

BRICK PERFORMANCE

BIOMECHANICAL ASSESSMENT

Name: **Sarah Laws**

Range of Motion

When we consider range of motion, we are looking at asymmetries and deficiencies, but also how the length tension relationship affects the bone in the joint. Our gold standards are taken from various papers and research. We expect some variation from gold standard (up to 15%) but the data suggests that the closer you are to the gold standards, the less stress on the joint.

Ankle

Movement	Left	Right	Gold Standard	Left %	Right %	Asymmetry %
Dorsiflexion Range	18°	17°	30°	60%	57%	5.0%
Plantarflexion Range	167°	163°	165°	101%	99%	2.0%

Knee

Movement	Left	Right	Gold Standard	Left %	Right %	Asymmetry %
Flexion Range	130°	131°	160°	81%	82%	1.2%
Extension Range	175°	175°	170°	103%	103%	0.0%

Ribcage

Movement	Left	Right	Gold Standard	Left %	Right %	Asymmetry %
Ribcage Rotation	46°	50°	45°	61%	67%	8.0%
Ribcage Flexion	38°	37°	30°	69%	67%	2.6%

Hip

Movement	Left	Right	Gold Standard	Left %	Right %	Asymmetry %
Flexion Range	115°	115°	90°	128%	128%	0.0%
Extension Range	21°	21°	30°	70%	70%	0.0%
Abduction Range	41°	45°	55°	75%	82%	8.6%
Adduction Range	35°	35°	35°	100%	100%	0.0%
Ext Rotation Range	53°	51°	45°	118%	113%	4.3%
Int Rotation Range	29°	30°	40°	73%	75%	2.7%

Shoulder

Movement	Left	Right	Gold Standard	Left %	Right %	Asymmetry %
Flexion Range	180°	180°	180°	100%	100%	0.0%
Ext Rotation Range	100°	106°	90°	111%	118%	5.9%
Int Rotation Range	61°	51°	70°	87%	73%	16.1%

Ankle

Movement	Left	Right	Left %	Right %	Asymmetry %
Dorsiflexion Force	185	184	66%	66%	0.5%
Plantarflexion Force	0	0	61%	69%	0%

Force

When we consider force, we are looking at asymmetries and deficiencies, but also how the length tension relationship affects the bone in the joint. Your percentiles are from your population group which factors in your age, gender and weight.

Ankle

Movement	Left	Right	Left %	Right %	Asymmetry %
Dorsiflexion Force	185	184	66%	66%	0.5%
Plantarflexion Force	0	0	61%	69%	0%

Knee

Movement	Left	Right	Left %	Right %	Asymmetry %
Flexion Force	161	166	54%	57%	3.0%
Extension Force	364	402	76%	84%	9.5%

Hip

Movement	Left	Right	Left %	Right %	Asymmetry %
Flexion Force	160	170	29%	33%	5.8%
Extension Force	0	0	89%	85%	0%
Abduction Force	116	150	46%	73%	22.9%
Adduction Force	159	168	81%	85%	5.3%
Ext Rotation Force	112	69	51%	12%	38.6%
Int Rotation Force	208	193	79%	71%	7.1%

Shoulder

Movement	Left	Right	Left %	Right %	Asymmetry %
I ISO Force	2	2	84%	89%	5.5%
Y ISO Force	2	2	60%	55%	8.5%
T ISO Force	1	2	29%	65%	55.3%

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 forward head posture is slightly 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.

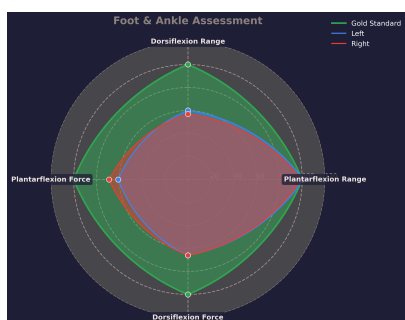
Core Assessment

The core function assessments primarily evaluate TVA strength, coordination, and multifidus activation. Your results indicate some dominance of the quadratus lumborum (QL) and lower back musculature, which appear to be compensating during the lower abdominal tests.

You have a slightly decreased lumbar curvature, which is likely contributing to the observed reduction in lower abdominal strength. The Lower Abdominal Coordination Test resulted in a fail, with the left side performing worse than the right, highlighting an asymmetry in coordination and strength. While your upper core demonstrated sufficient bracing capabilities, your lower core was unable to brace effectively.

We would like to teach you to use your deep lying core muscles, build their strength, and work on their coordination with a larger emphasis on your lower abdominals.

Ankle Assessment



The Left foot: Your left foot is positioned neutrally, with the ability to pronate and supinate; however, it exhibits slightly reduced capacity for pronation, primarily originating from the hip rather than the foot itself. There is minimal movement through the midfoot, indicating a lack of articulation and control in this area. Dorsiflexion range and strength are both poor, which may affect your overall stability and mobility. In contrast, plantarflexion shows good range but poor strength, suggesting a need for focused strength training, particularly through overcoming isometrics to enhance muscle engagement.

