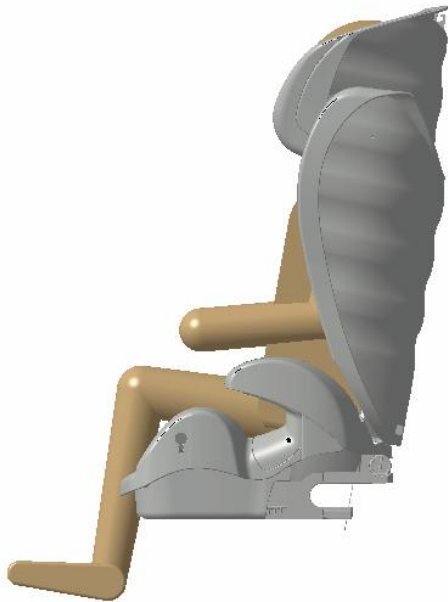
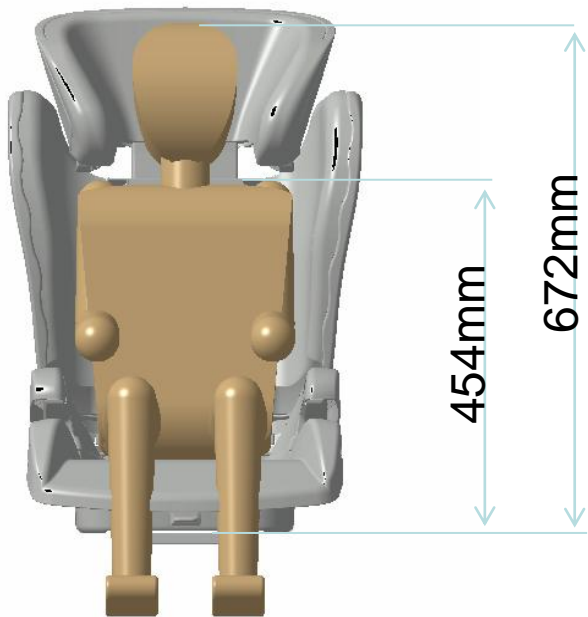
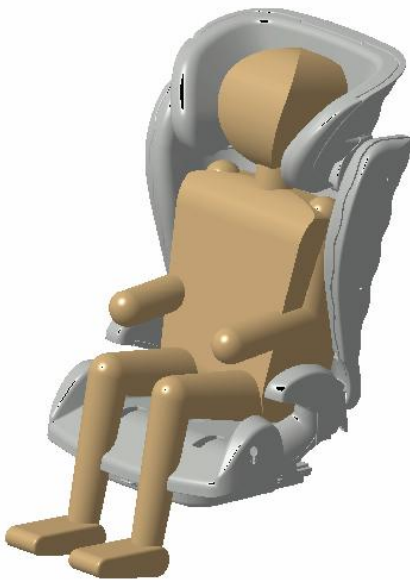


