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Cell phone use and driving performance of different age groups

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European Union
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Driver distraction

- Driver distraction is defined as "a diversion of attention from driving, because the driver is temporarily focusing on an object, person, task or event not related to driving, which reduces the driver's awareness, decision making ability and/or performance, leading to an increased risk of corrective actions, near-crashes, or crashes" (Young and Regan, 2007)

- Basic distraction experiment characteristics
  - Distraction source (cell phone, conversation with passenger, music, eating, visual, cognitive etc.)
  - Sample characteristics (size, gender, age distribution, benefits, questionnaire)
  - Experiment design (Practice trial, trial duration, counterbalancing, road environment, traffic conditions)
  - Driving related Outcomes

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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

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Objective

The analysis of the driving performance of drivers from different age groups, while talking on the cell phone

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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

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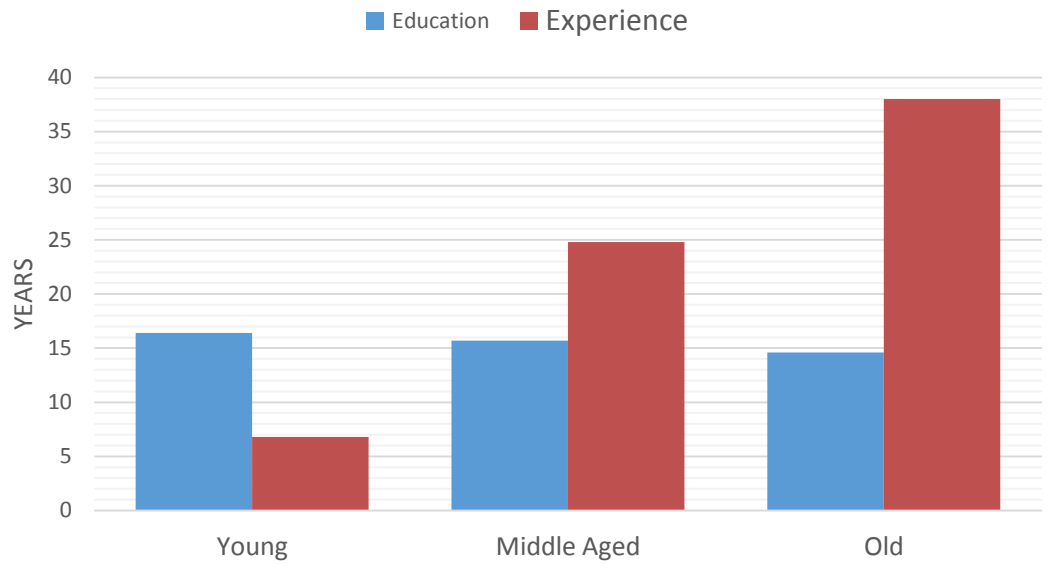
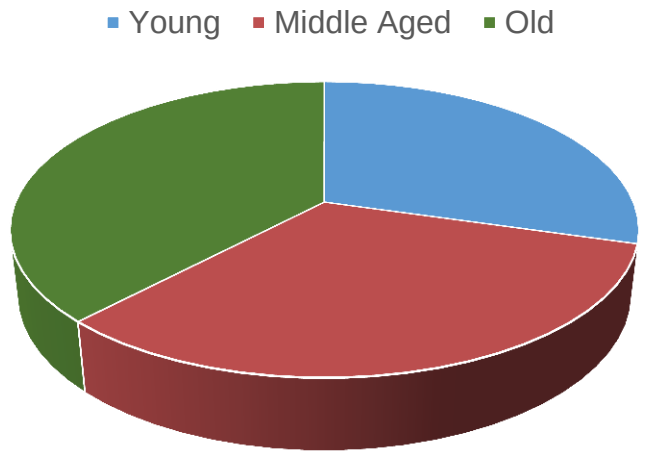
Experiment design

- Randomization
  - The purpose of randomization is to remove bias and other sources of extraneous variation, which are not controllable
- 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+)





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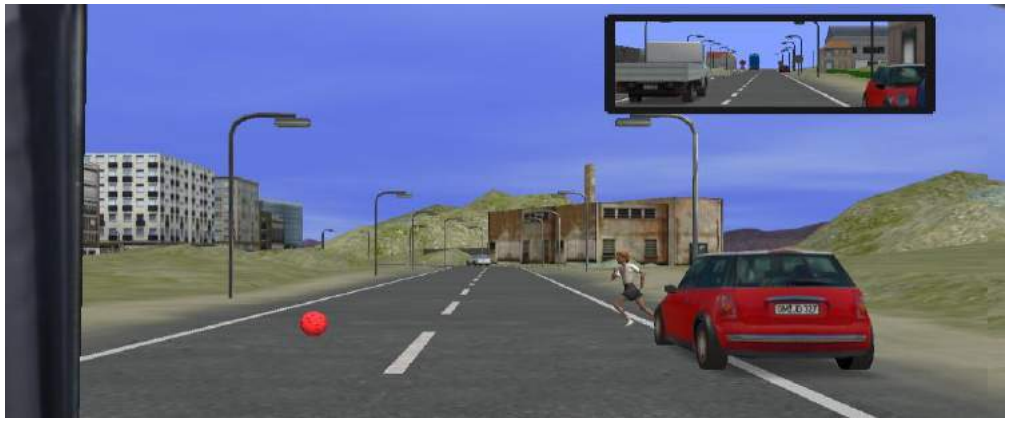
Analysis method

