

# Understanding driver self-regulating behavior: how does phone use influence vehicle control in real world?

Marco Dozza, Chalmers

James Sayer, UMTRI

Carol Flannagan, UMTRI



CHALMERS



## Summary

- Cellphone operation while driving
- Naturalistic data: IVBSS
- Cellphone  $\Leftrightarrow$  Longitudinal control (and age)
- Risk = Distraction – Self-Regulation

# Using Cellphones while Driving

- Legal in Sweden
- *Distraction hazard* - driving simulators say
- Not so bad in naturalistic data
  - *Talking not as bad as dialing*

# Research Questions

How does phone use influence vehicle control in real world?

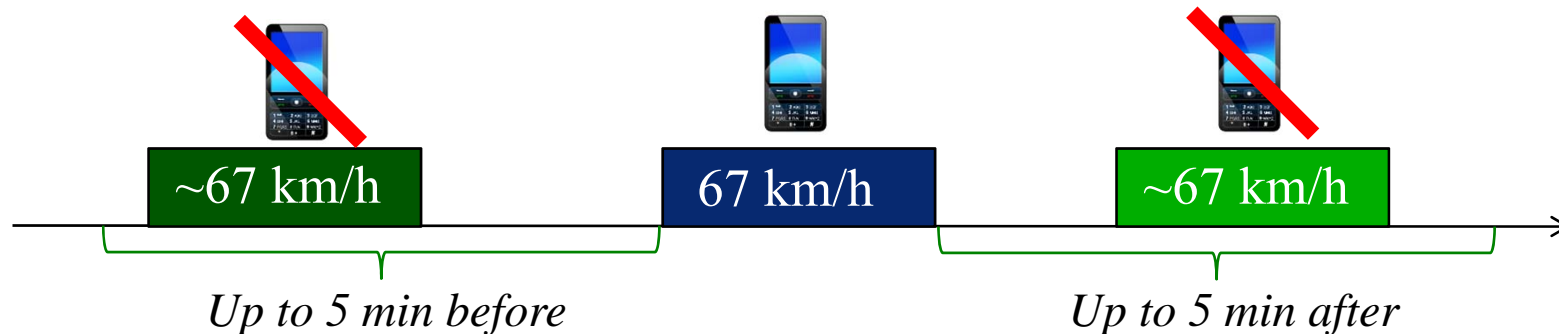
Is it the same for different age groups?

# Integrated Vehicle-Based Safety System

- 108 randomly sampled passenger car drivers
- 16 Honda Accord, 40 days per participant.
- Drivers were equally distributed in three different age groups: 20-30 (young), 40-50 (middle-age), and 60-70 (older)

## Dataset

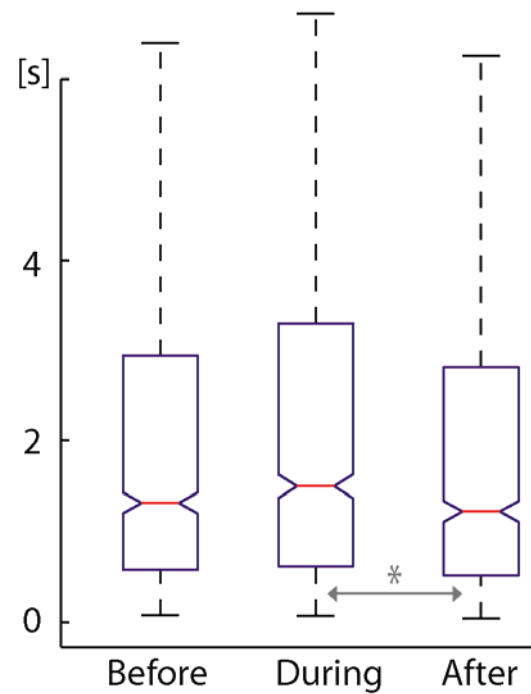
- 1033 identified phone-use segments from 91 different drivers
- 2066 matching baselines



