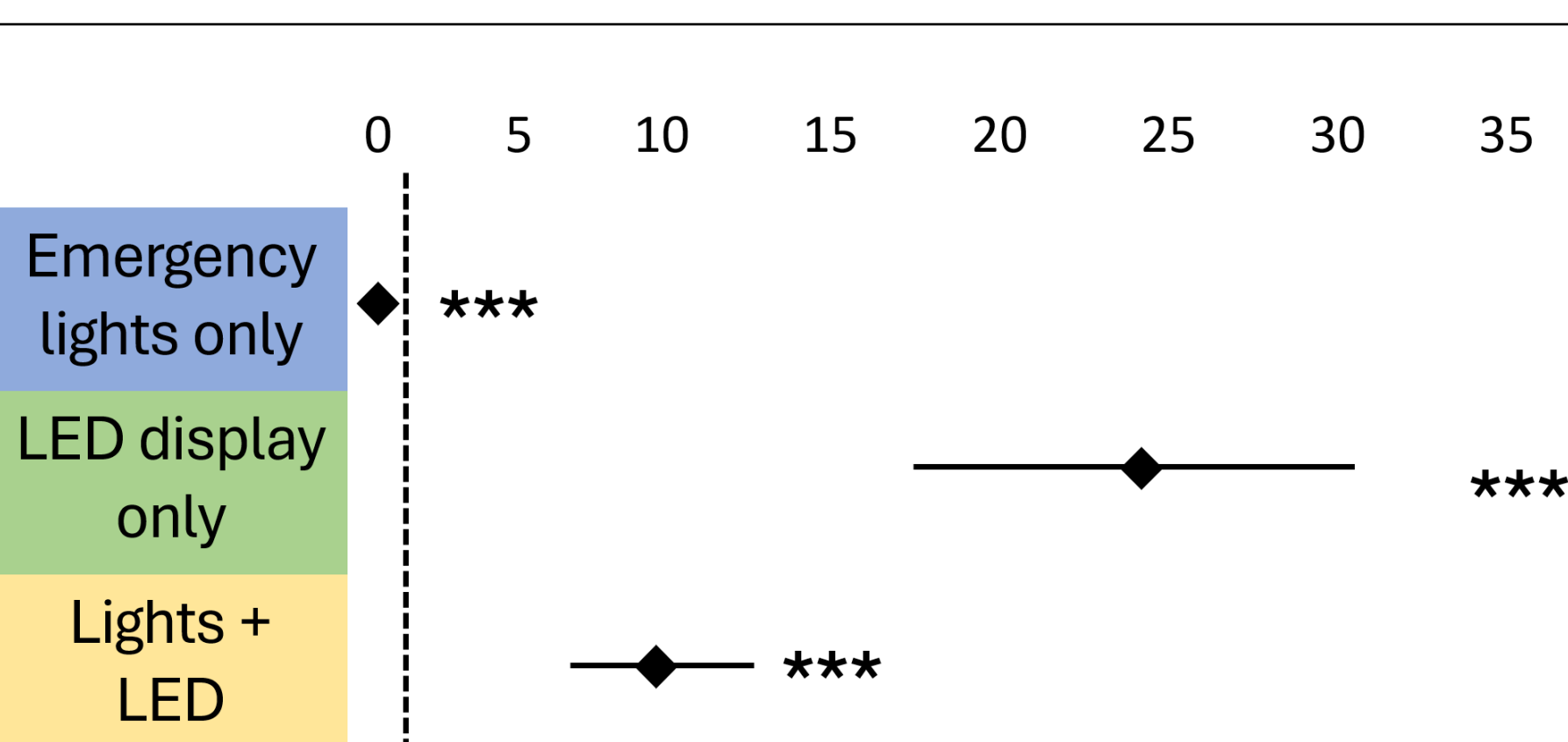


Fig. 6 – Behavior: Continue driving with the same speed and lateral position in scenario 4.

How were the signals perceived?

	Urgency	Visibility	Certainty	Danger	Stress
Emergency lights only	● ● ● ↑	● ● ● ↑		● ● ● ↑	
LED display only			↑		↓
Lights + LED		↑	↑		

Fig. 7 – How the different signals were perceived.

NEXT STEP

Explore LED displays in controlled driving experiments, including effects on drivers' visual attention.

ACKNOWLEDGEMENT

This study was performed by VTI with support from Standby.

Take home message

LED displays can help drivers respond appropriately to emergency vehicles, but are not currently permitted in Sweden

REFERENCES

Ledin, J. (2022). Utformning av blåljus påverkar trafikbeteenden: Alternative Emergency Vehicle Lighting Affects Traffic Behaviors [Master Thesis]. Linköping University.

Weibull, K., Lidestam, B., Holm, J., & Prytz, E. (2024). Alternative Emergency Vehicle Lighting Affects Traffic Behaviors. Proceedings of the Human Factors and Ergonomics Society Annual Meeting, 68(1), 1-7. doi:10.1177/10711813241260291

Kajsa Weibull
Kajsa.Weibull@vti.se

Magnus Nylin
Magnus.nylin@vti.se