Driving performance measures

- Average speed
- Average headway



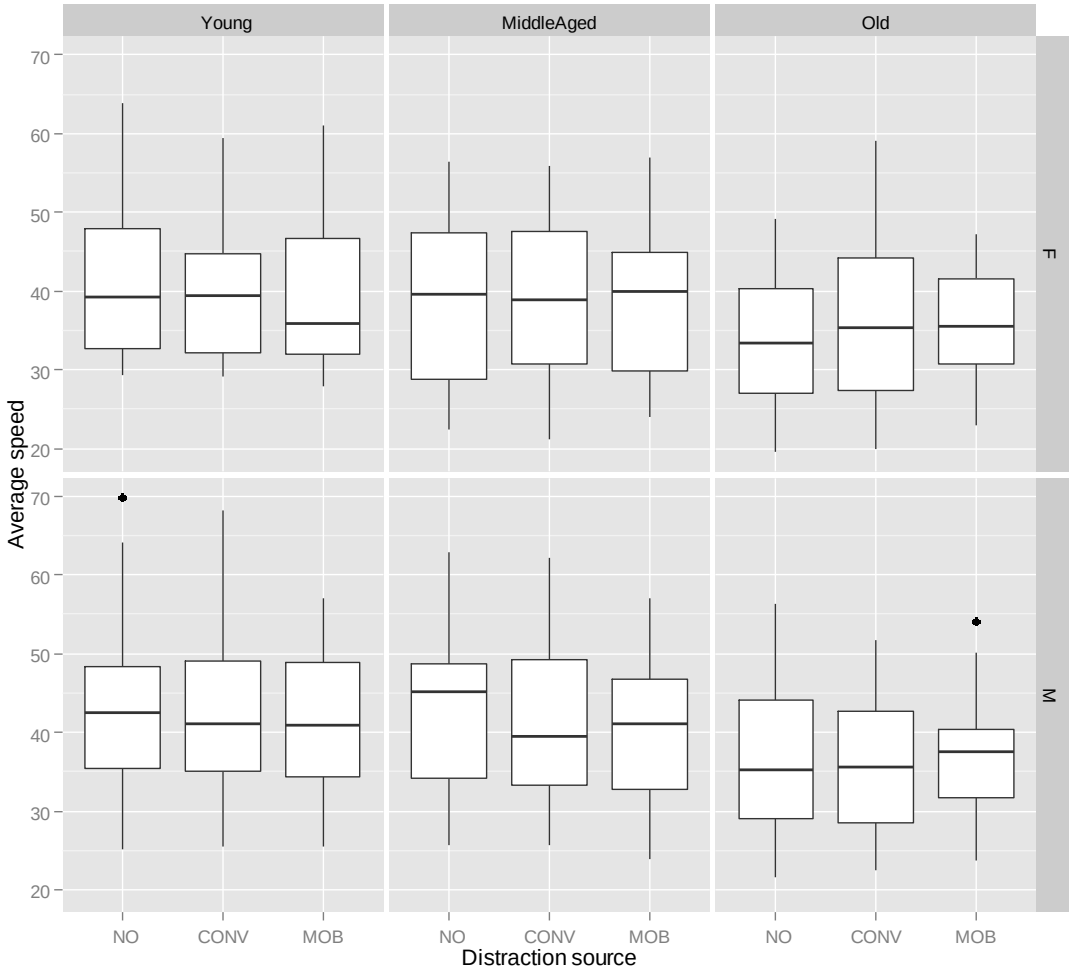
Statistical analysis method

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

Descriptive statistics (1/2)

Average speed distributions

- Older drivers drive in lower speeds regarding young and middle aged drivers
- Young and middle aged drivers reduce their speed, especially while talking on the mobile phone
- While conversing with the passenger drivers do not change the mean speed in the different distraction situations



