Two wheeler accidents

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Dries Hop

- Teacher / Investigator
  Police academy of the Netherlands
- Chief instructor for experienced rider training of the Dutch Motorcycle Assocation (KNMV)







Project two wheeler accidents

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Objective project two-wheeler accidents:

- The objective of the research was to find out if the braking behaviour of the motorcyclist before a collision could be analyzed

Phases project

- Investigation and study of existing literature
- Tests
  - Investigation of the marks and their direction
  - Pre-crash motion of the two-wheeler and the rider related to the marks
- Field investigation

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Brake tests

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Which wheel locked?

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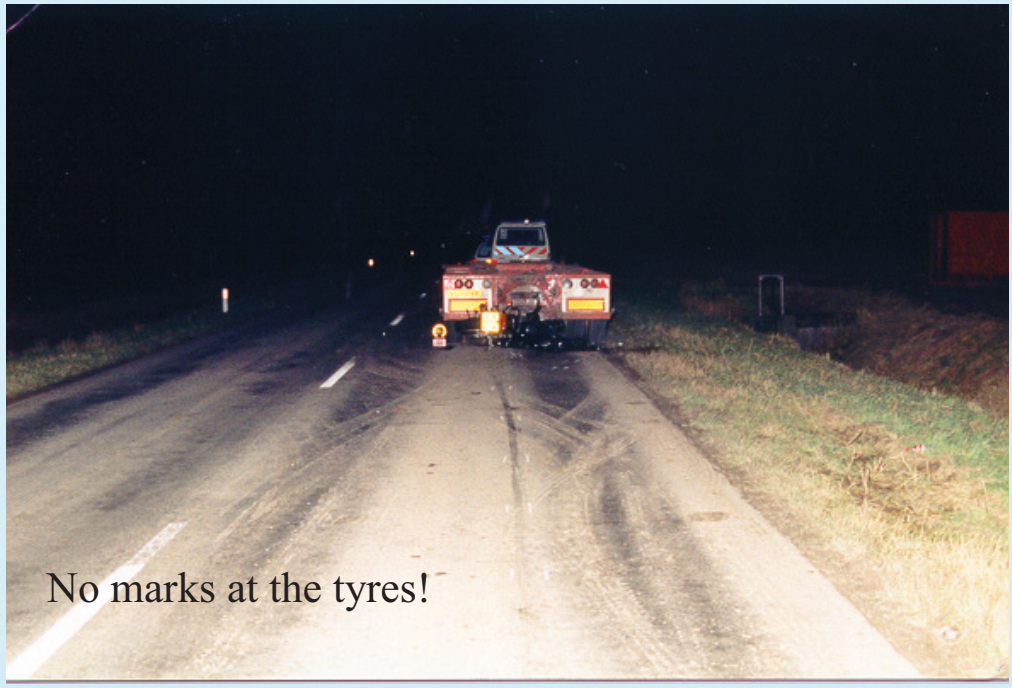

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Which wheel locked?

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Locking frontwheel

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Sometimes it is easy!

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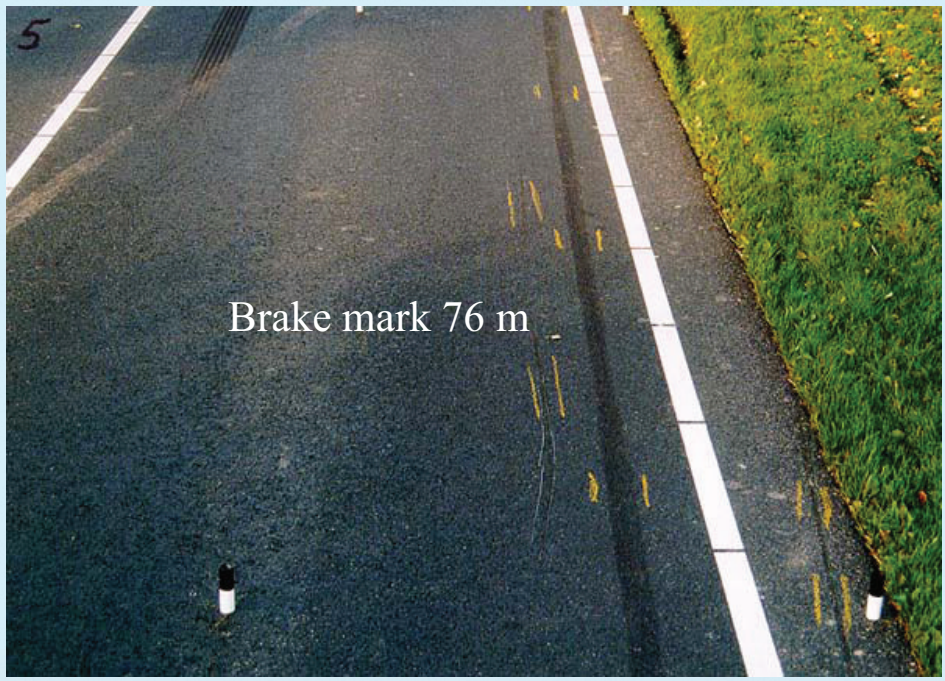

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Marks on the underside of the boots

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Did the rider apply the front brake?

