

Comparison of WorldSid and PMHS response to localized constant-speed impacts

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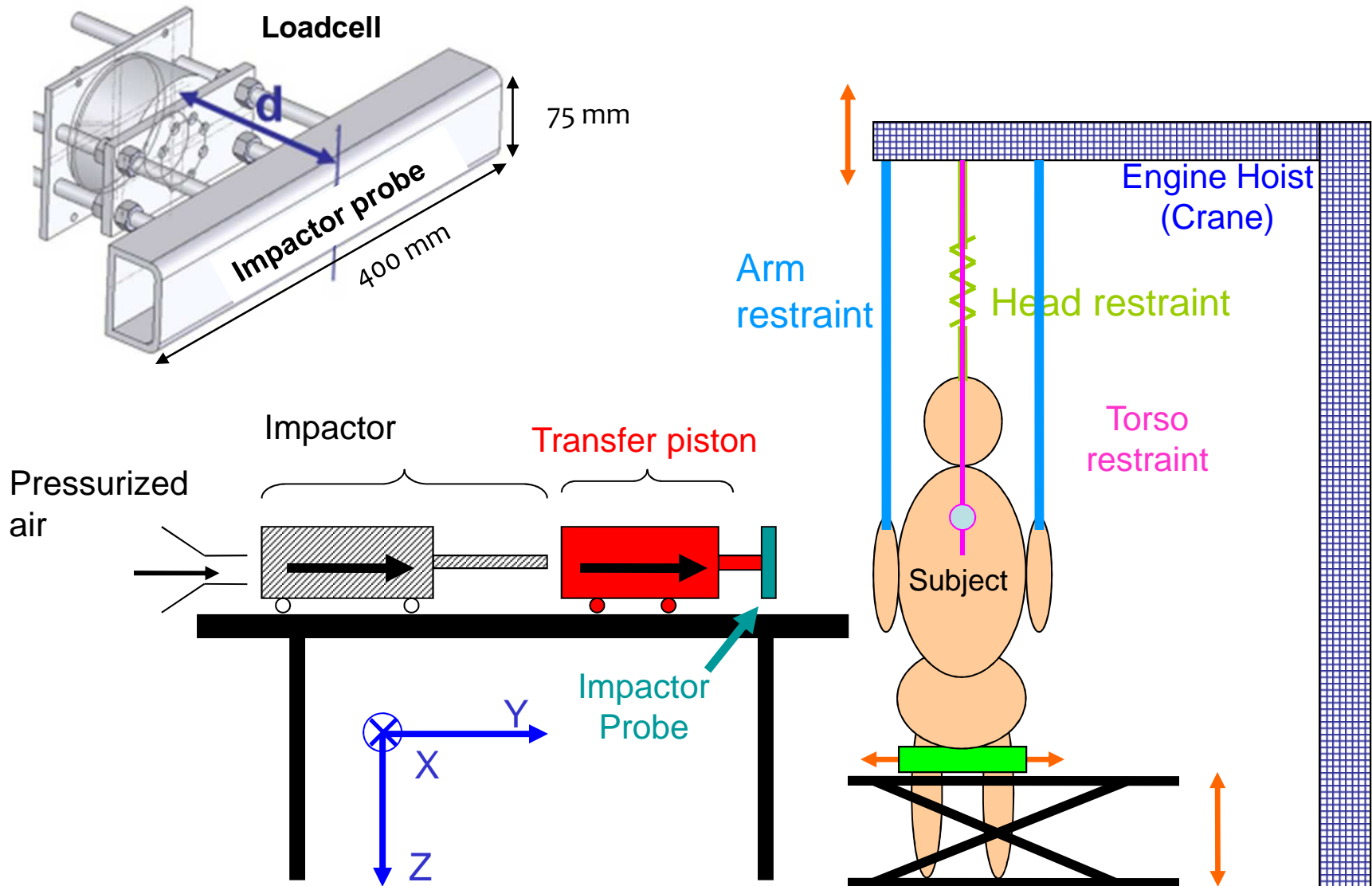
Center *for* Applied Biomechanics

Objectives

- Constant-velocity impact to shoulder and thorax (2 velocities, 3 directions, 3 levels)
- Comparison to previously published cadaver data (Subit et al, AAAM 2010)
- Chest deflection: 1D, 2D IR-Tracc, external measurement

Response of the Worldwide Side Impact Dummy (WorldSID) to localized constant-speed impacts (Sunnevang et al, under review AAAM 2011)

