

When do drivers use their mobile phone? An analysis on the context of mobile phone use based on naturalistic driving data.

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Introduction

- This study reports on (the context of manual) interactions with mobile phones
- The analysis is based on naturalistic driving data
- Data was gathered within the FP7 project INTERACTION

Method - Participants

- 21 participants: 14 males, 7 females
- Age ranging from 27 to 59 (M=37.3, SD=9.9)
- Regular drivers (>10,000 km/year = >6,200 miles/year)
- Participants used Mobile phone (and navigation device) at least once a week

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Method - Procedure

- Participants were briefed and signed the informed consent
- Participants drove the instrumented vehicle for 5 to 6 weeks
- Participants used the vehicle for their daily trips

Method - Vehicle instrumentation

- 5 Instrumented vehicles
  - 4 Lancia Ypsilon's
  - 1 Peugeot 207
- Equipment
  - 4 camera's
  - Accelerometer
  - Gyroscope
  - GPS
  - Map/GIS data on DAS
  - Several other sensors

Method - Vehicle instrumentation

Method – Data Analysis

		Subtask	Definition
Mobile phone use	Manual / Visual-manual interaction	Grabbing (mainly manual task)	Retrieve the mobile phone from the storage location into ones hand and return to the driving position.
		Operating (Visual manual task)	Touching the mobile phone to perform a task and looking at the device to support performing this task.
		Holding (manual task)	Having the mobile phone in the hand without operating it or making eye glances towards the device.
	Conversations	Hands free	From the first word spoken or the dialling button touched to the last word spoken or hang-up button pressed.
		Handheld	From the first word spoken or the dialling button touched to the last word spoken or hang-up button pressed.

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Method – Data Analysis

Method – Data Analysis

- 4 data reductionists reviewed all the video recorded
- Weekly training sessions to ensure consistency and quality
- 50 trips were coded by all 4 data reductionists (inter-coder reliability)
- Krippendorf's alpha $\alpha = 0.89$ same behaviour (nominal),
- And $\alpha = 0.83$ same event duration (ratio)
- First week of data was excluded from the analysis

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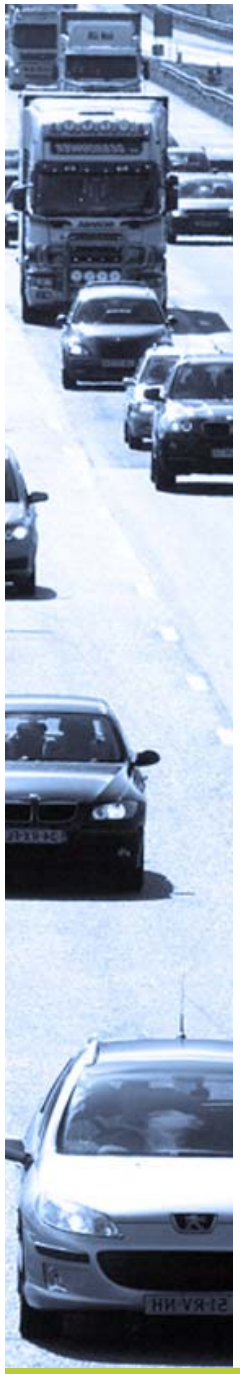
Sample video



Results - overview

- 1319 trips, 573 hours excluding first week
- Mean of 62 trips per participant (SD=21,6)
- In 40% of all trips participants used their mobile phone
- A total of 2577 interactions with the mobile phone were observed.

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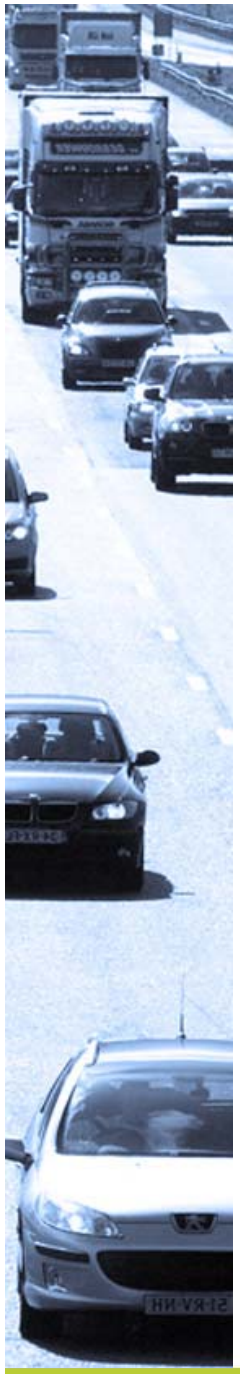

Results – Durations and frequencies

- 4% (SD=2.7) of driving time was spent on interacting with the mobile phone
- 4.7% (SD=4.3) of driving time was spent on conversations with the mobile phone
- Participants manually interacted with their mobile phone on average 4.2 times (SD = 2.9) per hour
- The average duration of manual interactions with the mobile phone was 31.0 seconds (SD = 15.5)
- the average duration of mobile phone conversations was 182.01 (SD=113.25)