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Did the rider apply the front brake?

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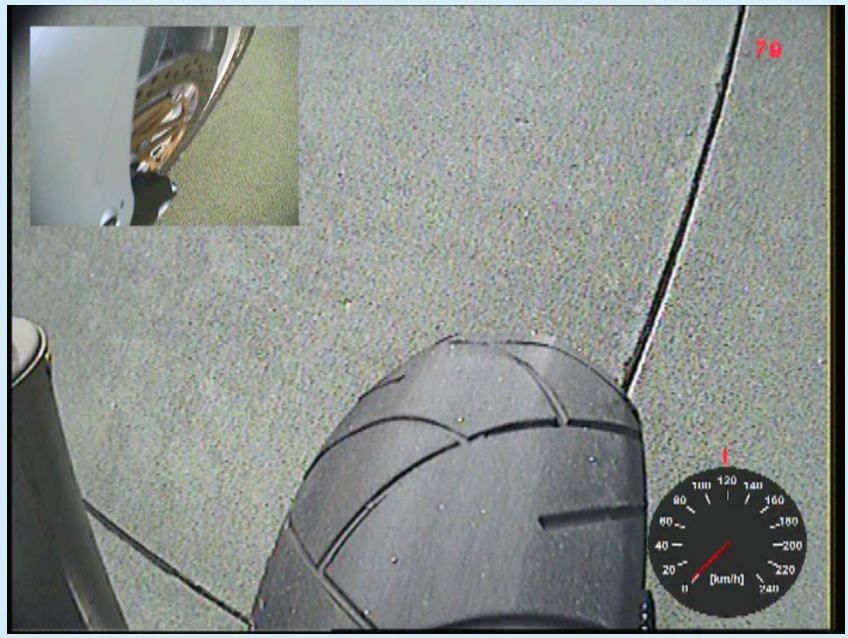

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Did the rider apply the front brake?

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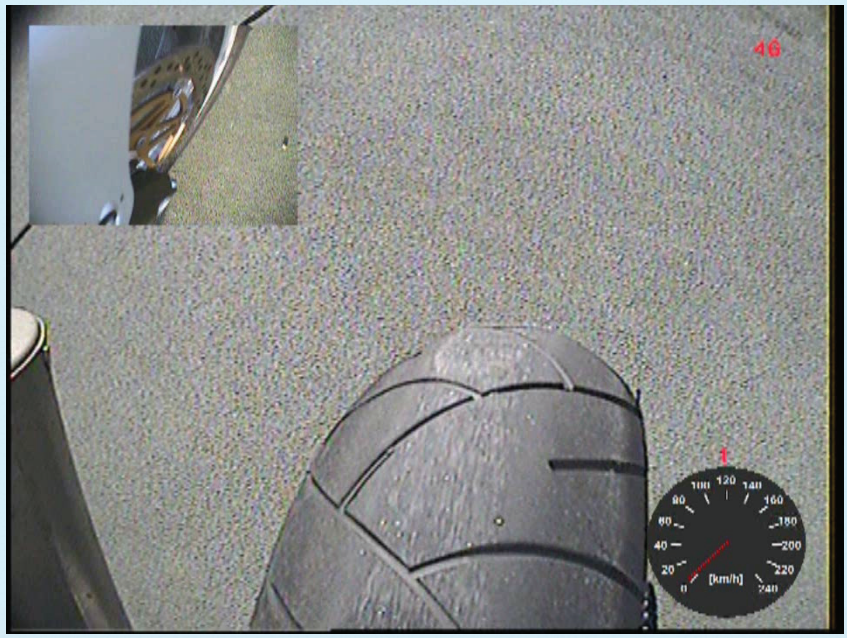

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Brake test and comparing the marks