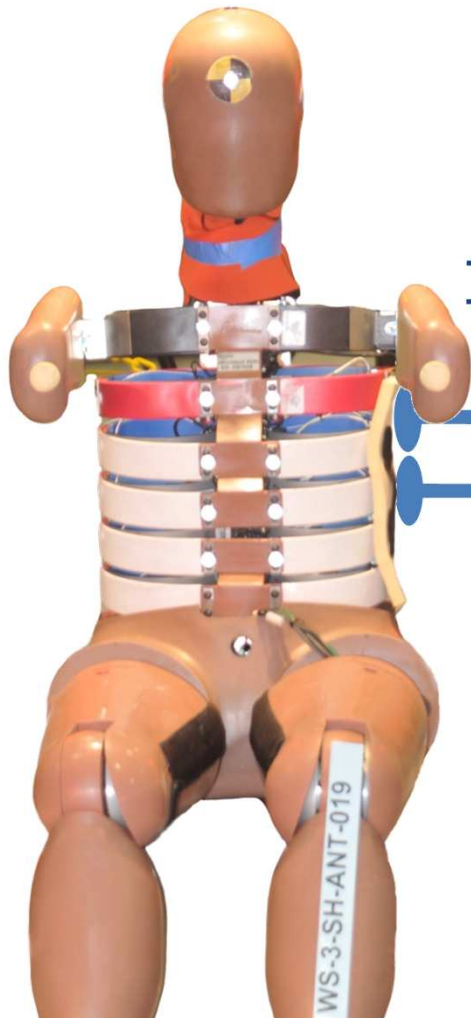
Side impact set-up - Posterior View



Test Conditions

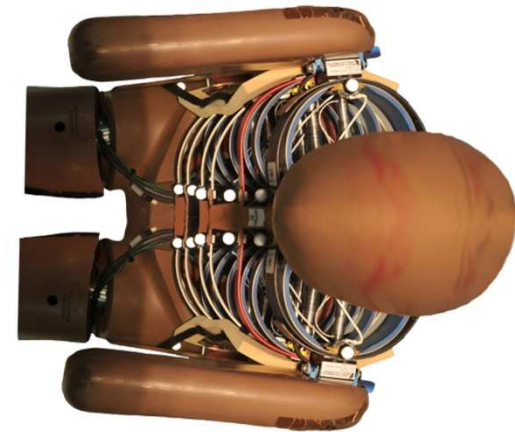
Two Speeds

1 m/s and 3 m/s

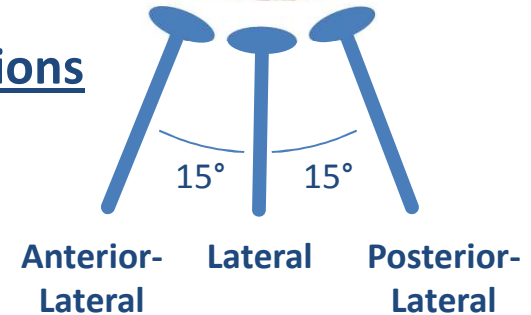


Three Locations

- Shoulder
- Upper Thorax
- Mid Thorax



Three Directions



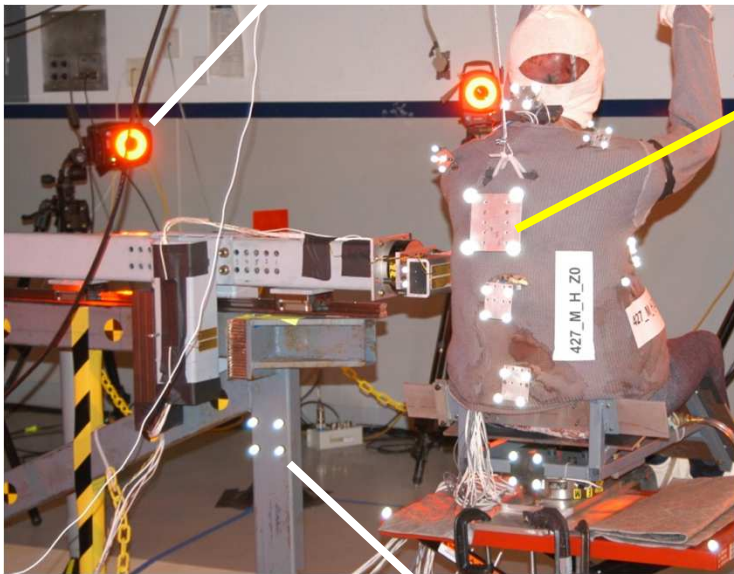
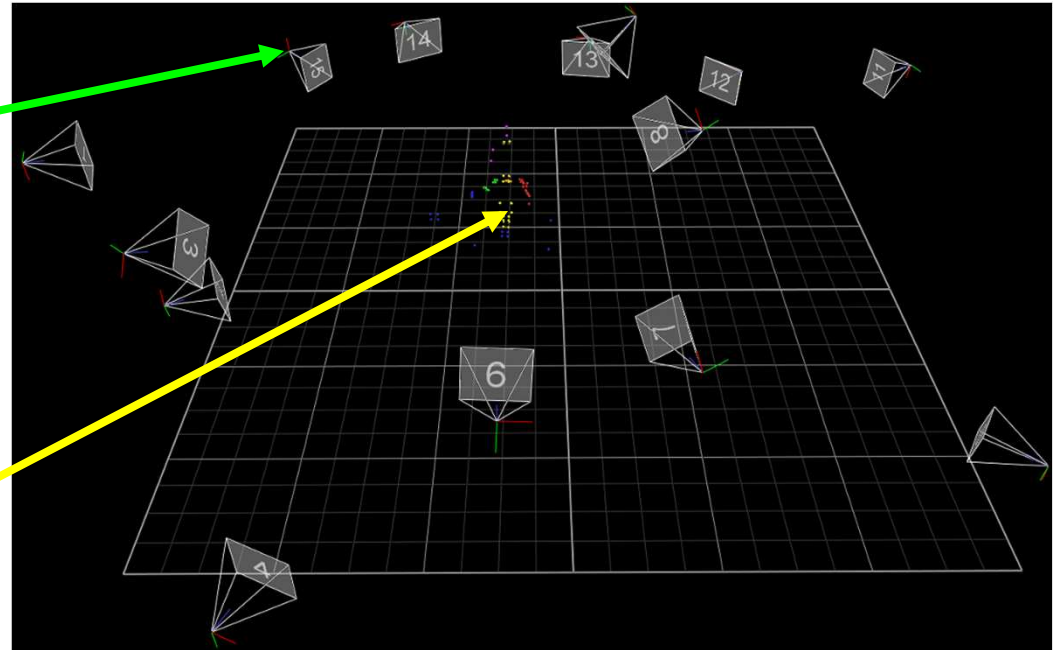
Stroke: 100 mm