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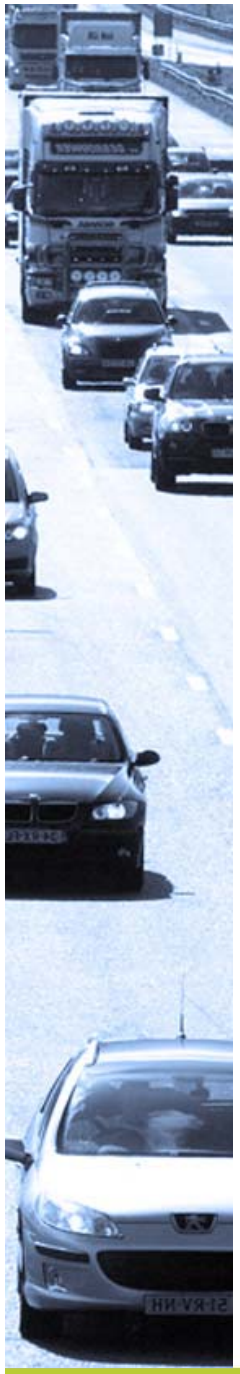
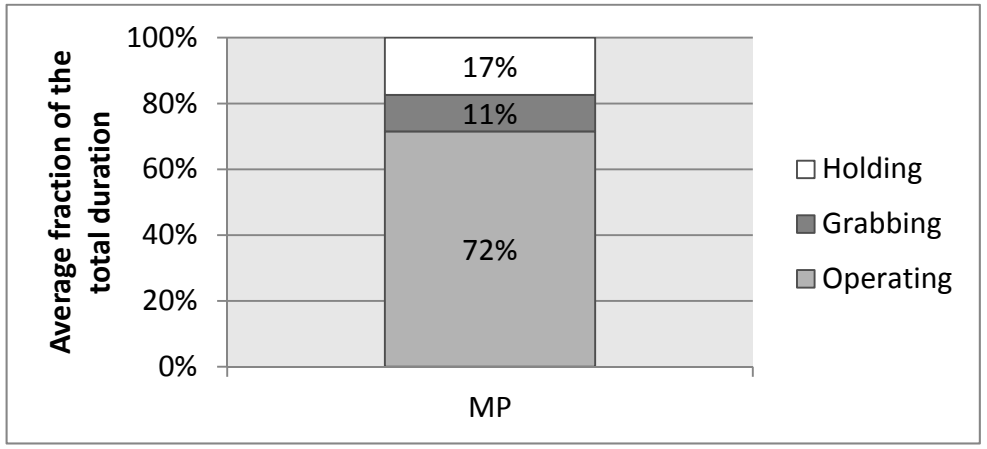
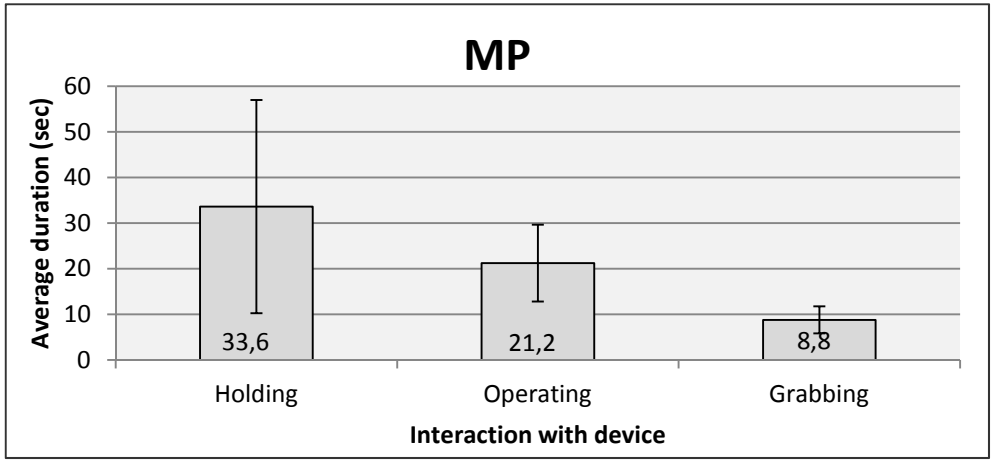


