6th European Transport Research Conference
MOVING FORWARD:
Innovative Solutions for Tomorrow's Mobility
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INVESTIGATING THE EFFECT OF AREA TYPE AND TRAFFIC CONDITIONS ON DISTRACTED DRIVING PERFORMANCE

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OUTLINE

- Background
- Objective
- Driving simulator experiment
  - Overview of the experiment
  - Driving at the simulator
  - Experiment design
- Analysis method
  - Driving performance measures
  - Statistical methods
- Results
- Conclusions

OVERVIEW OF EXPERIMENT

- Driving simulators allow for the examination of a range of driving performance measures in a controlled, relatively realistic and safe driving environment

- A driving simulator experiment was carried out within the framework of the Distract and the DriverBrain research projects (national research funding)

distrACT driverBRAIN

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Objective

The analysis of the effect of area and traffic conditions on driving performance of drivers while talking on the cell phone or conversing with the passenger

Driving simulator experiment

- Driving simulator
  - Foerst Driving Simulator (1/4 cab)
- Road environment
  - Rural: 2.1 km long, single carriageway
  - Urban: 1.7 km long, dual carriageway
- Traffic scenarios
  - QL: Low traffic - 300 vehicles/hour
  - QH: High traffic - 600 vehicles/hour
- Unexpected incidents at each trial
  - Child crossing the road
  - Sudden appearance of an animal

EXPERIMENT DESIGN

Randomization

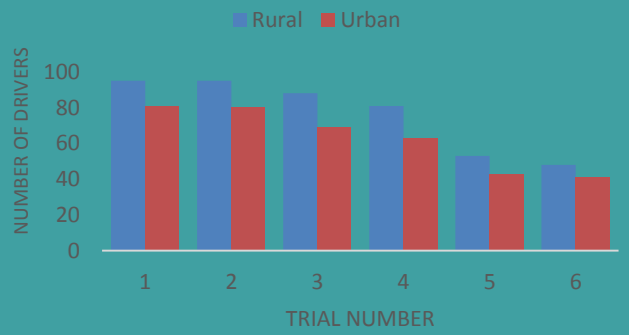
Randomization was implemented in the order of area type, traffic scenarios as well as distraction scenarios

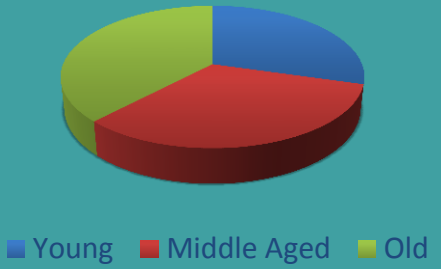
Familiarization

The participant practiced in handling the simulator, keeping the lateral position of the vehicle, keeping stable speed, etc.

Sample

- 28 young drivers (18-34)
- 31 middle aged drivers (35-54)
- 36 older drivers (55+)





Analysis methods

Driving performance measures

- Average speed
- Reaction time an unexpected incident

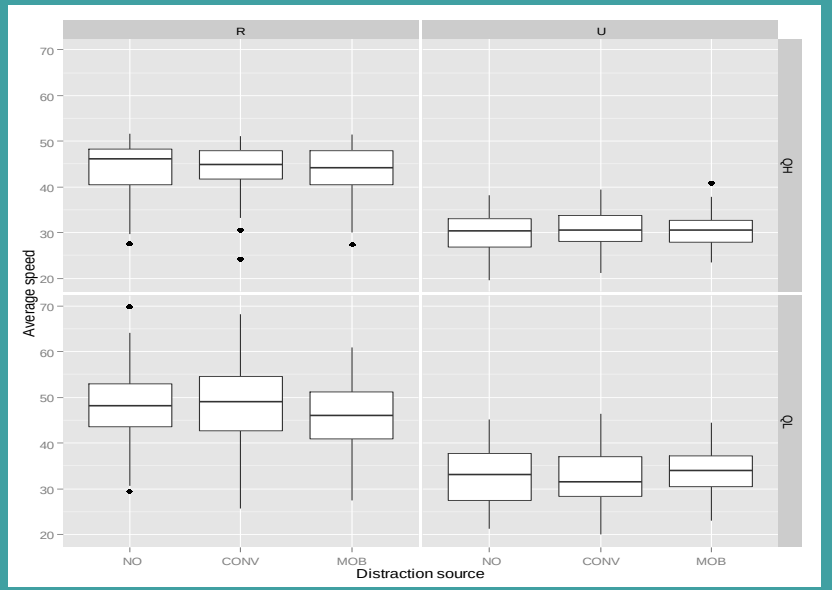
Statistical analysis method

- Descriptive analysis (box plots)
- Generalized linear models (GLM)
- generalized linear mixed models (GLMM)

