Information for testers

Thank you for supporting the Athletics Australia Injury Risk Benchmarking project. This assessment is part of a nationally coordinated approach by Athletics Australia to help athletes, coaches and local support providers identify specific areas of general condition and athletic function that can be developed to decrease potential risk of injury and time lost from training. It is intended that the tests can be performed by either a physiotherapist or strength and conditioning coach.

The broad aims of the benchmarking project are:

- i. Determine and implement a series of simple, consistent and reliable physical measures tests that may reasonably provide information for athletes, coaches and service providers about individual athlete injury risk based on intrinsic neuromuscular factors and lead to interventions to measurably reduce this risk.
- ii. Over time, gain normative data based on these tests that reflect both the actual test performances and true injury risk of the Athletics Australia cohort and use this information to both refine the benchmarking process and educate athletes, coaches and service providers.

AA intend to complement or add value to current daily training environment initiatives and the specifics of any current initiatives will be discussed with each SIS/SAS. It is proposed that tests will be delivered bi-annually with timelines reviewed following the testing pilot.

This project is not a comprehensive injury audit, a clinical screening tool or exhaustive list of functional tests. As such, Athletics Australia expects that local SIS/SAS, or independent service providers will continue to carry out any additional screening or testing protocols that they find beneficial. However, please be aware that under the recent NASS agreements, it is a requirement for Athletics Australia NASS funded athletes to participate in this benchmarking project.

There is currently limited normative benchmarking data for elite track and field populations. For this reason, the automated benchmark thresholds (highlighted red on the AMS testing form), are set at relatively conservative levels, with the intention of under calling potential issues rather than over calling. Any flagged test results are intended to serve as a prompt for further discussion between the athlete, coach and local support team, and where agreed an appropriate intervention plan implemented. It is anticipated that over time the benchmark thresholds will be revised to represent greater specificity and sensitivity.

Prior to the athlete consenting to testing, please advise the athlete to flag any current injury that prevents them from performing any of the tests. If the athlete experiences pain during the session, they should stop immediately and you should notify a relevant health care provider. Please be aware that some of the tests may cause fatigue or delayed muscle soreness and athletes should not train within 24 hours of the testing or until any muscle soreness has gone.

Testers should allow approximately 25 minutes and an additional 5 – 10 minutes for pole vault and javelin athletes.

Data collection for non-ambulant Para athletes will be coordinated directly through Wheelchair Track and Road or Throws camps and the information feedback to the athlete's coach and any relevant daily training environment service providers.

Data entry through AMS

- Testing data is collected through the AIS Smartabase Athlete Management System (AMS). The form is titled "Track & Field – Injury Risk Benchmarking".
- AA can facilitate access for any testers and instructions will be separately provided.
- The form can also be made available through any State Institute or Academy child sites.
- Prior to any testing sessions, testers should confirm they have access to the form and athletes scheduled for testing.

Testing equipment requirements

- Access to a plinth
- Electronic scales
- Tape measure
- Stopwatch
- Goniometer
- Step
- 25 degree decline board
- Floor tape for star excursion test
- Hand held dynamometer

Information for athletes - athlete information sheet to be provided to athletes

Remaining healthy and able to train is crucial for all high performance athletes. This assessment is part of a nationally coordinated approach by Athletics Australia to help you, your coach and your local support team identify specific areas of your general condition and athletic function that can be developed to decrease your potential risk of injury and time lost from training.

You may have been through a similar process in the past with your Physiotherapist or State Institute or Academy of Sport and some of the tests will be familiar. By coordinating these tests nationally and combining results with our injury data, Athletics Australia can ensure that all testing is consistent and that the feedback you receive is as track and field specific as possible. Your involvement will help refine this process further and enable Athletics Australia to provide all our athletes with the most up to date and accurate injury risk data anywhere in the world.

The tests are known to have an association with general athletic injury. Your coach and local support team may also choose to perform additional event specific tests or further clinical assessment as needed. Para athletes are requested to identify any tests that they are not able to perform.

You must advise the person conducting your testing if you have a current injury that prevents you from performing any of the tests. If you have pain during the session, stop immediately and notify your tester. Please be aware that some tests may cause fatigue or delayed muscle soreness and you should not train within 24 hours of the testing or until any muscle soreness has gone.

Where possible, data collection for U19 / NASS athletes occurs twice each year.

Test Protocols - able-bodied and ambulant Para athletes

Body weight

Test	Where possible measured with electronic scales	
Measure	Record weight in kilograms	
Leg length		
Test	Leg length is measured with the athlete in supine, using a tape measure from the midpoint of the greater trochanter to the midpoint of the medial malleolus.	
Measure	Record leg length in centimetres.	
<u>Knee to wall</u>		
Test	The athlete places the test foot on a tape measure perpendicular to the wall and lunges so the knee touches the wall. The foot is moved away from the wall until the knee can only make light contact with the wall while the foot remains flat on the ground.	
Measure	The distance from the big toe to the wall in centimetres.	
Look for	Ensure the athlete's knee remains 'over their 2 nd toe' and their pelvis is aligned parallel with the wall.	



