

Different Ways to Compensate Distraction while Using a Hands-Free Telephone in a Vehicle

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Driver Distraction and Inattention
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Secondary tasks like telephoning lead to distraction of the driver

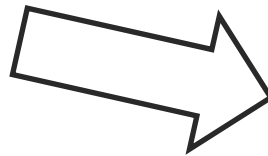
=> Driving behaviour?



- Results of simulator studies:

- Reducing speed
- Larger distances to the car in front

=> Distraction is compensated by more defensive driving



Situation in real life?



=> Analysis of naturalistic driving data

- Results of the simulator studies?
- Other ways of compensating?

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- **Data Base**
 - **Use of the hands-free telephone**
 - **Impact of Telephoning**
 - Driving behaviour
 - Situational influences
 - **Conclusion**

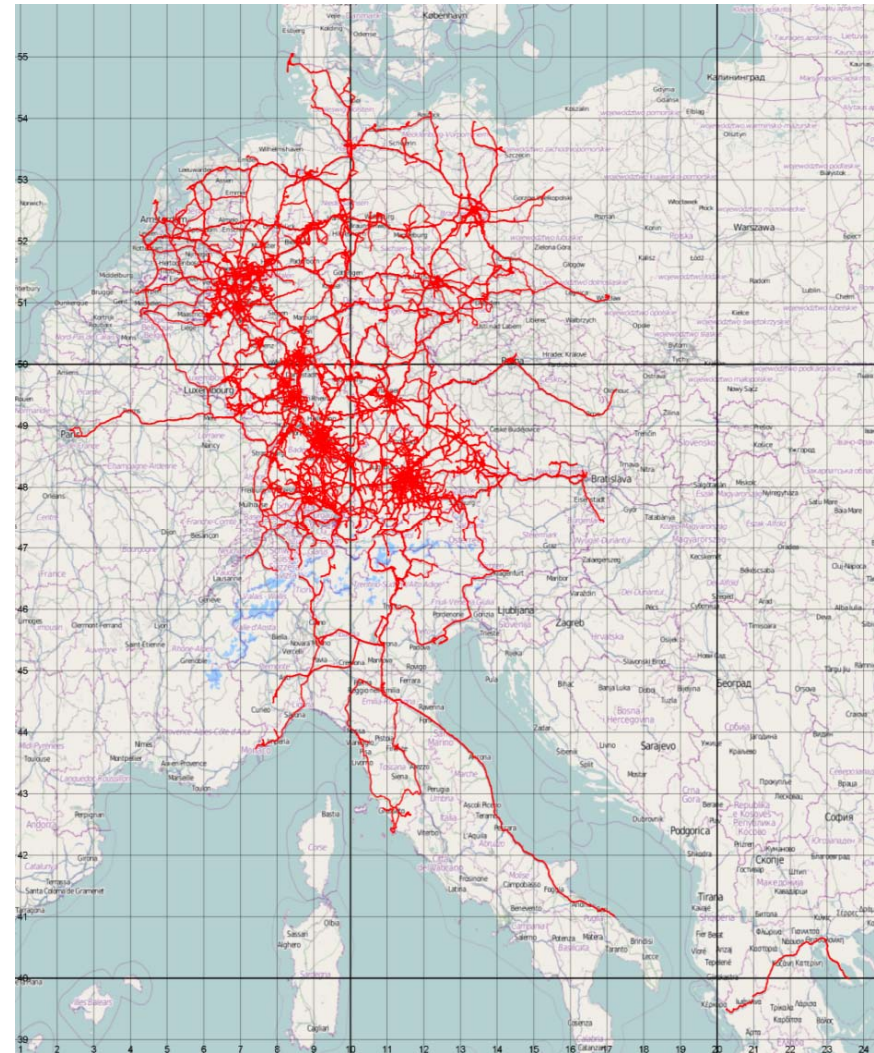
- **EU-project „euroFOT“ to evaluate driver assistance systems**
 - **Data from 115 drivers provided with a well-equipped car for three months**
 - **Three variants of navigation (without navigation system/build in/mobile)**
 - **Statement of the drivers if a trip is familiar or not at the beginning of a trip**
- **No other restrictions => Field operational test (FOT)**
=> Naturalistic driving study (NDS) for the use of the hands-free telephone