With/without jacket



SETUP: 15 Camera Vicon Configuration

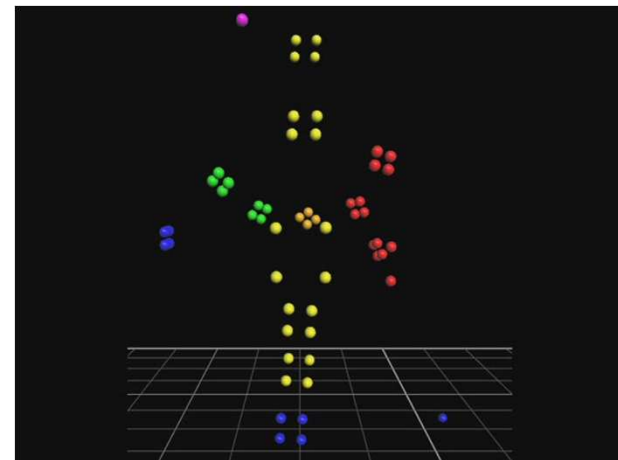
15 Vicon
MX
Cameras
1000 Hz



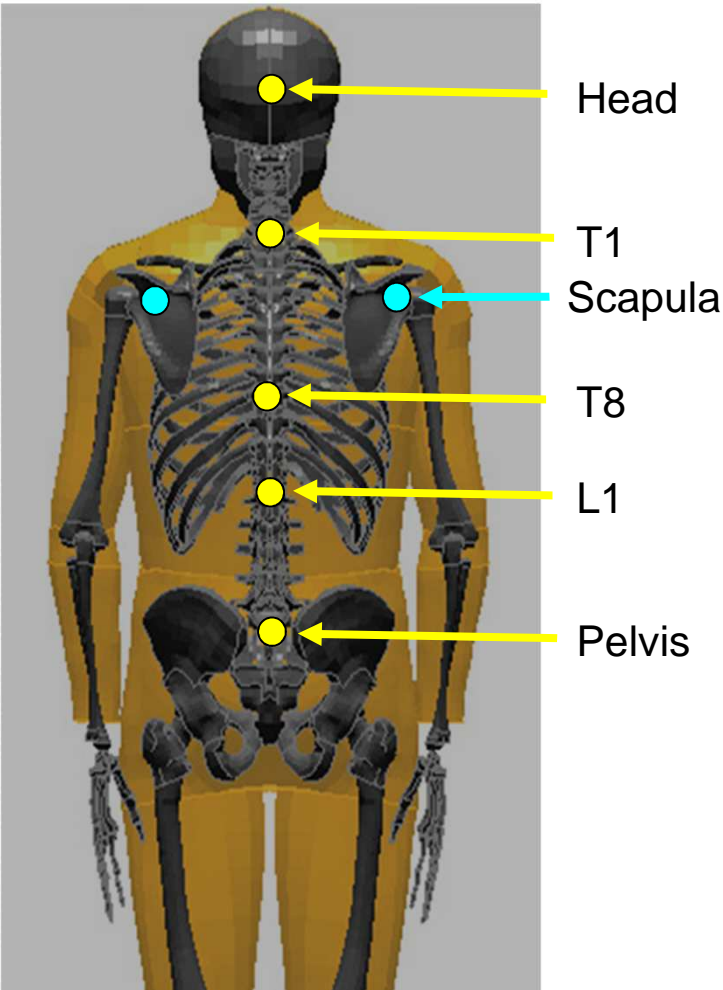
Retro-
reflective
Markers



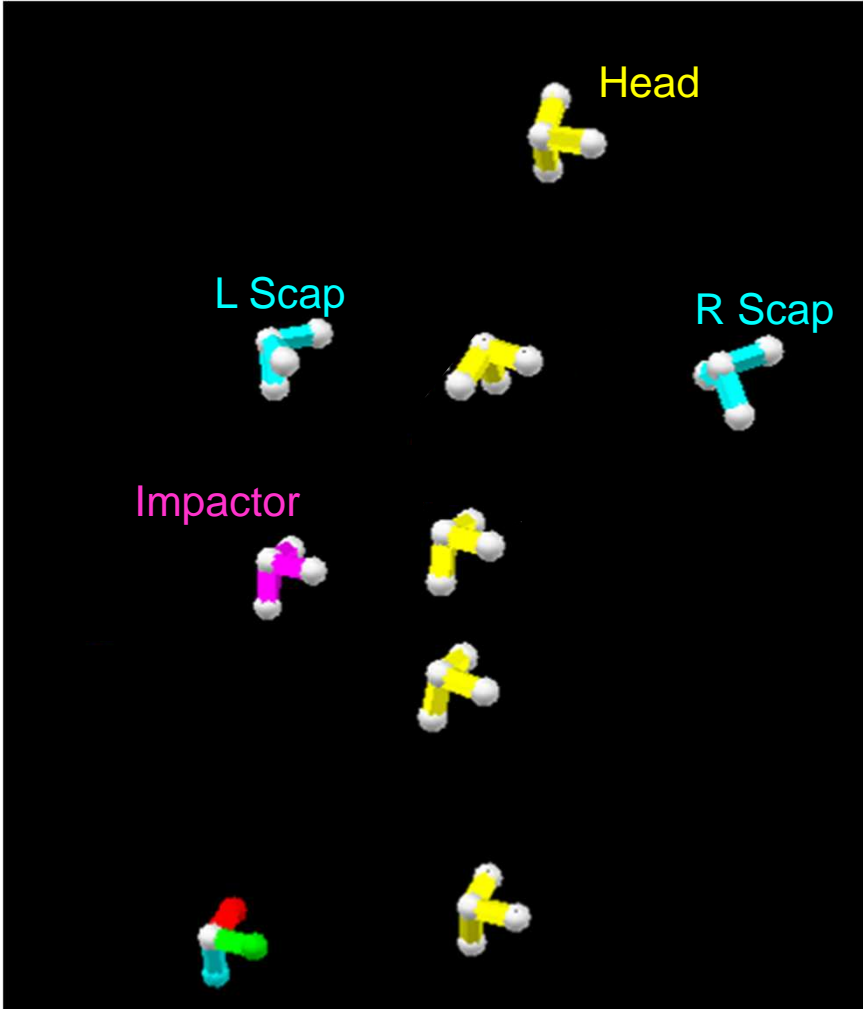
Captured Motion



Bone Based Coordinate Systems

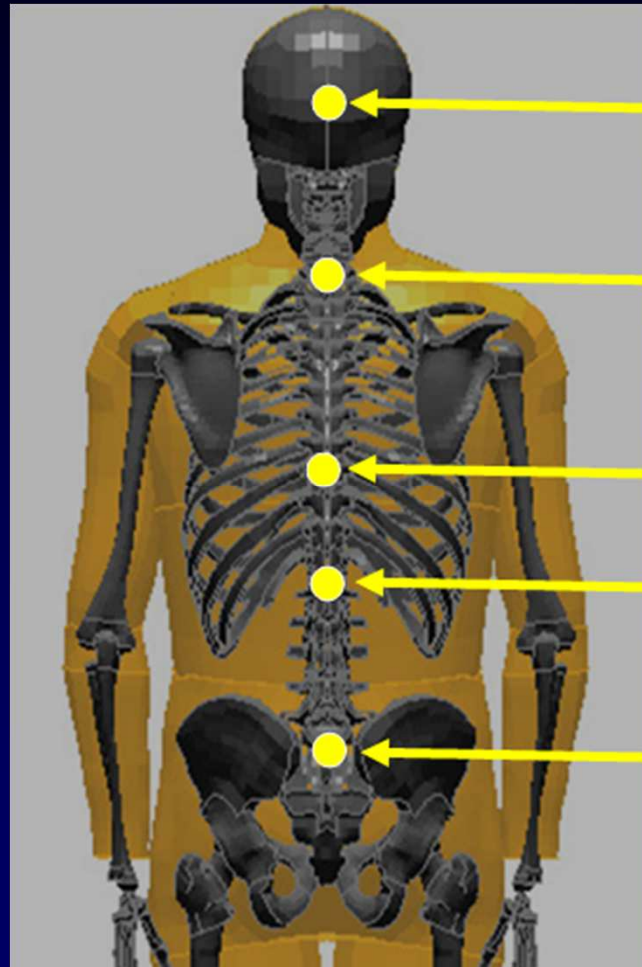


Posterior



Bone-based Coordinate Systems

Marker Locations (Spine)



