



THE EUROPEAN TOUR PHYSICAL ASSESSMENT FOR GOLFERS

EUROPEAN TOUR PHYSIOTHERAPY UNIT

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INTRODUCTION

- Low back is the most common site of injury for male professional golfers (Gosheger et al, 2003)
- Studies report incidence between 23.7% and 34.5% (McHardy et al, 2006)
- Professionals reach 80% peak muscle activity in the lumbar spine compared to 90% in amateurs (Hosea et al, 1990)
- Professionals incur 80% less lateral bending & shearing forces and 50% less torque than amateurs, with compression force similar in both (Hosea et al, 1990)
- In a study of 283 elite and professional golfers (Sugaya et al, 1998):
 - 72% experienced injuries that reduced performance or caused them to miss an event
 - of these, low back injury was responsible in 55%

In players with low back pain:

- 51% had right-sided pain
 - 28% had left-sided pain
 - 21% had central pain
- Right-sided vertebral osteophyte formation at L3/4 and facet joint changes at L3/4 & L4/5 were significantly higher in professionals than a control group (Sugaya et al, 1998)
 - Metz (1999) reported on stress fractures of the rib cage, typically on the leading side (left side for a right-handed golfer). Causes include:
 - increased playing schedule
 - increase in time spent practicing
 - constant activation of leading serratus anterior muscle in the downswing (Lord et al, 1996)



FORCES ON SPINE DURING SWING

- Forces occurring:
 - downward compression
 - side to side bending
 - back to front shearing (Hosea et al, 1990)
- Primary load-carrying component of the vertebra is cancellous bone, accounting for 50% of the compressive strength. Facet joints resist 20% of spinal compression load with some shock absorption from the nucleus pulposus (Hosea et al, 1990)
- Facet joints resist more than 50% of the back to front shearing load
- Only 2 or 3 degrees of intersegmental rotation can produce microtrauma in the lumbar facet joints
- Most common cause of disc herniation in a healthy disc is lateral bending combined with compression and torsion, all of which are major components of the golf swing
- Analysis of repetitive loading demonstrates potential for following pathologies:
 - muscle strain
 - internal disc disruption
 - disc herniation
 - facet arthropathy
 - stress fractures of vertebral body and pars
 - spondylolisthesis



FORCES ON SPINE DURING SWING (CONT'D)

- Compression loads of 8 times body weight in professional golfers - approx 7,500+/- 2400 Newtons (Hosea and Gatt, 1996)
- Cadaveric studies showed disc prolapse with loads of 5,450 Newtons (Adams and Hutton, 1988)
- Peak shear loads of 596+/-514 Newtons seen during swing of amateur golfers, with shear loads of 570+/- 190 Newtons capable of producing pars interarticularis fractures in cadavers (Cryon and Hutton, 1978)



INJURIES

Injury rate in professional golfers = 2 per year

Occurrence of injuries = 81%

54% of professional golfers consider their injuries to be chronic

Average time loss from Tour = 9.3 weeks

Up to 33% continue to play while injured

MOST COMMON INJURIES IN AMATEURS

- 1) Low back (36%)
- 2) Elbow (32%)
- 3) Wrist & hand (11%)
- 4) Shoulder (8%)

MOST COMMON INJURIES IN PROFESSIONALS

- 1) Low back (25%)
- 2) Neck (20%)
- 3) Wrist & hand (16%)
- 4) Shoulder (11%)

REASONS FOR INJURIES

- 1) Too much play or practice (69%)
- 2) Contact with object other than ball (20%)

50% injured at impact, 29% injured during follow through



INJURIES (CONT'D)

SPECIFIC INJURIES SEEN ON PGA EUROPEAN TOUR

1)Low back:

- Facet dysfunction
- Disc dysfunction
- Functional instability

2)Neck:

- Facet dysfunction
- Disc dysfunction
- Functional instability

3)Wrist & hand:

- Triangular Fibrocartilage Complex tear
- Extensor Carpi Ulnaris subluxation
- Scapho-lunate joint dysfunction/cyst formation/ganglion

4)Shoulder:

- Anterior instability of non-lead shoulder
- Posterior instability of lead shoulder

5)Hip:

- Labral tear
- Arthrosis



Table I. Injury distribution by site*, showing number of reports (when given) and percentages (in parentheses) (modified from Lindsay et al., 2000)

Study	Spine (%)			Upper limb (%)				Lower limb (%)				Other (%)
	Cervical (neck)	Thoracic	Lumbar	Shoulder	Elbow	Wrist	Hand	Hip/groin	Knee	Ankle	Foot	
McCarroll and Gioe (1982) in Lindsay et al. (2000): <i>n</i> = 393 professionals; mean age (range) = 30 (23–72) years	12 (3)	8 (2)	93 (24)	37 (9)	26 (7)	106 (27)	41 (10)	9 (2)	26 (7)	8 (2)	13 (3)	14 (4)
McCarroll et al. (1990): <i>n</i> = 708 amateurs; mean age (range) = 52 (15–86) years	28 (3)		244 (27)	84 (9)	234 (26)	144 (16)		22 (2)	66 (7)	18 (2)	12 (1)	34 (4)
Batt (1993): <i>n</i> = 53 amateurs; mean age (range) = 49.5 (17–85) years	2 (4)	13 (25)		2 (4)	4 (8)	15 (28)	2 (4)		4 (8)	3 (6)	2 (4)	(11)
Therriault and Lachance (1998): <i>n</i> = 528 amateurs; age range = 12–70 years	(40)			(42)				(18)				
Sugaya et al. (1999): <i>n</i> = 283 professionals; mean age (range) = 35 (21–54) years	93 (20)		154 (34)	44 (10)	45 (10)	42 (9)	7 (2)		26 (6)	20 (4)	6 (3)	14 (3)
Finch et al. (1999): <i>n</i> = 34 amateurs; median age (range) = 40.5 (24–65) years	(15)		(24)	(6)	(18)		(6)		(18)			(13)
McNicholas et al. (1999): <i>n</i> = 286 amateurs and professionals; age range = 0–70 years		(21)		(45)					(13)	(4)	(4)	
Gosheger et al. (2003): <i>n</i> = 643 amateurs and 60 professionals; mean age 46.2 ± 17.3 years	A: 45 (8.5) P: 11 (10)	5 (1.0) 3 (2.7)	80 (15.2) 24 (21.8)	98 (18.6) 14 (12.7)	131 (24.9) 11 (10.0)	68 (12.9) 22 (20.0)		15 (2.9) 3 (2.7)	17 (3.2) 6 (5.5)	28 (5.3) 1 (0.9)		
Vad et al. (2004): <i>n</i> = 42 professionals; mean age (range) = 30.7 (21–38) years			14 (33)									
McHardy et al. (2007): <i>n</i> = 588 amateurs; mean age = 59.1 ± 12.9 years			(18.3)	(11.8)	(17.2)					(12.9)		
Parziale et al. (2002): <i>n</i> = 145 amateurs and professionals; age range = 14–80 years	14	1	65	20	15				12		1	2
Fradkin et al. (2007): <i>n</i> = 304 amateurs; median age = 53 years	2	4	40	15	13	6	6	4	8	6	3	4

*Percentages are represented as a proportion of all reported injuries. A = amateur; P = professional.

