

Dynamic assessment of the injury protection of seats:
Physical and virtual dummy models for low severity tests

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vti

EqOP workshop #1

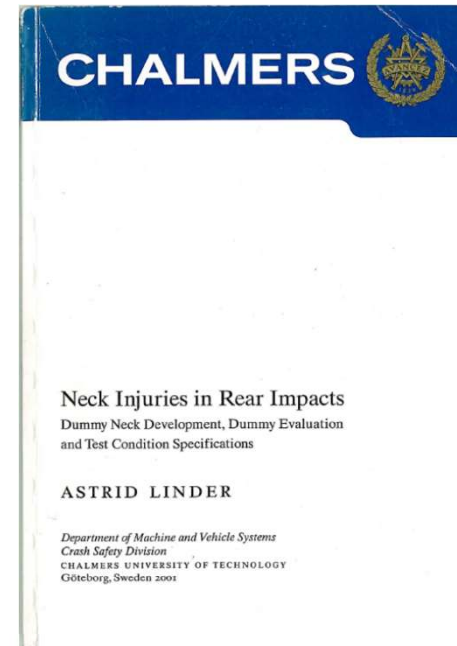
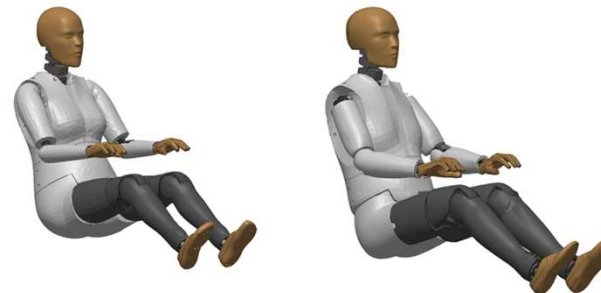
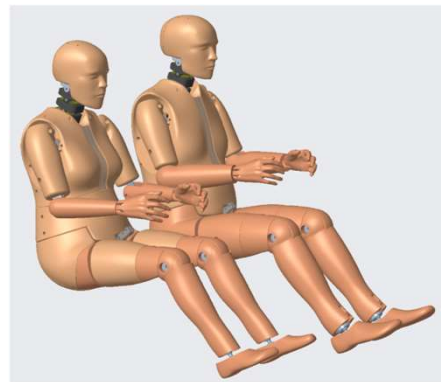
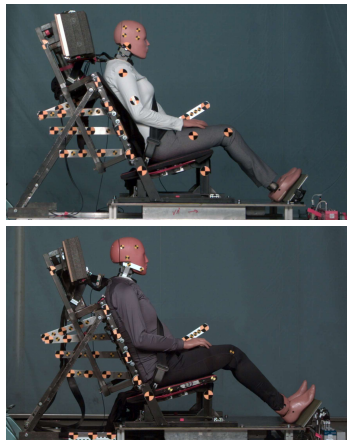
6 September 2023, BASt Bergisch Gladbach

Astrid Linder

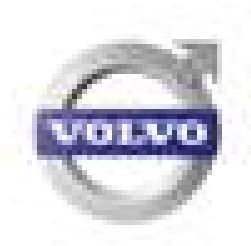
Professor, Traffic Safety, VTI
Adj Prof, Injury Prevention, Chalmers
PhD, Mechanical Engineering
MSc, Engineering Physics