PMHS

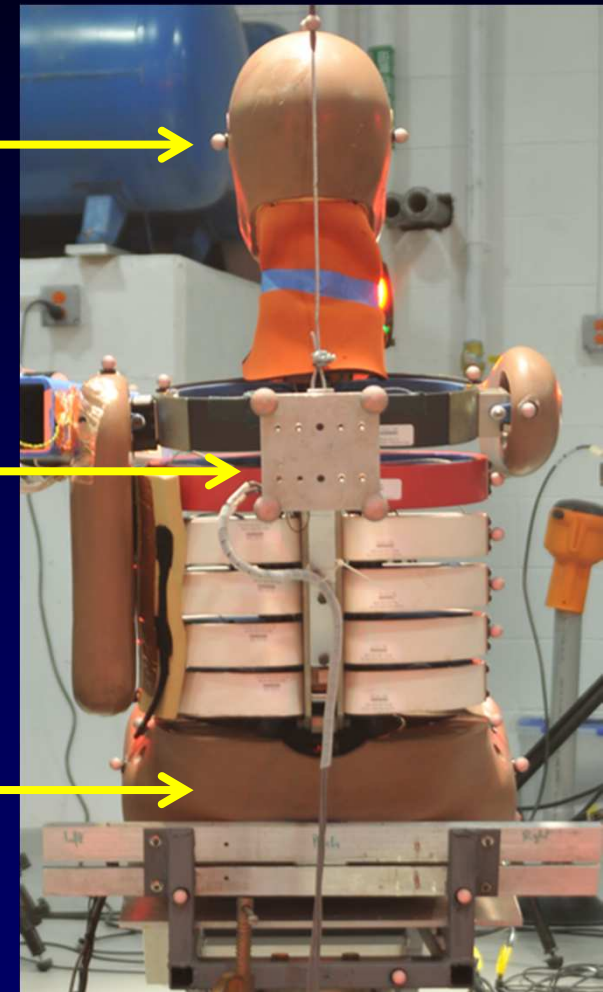
Head

T1

T8

L1

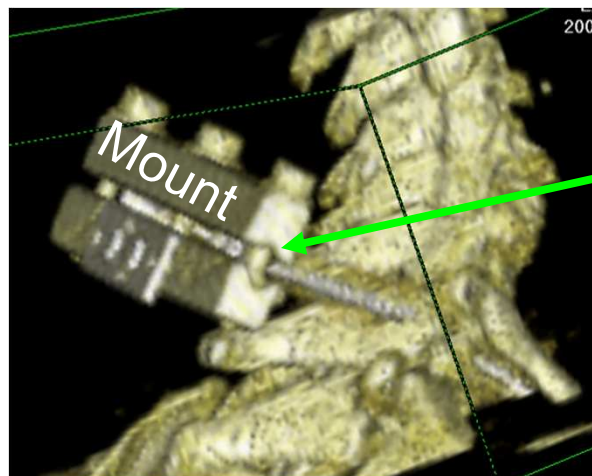
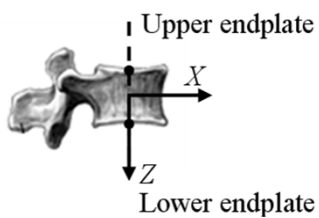
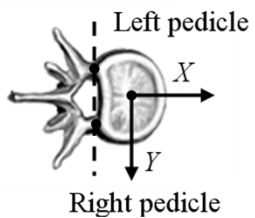
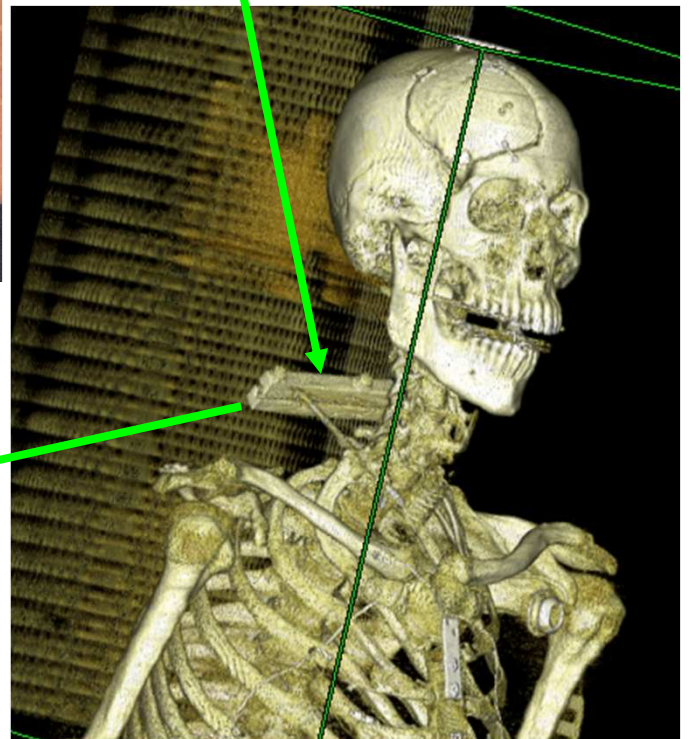
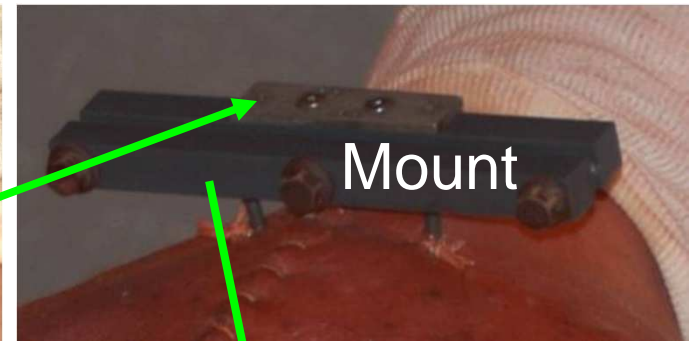
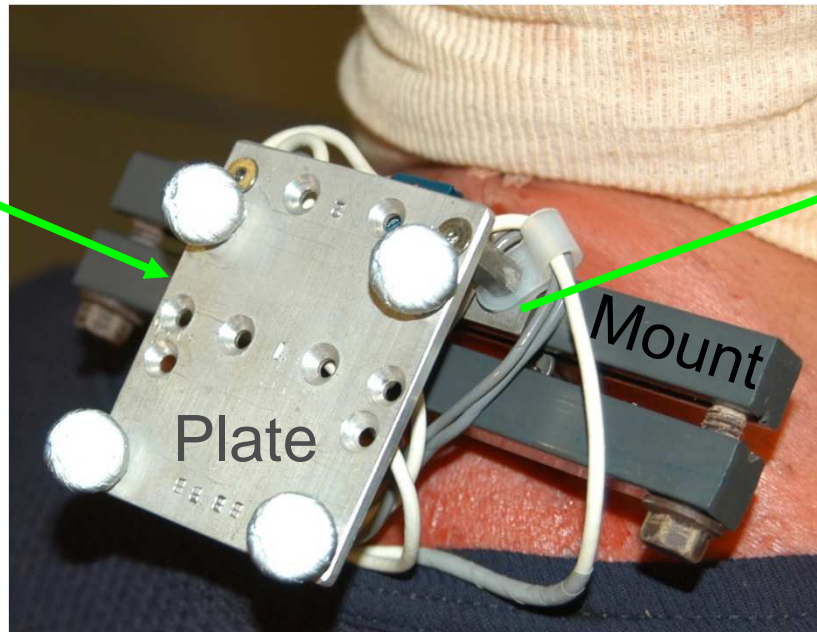
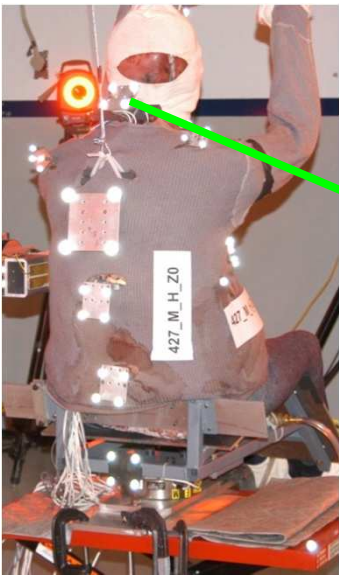
Pelvis



