SUPPLEMENTARY DIGITAL CONTENT 3

Data file that describes the used marker set and kinematic model

Marker positions

The following marker locations were used:

Foot segment

MET_1_ = medial aspect of metatarsophalangeal joint I
MET_5_ = lateral aspect metatarsophalangeal joint V
MET_23_ = superior side of the foot between metatarsophalangeal joint II & III
MET_1B_ = medial aspect of the base of metatarsophalangeal joint I
MET_5B_ = lateral aspect of the base of metatarsophalangeal joint V
CAL_P_ = dorsal superior aspect of the calcaneus
MAL_L_ = most protrusive part of lateral malleolus
MAL_M_ = most protrusive part of medial malleolus

Shank segment

MAL_L_ = most protrusive part of lateral malleolus
MAL_M_ = most protrusive part of medial malleolus
SAD_ = shank plate (4 markers: anterior distal part of plate)
SAP_ = shank plate (4 markers: anterior proximal part of plate)
SPD_ = shank plate (4 markers: posterior distal part of plate)
SPP_ = shank plate (4 markers: posterior proximal part of plate)
TUB_ = most protrusive port of tuberositas tibiae
KNM_ = between medial condyles of tibia & femur
KNL_ = between lateral condyles of tibia & femur

Knee segment

KNM_ = between medial condyles of tibia & femur
KNL_ = between lateral condyles of tibia & femur
TAD_ = thigh plate (4 markers: anterior distal part of plate)
TAP_ = thigh plate (4 markers: anterior proximal part of plate)
TPD_ = thigh plate (4 markers: posterior distal part of plate)
TPP_ = thigh plate (4 markers: posterior proximal part of plate)
TRO_ = most protrusive part of trochanter major of femur

Pelvis segment

SIA_ = spina iliaca anterior superior
SIP_ = spina iliaca posterior superior

_ indicates for both left and right leg.

Segment coordinate system definitions

The origin of the **thigh segment** coordinate system is centered at the functional hip joint. To create a functional joint, an algorithm calculates the point that is stationary when a movement trial in which the joint had modest range of motion about all three axes of rotation is performed. This movement should have sufficient range of motion that the computation statistics produce a reasonable stationary point, but the range of motion should not be too large because of soft tissue artefacts. The z-axis of the thigh is drawn as the extension from the line between the origin and the center of the medial and lateral knee markers and oriented cranially. The y-axis is drawn orthogonally on the longitudinal axis (z-axis) and the mean orientation of the projection of the lines between the trochanter and the knee markers on a perpendicular plane with the z-axis. The y-axis is oriented anteriorly. The x-axis is drawn orthogonal to the y-z plane and oriented to the right. The thigh is tracked by 4 markers mounted on a semi rigid plate taped halfway on the thigh.

The origin of the **shank segment** coordinate system is centered at the functional knee joint. To create a functional joint, an algorithm calculates the point that is stationary when a movement trial in which the joint had modest range of motion about all three axes of rotation is performed. This movement should have sufficient range of motion that the computation statistics produce a reasonable stationary point, but the range of motion should not be too large because of soft tissue artefacts. The z-axis of the shank is drawn as the extension from the line between the origin and the center of the malleoli markers and oriented cranially. The y-axis is drawn orthogonally on the longitudinal axis and the mean orientation of the projection of the lines between the knee markers and the malleoli markers on a perpendicular plane with the z-axis. The x-axis is drawn orthogonal to the y-z plane and oriented to the right. The shank is tracked by 4 markers on a plate halfway on the shank.

The origin of the **foot segment** coordinate system is centered between the malleoli markers. The y-axis is drawn between the origin and the center of the first and fifth metatarsal markers and oriented anteriorly. The x-axis is drawn orthogonally to the y-axis and parallel with the line through the metatarsal markers and oriented to the right. The z-axis is drawn orthogonal to the y-z plane and oriented cranially. The foot is tracked by the markers on the bases of the metatarsals and by the calcaneus marker.

The **pelvis segment** was created based on the CODA segment type in visual3D. R.ASIS was defined as the spina iliaca anterior superior (right), L.ASIS as the spina iliaca anterior superior (left), R.PSIS as the spina iliaca posterior superior (right) and L.PSIS as the spina iliaca posterior superior (left).

All joint angles and joint moments were calculated using a XYZ cardan sequence (X = sagittal; Y = frontal plane rotations; Z = transverse plane rotations) with the proximal segment as reference segment.