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Salford Running Performance Clinic

Gait Analysis Report

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Gait Analysis Report

Name: **Mr A N Other**	Age:
Weight:	Height:
Assessment Type: **Treadmill**	Running speed: **20 Km/h**
Clinical history: **L side chronic Achilles Tendinopathy.**	
Assessor: **Chris Bramah (BSc, MSc Physiotherapy, CSP registered)**	

About The Report

At the Running Performance Clinic we aim to give you a whole new understanding of the way you run and to provide you with a personalised training programme which will help you to improve your running style. In order to devise this programme we perform a full 3D motion analysis of your running gait and also carry out a clinical assessment of strength, flexibility and movement control. The results of both of these assessments are compared to our database of elite athletes and this allows us to identify aspects of your running gait which may predispose you to injury or reduce your running performance.

The following pages detail both our biomechanical and clinical findings, with each page dealing with a different aspect of your running gait. For each of these different aspects, we first give you an explanation of the biomechanical characteristics which are important and then provide series of boxes which illustrate how your characteristics compare to our database of elite endurance runners. At the end of each page we summarise the biomechanical findings and relate these to the results of the clinical assessment.

On the first page of the report are a set of recommendations which have been devised by a qualified physiotherapist after careful consideration of the biomechanical and clinical findings. These recommendations form the basis of an individualised training programme which incorporates very specific exercises and running drills. The physiotherapist will go through these exercises/drills with you on the day of your assessment.

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Recommendations

- **Recommendation 1:** Reduced rotation of the thorax, lumbar spine and pelvis towards the right side during left foot contact

  The reduced rotation towards the right side may reduce the pelvic recoil and forward momentum. Consequently the left side lower limbs may be required to generate more force for forward propulsion.

  This may be due to the following factors:
  - Reduced right posterior arm drive
  - Right side anterior shoulder restriction
  - Reduced right side spine rotation mobility

  Therefore it is recommended that you:
  - Work with your physiotherapist who will use mobilisation techniques to increase spine rotation mobility and reduce shoulder restriction
  - Perform thorax mobility exercises, such as the thoracic windmill
  - Focus on correct arm movement when running. The hands should come up no higher than shoulder height and then back level with the hip. The arms should also move in a forward and backward direction.

- **Recommendation 2:** There was increased total dorsiflexion of both ankles which may put excess stretch on the Achilles Tendon. Consequently drills encouraging ankle stiffness would be recommended. These include:
  - Bunny hops
  - Single leg bounds aiming for fast reaction off the floor

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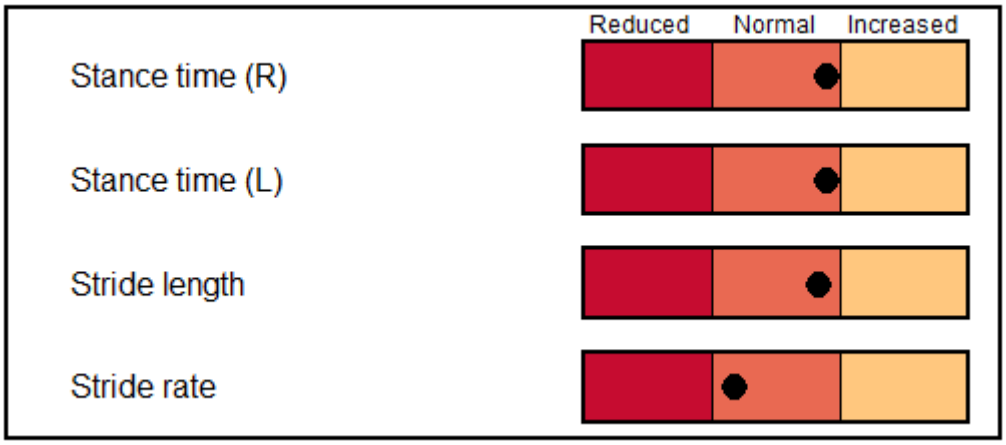
Summary gait characteristics

Explanation of summary gait characteristics:

Stance time refers to the amount of time your foot is in contact with the ground during running and our research shows that elite runners tend to run with a relatively short contact time, spending more time in the air.



