Biomechanical Assessment Report

Assessment Data Overview

Range of Motion Assessment

Ankle/Foot Range of Motion

Movement	Left	Right	Gold Standard	Left %	Right %	Asymmetry %
Dorsiflexion Range	18.0°	17.1°	**30°**	60%	57%	5.0%
Plantarflexion Range	166.7°	163.3°	**165°**	101%	99%	2.0%

Knee Range of Motion

Movement	Left	Right	Gold Standard	Left %	Right %	Asymmetry %
Flexion Range	129.6°	131.2°	**160°**	81%	82%	1.2%
Extension Range	175.1°	175.1°	**170°**	103%	103%	0.0%

Hip Range of Motion

Movement	Left	Right	Gold Standard	Left %	Right %	Asymmetry %
Flexion Range	128°	128°	**90°**	142.2%	142.2%	0.0%
Extension Range	70°	70°	**30°**	233.3%	233.3%	0.0%
Abduction Range	75°	82°	**55°**	136.4%	149.1%	8.5%
Adduction Range	100°	100°	**35°**	285.7%	285.7%	0.0%
Ext Rotation Range	118°	113°	**45°**	262.2%	251.1%	4.2%
Int Rotation Range	73°	75°	**40°**	182.5%	187.5%	2.7%

Shoulder Range of Motion

Movement	Left	Right	Gold Standard	Left %	Right %	Asymmetry %
Ext Rotation Range	111°	118°	**90°**	123.3%	131.1%	5.9%
Int Rotation Range	87°	73°	**70°**	124.3%	104.3%	16.1%
Flexion Range	100°	100°	**180°**	55.6%	55.6%	0.0%
Extension Range	*unavailable data°*	*unavailable data°*	**60°**	0%	0%	0%

Force Production Assessment

Ankle/Foot Force Production

Movement	Left	Right	Left %	Right %	Asymmetry %
Dorsiflexion Force	0.2	0.2	66%	66%	0.0%
Plantarflexion Force	0.9	1.0	61%	69%	10.0%

Knee Force Production

Movement	Left	Right	Left %	Right %	Asymmetry %
Flexion Force	1.0	1.0	54%	57%	5.3%
Extension Force	2.3	2.5	76%	84%	9.5%
Hamstring/Quad Ratio	0.0	0.0	0.44204851752021557%	0.4121951219512195%	6.8%

Hip Force Production

85

Movement	Left	Right	Left %	Right %	Asymmetry %
Flexion Force	29	33	1933.3%	2200.0%	12.1%
Extension Force	89	85	3560.0%	3400.0%	4.5%
Abduction Force	46	73	3833.3%	6083.3%	37.0%
Adduction Force	81		10125.0%	10625.0%	4.7%
Ext Rotation Force	51	12	8500.0%	2000.0%	76.5%
Int Rotation Force	79	71	15800.0%	14200.0%	10.1%

Shoulder Force Production

unavailable data

Movement	Left	Right	Left %	Right %	Asymmetry %
Ext Rotation Force	*unavailable data*	*unavailable data*	0%	0%	0%
Int Rotation Force	*unavailable data*		0%	0%	0%
Flexion Force	*unavailable data*	*unavailable data*	0%	0%	0%
I ISO	84	89	33600.0%	35600.0%	5.6%
Y ISO	60	55	20000.0%	18333.3%	8.3%
T ISO	29	65	10357.1%	23214.3%	55.4%

Ribcage/Thoracic Assessment

Increased Reduced

Measurement	Value	Gold Standard	Percentage	Status
Thoracic Curvature	37.0°	**30-35°**	113.8%	
Lumbar Curvature	27.0°	**30-35°**	83.1%	
Forward Head Posture	2.7 cm	**0-3 cm**	100%	**Normal**

Posture Assessment

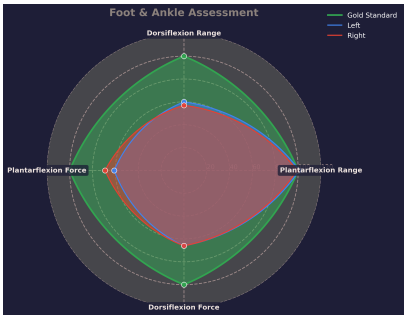
From the postural assessment we found some positive results as well as some areas we could concentrate on for improvement.
Your forward head posture was measured at 2.7cm (normal is deemed 0-3cm). Your thoracic (upper back) curvature was above our gold standard range, you measured 37.0 degrees, normal is considered 30-35. We saw a reduced curvature in your lumbar spine, you measured 27.0 degrees with normal being considered 30-35.

These readings indicate you have a forward head posture. So where your thoracic curvature is increased we could expect increased levels of force and tension being applied to the discs and muscles of your cervical and thoracic spine (neck and upper back). A reduced curve in your lumbar spine (lower back) this can be associated with worse force absorption and transference and therefore increased loading through the joints of the spine.

You were able to rotate your spine 46.0 degrees to the left and 50.0 degrees to the right, and could laterally flex (side bend) 38.0 degrees to the left and 37.0 degrees to the right.

The angle of pelvic tilt in quiet standing describes the orientation of the pelvis in the sagittal plane. It is determined by the muscular and ligamentous forces that act between the pelvis and adjacent segments. You were 6.0 (left) and 6.0 (right), normal is 7-10 degrees for females, showing your posterior tilt and matches the findings of a reduced lumbar curvature as the lumbar spine directly articulates with the sacrum and its joints with the pelvis.