SPINAL INJURIES

- Low back is the most common site of injury for male professional golfers
 - Studies report incidence between 23.7% and 34.5%
 - Professionals reach 80% peak muscle activity in the lumbar spine compared to 90% in amateurs
 - Professionals incur 80% less lateral bending & shearing forces and 50% less torque than amateurs, with compression force similar in both
 - In a study of 283 elite and professional golfers:
 - 72% experienced injuries that reduced performance or caused them to miss an event
 - of these, low back injury was responsible in 55%
- In players with low back pain:
- 51% had right-sided pain
 - 28% had left-sided pain
 - 21% had central pain
- Right-sided vertebral osteophyte formation at L3/4 and facet joint changes at L3/4 & L4/5 were significantly higher in professionals than a control group
 - Forces occurring in the swing:
 - downward compression
 - side to side bending
 - back to front shearing



SPINAL INJURIES (CONT'D)

- Primary load-carrying component of the vertebra is cancellous bone, accounting for 50% of the compressive strength. Facet joints resist 20% of spinal compression load with some shock absorption from the nucleus pulposus
- Facet joints resist more than 50% of the back to front shearing load
- Only 2 or 3 degrees of intersegmental rotation can produce microtrauma in the lumbar facet joints
- Most common cause of disc herniation in a healthy disc is lateral bending combined with compression and torsion, all of which are major components of the golf swing
- Amateurs rotate hips excessively in backswing compared to professionals
- Amateurs take 31% more time to rotate through same range as professionals
- Analysis of repetitive loading demonstrates potential for following pathologies:
 - muscle strain
 - internal disc disruption
 - disc herniation
 - facet arthropathy
 - stress fractures of vertebral body and pars
 - spondylolisthesis
- Compression loads of 8 times body weight in professional golfers - approx 7,500+/- 2400
- Cadaveric studies showed disc prolapse with loads of 5,450 Newtons



UPPER LIMB INJURIES

1) Shoulder

- Shoulder girdle includes the clavicle, shoulder bone, and four articulations:
 - sternoclavicular, acromioclavicular, glenohumeral and scapulothoracic joints
- Professionals may perform over 2000 shoulder revolutions per week
- Tissues will break down faster than they can be repaired; consequently overuse is definitely a risk
- Overuse is considered to be the major reason of shoulder stress pathology and results in micro-trauma with an inflammatory response
- Post inflammatory changes such as bursitis, synovitis or tendinitis may results in a less active shoulder motion & muscle weakness and may lead to an atrophy of the rotator cuff muscles. This is called a pain-weakness--atrophy sequence and may if untreated lead to rotator cuff tears
- Instability is the most significant predisposing factor for glenohumeral dysfunction in the athletic shoulder
- Risk of anterior dislocation of trailing arm and posterior dislocation of the lead arm leading arm during backswing



UPPER LIMB INJURIES (CONT'D)

- Risk of anterior dislocation of lead arm as the arm in through-swing as shoulder is externally rotated, abducted, and extended
- Hyper-elastic joints or gleno-humeral instability also decreases shoulder function and may lead to impingement syndromes
- Shoulder problems most often occur among older players and most frequently in the left, target side. Pain may be related to impingement when it occurs at the top of the back swing, where the arm is maximally elevated, and there is a large eccentric load on the shoulder musculature
- Posterior shoulder pain at the top of the backswing may be posterior capsulitis

2) Elbow

- Up to 20% of medial epicondylitis are associated with ulnar nerve symptoms
- Torque created by the club, and high stress placed on the wrists at the start of the downswing and at impact, combine to make tendinitis a very common problem in the elbow
- Injuries in the elbow are frequently caused by poor swing mechanics
- Electromyographic activity was analysed in the forearm's muscles in a group of 16 male golfers (98 had medial epicondylitis). Recorded activity of the flexor muscles from the symptomatic subjects was significantly higher than for the non-affected subjects both at address and swing phases



UPPER LIMB INJURIES (CONT'D)

3) Wrist & hand

- Wrist motions of 45 golfers were analysed. 20 had hand, wrist, or forearm pain and 25 had no pain at all. The group with pain used a greater arc of motion in the target side's wrist during the golf swing than the control group.
- In the swing, the frontal plane range of motion of the affected group had a mean of 68 degrees, versus 36 degrees for the normal group. In the frontal plane motion, clinically, the group with pain had less arc of motion with a mean range of motion of 61 degrees, versus 75 degrees for the non-affected group
- The group with pain ranged from 56% to 84% of the strength of the normal group
- De Quervain tenosynovitis is an inflammation of the abductor pollicis longus and extensor pollicis brevis tendons. It gives a swelling and tenderness of the first dorsal compartment of the wrist caused by the ulnar deviated position the left wrist gains during the golf swing, or a too tight grip of the club
- Triangular Fibrocartilage Complex tear
- Extensor Carpi Ulnaris subluxation
- Scapho-lunate joint dysfunction/cyst formation/ganglion



LOWER LIMB INJURIES

1) Hip

- Hip problems reported in golf are relatively uncommon, but include
 - Labral tear
 - Femero-acetabular impingement
 - Hip joint arthrosis
 - Adductor muscle tear/tendinopathy/enthesiopathy
 - Psoas muscle tear/tendinopathy/enthesiopathy

2) Knee

- Of 35 golfing knee injuries, most were found to be overuse injuries and not acute trauma. 15 people had target side problems, 17 had trailing side problems, and 3 had bilateral problems
- Most common cause of injury was:
 - Torn medial meniscus (49%)
 - Osteoarthritis (29%)
 - Torn lateral meniscus
 - Chondromalacia patella
 - Loose bodies in the knee.
- 15 patients had previous meniscectomies and had developed their pain while beginning to play golf



LOWER LIMB INJURIES (CONT'D)

- The shoe locks the foot to the ground and holds the left tibia in internal rotation in the follow-through, adding stress to the medial target side's knee during the knee-flexion position
- Q-angles and pronation of the feet increase stress on the patellofemoral joint during the golf swing
- Other knee problems can result from overuse of tight hamstrings, tight calves or foot pronation

3) Ankle & Foot

- Foot problems reported in golf include
 - Blisters
 - Contact dermatitis
 - Athlete's foot
 - Lesser toe deformities
 - Morton's neuroma
 - Hallux rigidis and valgus
 - Plantar fasciitis
 - Haglund's deformity
 - Achilles tendinopathy
 - Ligament injuries of the ankle
 - Anterior/posterior impingement of the ankle



JOINT FACTORS

- Elite golfers with low back pain addressed ball with increased lumbar spine flexion compared to controls:

37.0 +/- 11.4 degrees vs. 25.3 +/- 6.6 degrees

- Elite golfers with low back pain recorded greater range of left lateral bending than controls:

6.7 +/- 3.2 degrees vs. 0.5 +/- 3.1 degrees

- Maximum spinal flexion during swing was greater for elite golfers without low back pain:

50.7 +/- 7.2 degrees vs. 44.0 +/- 5.3 degrees (Lindsay, 2002)

- Apparent lesser increase of spinal flexion in downswing for golfers with low back pain (7 degrees vs. 25 degrees) could be explained by increased range of posterior tilt in non-low back pain group (?increased abdominal activity)