Findings:

- Patterns within normal limits

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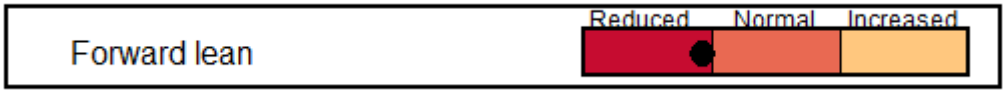
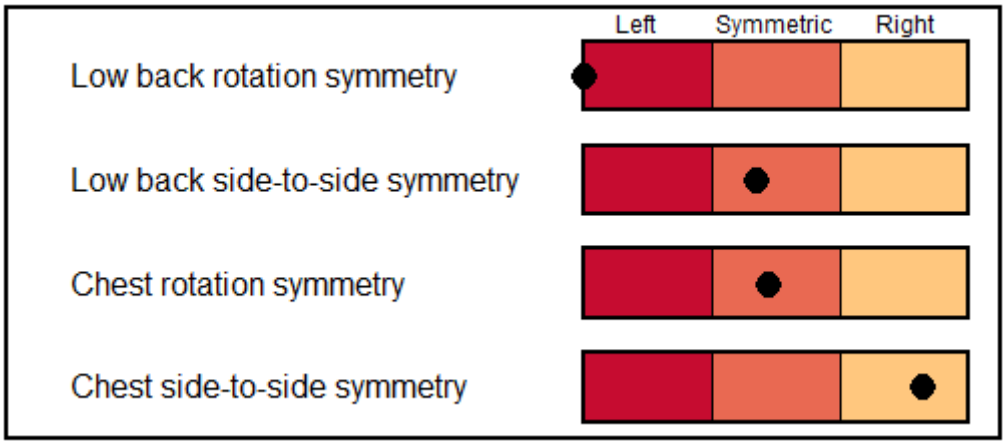
Spinal Motion

Explanation of spinal motion:

Forward lean refers to the inclination of your chest as you run. If this is increased then you are effectively leaning forward too far. The other measures capture the symmetry of movement of either low back or chest. By rotation symmetry we refer to the twisting around the middle of your body which happens as you run, whereas side-to-side symmetry refers to the slight tilting to the left and right which also occurs as you run.





Findings:

- Increased time in left side flexion during left stance. Side flexion to one side has the effect of moving the vertical ground reaction force lateral to the knee which can increase inward movement of the knee. The increased left side flexion may be due to:

  1) reduced hip & lateral trunk strength causing an inability to control the opposite side of the pelvis – this results in a compensatory trunk lean or
  2) weak adductors leading to an inability to control the outward movement of the knee

- Reduced rotation towards the right side of both the thorax (5^{o}), lumbar spine (10^{o}) and pelvis (10^{o}) (this is discussed in pelvic section below)

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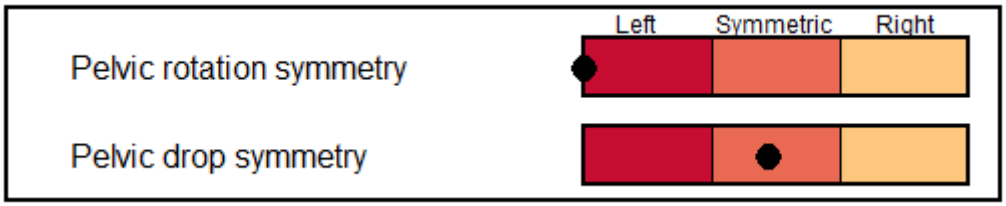
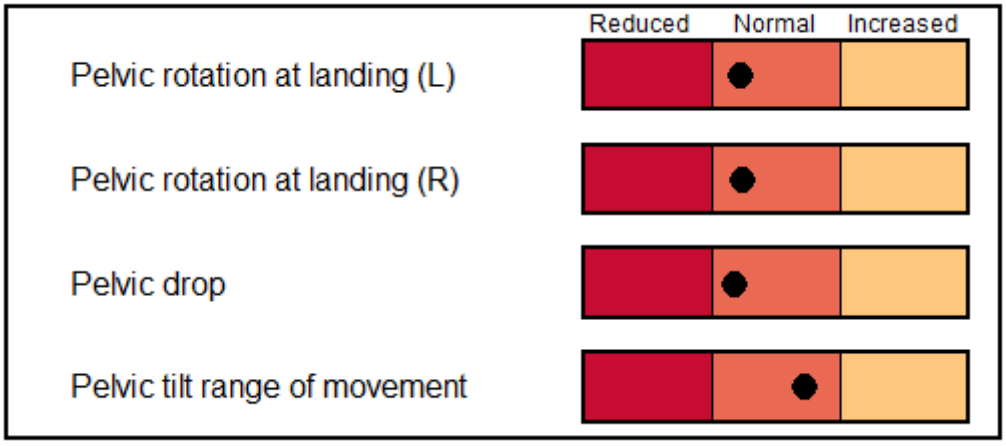
Pelvic Motion

Explanation of pelvic motion:

Pelvic rotation refers to the rotational movement of the pelvis around the midline of the body which happens during running. Our research shows that elite athletes have only a small degree of pelvic rotation as their foot contacts the ground. Pelvic drop refers to the leftward and then rightwards drop of your pelvis which occurs as you run. If this drop is too large then it may indicate weakness in the hip muscles. Pelvic tilt refers to the rotation of the pelvis about a line through both hip joints. Again too much of this movement may indicate weakness of the hip or core muscles.