DESCRIPTIVE STATISTICS (1/2)

Average speed distributions

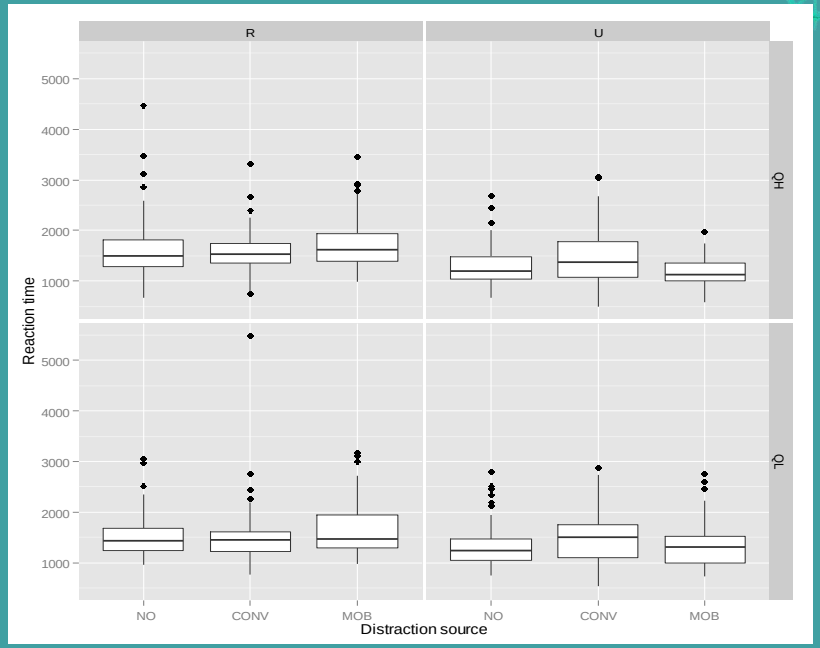
- Average speed is lower in urban areas than in rural areas both in high and low traffic
- In high traffic the effect of distraction on average speed is less significant
- In low traffic in rural areas, talking on the cell phone leads to reduction in average speed



DESCRIPTIVE STATISTICS (2/2)

Reaction time distributions

- Both in rural and urban areas in low traffic conditions distracted driving results to increased reaction time
- In urban areas, reaction time while conversing with the passenger is clearly higher than talking on the cell phone



Regression analysis – Average speed

	Generalised Linear Model		Generalised Linear Mixed Model	
Variables	Est.	t value	Est.	t value
Intercept	44,85	111,04	46,53	60,69
Distraction - Cell phone	-1,22	-2,82	-1,22	-7,00
Age group - Older	-6,15	-14,99	-6,15	-7,32
Gender - Male	2,68	7,25	2,67	2,68
Area type - Urban	-14,54	-39,31	-14,54	-56,22
Traffic - Low	3,17	8,64	3,17	11,94
Summary statistics				
df	7		8	
Final log-Likelihood	-2.584,90		-2.396,94	
AIC	5.183,80		4.809,87	

- Area type has the highest effect on average speed, as drivers in rural areas drive at the highest speeds, as expected due to the less complex driving environment

Regression analysis – Reaction Time

	Generalised Linear Model		Generalised Linear Mixed Model	
Variables	Est.	t value	Est.	t value
Intercept	1.546,15	111,04	1.544,04	35,22
Distraction – Passenger	66,62	-2,82	69,82	1,96
Distraction - Cell phone	85,74	-14,99	91,84	2,25
Age group - Older	286,30	7,25	292,70	6,09
Gender - Male	-181,90	-39,31	-180,36	-4,00
Area type - Urban	-189,01	8,64	-188,73	-5,98
Summary statistics				
df	7		8	
Final log-Likelihood	-6.121,50		-6.086,52	
AIC	12.257,00		12.189,17	

- Male drivers achieved much better reaction times compared to female drivers indicating that they are probably more concentrated and perform quicker in case of an unexpected incident

Conclusions (1/2)

- Results indicate that area type has the highest effect on average speed
- The use of a cell phone while driving results in reduced speeds in both environments within the framework of compensatory behaviour
- While talking on the cell phone or conversing with passenger, drivers of all age groups achieved higher reaction times compared with undistracted driving in all conditions

Conclusions (2/2)

- Young and middle aged drivers achieve higher reaction times when conversing with the passenger than talking on the cell phone
- Female drivers, especially in rural areas, were found to have the worst reaction times, while being distracted
- In urban areas, the complex road environment alerts the drivers in order to self-regulate their driving to compensate for any decrease in attention to the driving task

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