Results - durations and frequencies



Average fraction of manual interaction subtasks



Mean duration (seconds) of manual interaction subtasks

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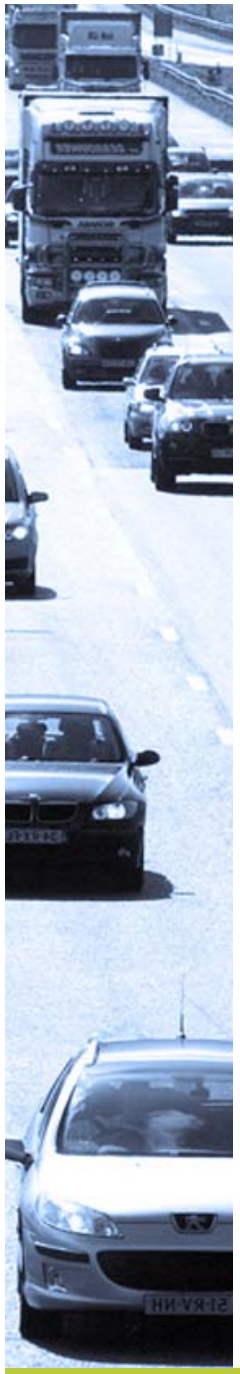
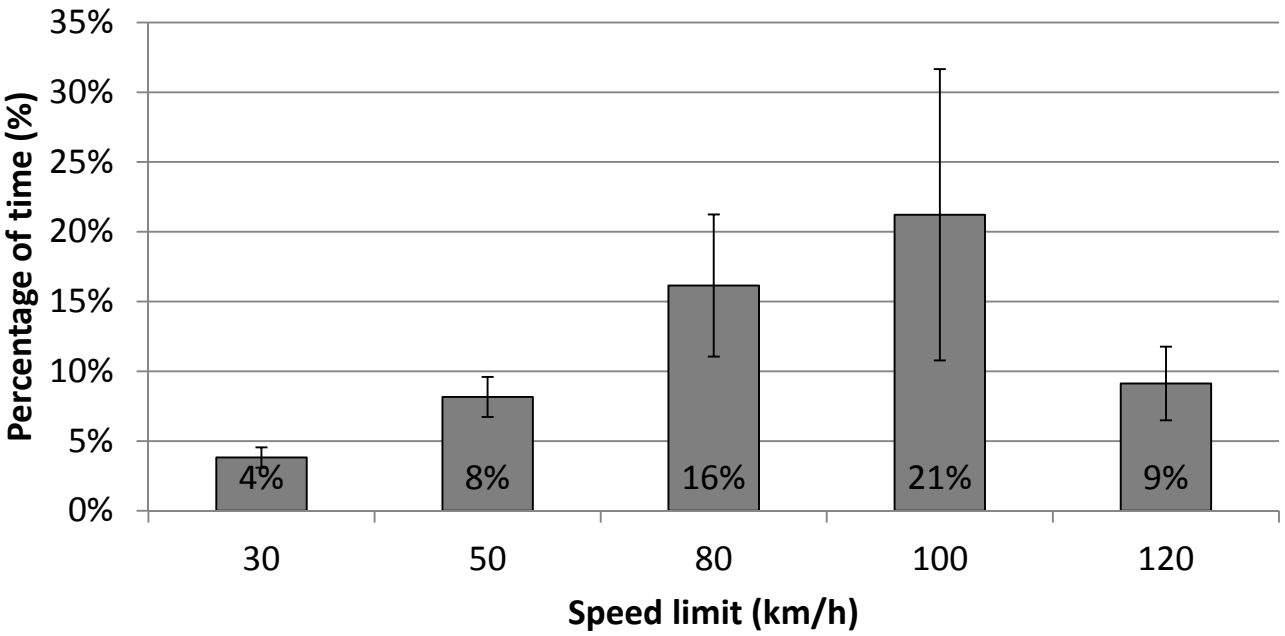
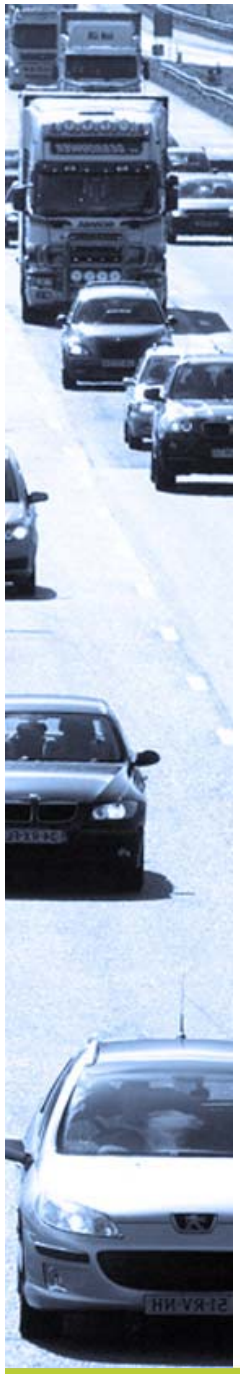