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Field investigation

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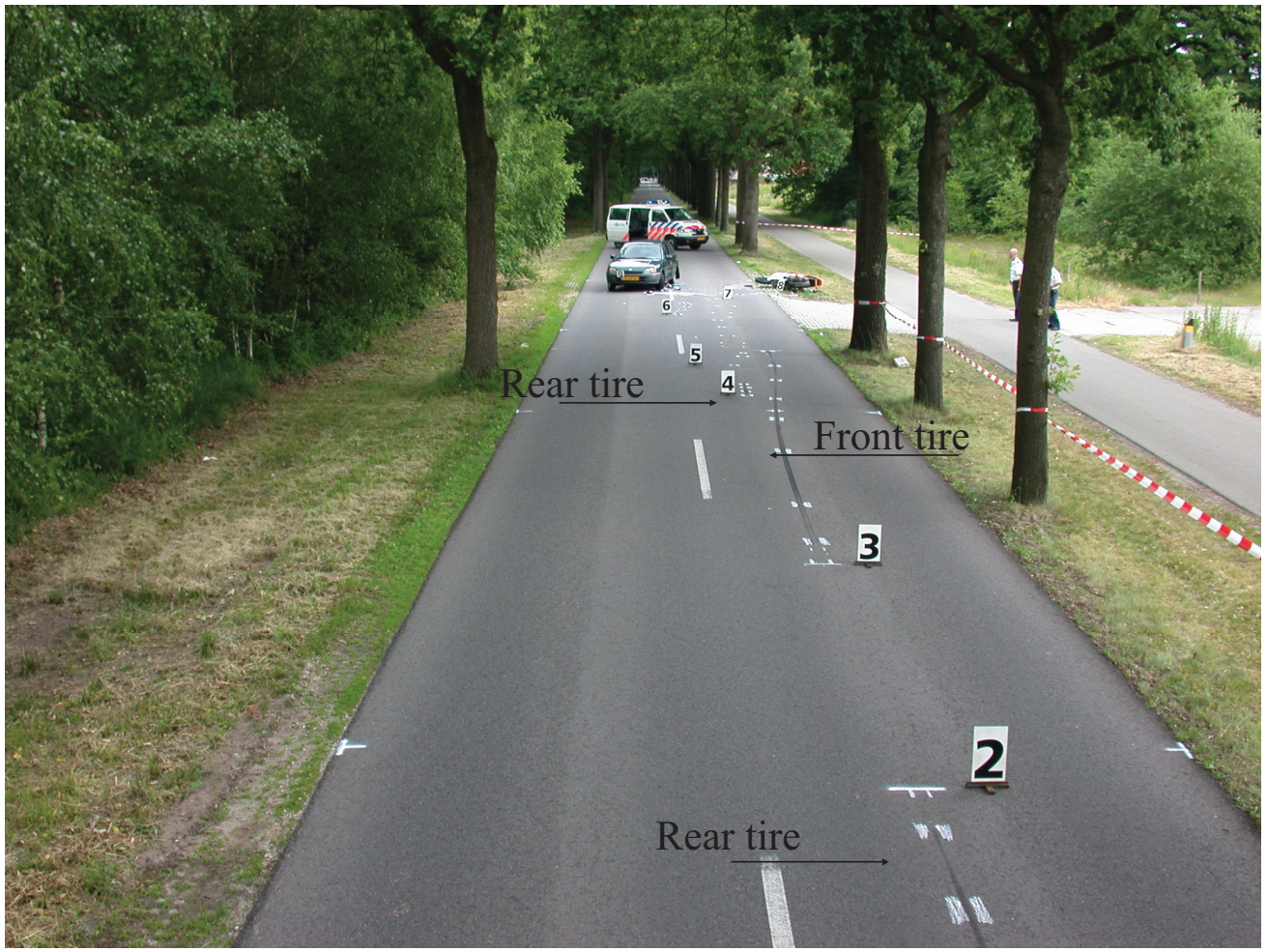
Rear tire
Front tire
Rear tire
2
3
4
5
6
7

Depth and direction

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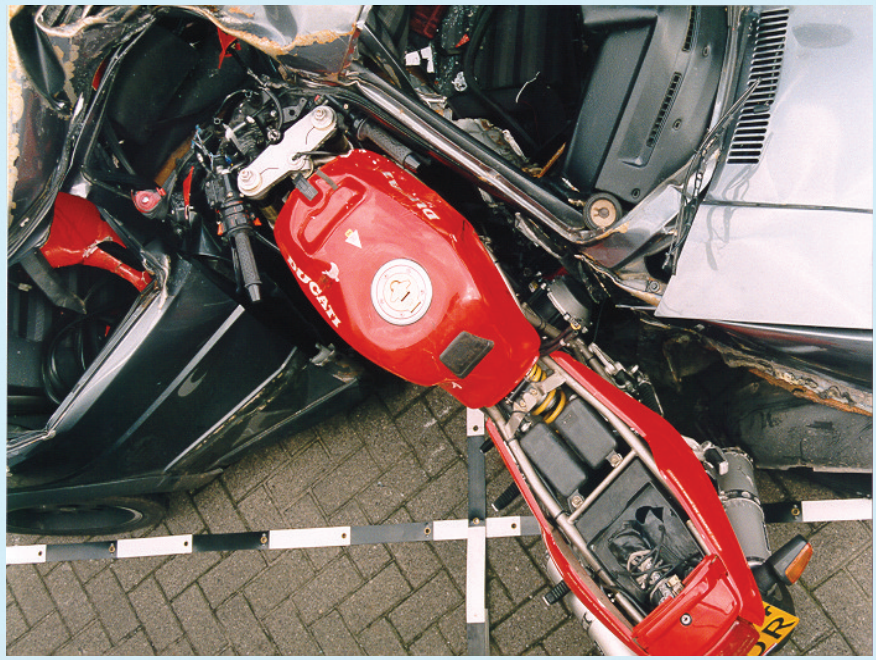

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And deformation of the car

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Drag tests

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Brake test on the scene

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What can we learn from accidents?