MUSCULAR FACTORS

Erector Spinae:

- Reduced ES activity at L4 level seen in elite golfers with low back pain at top of backswing and start of downswing (Cole et al, 2008)
- Reduced ES activity = reduced dynamic stiffness of lumbar spine, therefore able to rotate spine with reduced spinal loading (Cole et al, 2008)
- Association between reduced trunk extensor endurance and quadriceps inhibition in golfers with low back pain (Suter et al, 2001)

External Oblique:

- Elite golfers with low back pain demonstrated delayed onset of EO activity (Horton et al, 2001)
- Elite golfers with low back pain demonstrated reduced left rotational endurance (Lindsay et al, 2006)

Fatigue:

- No fatigue observed in EMG activity of rectus abdominis, internal/external oblique of elite golfers following a 50 minute practice session. However, existing low back pain was exacerbated following the session (average VAS score increased from 23.5 to 34.4) (Cole et al, 2008)



RISK FACTORS

- BMI inversely related to occurrence of low back pain:
 - Average BMI of 27.7kg/m² in asymptomatic individuals vs. average BMI of 24.4kg/m² in symptomatic individuals (Lindsay et al, 2002)
 - high BMI not associated with increased golf injury rate, although golfers with BMI>25kg/m² more likely to report non golf-related low back pain (Gosheger et al, 2003)
- Left side bridge endurance test greater than right side bridge endurance test by >12.5 seconds = increased likelihood of low back pain



Left side bridge endurance test is optimal challenge of quadratus lumborum (McGill et al, 1999)

- Hip flexor tightness of >5° predicted reports of low back pain affecting golf performance (Evans et al, 2005)



RISK FACTORS (CONT'D)

- Decreased lumbar spine extension, lead hip internal rotation and lead hip Fabere's distance correlated to a history of low back pain in professional golfers (Vad et al, 2004), although decreased lumbar spine extension may not be a predictor of future episodes of low back pain (Evans, 2005)

	Symptomatic (n=14)	Asymptomatic (n=28)
Lumbar extension (degrees)	15.7 +/- 1.3	24.3 +/- 1.4
Fabere's distance (cm)		
Lead	16.8 +/- 1.3	9.3 +/- 1.5
Non-lead	6.7 +/- 1.3	6.8 +/- 1.2
Hip internal rotation (degrees)		
Lead	11.8 +/- 1.2	16.9 +/- 1.3
Non-lead	19.9 +/- 1.7	19.7 +/- 1.6

Fabere's distance



ASSESSMENT TOOLS

- Isometric trunk flexor endurance
- Isometric trunk extensor endurance (modified Beiring-Sorensen test)
- Lateral bridge

(McGill, 1999)

- Prone bridge
- One-legged squat
- Sitting hip flexion
- Supine hip extension
- Overhead deep squat

(Hellstrom, 2008)

- Hip internal rotation range & symmetry
- Fabere's distance
- Lumbar spine extension

(Vad, 2004)

- Biomechanics: force plate, movement analysis
(address position, spine angle, trunk/hip rotation)



INTERVENTION

- Movement analysis:
 - hip internal rotation range & symmetry
 - Fabere's distance
 - lumbar spine extension
 - range of hip vs. trunk rotation
 - lumbar flexion throughout swing
 - lumbar lateral bending throughout swing
- Muscle function:
 - isometric trunk flexor endurance
 - isometric trunk extensor endurance
 - lateral bridge
 - prone bridge
 - one-legged squat
 - sitting hip flexion
 - supine hip extension
 - overhead deep squat
- Address position
- Practice habits (risk of overuse):
 - time spent in lumbar flexion e.g. putting
 - number of balls hit
 - attempted increased driving distance
- Extrinsic factors:
 - time spent traveling (sitting) i.e. reduced activity of lumbar stabilisers
 - different beds each week
 - lifting luggage, children etc



SCREENING

A) LEVEL 1 SCREEN

- 1) Bridging - Double Leg
- 2) Isometric Hip Adduction - Bridging
- 3) Isometric Hip Adduction - Knees Extended
- 4) Isometric Hip Adduction - Prone
- 5) Isometric Hip Extension - Prone
- 6) Four-point Kneeling
- 7) Isometric Trunk Extension
- 8) Isometric Trunk Flexion
- 9) Isometric Trunk Lateral
- 10) Plank
- 11) Single Leg Squat
- 12) Vertical Jump
- 13) Medicine Ball Toss
- 14) 90/90 Functional Position
- 15) Sitting Trunk Rotation
- 16) Scapula Dyskinesia - Scapula Pinch
- 17) Scapula Dyskinesia - Wall Push-up
- 18) Scapula Dyskinesia - Lateral Slide
- 19) Glenohumeral Instability - Apprehension
- 20) Glenohumeral Laxity - Load and Shift
- 21) Hip Medial Rotation - Supine
- 22) Hip Lateral Rotation - Supine
- 23) Hip Medial Rotation - Prone
- 24) Hip Lateral Rotation - Prone
- 25) Femero-Acetabular Impingement
- 26) Hamstring
- 27) Iliopsoas
- 28) Star Excursion Balance Test
- 29) Beighton Score
- 30) Eye Dominance
- 31) R/L Handed
- 32) Stance Dominance
- 33) Posture

SCREENING

B) LEVEL 2 SCREEN

- 1) Bridging - Single Leg
- 2) Single Leg Lower
- 3) Core Assessment - Heel Slide
- 4) Single Leg Fallout
- 5) Four-point Kneeling - Contralateral
- 6) Four-point Kneeling - Ipsilateral
- 7) Isometric Lateral Straight Arm
- 8) Cervical ROM
- 9) Pectoralis Major
- 10) Pectoralis Minor
- 11) Trunk Side Flexion - Sitting
- 12) Latissimus Dorsi - Standing
- 13) Latissimus Dorsi - Supine
- 14) Wrist Flexion
- 15) Wrist Extension
- 16) Wrist Pronation
- 17) Wrist Supination
- 18) Piriformis
- 19) Rectus Femoris
- 20) Iliotibial Band/Tensor Fascia Lata
- 21) Iliotibial Band Functional Test
- 22) Hurdle Step
- 23) Double Leg Balance
- 24) Vertical Jump Test (2)

SCREENING

A) LEVEL 1 SCREEN

1) BRIDGING - Double Leg

Starting Position:

Crook lying with feet together
Lumbar spine in neutral
Position feet so that knees are flexed to 90 degrees
Arms folded across chest

Test:

Engage core
Lift pelvis clear of floor until hips are in neutral position
Hold for 10 seconds
Perform 3 repetitions

Measurement:

Quality and control of movement over 3 repetitions

Notes:

Ensure activation of gluts and non-dominance of hamstrings
i.e. no cramping
Maintain lumbo-pelvic position
Do not allow pelvis to rotate

2) ISOMETRIC HIP ADDUCTION - Bridging

Starting Position:

Crook lying with feet together
Lumbar spine in neutral
Position feet so that knees are flexed to 90 degrees
Arms folded across chest

Test:

Position pressure cuff (inflated to 20mmHg) between knees,
just superior to medial femoral condyles
Engage core
Lift pelvis clear of floor until hips are in neutral position
Perform maximal isometric hip adduction (squeeze)

Measurement:

Maximum pressure recorded in mmHg

Notes:

Ensure activation of gluts and non-dominance of hamstrings
i.e. no cramping
Maintain lumbo-pelvic position
Do not allow pelvis to rotate
Target = 200-240 mmHg

SCREENING

A) LEVEL 1 SCREEN

1) BRIDGING - Double Leg



2) ISOMETRIC HIP ADDUCTION - Bridging



SCREENING

A) LEVEL 1 SCREEN

3) ISOMETRIC HIP ADDUCTION - Knees Extended

Starting Position:

Supine lying
Lumbar spine in neutral
Arms folded across chest

Test:

Position pressure cuff (inflated to 20mmHg) between knees, just superior to medial femoral condyles
Engage core
Flex hips to 30 degrees with knees extended
Perform maximal isometric hip adduction (squeeze)

Measurement:

Maximum pressure recorded in mmHg

Notes:

Maintain lumbo-pelvic position
Target = 240-260 mmHg

4) ISOMETRIC HIP ADDUCTION - Prone

Starting Position:

Prone lying
Arms relaxed by sides

Test:

Position pressure cuff (inflated to 20mmHg) between knees, just superior to medial femoral condyles
Engage core
Extend both hips to 10 degrees
Perform maximal isometric hip adduction (squeeze)

Measurement:

Maximum pressure recorded in mmHg

Notes:

Maintain lumbo-pelvic position
Target = 260-280 mmHg

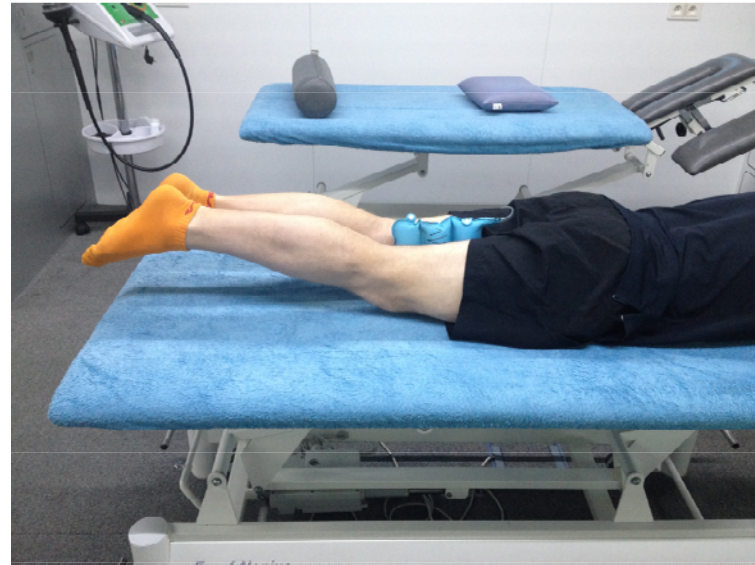
SCREENING

A) LEVEL 1 SCREEN

3) ISOMETRIC HIP ADDUCTION - Knees Extended



4) ISOMETRIC HIP ADDUCTION - Prone



SCREENING

A) LEVEL 1 SCREEN

5) ISOMETRIC HIP EXTENSION - Prone

Starting Position:

Prone lying
Arms relaxed by sides

Test:

Engage core
Extend one leg to 10 degrees extension with knee extended
Hold isometric extension for 10 seconds
Repeat on other side

Measurement:

Observe firing pattern:

- 1) Gluteus maximus
- 2) Hamstring
- 3) Contralateral ES
- 4) Ipsilateral ES
- 5) Contralateral TES
- 6) Ipsilateral TES

Observe hip/pelvic rotation + lumbar spine hyperextension

Notes:

Maintain lumbo-pelvic position
Do not allow pelvis to rotate

6) FOUR-POINT KNEELING

Starting Position:

Four-point kneeling with spine in neutral
Keeping spine in neutral, contract TA

Test:

Slowly raise one arm until horizontal with elbow extended
Lower arm and repeat with opposite side
Slowly extend one leg until horizontal with knee extended
Lower leg and repeat with opposite side

Measurement:

Quality and control of movement over 3 repetitions of each element

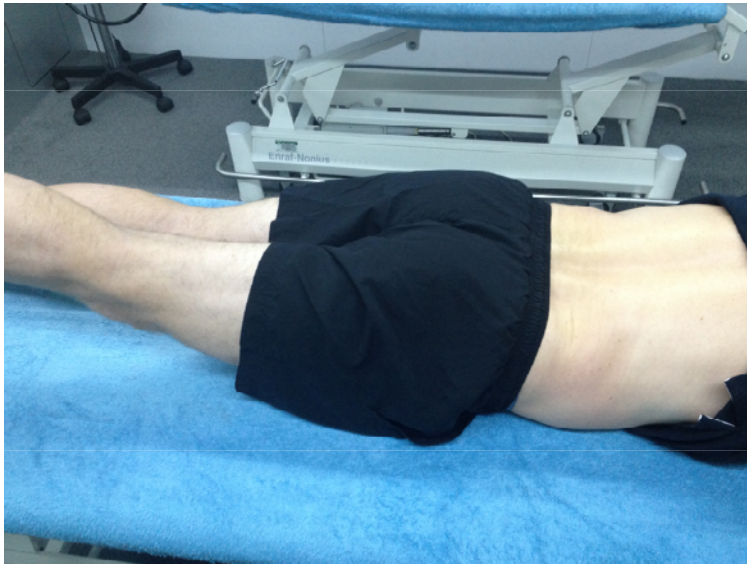
Notes:

Poor rotational control indicated by > 2.5cm rotation of lumbar or thoracic spine
Ensure lumbar spine neutral is maintained

SCREENING

A) LEVEL 1 SCREEN

5) ISOMETRIC HIP EXTENSION - Prone



6) FOUR-POINT KNEELING



SCREENING

A) LEVEL 1 SCREEN

7) ISOMETRIC TRUNK EXTENSION

Starting Position:

Prone lying with ASIS on edge of bed, torso cantilevered
Arms folded across chest
Lower body strapped to bed at knee crease

Test:

At start of test, upper body held horizontal
Maximum sustained hold performed
Test terminated when upper body drops 25cm

Measurement:

Extension time in seconds

Notes:

Ensure upper body is firmly cantilevered

8) ISOMETRIC TRUNK FLEXION

Starting Position:

Crook sitting
Upper body at angle of 60 degrees to bed
Knees and hips flexed to 90 degrees
Lumbar spine in neutral position
Arms folded across chest
Toes placed under toe straps

Test:

At start of test, upper body held at 60 degree angle
Maximum sustained hold performed
Test terminated when upper body leaves 60 degree angle

Measurement:

Flexion time in seconds

Notes:

Ensure toes are held in straps

SCREENING

A) LEVEL 1 SCREEN

7) ISOMETRIC TRUNK EXTENSION



8) ISOMETRIC TRUNK FLEXION



SCREENING

A) LEVEL 1 SCREEN

CORE RATIOS	Men		Women	
	Secs	Ratio	Secs	Ratio
Extension	162	1.0	185	1.0
Flexion	136	0.84	134	0.72
RSB	95	0.59	75	0.40
LSB	99	0.61	78	0.42
Ratios		Ratio		Ratio
Flex/Ext		0.84		0.72
RSB/LSB		0.96		0.96
RSB/Ext		0.59		0.40
LSB/Ext		0.61		0.42

