Introduction

This battery of testing protocols is used to assess the physiological status of Australian Football players. The tests have been selected to represent a range of physical and performance characteristics, including body composition, flexibility, lower-body power, speed, agility, anaerobic capacity and aerobic endurance. These tests form part of the official AFL National Draft Combine Program and are used widely in the premier competition of the sport, the Australian Football League (AFL). Additional protocols have been suggested for tests that may be conducted when specialised equipment is available.

Australian Football is a physically demanding team sport requiring a combination of highly developed fitness capacities. Players at the elite level typically cover approximately 12 km per match, although this varies slightly depending on position (Coutts et al. 2010; Gray and Jenkins 2010; Pyne et al. 2006; Wisbey et al. 2010). There are also substantial differences in match running performance between elite and subelite levels (Brewer et al. 2010). The game is characterized by frequent accelerations, decelerations, changes in direction and heavy physical contact (Coutts et al. 2010; Wisbey et al. 2010). This combination of demands provides a challenge for both the assessment of physical attributes and design of training programs.

Match work rates and the development of various physical capacities in Australian Football players are well documented (Appleby and Dawson 2002; Brewer et al. 2010; Dawson et al. 2004a,b; Wisbey et al. 2010). Much of this work relates to new smart sensor technologies that provide estimates of movement patterns and physical demands on game day (Wisbey et al. 2010) and also in training (Dawson et al. 2004a,b). Collectively this information points to the highly intermittent and intense nature of Australian Football games and training.

There are several potential benefits of physiological testing with junior and senior Australian Football players. Physiological testing can distinguish between starters and nonstarters at the beginning of an AFL season (Young et al. 2005) and the likely progression from junior to the elite level (Pyne et al. 2005). A number of recent studies have described capacities of elite junior players (Veale et al. 2008, 2009). Details on long-term power development in AFL players (McGuigan et al. 2009), the relationship between power and sprint performance (Young et al. 2011), and speed qualities in elite players (Young et al. 2008), provide useful information for coaches and sports scientists.
The highly demanding nature of Australian Football, the established links between various physical capacities and career progression, and data describing the level of development in various qualities at the elite level, justify regular profiling of junior and senior players. Such testing allows objective decisions to be made regarding the design and implementation of programs aimed at improving Australian Football match performance.

**Athlete Preparation**

Standardized pretest preparation is recommended to enable reliable and valid physiological data to be obtained. Specific information relating to the preparation of the athlete and the testing environment is provided in the *AIS Pretest Environment and Athlete Preparation* document. In addition, a number of considerations pertaining to performance testing of footballers are outlined in this section.

**Diet**
Athletes should be encouraged to follow their normal dietary practices in the 24-48 h preceding testing. A light breakfast should be consumed before testing conducted in the morning, and similarly a light lunch should be consumed 2 to 3 h before afternoon testing.

**Training**
Athletes should be tested in a relatively fresh state so that they can give a full, unhindered effort in maximal effort tests. It is preferred that athletes only have a light skill-oriented session on the evening before testing and that intensive training be conducted after testing.

**Testing**
Athletes should be familiar with test procedures and protocols before commencement. Written and verbal instructions should be provided as necessary. Athletes being tested for the first time should undertake familiarization trials or sessions. Written informed consent may be required (from the player or parent/guardian) prior to testing in some circumstances.

**Test Environment**
Anthropometry testing can be conducted in the laboratory or a suitable indoor area (small room) where athletes can be measured in private. The 20 m sprint, vertical jump, agility run, multistage shuttle run and 6 x 30 m repeat sprint ability test should all be conducted indoors where possible. The indoor venue should have a properly sprung wooden floor suitable for indoor sports. The surface should be clean, free of dust and in good condition. The 3 km time trial should be conducted on a properly marked 400 m athletic track preferably one with a synthetic surface. Environmental conditions should be recorded; if conditions are too adverse testing should be postponed to another time.
Recommended Test Order

It is important that field and strength tests be completed in the same order to control the interference between tests. This order also allows valid comparison of results from different testing sessions. The order is as follows:

<table>
<thead>
<tr>
<th>DAY</th>
<th>TESTS</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,</td>
<td>Anthropometry</td>
<td>Anthropometry conducted in laboratory</td>
</tr>
<tr>
<td>morning</td>
<td>20 m sprint</td>
<td>For court testing divide athletes into four groups and rotate</td>
</tr>
<tr>
<td></td>
<td>AFL agility run</td>
<td>on four stations (two stations for vertical jump testing)</td>
</tr>
<tr>
<td></td>
<td>Vertical jump</td>
<td></td>
</tr>
<tr>
<td>1,</td>
<td>Repeat sprint ability</td>
<td></td>
</tr>
<tr>
<td>afternoon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Multistage shuttle run or Yo-Yo intermittent recovery or 3 km time trial</td>
<td>Divide athletes into groups of ~ 8-10</td>
</tr>
<tr>
<td>3</td>
<td>Strength and power testing</td>
<td>Power tests should be undertaken before maximum strength tests</td>
</tr>
</tbody>
</table>

Equipment Checklist

**Anthropometry:**
- [ ] Stadiometer (wall mounted)
- [ ] Balance scales (accurate to +/- 0.05 kg)
- [ ] Anthropometry box
- [ ] Skinfold calipers
- [ ] Marker pen
- [ ] Anthropometric measuring tape
- [ ] Arm span scale
- [ ] Recording sheet
- [ ] Pen

**20 m Sprint Test:**
- [ ] Electronic light gate equipment
- [ ] Measuring tape
- [ ] Field marking tape
- [ ] Witches hats
- [ ] Recording sheet (optional)
- [ ] Pen

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Planned AFL Agility Run:
[ ] Electronic light gate equipment
[ ] Measuring tape
[ ] Field marking tape
[ ] 5x poles (see planned AFL agility run test procedure)
[ ] Recording sheet (optional)
[ ] Pen

Vertical Jump Test:
[ ] Yardstick © jumping device (e.g. Swift Performance Yardstick)
[ ] Measuring tape
[ ] Field marking tape
[ ] Recording sheet
[ ] Pen

6x 30 m Repeat Sprint Ability Test:
[ ] Electronic light gate equipment
[ ] Measuring tape
[ ] Witches hats
[ ] Sound box or CD/MP3 player
[ ] 6 x 30 m RSA test CD/MP3
[ ] Stopwatch
[ ] Recording sheet
[ ] Pen

Multistage Shuttle Run Test or Yo-Yo Intermittent Recovery Test:
[ ] Measuring tape
[ ] Field marking tape
[ ] Witches hats
[ ] Amplifier or CD player
[ ] Multistage shuttle run or Yo-Yo intermittent recovery test CD (or MP3 file)
[ ] Stopwatch
[ ] Recording sheet
[ ] Pen

3 km Time Trial (run):
[ ] 400 m synthetic running track
[ ] Stopwatches
[ ] Recording sheet
[ ] Pen
Strength and Power testing:
[ ] Bench
[ ] Chin up bar
[ ] Barbell (Olympic 20 kg)
[ ] Weight plates (2.5-25 kg increments)
[ ] Incline leg press or squat rack
[ ] Recording sheet
[ ] Pen
[ ] Optional - Force plate and/or linear position transducer connected to laptop computer

Test Protocol - Anthropometry

Rationale -
Size and shape of players are important features of the game. Anthropometric measures are useful in
talent identification and development, and also in management of the training and dietary practices of
senior players with mature physiques.

Test Procedure -
Measurement of height, body mass, arm length, hand span and skinfolds should be carried out prior to
field testing protocols. Skinfolds are recorded over seven sites (triceps, biceps, subscapular, supraspinale,
abdomen, thigh and calf). The individual skinfold measures as well as the sum of the seven sites should be
reported. Refer to anthropometry protocols outlined in AIS Surface Anthropometry document, for a
detailed description of all anthropometric test procedures.

Although the description of skinfold measurement procedures seems simple, a high degree of technical
skill is essential for consistent results. It is therefore important that these measurements be taken by an
experienced tester who has been trained in these techniques. It is also important that where possible the
same tester conduct each re-test to ensure adequate reliability.