Findings:

- Increased rotation towards the left stance limb and reduced right sided rotation at left toe off. The reduced rotation towards the right side may reduce the pelvic recoil and forward momentum. Consequently the left leg may be required to generate more force for forward propulsion. Potential factors contributing to the reduced right sided rotation include:

  1) Reduced rotational core strength (internal and external obliques)
  2) Abnormal function of the posterior chain muscles, lat. dorsi & glut. max
  3) Right side anterior shoulder restriction
  4) Lack of right side lumbar spine rotation mobility

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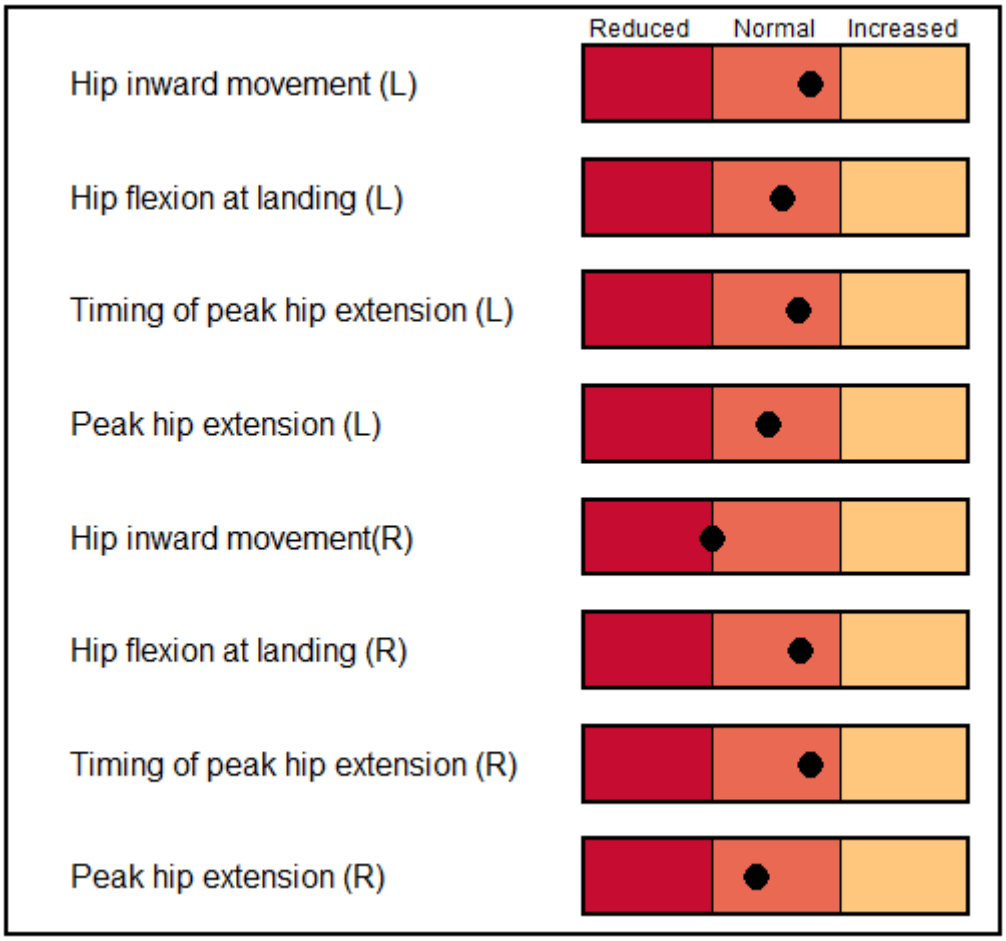
Hip Motion

Explanation of hip motion:

As your leg contacts the ground your hip is flexed, bringing your knee in front of your body. However, the maximum degree of hip flexion occurs as your leg swings through, just before landing. Once your foot is in contact with the ground, the hip extends, reaching peak hip extension just before your foot leaves the ground.



