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HOW DOES DISTRACTED DRIVING AFFECT REACTION TIME OF OLDER DRIVERS?



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Outline



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Older driver characteristics

- Older drivers have a relatively **high fatality rate** due to:
 - functional limitations
 - physical vulnerability
 - low annual mileage
- Particular **Older Driver Behaviour characteristics**
 - driving habits
 - social behaviour
 - risk compensation
 - changing behaviour over time



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**



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

Objective

The analysis of the reaction time of older drivers, while talking on the cell phone and conversing with another passenger



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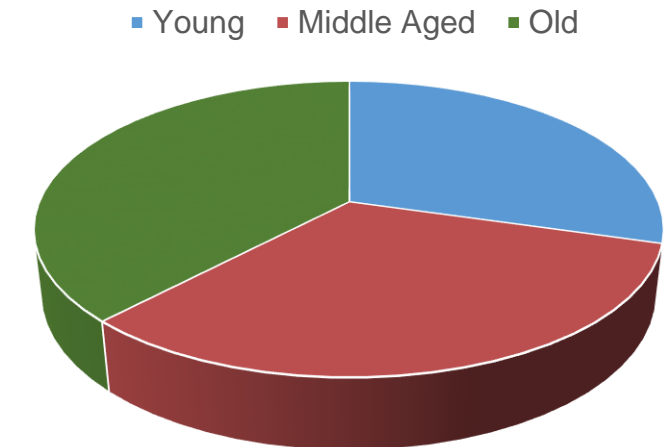
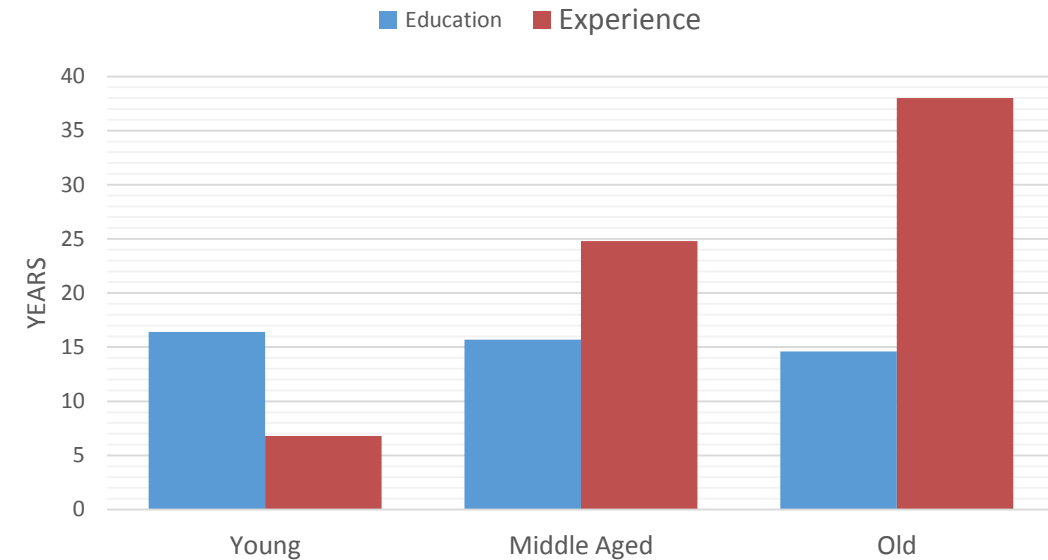
Driving simulator experiment

- 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



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+)



Driving performance measure

- Reaction time an unexpected incidents (refers to the time between the first appearance of the event on the road and the moment the driver starts to brake)