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Accident Exploration Model

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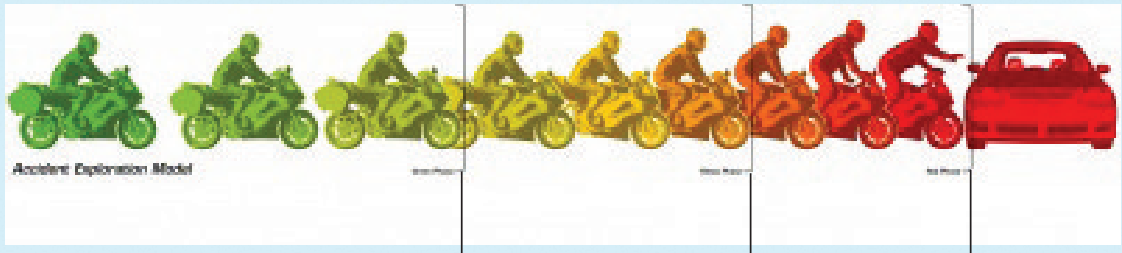

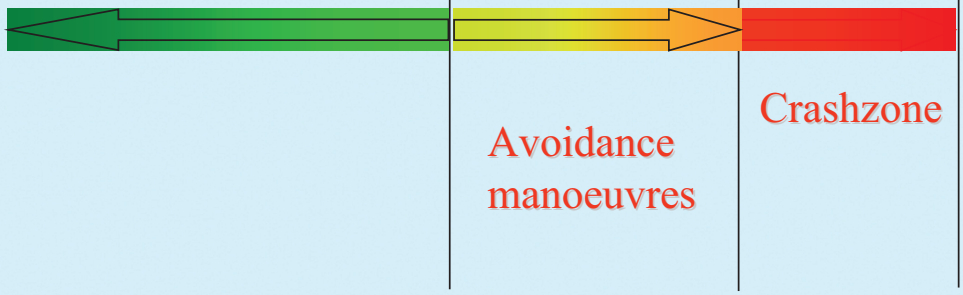

Avoidance manoeuvres

Crashzone

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What's risk?

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Risk = chance x result

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Subjective risk

Risk perception

Risk perception??

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Focus rider training:

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KONINKLIJKE NEDERLANDSE MOTORRIJDERS VERENIGING

oyal Dutch motorcycle association

- Risk perception
- In experienced rider training at circuit: (VRO 1, 2 and 3)
- Focus on limitations motorcycle and the rider (humanfactor) by doing al kind of exercises

Focus rider training:

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KONINKLIJKE NEDERLANDSE MOTORRIJDERS VERENIGING

oyal Dutch motorcycle association

- Risk perception
- In experienced rider training on public roads (VRO R)

- Is there any risk?
- Is it necesary to react on it?
- What kind of reaction?
- Execution → To prevent a collision avoidance manoeuvre

Risky situation

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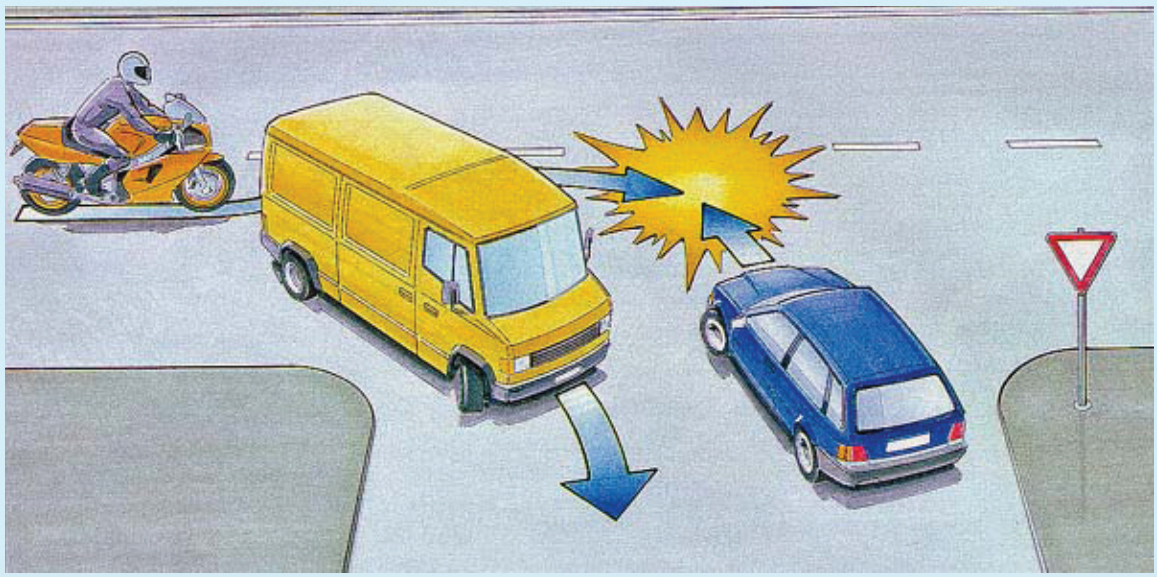

