Distraction and workload driving around Amsterdam

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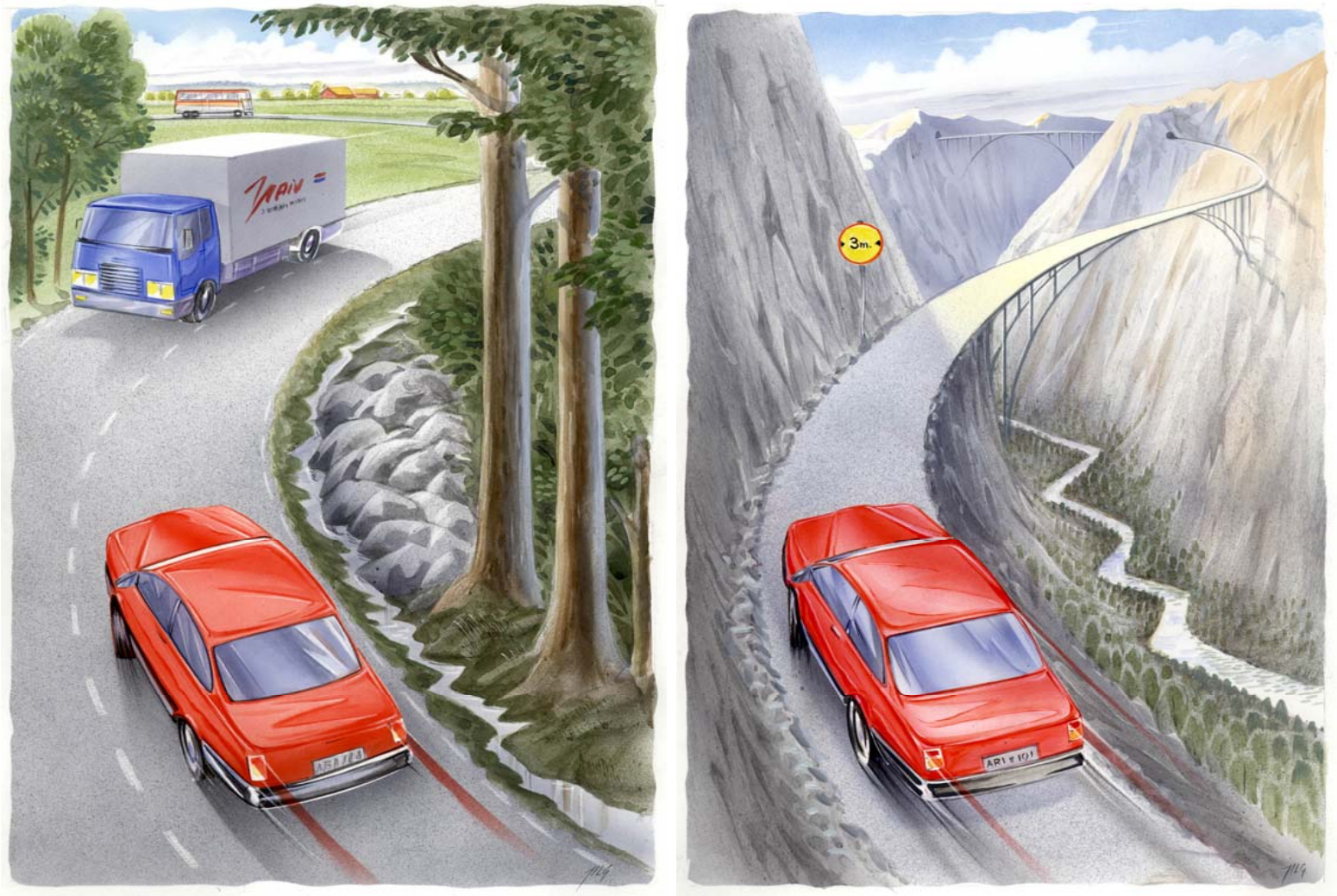
TNO | Knowledge for business

Driving seems so easy

(Lie, 2003)



Driver Distraction and Inattention – *what I learned today…*

Mike Reagan

- Distraction often poorly (or not) defined…
- Attention = key concept
  - *Distraction* is about distribution of attention
  - *Workload* is about amount of attention required
- Holiday photo's can be thrown in !

Nina Schaap

- Distraction and workload are similar, not the same
- Distraction: readiness to respond, to detect events are important
- Peripheral Detection Task (PDT) can be used to assess this

Research question

What is the influence of environmental characteristics on workload?

A10 Beltway Amsterdam
Very complex environment with:
- Buildings
- Fly-overs
- traffic signs
- on- and off ramps
- motorway junctions
- VMS
- DRIPS
- advertisements
- etc.

