



# HEAD RESTRAINT POSITION

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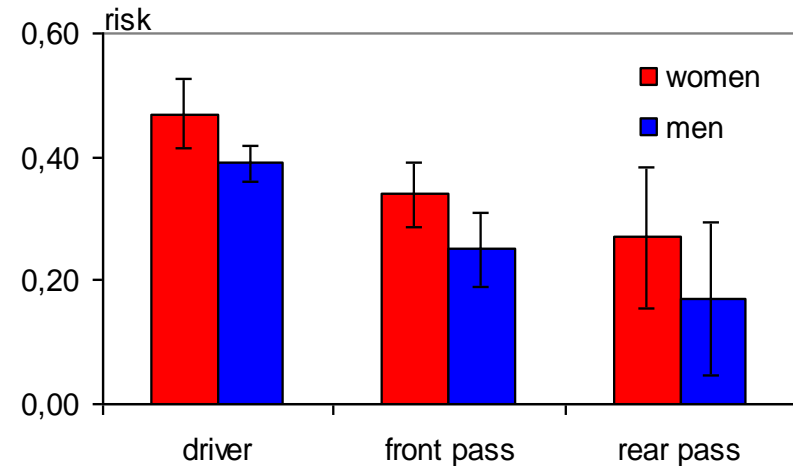
**Volvo Car Corporation**



# EXAMPLES OF FACTORS INFLUENCING AISI NECK INJURY RISKS IN REAR END IMPACTS



- Impact configuration
- Impact severity
- Car model
- Seat type and adjustment
- Seating position (driver vs passenger)
- Sitting posture
  - Rotated head
  - Backset
- Gender
- Stature
- Age
- .....