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Risky situation

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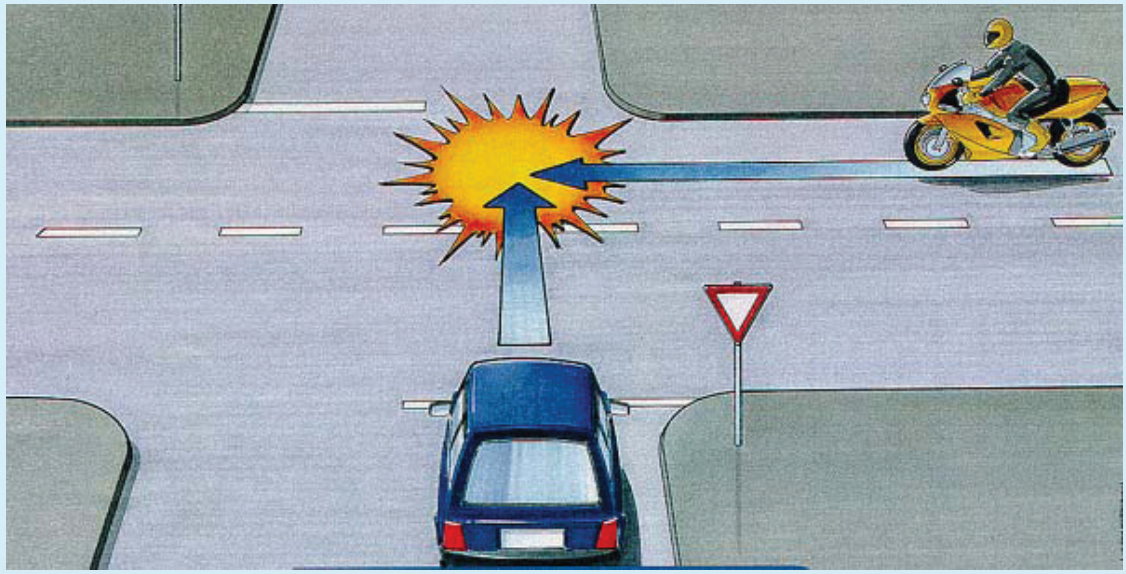

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Risky situation

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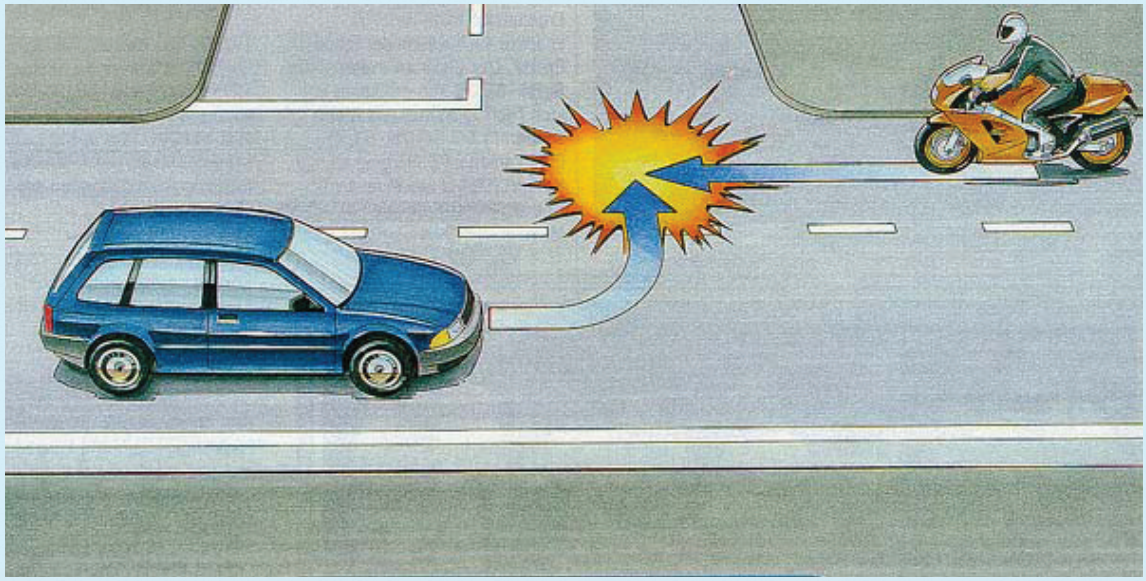

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Result of MAIDS

- MAIDS about speed:

> Travelling and impact speeds for all PTW categories were found to be quite low, most often below 50 km/h. There were relatively few cases in which excess speed was an issue related to accident causation.

- Remark: The problem in many cases is to find the speed prior to the first (brake)marks!
- Analyse data from on board data systems
- Example accident with video