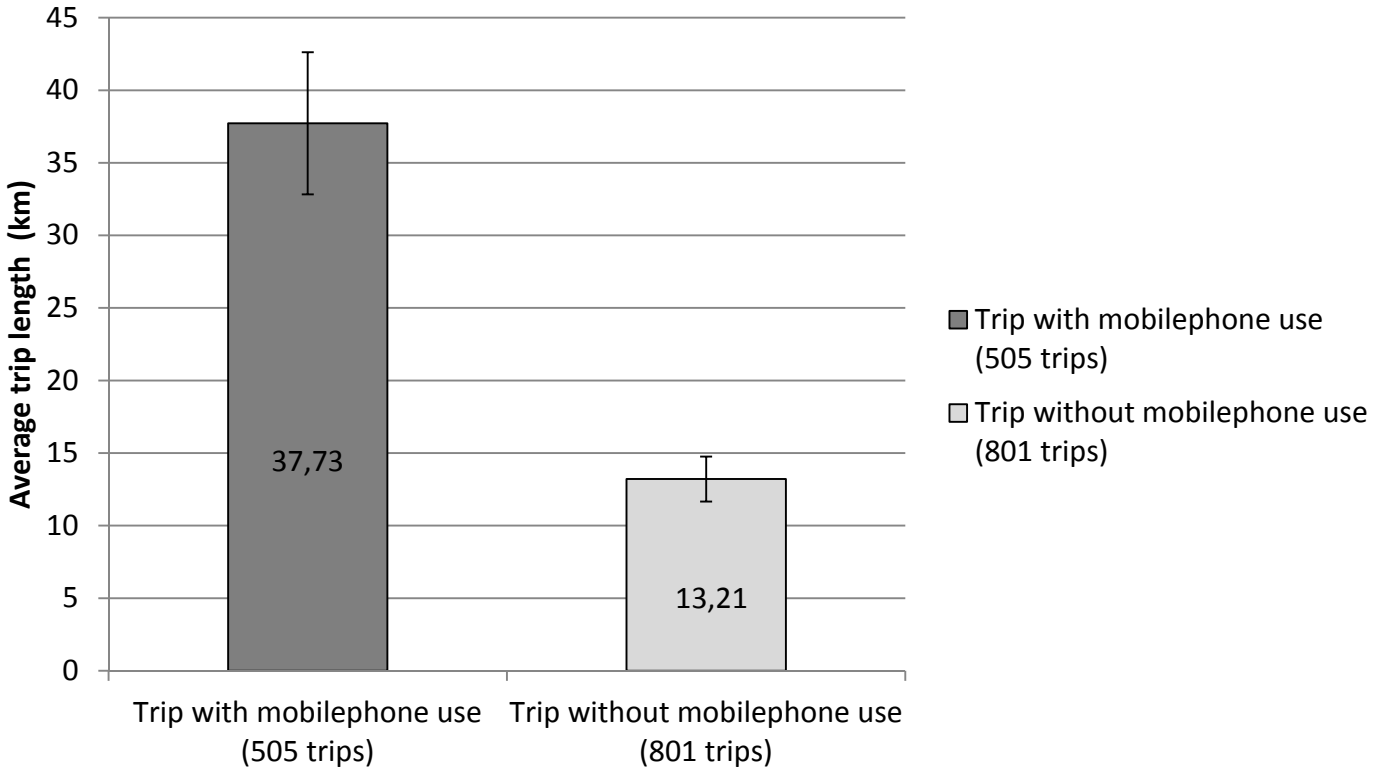
Results – Context of mobile phone use

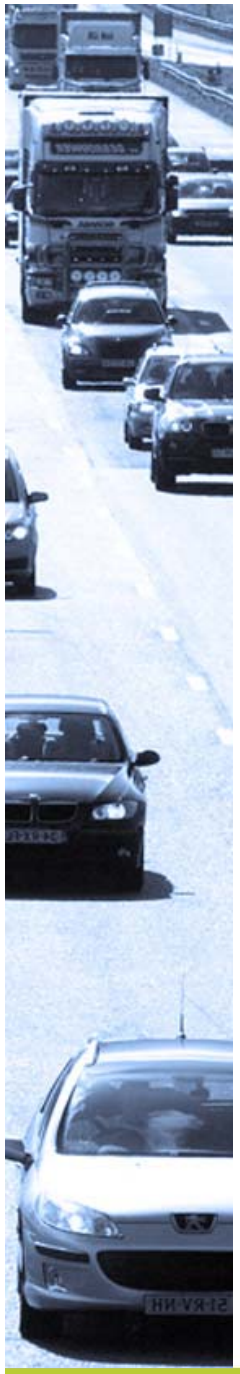


Proportion of time spent using the mobile phone while driving in different speed limit categories for trips in which the mobile phone was used (error bars represent standard error)