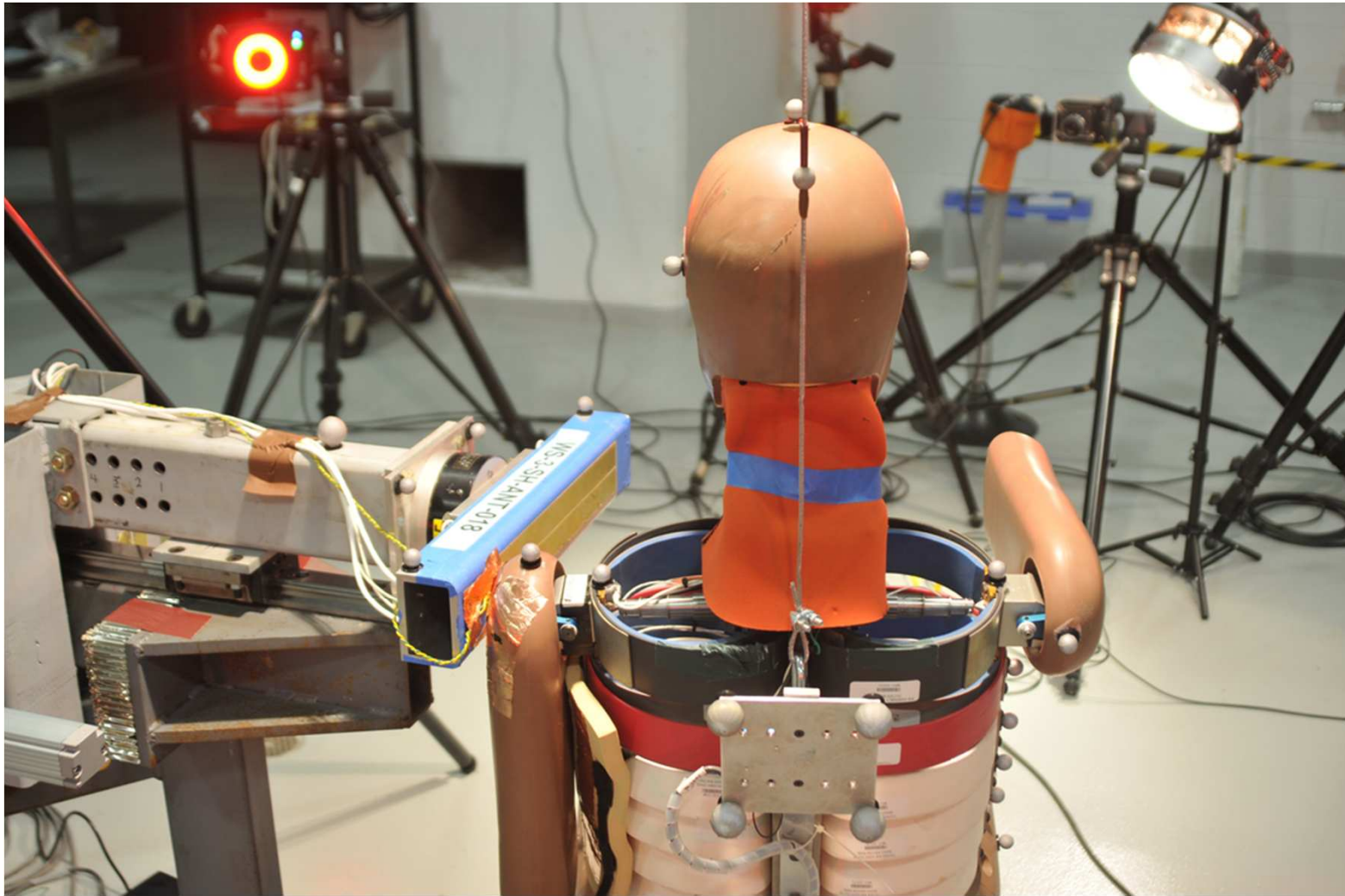
Dummy

Vicon Hardware: 4-Marker Clusters

Rigid attachment to anatomical locations via specialized hardware

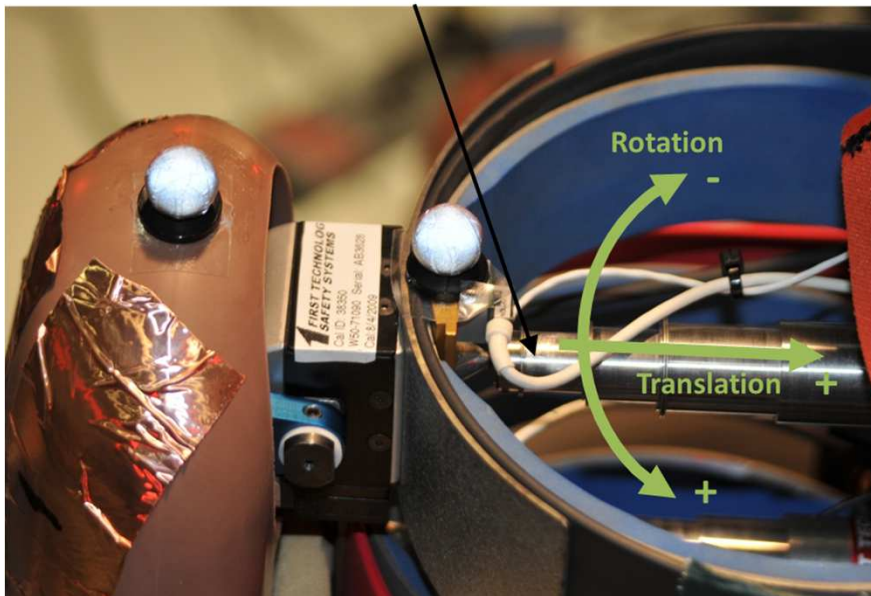


Impact force

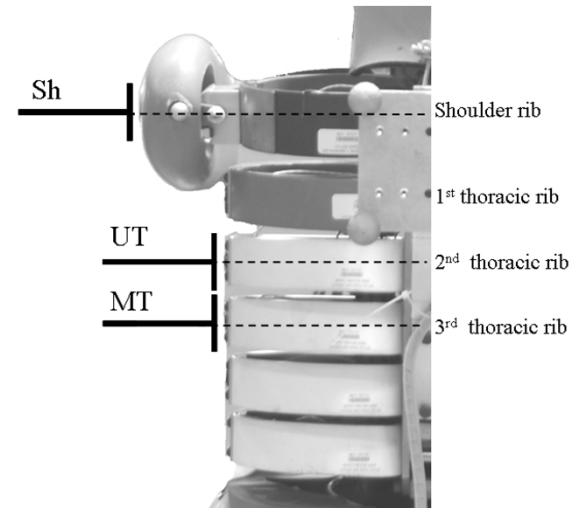