Statistical analysis method

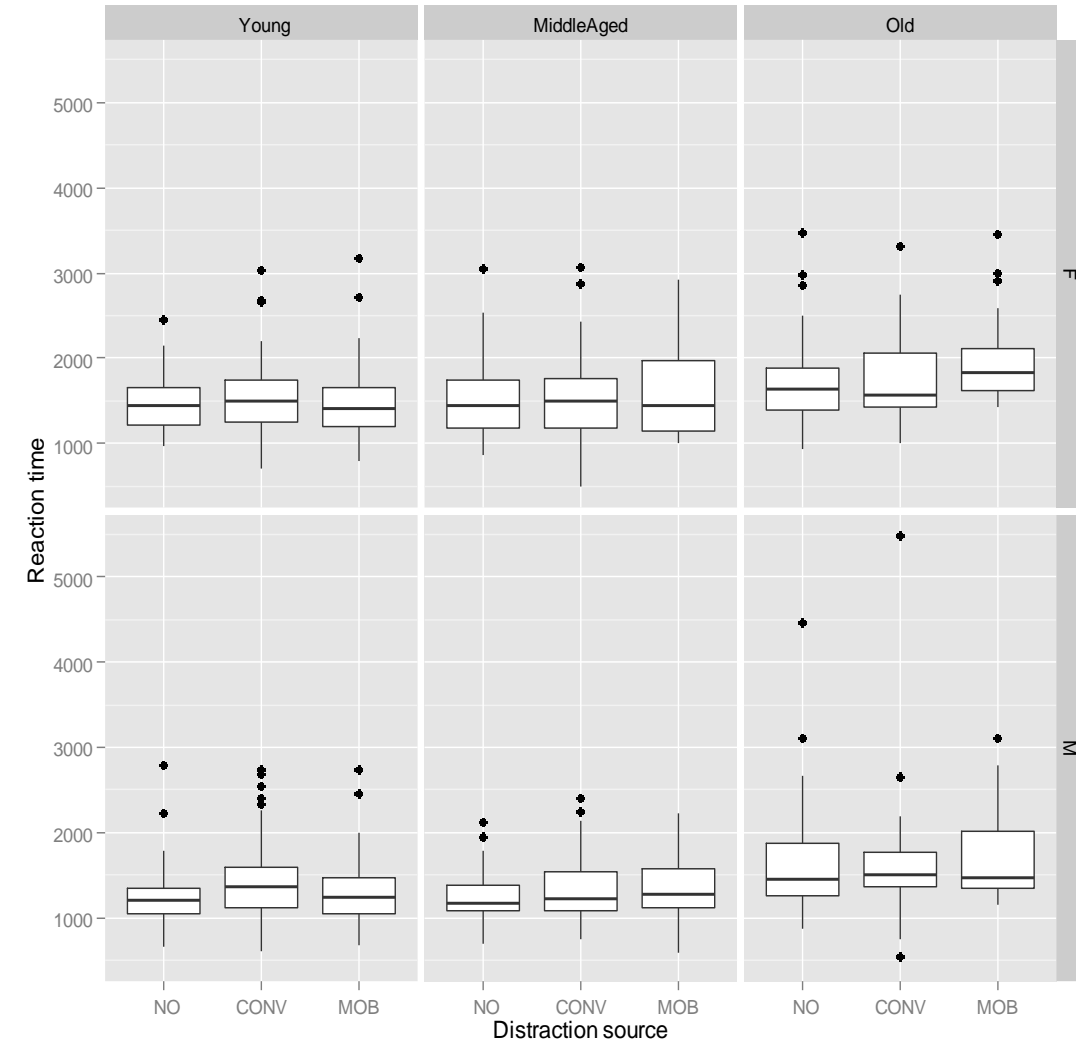
- Descriptive analysis (box plots)
- Generalized linear models (GLM)
- generalized linear mixed models (GLMM)



Results (1/3)