Booster Seats and Cushion: Investigations on Stature and Belt Routing

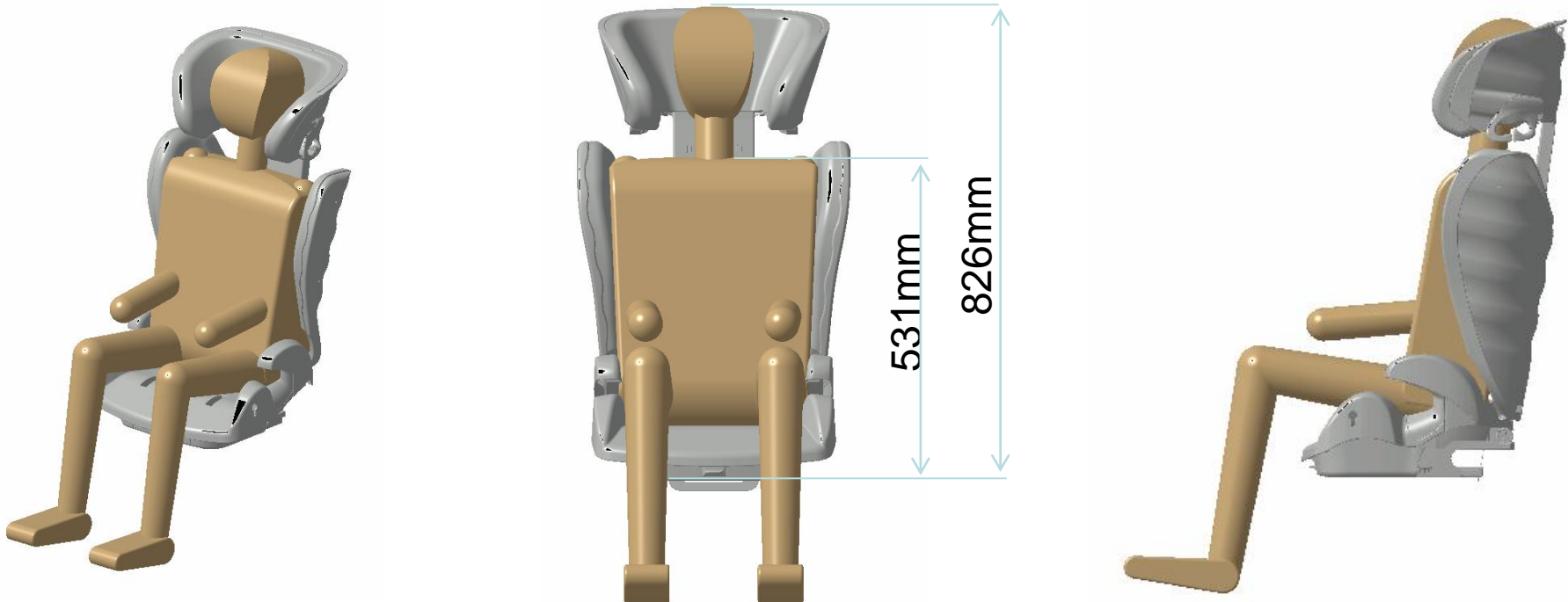
Michael Grohspietsch, Farid Bendjellal

- CAD investigation with anthropometric data from GRSP/2011/15 Annex18
 - » Constructed 95%ile « CAD » Dummies
 - » Group 2-3 Seat with Isofix attachment
- Installation in 3 different car categorises:
 - » Compact car **FIAT 500** 2011
 - » Mid range car **VW Golf VI** 2011
 - » Van **VW Sharan** 2011
- Installation with children in 3 different size range
 - » 1,05m / 4,5 years / 20kg / Female
 - » 1,40m / 9 years / 34kg / Female
 - » 1,47m / 9 years / 35,5kg / Female
- Booster with backrest and Booster only

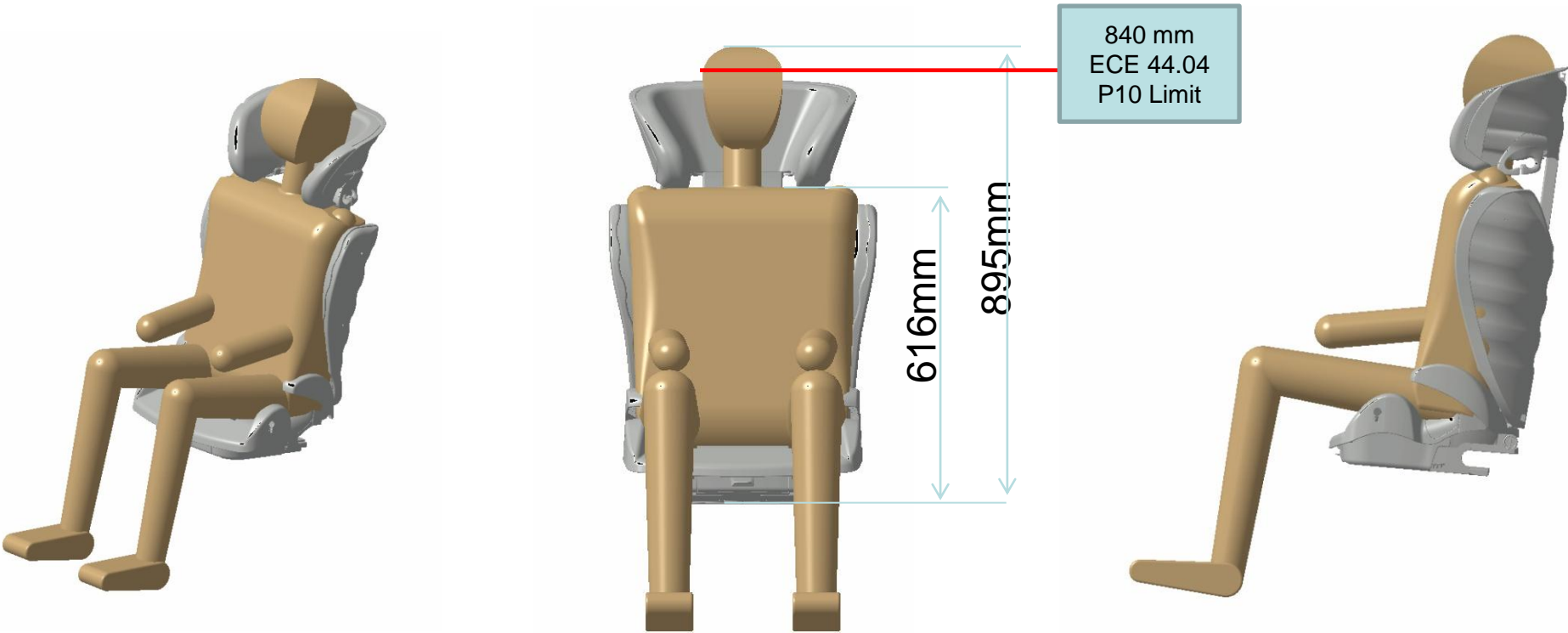
- Stature **1,0m** 95%ile according to GRSP/2011/15 Annex18