Method

Compare measures of workload and driving behaviour on exactly the same road only differing in richness of the environment

1. Complex, full environment
2. Empty environment

NB: road layout and other traffic stays the same

Complex: Realistically modelled environment based on real life photography

Empty: Same road, environment taken away

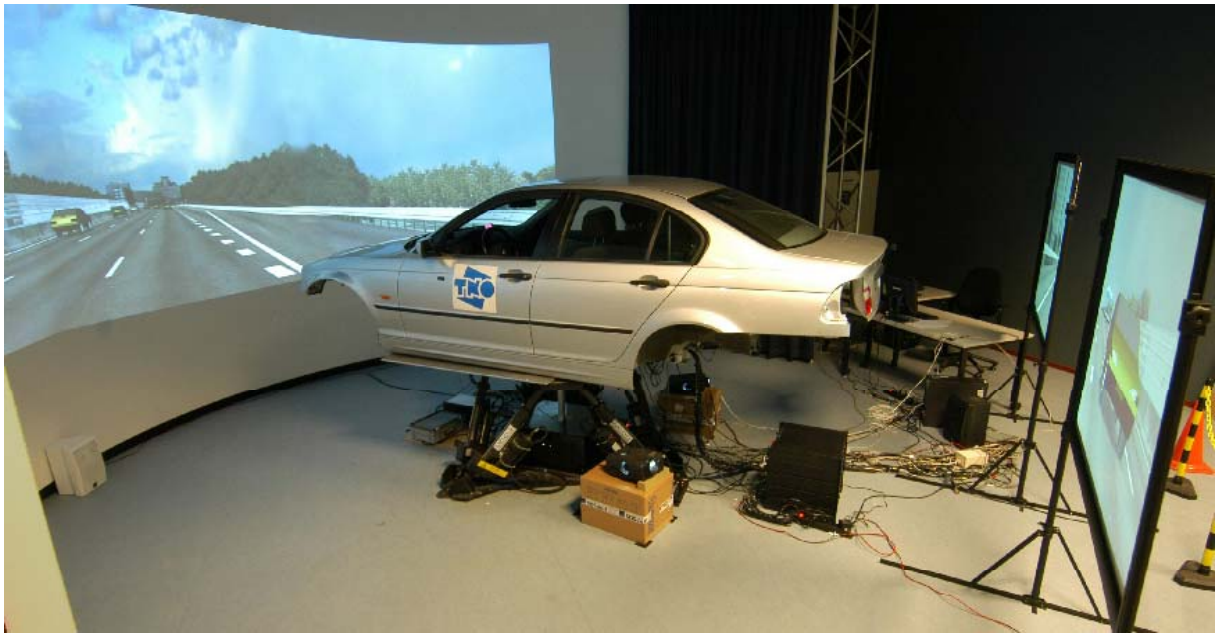
Workzone


Ring Amsterdam
RAI
Utrecht 46
Amersfoort 46
90
RAI
Rivierenbuurt

Workzone removed

Simulator

- TNO's moving base driving simulator
- Other traffic: fluent, high density
  - 100 km/h with slight fluctuations
  - 1 s time headway
  - all lanes occupied



Dependent variables

- Peripheral Detection Task
- Secundary task: Digit Task
- RSME

- Behavioural measures

Peripheral detection Task (PDT)

- Suitable for short periods of time (peak loads)
- Able to measure variations in workload
- Is not distracting attention
- Suitable for different workload conditions:
  - road environment
  - traffic situation
  - in-vehicle system
  - etc.

- Target presented during 1 s
- 3-5 s inter-stimulus interval

Digit Task

- Visual detection task
- Display on the ground of the car in front of passenger's seat

- Neutral stimulus: '00'
- Target stimulus: '99'

- Target presented during 2 s
- 3-8 s inter-stimulus interval

Digit Task vs PDT
- *Can only be seen when looking*
- *Better for 'spare capacity' ?*
- *More interfering ?*
- *More variability?*