Research Areas

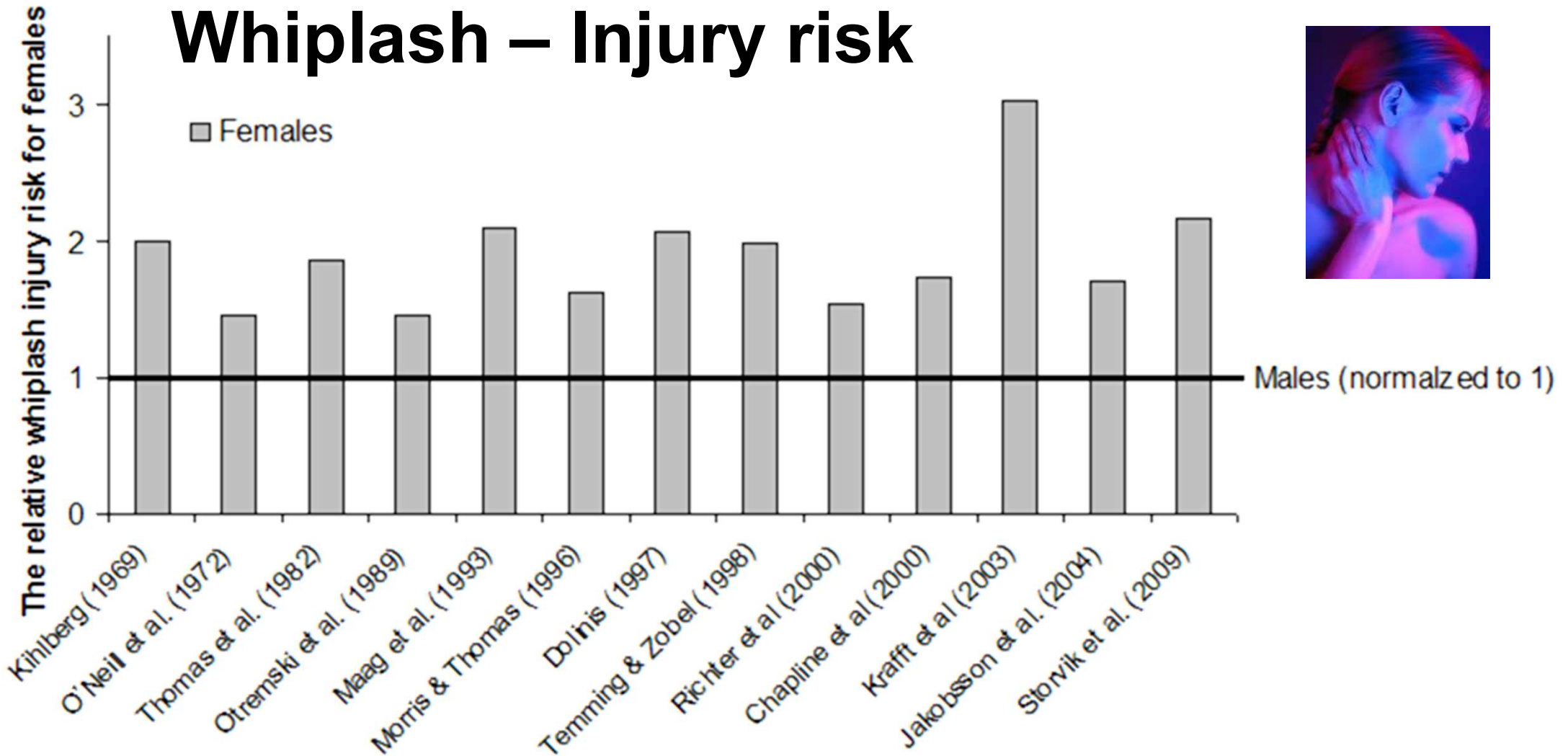
Crash Safety and Injury Prevention



BioRID: Biofidelic Rear Impact Dummy



Whiplash – Injury risk

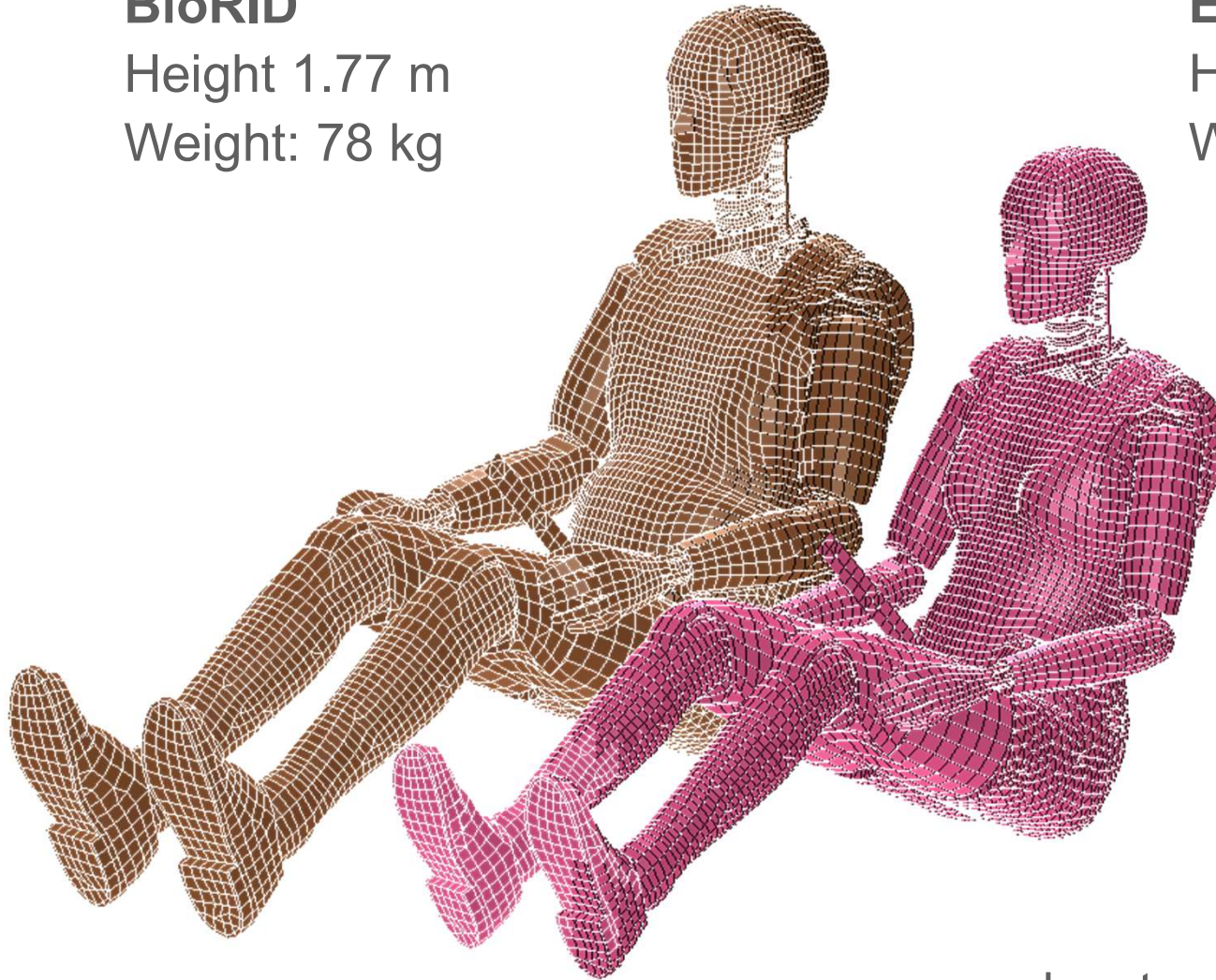


Source: Carlsson 2012

BioRID

Height 1.77 m

Weight: 78 kg



EvaRID

Height: 1.62 m