Ankle Assessment



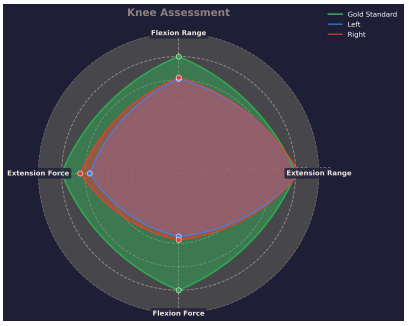
1. The Left foot: Your left rear foot had a centre of mass over the 2nd metatarsal which demonstrates you naturally stand in a neutral position. With your ankle in a state of dorsiflexion (knees over toes) you could pronate the leg but there was little to no movement at the mid foot to promote this. You were not able to supinate very effectively as there was little translation of this through your medial arch. Your left ankle had poor range and strength in dorsiflexion, with plantarflexion being good but weak.
2. The Right foot: Your right foot was very similar to the left but could pronate slightly better. The right foot had similarly poor range of motion in dorsiflexion.
3. Foot and Ankle summary: Asymmetry is present in your foot and ankle function, with both feet having poor dorsiflexion range and strength. What was most notable was your inability to effectively articulate the bones of the mid-foot. There is a lack of movement and control through the fascia on the sole of the foot. Subconscious movement (not controlled gym based movement but more dynamic gait cycle movements) should be introduced along with motion to promote lengthening of the tissues in your foot. In order to generate force or contract, we must first lengthen the tissue through articulation.

Knee Assessment

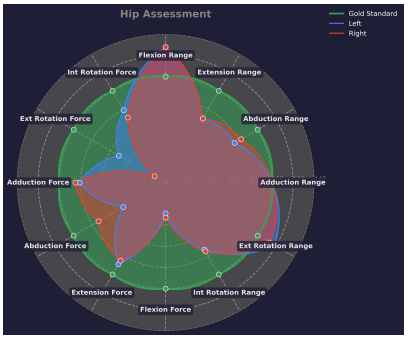
The Left knee achieved good range, 19% below our gold standard in flexion (distal hamstring), and was 3% above our gold standard in extension (distal quadriceps). Your left knee was surprisingly weak, both in flexion (distal hamstrings) and extension (quadriceps) and your knee extension needs to improve first to increase your hamstring to quad ratio.

The Right knee had near identical range to the left. While the right knee flexion was stronger, your right knee extension was considerably stronger so your hamstring to quadriceps ratio was worse on the right.

Knee summary: There is some good range available at the knee in extension but there needs to be a large focus on flexion. We would like to improve the flexion peak force in order to increase your hamstring to quadriceps ratio as well as building some tolerance in left knee extension.



Hip Assessment



The Left hip showed great range of motion in flexion but large strength deficits in all movements except extension, affecting force production and movement patterns. The right side showed similar range of motion to the left side but with a notable reduction in force production in flexion and abduction.

Hip summary: Significant reduction in hip extension range of motion compromises pelvic stability. Hip extension helps stabilise the pelvis and when range of motion and strength are poor this influences proper alignment of the lower limb. Hip extension strength is essential for propulsion and preventing excessive back extension, leading to inefficient movement patterns and increased injury risk.

Large deficits in external rotation strength affect functional capacity. External rotation in closed & open-chain movements plays important roles in squatting and deadlifting activities. Having range and strength here is vital for maintaining hip joint integrity and stability. The flexor mechanism also plays a role in force transmission from hip muscles to the lower limb and ultimately to the ground. Optimising external rotation mechanics will allow for more efficient energy transfer during both closed and open-chain movements. It's necessary to reduce the current asymmetry present at the hip.

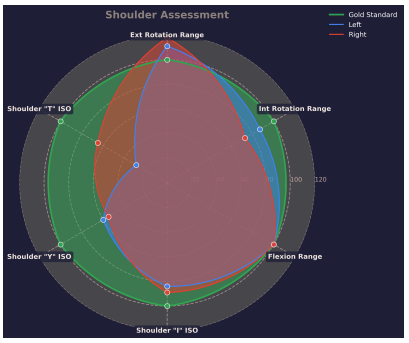
The large deficits in internal rotation range of motion on the left side suggest joint restrictions limiting optimal positioning during functional movements. Combined with external rotation strength deficits, this creates movement pattern dysfunction that compromises hip joint integrity and energy transfer. The flexor mechanism also plays a role in force transmission from hip muscles to the lower limb. Optimising internal rotation mechanics will improve energy transfer during both closed and open-chain movements. It's necessary to reduce the current deficiencies present at the hip.

Shoulder Assessment

The Left Shoulder had great range in external rotation and internal rotation, with a slight bias towards external rotation. However, the left shoulder was notably weaker in all isometric positions (Shoulder "I", Shoulder "Y", and Shoulder "T") compared to the right. This demonstrates a dominance in the deltoids, rotator cuff muscles, and scapula on the right side.

The Right Shoulder had greater external rotation but less internal rotation when compared to the left. The right shoulder was stronger in internal rotation but significantly weaker in all isometric positions (Shoulder "I", Shoulder "Y", and Shoulder "T") when compared to the left. This highlights a dominance in your transverse plane range on the right, but a reliance on the serratus anterior, rhomboids, and latissimus dorsi on the left for isometric stability and strength.

Shoulder Summary: Our testing highlighted some clear differences in how your shoulder complex produces force through different planes on each side. There is a large reliance on the latissimus dorsi on the right and the deltoids and rotator cuff muscles on the left for isometric stability and strength. Your programming should bias unilateral movements to target these asymmetries while progressively overloading the areas of weakness, which are different on each side. Additionally, it would be beneficial to focus on soft tissue work and scapula mobility to improve the range and function of the left shoulder.



Note: *All values are normalized to the patient's body weight and compared to gold-standard ranges. Range measurements are in degrees, force measurements are relative to body weight. "Unavailable data" indicates measurements that could not be obtained during the assessment. Asymmetry percentages: Green (0-10%), Yellow (11-20%), Red (>20%)*