

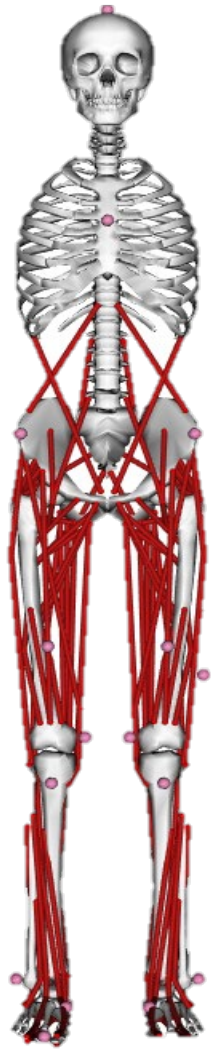


Scaling

by Hans Kainz

OpenSim Workshop 2018

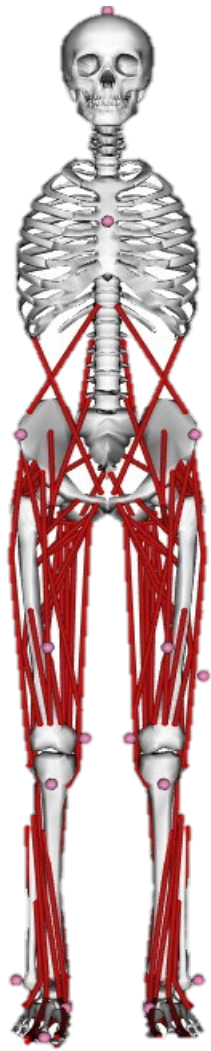
Why scaling?