Chest lateral deflection

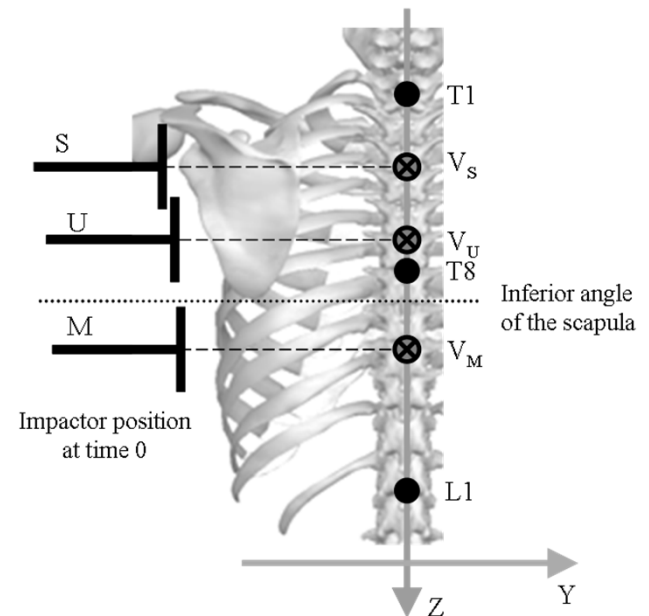
Dummy Rib Deflection Sensor IRTracc



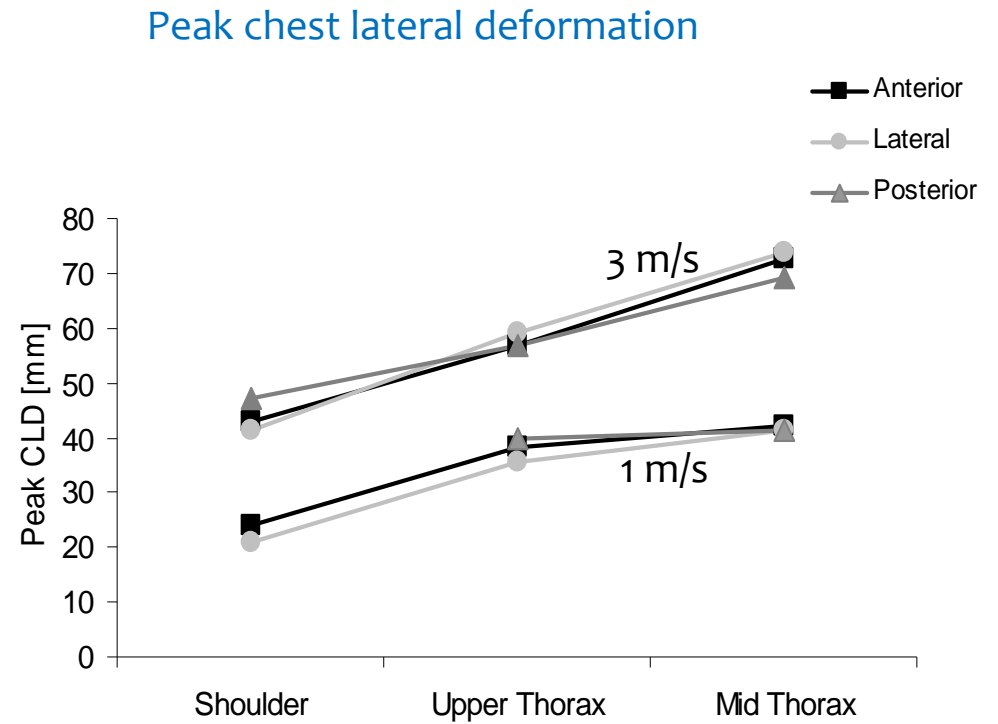
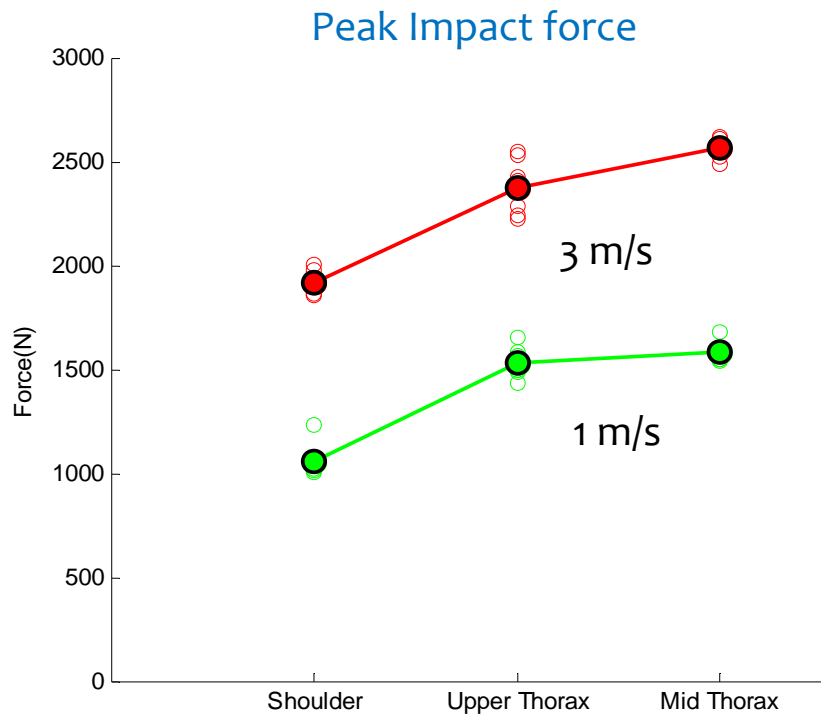
Internal deflection (1D, 2D)