Method

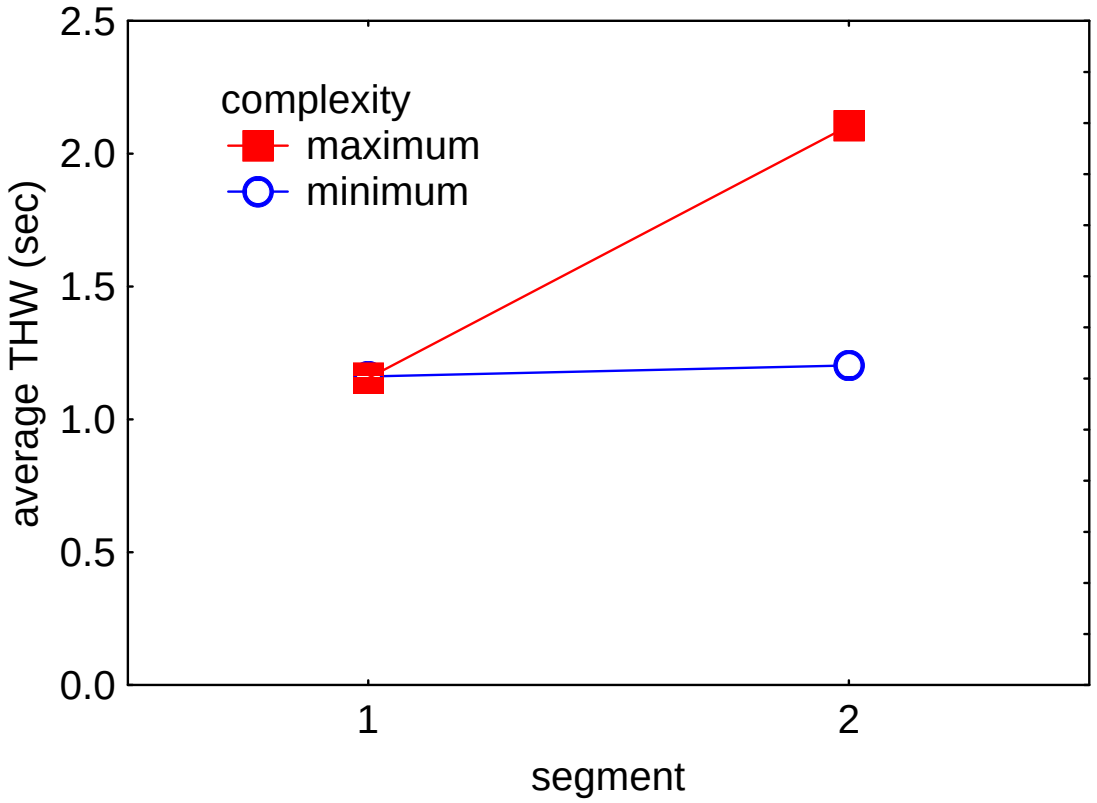
- Participants: 45 experienced drivers.

- Instruction: "*You are in a hurry*"
  (to avoid compensation on primary task)