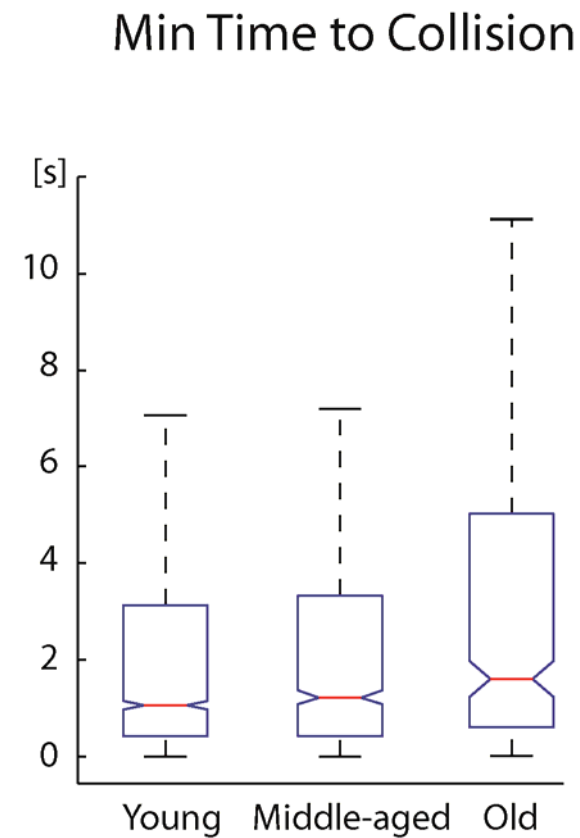
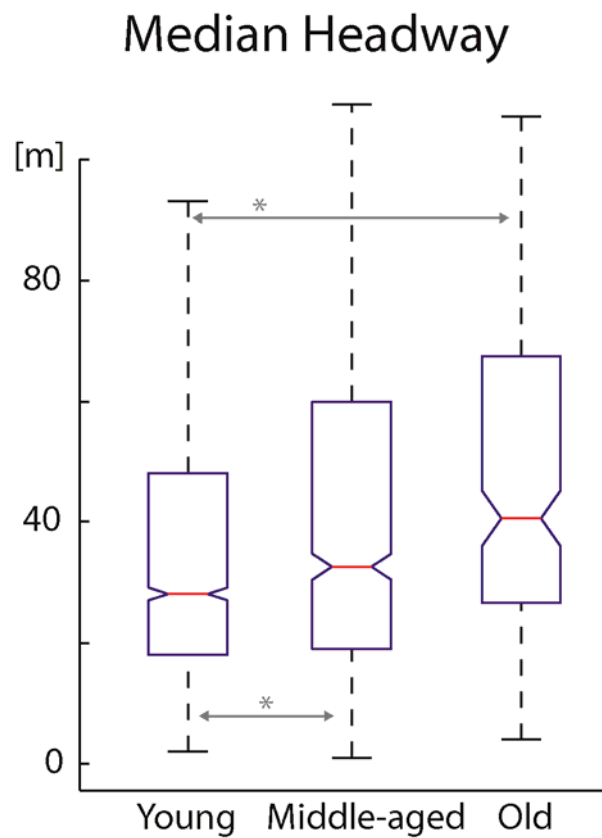
- Minimum Time to Collision and Median Headway

# Results

Min Time to Collision



# Results





## Self-regulation

- While using a phone drivers self-regulate increasing their safety margins.
- Older drivers may be aware of their reduced reaction times and self-regulate more than younger driver to achieve similar safety margins as younger drivers (i.e. self-regulation is an innate and general mechanism).

## Conclusions

$$\text{Risk} = \text{Distraction} - \text{Self-regulation}$$

- Simulators studies may overestimate distraction by overlooking self-regulation\*.
- If self-regulation is appropriate there is no risk.
- Intelligent systems may measure and boost self-regulation as a distraction countermeasure.

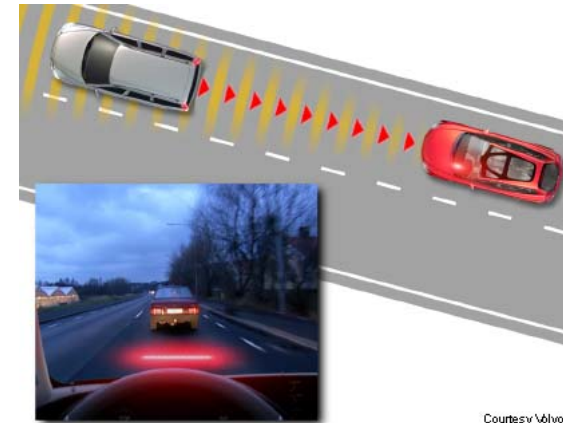
\* Schömig, N., Metz, B., 2012

## Example: Longitudinal Support

$$\text{Risk} = \text{Distraction} - \text{Self-regulation}$$

↓ Distraction: increase sensitivity (increase TTC for a warning)

↑ Self-regulation: increase headway



## Example: Lateral Support

$$\text{Risk} = \text{Distraction} - \text{Self-regulation}$$

↓ Distraction: increase sensitivity (increase TLC for a warning)

↑ Self-regulation: offset the vehicle in the lane