Results after preprocessing steps

	Overall
Number of Participants	115
Number of Participants with complete data set	104
Number of Trips	39 703
Observed Kilometers	1 013 262
Observed Hours	15 129

- Objective data with a few hundred variables
- Video data from nearly all trips

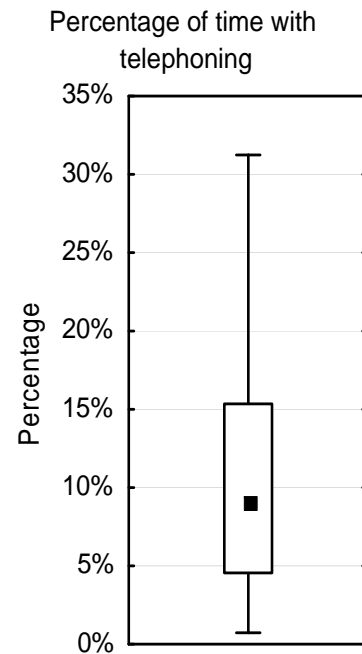




Use of the hands-free telephone

Telephone – Basic Results

- **87 use the hands-free telephone in a vehicle:**

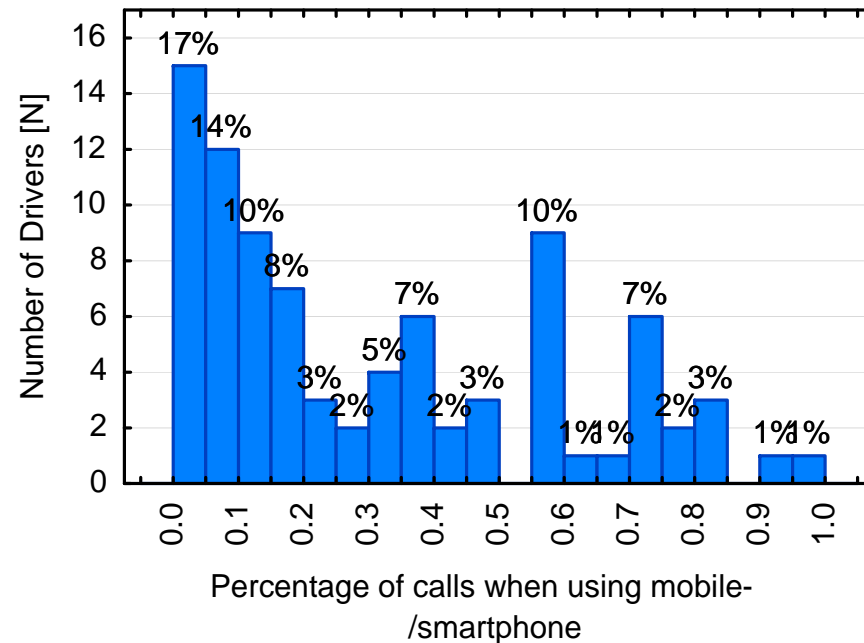
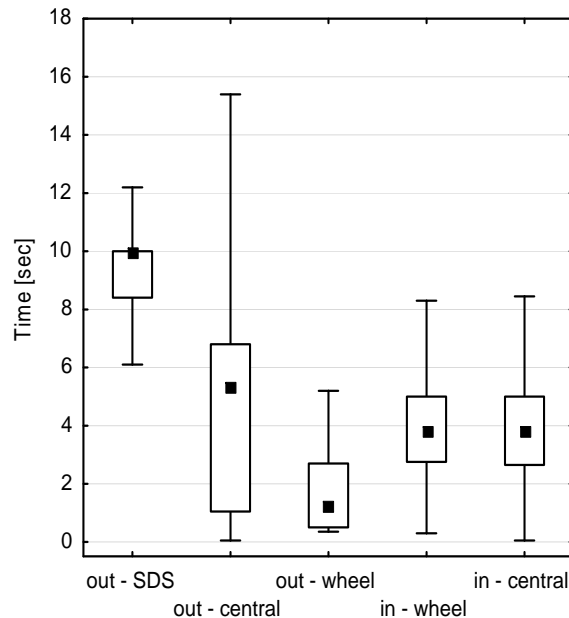


