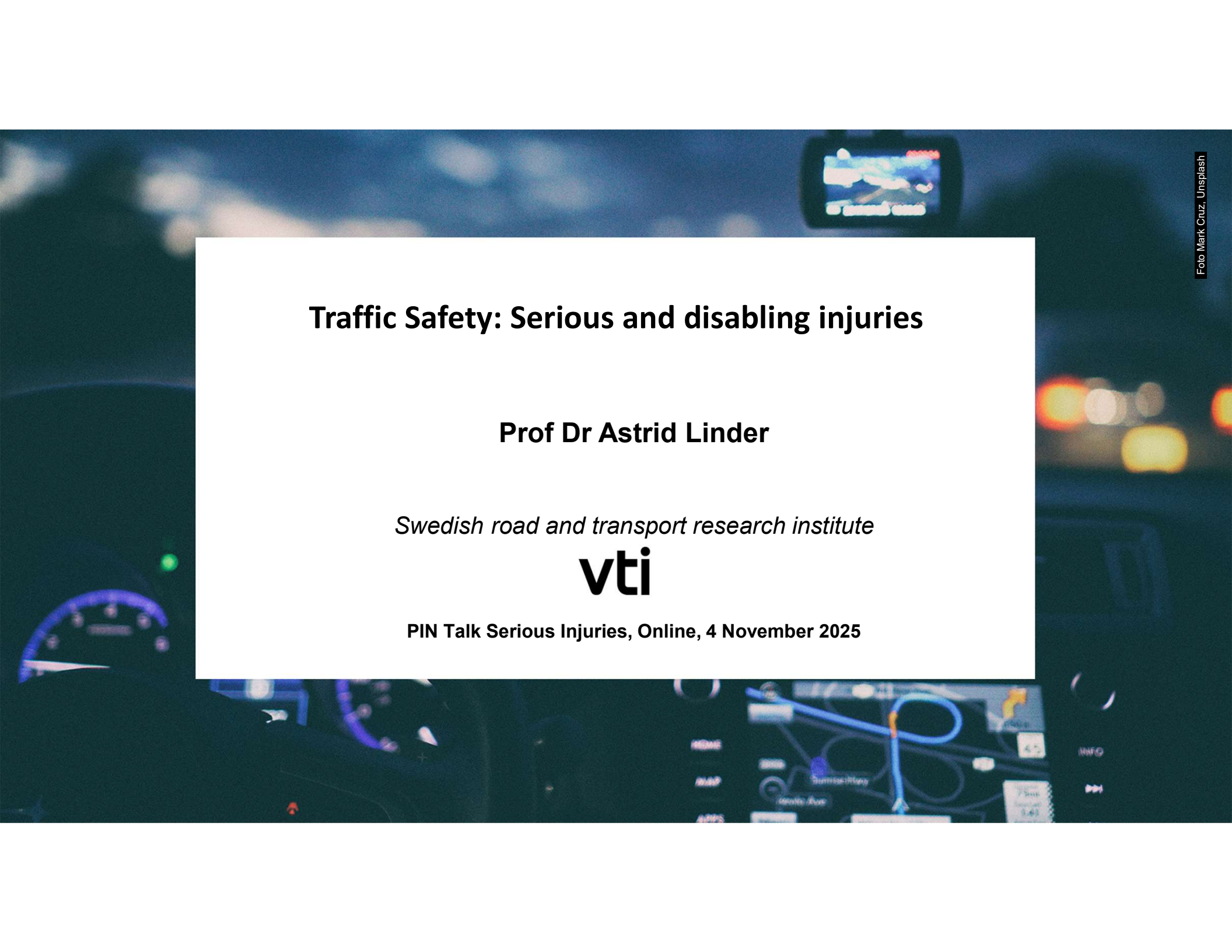




Traffic Safety: Serious and disabling injuries

Prof Dr Astrid Linder

Swedish road and transport research institute

vti

PIN Talk Serious Injuries, Online, 4 November 2025

Astrid Linder

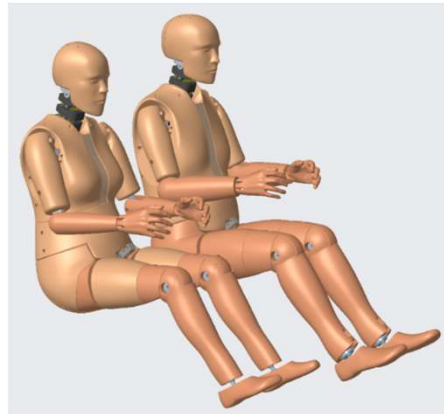
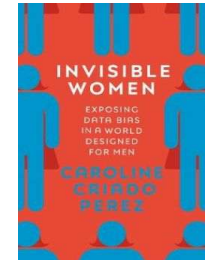
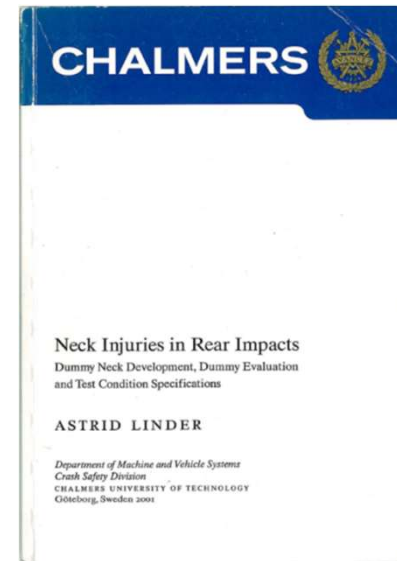
Professor, Traffic Safety, VTI