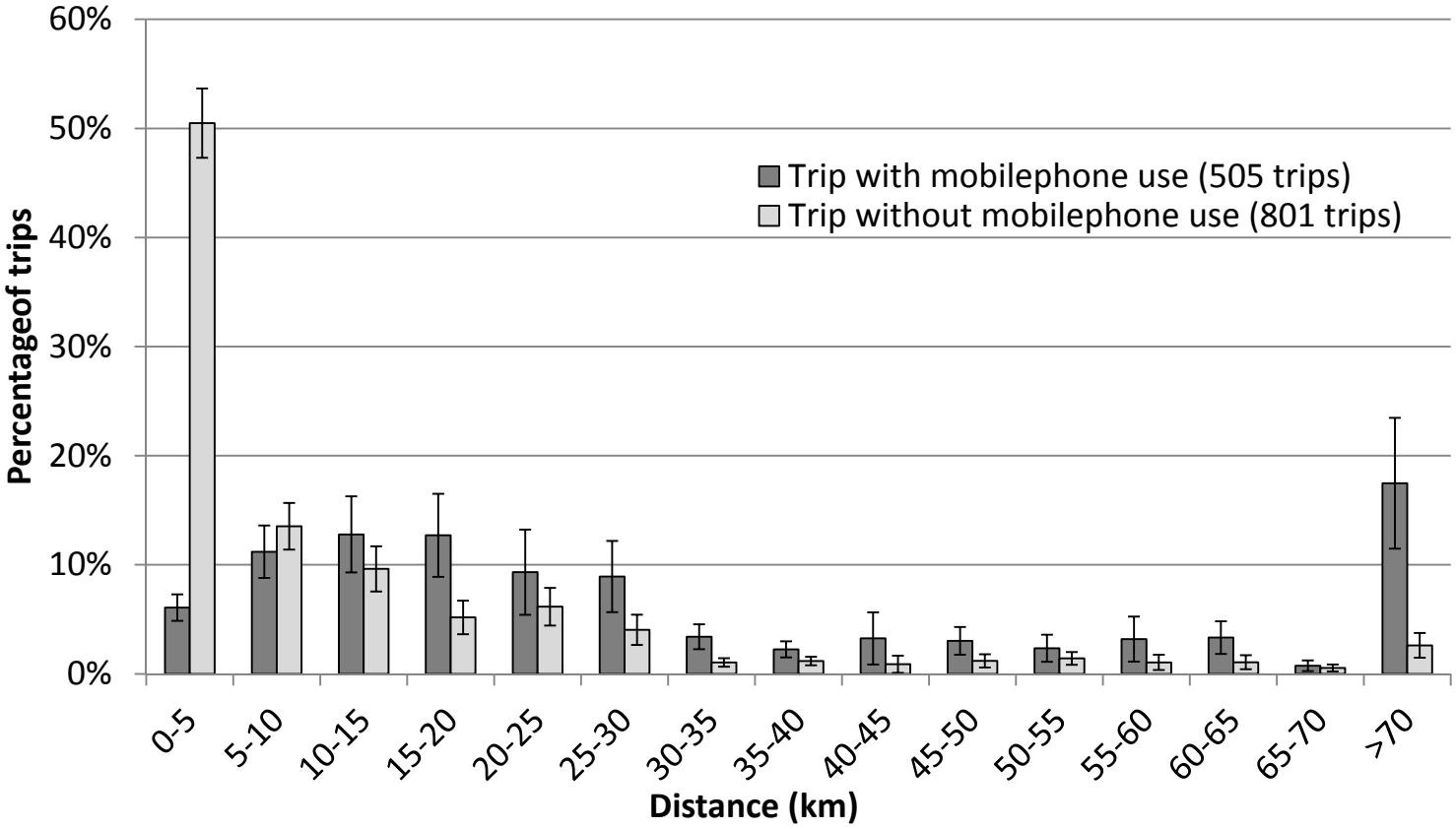


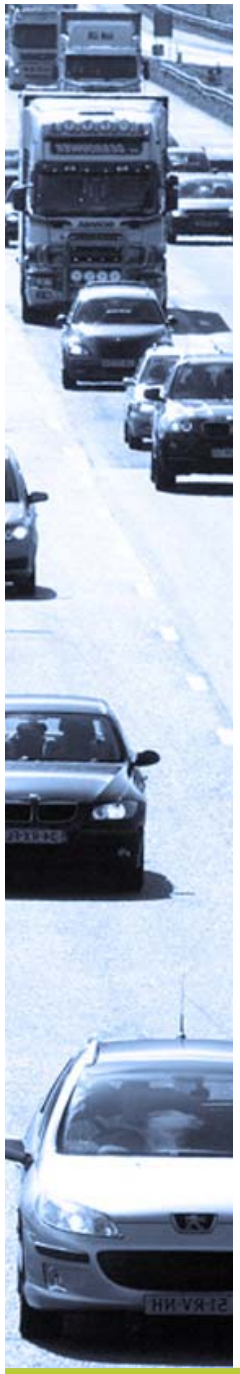
Results – Trip length



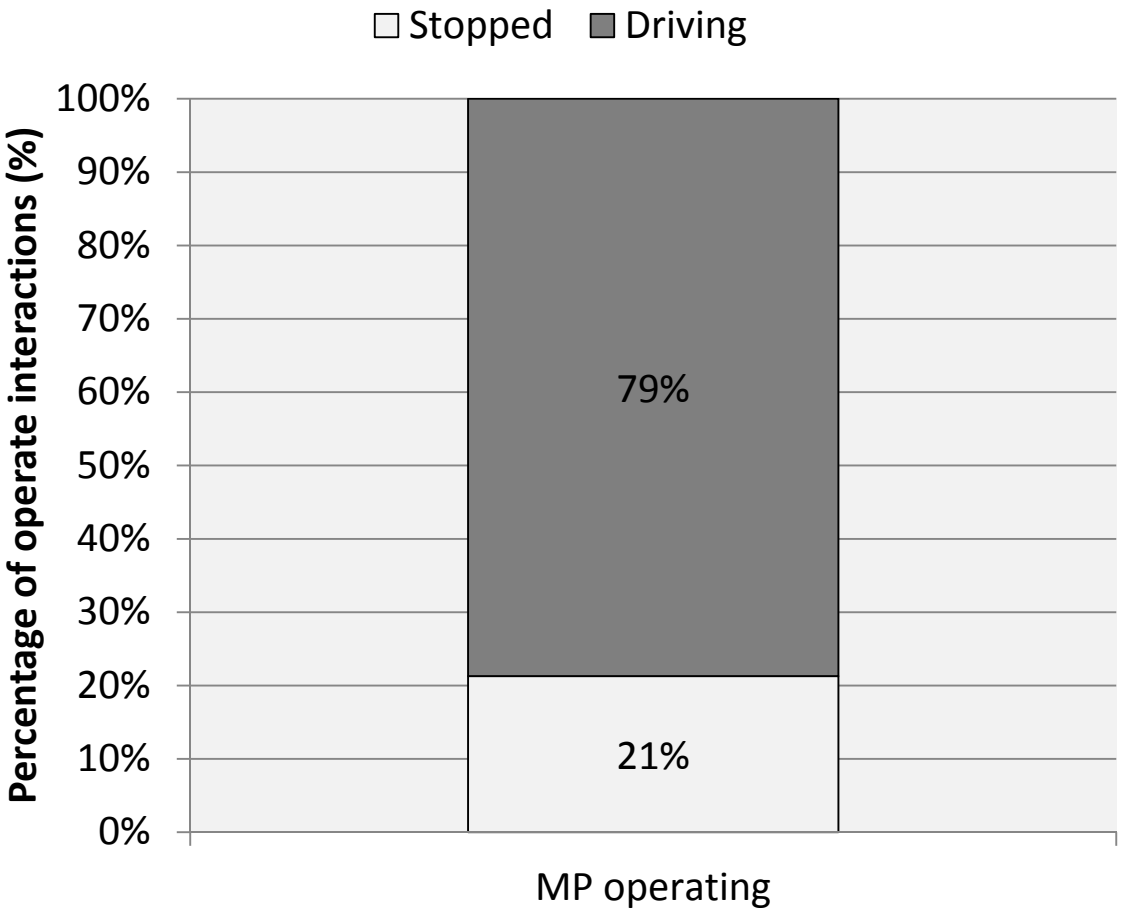


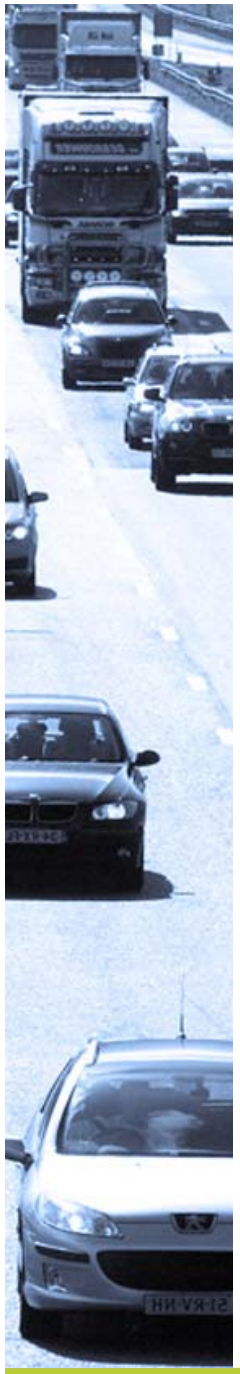
Results – Trip length





Results – Speed and mobile phone use





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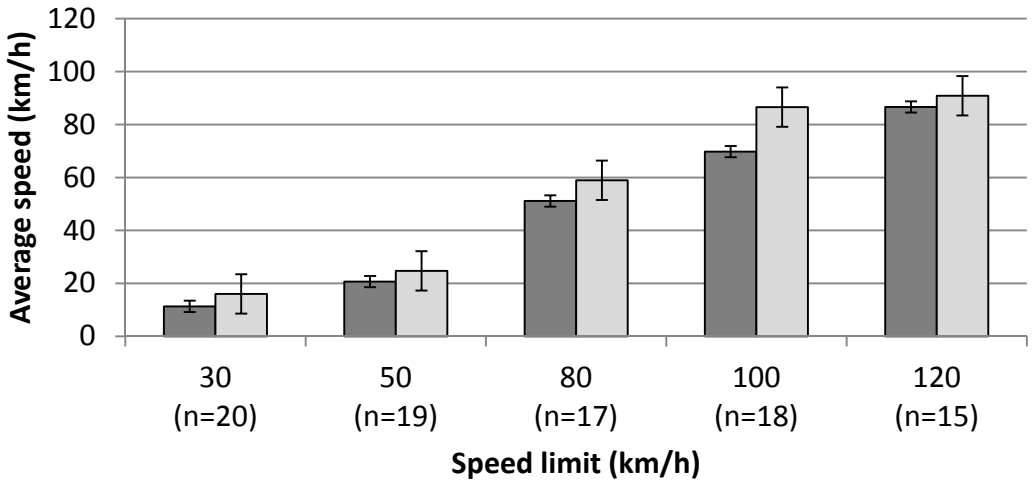

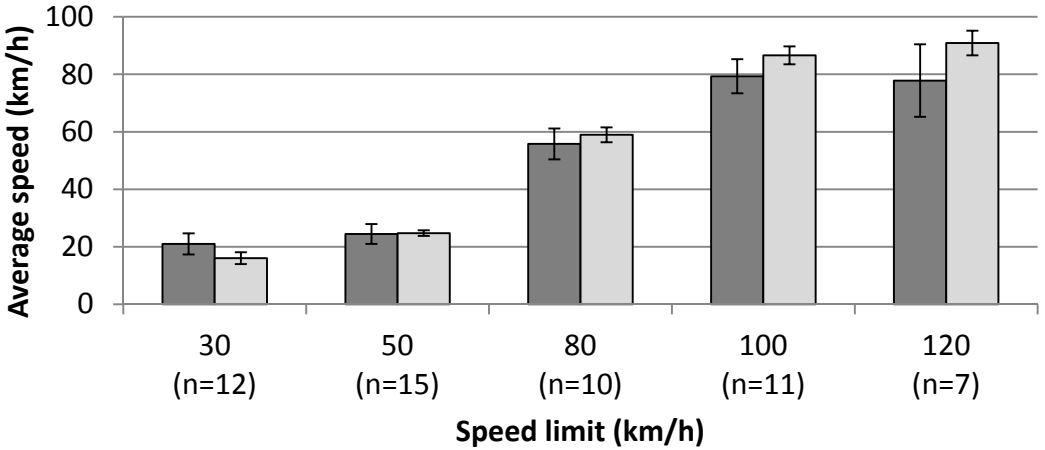