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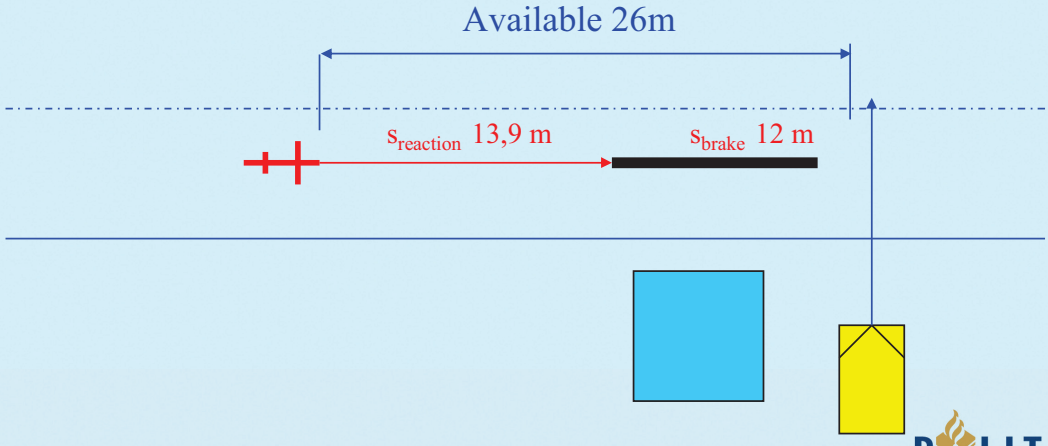
Effect of speed

Mc v 50 km/h
a 8 m/s^2
$t_{reaction}$ 1 s

$$s_{stop} = v \times t + \left(\frac{v^2}{2a} \right)$$



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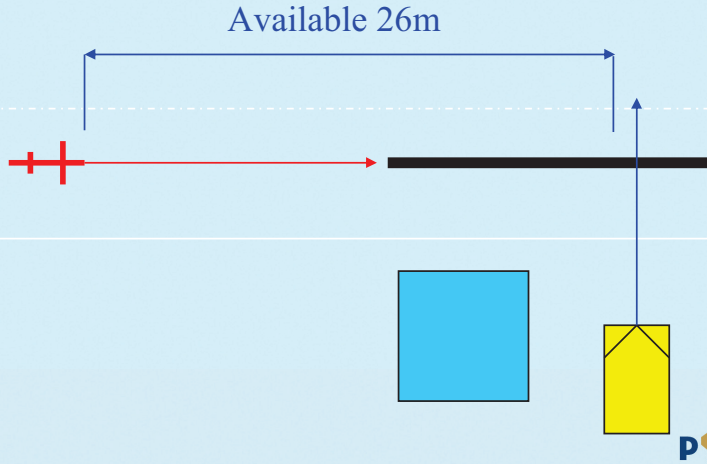

Effect of speed

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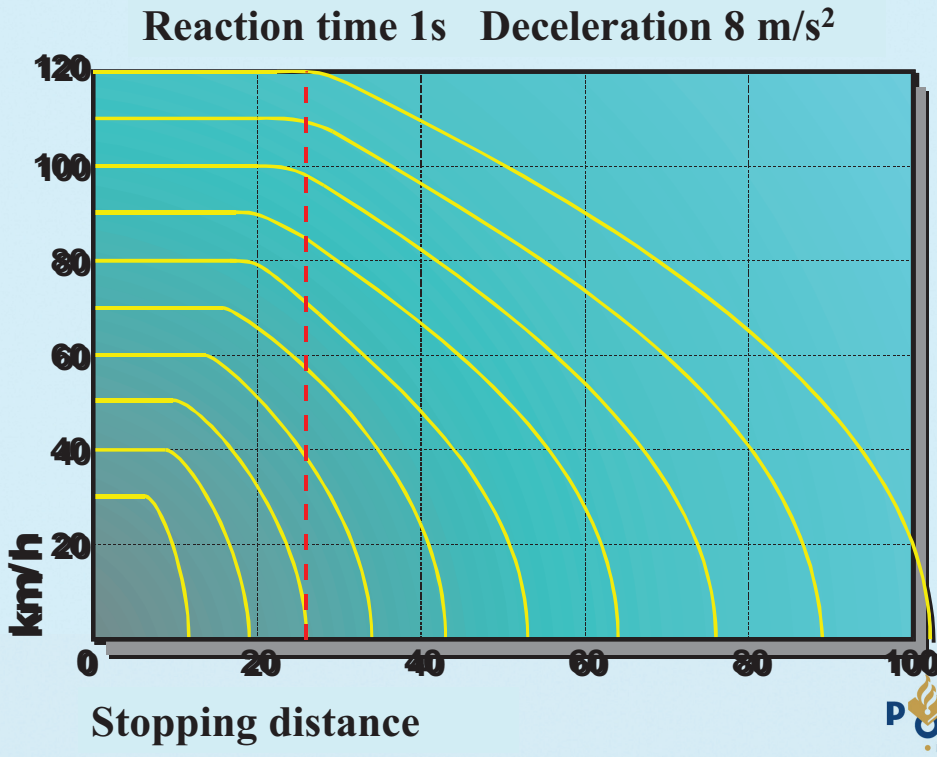

