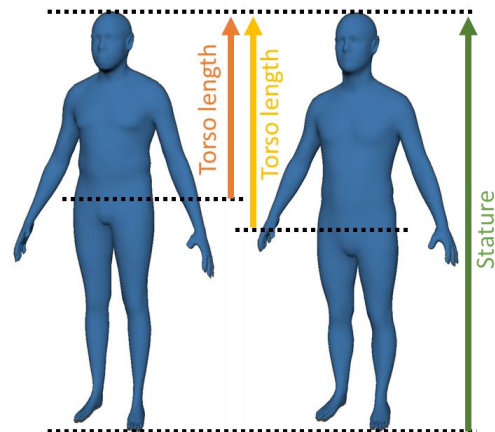


Beyond Percentiles: Investigating Intrapercentile Anthropometric Variations and their Role in Occupant Injury Risk

Background

Research has shown that anthropometry is a very important influence factor on passenger car occupant injury risk; occupant safety systems in modern vehicles are developed and tested using an average (50th percentile) male and a small (5th percentile) female crash test dummy; increasingly however, detailed human body models (HBMs) are used instead of simplified crash test dummies. These offer a number of advantages, one being that different sizes can be derived more easily. As a result, it is expected that a variety of human sizes (anthropometries) will be used in future development and testing programmes. However, there is a lack of research on the effects of intrapercentile anthropometric variations, i.e. the effects of differences in anthropometry beyond the overall height and weight. For example, people can have longer legs and a shorter torso (and vice versa) while being the same overall height. Since they enable to vary desired parameters while keeping all other variables constant, finite element simulations provide an excellent tool for research in this domain.



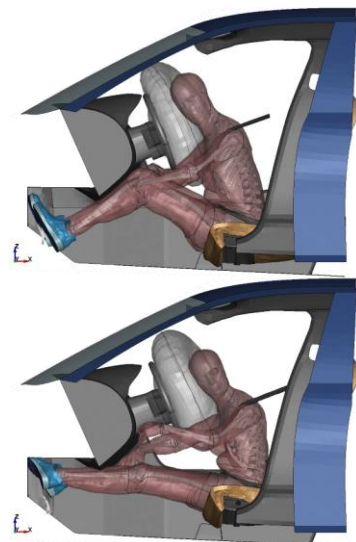
Example of different leg/torso length at same stature.

Goals

- Identification of relevant anthropometrical dimensions for variation.
- Analysis of the effects of this variation in a generic vehicle environment using a variety of crash loads.

Tasks

- **Familiarization** with anthropometry, HBM-based occupant safety and existing injury risk assessment methods.
- **Conceptualization** of an appropriate simulation matrix varying suitable anthropometrical parameters.
- **Creation of a simulation setup** based on existing modules available at the VSI.
- **Simulation and analysis** of all variants of the simulation matrix.
- **Deduction** of the effects of the analysed anthropometrical changes on occupant injury risk.



Example of different HBM anthropometry resulting in different kinematics at identical loads (using an AD seat position in this case).

Suitable for students of

- MSc Mechanical Engineering/Mechanical Engineering and Business Economics

Organisational overview

- Start: anytime
- Performance bonus: € 2.500,- (up to 4000,- for excellent work)
- Contact: Felix Ressi, felix.ressi@tugraz.at