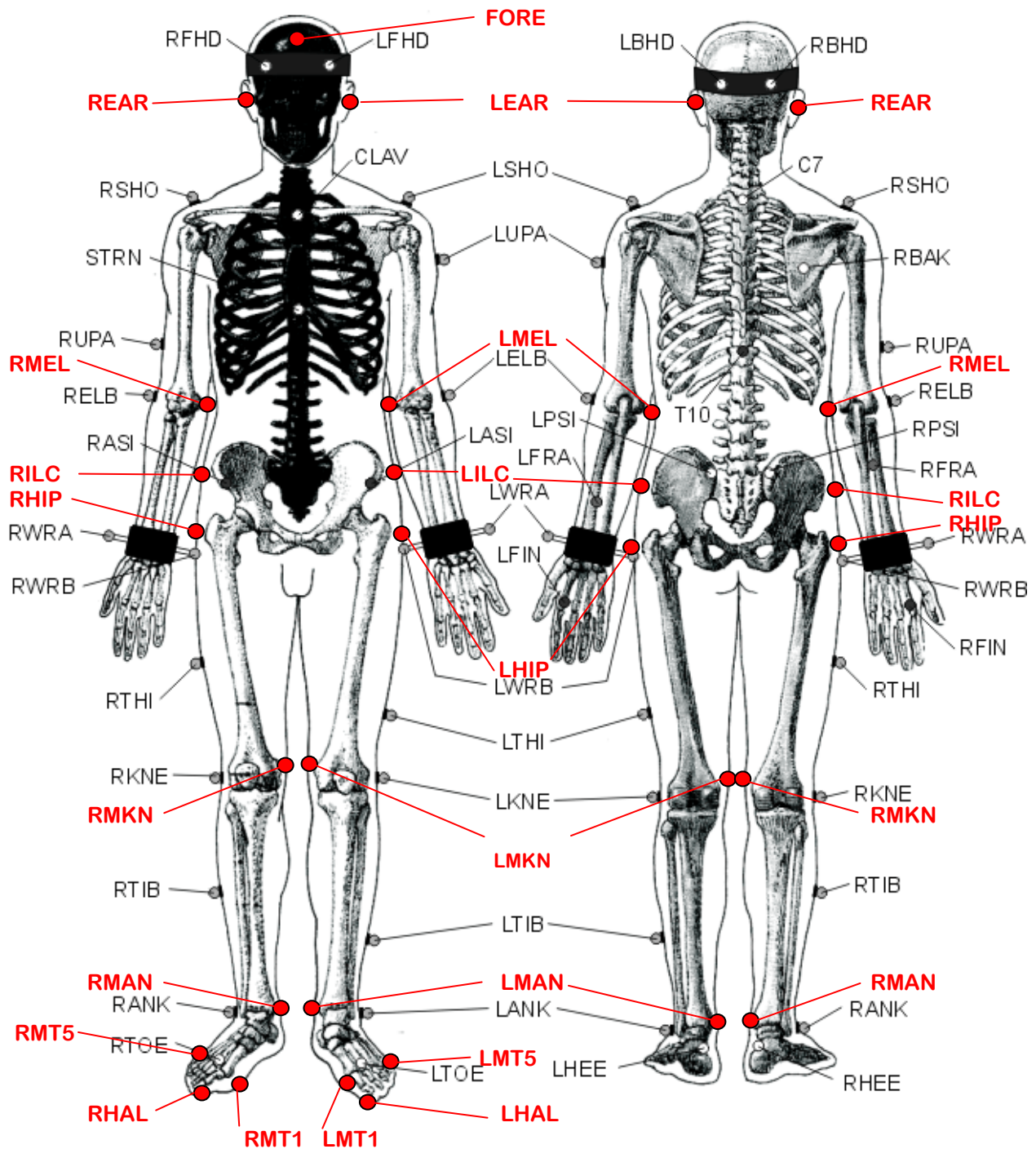


uOttawa Marker Placement



Red ● markers are additional for use by uOttawa Gait lab.

The following describes in detail where the markers should be placed on the subject. Where left side markers only are listed, the positioning is identical for the right side. Markers defined in grey are not normally used.

Upper Body

Head Markers

LFHD	Left front head	Located approximately over the left temple
RFHD	Right front head	Located approximately over the right temple
LBHD	Left back head	Placed on the back of the head, roughly in a horizontal plane of the front head markers
RBHD	Right back head	Placed on the back of the head, roughly in a horizontal plane of the front head markers
FORE	Forehead	Middle anterior aspect of forehead
LEAR	Left ear	Left ear canal
REAR	Right ear	Right ear canal

The markers over the temples define the origin, and the scale of the head. The rear markers define its orientation. If they cannot be placed level with the front markers, and the head is level in the static trial, tick the “Head Level” check box under options on “Run static model” in the pipeline when processing the static trial. Many users buy a headband and permanently attach markers to it.

Torso Markers

C7	7 th Cervical vertebrae	Spinous process of the 7th cervical vertebrae
T10	10 th thoracic vertebrae	Spinous Process of the 10th thoracic vertebrae
CLAV	Clavicle	Jugular notch where the clavicles meet the sternum
STRN	Sternum	Xiphoid process of the sternum
RBAK	Right back	Place in the middle of the right scapula. This marker has no symmetrical marker on the left side. This asymmetry helps the auto-labeling routine determine right from left on the subject.