	Number of Calls	Duration of Telephoning [hours]
Total	29874	1248
Outgoing	16910 (56,6%)	681 (54,6%)
Incoming	3163 (10,6%)	167 (13,4%)
No Button Pressed	8698 (29,1%)	343 (27,5%)
Unknown	1103 (3,7%)	57 (4,6%)

- **Large differences between the drivers, more outgoing calls, a lot of calls are initiated without using the vehicle devices**

Telephone – Basic Results

- Handling of the telephone system – a closer look



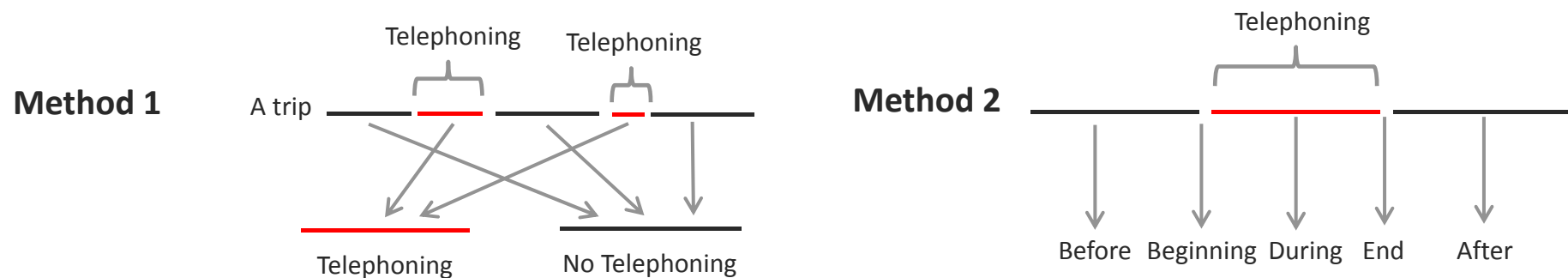
- Voice control needs the longest time
- To accept a call, drivers need less than 4 sec (including ringing)
- A few drivers prefer dialing via their mobile-/smartphone



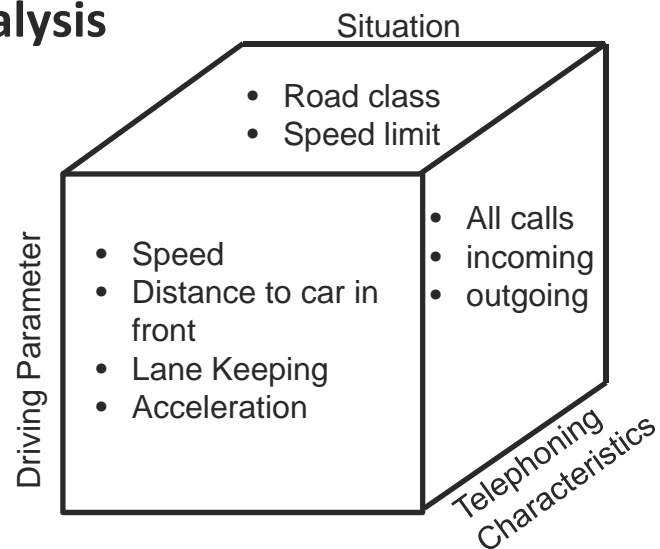
Impact of Telephoning

Impact of Telephoning

- Two methods are used to analyze driving behaviour:

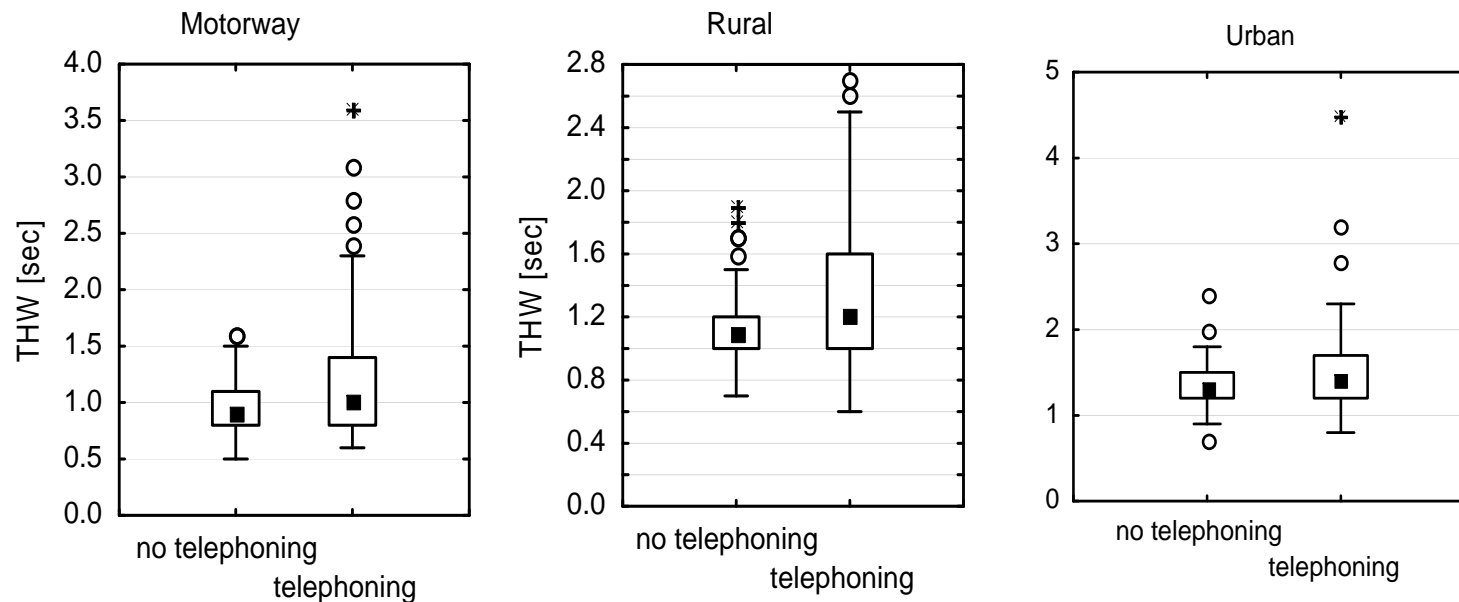


- Parameter for analysis



Impact of Telephoning – Distance to Car in front

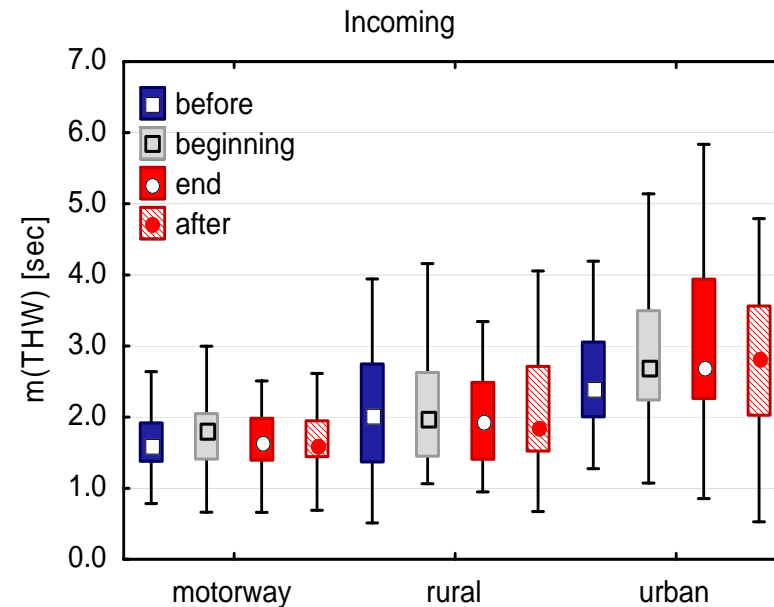
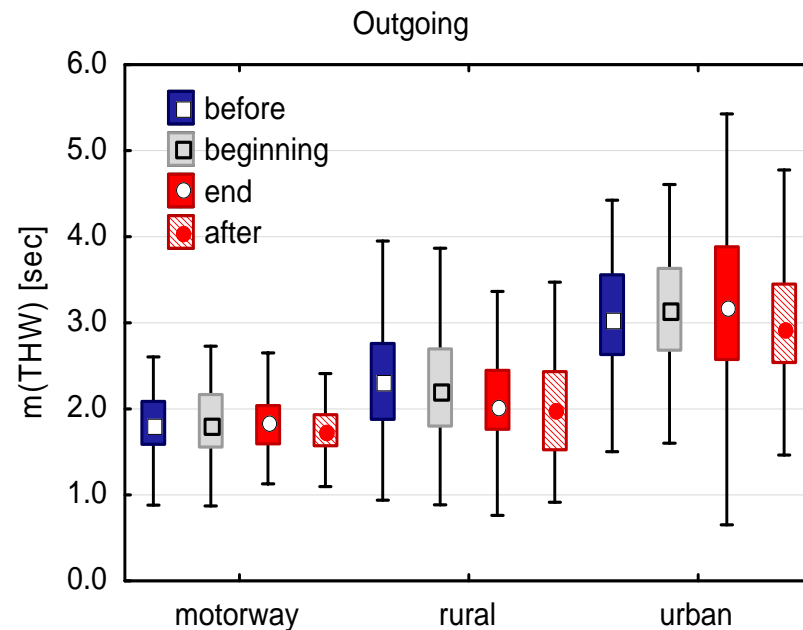
Method 1 for outgoing calls



- A significant increase of the distance for all road classes can be found
- The results for incoming calls are similar