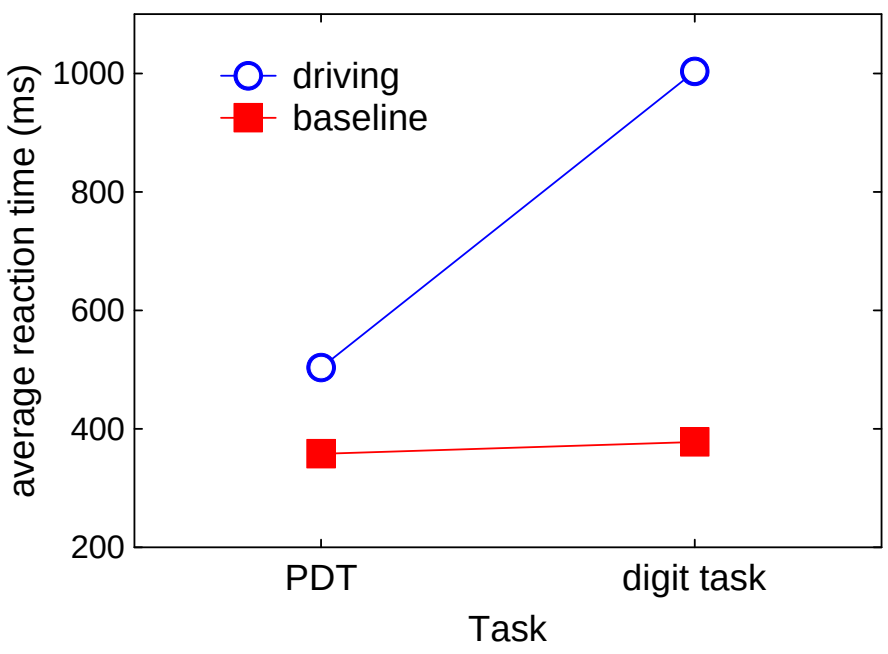
<u>Design</u>

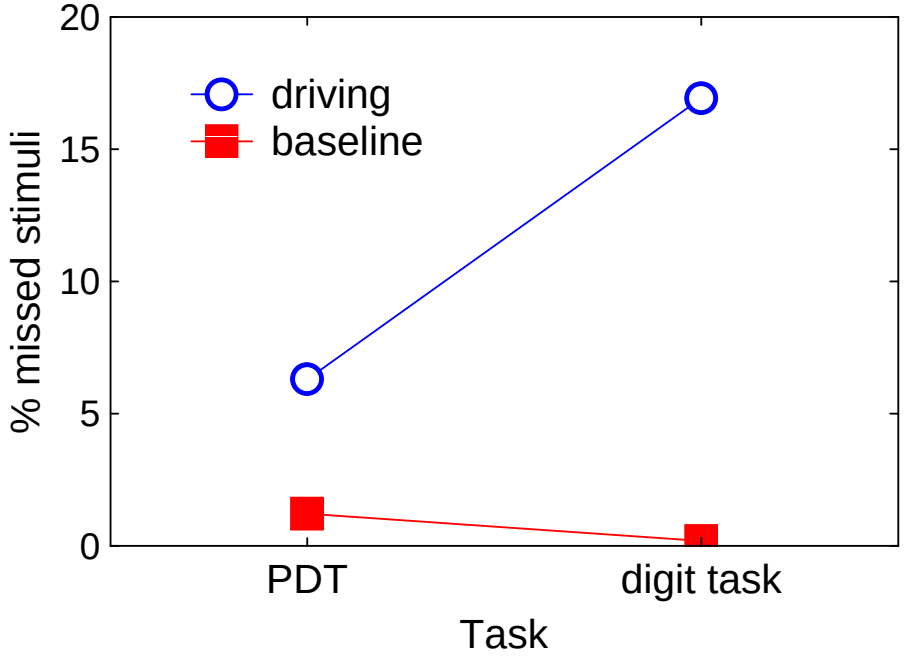
- Complexity (minimum – maximum)
- Segment (1: normal motorway; 2: road works)
- Secondary task
  - Without
  - With
    - PDT or digit task (between ss)

