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Effects of handheld mobile conversations on experienced phone users' simulated driving performance

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FERSI
Road Safety Research

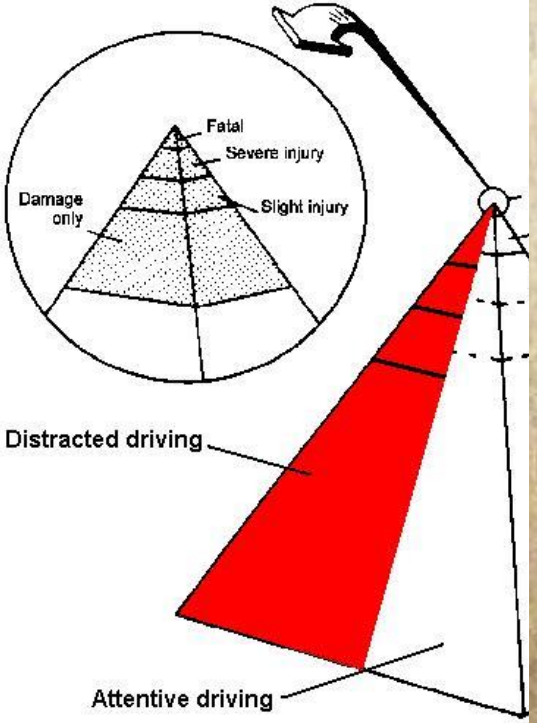
This presentation

- Objective: Assess effects of mobile phone conversations on driving performance.
  - What is driving?
  - What is distracted driving?
  - What effects can be found in the literature?
  - Method: Driving simulator
  - Results, classified
  - Conclusion