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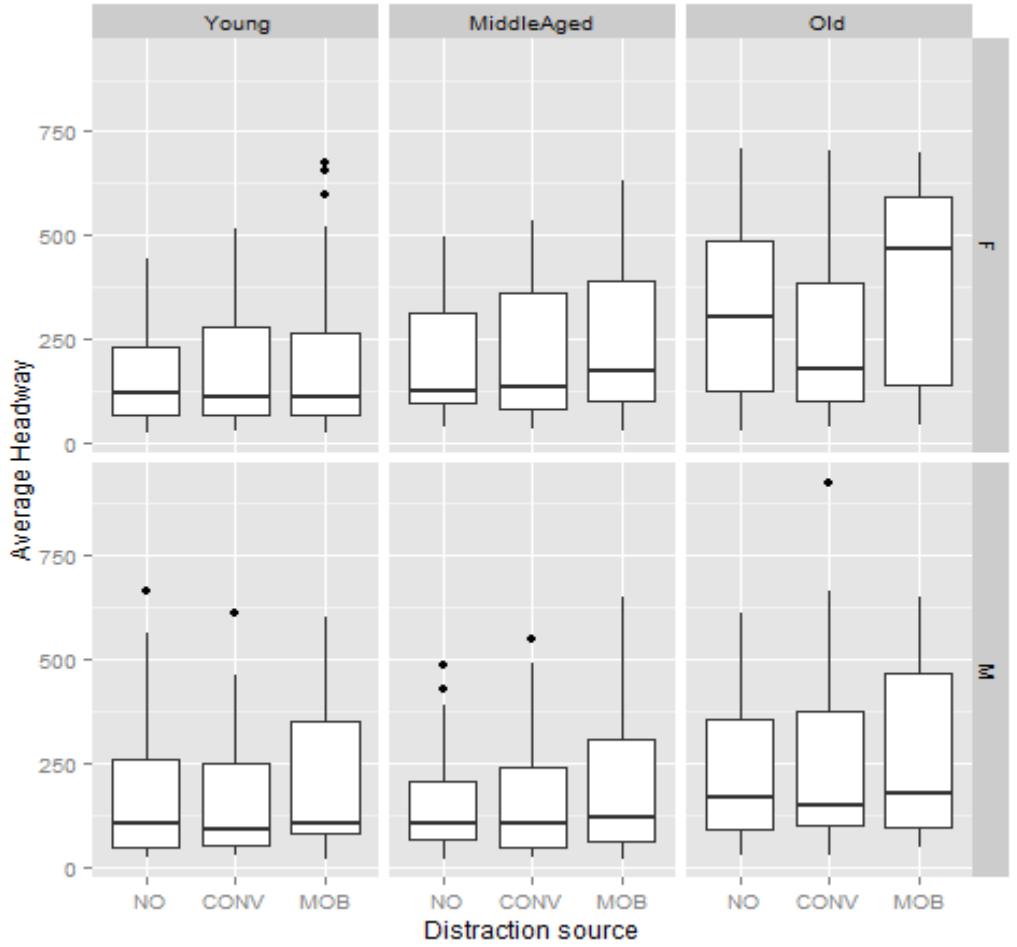
Descriptive statistics (2/2)

Average headway distributions

- While talking on the mobile phone, young and older drivers keep much larger distances from the vehicle ahead compared to all other trials
- No pattern can be identified between conversing with passenger and driving without any distraction



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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	47,51
Distraction - Cell phone	-1,22	-2,82	-2,03	-6,10
Age group - Older	-6,15	-14,99	-6,03	-5,32
Gender - Male	2,68	7,25	2,36	2,54
Area type - Urban	-14,54	-39,31	-14,92	-52,33
Traffic - Low	3,17	8,64	3,26	11,65
Summary statistics				
df	7		8	
Final log-Likelihood	-2.584,90		-2.396,94	
AIC	5.183,80		4.809,87	

- The use of cell phone while driving results in reduced speeds for all drivers
- Gender and area type and traffic conditions have a statistical significant effect on the model

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Regression analysis - Average headway

	Generalised Linear Model		Generalised Linear Mixed Model	
Variables	Est.	t value	Est.	t value
Intercept	213,22	27,78	212,20	19,40
Distraction – Cell phone	47,22	5,76	56,92	7,49
Age group - Older	71,21	9,13	80,42	6,36
Gender – Male	-33,30	-4,75	-33,82	-2,77
Traffic – Low	153,07	21,96	154,53	24,78
Area type - Urban	-216,45	-30,79	-211,04	-33,01
Summary statistics				
df	7		8	
Fina log-Likelihood	-5.052,70		-4.998,64	
AIC	10.119,00		10.013,28	

- Older drivers tend to keep much higher distance from the vehicle ahead compared to young and middle aged drivers
- While talking on the cell phone drivers tend to keep larger distances from the vehicle in front

Conclusions (1/2)

- The different distraction mechanism between cell phone and conversation with the passenger is correlated with driver's age
- Cell phone use distraction is consisted of prolonged and repeated glances to the cell phone and older drivers have difficulty in maintaining the device
- When conversing with the passenger, drivers' glance is out of the road very often, however older drivers feel more secured and can handle better the situation of the unexpected incident

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Conclusions (2/2)

- 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
- The reduction in vehicle speed and the increase in headway is revealing an attempt of drivers to counter-balance the increased mental workload
- Compensatory behaviour can occur at a number of levels ranging from the strategic (e.g. choosing not to use a mobile phone while driving) to the operational level (e.g. reducing speed)

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