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Effect higher crash speed

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Effect higher crash speed

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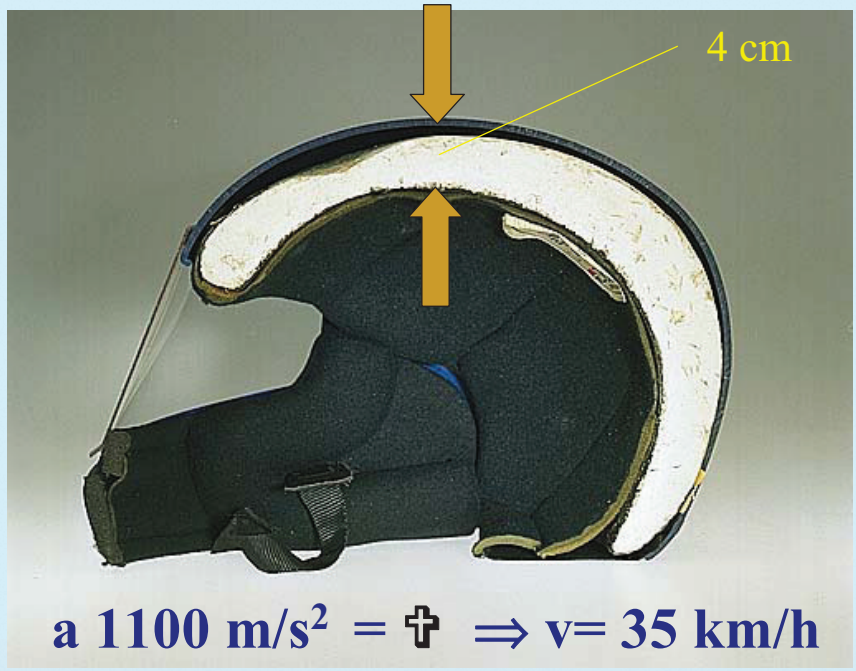

$a\ 1100\ m/s^2 = ✝ \Rightarrow v = 35\ km/h$

Education OV

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What's the solution?

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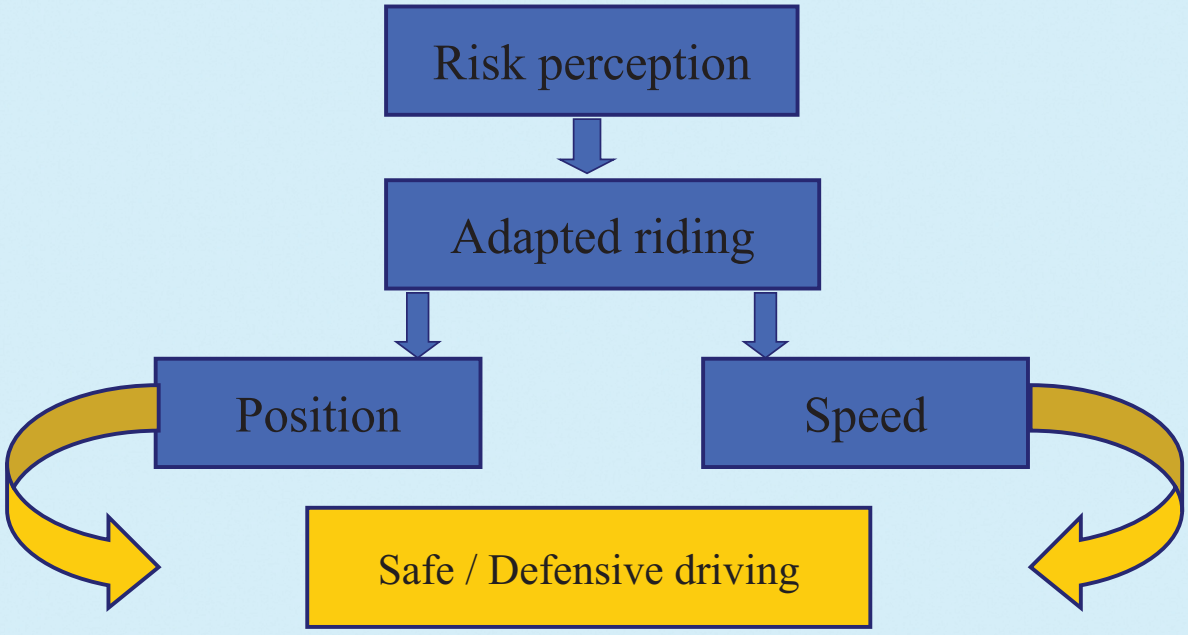

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Result of investigation

- **Investigation Gesamtverband der Deutschen Versicherungswirtschaft e.V. (GDV)**
  - 910 accidants (A)
  - 610 accidents between motorcycle and car (B)
  - In 65% rider of motorcycle brakes prior to crash
  - In 20% the rider came to a fall
  - In 93% with ABS there would be no accident (B)
  - 40% in single accidents
  - Each year in this accidents and in single accidents 10% less of deaths and injuries (A)
  - 70 deaths and 3000 injuries