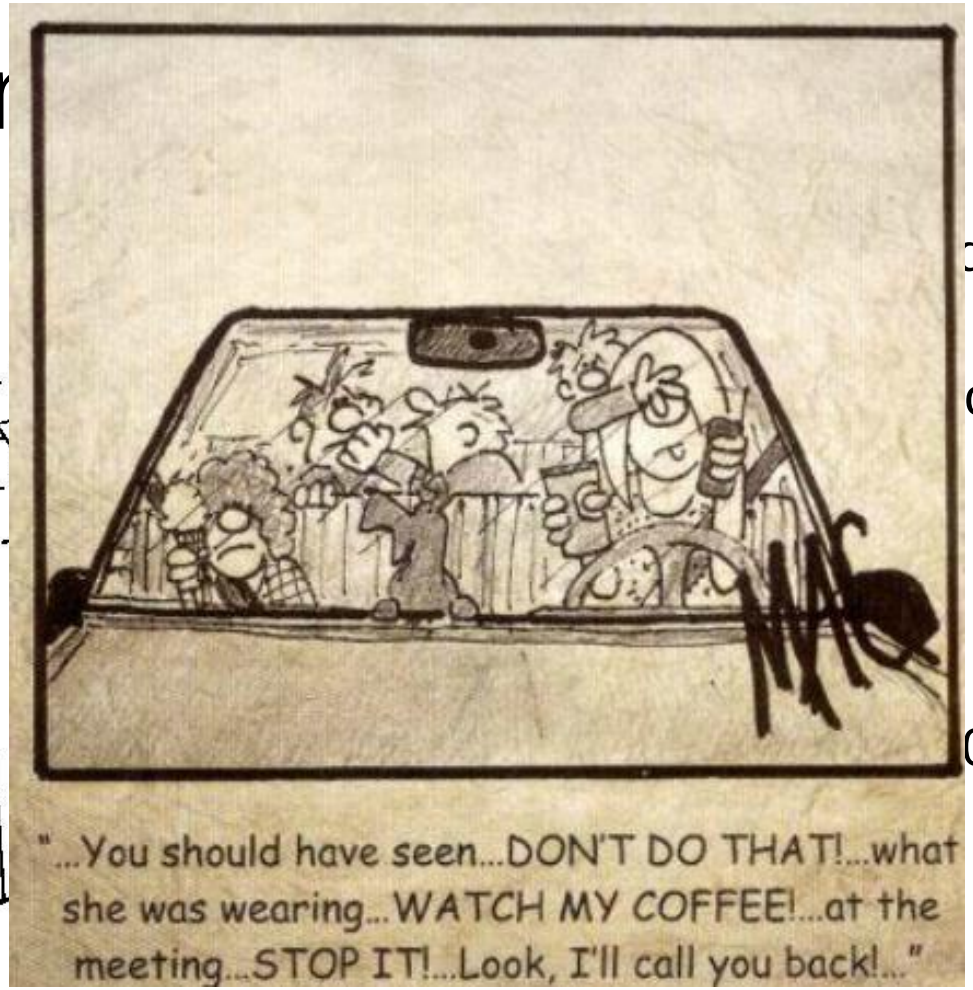
Driving

- Get from A to B, safely, fast, comfortably
- Task: Drive between the lines and distant from other cars
  - Warning other cars (i.e., blinkers)
- Michon: Hierarchical structure
  - Strategic: Planning, mode, CBA, comfort, speed
  - Tactical: Manouvring: lane, accelerating
  - Operational: Automatic tasks

Distractio



Hydén



d driving

o driving

0% of road

History



- Phones for over 20 years
- Experiments: Phoning is dangerous
- Now,100-car naturalistic driving, 2006; 69 crashes, 761 near-crashes: No increase in crash risk
  - handheld: equal risk
  - hands free: reduced risk
- → Controversy: was it science / behavioural adaptation / other?
- Maybe effects are there but they are compensated for?

(Some) effects of phoning reported

- Increase in reaction time (workload)
  - Braking late
- Increase in self-reported workload
- Longer headway distance
- Slower
- Effect of complex conversation > differences handheld or handsfree
- Lateral performance better (effect larger for handsfree, but true also for handheld)

Study in a nutshell

- Part of a driving simulator study
  - Method
  - Many variables recorded, but not processed
- Reanalysis:

  Which measures show differences between normal driving and driving during a handheld phone conversation?
- In terms of Michon

Method

Sample:

- 21, 1 simulator sick (related to motion sickness), 20 left, 6 female, 14 male.
- Age: 27-59 (M=38, SD=10)
- Frequent phone users (while driving)
- 10,000 km / year
- 30€ for each visit

Method: Simulator



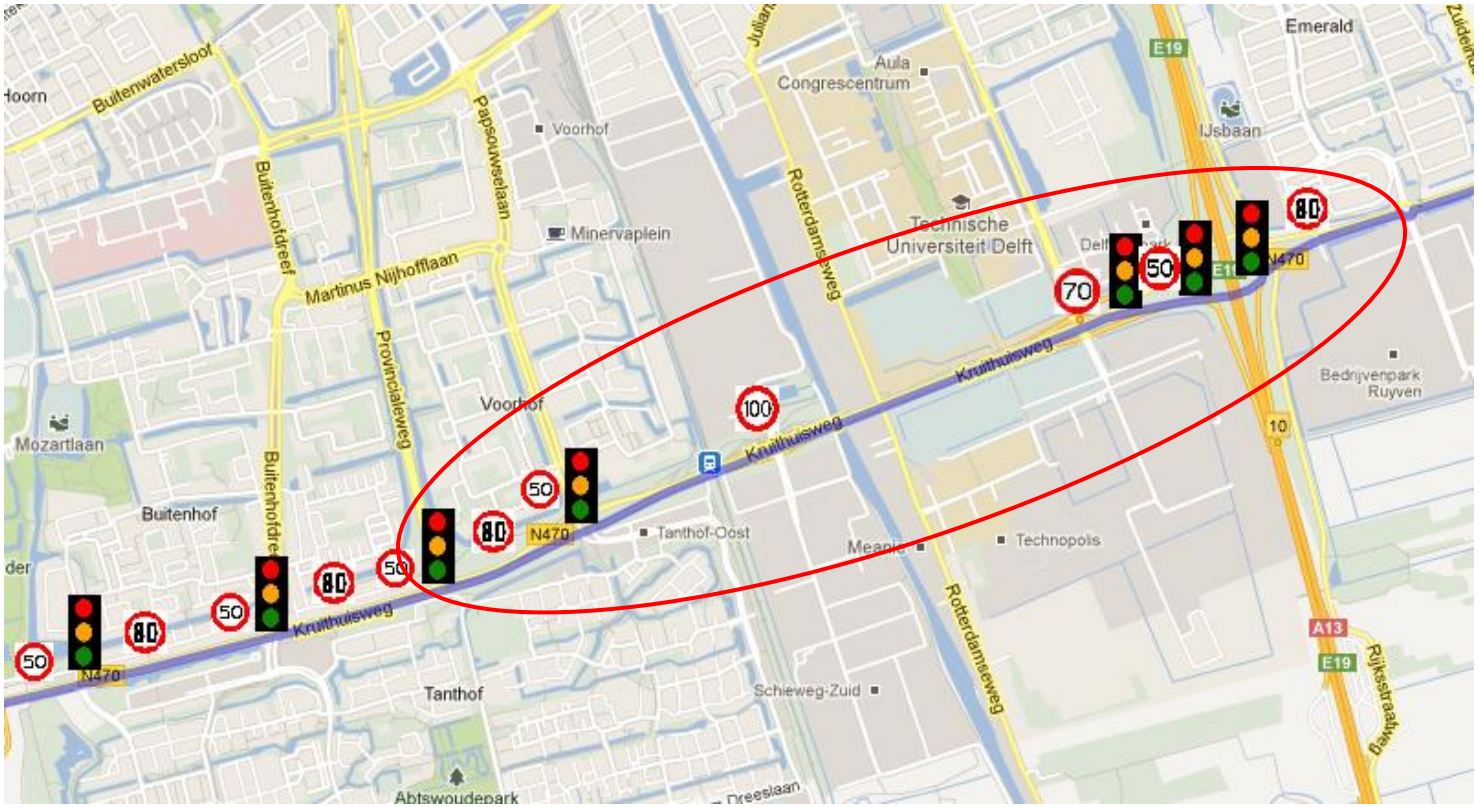
- Delft University of Technology
- Built by a Dutch company
- Build your own environment:

The sky is the limit

- Other traffic
- Airco@20
- Seatbelt included (wearing rate: approx. 70%)



Method: Route



Method: Procedure

- 2 sessions:
  - Phoning + baseline
  - Counterbalanced
  - At least 7 days between sessions
- Phoning task:
  - Remote experimenter, after reaching a certain point
  - 10 questions, 2x5 categories:
    - List: *list as many places startin gwith an A as possible*
    - Answering: *which woman is taller if Jane is shorter than Kim?*
    - And: True or false, describing, repeat a sentence
  - Handheld

Method: Dependent variables

- Strategic (speed choice related)
  - Traffic light waiting time
  - Speed limit exceeding
  - Duration
- Tactical
  - Lance choice
  - Acceleration
  - Deceleration
- Operational
  - Indicator use
  - Steering wheel movements
  - Braking force

Results: Strategic level

Variable	Phoning	Baseline	Paired samples t-test*
Traffic light wait time (s)	52.6	39.4	t=2.48, p<.05
Duration (s)	270.3	233.4	t=4.34, p<.05
Speed limit exceeding (% of time driving 20%>speed limit, overall)	4.9%	7.5%	z=-2.2, p<.05
Exceeding on 70 km/h limit stretch (% o ftime 20% > 70 km/h)**	20%	54%	z=-2.2., p<.05

*Wilcoxon signed-rank test in case the variable pair violated t-test assumptions
**Stretch with highest % of speeding

