Appendix 1: Test descriptions for hip strength and ROM in football players

Equipment

1 skin marker	1 hand-held dynamometer (Powertrack)
1 tape measure, flexible	1 goniometer
1 tape measure, rigid	2 digital inclinometers

Marking up

- Participant in supine
- Mark a line around the tibia 8 cm proximally from the most prominent point of lateral malleolus.
- Mark a line 5 cm above the superior pole of patella and equivalent point laterally.
- Mark ASIS bilaterally.
- Measure from ASIS to the anterior mark on tibia to the nearest half cm.



Strength Tests

1. Eccentric Adduction (side-lying)

- Participant lies on the side of the tested leg, knee straight and foot beyond the end of bed. Hip and knee of the non-tested leg is in 90° flexion with knee resting on a firm surface to maintain neutral pelvic rotation. Participant holds on to the side of the bed with one hand for stabilisation.
- Examiner lifts the tested leg into full adduction with the HHD placed on the medial tibial mark. The participant exerts a 3 sec isometric maximum voluntary contraction against the HHD and a 2 sec break is then performed by the examiner pushing the leg slowly towards the bed, ensuring not to touch the bed. Examiner uses two hands if required to break the force.
- Standardised instruction is: **"go ahead-push-push-push-push"**, a total of 5secs. Participant instructed to push as hard as possible within their comfort zone and maintain the effort while the break is performed. One practice test and three maximal tests are performed with 30 sec rest period between tests.
- Any pain experienced by the participant during testing is recorded using an 11 point NRS pain scale (0-10), with location also recorded.
- The maximal score of the three tests is recorded in Newtons.



2. Eccentric Abduction (side-lying)

- Participant lies on the side of the non-tested leg, hip and knee in 90° flexion and holds on to the side of the examination bed with one hand for stabilisation.
- Examiner lifts tested leg into abduction until level with body, knee straight and the HHD placed on the lateral tibial mark. The participant exerts a 3 sec isometric maximum voluntary contraction against the HHD and a 2 sec break is then performed by the examiner pushing the leg slowly towards the bed, ensuring not to touch the bed. Examiner uses two hands if required to break the force.
- Standardised instruction is: **"go ahead-push-push-push-push-push"**, a total of 5secs. Participant is instructed to push as hard as possible within their comfort zone and maintain the effort while the break is performed. One practice test and three maximal tests are performed with a 30 sec rest period between tests.
- Any pain experienced by the participant during testing is recorded using an 11 point NRS pain scale (0-10), with location also recorded.
- The maximal score of the three tests is recorded in Newtons.



3. Adductor Squeeze Test

- Participant lies supine with 45˚ hip flexion and feet flat on the table. Examiner places hand with HHD between the knees.
- Participant presses knees together, against the HHD and examiner's hand, with maximal force, without lifting the legs or pelvis.
- The presence of pain in the hip/groin is recorded using an 11 point NRS pain scale (0-10), and location recorded
- The test is conducted once and score recorded in Newtons.



Range of Motion Tests

4. Hip Internal Rotation (supine) • Participant lies supine with 90° hip and knee flexion. • Stationary arm of the goniometer is aligned parallel to the line across the anterior superior iliac spines of the pelvis with the goniometer centred over the patella apex, and the moving goniometer arm along the tibia. • Maximal internal rotation is measured as the deviation from the zero starting position • Range of motion test is repeated twice, and the average score recorded.	
5. Hip External Rotation (supine) • Participant lies supine with 90° hip and knee flexion. • Stationary arm of the goniometer is aligned parallel to the line across the anterior superior iliac spines of the pelvis with the goniometer centred over the patella apex, and the moving goniometer arm along the tibia. • Maximal external rotation is measured as the deviation from the zero starting position • Range of motion test is repeated twice, and the average score recorded.	
6. Bent Knee Fall Out (BKFO) • Participant lies supine with 90° knee flexion, 45° hip flexion, and feet together. Participant is instructed to allow their knees to fall outward whilst keeping their feet together, and the examiner uses gentle over-pressure to check that the player has relaxed at the limit of movement. • The distance between the most distal point on the head of the fibula and the surface of the bed is measured using an inflexible tape measure and distance is recorded in cm to the nearest 0.5 cm. • Range of motion test is conducted once.	

7. Hip Abduction (side-lying) • Participant is placed in side-lying on the non-tested side with hip and knee of the bottom/non-tested leg in 90° hip and knee flexion. • Adjust the bed height so the hip of the tested leg is at the same height as the tester's hip. • Examiner stabilizes the participant's pelvis with their own hip, and holds medially on the knee of the tested leg, which is placed in a relaxed knee flexion angle (~60°) with the examiner's forearm supporting the participant's lower leg. • Participant's leg is abducted towards the ceiling to end of range, maintaining the hip in neutral flexion/extension. • ROM is measured with the digital inclinometer on the lateral thigh mark of the tested leg and repeated 3 times, with the average score recorded.	
8. Hip Internal Rotation in prone • Participant placed in prone with 90° knee flexion. • Examiner places digital inclinometers on the medial side of each tibia. • Participant keeps knees together and examiner moves ankles apart to end range of hip internal rotation range, ensuring that the pelvis remains level. • Measure is repeated 3 times, with the average score recorded	