Weight: 62 kg

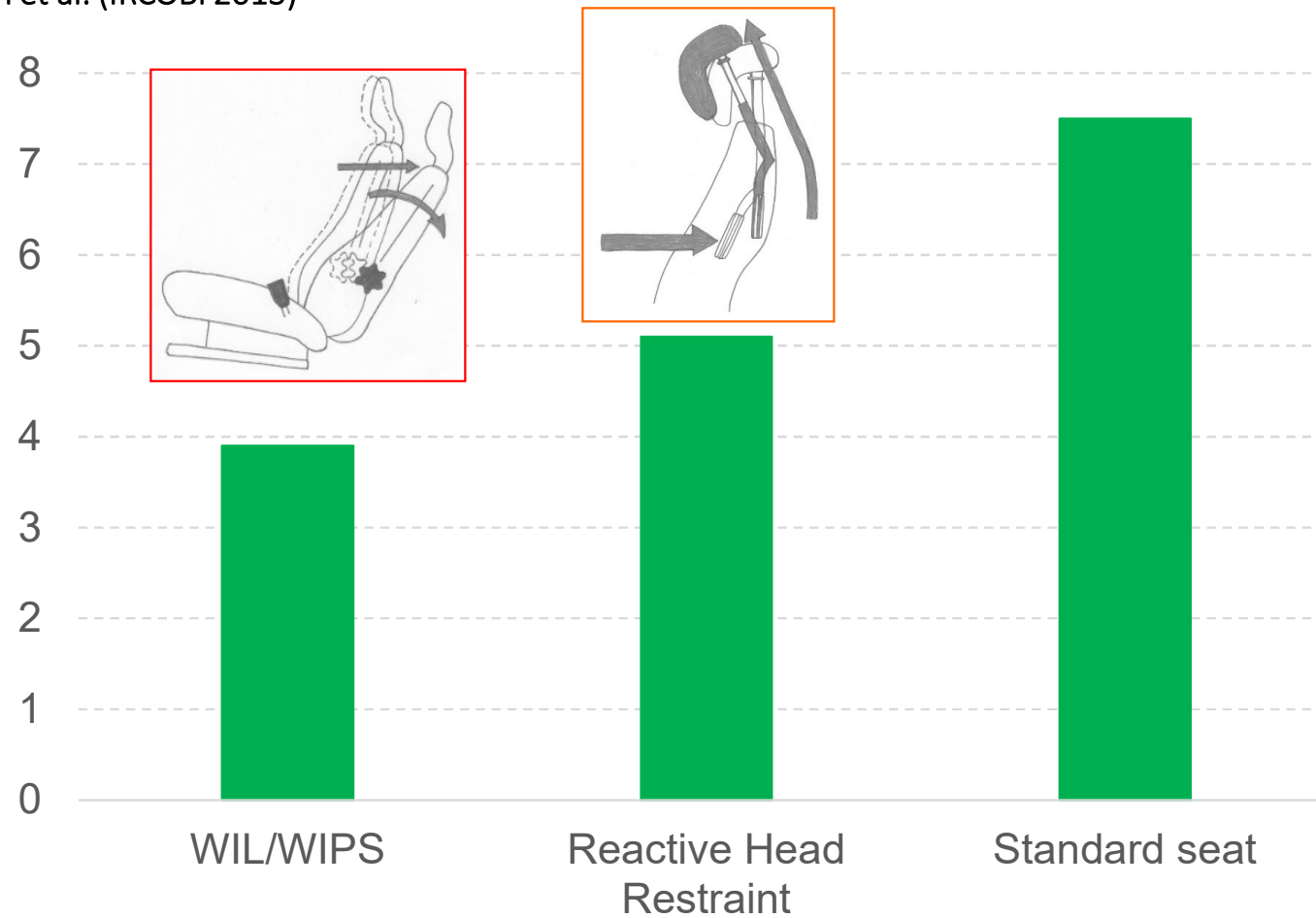


www.adseat.eu

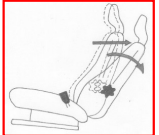
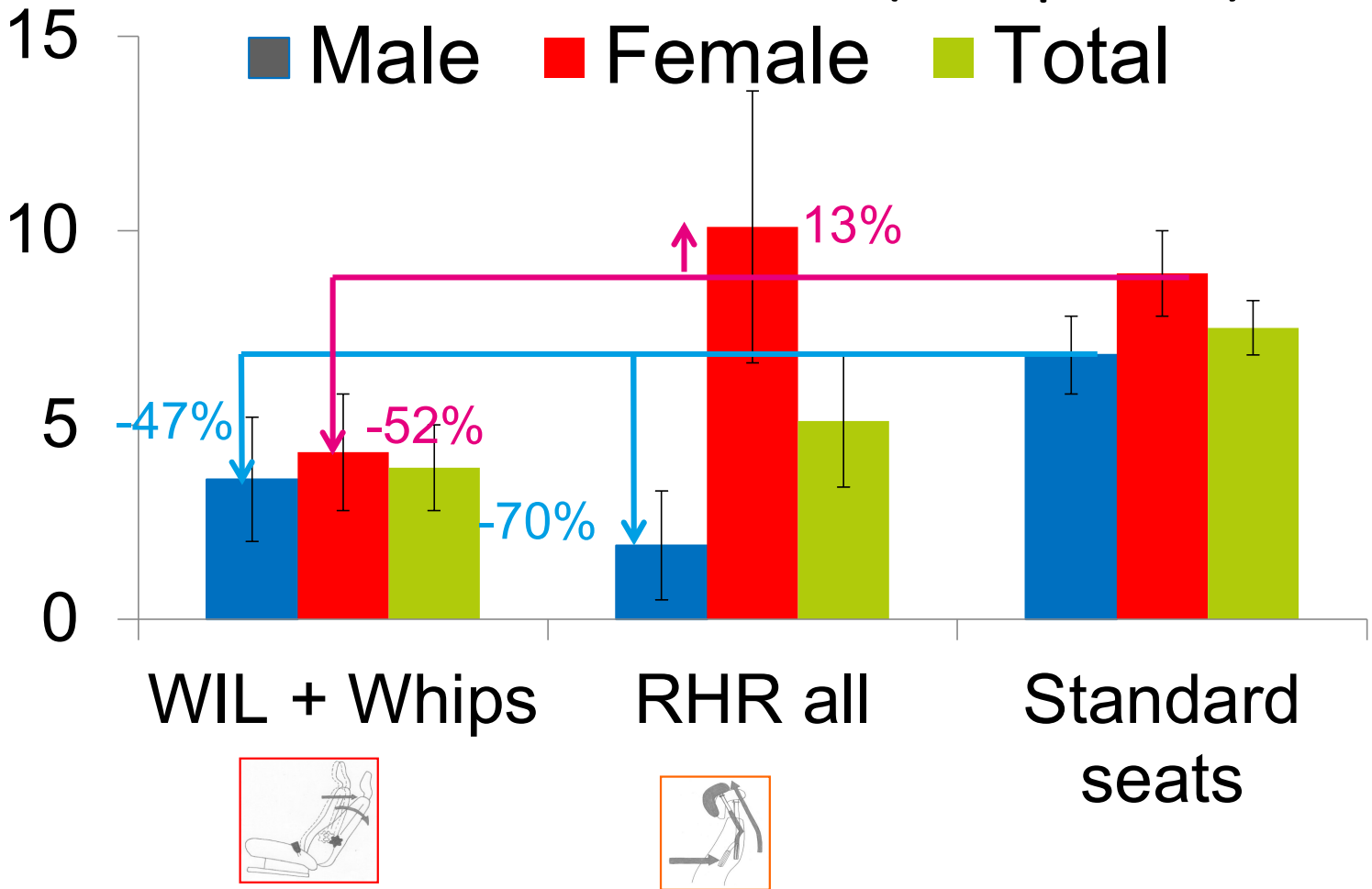
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Seat performance, risk of PMI (whiplash)

Kullgren et al. (IRCOBI 2013)