Results: Tactical level

Variable					es t-test
Acceleration (m					
Deceleration (m					
Lance choice (%					



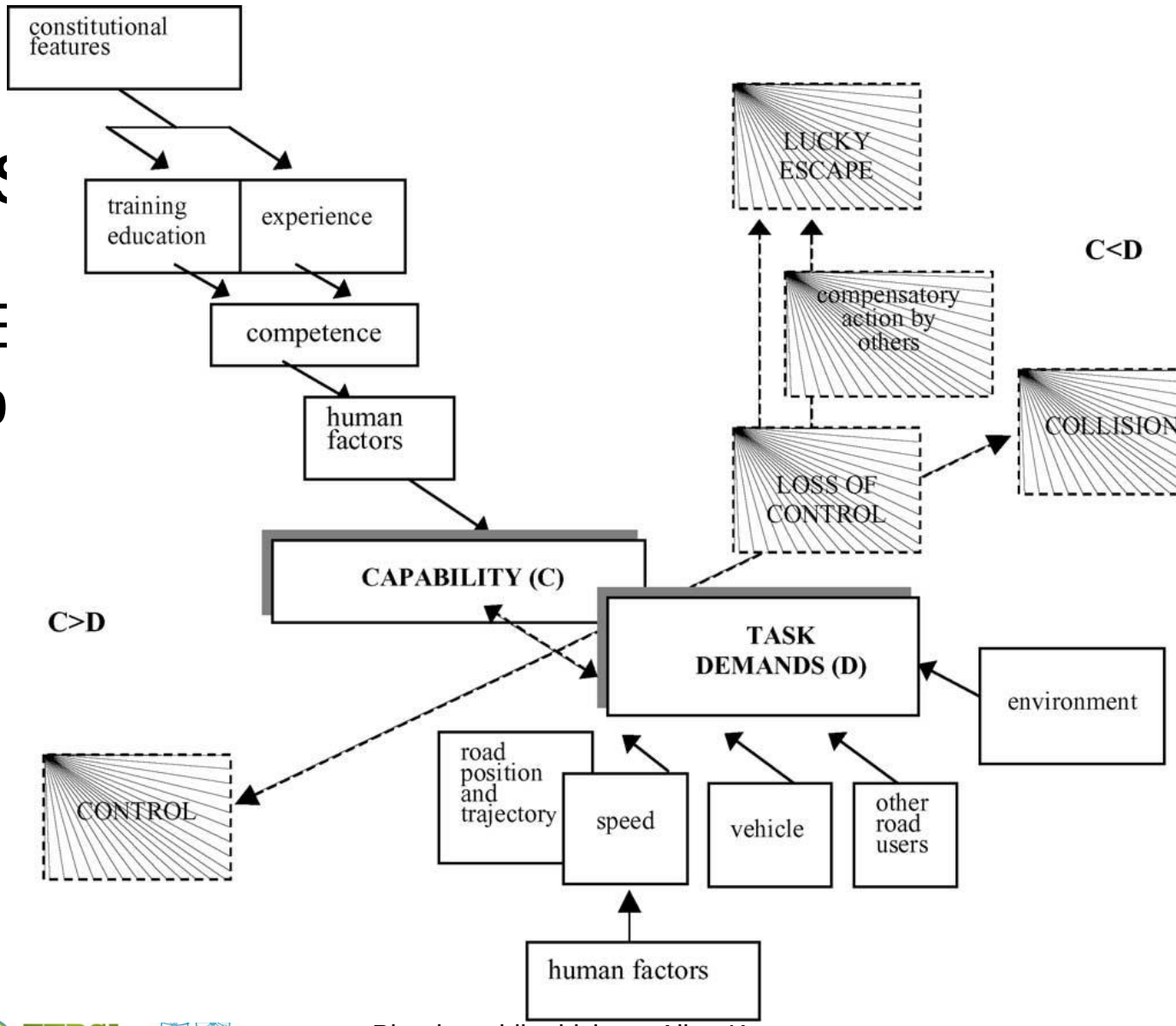
Results: Operational level

Variable	Phoning	Baseline	Paired samples t-test*
Indicator use (% of time)	1.3	3.5	z=-3.92, p<.05
Steering wheel movements (sd, in degrees)	7.6	11.9	z=-2.09, p<.05
Braking: 10 s interval before stop (force, 0-100%)	10.7	12.1	N.S.
Braking: 5 s interval	13.3	16.2	t=-2.21, p<.05

*Wilcoxon signed-rank test in case the variable pair violated t-test assumptions
**Also slightly higher speed before full stop: 18.4 vs 19.8 km/h for 10s, and 11.5 vs 12.3 for 5 s.

Dis

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  - ent /
  - C>D +
  -



Discussion: Tactical level

- No effects on acceleration / deceleration
- Overtaking similar
  - Short stretch (2km)

Discussion: Operational

- Indicator use: Less often due to 1 hand (anecdote)
- Shifting gears
- Less steering variation: Fewer corrections
  - Better at lanekeeping was found before
- Slightly fiercer braking – related to increases in reaction time

Limitations

- Other behaviour while being observed
- No real risks in a simulator
- Mild dizziness



Conclusion

- More conservative driving
- Lateral performance improved

- We may have learned, compensate for the fact we know?
- Simulator results do not match reality?
- Slower driving says it all?

Questions?


HELLO - IS THAT ACE PLUMBING?
YES - SPEAKING
WELL, PULL OVER! YOU SHOULDN'T BE USING A MOBILE PHONE WHILST DRIVING!
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