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Only operate the foot pedal

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Brake test

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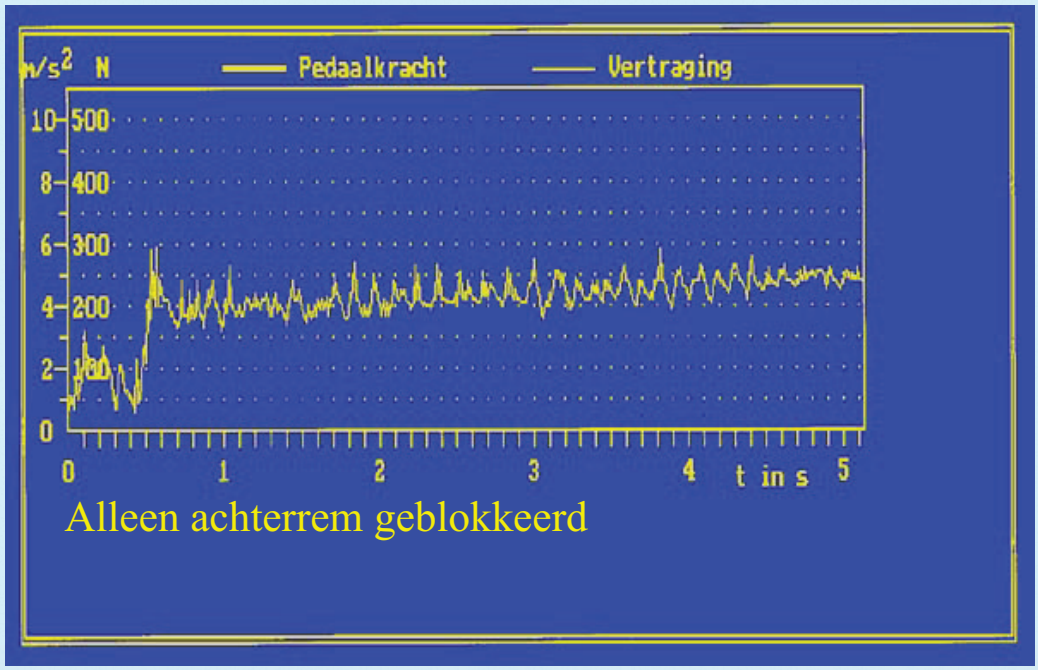

Alleen achterrem geblokkeerd

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Calculation

60 m brakemark / crashspeed 50 km/h / a 4 m/s^2

$$v_o = \sqrt{2as + v^2}_{bots}$$

$$v_o = 93\ km/h$$

Based on a $t_{reaction}$ of 1 s, the first point of perception is at a distance of
60 + 26 = 86 m prior to the crash point

At which distance from the car the motorcycle would have stopped if the motorcyclist only operate the foot pedal and the motorcycle was equipped with a dual combined braking system?

Result brake test

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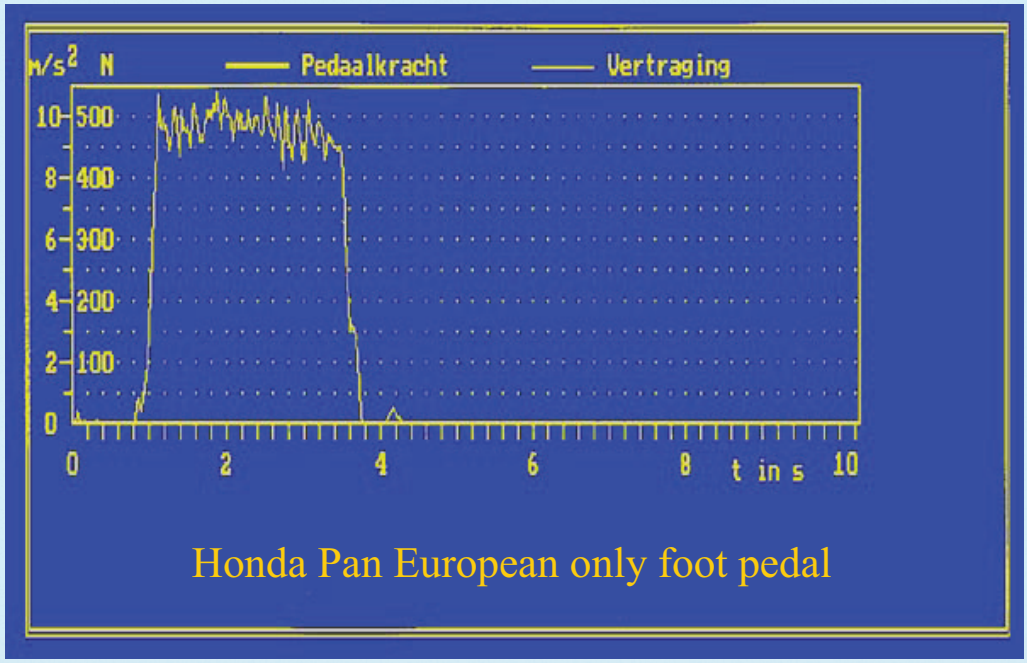

Honda Pan European only foot pedal

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Calculations

$$s_{stop} = v \times t + \left(\frac{v^2}{2a} \right)$$

$$s_{stop} \approx 61m$$

This means that the motorcycle 25 m prior to the crash point would have come to a stop. At this point the accident Motorcycle still had a speed of 71 km/h.

ABS / Combined BS

- Realising a maximum deceleration even under critical conditions
- The maximum deceleration in a short time
- Capacity for other aspects
- Less stress
- No fall due to overbraking
- Decreasing the crash speed / less severity
- With combined braking systems also high deceleration if only the footpedal is used

Thank you for youre attention

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