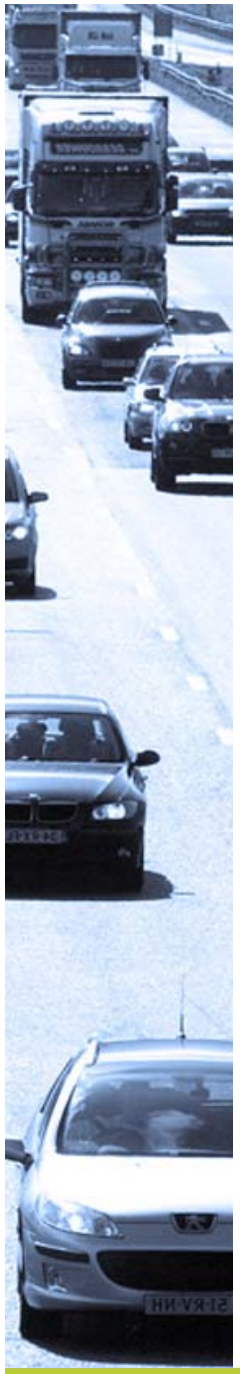

Conclusions

- A substantial amount of driving time was spent on using the mobile phone (8.7% of driving time)
- Most of the time interacting with the devices was spent on the visual-manual subtask *operating*
- Participants allow themselves on average 21 s to perform a visual manual task
- The proportion of time spent using the mobile phone seems to increase on roads with higher speed limits