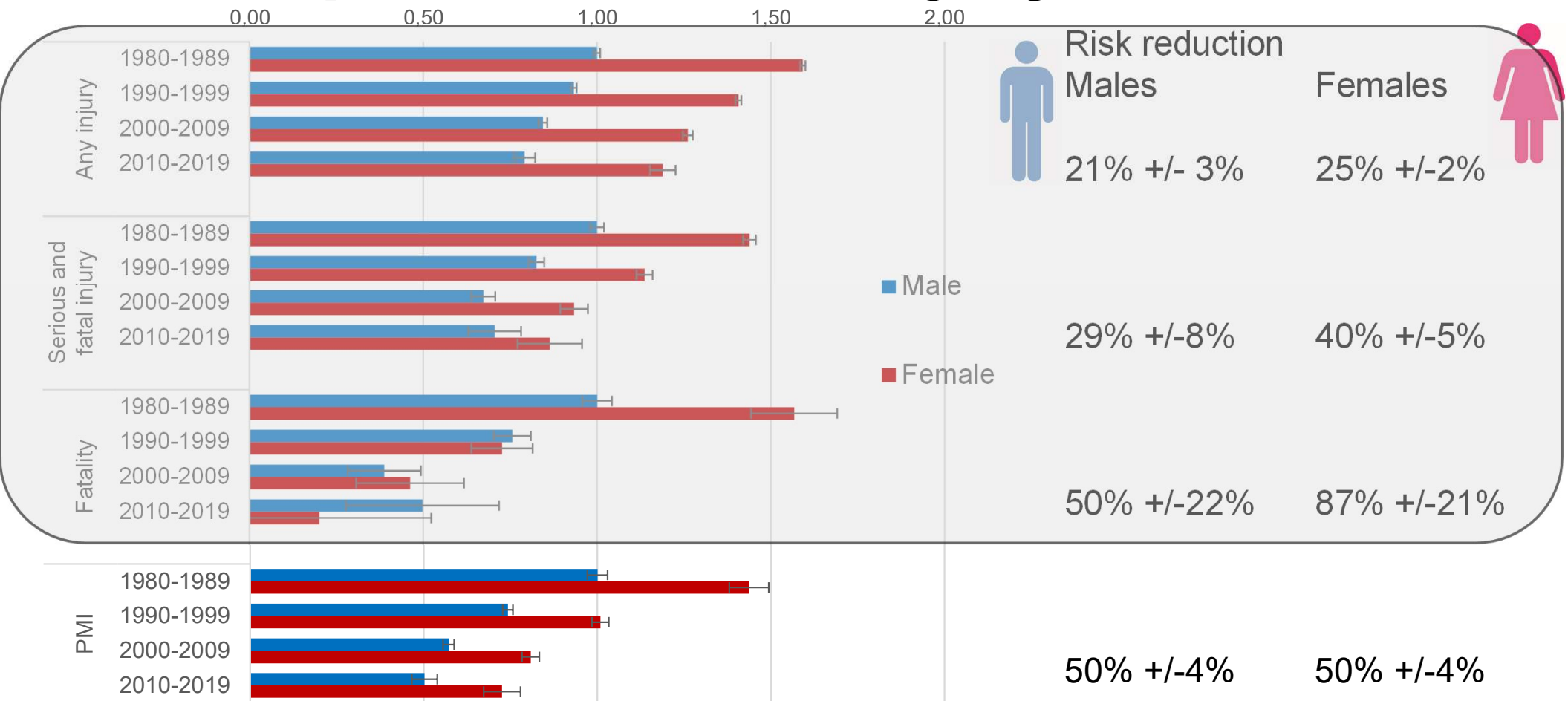
Seat performance, risk of PMI (whiplash)



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.

Development, relative injury risk

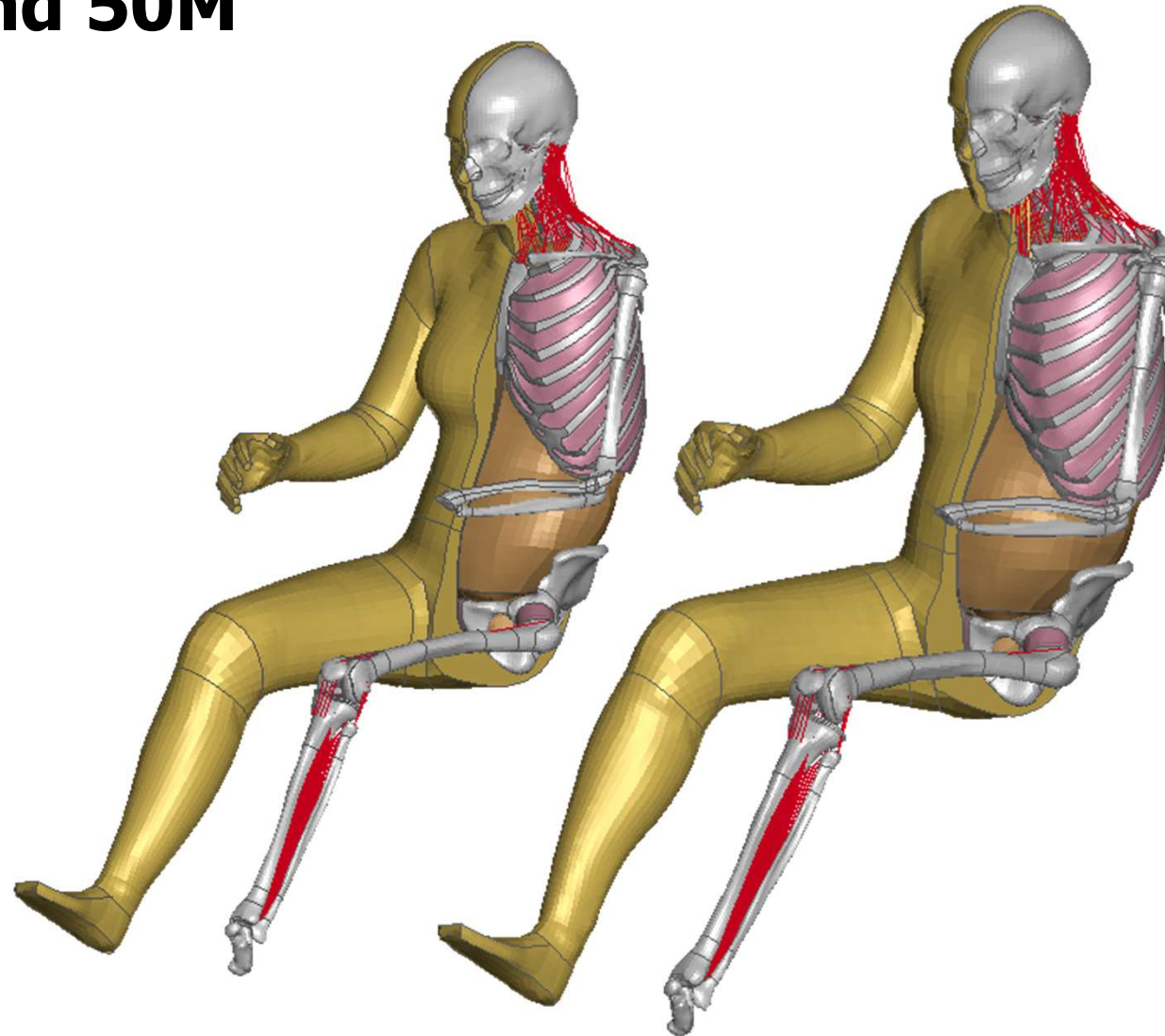
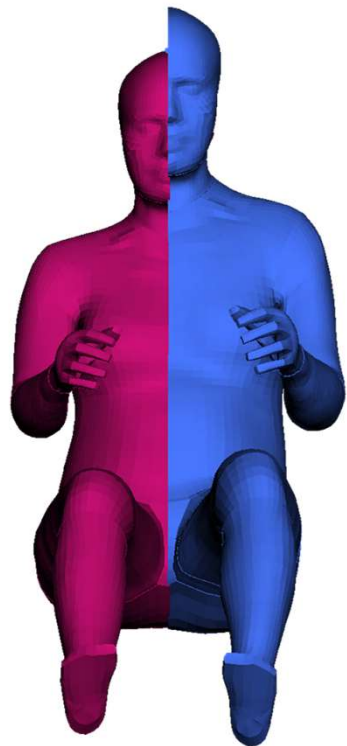
Folksam