The Right foot: The right foot mirrors the left in its neutral position and ability to pronate and supinate, with similar limitations in pronation that also stem from the hip. Like the left, there is very little movement through the midfoot, indicating a bilateral issue with midfoot articulation. Dorsiflexion range and strength are poor on this side as well, while plantarflexion maintains good range but lacks strength, reflecting a consistent pattern across both feet.

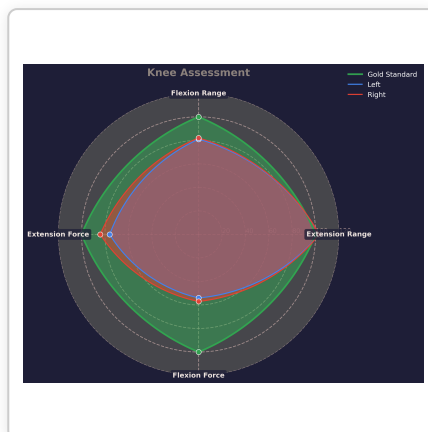
Foot and Ankle summary: There is notable asymmetry between your feet, particularly in the capacity for pronation and midfoot movement. Both feet demonstrate poor dorsiflexion strength and range, which could compromise your overall foot function and stability. It is essential to prioritize building strength in both feet, particularly through isometric exercises, while also enhancing control and awareness of foot movements. Incorporating dynamic activities that promote midfoot articulation and engaging in subconscious movement patterns will be beneficial for improving overall foot function and addressing the identified weaknesses.

Knee Assessment

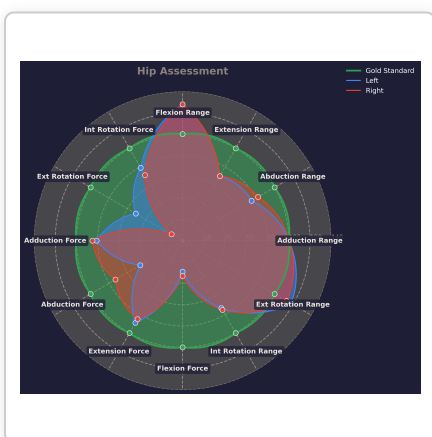
The Left knee achieved good range in extension, 3% above our gold standard but was significantly limited in flexion, being 19% below the gold standard (distal hamstring). Additionally, the left knee demonstrated poor strength in flexion, being 46% below the gold standard, which is concerning for overall knee function. The hamstring to quadriceps ratio on the left side was classified as poor, indicating a need for improvement in the flexion/extension mechanisms. It is also noteworthy that the left knee extension strength was 10.5% weaker than the right.

The Right knee exhibited similar range limitations in flexion, lacking 18% compared to the gold standard, but was slightly stronger than the left knee in this regard, being 1.2% stronger. However, the right knee also showed poor strength in flexion, at 43% below the gold standard. Both knees had equal range in extension, but the right knee was stronger in extension, which may contribute to a less favorable hamstring to quadriceps ratio on this side.

Knee summary: While both knees show good range in extension, there is a significant need to address the deficits in flexion range and strength. Improving the peak force in flexion will be crucial for enhancing the hamstring to quadriceps ratio and overall knee stability. Focused rehabilitation on the left knee's flexion strength is particularly important to balance the strength and function between both knees.



Hip Assessment



The Left hip showed excellent range in hip flexion and external rotation, but significant deficits in hip extension, abduction, and internal rotation. The large deficits in strength across multiple movements, particularly in flexion, adduction, and internal rotation, compromise overall hip joint integrity and affect movement patterns.

The Right hip demonstrated similar range capabilities in flexion and external rotation but exhibited notable deficits in hip extension, abduction, and internal rotation as well. While the strength was slightly better on average compared to the left, the large deficits in force production across all assessed movements hinder propulsion and effective energy transfer.

Hip summary: The large deficits in hip extension range on both sides negatively impact pelvic alignment, which is crucial for maintaining proper lower limb function. The significant strength deficits, particularly in flexion and abduction, further compromise propulsion and stability. The notable asymmetry in hip abduction and the inverse relationship in range of motion highlight the need for targeted interventions to improve femur positioning and overall hip joint integrity. Addressing these deficits is essential for optimizing movement patterns and enhancing functional performance.

To optimize your shoulder girdle function, we need to focus on the mechanics of the ribcage and scapula. The identified deficits in shoulder movements, particularly on the left side with the "I", "Y", and "T" patterns, and on the right side with internal rotation, suggest a need for a comprehensive resistance training approach. Incorporating heavy isometrics and eccentrics, alongside fascial release techniques, will help improve the engagement of the deltoids and rotator cuff complex, ultimately enhancing shoulder stability and function.

Please book in a call so we can talk through your findings and get you back to pain free performance.

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