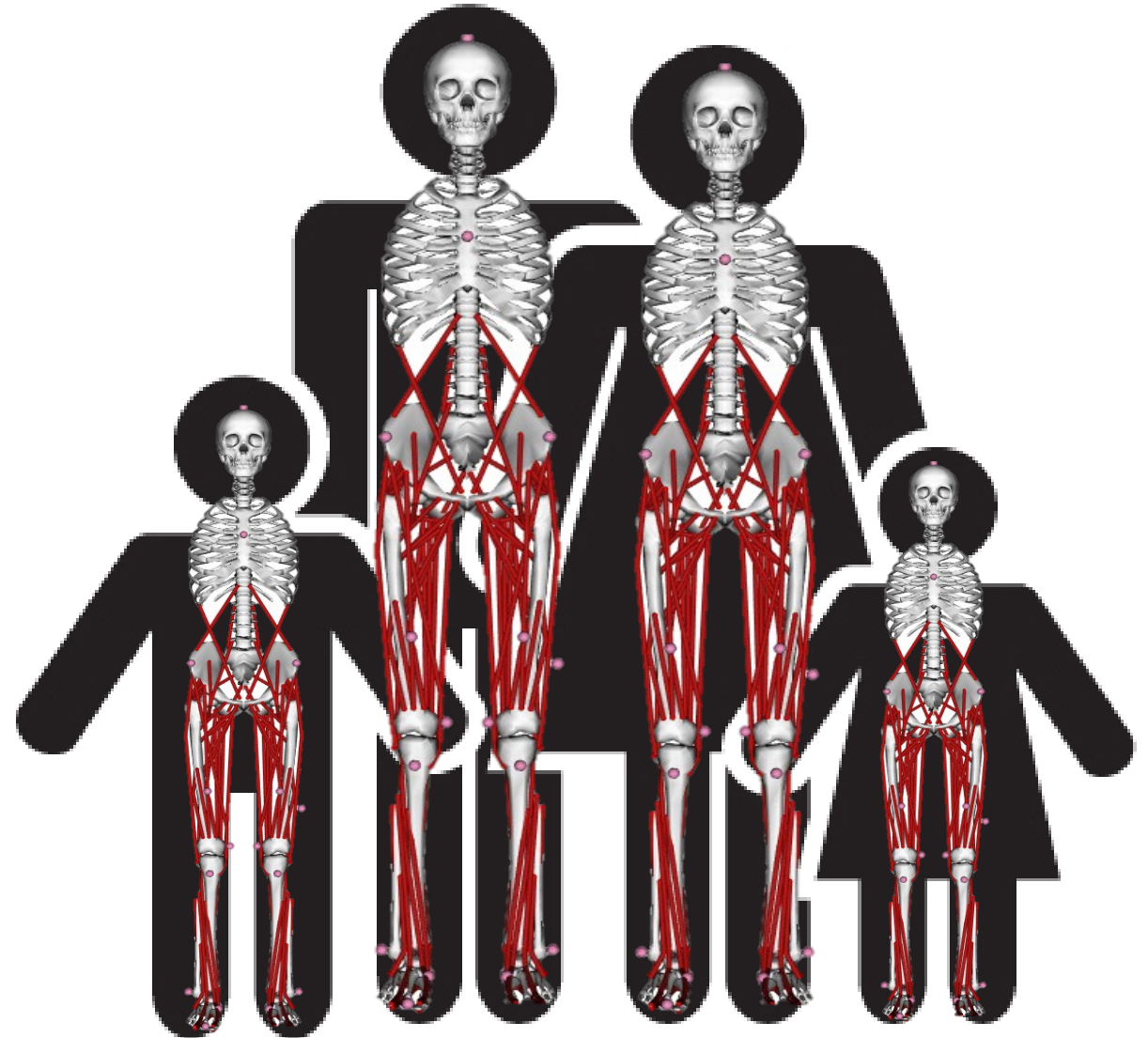
Generic model



Why scaling?