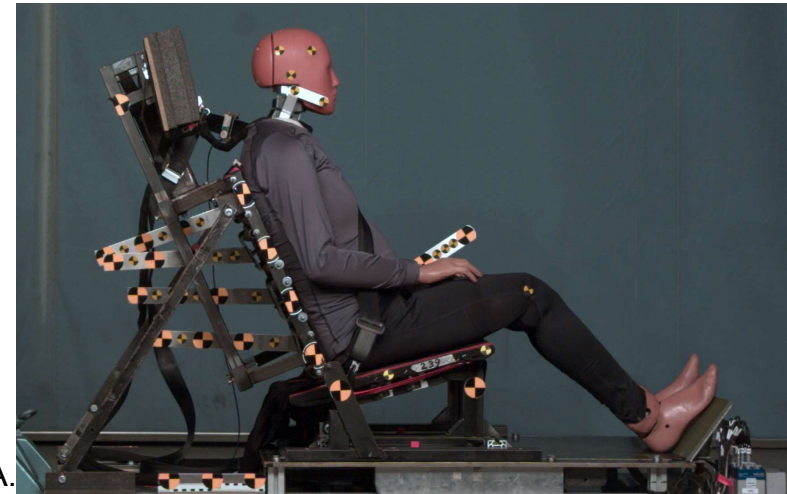
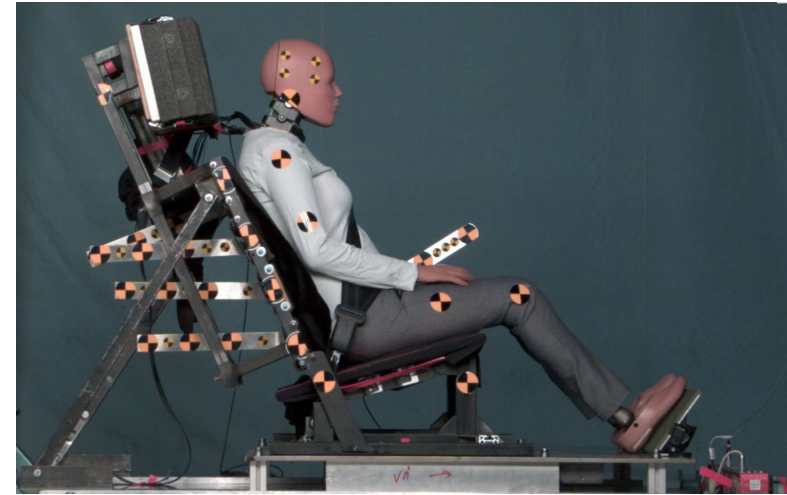
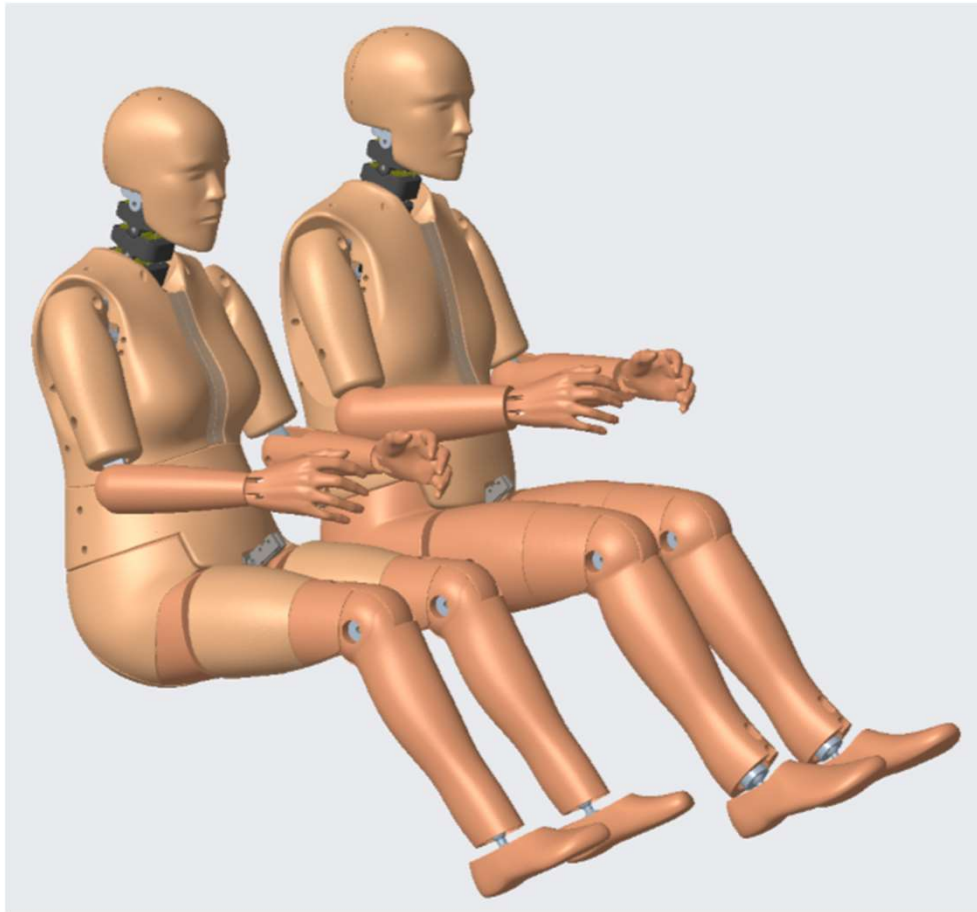
Kullgren et al. (2020) Developments in car crash safety since the 1980s, IRCOBI Conference, IRC-20-14



