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What is Naturalistic Driving?

How can it be used to monitor behaviour?

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Driver Behaviour Models

- Brown (1994)
- Fuller (1984, 1991)
- Gibson and Crooks (1938)
- Hollnagel et al (2004)
- Michon (1985)
- McKenna (1988)
- Ranney (1994)
- Rumar (1985)
- Stanton and Young (2002)
- Summala (1986, 1996)

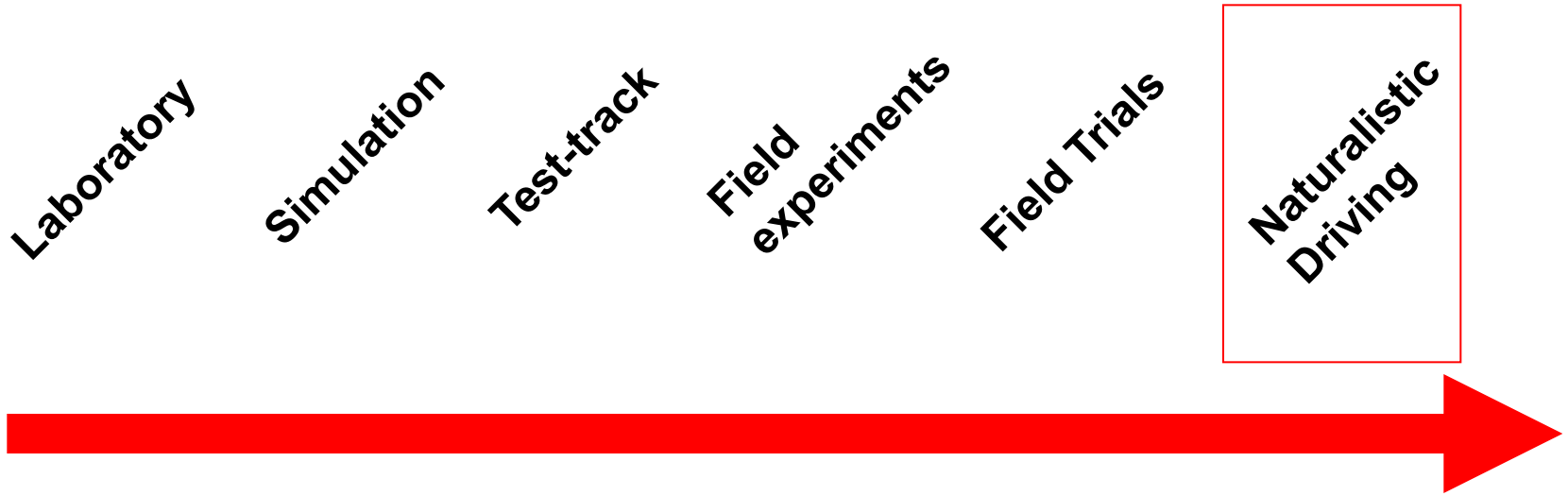
- Etc etc

- Accident proneness
- Skill
- Utility maximising
- Driver risk
- Risk homeostasis
- Task-capability interface

- ECOLOGICAL VALIDITY

Driver Behaviour Evaluations

Range of driver behaviour, design, test and evaluation tools



What are Naturalistic Observations?

- Unobtrusive observation of driver behaviour in daily journeys
- Video (inside/outside)
- GPS/Galileo
- Vehicle dynamics data collection
- Analysis of all data after observation period
- Allows to build a database and to study drivers' behaviour under normal, critical and crash conditions

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Naturalistic Driving

- Allows insight into behaviour that cannot be investigated by traditional research methods
- In depth insight in pre-crash (knowledge of what the driver was doing, the pre-crash conditions etc)
- Can be used to monitor driver behaviour
- Large data-sets can be built which allow in-depth analyses (although these large data sets bring about their own challenges)