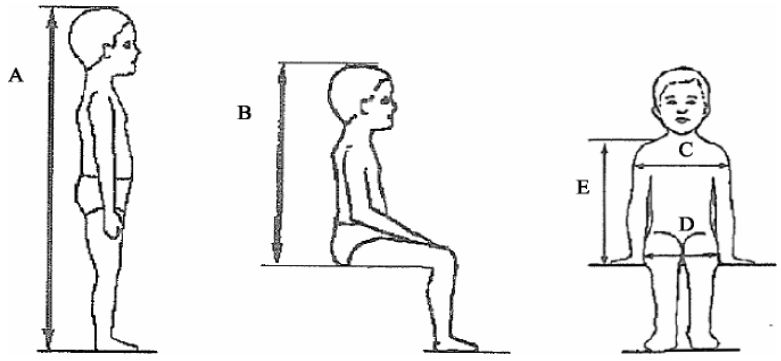
- Stature **1,35m** 95%ile according to GRSP/2011/15 Annex18



- Stature **1,5m** 95%ile according to GRSP/2011/15 Annex18



- Anthropometric data of children



<i>Stature cm</i>	<i>Sitting height cm</i>	<i>Shoulder breadth cm</i>	<i>Hip breadth cm</i>	<i>Shoulder height cm</i>
A	B	C	D	E
	95%ile	95%ile	95%ile	95%ile

		A	B	E	C	D
Age [years]	Weight [kg]	Stature [cm]	Sitting height [cm]	Shoulder height [cm]	Shoulder breadth [cm]	Hip breadth [cm]
9	35,5	147	75	50	34	26
9	34	140	72	48	32	24
4,5	20	105	58	35	25	22