Impact of Telephoning – Distance to Car in front

Method 2 for outgoing and incoming calls



- A significant increase of the distance to the car in front can be found only for outgoing calls in urban areas
- Also there are no other significant effects

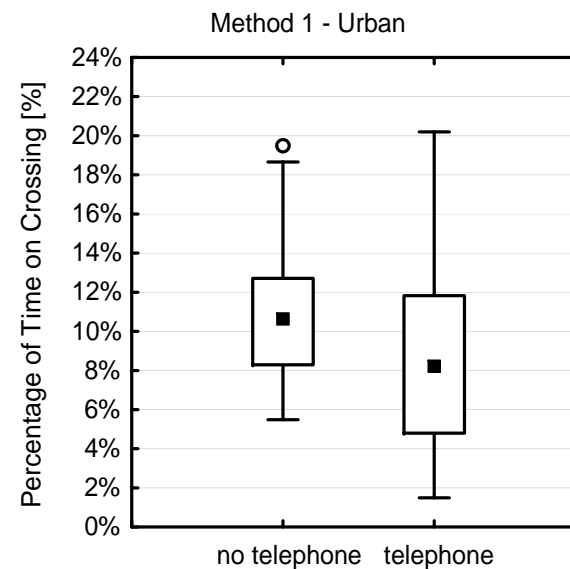
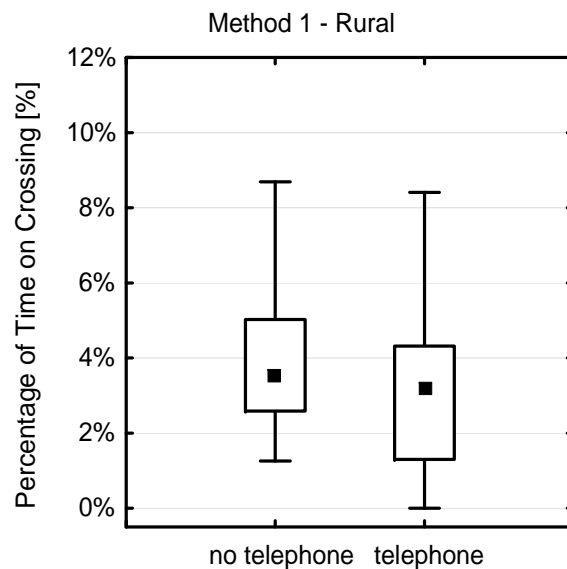
Impact of Telephoning - Results