SCREENING

A) LEVEL 1 SCREEN

9) ISOMETRIC TRUNK LATERAL

Starting Position:

Lying on side on mat
Position one elbow directly beneath shoulder, forearm in mid pronation
Feet together
Upper arm resting on side
Keeping spine in neutral, contract TA

Test:

Support body weight on forearm, forming straight line from head to feet

Measurement:

Number of seconds correct form can be maintained
Record measurement for both sides

Notes:

Test finishes with any loss of form or shaking
Always begin test with same side
Rest for 2 minutes between sides

10) PLANK

Starting Position:

Lying face down on mat
Position elbows directly beneath shoulders, forearms in mid pronation
Feet shoulder width apart
Keeping spine in neutral, contract TA

Test:

Support body weight on forearms and toes, forming straight line from feet to shoulders

Measurement:

Number of seconds correct form can be maintained

Notes:

Test finishes with any loss of form or shaking

SCREENING

A) LEVEL 1 SCREEN

9) ISOMETRIC TRUNK LATERAL



10) PLANK



SCREENING

A) LEVEL 1 SCREEN

11) SINGLE LEG SQUAT

Starting Position:

Standing with feet shoulder width apart
Hands on hips

Test:

Take weight on to one leg
Keeping heel on floor and head/chest facing forward,
descend slowly into squat position as far as comfortable
Return slowly to start position
Up to 3 repetitions for best effort

Measurement:

Pass:

Upper torso is parallel with tibia or towards vertical
Knees are aligned over feet
Lumbo-pelvic position maintained

Fail:

Upper torso is not parallel with tibia or towards vertical
Knees are not aligned over feet
Lumbar flexion noted

Notes:

Note quality of movement

12) VERTICAL JUMP

Starting Position:

Before test, vertical reach measured in standing with hand
closest to wall and recorded as reach height
Starting position is from dynamic squat with as much knee
flexion as desired

Test:

Athlete leaps as high as possible, using both arms and legs
Wall is touched at highest point of jump and distance
recorded as jump height
Best of 3 attempts is recorded

Measurement:

Jump height minus reach height in cm

Notes:

Athlete can use as much knee flexion as desired

SCREENING

A) LEVEL 1 SCREEN

11) SINGLE LEG SQUAT



SCREENING

A) LEVEL 1 SCREEN

13) MEDICINE BALL TOSS

Starting Position:

Seated, with back to wall on a mat
Legs extended, slightly apart
2kg medicine ball is held with hands at side and slightly behind centre

Test:

Medicine ball is brought to chest and then thrown as far as possible
Best of 3 attempts is recorded

Measurement:

Distance from wall where ball lands in cm

Notes:

Back should remain in contact with the wall

14) 90/90 FUNCTIONAL POSITION

Starting Position:

Standing against wall with heels 5cm away from wall
Lumbar spine flattened against wall
Head retracted to touch back of head to wall, eyes level

Test:

Keeping lumbar spine flattened, abduct shoulders to 90 degrees and flex elbows to 90 degrees with palms down
Keeping wrists in neutral, laterally rotate shoulders to touch dorsum of wrists against wall

Measurement:

Angle between test forearm and vertical in degrees
Goniometer axis centred over lateral aspect of elbow joint.
One arm of goniometer is aligned with wall (vertical) and other with shaft of ulna
Repeat for both internal + external rotation
Record measurement for both sides

Notes:

Touching dorsum of wrist to wall with wrist joint in neutral and lumbar spine flattened should be attained
If able to touch wall, record total range of external rotation away from wall (hypermobility)

SCREENING

A) LEVEL 1 SCREEN

13) MEDICINE BALL TOSS



14) 90/90 FUNCTIONAL POSITION



SCREENING

A) LEVEL 1 SCREEN

15) SITTING TRUNK ROTATION

Starting Position:

Sitting astride chair with feet flat on floor
Hips and knees and ankles flexed to 90 degrees
Pole held behind thoracic spine at level of spine of scapulae

Test:

Athlete rotates as far as possible without pelvic movement or loss of foot contact with floor
Movement tested to both sides

Measurement:

Thoracic rotation in degrees
Estimation of angle formed between pole in finishing position and pole in starting position when viewed from above
Record measurement for both sides

Notes:

Ensure no compensations
Record as right and left rotation – observe symmetry

16) SCAPULA DYSKINESIA - Scapula Pinch

Starting Position:

Standing with arms by side
Elbows flexed to 90 degrees with forearm in mid range pronation/supination

Test:

Athlete pinches shoulder blades together and holds isometrically for at least 20 seconds

Measurement:

Able to sustain isometric contraction without burning pain for at least 20 seconds

Notes:

Ensure no compensations

SCREENING

A) LEVEL 1 SCREEN

15) SITTING TRUNK ROTATION



16) SCAPULA DYSKINESIA - Scapula Pinch



SCREENING

A) LEVEL 1 SCREEN

17) SCAPULA DYSKINESIA - Wall Push-Up

Starting Position:

Standing 45cm away from wall, feet shoulder width apart
Place hands on wall at shoulder height, shoulder width apart
Hands in “ten-to-two” position

Test:

Athlete bends elbows and brings face to the wall, keeping back and hips straight, then pushes back to starting position
Repeat 10 times

Measurement:

Observe pseudo-winging or true winging of scapula

Notes:

Test assess strength of serratus anterior

18) SCAPULA DYSKINESIA - Lateral Slide

Starting Position:

Standing with arms by side
Mark inferior/medial border of both scapulae
Mark nearest spinous process

Test:

Measure distance from inferior/medial border to marked spinous process in 3 positions:

- at rest
- hands on hips, fingers anterior/thumb posterior
- shoulders abducted to 90 degrees with full internal rotation

Measurement:

Distance in cm on left and right in 3 positions

Notes:

>1.5cm asymmetry is positive scapula dyskinesia

SCREENING

A) LEVEL 1 SCREEN

17) SCAPULA DYSKINESIA - Wall Push-Up



18) SCAPULA DYSKINESIA - Lateral Slide



SCREENING

A) LEVEL 1 SCREEN

19) GLENOHUMERAL INSTABILITY - Apprehension

Starting Position:

Lying supine with elbow flexed to 90 degrees

Test:

Clinician abducts shoulder to 90 degrees, then laterally rotates to 90 degrees

Apply anterior-posterior force to anterior humeral head

Repeat on both sides

Measurement:

Record if apprehension is registered or whether athlete resists movement

Record whether symptoms improve with AP force

Compare sides

Notes:

Apprehension denotes anterior instability, further confirmed if symptoms decrease with AP force

20) GLENOHUMERAL LAXITY - Load and Shift

Starting Position:

Sitting with hands relaxed on thighs

Test:

Clinician stabilises shoulder by fixing spine of scapula and clavicle

Humeral head is compressed into glenoid then translated anteriorly and posteriorly

Measurement:

Extent of anterior and posterior translation

Compare both sides

Notes:

Apprehension or provocation of instability is positive test

SCREENING

A) LEVEL 1 SCREEN

19) GLENOHUMERAL INSTABILITY - Apprehension



20) GLENOHUMERAL LAXITY - Load and Shift



SCREENING

A) LEVEL 1 SCREEN

21) HIP MEDIAL ROTATION - Supine

Starting Position:

Supine lying with both hips, knees and ankles flexed to 90 degrees

Arms relaxed by sides

Contralateral hip and knee then extended

Test:

Athlete moves ankle of testing leg as far laterally as possible without pelvic movement or hip hitching

Measurement:

Medial rotation in degrees

Goniometer axis centred over anterior of the hip. One arm of goniometer aligned with shaft of tibia and other aligned parallel with extended leg

Record measurement for both sides

Notes:

Ensure no pelvic movement or hip hitching

22) HIP LATERAL ROTATION - Supine

Starting Position:

Supine lying with both knees and ankles flexed to 90 degrees

Arms relaxed by sides

Contralateral hip and knee then extended

Test:

Athlete moves ankle of testing leg as far medially as possible without pelvic movement or hip hitching

Measurement:

Lateral rotation in degrees

Goniometer axis centred over anterior of the hip. One arm of goniometer aligned with shaft of tibia and other aligned parallel with extended leg

Record measurement for both sides

Notes:

Ensure no pelvic movement or hip hitching

SCREENING

A) LEVEL 1 SCREEN

21) HIP MEDIAL ROTATION - Supine



22) HIP LATERAL ROTATION - Supine



SCREENING

A) LEVEL 1 SCREEN

23) HIP MEDIAL ROTATION - Prone

Starting Position:

Prone lying with both knees and ankles flexed to 90 degrees
Arms relaxed by sides
Contralateral knee then extended

Test:

Athlete moves ankle of testing leg as far laterally as possible without pelvic movement or hip flexion

Measurement:

Medial rotation in degrees
Goniometer axis centred over anterior of the hip. One arm of goniometer aligned with shaft of tibia and other aligned vertically
Record measurement for both sides

Notes:

Ensure no pelvic movement or hip flexion

24) HIP LATERAL ROTATION - Prone

Starting Position:

Prone lying with both knees and ankles flexed to 90 degrees
Arms relaxed by sides
Contralateral knee then extended

Test:

Athlete moves ankle of testing leg as far medially as possible without pelvic movement or hip flexion

Measurement:

Lateral rotation in degrees
Goniometer axis centred over anterior of the hip. One arm of goniometer aligned with shaft of tibia and other aligned vertically
Record measurement for both sides

Notes:

Ensure no pelvic movement or hip flexion

SCREENING

A) LEVEL 1 SCREEN

23) HIP MEDIAL ROTATION - Prone



24) HIP LATERAL ROTATION - Prone



SCREENING

A) LEVEL 1 SCREEN

25) FEMERO-ACETABULAR IMPINGEMENT

Starting Position:

Lying supine with legs extended

Test:

Clinician performs 4 tests on both sides:

1) FAIR

Hip and knee taken into 90 degrees flexion. Full hip internal rotation is added, followed by adduction

2) McCarthy

Hip and knee taken into 90 degrees flexion. Full hip external rotation is added, followed by extension. If negative, repeat test with internal rotation

3) Posterior Labral

Hip is moved from flexion, adduction, internal rotation to extension, abduction, external rotation

4) Anterior Labral

Hip is moved from flexion, external rotation, abduction to extension, internal rotation, adduction

Measurement:

Pain, reproduction of symptoms or clicking are positive tests

Notes:

If positive tests are recorded, any reduced internal rotation should not be passively mobilised

26) HAMSTRING

Starting Position:

Sitting on side of plinth with knees flexed to 90 degrees and hands clasped behind back

Full anterior pelvic tilt and lumbar lordosis

Test:

Extend test knee until point of pelvic rotation or lumbar flexion

Measurement:

Flexion of test knee in degrees

Goniometer axis centred on lateral knee joint line. One arm of goniometer aligned with femur and the other aligned with tibia

Record measurement for both sides

Notes:

Maintain trunk and pelvis position throughout

SCREENING

A) LEVEL 1 SCREEN

25) FEMERO-ACETABULAR IMPINGEMENT



26) HAMSTRING



SCREENING

A) LEVEL 1 SCREEN

27) ILIOPSOAS

Starting Position:

Supine lying, buttock creases level with end of the plinth
Pull both knees firmly to chest
Contralateral hip held in maximum flexion (can be assisted)

Test:

Relax test hip into extension with passive end point

Measurement:

Flexion of test hip in degrees
Goniometer axis centred over greater trochanter of test hip.
One arm of goniometer aligned with shaft of femur and other pointing towards centre of the shoulder joint
Record measurement for both sides

Notes:

Perform test for both hips

28) STAR EXCURSION BALANCE TEST

Starting Position:

Eight point star is mapped out on the ground with tape
Standing on one leg with distal 1st toe in line with edge of tape

Up to 6 practices permitted prior to test

Test:

While maintaining single leg stance, the athlete reaches as far as possible along each of the tapes

Measurement:

Mark most distal point of reach foot on tape and measure distance from start point

Notes:

Test is discarded if:

- unilateral stance is not maintained
- stance foot is moved or lifted
- reach foot is touched down
- reach foot is not returned to start position

Limb length is measured from inferior ASIS to distal lateral malleolus for both lower limbs

Reach = maximum reach distance/limb length x 100

Composite reach = [sum of maximum reach length for each direction/limb length ÷ 8] x 100

SCREENING

A) LEVEL 1 SCREEN

27) ILIOPSOAS



28) STAR EXCURSION BALANCE TEST



SCREENING

A) LEVEL 1 SCREEN

29) BEIGHTON SCORE

Test:

Hands Flat On Floor = 1 point
Knee Bends Back = 1 point for each side
Elbow Bends Back = 1 point for each side
Thumb Touches Forearm = 1 point for each side
Little Finger Bends > 90 degrees = 1 point for each side

30) EYE DOMINANCE

Starting Position:

Standing - extend both hands at arms length and make small triangle by overlapping hands and thumbs

Test:

Focus on a distant object through the triangle
Alternately open and close eyes and record which eye can still see distant object when opposite eye is closed
Change overlap of hands and repeat test
Change back to original overlap of hands and repeat test

Measurement:

Record right or left eye dominant

Notes:

This is termed Porta test

SCREENING

A) LEVEL 1 SCREEN

29) BEIGHTON SCORE

	SCORE	
	Left	Right
1. Can you put your hands flat on the floor with your knees straight?	1	1
2. Can you bend your elbow backwards?.....	1	1
3. Can you bend your knee backwards?.....	1	1
4. Can you bend your thumb back on to the front of your forearm?.....	1	1
5. Can you bend your little finger up at 90° (right angles) to the back of your hand?.....	1	1
	9	

30) EYE DOMINANCE



SCREENING

A) LEVEL 1 SCREEN

31) R/L HANDED

Measurement:

Right-handed or Left-handed

Notes:

Question: writing hand

Question: 1 hand v 2 hand sports

32) STANCE DOMINANCE

Measurement:

Right leg or Left leg

33) POSTURE

Measurement:

Photographs of normal posture: Front, Rear, Side Views

Photographs of 5-iron posture: Front, Rear, Side Views

SCREENING

B) LEVEL 2 SCREEN

1) BRIDGING - Single Leg

Starting Position:

Crook lying with feet together
Lumbar spine in neutral
"March" feet until tibias are vertical

Test:

Keeping spine in neutral, contract TA
Lift pelvis clear of floor until hips are in neutral position
Maintain position of hips and extend one knee fully
Hold for 10 seconds
Perform 3 repetitions with each leg

Measurement:

Quality and control of movement over 3 repetitions

Notes:

Ensure activation of gluts and non-dominance of hamstrings
i.e. no cramping
Maintain lumbo-pelvic position
Do not allow pelvis to rotate or shift laterally

2) SINGLE LEG LOWER

Starting Position:

Supine lying with lumbar spine in posterior tilt
Pressure cuff placed under lumbar spine, inflated to 40 mmHg
Hips passively flexed to 90 degrees with knees fully extended

Test:

Keeping spine in posterior tilt, contract TA
Actively lower one leg to touch heel to plinth, then return to start position

Measurement:

Angle formed between legs and horizontal at point where posterior tilt is lost ~ 10 mmHg decrease of pressure cuff

Notes:

Ensure posterior tilt is maintained
Avoid substitution e.g. excessive arm use

SCREENING

B) LEVEL 2 SCREEN

3) CORE ASSESSMENT - Heel slide

Starting Position:

Lying supine with 3-chamber pressure cell under lumbar spine

Distal edge of cuff in line with PSIS

Lumbar spine in neutral

Knees flexed to 90 degrees

Arms relaxed by side

Inflate cuff to baseline of 40 mmHg

Test:

Draw in the abdominal wall without moving the spine or pelvis

Breathing normally, slowly extend one leg by sliding heel on plinth and return to start position

Pressure should remain at 40mmHg

Perform 3 repetitions with each leg

Measurement:

Ability to perform 3 repetitions with normal breathing pattern and without substitution

Notes:

Ensure no movement of spine or pelvis

Ensure correct engagement of TA

4) SINGLE LEG FALLOUT

Starting Position:

Crook lying with feet together

Knees flexed to 90 degrees

Lumbar spine in neutral

Test:

Keeping spine in neutral, contract TA

Keep pelvis level and lower one bent leg out to the side

Return leg to start position

Measurement:

Quality and control of movement over 3 repetitions

Notes:

Keep pelvis level, do not allow to rotate

Bent leg should be lowered through at least 45 degrees of hip abduction without pelvic rotation

SCREENING

B) LEVEL 2 SCREEN

5) FOUR-POINT KNEELING - Contralateral

Starting Position:

Four-point kneeling with spine in neutral
Keeping spine in neutral, contract TA

Test:

Slowly raise one arm and contralateral leg
Arm should reach horizontal with elbow extended
Leg should reach horizontal with knee extended
Lower arm and leg and repeat with opposite limbs

Measurement:

Quality and control of movement over 3 repetitions of each element

Notes:

Poor rotational control indicated by > 2.5cm rotation of lumbar or thoracic spine
Ensure lumbar spine neutral is maintained

6) FOUR-POINT KNEELING - Ipsilateral

Starting Position:

Four-point kneeling with spine in neutral
Keeping spine in neutral, contract TA

Test:

Slowly raise one arm and ipsilateral leg
Arm should reach horizontal with elbow extended
Leg should reach horizontal with knee extended
Lower arm and leg and repeat with opposite side

Measurement:

Quality and control of movement over 3 repetitions of each element

Notes:

Poor rotational control indicated by > 2.5cm rotation of lumbar or thoracic spine
Ensure lumbar spine neutral is maintained

SCREENING

B) LEVEL 2 SCREEN

7) ISOMTERIC LATERAL STRAIGHT ARM

Starting Position:

Lying on side on mat
Position one elbow directly beneath shoulder, forearm in mid pronation
Feet together
Upper arm resting on side
Keeping spine in neutral, contract TA

Test:

Support body weight on forearm, forming straight line from head to feet

Measurement:

Number of seconds correct form can be maintained
Record measurement for both sides

Notes:

Test finishes with any loss of form or shaking
Always begin test with same side
Rest for 2 minutes between sides

8) CERVICAL RANGE OF MOTION - Rotation

Starting Position:

Sitting with lumbar spine in neutral

Test:

Rotation of cervical spine as far as comfortable in each direction

Measurement:

Distance in cm from tragus of ear to centre of suprasternal notch

Record measurement for both sides

Notes:

Ensure no cervical spine flexion or extension

SCREENING

B) LEVEL 2 SCREEN

CERVICAL RANGE OF MOTION - Side Flexion

Starting Position:

Sitting with lumbar spine in neutral

Test:

Side flexion of cervical spine as far as comfortable in each direction

Measurement:

Distance in cm from tragus of ear to coronoid process of clavicle

Record measurement for both sides

Notes:

Ensure no cervical spine flexion, extension or rotation

9) PECTORALIS MAJOR - Clavicular Head

Starting Position:

Supine with arms by sides (palms against thighs) and test shoulder flush with edge of plinth

No pillow if tolerated

Test:

With elbow extended, flex test shoulder to 90 degrees, then horizontally extend to point of resistance (NB palm up)

Measurement:

Angle between test arm and horizontal in degrees

Goniometer axis centred over superior aspect of shoulder.

One arm of goniometer aligned with plinth and other with shaft of the humerus

Record measurement for both sides

Notes:

Arm should be able to pass horizontal

SCREENING

B) LEVEL 2 SCREEN

PECTORALIS MAJOR - Sternal Head

Starting Position:

Supine with arms by sides (palms against thighs) and test shoulder flush with edge of plinth

No pillow if tolerated

Test:

With elbow extended, abduct test shoulder to 120 degrees, then horizontally extend to point of resistance (palm up)

Measurement:

Angle between test arm and horizontal in degrees

Goniometer axis centred over superior aspect of shoulder.

One arm of goniometer aligned with plinth and other with shaft of the humerus

Record measurement for both sides

Notes:

Arm should be able to pass horizontal

10) PECTORALIS MINOR

Starting Position:

Supine with arms by sides (palms against thighs)

No pillow if tolerated

Test:

Distance from posterior angle of acromion to plinth, while lying in relaxed position

Measurement:

Distance in cm

Record measurement for both sides

Notes:

If required, use manual pressure on the anterior of the shoulder to assess how far the muscle will stretch

SCREENING

B) LEVEL 2 SCREEN

11) TRUNK SIDE FLEXION - Sitting

Starting Position:

Sitting with back in neutral against a wall
Hips, knees and ankles flexed to 90 degrees
Strap around thighs and chair to prevent hip hitching
Arms relaxed by sides

Test:

Mark height of tip of middle finger on wall
Athlete side flexes while keeping arm vertical
Mark height of tip of middle finger on wall at finishing position
Record measurement for both sides

Measurement:

Range of side flexion in cm between finishing mark and starting mark

Notes:

Movement terminates with any rotation of spine, loss of wall or floor contact, or hip hitching