Adj Prof, Injury Prevention, Chalmers

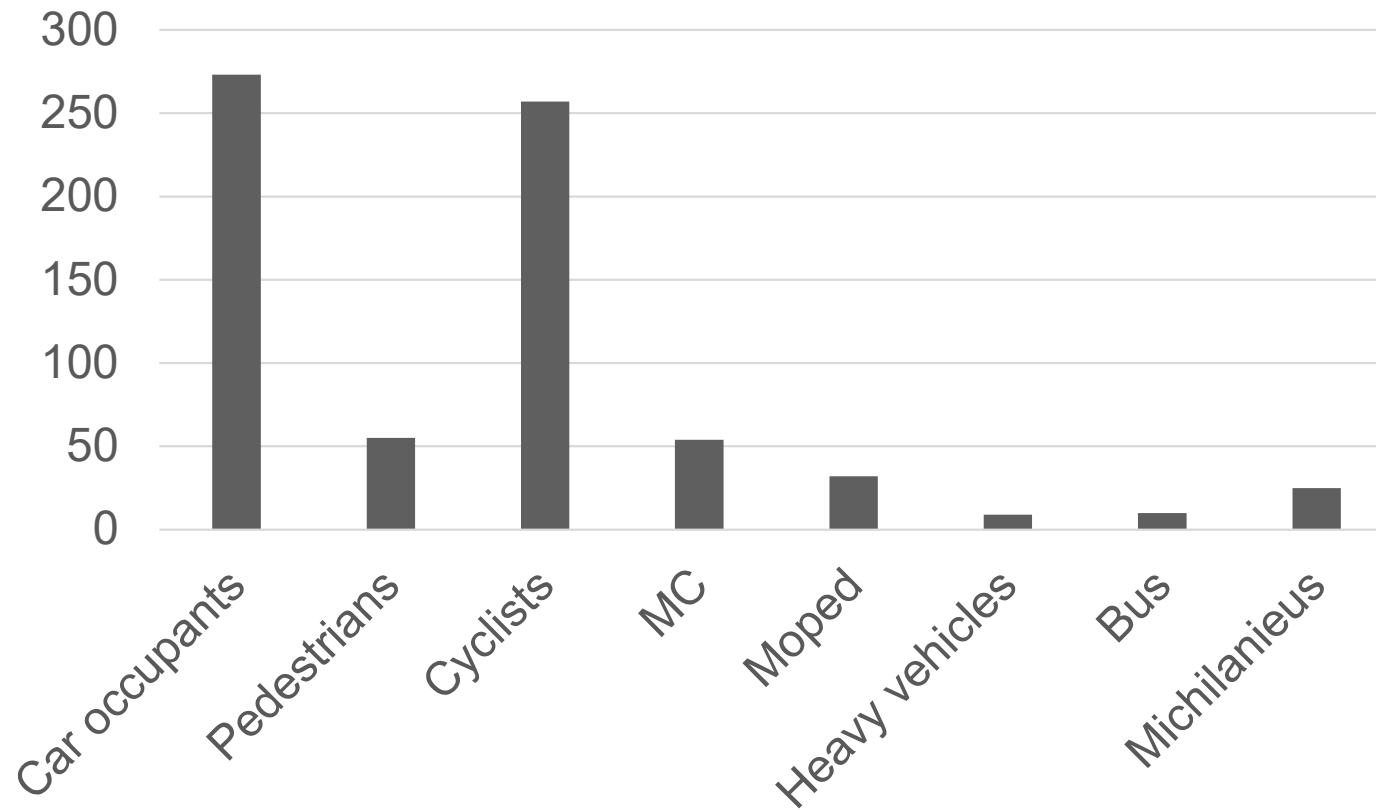
Adj Prof, Monash University, Australia

PhD, Mechanical Engineering

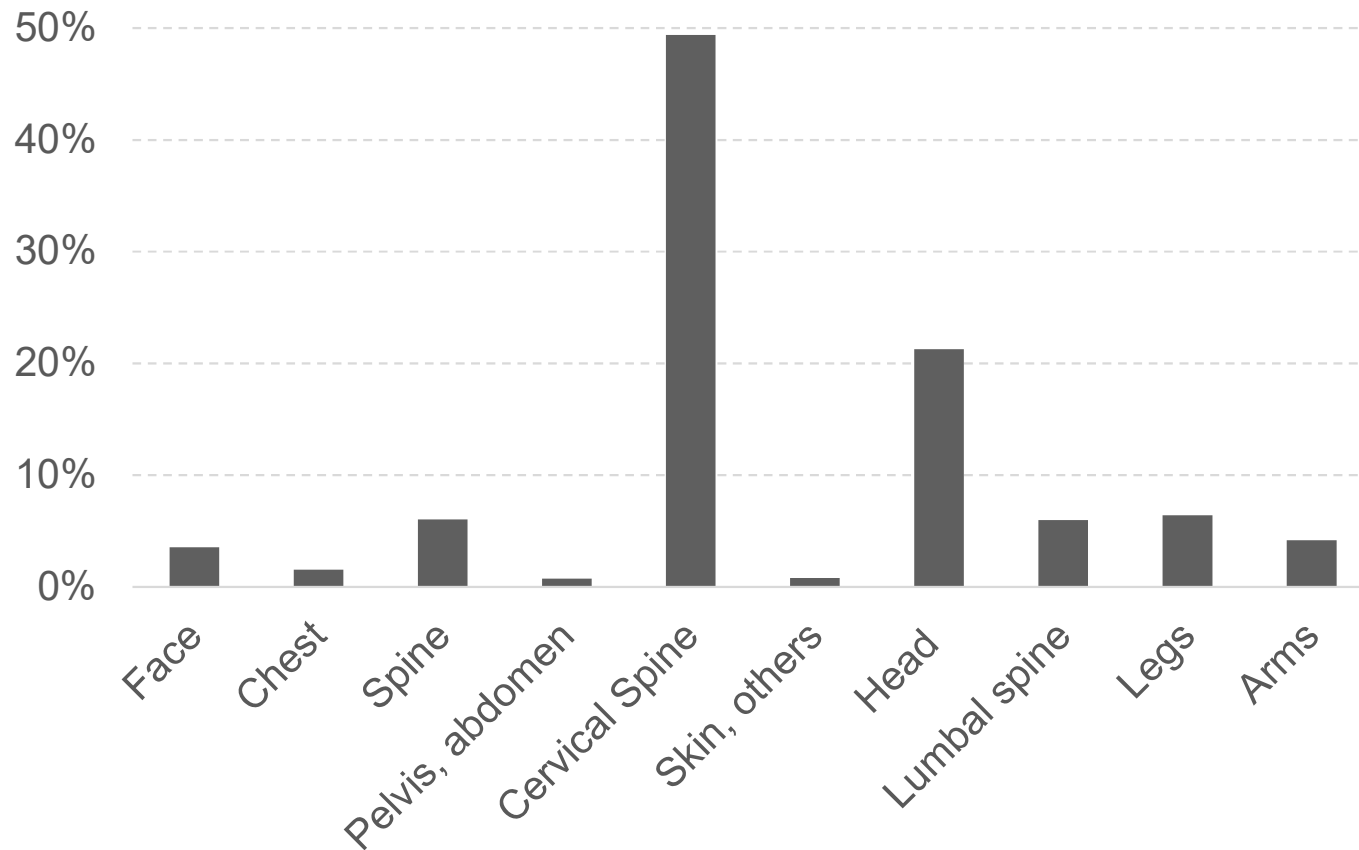
MSc, Engineering Physics



PMI 10%+, 2014, Sweden



Car occupants PMI 10%+ (Sweden 2015, Strada data)



Developments in car crash safety since the 1980s

Kullgren et al. (2020) Developments in car crash safety since the 1980s, IRCOBI Conference, IRC-20-14

Material - method

Crashes and injuries occurring years 2000–2019 reported to STRADA (Swedish national traffic accident database)