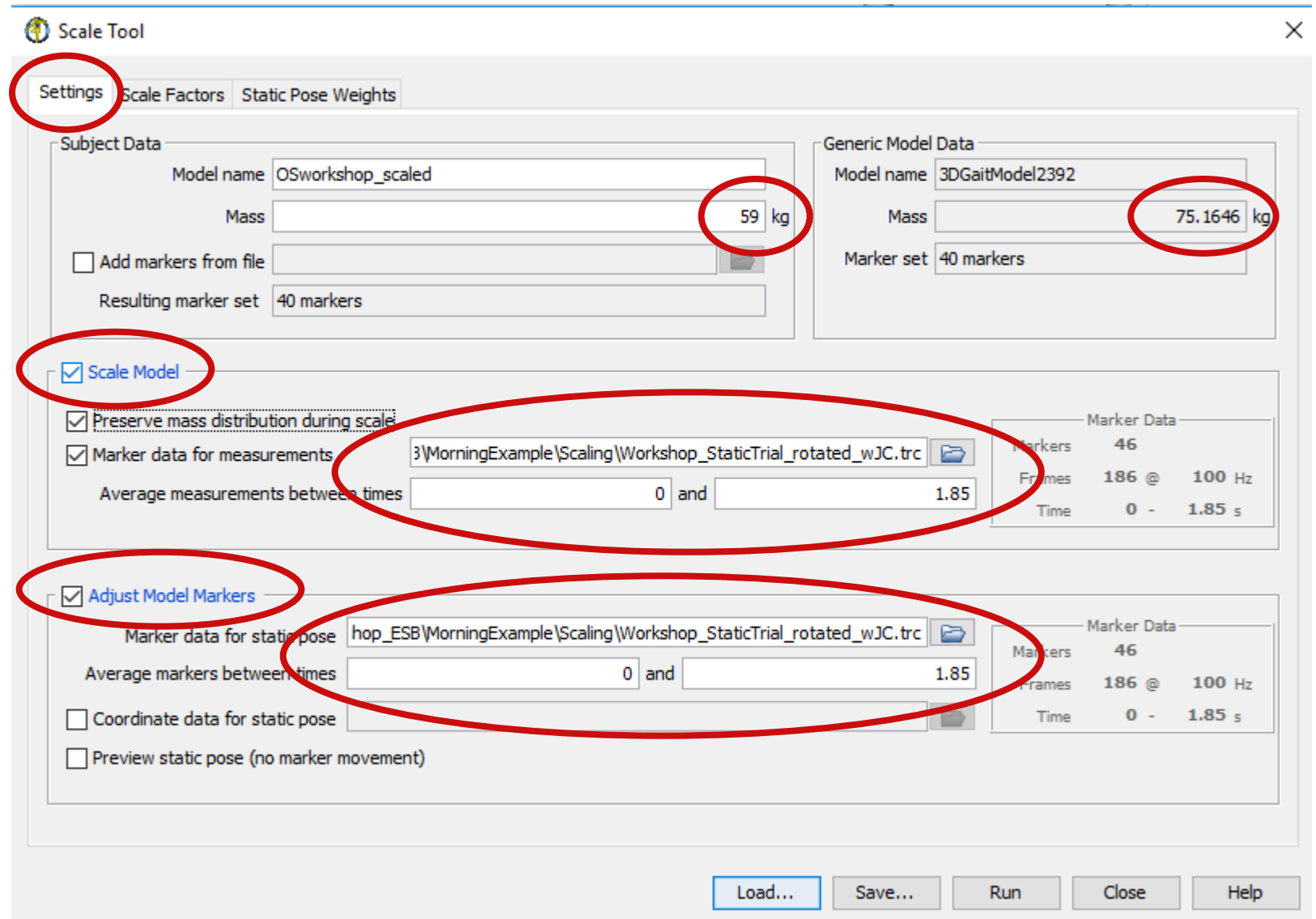


Generic model



Scaling in OpenSim

Tools → Scale model...



Definition of scale factors

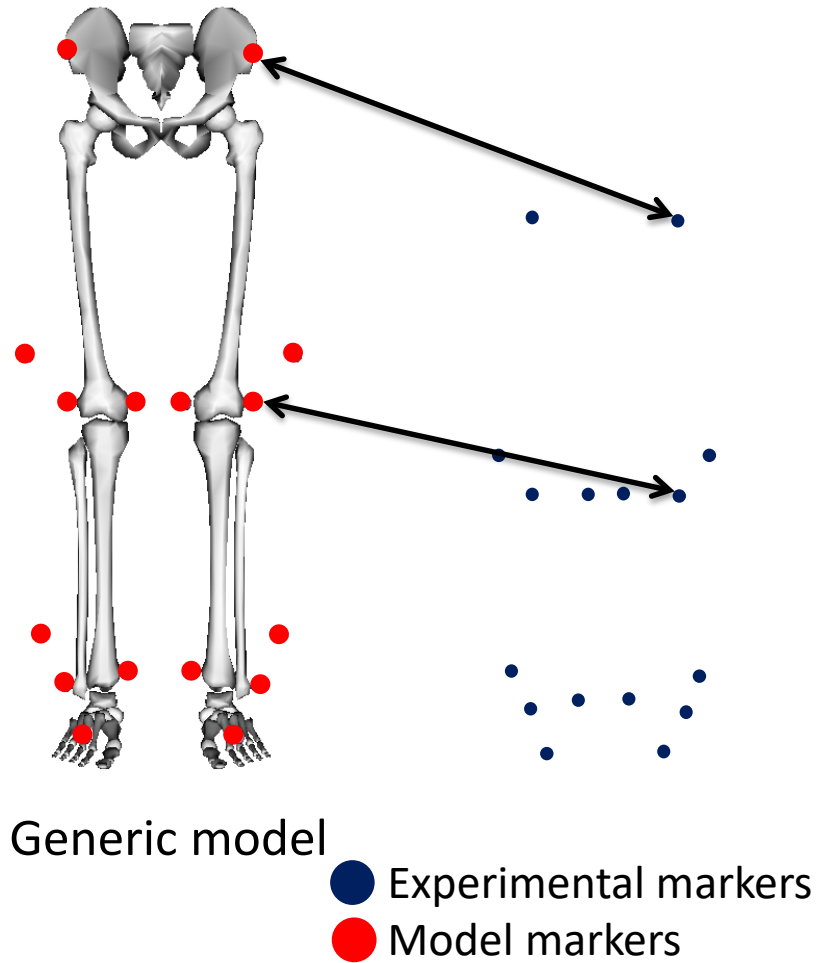
scales model segments
as well as mass
properties, muscles, etc.

The screenshot shows the 'Scale Tool' window with the 'Scale Factors' tab selected. The 'Use manual scales' option is chosen. The table below lists the scale factors for various body segments.