VIVA+ 50F and 50M



Seat Evaluation Tool, SET 50F and 50M



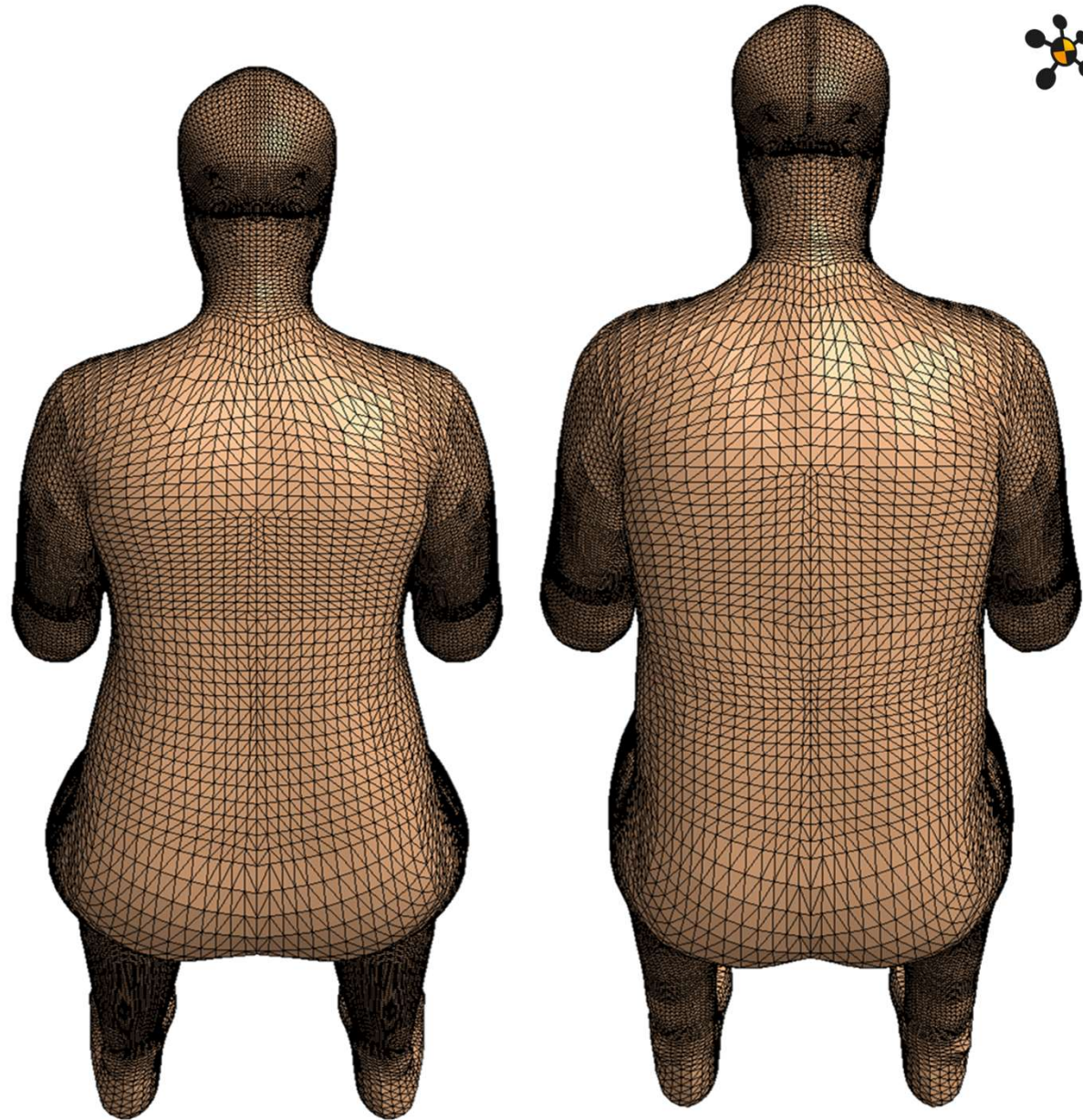
Karemyr et al. (2022) The Seat Evaluation Tools (SETs), VTI report 1147A.