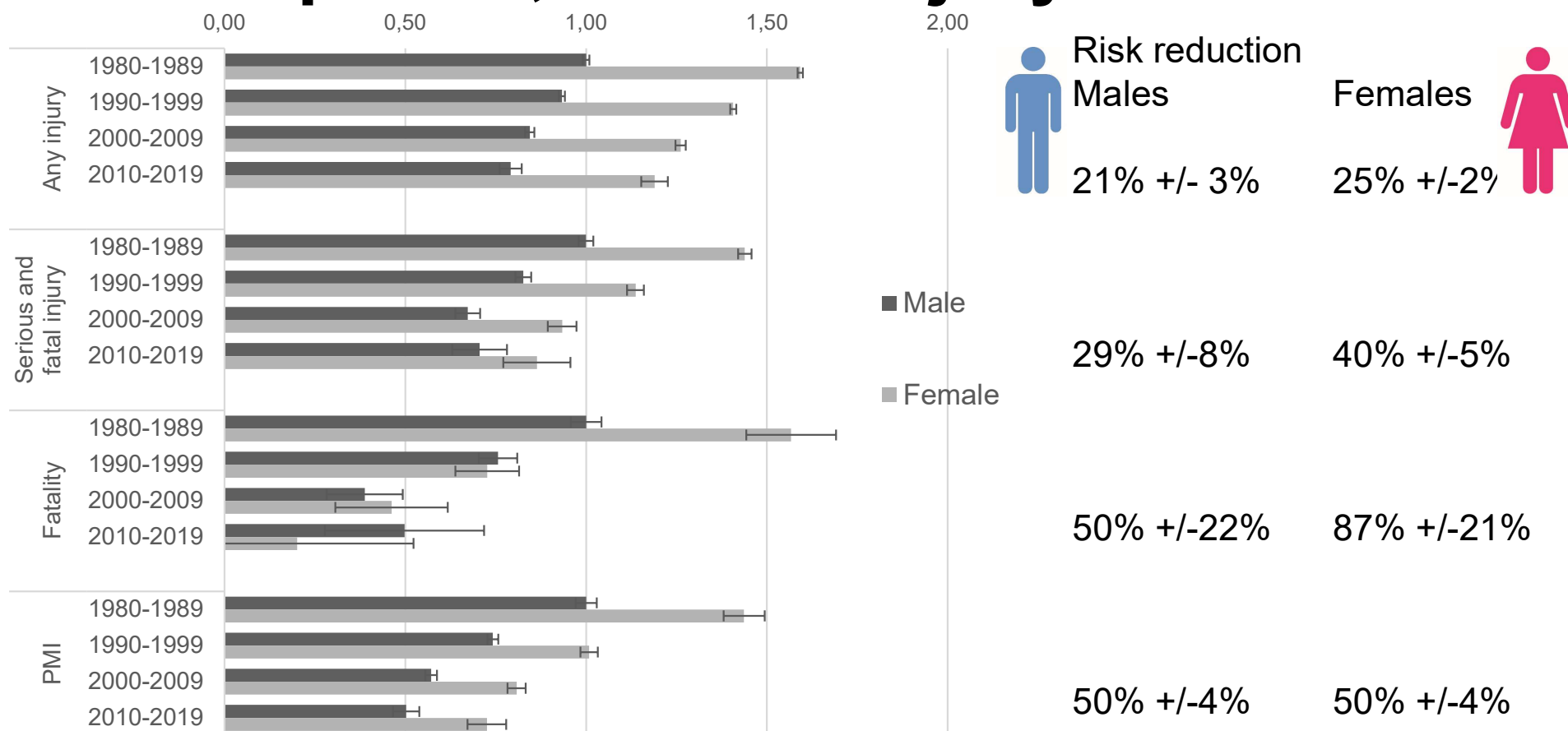
- Two-car crashes reported by the police were used to calculate relative risk of any injury, fatal and serious injury and fatality respectively (**n=117,234**)
- Occupant injuries reported by Swedish hospitals were used to assess risk for permanent medical impairment (**144,521** diagnoses for **55,597** occupants)