Body Name	Measurement(s) Used	Applied Scale Factor(s)
ground	Unassigned	1.0
pelvis	pelvis	1.001614
femur_r	thigh	0.956165
tibia_r	shank	0.955018
talus_r	foot	0.952130
calcn_r	foot	0.952130
toes_r	foot	0.952130
femur_l	thigh	0.956165
tibia_l	MANUAL SCALES	0.950000
talus_l	foot	0.952130
calcn_l	foot	0.952130
toes_l	foot	0.952130
torso	torso	0.988918

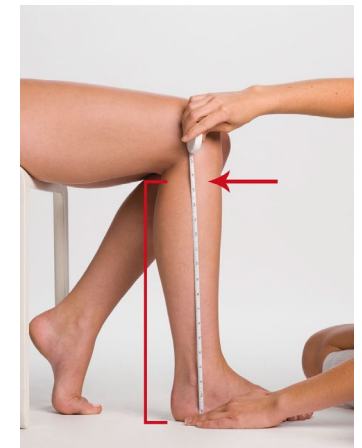
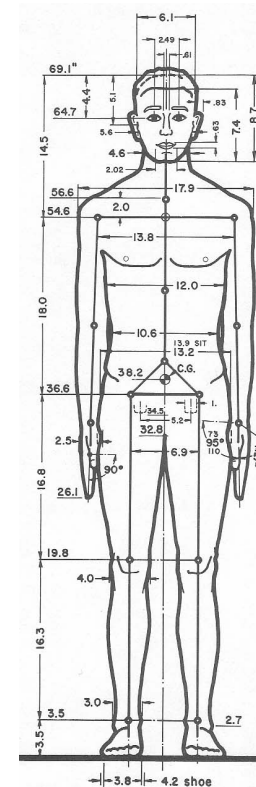
Definition of scale factors

Measurement-based scaling



Manual scaling

specified by the user based on some predetermined measure e.g. anthropometric measurements



Definition of scale factors

The screenshot shows the 'Scale Tool' interface with the 'Scale Factors' tab selected. The 'Edit Measurement Set' button is highlighted with a red circle. A 'Measurement Set' dialog box is open, displaying a table of measurements and marker pairs.

Scale Tool Interface:

- Tab: **Scale Factors** (circled in red)
- Buttons: **Edit Measurement Set** (circled in red), **Reset to Measurement**
- Options: Use measurements, Use manual scales

Measurement Set Dialog:

Measurements		Marker Pairs					
<input checked="" type="checkbox"/> torso	+	STRN	CLAV	<input checked="" type="checkbox"/>	T10	C7	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> pelvis	+	LASI	RASI	<input checked="" type="checkbox"/>			
<input checked="" type="checkbox"/> thigh	+	LASI	LKNE	<input checked="" type="checkbox"/>	RASI	RKNE	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> shank	+	LKNE	LANK	<input checked="" type="checkbox"/>	RKNE	RANK	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/> foot	+	RTOE	RHEE	<input checked="" type="checkbox"/>	LTOE	LHEE	<input checked="" type="checkbox"/>
<input type="checkbox"/> Unnamed							

Buttons: **OK**, **Load...**, **Save...**, **Run**, **Close**, **Help**

Definition of scale factors

Scale Tool

Settings | **Scale Factors** | Static Pose Weights

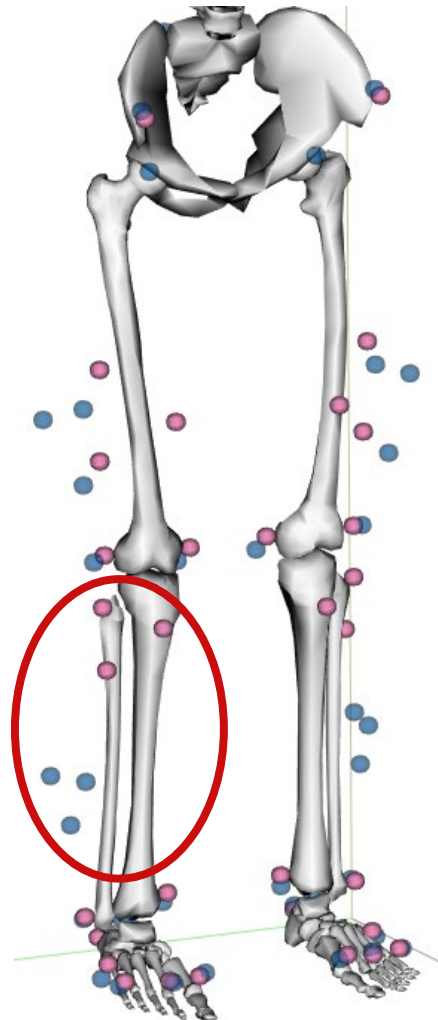
Use measurements shank = shank = shank Uniform [Edit Measurement Set](#)