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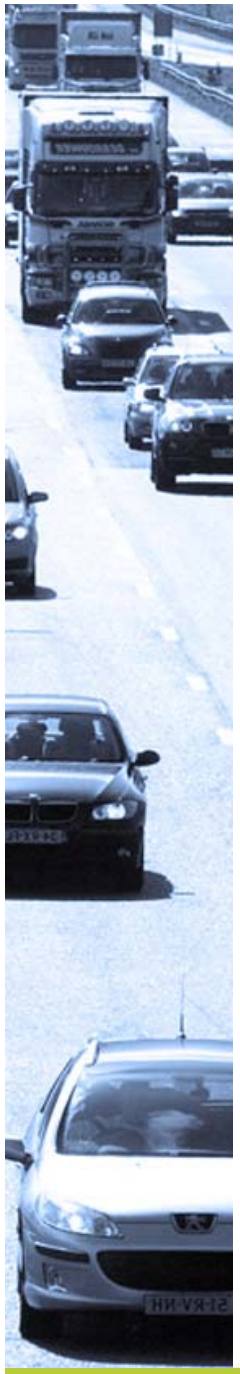

Conclusions

- Average trip length was significantly higher for trips in which the mobile phone was used.
- The major part (~80%) of all visual manual interactions were performed while driving
- Average speed while interacting with the mobile phone is lower when compared to baseline

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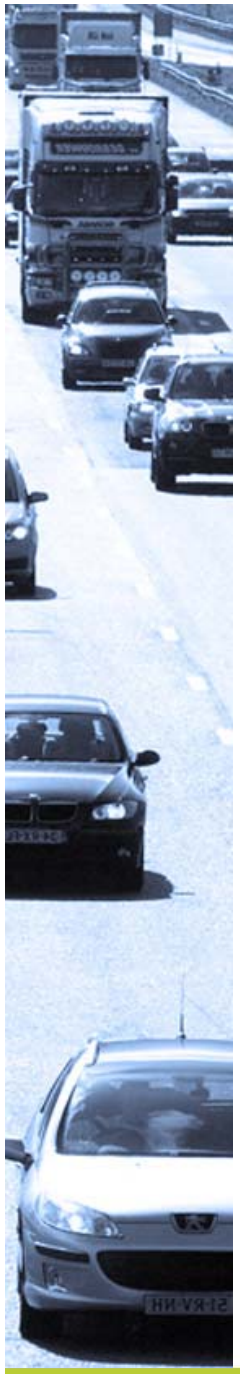
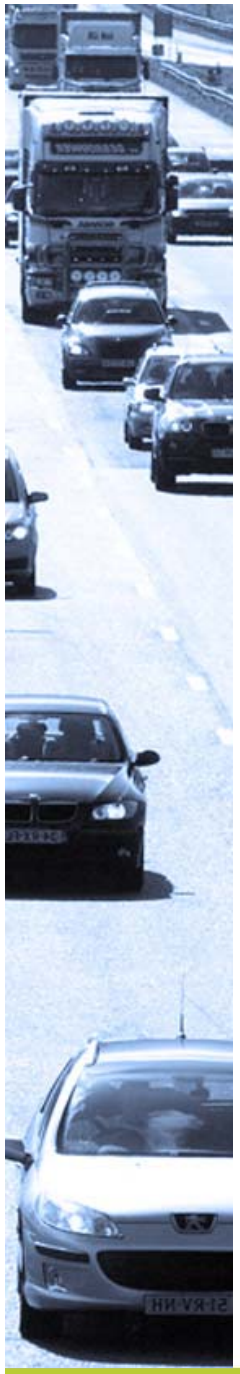
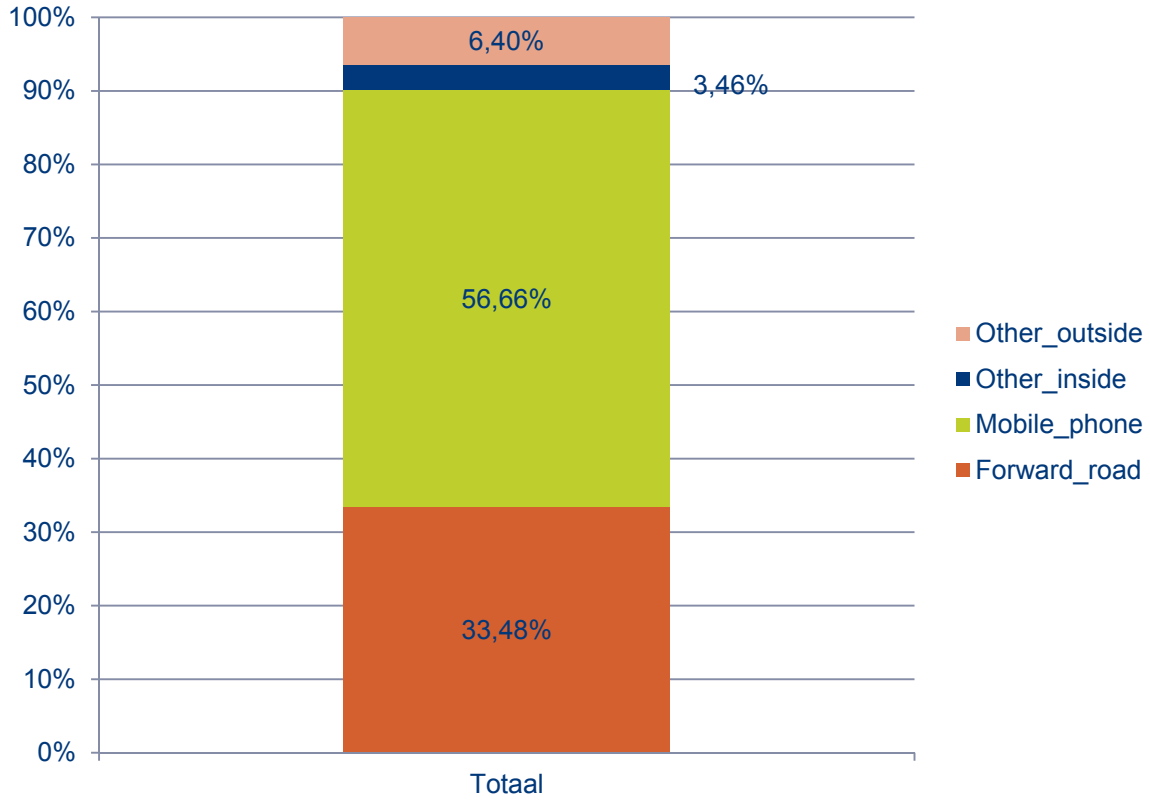