The cars were categorised in ten-year periods according to year of introduction

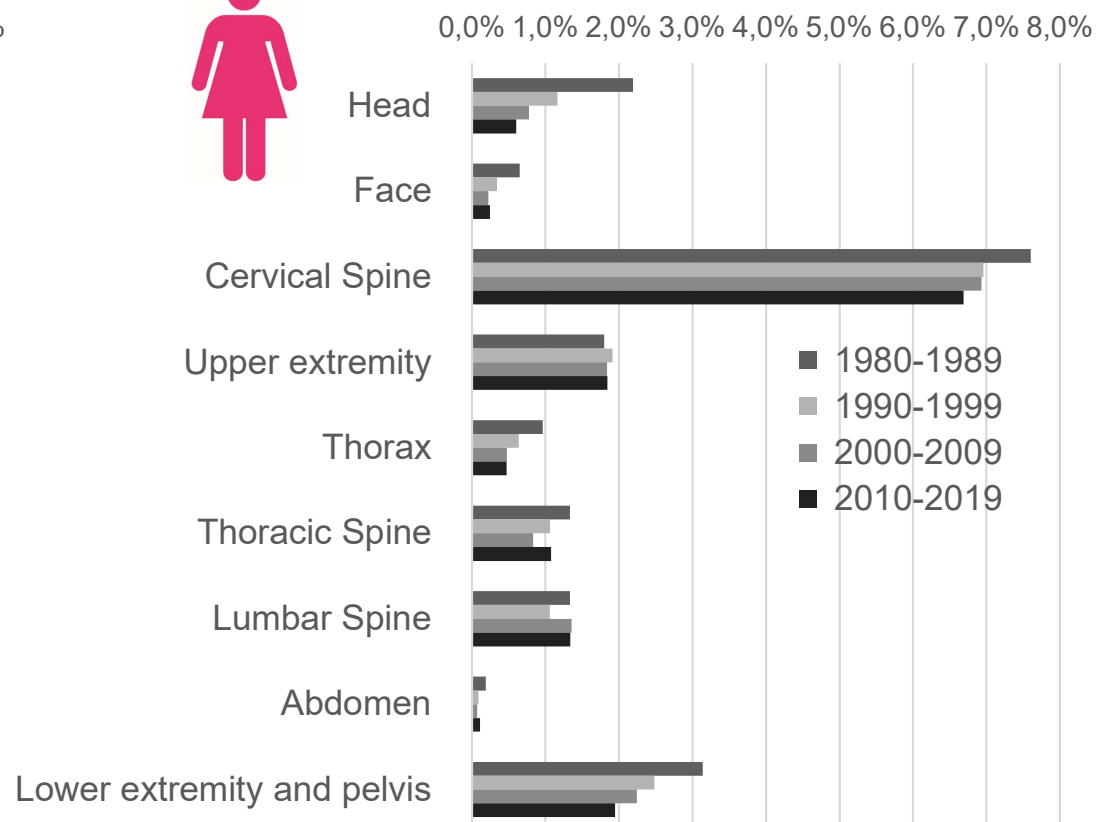
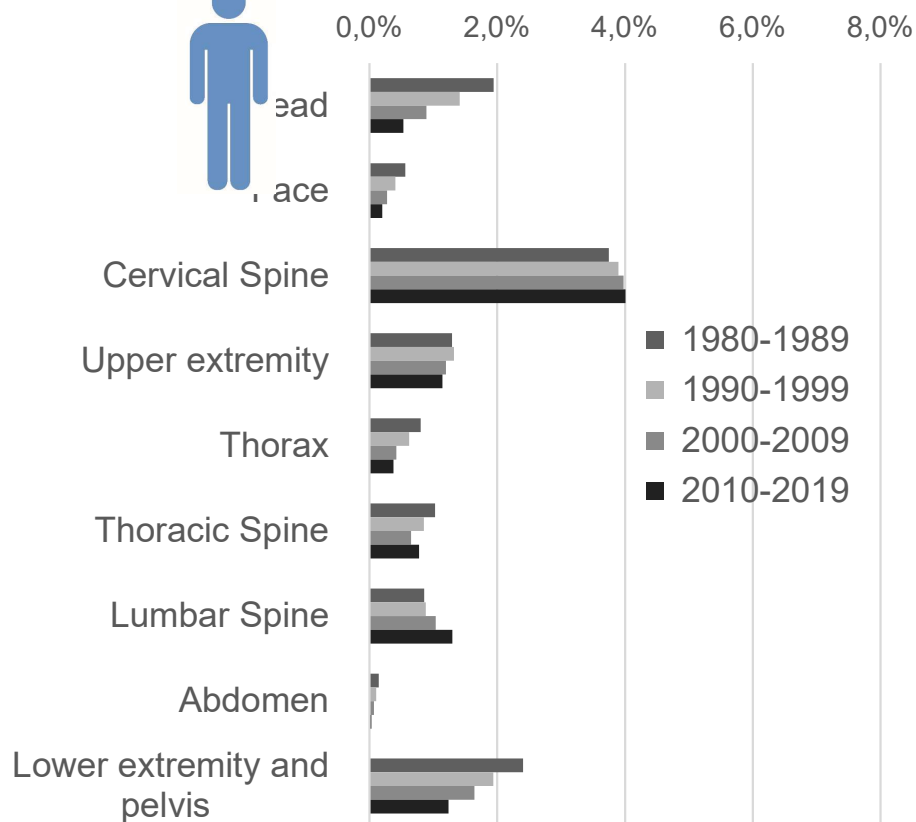
Injuries leading to permanent medical impairment for different body regions, females and males