Findings:

- Peak hip inward movement (adduction) was reduced on the right. This coincides with reduced inward knee rotation. Although this is not contributing to current injury problems, on clinical examination it was noted that there was restricted medial rotation of the right hip and this may therefore warrant future monitoring.

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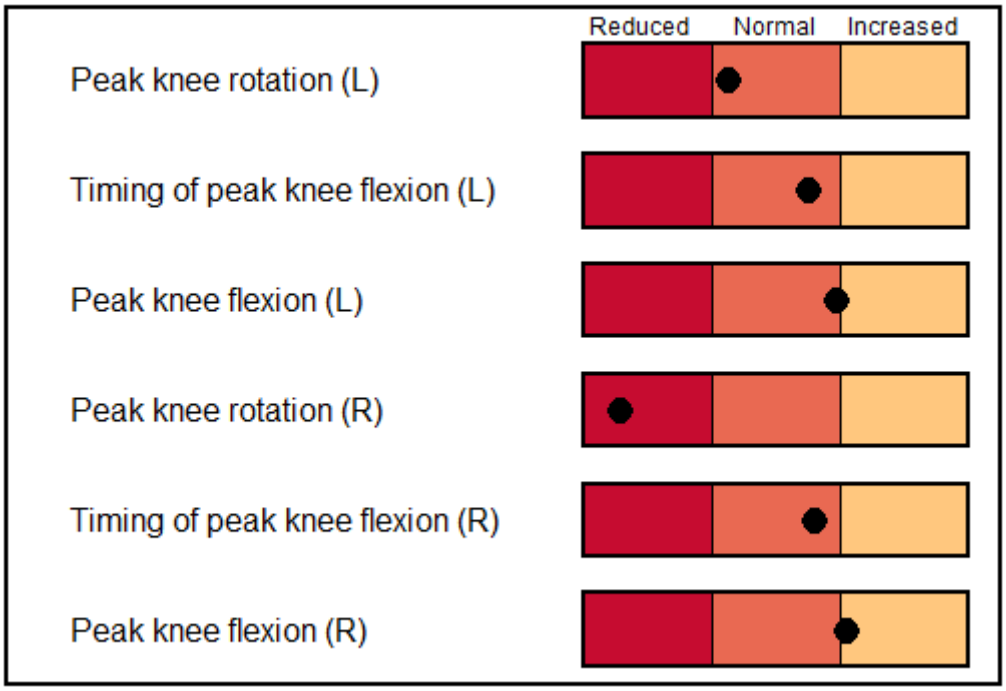
Knee Motion

Explanation of knee motion:

Your knee starts to bend (or flex) as soon as your foot lands on the ground. This flexing continues to a maximum midway through stance, after which the knee straightens. During the early part of stance there is also rotation of the knee about an axis along the length of the leg. This rotation happens in response to the pronation of the foot and corresponding internal rotation of the lower leg. Too much internal rotation of the knee may indicate excessive internal rotation of the tibia and be linked to foot pronation.



Findings:

- Left knee lands in greater internal rotation at contact and is in greater internal rotation at midstance when compared to the right knee (contact: left 2^{o} right -9^{o} mid stance: left 17^{o} right 2^{o}) however this appears to be within normal limits.
- It is worth noting that hip abduction strength and external rotation strength was symmetrical but was lower than values in our database (clam: 56LBs v 70LBs Abduction: 56LBs v 71LBs)

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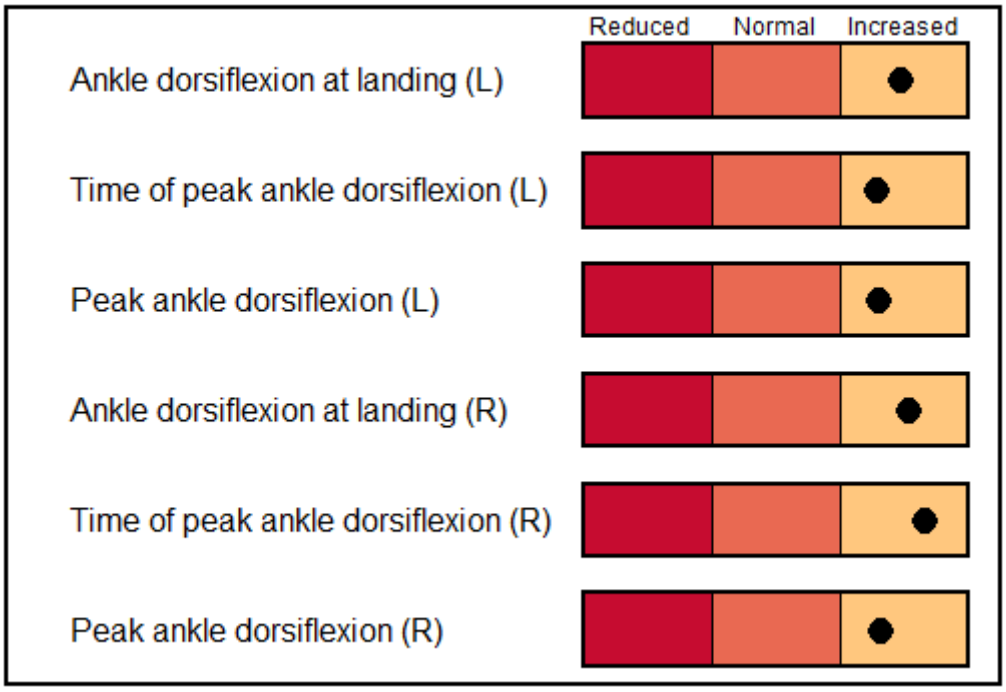
Ankle Motion