Repeated calf raise

Test The athlete performs a single leg calf raise from maximal dorsiflexion to maximal plantarflexion over the edge of a step. The athlete may use 'finger-tip balance' against a wall or other support and is instructed to "keep your knee straight and avoid hitching through your hip."

> Repetitions must be performed at a rate of one raise every 2 seconds (i.e. 1 second up: 1 second down). Where possible, a metronome should be used to maintain the test frequency.

Measure The number of successful repetitions.

AA Injury Risk Benchmarking project Tester information

Look for

The test should be stopped if:

- The athlete achieves a maximum of 30 repetitions
- The athlete stops prior to 30 repetitions
 - The athlete cannot maintain the rate of one raise every two seconds
- The athlete is unable to perform the full range of PF or DF on two repetitions
- The athlete performs a compensatory movement (e.g. knee flexion or hip hitch) on two repetitions



Single leg decline squat

Test The athlete performs 10 single leg squats on a 25 degree decline board and is instructed to "keep your knee over the second toe and ensure your pelvis maintains a horizontal (coronal) alignment throughout the test." A 'hands to opposite shoulders' posture must be maintained throughout the test. Repetitions must be performed at a rate of one squat every 2 seconds (i.e. 1 second up : 1 second down). Where possible, a metronome should be used to maintain the test frequency.

To standardise squat depth, the athlete's big toe should be 10 centimetres from the base of the decline board and they should touch the heel of their contralateral foot on the ground "as lightly as possible." Weight transfer is not allowed.

Measure The test is graded 0-3 (see below)

Look for:

0	Unable to complete 10 repetitions to required depth or frequency
1	Able to complete 10 repetitions to required depth and frequency but does not maintain <i>both</i> knee over 2 nd toe <i>and</i> horizontal coronal pelvic alignment
2	Able to complete 10 repetitions to required depth and frequency but does not maintain either knee over 2 nd toe or horizontal coronal pelvic alignment
3	Performs 10 repetitions to required depth and frequency and maintains knee over 2 nd toe and horizontal coronal pelvic alignment



November, 2015

<u>Single leg 'bridge'</u>

Test The athlete lies supine with the test leg flexed so that the heel is adjacent to the contralateral knee joint axis. The contralateral leg is then raised from the plinth for the duration of the test. A 'hands to opposite shoulders' posture must be maintained throughout the test.

The athlete is instructed to "raise and lower your hips 10 times, without sagging through your back or letting the opposite side of your pelvis drop."

Repetitions must be performed at a rate of one raise every 2 seconds (i.e. 1 second up : 1 second down) and must attain neutral (i.e. 0 degrees) hip extension at the high point of the raise . Where possible, a metronome should be used to maintain the test frequency.

Measure The test is graded 0-3 (see below)

Look for

0	Unable to complete 10 repetitions to required height or frequency
1	Able to complete 10 repetitions to required height and frequency but does not maintain spinal posture <i>and</i> horizontal transverse pelvic alignment
2	Able to complete 10 repetitions to required depth and frequency but does not maintain either spinal posture or horizontal transverse pelvic alignment
3	Performs 10 repetitions to required depth and frequency and maintains spinal posture and horizontal transverse pelvic alignment



<u>Star excursion – posteromedial</u>

Test A 'Y' is marked on the floor with two diagonal lines at 135 degrees from the central line and the centre point of the Y marked. The athlete stands barefoot with the posterior margin of one heel on the centre point of the Y. A 'hands to opposite shoulders' posture must be maintained throughout the test.

The athlete is instructed to "reach back & out with your leg and touch your toes as lightly as possible as far along the marked line as you can." Athletes are given two practice repetitions.

Measure The furthest of three subsequent test repetitions is measured from the midpoint of the Y.

Look for

The athlete must touch the actual line and return to the starting position without losing balance. Weight transfer is not allowed when reaching back and out for the line.



Hip impingement pain

Test With the athlete in supine, their hip is passively taken to 90 degrees of flexion and then adducted and internally rotated.

Measure The test is graded positive or negative.

Look for Positive - pain is produced in the groin region (buttock pain is not a positive result). Negative – pain is not produced in the groin region.

Hand held dynamometry

Athletes with no experience using HHD should ideally perform a two repetition trial at the beginning of the benchmarking session and then perform the measured test at the end of the session.