External deflection

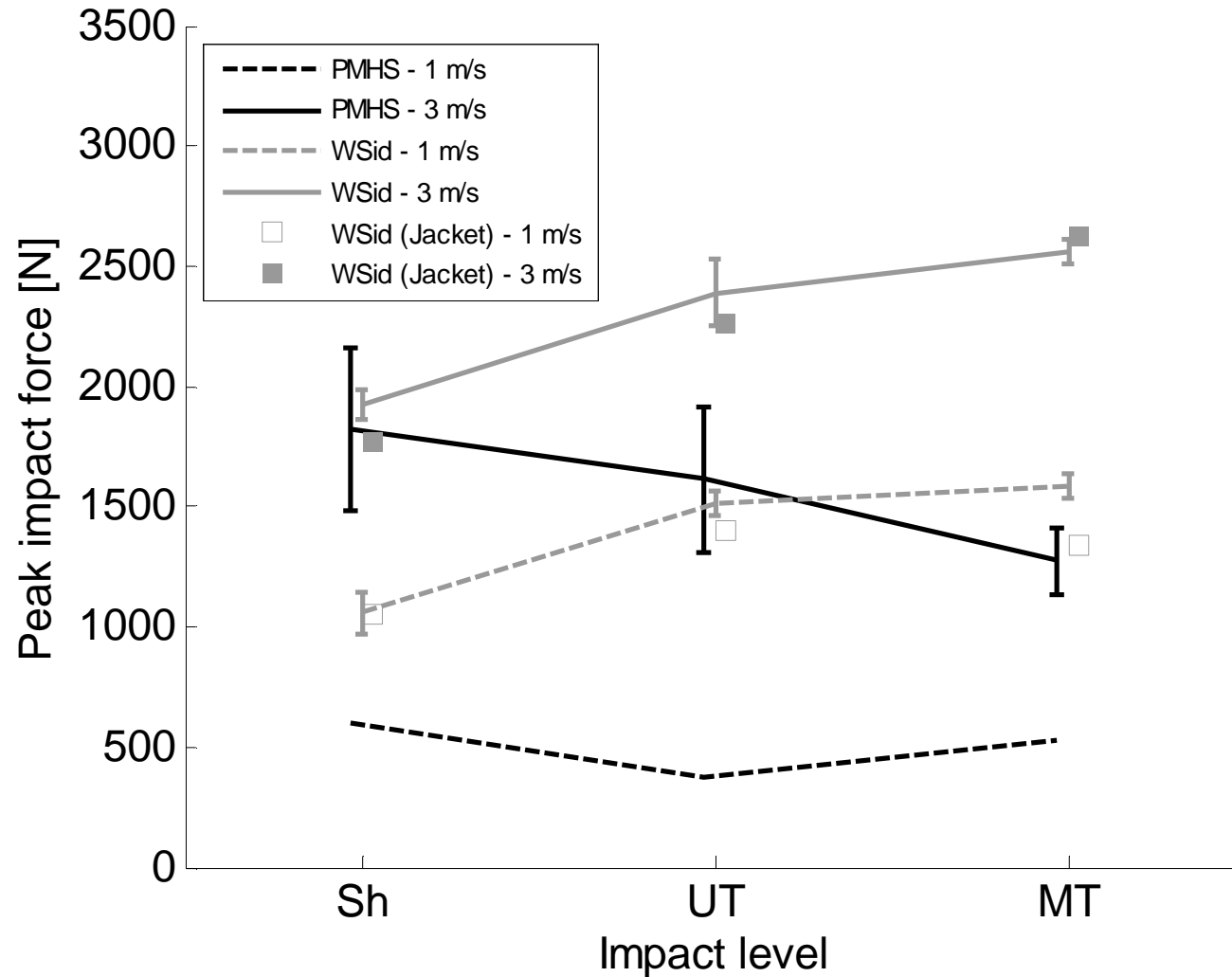


Trend for WorldSID



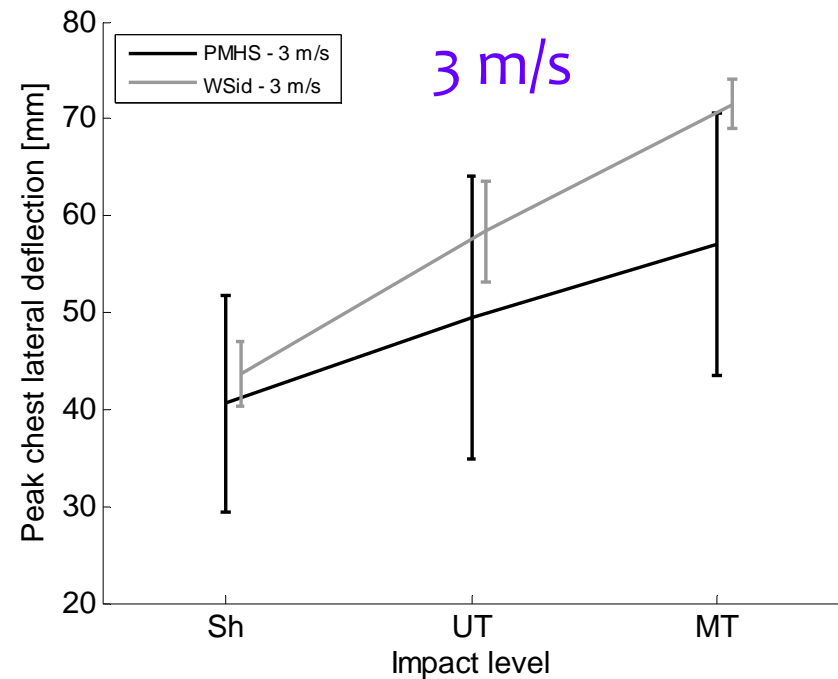
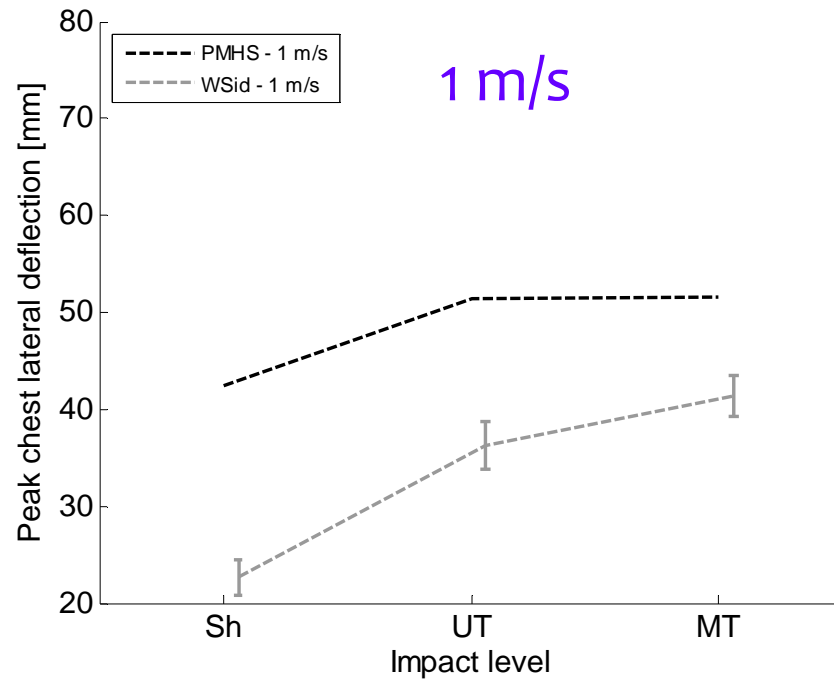
PMHS/WorldSID comparison

Peak impact force



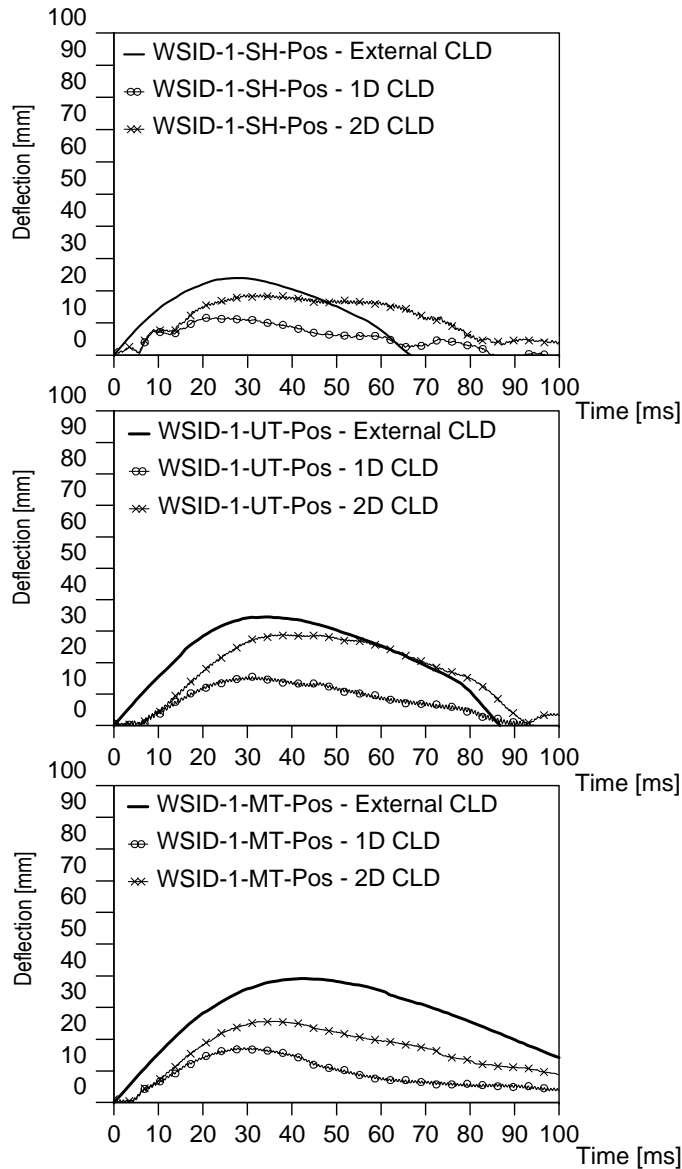
PMHS/WorldSID comparison

Peak external deflection

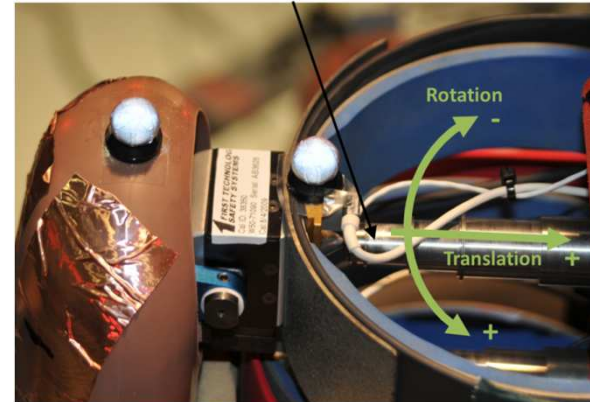


Work in progress

1D vs 2D chest deformation



Dummy Rib Deflection Sensor IRTracc



	Shoulder		Upper Thorax		Mid Thorax	
	1D / Ext.	2D / Ext.	1D / Ext.	2D / Ext.	1D / Ext.	2D / Ext.
Anterior	0.7	0.8	0.5	0.6	0.4	0.5
Lateral	0.9	0.9	0.7	0.7	0.5	0.5
Posterior	0.6	1.0	0.5	1.0	0.4	0.7

Future research

- Investigate differences in deflection
- Investigate differences in trend (3 m/s)
- Spine kinematics/rib cage deformation