Data Analysis -
Anthropometric data can be used for serial monitoring (within-subject) of individual players during the
preseason and competition season. For talent identification anthropometric data can be used for cross-
sectional (between-subject) comparison of the size and shape of players. Interpretation of data for
younger players should account for variations in the time course of physical growth and maturation.

Normative Data -
The table below presents anthropometric normative data for Australian Football players.
Anthropometric data for Australian Football players (mean ± SD; range)

<table>
<thead>
<tr>
<th></th>
<th>Mean ± SD; Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height, m</td>
<td>1.86 ± 0.06 (1.67-2.02)</td>
</tr>
<tr>
<td>Body Mass, kg</td>
<td>81 ± 8 (63-107)</td>
</tr>
<tr>
<td>∑7 Skinfolds, mm</td>
<td>56 ± 13 (31-113)</td>
</tr>
<tr>
<td>Arm length, cm</td>
<td>82 ± 4 (69-89)</td>
</tr>
<tr>
<td>Hand Span, cm</td>
<td>22.9 ± 1.5 (18.9-27.5)</td>
</tr>
</tbody>
</table>

**Typical error:** Height = 0.01m; Body Mass = 1.5kg; Skinfolds = 1.5mm


Note: All normative data provided are for players of ~18 years of age and will vary for older players in senior football.

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**Test Protocol - Vertical Jump Test**

**Rationale** -
The vertical jump is used to assess leg power and jumping ability, which are important element in AFL when jumping for the ball in marking, scrimmages or ruck contests.

**Test Procedure** -
For Australian Football, two variations of the vertical jump test are implemented. The first is the standing vertical jump (with arm swing and countermovement). The second variation is the running vertical jump test.

**Standing Reach Height (standing and running tests)**

i. The athlete should stand with their feet together side-on to the Yardstick® jumping device.

ii. Keeping the heels on the floor and looking straight ahead, the athlete reaches upward with their dominant hand as high as possible, fully elevating the shoulder to displace the vanes (e.g. vane 25 is displaced = 25 cm).

iii. Record this as the standing reach height in centimetres.

iv. The absolute standing reach height from the floor may be calculated as the pole setting height (i.e. the height the zero vane is from the floor; either 160, 170, 180, 190, 200 or 210 cm) plus the highest vane displaced. Record this measure in centimetres.

**Standing Vertical Jump Height**

i. Move several of the lower vanes away before instructing the athlete to stand close to the Yardstick® for their jump.

ii. An arm swing and countermovement are used to jump as high as possible with the athlete displacing the vanes at the height of the jump.

iii. The take-off must be from two feet with no preliminary steps or shuffling, however feet can be comfortably apart.

iv. The athlete performs at least three trials and may continue as long as improvements are being made. The best trial, that is the highest vane displaced, is recorded as the jump height.
v. Calculate the difference between jump height and standing reach height to give the relative vertical jump result in centimetres (cm).

vi. The absolute jump height from the floor may be calculated as the pole setting height (i.e. the height the zero vane is from the floor; either 160, 170, 180 cm etc.) plus the highest vane displaced (e.g. vane 80 = 80 cm). Record this measure in centimetres.

**Running Vertical Jump Height**

i. Field marking tape is used to place a mark 5 m to the left and right side of the Yardstick® (allowing for a straight line approach).

ii. Standing reach height is measured as per standing vertical jump test.

iii. After several of the lower vanes are moved away, the athlete stands at the 5 m mark to commence the test.

iv. Using an approach run-up, the athlete jumps vertically off the outside leg and reaches as high as possible with the inside hand displacing the vanes at the height of the jump (the action is similar to a ruck contest).

v. The take-off must be from one foot. The left side is taken as the left leg take off - right hand jump, and the right side is taken as the right leg take off - left hand jump.

vi. The athlete performs three trials from each side.

vii. Jump height is recorded as the highest vane displaced for both the left and right sides.

viii. The difference between maximal jump height and standing reach height is calculated to give the relative jump result in centimetres (cm) for both sides.