Explanation of ankle motion:

The ankle functions in a similar way to the knee, bending (or dorsiflexing) during the first half of stance and then extending during the latter part.



Findings:

- Increased dorsiflexion throughout. The increased dorsiflexion at landing is due to foot contact position (being heel strike).
- The increased total dorsiflexion may put excess stretch on the Achilles Tendon and therefore drills encouraging ankle stiffness would be recommended.
- On clinical examination the right ankle demonstrated excessive passive dorsiflexion compared to our database (38.4° v database average of 33°) whereas the left ankle demonstrated dorsiflexion within normal limits (32.6°).

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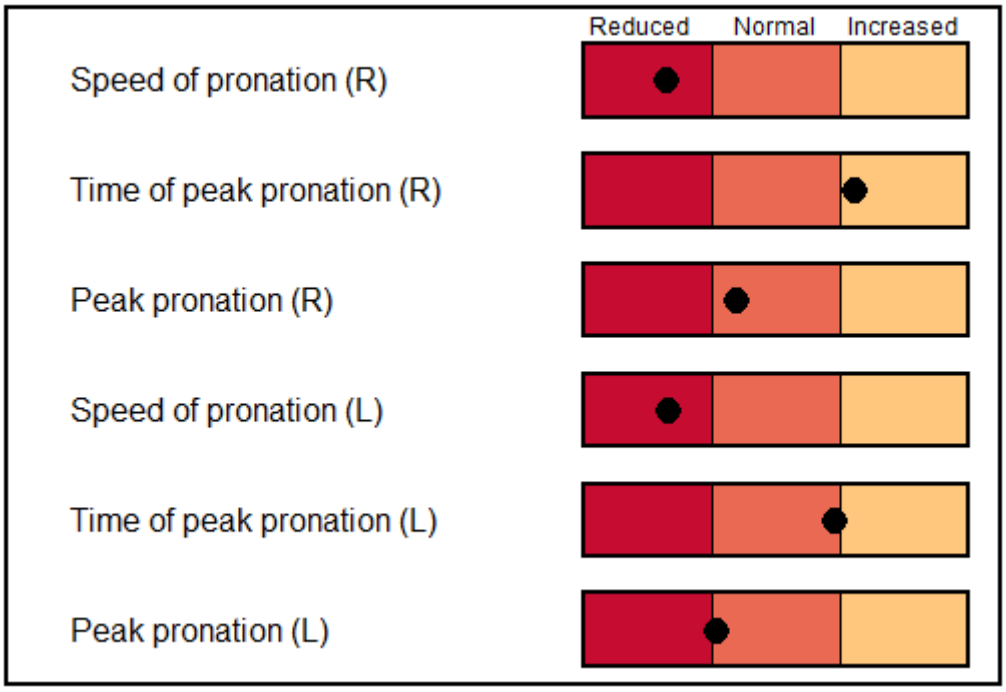
Foot Motion

Explanation of foot motion:

As your foot contact there is an inward rotation of the heel which is associated with a pronation movement (arch collapse) of the whole foot. This pronation movement is a normal response which acts to reduce impact forces. However, in some people it there is either excessive pronation movement or an excessively fast pronation and this can lead to a range of injuries, including knee and ankle pain.



Findings:

- Peak pronation was relatively reduced on the left foot. Although this was not of clinical concern it may be worth monitoring foot mobility.
- All other values were not of clinical concern as they are coordinated with the motion of the hip and knee