Results: headway

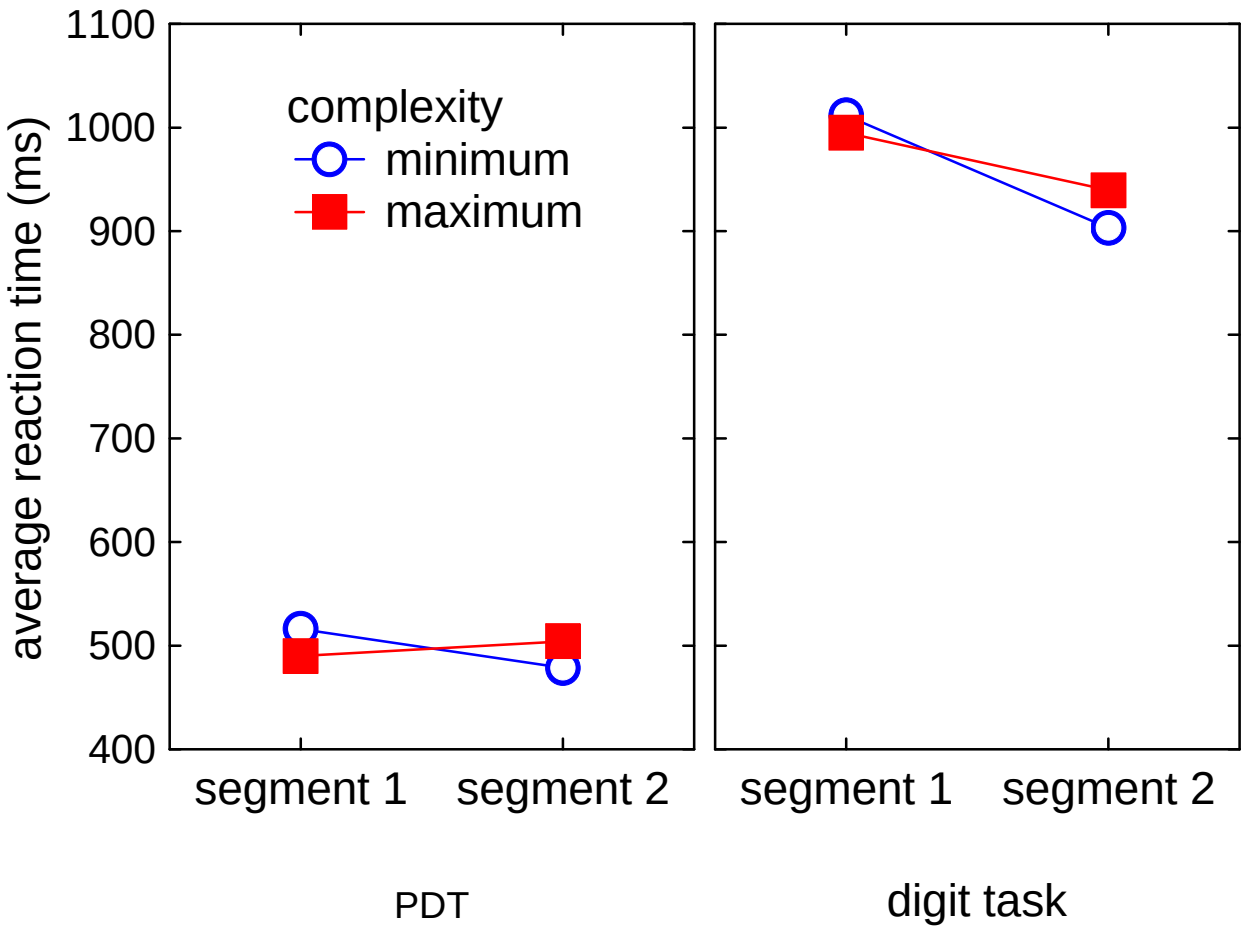


Secondary tasks

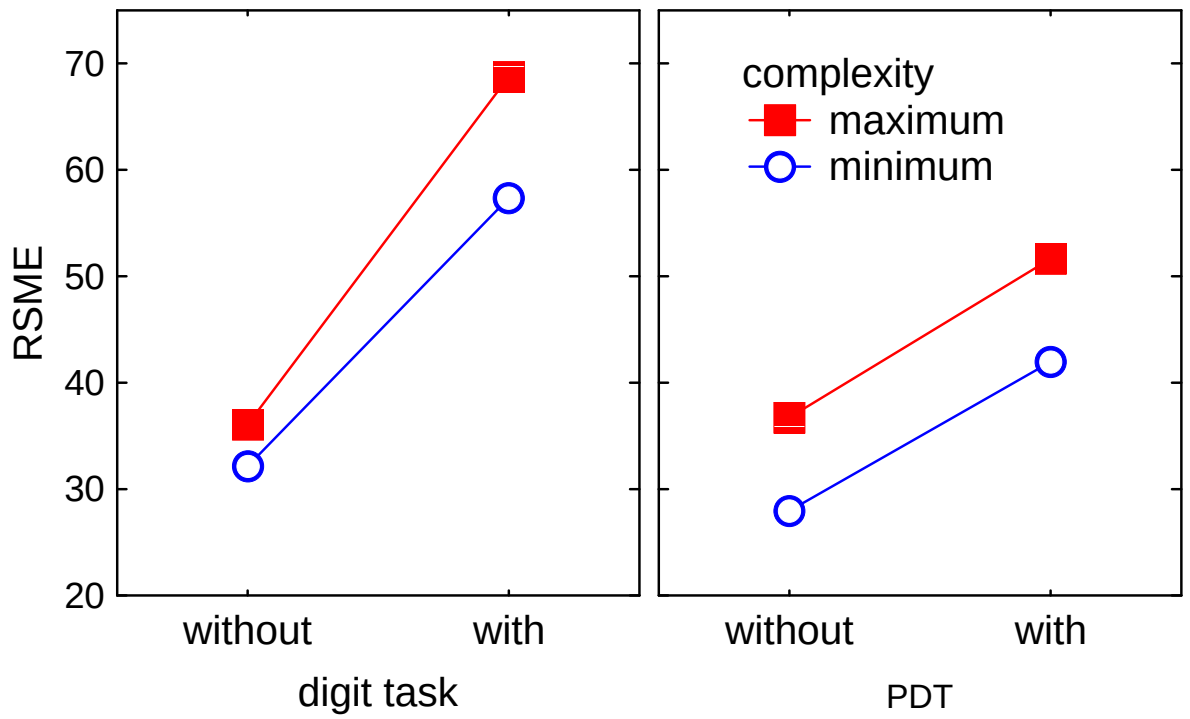




RT


1100
1000
900
800
700
600
500
400
average reaction time (ms)
complexity
minimum
maximum
segment 1
segment 2
segment 1
segment 2
PDT
digit task

Rating Scale Mental Effort



Discussion & Conclusions

- In this setting (*you're in a hurry*, plus secondary task): seems that subjects were able to avoid distraction by the visual complex environment.

Environment complexity:

- No effects in secondary tasks
- Effects in subjective rating (but which part of the run…?)

Secondary tasks did show effects:

- Straight road versus curve
- Lane keeping versus lane changing