**Data Analysis -**

Absolute jump heights are likely to be more important for ruckmen and key position players in contested marking situations. The test results reflect the underlying jumping ability of players in a rested state. Another question is how jumping ability is affected by fatigue and there is interest in implementing jumps tests to address this. In AFL players, the ratio of flight time to contraction time calculated during a countermovement jump is a sensitive measure of neuromuscular fatigue (Cormack et al. 2008). However, determination of this ratio requires use of a force plate and specialized software that might not be readily available in all programs. Another potentially useful variable for monitoring fatigue status in AFL players is average flight time calculated from five repeated countermovement jumps. Although this variable is a less sensitive fatigue marker, it can be calculated using a simple timing mat (Cormack et al. 2008).

**Normative Data -**

Vertical jump normative data for Australian Football players is presented below.
**Test Protocol - 20m Sprint Test**

**Rationale -**
This is a simple and easily administered test of the ability to sprint from a stationary start to 20 m. Over this short distance it is likely that the test is primarily a measure of acceleration qualities rather than maximal running velocity.

**Test Procedure -**
For Australian Football, the sprint test is conducted over 20 m, with intermediate distances of 5 m and 10 m.

i. Measure out specified distances with the measuring tape, checking that there are no twists in the tape when laid out. It is useful, where possible, to use a lane marker or sideline (straight line) to lay the measuring tape along.

ii. Mark each interval (i.e. 5, 10, 20 m) with masking tape including a start line (0-m) and a finishing line (20 m).

iii. Place two cones approximately 4 m after the last set of timing gates.

iv. Set the timing gates at the appropriate intervals (0, 5, 10 and 20 m).

v. Timing lights on the start line should be set at a lower height to ensure capture of the start. Other timing lights should be set at approximately torso height and approximately 1.5-2.0 m apart.

vi. Athletes start from a stationary, upright position with the front foot on the 0 m point, in line with the start gate. The starting position is with front foot toe just touching the start line (0 m), heel up on back foot, body mass over the front foot, with shoulders and hips square in a crouched “ready” position.

vii. Once in the ready position, all subsequent movement must be in a forward direction (i.e. no rocking is allowed).

viii. The athlete may start in their own time once they have been advised the system is ready.

ix. The athletes should be instructed to sprint as fast as possible ensuring they don’t decelerate until they have passed the cones set 4-m after the final gate.

x. Split times (at 5 and 10 m) and final time (20 m) for three trials are recorded to the nearest 0.01 s.

xi. Allow at least 2 min active recovery/rest between sprint trials.

xii. The best time for each split and final time are used as the final result even if these times come from different trials.

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**Vertical jump data for Australian Football players (mean ± SD; range)**

<table>
<thead>
<tr>
<th>Vertical Jump – Absolute, cm</th>
<th>Vertical Jump – Relative, cm</th>
<th>Running Jump – Right, cm</th>
<th>Running Jump – Left, cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>305 ± 11 (280-336)</td>
<td>60 ± 6 (44-80)</td>
<td>70 ± 8 (50-95)</td>
<td>76 ± 7 (54-94)</td>
</tr>
</tbody>
</table>

**Typical error:** Relative jump = 1.4 cm

Data Analysis -
Players should be rested and relatively fresh for sprint testing to obtain valid results. A well-structured warm-up is important to limit the risk of injury and promote optimal performance. The 20 m test has a long history in the Australian Football community and many clubs and programs have established internal reference values. A common variation of this test is the 40 m sprint with timing gates at the 10, 20, 30, and 40 m marks. The longer distance should permit a better estimation of maximal running velocity (Vmax), computed as the mean velocity between the 30 and 40 m gates, to complement the assessment of acceleration over 5, 10 and 20 m in the standard 20 m protocol.

Normative Data -
The table below presents sprint test normative data for Australian Football players.