Development, relative injury risk

Folksam

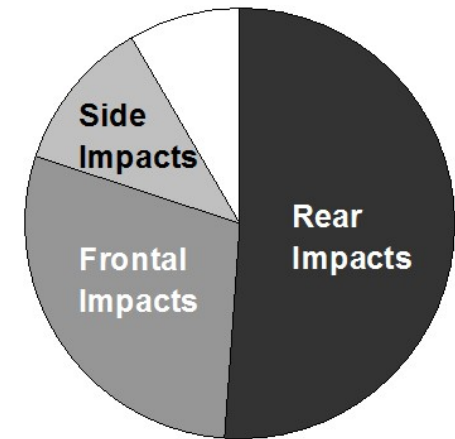


Risk of PMI (>1%), different body regions **Folksam**

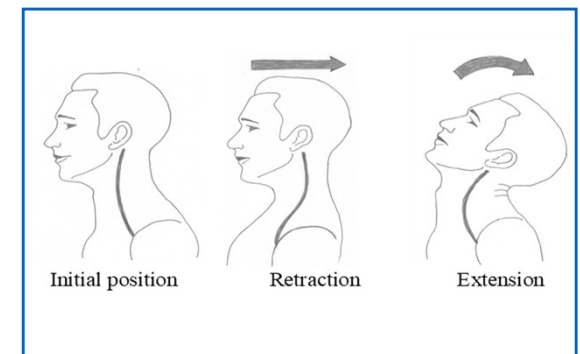


Whiplash injuries

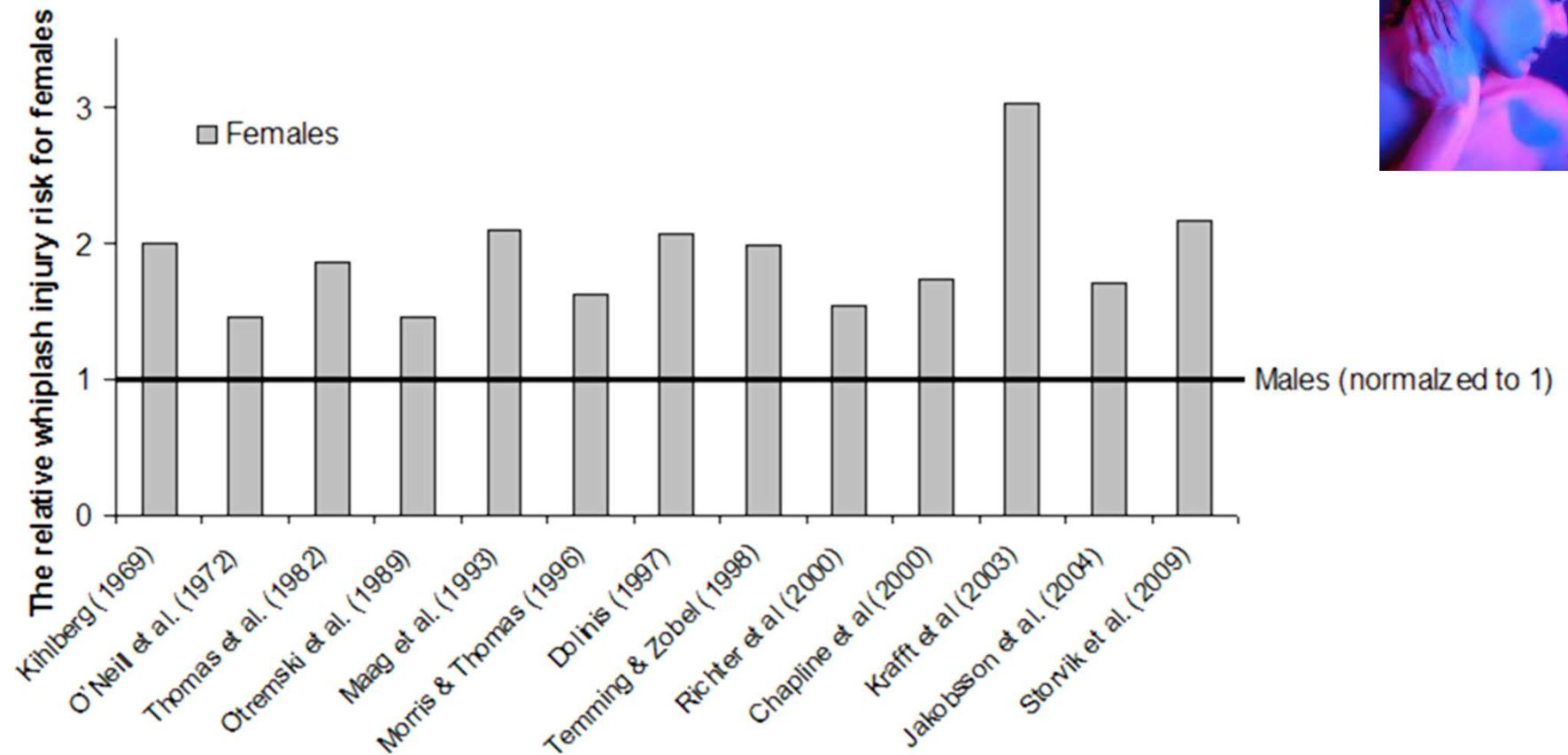
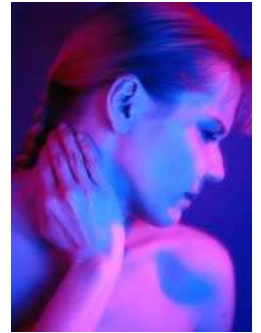
- **50% - 60% of the cost** for the insurance companies of all injuries leading to permanent medical impairment
- Most common in rear impacts
- The hypotheses of injury mechanisms:
In the retraction motion