Hip abduction strength

- **Test** The athlete lies in spine with the hip in a neutral position and their ankle over the edge of the bed. The opposite leg is flexed and the athlete holds onto the side of the bed with both hands. The examiner places the HHD against the resistance point, 5cm proximal to the lateral malleolus and instructs the athlete to "go ahead push –push push –push" maximally against the HHD for an initial period of two seconds and is then pushed eccentrically towards hip adduction to 'break' the athlete's maximum resistance.
- Measure The maximum force from three tests is recorded in Newtons.
- Look for The athlete must not perform compensatory movements such as hip flexion or external rotation.



Hip adduction strength

Test The athlete lies in spine with the hip in a neutral position and their ankle over the edge of the bed. The opposite leg is flexed and the athlete holds onto the side of the bed with both hands.

The examiner places the HHD against the resistance point, 5cm proximal to the medial malleolus and instructs the athlete to "go ahead – push –push –push –push" maximally against the HHD for an initial period of two seconds and is then pushed eccentrically towards hip adduction to 'break' the athlete's maximum resistance.

- Measure The maximum force from three tests is recorded in Newtons.
- Look for The athlete must not perform compensatory movements such as hip flexion or internal rotation.



Hip extension strength

Test The athlete lies in prone with the hip in neutral and the knee flexed 70-90 degrees. The athlete holds onto the side of the bed with both hands.

The examiner places the HHD against the resistance point, 5cm proximal to the knee crease and instructs the athlete to "go ahead – push –push –push –push" while applying a force to 'match' the athlete's maximal effort.

- **Measure** The maximum force from three tests is recorded in Newtons.
- Look for The athlete must not perform compensatory movements such as trunk extension or rotation.



Hip flexion strength

Test The athlete sits on the end of the bed and then props back onto their elbows, holding onto the side of the bed with both hands.

The examiner places the HHD against the resistance point, 5cm proximal to the proximal edge of the patella and instructs the athlete to "go ahead – push – push – push – push" while applying a force to 'match' the athlete's resistance.

- Measure The maximum force from three tests is recorded in Newtons.
- Look for The athlete must not perform compensatory movements such as trunk flexion or rotation.



Knee flexion strength

Test: The patient lies in prone and holds onto the side of the bed with both hands. The test leg is held in approximately 30 degrees flexion with the HHD against the resistance point, posterior to the ankle joint in line with the malleoli.

The athlete is instructed to "go ahead – pull –pull –pull" maximally against the HHD for an initial period of two seconds and is then pulled eccentrically towards knee extension to 'break' the athlete's maximal resistance.

- Measure The maximum force from three tests is recorded in Newtons.
- Look for The athlete must not perform compensatory movements such as hip flexion or trunk rotation.



Thoracic rotation-extension mobility

Test The athlete lies on their side in a crook lying position with their bottom arm extended in front and the hand of their top arm resting on their sternum. The tester provides a buttress behind the athlete to block lumbo-pelvic rotation during the test manoeuvre. The athlete rotates their top shoulder back towards the bed.

Measure The test is graded pass or fail (see below):

Pass	The posterior aspect of the shoulder girdle makes contact with the bed
Fail	The posterior aspect of the shoulder girdle does not make contact with the bed

Look for Larger muscled athletes making contact with the posterior aspect of their upper arm rather than shoulder girdle.



Biering-Sorensen

- **Test** The athlete lies prone with their feet together, ASIS's on edge of the bed and hands supported on a chair beyond the head of the bed. The Tester lies across the athlete's lower legs below the knee to support the athlete. The athlete folds their arms across their chest, maintaining a neutral spinal posture parallel to the ground.
- Measure The number of seconds that the athlete can sustain this position.
- **Look for** The test should be stopped if:
 - The athlete achieves a maximum of 180 seconds
 - The athlete stops prior to 180 seconds
 - The athlete cannot maintain the original starting position (i.e their shoulders start to drop or arches into hyperextension) and cannot correct the position after a single warning.



Additional test protocols - pole vault & javelin athletes only

Shoulder internal rotation mobility

Test The athlete lies in supine with their shoulder abducted to 90 degrees, elbow flexed to 90 degrees, forearm orientated vertically towards the ceiling and hand facing the foot end of the bed.

The tester places one hand on the athlete's shoulder to prevent it lifting from the bed and passively moves the shoulder into internal rotation until the end range position is determined.

- **Measure** The angle between the starting vertical and the end range plane of the forearm using a goniometer.
- Look for The athlete's shoulder girdle must not rise from the bed.



Shoulder external rotation mobility

Test The athlete lies in supine with their shoulder abducted to 90 degrees, elbow flexed to 90 degrees, forearm orientated vertically towards the ceiling and hand facing the foot end of the bed.

The tester places one hand on the athlete's shoulder to prevent it lifting from the bed and passively moves the shoulder into external rotation until the end range position is determined.