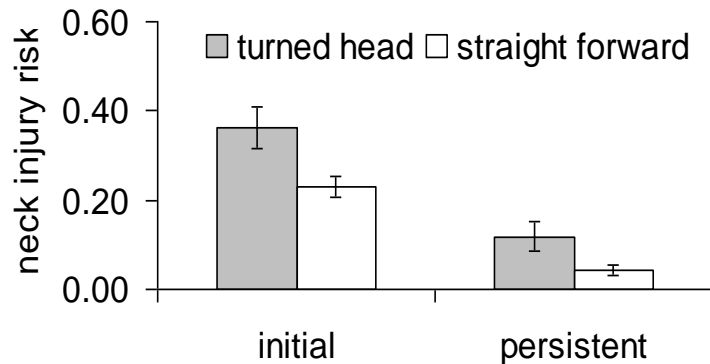


Ref. Jakobsson et al. AAP (32) 2000

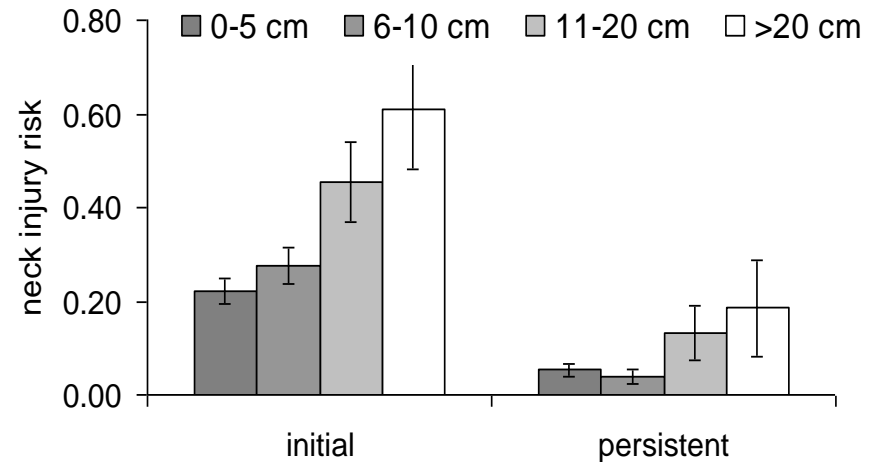
# OCCUPANT POSTURE SIGNIFICANTLY INFLUENCE AISI NECK INJURY RISK



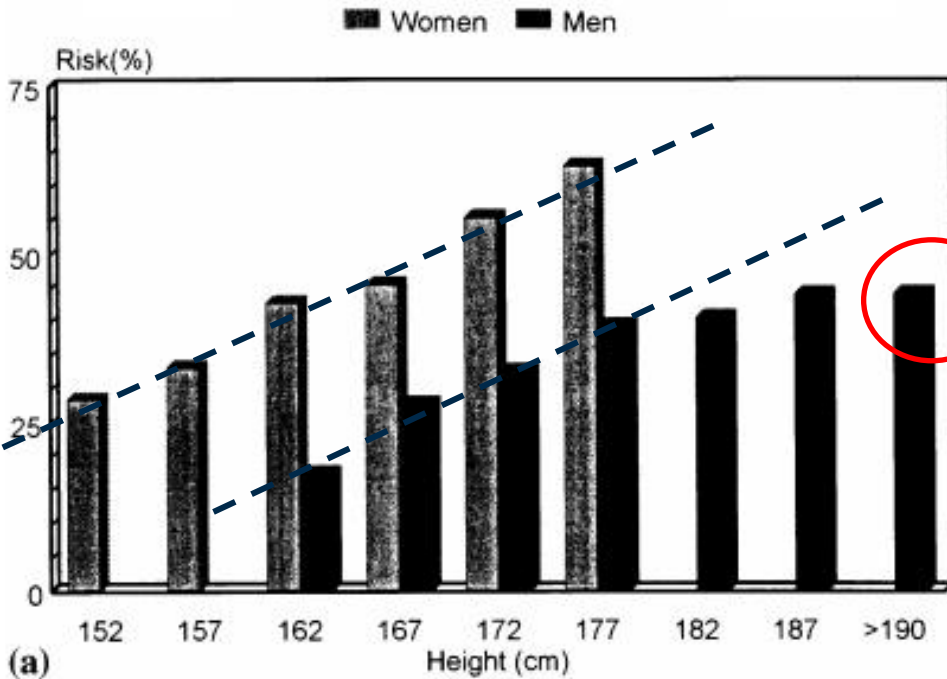
Head rotated posture at impact



Distance between head and head restraint



# INFLUENCE OF STATURE

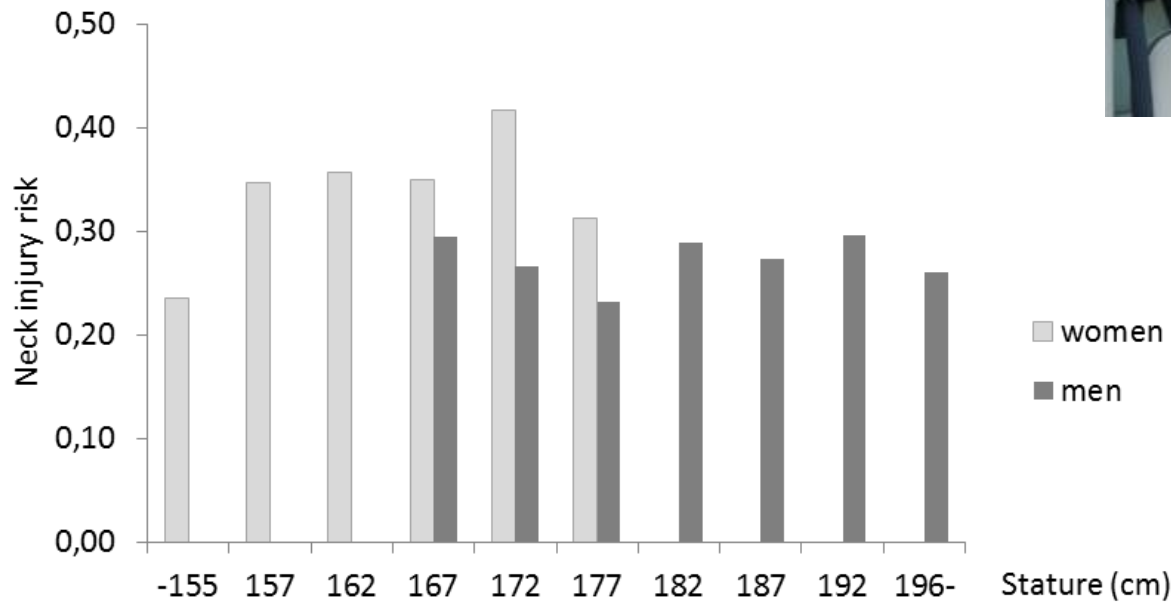


When separated by gender, there is an **increased injury risk with increased stature.**

However, there is **no evidence** that drivers of very high stature (>190cm) are at a sign higher risk than drivers of shorter stature.



# INFLUENCE OF STATURE, MORE RECENT VOLVO CARS



2350 Drivers in WHIPS seats (year models 1998- ->)  
Ref. Volvo Cars Accident Database, not published

# SUMMARY

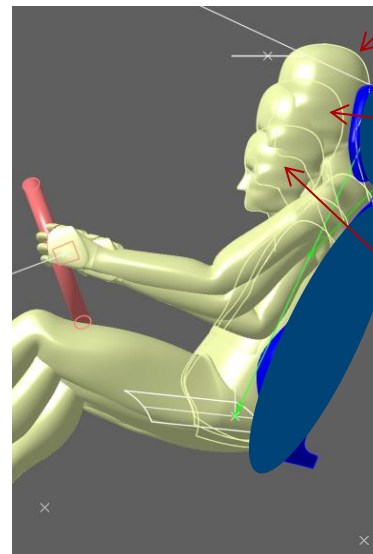


Even support for whole back and head is beneficial.

- We support inclusion of backset in evaluation method

From real world data, no evidence of significant increased risk for the tallest drivers.

- The limit of 800 is sufficient and represent a good balance of seat and head restraint design for a large range of drivers.



**99%-ile male**

Stature: 199cm

Sitting height: 102cm

**Approx. 50/50 mixed population male/females**

Stature: 174cm

Sitting Height: 90cm

**5%-ile female**

Stature: 153cm

Sitting height: 82cm