Based on Krafft (1998)

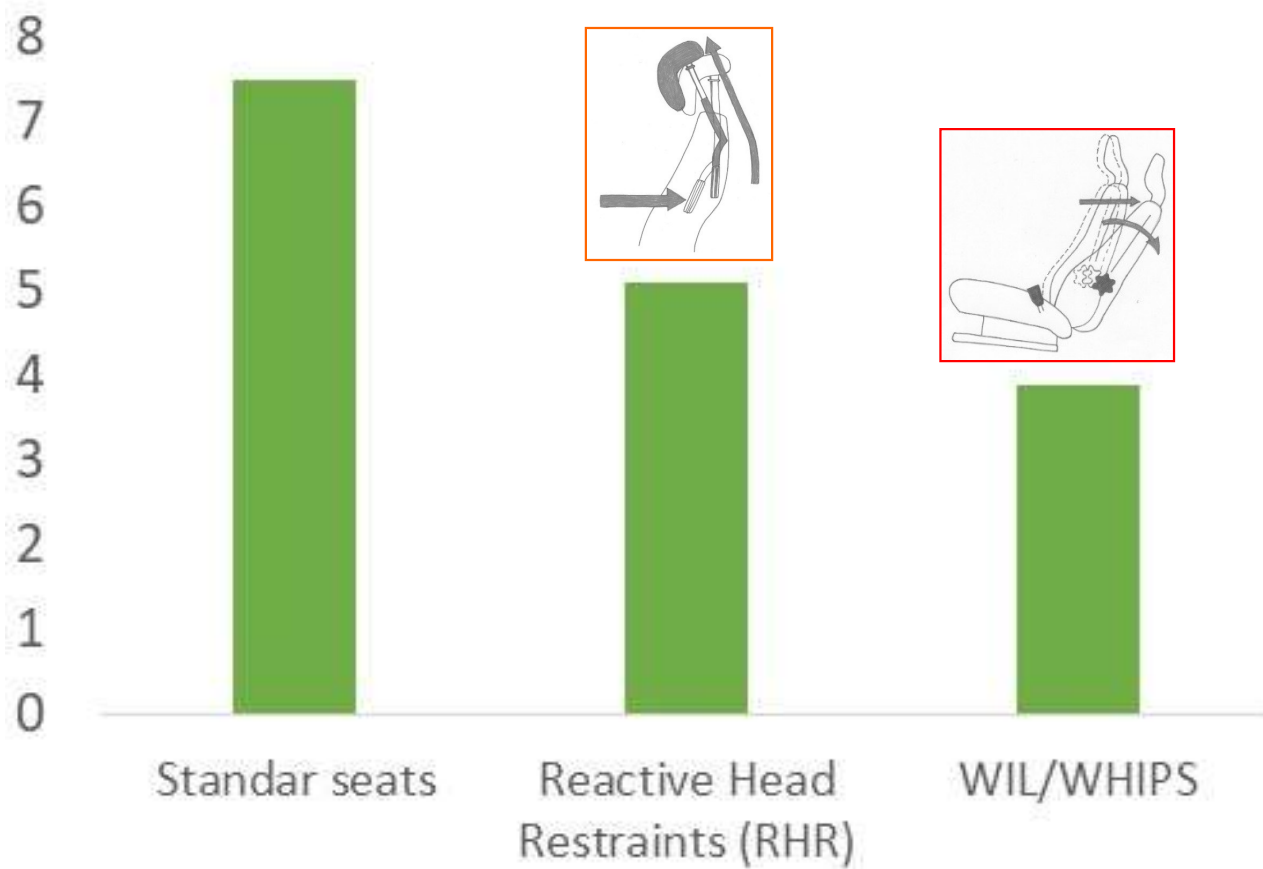


Whiplash – Injury risk

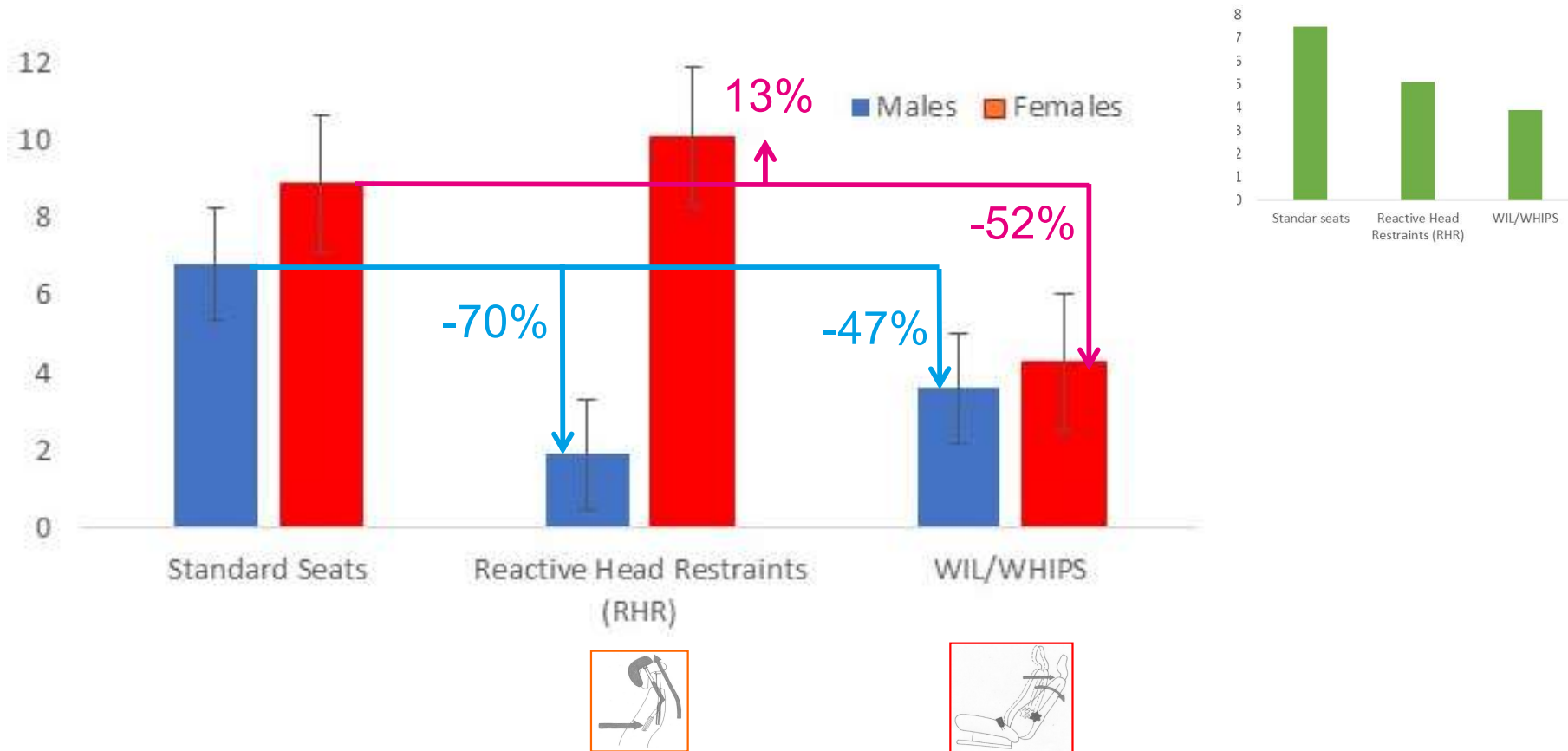


Seat performance, risk of PMI 10%+ (whiplash)

Kullgren et al. (IRCOBI 2013)



Seat performance, risk of PMI 10%+ (whiplash)



Kullgren et al. (2013) Development of Whiplash Associated Disorders for Male and Female Car Occupants in Cars Launched Since the 80s in Different Impact Directions, IRCOBI Conference.

Thank you for your attention