12) LATISSIMUS DORSI - Standing

Starting Position:

Standing against wall with heels 5cm away from wall
Lumbar spine flattened against wall
Head retracted to touch back of head to wall, eyes level

Test:

Keeping elbow straight and lumbar spine flattened, raise one arm at a time up above head
Try to touch wall with back of hand

Measurement:

Angle between test arm and vertical in degrees
Goniometer axis centred over lateral aspect of shoulder joint. One arm of goniometer is aligned with wall (vertical) and other with shaft of humerus
Record measurement for both sides

Notes:

Minimum measurement of 160 degrees should be attained

SCREENING

B) LEVEL 2 SCREEN

13) LATISSIMUS DORSI - Supine

Starting Position:

Supine in crook lying position
Knees flexed to 90 degrees with feet flat on plinth
Lumbar spine actively flattened against plinth
Test arm in full external rotation
Other arm by side (palm against thigh)

Test:

While maintaining position of pelvis with light pressure, test arm is elevated through flexion until point of resistance

Measurement:

Angle between test arm and horizontal in degrees
Goniometer axis centred over lateral aspect of shoulder joint. One arm of goniometer is aligned with plinth (horizontal) and other with shaft of humerus
Record measurement for both sides

Notes:

Movement terminates with any rotation of pelvis or lumbar spine extension

14) WRIST FLEXION

Starting Position:

Sitting with forearm supported on plinth
Elbow flexed to 90 degrees
Forearms supinated

Test:

Isolating movement, flex wrists as far as possible keeping fingers relaxed

Measurement:

Flexion of test wrist in degrees
Goniometer axis centred over wrist joint at ulnar side. One arm of goniometer aligned with shaft of ulna and other aligned with shaft of fifth metacarpal
Record measurement for both sides

Notes:

Ensure movement is isolated to wrist and no compensations made
Forearms should not lift off the plinth

SCREENING

B) LEVEL 2 SCREEN

15) WRIST EXTENSION

Starting Position:

Sitting with forearm supported on plinth
Elbow flexed to 90 degrees
Forearms pronated

Test:

Isolating movement, extend wrists as far as possible keeping fingers relaxed

Measurement:

Flexion of test wrist in degrees
Goniometer axis centred over wrist joint at ulnar side. One arm of goniometer aligned with shaft of ulna and other aligned with shaft of fifth metacarpal
Record measurement for both sides

Notes:

Ensure movement is isolated to wrist and no compensations made

16) WRIST PRONATION

Starting Position:

Sitting with forearm supported on plinth
Elbow flexed to 90 degrees
Forearms in mid range

Test:

Isolating movement, pronate forearms as far as possible keeping fingers relaxed

Measurement:

Pronation of test wrist in degrees
Record measurement for both sides

Notes:

Ensure movement is isolated to forearm and no compensations made

SCREENING

B) LEVEL 2 SCREEN

17) WRIST SUPINATION

Starting Position:

Sitting with forearm supported on plinth
Elbow flexed to 90 degrees
Forearms in mid range

Test:

Isolating movement, supinate forearms as far as possible
keeping fingers relaxed

Measurement:

Supination of test wrist in degrees
Record measurement for both sides

Notes:

Ensure movement is isolated to forearm and no
compensations made

18) PIRIFORMIS

Starting Position:

Supine with hip on test side flexed to 45 degrees
Place foot of test leg on lateral side of opposite knee

Test:

Apply pressure to lateral aspect of test knee, stretching
across opposite leg
Movement terminates with any rotation of pelvis

Measurement:

Subjective assessment of medial rotation
Comparison between sides

Notes:

Terminate test if discomfort in groin

SCREENING

B) LEVEL 2 SCREEN

19) RECTUS FEMORIS

Starting Position:

Supine lying, buttock creases level with end of the plinth
Pull both knees firmly to chest
Contralateral hip held in maximum flexion (can be assisted)
Knee of test leg flexed to 90 degrees

Test:

Relax test hip into extension with passive end point while maintaining 90 degrees knee flexion

Measurement:

Flexion of test hip in degrees
Goniometer axis centred over greater trochanter of test hip.
One arm of goniometer aligned with shaft of femur and other pointing towards centre of the shoulder joint
Record measurement for both sides

Notes:

Perform test for both hips

20) ILIOTIBIAL BAND/TENSOR FASCIA LATA

Starting Position:

Supine lying, buttock creases level with end of the plinth
Pull both knees firmly to chest
Contralateral hip held in maximum flexion (can be assisted)
Knee of test leg flexed to 90 degrees

Test:

Relax test hip into extension, then passively push into adduction until no further movement is possible

Measurement:

Flexion of test hip in degrees
Goniometer axis centred over greater trochanter of test hip.
One arm of goniometer aligned with shaft of femur and other pointing towards centre of the shoulder joint
Record measurement for both sides

Notes:

Movement is terminated if pain is elicited
Ensure pelvis remains perpendicular to plinth

SCREENING

B) LEVEL 2 SCREEN

21) ILIOTIBIAL BAND FUNCTIONAL TEST

Starting Position:

Weight-bearing on one leg with knee in slight flexion
Foot in neutral (no pronation or supination)
Hands placed on hips

Test:

Rotate hips and trunk to place opposite foot at 90 degrees to weight-bearing foot
Both knees should remain slightly flexed
Heel of front foot must be placed against toes of rear foot
Rear foot should remain in contact with ground with no additional pronation or supination

Measurement:

Able to complete test or not

Notes:

Opposite leg to dominant hand should have greater range of internal rotation

22) HURDLE STEP

Starting Position:

Standing with feet shoulder width apart, toes below hurdle
Hurdle adjusted to height of athlete's tibial tuberosity
Dowel positioned across shoulders below neck

Test:

Athlete steps slowly over hurdle, touching heel on ground the other side and then returns to starting position

Measurement:

Pass:

Hips, knees and ankles remain aligned in the sagittal plane
Minimal to no movement noted in lumbar spine
Dowel and hurdle remain parallel

Fail:

Hip, knee and ankle alignment lost
Movement noted in lumbar spine
Dowel and hurdle do not remain parallel
Contact between foot and hurdle occurs
Loss of balance is noted
Record measurement for both sides

Notes:

Note quality of movement
Always start with assessment of same side

SCREENING

B) LEVEL 2 SCREEN

23) DOUBLE LEG BALANCE TEST

Starting Position:

Standing with feet shoulder width apart on 5cm diameter non-compressible foam cylinder
Maintain weight in centre of foot (heel and toe off ground)

Test:

Squat until femurs horizontal without touching heel or toe on ground more than once

Measurement:

Record if able to squat until femurs horizontal without touching heel or toe ground more than once

Notes:

Explain test and allow 30 seconds of practice

24) VERTICAL JUMP TEST (2)

Starting Position:

Before test, vertical reach measured in standing with hand closest to wall and recorded as reach height
Starting position is from static squat with 90 degree knee flexion

Test:

Athlete leaps as high as possible from static squat, using both arms and legs
Wall is touched at highest point of jump and distance recorded as jump height
Best of 3 attempts is recoded

Measurement:

Jump height minus reach height in cm

Notes:

Squat must be static to ensure consistency

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