■ Booster with backrest



Compact Car



Mid Range Car



Van

■ Booster with backrest



Compact Car



Mid Range Car



Van

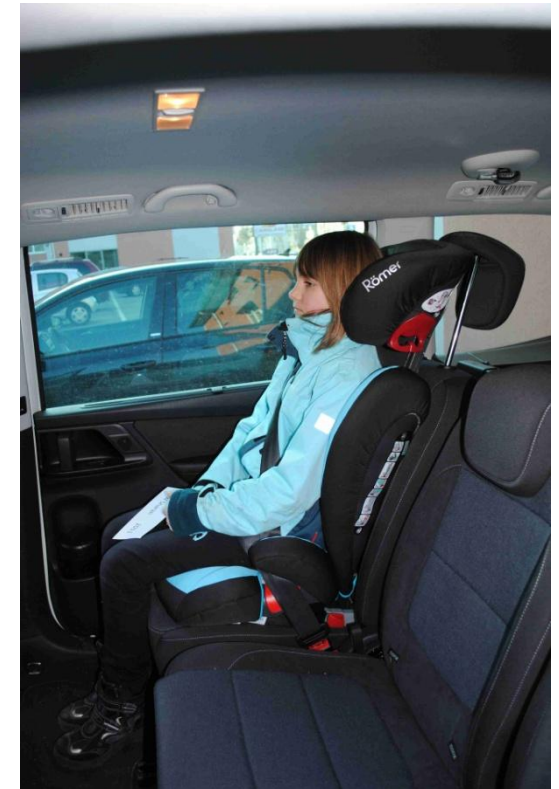
■ Booster with backrest



Compact Car



Mid Range Car



Van

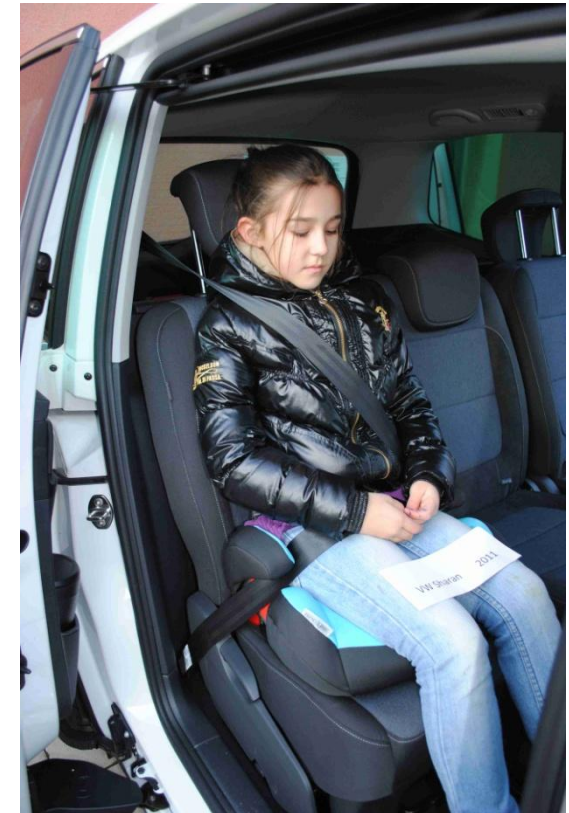
■ Booster only



Compact Car



Mid Range Car



Van

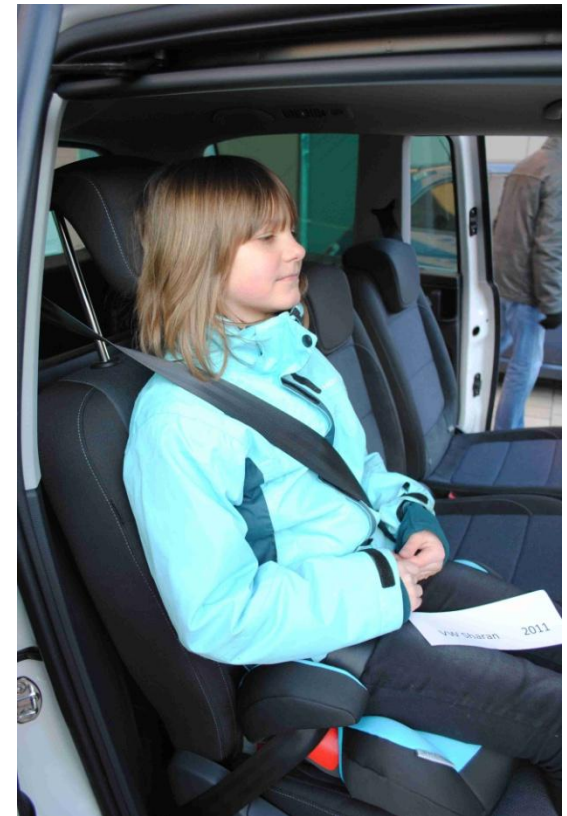
■ Booster only



Compact Car



Mid Range Car



Van

- CAD investigation shows an issue with the 1,5 m stature
 - » 1,5m 95%ile already above the 840mm ECE 44 limit for the P10 (§ 7.1.4.4.1.1)
- 1,5 m 95%ile will pose a design challenge in terms of shoulder width
- It appears that 1m stature would be an appropriate lower limit for these restraint systems
- The occupant with Booster only is fully exposed in side impact
- Further installations with real children are needed