<table>
<thead>
<tr>
<th>Distance</th>
<th>Time (mean ± SD; range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 m</td>
<td>1.09 ± 0.05 (0.95-1.27)</td>
</tr>
<tr>
<td>10 m</td>
<td>1.81 ± 0.07 (1.65-2.03)</td>
</tr>
<tr>
<td>20 m</td>
<td>3.04 ± 0.09 (2.82-3.37)</td>
</tr>
</tbody>
</table>

Typical error: Sprint time = 0.03s


Test Protocol - Planned AFL Agility Run

Rationale -
The run is an AFL-specific planned agility test and used to indicate an athlete’s overall agility and ability to change direction at speed around a short twisting course. This planned agility test, and other variations, are complementary to reactive agility testing.

Test Procedure -

i. Two sets of light gates are required, one at the start and one at the finish. The poles (obstacles) are typically made from PVC pipe with a circumference of ~35 cm and are ~ 1.5 m high. Field marking tape should be placed on the floor at two corners of the obstacle so it can be accurately re-positioned if it is knocked over.

ii. Athletes start from a stationary, upright position with the front foot on the 0 m point, in line with the start gate. Athletes weave in and out of the obstacles or poles as per the figure below and should avoid moving them in any way. If a pole is moved or knocked over completely, the trial is stopped and the athlete must start again (after a brief rest).

iii. Athletes should complete a short warm-up of light running, dynamic stretching and some run throughs. After instruction, athletes should have a practice trial at 50% effort to familiarise themselves with the course.

iv. Three maximal effort trials are recorded and the best time (seconds reported to two decimal places) taken as the score. Allow 2 to 3 min recovery between trials.
Data Analysis -
This test is categorized as a planned agility test because it involves a fixed protocol in which athletes know the required movement pattern. The other variant is a reactive agility test whereby the player has to react to an external stimuli (e.g. light signal, another player, video screen). Reactive agility tests are thought to be more game-specific and possibly correlate better with actual performance. Refer to Perceptual-Cognitive and Perceptual-Motor Contributions to Elite Performance chapter for further detail. Athletes who are slow on the agility run should be given footwork drills, agility drills with and without the ball, and some acceleration and deceleration training. Consideration should also be given to levels of underlying strength and power qualities that can be developed with appropriate resistance training programs.

Normative Data -
Normative data for the AFL agility run for Australian Football players is presented below.

**AFL agility run data for Australian Football players**
*(mean ± SD; range)*

<table>
<thead>
<tr>
<th>Agility Run, s</th>
<th>8.57 ± 0.28</th>
</tr>
</thead>
<tbody>
<tr>
<td>(7.89-9.57)</td>
<td></td>
</tr>
</tbody>
</table>

*Typical error:* Run time = 0.13s


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Rationale -
Both of these tests provide a simple means of quantifying endurance fitness.

Test Procedure – Multistage Shuttle Run Test -

i. Measure the 20 m distance and mark it clearly with marking tape and cones set at approximately 1.5 m intervals.

ii. Have athletes line up along one of the lines, ready to start.

iii. Start the CD and ensure the athletes listen carefully to the instructions. The commentary will provide a brief explanation of the test leading to a 5 s countdown before the start of the test itself. Begin the test at level 1.

iv. The CD emits a single ‘beep’ at various intervals. The athlete must try to be at the opposite end of the 20 m track by the time the following beep sounds. After approximately each min, the time interval between beeps decreases with running speed increasing accordingly.

v. If the athlete arrives at the line before the beep sounds, they should turn (by pivoting) and wait for the beep before continuing to the next line.

vi. If an athlete fails to reach the line at the sound of the ‘beep’ the athlete must receive a warning that they will be eliminated if they are not at the opposite end of the 20 m track at the sound of the next ‘beep’.

vii. When near exhaustion, athletes falling short of the 20 m line twice in succession (one warning and a subsequent missed line) have their test terminated and their score recorded. Their score is the level and number of shuttles immediately previous to the ‘beep’ on which they were eliminated.

viii. Collection of additional indicators of maximal effort such as rating of perceived exertion (RPE), HR and blood lactate concentration can be done at the completion of the test.

ix. After completing the test athletes should cool down by walking followed by stretching.