- **Measure** The angle between the starting vertical and the end range plane of the forearm using a goniometer.
- Look for The athlete's shoulder girdle must not rise from the bed.



Hand Held Dynamometry

Shoulder internal rotation strength

Test The athlete sits on the edge of the bed with their arm by their side, elbow flexed to 90 degrees and thumb pointing to the ceiling. The athlete is told not to raise their elbow away from their side or lean towards the HHD during the test.

The examiner places the HHD against the resistance point, 5cm proximal to the anterior wrist crease and instructs the athlete to "go ahead – push –push – push" maximally against the HHD for an initial period of two seconds and is then pushed eccentrically towards shoulder external rotation to 'break' the athlete's maximum resistance.

- Measure The maximum force from three tests is recorded in Newtons.
- Look for The athlete must not perform compensatory movements such as shoulder abduction or trunk lateral flexion.

Shoulder external rotation strength

Test The athlete sits on the edge of the bed with their arm by their side, elbow flexed to 90 degrees and thumb pointing to the ceiling. The athlete is told not to raise their elbow away from their side or lean towards the HHD during the test.

The examiner places the HHD against the resistance point, 5cm proximal to the posterior wrist crease and instructs the athlete to "go ahead – push –push – push" maximally against the HHD for an initial period of two seconds and is then pushed eccentrically towards shoulder internal rotation to 'break' the athlete's maximum resistance.

- **Measure** The maximum force from three tests is recorded in Newtons.
- Look for The athlete must not perform compensatory movements such as shoulder abduction or trunk lateral flexion.

For further information about test protocols, please contact Project Lead, Matt Lancaster at <u>mattlancaster@hotmail.co.uk</u>.

Appendix 1 - Tests

Able-bodied & Para Ambulant athletes		
1	Body weight	
2	Leg length	
3	Knee to wall	
4	Repeated calf raise	
5	Single leg decline squat	
6	Single leg 'bridge'	
7	Star excursion – posteromedial	
8	Hip impingement pain	
9	HHD - Hip abduction strength	
10	HHD - Hip adduction strength	
11	HHD - Hip extension strength	
12	HHD - Hip flexion strength	
13	HHD - Knee flexion strength	
14	Thoracic rotation-extension mobility	
15	Biering-Sorensen	

Pole vault and javelin only		
16	Shoulder internal rotation mobility	
17	Shoulder external rotation mobility	
18	HHD - Shoulder internal rotation strength	
19	HHD - Shoulder external rotation strength	

Auto calculated data		
1	Star excursion : leg length ratio	
2	Hip abduction : body weight ratio	
3	Hip abduction : adduction ratio	
4	Knee flexion : body weight ratio	
5	Hip extension : knee flexion ratio	
6	IR:ER ratio	
7	Shoulder IR / body weight	

Appendix 2 – November 2015 Benchmark Thresholds

Test	Benchmark	
Body weight	N/A	
Leg length	N/A	
Knee to wall (ankle dorsiflexion)	< 7 or difference > 2	
Repeated calf raise (max 30)	< 25 or difference > 5	
Single leg decline squat (x 10)	< 3 (i.e. 2 or less)	
Single leg 'bridge' (x10)	< 3 (i.e. 2 or less)	
Star excursion – posteromedial	L:R > 15% difference	
Star excursion : leg length ratio	No benchmark 2015	
Hip impingement pain	Yes	
Hip abduction	L:R > 15% difference	
Hip abduction : body weight ratio	No benchmark 2015	
Hip adduction	L:R > 15% difference	
Hip abduction : adduction ratio	< 85 % or > 115%	
Hip extension	L:R > 15% difference	
Hip flexion	L:R > 15% difference	
Knee flexion	L:R > 15% difference	
Knee flexion : body weight ratio	No benchmark 2015	
Hip extension : knee flexion ratio	No benchmark 2015	
Thoracic rotation-extension	No	
Biering-Sorensen	< 100 secs	

Appendix 3 – project Team

Matt Lancaster	AA Consultant Physiotherapist - Special Projects	Project Lead
Brent Kirkbride	AA Chief Physiotherapist	Project Team Member
Victoria Moore	AA Para SSSM Coordinator	Project Team Member
Ben Raysmith	AIS Track and Field Physiotherapist	Project Team Member
Ali Campbell	AA High Performance Services Manager	Project Coordinator
Craig Hilliard	AA Head Coach	Project Advisor
Andrew Faichney	AA Paralympic Program Manager	Project Advisor
Ross Smith	AA Lead - Strength and Conditioning	Project Advisor
Dr Adam Castricum	AA Chief Medical Officer	Project Advisor
Kevin Cragie	AA Junior Physiotherapy Coordinator	Project Advisor