parameters	Method 1 telephoning vs. no telephoning			Method 2 before vs. beginning vs. end vs. after		
	motorway	rural	urban	motorway	rural	urban
m(v)	<<	<<	<<			
diff (v)				>>	-	>>
% too fast	-	-	-	<<	-	-
% too slow	-	-	-	-	-	-
m(THW)	>>	>>	>	-	-	-
diff (THW)				-	<	<
% critical (THW)		-		-	-	-
% critical (TTC)	<<	<<	<<	-	-	-
sdlp				<<		<<
% critical TLC	<<	<<	<<	-	-	-
max(dlw)				-	-	-
min(ax)				-	-	-
max(ax)				-	>>	>

- Results from method 1 resemble more closely results known from simulator studies
- In general the compensational effects are not so high
=> Other ways to compensate distraction?

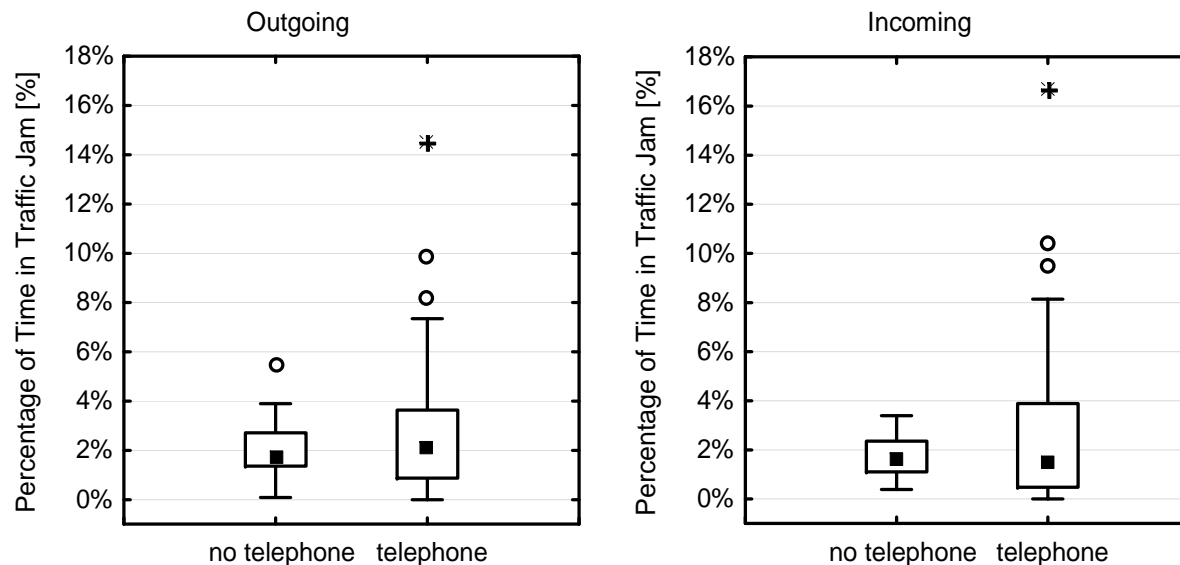
Impact of Telephoning – Situation

Analysis of different situations: Incoming calls on crossings (Method 1)



- Less time is spent on telephoning on crossings
- Similar effect for lane changes on motorway

Analysis of different situations: Traffic jam on motorways (Method 1)



- Drivers prefer telephoning in traffic jams
- In general: simpler situations are used for telephoning, complex situations are avoided

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- The usage of the hands-free telephone has been analyzed based on ND-data (> 100 drivers, ~1 000 000 kilometers).
 - The frequency of talking on the telephone differs largely between drivers.
 - Most calls are initiated by the drivers.
 - Some drivers initiate all/most calls with their hand-held mobile-/smartphone.
 - The effects of telephoning known from simulator studies can be partly replicated (larger distance + lower speed).
 - Drivers seem to prefer less demanding driving situations for telephoning
Compensation through choosing appropriate situations for distraction?

Thank you!

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