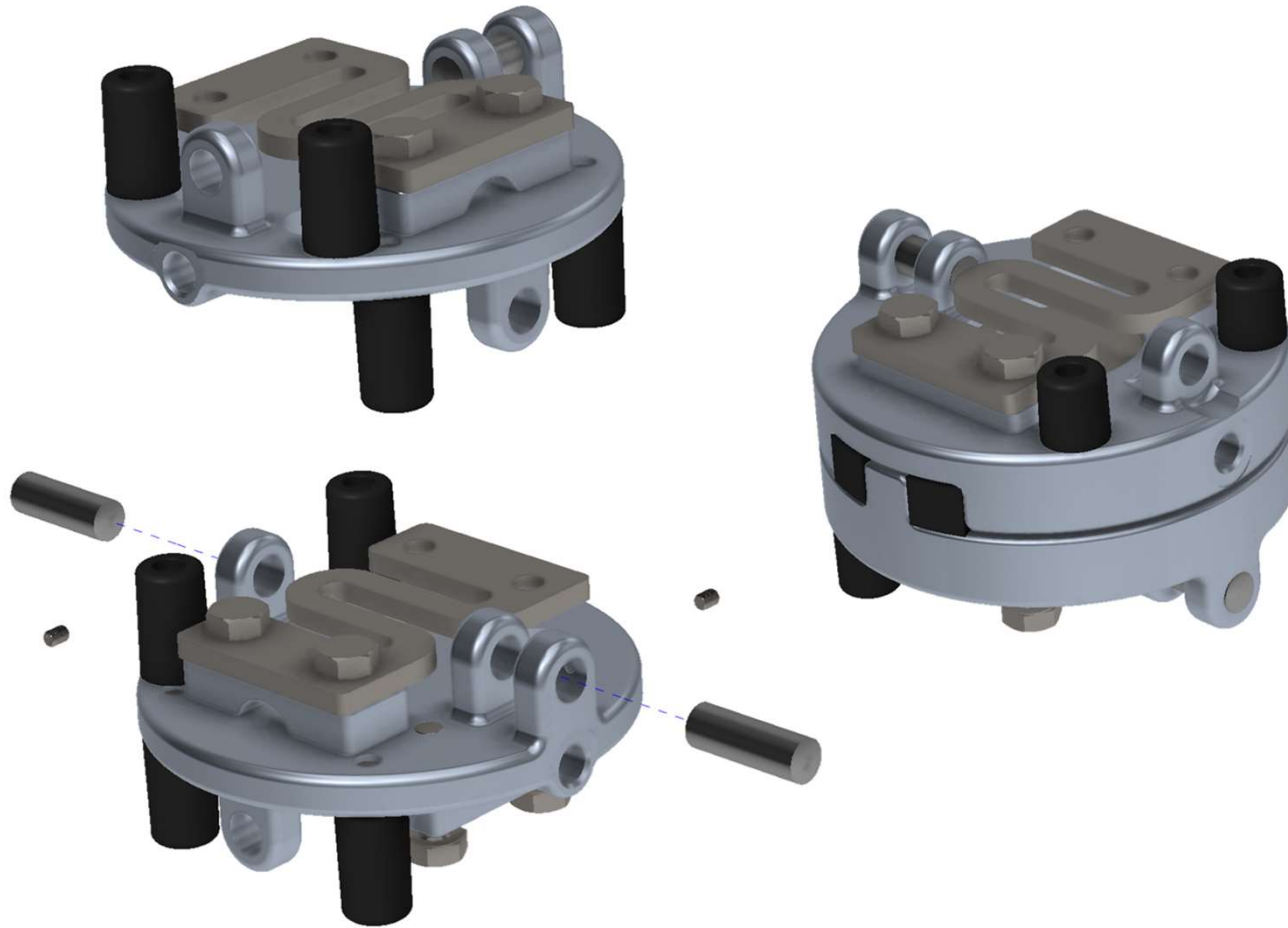
Average female and male

Weight and height
Shape of the torso
Stiffness of the neck

Geometry: humanshape.org

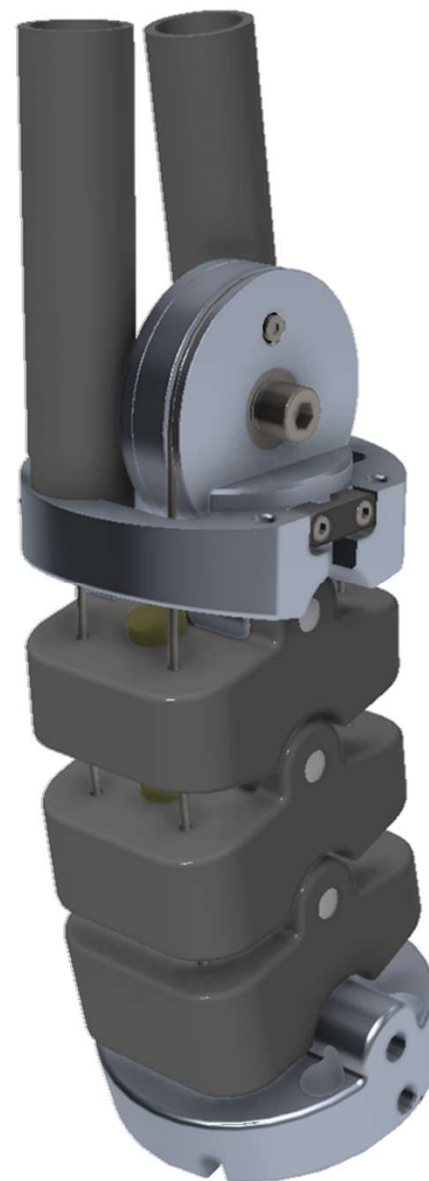


Spine

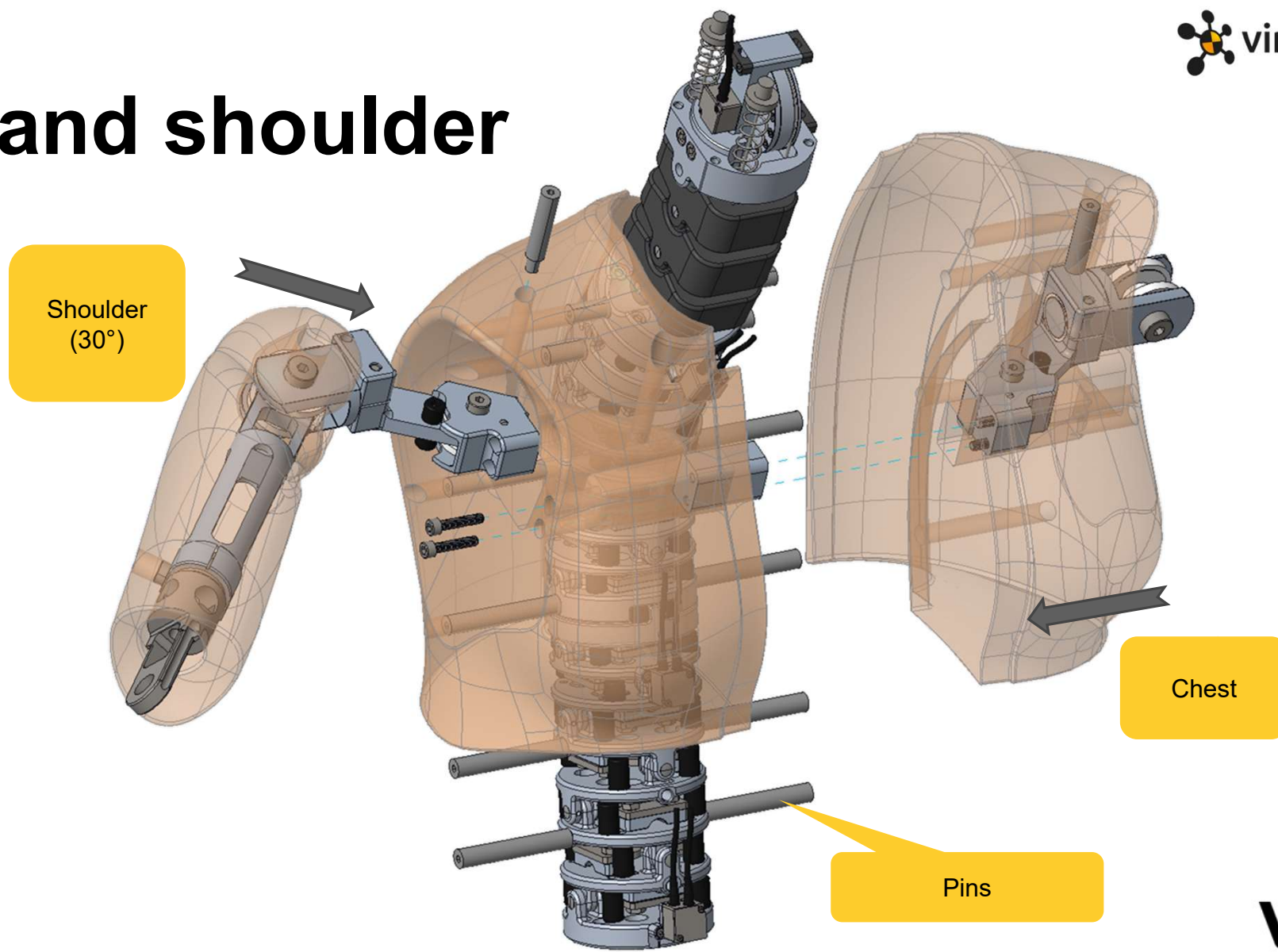


The cervical spine

Damping system (BioRID style)
placed inside head

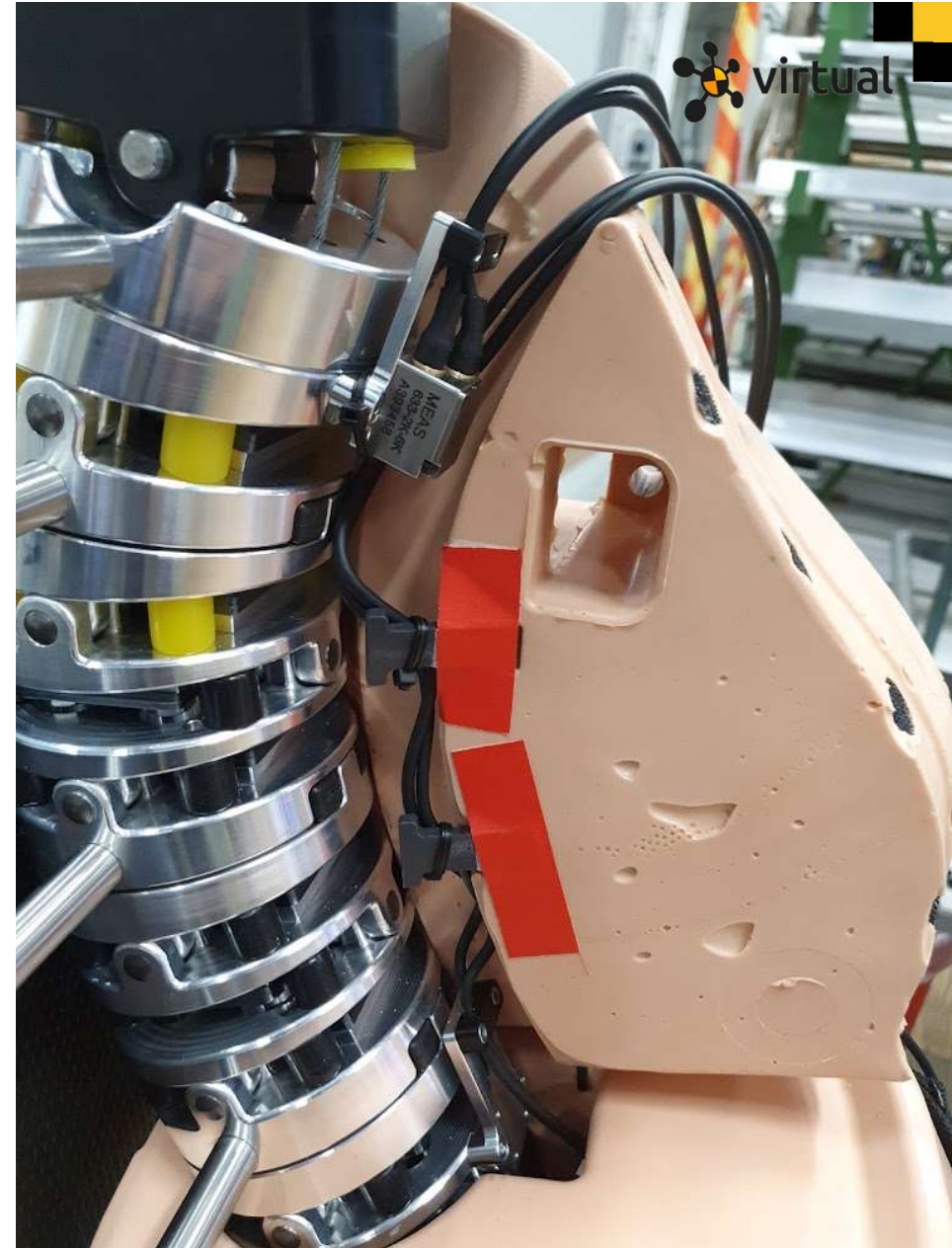
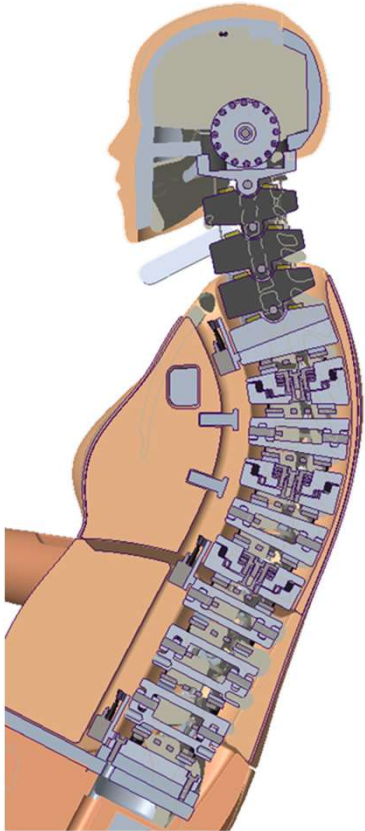


Chest and shoulder



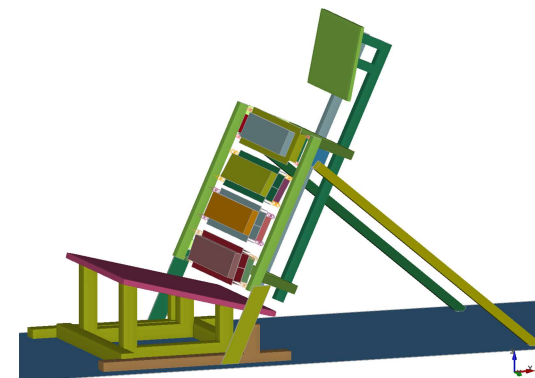
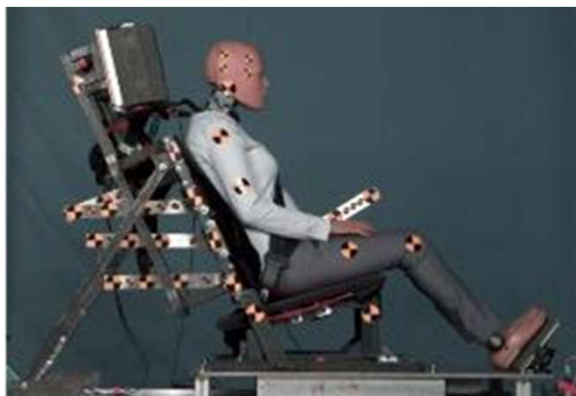
Design and measurement equipment

Combined gyro & 3-axis accelerometers at C1, T1, T8 & Pelvis





SETs and FE SETs



Next steps

- Fine tuning of the SETs: Rubber block between vertebrae and adjusting weights.
- Test at Autoliv with 2 different seats, Euro NCAP 16 km/h mid severity pulse.
- SETs displayed at Carhs, the SafeSeats Experience, 15-16 November.
- Publication of SETs v0.2 and open-source FE SETs

Thank you for your attention

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