Use manual scales 0.95 = 0.95 = 0.95 Uniform [Reset to Measurement](#)

Body Name	Measurement(s) Used	Applied Scale Factor(s)
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calc_n_r	foot	0.952130
toes_r	foot	0.952130
femur_l	thigh	0.956165
tibia_l	MANUAL SCALES	0.950000
talus_l	foot	0.952130
calc_n_l	foot	0.952130
toes_l	foot	0.952130
torso	torso	0.988918

[Load...](#) [Save...](#) [Run](#) [Close](#) [Help](#)

Adjust model markers

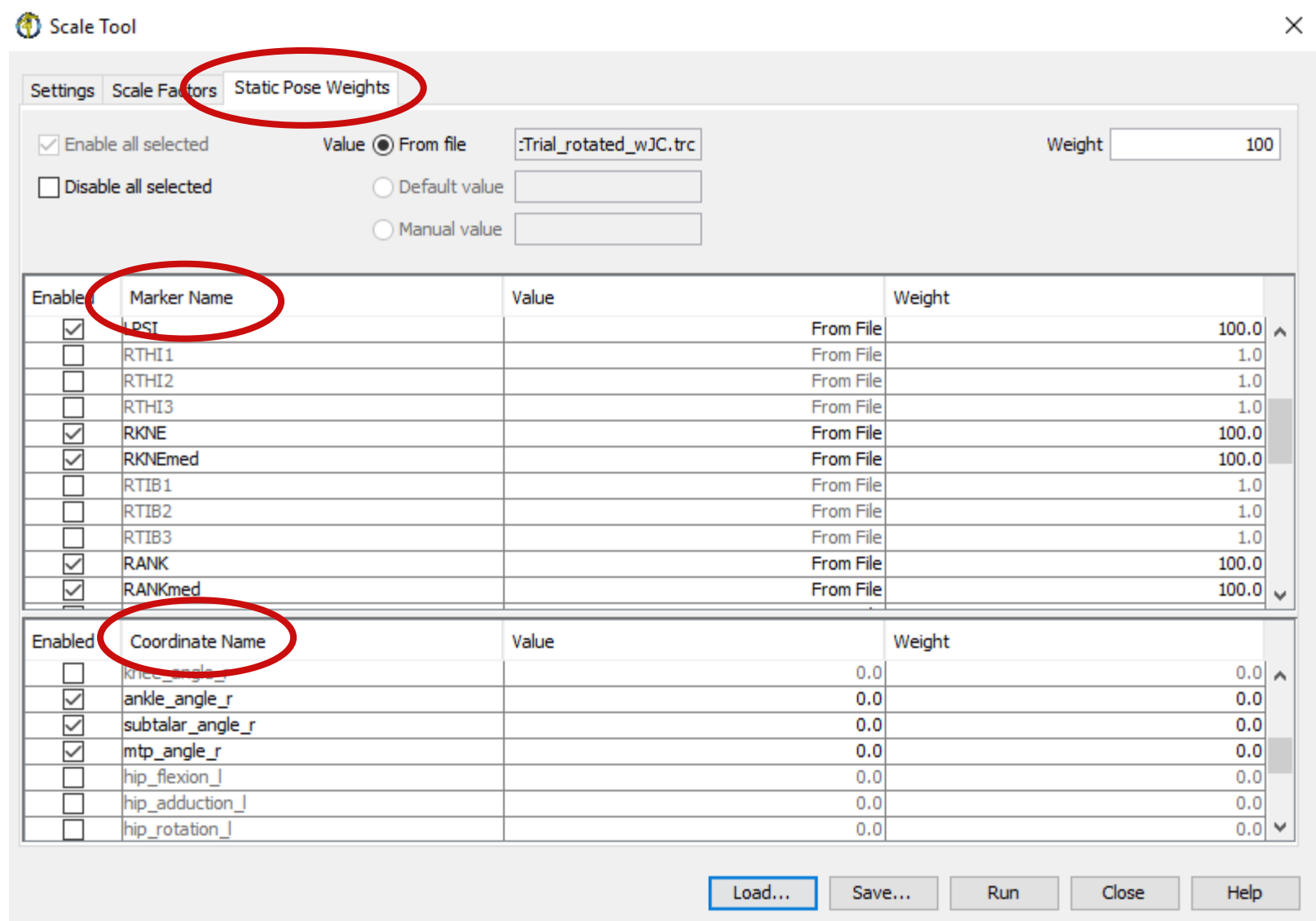