C7, T10, CLAV, STRN define a plane hence their lateral positioning is most important.

Arm Markers

LSHO	Left shoulder	Placed on the acromioclavicular joint
LUPA	Left upper arm marker	Place on the upper arm between the elbow and shoulder markers. Should be placed asymmetrically with RUPA
LELB	Left elbow	Place on lateral epicondyle approximating elbow joint axis
LMEL	Left medial elbow	Place on medial epicondyle approximating elbow joint axis
LFRA	Left forearm marker	Place on the lower arm between the wrist and elbow markers. Should be placed asymmetrically with RFRA
LWRA	Left wrist marker A	Left wrist bar thumb side
LWRB	Left wrist marker B	Left wrist bar pinkie side

The wrist markers are placed at the ends of a bar attached symmetrically with a wristband on the posterior of the wrist, as close to the wrist joint center as possible.

LFIN	Left fingers	Actually placed on the dorsum of the hand just below the head of the second metacarpal
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Lower Body

Pelvis

LASI	Left ASIS	Place directly over the left anterior superior iliac spine
RASI	Right ASIS	Place directly over the right anterior superior iliac spine

The above markers may need to be placed medially to the ASIS to get the marker to the correct position due to the curvature of the abdomen. In some patients, especially those who are obese, the markers either cannot be placed exactly anterior to the ASIS, or are invisible in this position to cameras. In these cases, move each marker laterally by an equal amount, along the ASIS-ASIS axis. The true inter-ASIS distance must then be recorded and entered on the subject parameters form. These markers, together with the sacral marker or LPSI and RPSI markers, define the pelvic axes.

LPSI	Left PSIS	Place directly over the left posterior superior iliac spine
RPSI	Right PSIS	Place directly over the right posterior superior iliac spine

LPSI and RPSI markers are placed on the slight bony prominences that can be felt immediately below the dimples (sacroiliac joints), at the point where the spine joins the pelvis.

SACR	Sacral wand marker	Place on the skin mid-way between the posterior superior iliac spines (PSIS). An alternative to LPSI and RPSI.
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SACR may be used as an alternative to the LPSI and RPSI markers to overcome the problem of losing visibility of the sacral marker (if this occurs), the standard marker kit contains a base plate and selection of short “sticks” or “wands” to allow the marker to be extended away from the body, if necessary. In this case, it must be positioned to lie in the plane formed by the ASIS and PSIS points.

LILC	Left iliac crest	Place on the mid-superior aspect of the left iliac crest
RILC	Right iliac crest	Place on the mid-superior aspect of the right iliac crest

Use **LILC and RILC as alternative to the above-mentioned pelvic markers**. These markers require right and left hip markers to fully define the pelvis.

Leg Markers

LKNE	Left knee	Place on the lateral epicondyle of the left knee
LMKN	Left medial knee	Place on the medial epicondyle of the left knee

To locate the “precise” point for the knee marker placement, passively flex and extend the knee a little while watching the skin surface on the lateral aspect of the knee joint. Identify where knee joint axis passes through the lateral side of the knee by finding the lateral skin surface that comes closest to remaining fixed in the thigh. This landmark should also be the point about which the lower leg appears to rotate. Mark this point with a pen. With an adult patient standing, this pen mark should be about 1.5 cm above the joint line, mid-way between the front and back of the joint. Attach the marker at this point.

LTHI	Left thigh	Place the marker over the lower lateral 1/3 surface of the thigh, just below the swing of the hand, although the height is not critical.
LHIP	Left hip	Superior aspect of greater trochanter

The thigh markers are used to calculate the knee flexion axis location and orientation. Place the marker over the lower lateral 1/3 surface of the thigh, just below the swing of the hand, although the height is not critical. The anteroposterior placement of the marker is critical for correct alignment of the knee flexion axis. Try to keep the thigh marker off the belly of the muscle, but place the thigh marker at least two marker diameters proximal of the knee marker. Adjust the position of the marker so that it is aligned in the plane that contains the hip and knee joint centers and the knee flexion/extension axis. There is also another method that uses a mirror to align this marker, allowing the operator to better judge the positioning.

LANK	Left ankle	Place on the lateral malleolus along an imaginary line that passes through the transmalleolar axis
LMAN	Left medial ankle	Place on the medial malleolus
LTIB	Left tibial wand marker	Similar to the thigh markers, these are placed over the lower 1/3 of the shank to determine the alignment of the ankle flexion axis

The tibial marker should lie in the plane that contains the knee and ankle joint centers and the ankle flexion/extension axis. In a normal subject the ankle joint axis, between the medial and lateral malleoli, is externally rotated by between 5 and 15 degrees with respect to the knee flexion axis. The placements of the shank markers should reflect this.

Foot Markers

LTOE	Left toe	Place over the second metatarsal head, on the mid-foot side of the equinus break between fore-foot and mid-foot
LHEE	Left heel	Place on the calcaneus at the same height above the plantar surface of the foot as the toe marker
LHAL	Left hallux	Anterior surface of left hallux (big toe)
LMT1	Left metatarsal 1	Medial aspect of head of left metatarsal one
LMT5	Left metatarsal 5	Lateral aspect of head of left metatarsal five