

Supplementary File- Inclusion/ Exclusion Criteria

All Subjects Exclusion Criteria

Subjective (Exclude if yes to any one of the following)	
History of musculoskeletal surgery	Yes
History of traumatic knee dislocation	No
Neurological symptoms affecting gait	
Objective (Exclude if positive tests for any one of the following)	
Leg length discrepancy: ASIS to Medial Maleoli >1cm Hip: Impingement Signs: FABERS FAIR Knee Meniscus: McMurrays test Apleys Grind Test Knee Ligaments: Varus stress test Valgus stress test Lachmans Anterior draw test Posterior Draw test Ankle: Posterior Impingement Signs Tibia: Shin Oedema Compression of Tibial Body	Positive Negative

Patellofemoral Pain Syndrome Inclusion/ Exclusion

Inclusion	
History Insidious onset during running	Yes
Symptoms Peripatella or retropatella pain Minimum Pain Running 3/10 NRS Begins the run pain free Minimum 3 month history Pain with running and any one of the following activities: Stairs Squatting Rising from sitting Jumping	Yes
Objective Pain with any one of the following: Patella compression Patella apprehension (Clarks test) Palpation lateral patella facet Isometric quadricep contraction (30 knee flexion)	Yes
Exclusion	
Symptoms Onset following trauma Constant unremitting pain Onset due to participation in any other sporting activity	Yes No
Objective (See All Exclusion Criteria)	

Iliotibial Band Syndrome Inclusion/Exclusion

Inclusion	
History Insidious onset during running	Yes
Symptoms Lateral Knee Pain Minimum Pain Running 3/10 NRS Begins the run pain free Minimum 3 month history Pain eases after cessation of running	Yes
Objective Nobles Compression Test Pain on palpation of lateral femoral condyle	Yes
Exclusion	
Symptoms Onset following trauma Constant unremitting pain Onset due to participation in any other sporting activity (Also see all exclusion criteria)	No
Objective (See All Exclusion Criteria)	

Medial Tibial Stress Syndrome Inclusion/Exclusion

Inclusion	
History Insidious onset during running	Yes
Symptoms Distal medial shin pain Minimum Pain Running 3/10 NRS Begins the run pain free Minimum 3 month history Pain eases after cessation of running	Yes
Objective Shin palpation test: Pain on palpation of the medial ridge of the tibia at the insertion of the tibialis posterior and medial fibres of the soleus	Yes
Exclusion	
Symptoms Onset following trauma Constant unremitting pain Onset due to participation in any other sporting activity Sensation of cramping, burning or pins and needles (Also see all exclusion criteria)	No
Objective (See All Exclusion Criteria)	

Achilles Tendinopathy Inclusion/ Exclusion

Inclusion	
History Insidious onset during running	Yes
Symptoms Mid portion achilles pain 2 – 5 cm above insertion at calcaneus Minimum Pain Running 3/10 NRS at beginning Pain eases into running Minimum 3 month history Morning stiffness easing with movement	Yes
Objective Pain on palpation of mid portion of achilles (2cm to 5cm above calcaneus) Pain on hopping	Yes
Exclusion	
Symptoms Onset following trauma Constant unremitting pain Posterior ankle impingement signs Positive Thompson test for AT rupture Onset due to participation in any other sporting activity (Also see all exclusion criteria)	No
Objective (See All Exclusion Criteria)	

Supplementary File – Marker Placement

Anatomical and tracking markers

Kinematic data were collected from subjects from the trunk, lumbar spine, pelvis, thigh, shank and foot using 15mm retroreflective markers.

Trunk

To track the trunk a rigid plate with three attached non collinear markers was attached to the sternum of each subject. The anatomical reference frame was defined using markers attached to C7, the sixth thoracic vertebrae (T6), the suprasternal notch and the xiphoid process (Figure 1).

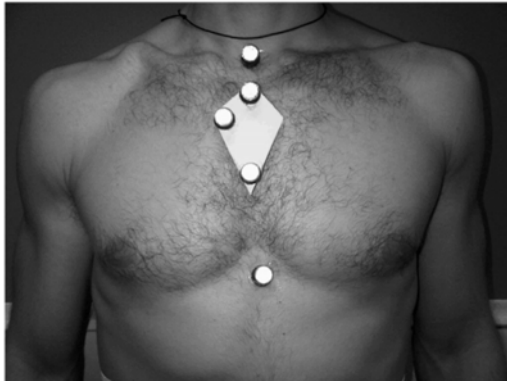


Figure 1: Image of the markers used to track the thoracic spine during running.

Lumbar spine

In order to track the lumbar spine elasticon bandage was wrapped around the lumbar region in order to reduce soft tissue artefact associated with skin based marker placement. To track the lumbar spine four markers were attached to the spine around the central reference markers. Anatomical reference markers were placed over the lumbar spine at the T12-L1 joint space, L5-S1 joint space and midway between these two (Figure 2).



Figure 2: Image of the markers used to track lumbar spine during running.

Pelvis

The pelvis segment was defined and tracked using markers placed over the anterior superior iliac spines and the posterior superior iliac spines.

Hip & Knee

The hip and knee segments were tracked using rigid cluster plates with four non collinear markers attached to the lateral shank and thigh. Anatomical reference markers were attached bilaterally to the lateral and medial knee epicondyles and greater trochanters.

Ankle

The ankle segment was tracked using markers attached to the shoe over the calcaneus, first and fifth and second metatarsal heads. Anatomical reference markers were attached bilaterally to the medial and lateral malleoli.

Rearfoot

An additional two markers were placed on the rear of the shoe, along with the calcaneus marker, to form an inverted L shape. This was used to track the frontal plane motion of the rearfoot. Anatomical reference markers included bilateral medial and lateral malleoli.

Anatomical Coordinate Frame

Anatomical coordinate frames were constructed in the following manor:

Trunk

A z- axis was defined as the line connecting the midpoint between the PX and T6 and the midpoint between IJ and C7 and pointing upwards. The X – axis was defined as the line perpendicular to the plane formed by IJ, C7 and the midpoint between PX and T6 pointing right. The Y- axis was defined as the common perpendicular to the Z and X axis pointing forward.

Lumbar

Lumbar frame was aligned with the pelvic frame. The origin positioned 5% from the L5-S1 marker to the pelvic origin.

Hip, knee, ankle and rearfoot

The z axis pointed upwards and was aligned with the long axis of the femur. This was defined from the hip joint centre. The X axis pointed right and was perpendicular to the Z axis and in the plane containing the knee epicondyles and hip joint centre and the Y axis defined as the common perpendicular. The shank coordinate frame was defined using the knee epicondyles and ankle malleoli. The ankle segment was defined from the ankle malleoli and the markers on the first and fifth metatarsal heads and the rearfoot was defined using markers on the medial and lateral malleoli.