adjusts the model markers to match the experimental markers at the static pose

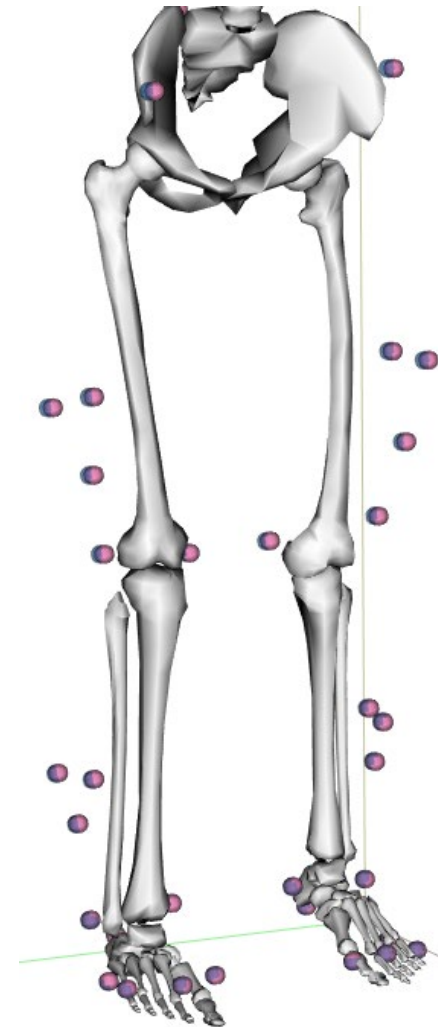
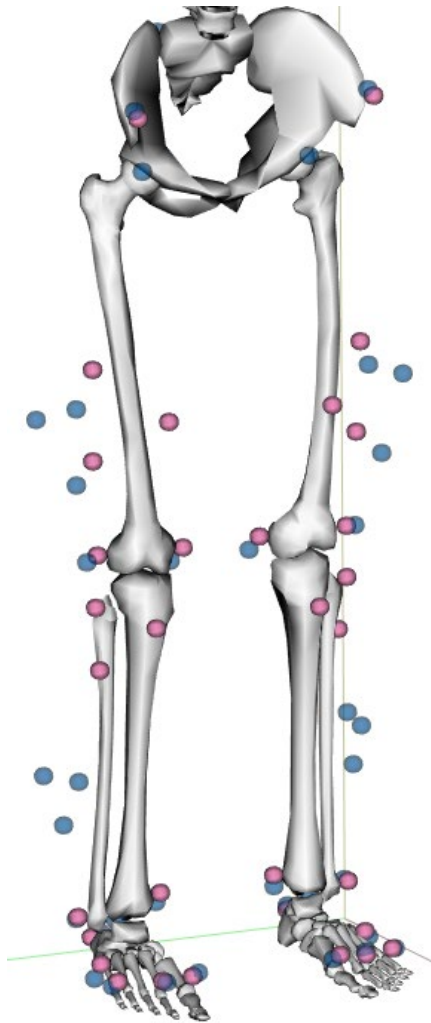
Define weights

places model in static pose (by IK)

adjusts model markers



Scaled model



Hints

Scaling can have a big impact on your simulation results

Use joint centers for scaling in participants with movement disorders

Kainz et al. (2017), J App Biomech 33(5), 354-360.

Demo of scaling tool

