

Geometrical Dummies for Usability and Fitting Tests

The Need for Standardised Dummies in the Child Restraint System Usability Test

on behalf of ANEC, the consumer voice in standardisation

History

- Stiftung Warentest initiative in 2002
- Request after presentation on a CRS test/ wrong belt course
What is too far outside?
- No suitable dummies available
- TNO, TÜV, Dekra specialised on dynamic testing
- Tradition of consumer organisations to focus on ease of use

Dummies in use until recently

- Due to the lack of appropriate usability dummies, real children or crash test dummies have been used
- Children of different ages and sizes have been involved and annually recruited newly
- Where necessary crash test dummies were added
- The test set up with children demands for a problematic planning and constitutes ethical problems
- Until now mainly consumer groups and automobile associations have gained extensive experience in usability tests. ECE 44 performing labs usually lack such

Reasons for New Dummies

- 50% crash test dummies not sufficiently reflecting children
- Objectify ease of use testing
- Help for running continuous tests, comparable information
- Comparison of existing dummies revealed lack of suitable tools
- Apparently new dummies needed not only for CRS tests

Needed Dummy Sizes

- 95% 13 kg (“12mo Baby dummy”, biofidelic in weight)
- 15/18 kg Toddler in 5 and 95 percentile, biofidelic also in weight, very important to assess group I (“3 years old”)
- 95% child 25 kg, not biofidelic in weight, important intermediate for belt routing (“6 year old”)
- Child 150 cm („12 year old“)
- Coloured indicators for correct / incorrect belt routing

Run of the Project

- Costly unusual work to develop tools for testing
- Co-operation consumer groups and motoring clubs started:
ETC European Test Consortium
- Ease of use test with children giving new focus
- Kiel University specialized on anthropometry, ergonomics
- Commission and realization at Kiel University in 2003
- Development and production of a prototype set
- Later part of the NPACS work and EC funded project although not outlined in the beginning

From Prototype to Small Series

- Kiel University not able to set up series production
- Discussion with FTSS
- Alternatives in Europe
- Discussions with test partners, Consumer's Union, USA
- NHTSA, University of Virginia, ISO work
- GESAC, USA, commissioned in 2005

Dummy Family



Child Size Comparison



15 kg 5%



18 kg 95%



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Measurements and weights of the usability dummies (Kieler Kinder) I



Type	Age	3 years	3 years	6 years	150 cm/12 years
	Size	small	big	big	middle
		[mm]			
General	Body height	935	1085	1265	1500
	Sitting height	525	600	690	755
	Weight [kg]	13,4	20,8	27,2	40
Head	Head circumference	470	530	545	540
	Neck circumference	227	271	284	302
Trunk	Distance horizontal shoulder joints	182	215	250	290
	Distance horizontal hip joints	100	125	140	160
	Distance vertical shoulder joint hip joint	290	310	395	430
	Breadth shoulders bideltoid	215	260	310	345
	Breadth chest	150	190	200	225
	Depth chest	115	130	150	165
	Waist circumference	455	550	560	625
	Breadth waist	145	185	200	215
	Hip circumference	500	610	665	770
	Breadth hip	100	115	230	270

Informal Group on CRS, BaSt, 21th
January 2009, Henry Goeflitz

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Measurements and weights of the usability dummies (Kieler Kinder) II



Type	Age	3 years	3 years	6 years	150 cm/12 years
	Size	small	big	big	middle
		[mm]			
Legs	Upper leg length	200	245	265	370
	Lower leg length	230	295	355	425
	Thigh circumference	280	360	415	440
	Calf circumference	190	240	270	300
	Lower leg circumference (min)	150	195	194	204
Arms	Upper arm length	150	190	245	290
	Lower arm length	230	280	355	410
	Upper arm circumference	150	200	205	230
	Lower arm circumference (max)	140	190	190	215
	Lower arm circumference (min)	110	135	140	148
	Hand circumference	111	142	160	181
Sitting	Popliteal height	205	265	320	390
	Buttock-popliteal-length	225	290	340	430
	Hip breadth sitting	180	230	238	285

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New Usability Dummies Dimensions

NPACS dummy name	N9	N13	N15	N18	N25	N150
Children real weight or size	9 kg	13 kg	15 kg	18 kg	25 kg	150 cm
Percentile	50th	50th	5th	50th	50th	50th
for ECE R44-04 weight group	I lower end	0+ upper end	II,III lower end, 0+ upper end	I, upper end	II, upper end	III, upper end
weight [kg]	9	13	15	18	18	18
Stature	708	900	850	1080	1250	1500
Seating height	450	541	515	602	686	775

Future Work

- Most of the geometrical dummies available
- Start of application in CRS testing to learn about
- In future influence on the rating but still tests with children

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