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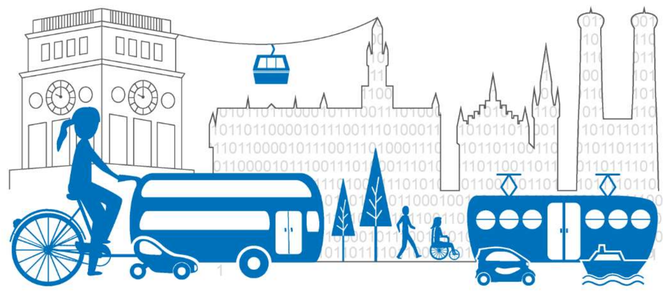

# How an unexpected incident affects speed related driving performance measures

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## Overview

- The **objective** is to investigate the effect of an unexpected incident on speed related driving performance
- A **driving simulator experiment** was carried out including 12 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** is estimated

## 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:

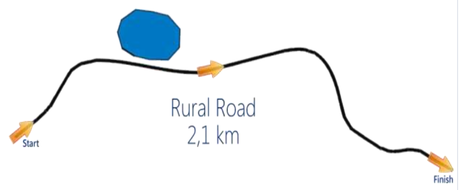
- handling the simulator (starting, gears, wheel handling etc.)
- keeping the lateral position of the vehicle
- keeping stable speed, appropriate for the road environment
- braking and immobilization of the vehicle.

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 scenarios

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

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

## Method of Analysis

- The **experiment data** storage was performed automatically at the end of each experiment. The simulator recorded data at intervals of 33 milliseconds
- 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 of the model is the **difference of average speed before and after the event**

## Results

| Variables | Estimate | Std. Error | t value | Pr(>\|t\|) |
|---|---|---|---|---|
| **Intercept** | -13.152 | 1.583 | -8.305 | < 0,000 |
| **Age - Young** | 1.772 | 1.085 | 1.632 | 0.105 |
| **Experience** | 0.085 | 0.035 | 2.397 | 0.018 |
| **Traffic – Low** | -2.852 | 0.570 | -4.99 | < 0,000 |
| **Cell phone use** | 2.212 | 1.303 | -1.69 | 0.090 |
| **Summary statistics** | | | | |
| **AIC** | 6.616.44 | - | | |
| **Log-restricted-likelihood** | -3.301.22 | | | |

- Focusing on driver characteristics **young drivers** tend to change more their speed after an unexpected incident compared to middle aged and older drivers
- Regarding road environment in **low traffic conditions** speed difference due to the event is lower indicating that after the even is significantly
- More experienced drivers achieve a more compensatory behaviour after the event

## Conclusions

- Drivers while **talking on the cell phone** exhibit in a higher extent compensatory behaviour after an unexpected incident, because the physical presence of a hand-held phone acts as a reminder to the driver of the potential safety threat posed by the use of the phone.
- While **conversing with the passenger**, driver has a lower level of compensatory behaviour however his attention is more often diverted from the road
- The effect of several **driver** and r**oad environment characteristics** is quantified on the different speeding strategies after an unexpected incident
- The research is essential for **policy makers**, professionals involved in testing safety systems and those involved in designing and evaluating new driving environments.

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