Future research

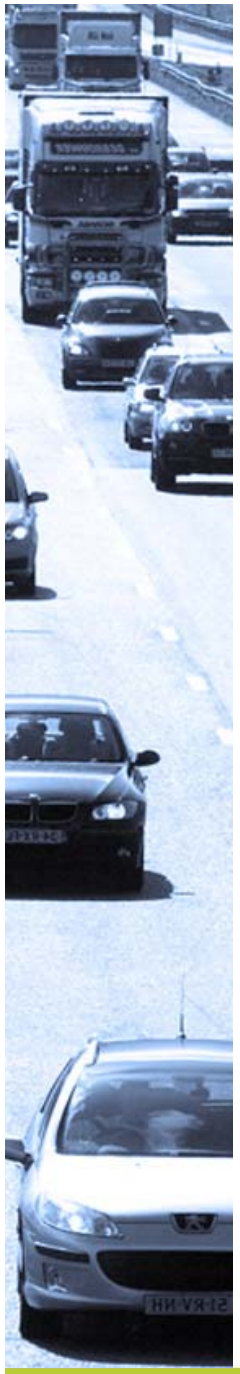
- Driving context/complexity of situations
- Glance behaviour
- …



Preliminary results – Glance behaviour



Glance distribution while o*perating* the mobile phone



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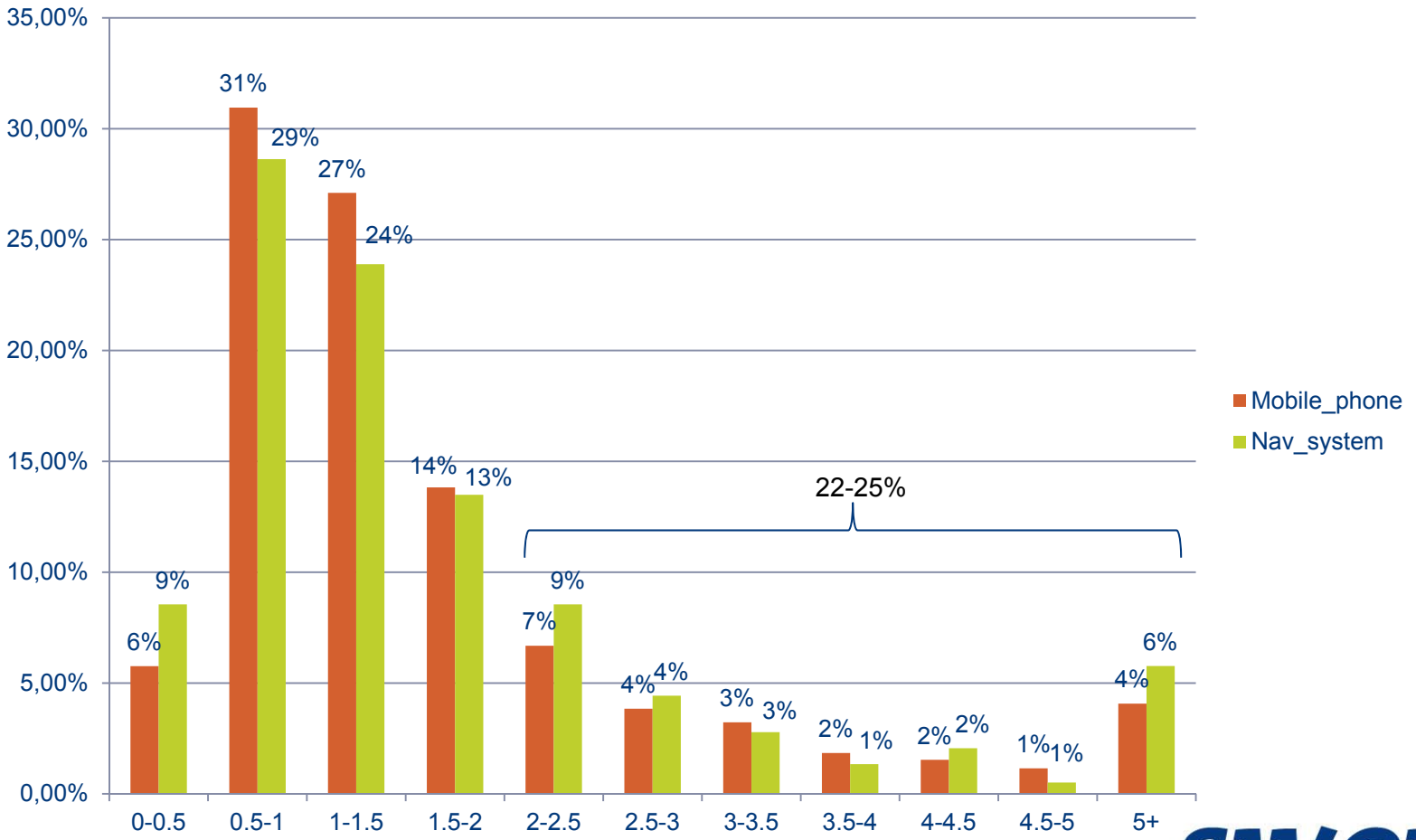

Thank you for your attention.

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