Age and gender distributions

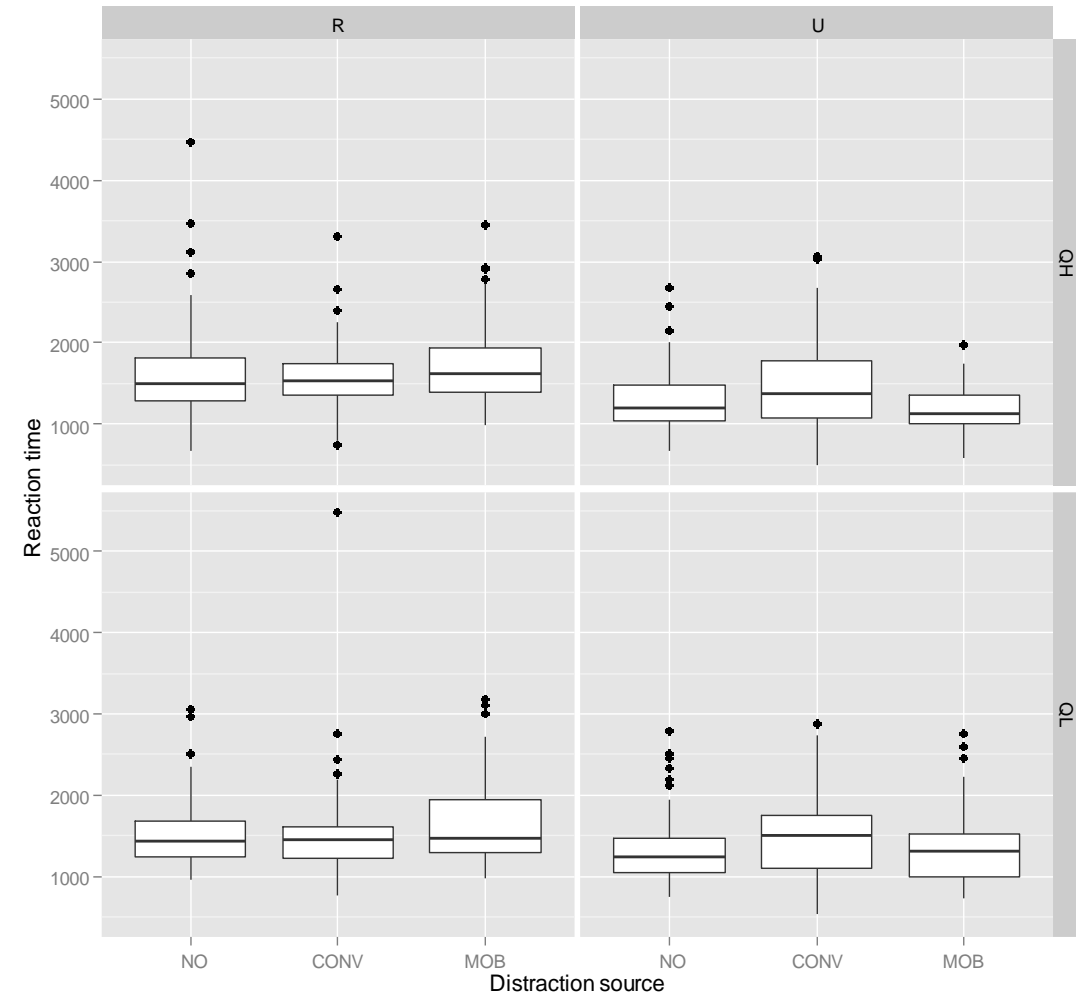
- While talking on the cell phone or conversing with passenger, drivers of all age groups have higher reaction times compared with undistracted driving
- The worst reaction time while talking on the mobile phone occurs in older drivers
- Young and middle aged drivers of both genders are characterized by higher reaction times when conversing with a passenger than when talking on the cell phone



Results (2/3)

Area type and traffic condition

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



Results (3/3)

Variables	Generalised Linear Model		Generalised Linear Mixed Model	
	Est.	t value	Est.	t value
Intercept	1.562,98	44,00	1.566,05	37,60
Age group = Old	234,29	5,85	236,38	4,54
Distraction - Conversation	73,57	1,95	71,47	1,93
Distraction – Cell phone	100,87	2,45	112,05	2,74
Gender - Male	-190,30	-5,74	-192,78	-5,89
Area type - Urban	-216,52	-6,66	-218,52	-5,00
Summary statistics				
df	7		8	
Initial Log-Likelihood	-9.460,96		-9.428,39	
AIC	18.935,00		18.872,00	

- **Age** has the higher effect on reaction time as older drivers have the worst reaction times comparing to young and middle aged
- **Gender** and **area type** have a statistical significant effect on the model

Conclusions (1/2)

- Reaction time of the drivers at unexpected incidents exhibited **differences** between talking on the mobile phone and conversing with the passenger
- 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



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
- **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)
- **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



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