Monitoring versus Research

- Monitoring ("what is happening") intends to describe the prevalence of certain behaviour, such as
  - the percentage of kilometres driven with a BAC level above 0,5‰ or above 1,3 ‰, by day of week and age of driver
  - the percentage of trips in which excessive speeding occurs, by age & gender of driver
- Research ("why is it happening") is intended to determine increased risk of a certain behaviour comparable to Blomberg curve on alcohol

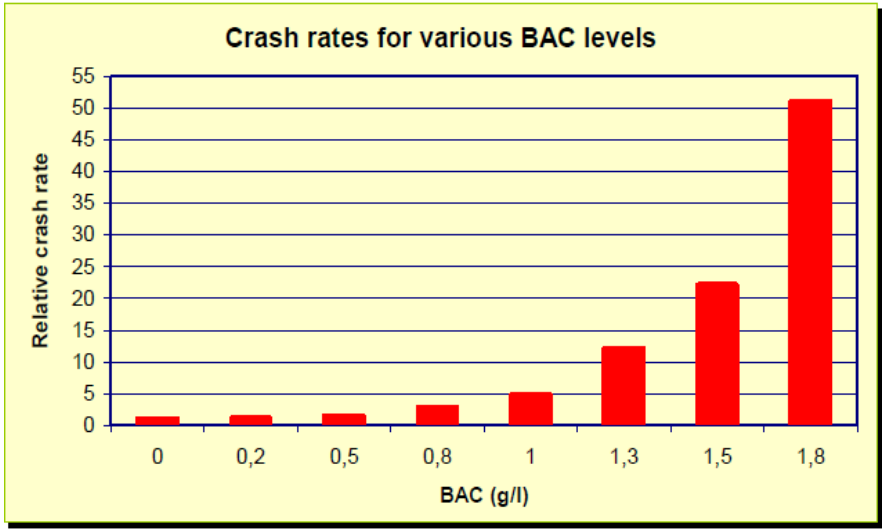

Figure 2. *Crash rates for various BAC levels (Blomberg et al., 2005)*

Monitoring behaviour

- Trip information
  - Number of trips
  - Length (Km)
  - Duration
  - Road choice
- Speed
  - Average speeds
  - speed relative to speed limit
  - speed choice
- Acceleration
  - Force/duration

The 100-Car Naturalistic Driving Study:

Implications for Safety

Overview

- Virginia Tech Transportation Institute, funded by NHTSA.
- 109 cars: 12 to 13 months data collection per car.
- Main aim was to determine the risk of collision (and near collisions) for various sources of inattention.
- Exposure was manipulated by skewing the sample towards younger, higher mileage drivers.
- Six vehicle types were instrumented.

Overview (continued)

- 2 million vehicle miles
- 43,000 hours of data
- 241 drivers
- 15 police-reported crashes
- 67 non-reported crashes, 761 near-crashes
- 8,295 ‘incidents’ (near-misses)

Event database

- Crash: Any physical contact between the subject vehicle and another vehicle, fixed object, pedestrian, cyclist, animal, etc., as assessed by either the lateral or longitudinal accelerometers.
- Near-crash: A conflict situation requiring a rapid, severe, evasive manoeuvre to avoid crash.
- Incident: A conflict requiring an evasive manoeuvre, but of lesser magnitude than a near crash.

Parameters used

1. Lateral acceleration
2. Longitudinal acceleration
3. Event button
4. Forward time-to-collision
5. Rear time-to-collision
6. Yaw rate

100 Car Study - Headline results

- Driving while drowsy increases an individual's near-crash/crash risk by between 4 and 6 times
- Engaging in complex secondary tasks increases risk by 3 times; moderate secondary tasks double the risk.
- Results of the population attributable risk analysis indicated that driving while drowsy was a contributing factor for between 22% and 24% of the crashes and near-crashes, and secondary-task distraction contributed to over 22% of all crashes and near-crashes.
- Those drivers who frequently engage in inattention-related activities are also more likely to be involved in inattention-related crashes and near-crashes.

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