Test Procedure – Yo-Yo Intermittent Recovery Test -

i. Using a measuring tape and marking tape, measure out a 20 m test course as per figure 2.

ii. Place markers 2 m apart at both ends of the 20 m test course (i.e., at start and turning lines).

iii. In addition to marking the 20 m line, measure out a 5 m distance behind the start line.

iv. Place a marker on the recovery line aligned to the middle of two markers on the start line, as outlined in figure 2. Ensure there is one course setup per athlete being tested.

v. Athletes assume a starting position on the start line.

vi. The Yo-Yo test CD is started (audio software is available from a variety of commercial and academic sources).
vii. At the time of the first signal, athletes run forward to the turning line. At the sound of the second signal, athletes arrive and turn at the turning line and then run back to the starting line arriving on the next beep. When the start marker is passed, the athletes continue forward at a reduced pace (jogging) toward the 5 m mark, where they then turn around the cone and return to the start line. At this point the athletes stop and wait for the next signal to sound. It is important that the athletes are stationary on the start line before the commencement of each sprint.

viii. Athletes are required to place one foot either on or over the start or turning lines at the sound of each beep.

ix. Athletes should continue running for as long as possible, until they are unable to maintain the speed as indicated by the CD (or MP3 file).

x. The end of the test is indicated by the inability of an athlete to maintain the required pace for two successive trials. The first time the start line is not reached, a warning is given; the second time the athlete must withdraw.

xi. When the athlete withdraws, the last level and the number of 2 x 20 m intervals performed at this level are recorded on the appropriate recording sheet. (The last 2 x 20 m interval is included, even if the athlete did not complete at the right pace).

xii. Additional indicators of maximal effort such as rating of perceived exertion, heart rate, and blood lactate concentration can be collected at the completion of the test.

xiii. The Yo-Yo IRT is effort dependent, so for valid results athletes must attempt to reach the highest level possible before stopping.

xiv. Verbal encouragement should be given to the athletes throughout the test.

xv. Upon completion of the test, all athletes should be encouraged to perform a warm down.

xvi. The final Yo-Yo intermittent recovery speed and interval score obtained by each athlete are used to calculate the total distance covered by the athlete during the test.

Note: If an athlete is able to run faster than speed level 23 on IRT1, they should perform the IRT2 on the next occasion.

Data Analysis -
Athletes who score poorly on this test need additional endurance or aerobic training in the form of longer, slower intervals or shorter, faster intervals. Endurance fitness often improves substantially during the preseason period, and is then maintained rather than improved during a long competitive season.

Normative Data -
The table below presents normative data for the multi-stage fitness test for Australian Football players.
Multistage shuttle run test data for Australian Football players  
(mean ± SD; range)

| MSRT  
(level/shuttle) |  
| 13/5 ± 1/0  
(10/2 to 15/7) |

Typical error: Shuttles = 4  
Data source: AFL National Draft Combine results for elite 18 year old players, 2006-2009 (n=214 players)

Test Protocol – 3km Time Trial

Rationale -  
The 3 km time trial is a field test that provides a measure of endurance fitness of AFL players. The test is self-paced, making it complementary to the externally-paced multistage shuttle run test or Yo-Yo intermittent recovery tests often used to assess aerobic fitness.

Test Procedure -  
i. A marked 400 m athletics track is used (7.5 laps x 400 m). A synthetic surface is preferred although a well-cut and maintained grass track could be a suitable alternative. The ambient temperature, relative humidity, wind speed and direction should be recorded.  
ii. The test protocol is a single maximal-effort 3 km time trial. Athletes should be given a short warm-up of light running and stretching and basic instructions on pacing.  
iii. Athletes should be encouraged to adopt an even pacing with a fast finish strategy. An athlete expecting to run ~11 min for 3 km should run at ~88 s per lap, or ~92 and ~96 s per lap for 11:30 and 12 min respectively. A common mistake is to go out too fast on the first lap.  
iv. Athletes should be tested in small groups of 10 to 20 players. Staff members should be assigned to the following roles: starter, lap counter, one or more spotters for finishing order of players, a spotter for stragglers who are lapped, one or more time keepers and a recorder.  
v. Athletes should be given verbal instructions during the 3 km time trial including the numbers of laps completed or remaining, the elapsed time and general encouragement on effort and performance.  
vi. The total time in minutes and seconds for the 3 km for each player is reported.

