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How unexpected events affect lateral position variability?

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Overview

- The **objective** is to investigate the effect of an unexpected incident on lateral position variability
- A **driving simulator experiment** was carried out including 24 unexpected events for each participant
- The effect of **several parameters** including driver distraction sources (cell phone use, conversation with passenger), driver characteristics (age, gender, driving experience) and road and traffic characteristics are quantified

Experiment design

Sample

The sample of participants is 95 drivers

- 28 young drivers aged 18-34 years old
- 31 middle aged drivers aged 35-54 years old
- 36 older driver aged 55-80 years old

Familiarization

During the familiarization with the simulator, the participants practiced in:

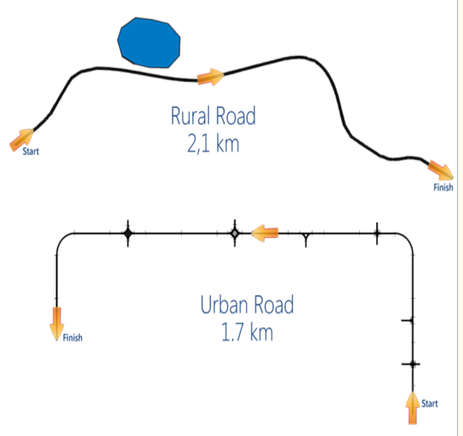
- handling the simulator (starting, gears, wheel handling etc,)
- keeping the lateral position of the vehicle
- keeping stable speed, appropriate for the road environment
- braking and immobilization of the vehicle

When all criteria the above were satisfied (there was no exact time restriction), the participant moved on to the next phase of the experiment

Driving experiment

Road environments:

- A rural route that is 2,1 km long, single carriageway and the lane width is 3m, with zero gradient and mild horizontal curves
- An urban route that is 1,7km long, at its bigger part dual carriageway, separated by guardrails, and the lane width is 3,5m



Traffic scenarios:

- Moderate traffic conditions, corresponding to an average traffic volume Q=300 vehicles/hour
- High traffic conditions, corresponding to an average traffic volume of Q=600 vehicles/hour

Distraction conditions:

- undistracted driving
- driving while conversing with a passenger
- driving while conversing on a mobile phone

Conversation topics

Family, Origin, Accommodation, Travelling, Geography, Interests, Hobbies, Everyday life, News, Business

Incidents

24 unexpected incidents occurred at fixed Points of each trial (two incidents per trial)

Analysis method

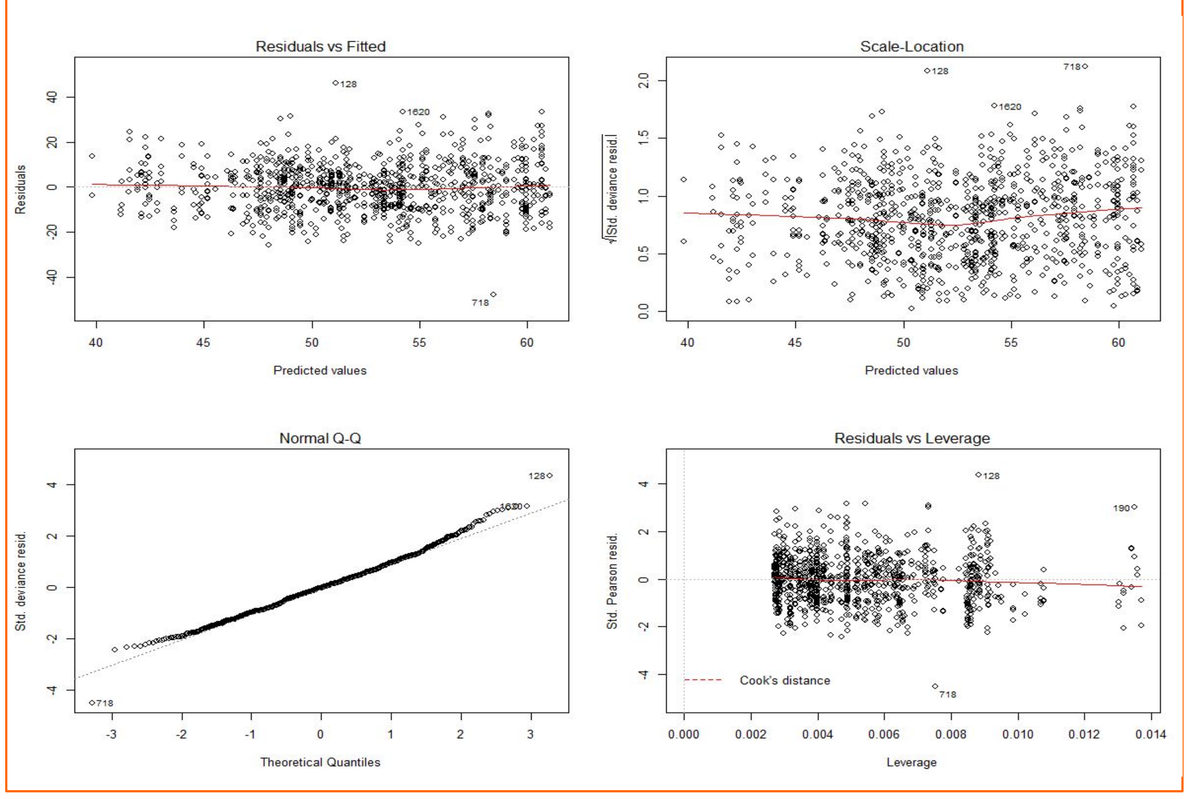
- The **average value** of all driving performance measures was estimated for a time period of 30 seconds before and 30 seconds after the event
- A Generalized Linear Mixed Model (**GLMM**) is developed where the dependent variable is the **difference of lateral position variability before and after the unexpected event**

Results

Since the data involve **repeated measured observations** from each individual drive, a Generalized Linear Mixed Model is developed as follows:

Variables	Estimate	Std, Error	t value	Pr(>|t|)
Intercept	0,136	0,006	20,819	< 0,000
Cell phone use	0,022	0,006	3,395	0,001
No distraction	0,001	0,005	2,292	0,022
Young age group	-0,008	0,007	-1,847	0,047
Speed difference	-0,002	0,001	-5,915	< 0,000
Summary statistics				
AIC	-2,126,61	-		
Log-restricted-likelihood	-24,20			

The following graphs indicate the suitability of the model



Conclusions

- **Cell phone use** increased the difference of lateral position variability indicating that drivers while talking and holding the cell phone achieved a different position of the vehicle on the road after an unexpected event
- **Conversing with a passenger** was not found to affect significantly the difference of lateral position variability
- **Younger drivers** change less their lateral position variability after an incident compared with middle aged and older drivers

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