



Driving while fatigued in slippery road conditions - a neglected issue

Igor Radun^{1,2}, Mattias Wahde³, Michael Ingre¹, Jenni Radun², Ola Benderius³ and Göran Kecklund¹

¹Stress Research Institute, Stockholm University, Stockholm, Sweden, ²Human Factors and Safety Behavior Group, Institute of Behavioral Sciences, University of Helsinki, Finland,

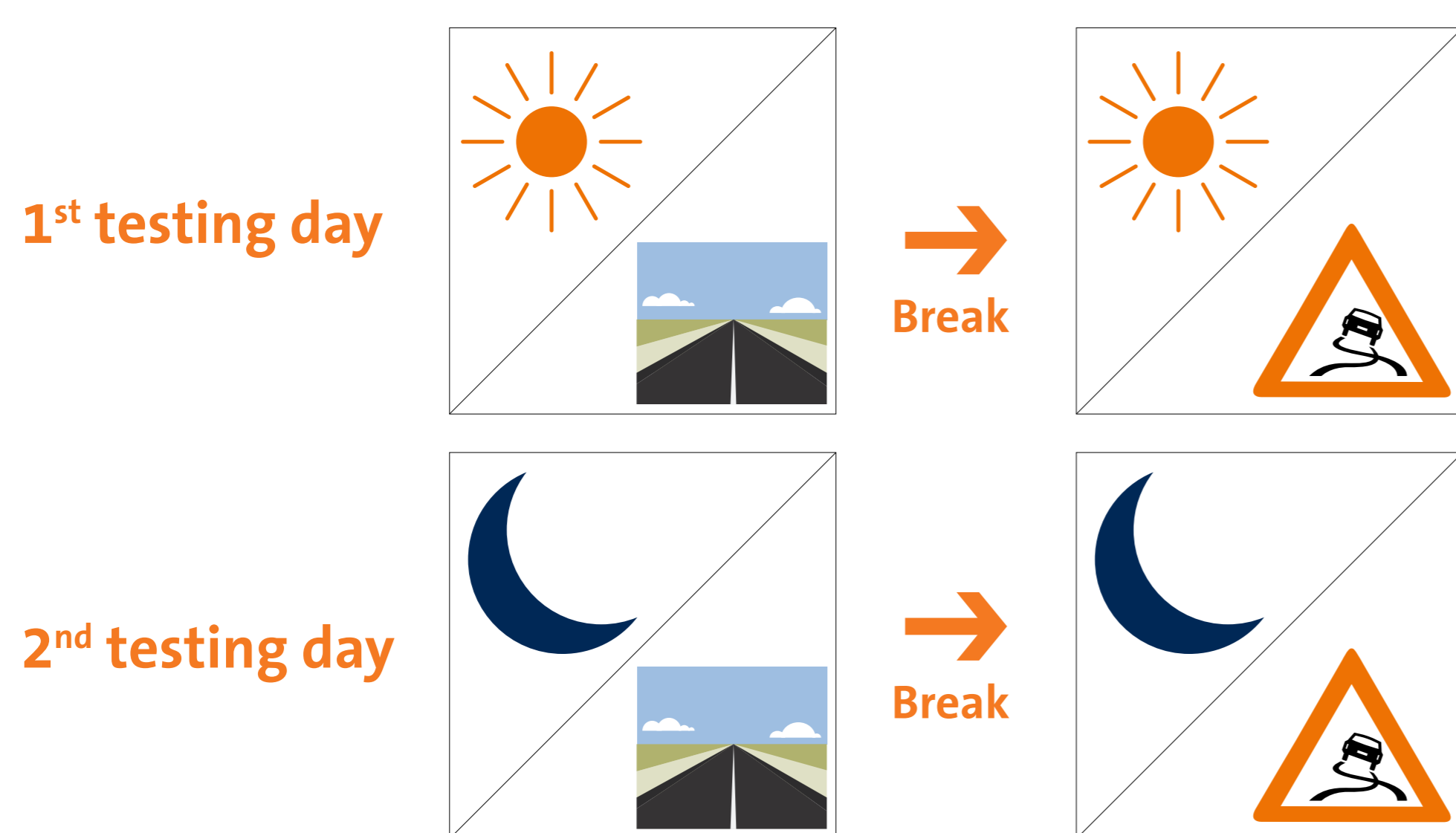
³Department of Applied Mechanics, Chalmers University of Technology, Göteborg, Sweden

Introduction and Purpose

- Fatigued drivers have problems in keeping the vehicle within the lines (higher standard deviation of lateral position and more line crossing; e.g. Philip et al., 2005)
 - Fatigued drivers less often make corrective steering wheel movements, which are, however, of higher amplitude (Thiffault & Bergeron, 2003; Verwey & Zaidel, 1999)
 - Performing sudden or sharp steering movement on a slippery road is risky maneuver increasing the chance of losing the control of the vehicle.
- >Are fatigued drivers, compared to rested drivers, at higher risk when driving on slippery roads?

Methods

Twelve young men participated in a driving simulator experiment with two counter-balanced conditions: normal vs. slippery road x day (alert) vs. night (fatigued) driving. Time-on-task effects were also tested. An advanced moving-base driving simulator was used (Swedish National Road and Transport Research Institute, VTI, Linköping). The participants drove ca. 52km on a monotonous two-lane highway and rated their sleepiness seven times using Karolinska Sleepiness Scale (KSS). Standard deviation of lateral position (SDLP) was a measure of driving performance while blink durations (BD) were extracted from electrooculogram. Data was analyzed with mixed-effect multilevel ordinal logistic (KSS data) and linear regression models (SDLP and BD data).



Conclusions

The subjective sleepiness ratings indicate that driving in demanding road condition (i.e. slippery road) might further exhaust already sleepy drivers. This is not reflected in driving behaviour probably due to short driving duration in this experiment.

Limitations

The duration of the drive was kilometer based, not time based, so there was a variation in time on task. Small number of participants. Small effect sizes. How realistic was slippery condition?

References

Philip, P., Sagaspe, P., Taillard, J., Valtat, C., Moore, N., Åkerstedt, T., Charles, A., & Bioulac, B. (2005). *Fatigue, sleepiness, and performance in simulated versus real driving conditions*. *Sleep*, 28, 1511-1516.

Thiffault, P., & Bergeron, J. (2003). *Monotony of road environment and driver fatigue: a simulator study*. *Accident Analysis and Prevention*, 35, 381-391.

Verwey, W. B., & Zaidel, D. M. (1999). *Preventing drowsiness accidents by an alertness maintenance device*. *Accident Analysis and Prevention*, 31, 199-211.

Funding

The study was financed by the Swedish Transport Administration (Trafikverket) and SAFER - Vehicle and Traffic Safety Centre, Göteborg, Sweden.

Results

	KSS	SDLT	Blink duration
Time on task	p<0.001	p<0.01	p<0.001
Road type			
Day/night	p<0.001		
Time on task* Road type			
Time on task* Day/night	p<0.05		
Road type*Day/night	p<0.05		
Time on task* Road type*Day/night	p<0.05		