Data Analysis -  
The 3 km time trial is a field test that provides a measure of endurance fitness. Younger players often have limited experience with pacing long efforts like this, so some familiarisation and prior pacing efforts in training is suggested. The test is self-paced making it complementary to the externally-paced multistage shuttle run test. Athletes scoring poorly on this test need additional endurance (volume) training.

Normative Data -  
Normative data for the 3 km time trial run for Australian Football players is presented below.
3 km time trial data for Australian Football players
(mean ± SD; range)

<table>
<thead>
<tr>
<th>3 km Time, min:s</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:20 ± 0:45</td>
</tr>
<tr>
<td>(9:37-15:13)</td>
</tr>
</tbody>
</table>

**Typical error:** Time trial time = 24s

Data source: AFL National Draft Combine results for elite 18 year old players, 2006-2009 (n=196 players)

---

**Test Protocol – 6 x 30m Repeat Sprint Ability (RSA) Test**

**Rationale** -
Repeat high-intensity efforts are a feature of AFL football. A number of different protocols have been developed in the last decade or so for assessment of the ability to repeat short sprints. The AFL has conducted the 6 x 30 m repeat sprint test at the National Combine camp since 2006. All AFL clubs use some form of repeat effort test to assess this attribute in their players.

**Test Procedure** -

i. The protocol is a 6 x 30 m maximal effort running sprint test on a 20 s cycle. The test is a measure of speed-endurance and repeated sprint ability. A short warm-up of light running and dynamic stretching should be undertaken prior to the test. If this test is conducted after other tests, adequate recovery should be provided.

ii. Testing is conducted indoors on a polished wooden (sprung) floor or indoor synthetic running track with sufficient space (approximately 70 m of track or floor).

iii. All athletes should be given appropriate warm-up and instructions for undertaking the test.

iv. Electronic light gates are used as the timing system. Generally two or three instrumented lanes are set up in parallel when testing large numbers of athletes.

v. Each player will complete one maximal effort trial involving 6 x 30 m sprints from a standing start. The start line is marked 1.0 m behind the line of the electronic timing gates at both ends of the track. The player is asked to complete each 30 m sprint as a maximal effort.

vi. The athletes are required to run through at least 10 m past the 30 m timing gate and then return by walking or with a slow recovery jog to the start gate ready for the next effort in the opposite direction. This procedure will apply at both ends of the testing lane.

vii. Athletes will be given a 10 s and 5 s warning (beep) at which time they must position themself at the starting line and wait for the countdown. The starting action is standardised with a crouch start -front foot to the starting line. Athletes should be instructed and reminded not to crouch too early as this often puts them out of balance.
viii. A pre-recorded MP3 track is used to conduct the test with all timing instructions and signals included for the athlete and testing staff.

ix. The total time (in seconds) is used as the criterion score. Other measures include the comparison of the fastest time against the primary 20 m sprint test time, and the percentage decrement in velocity (time) over the test but these are characterised by poorer reliability.

x. The RSA test can be conducted in the same testing session as the other fitness tests (20 m sprint, jumps and agility), although given its moderately fatiguing nature, it is routinely conducted as a separate test. It is recommended that if undertaken with other tests the 6 x 30 m RSA test is conducted as the last test of the session.

**Data Analysis -**
The results of the RSA test are primarily used for evaluation rather than prescription of training speeds. The total time for the six sprints (in seconds) is used as the criterion score rather than calculation of decrement indices such as percentage reduction from fastest to slowest sprint, first to last sprint, or a predicted target time. These indices are probably too noisy for routine use in testing of high level players.

**Normative Data -**
The table below presents normative data for the AFL repeat sprint ability test for Australian Football players.

<table>
<thead>
<tr>
<th>Repeat sprint ability data for Australian Football players (mean ± SD; range)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Time, s</strong></td>
</tr>
<tr>
<td>25.63 ± 0.78</td>
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<td>(23.59-27.51)</td>
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**Typical error:** Time = 0.20s

Data source: AFL National Draft Combine results for elite 18 year old players, 2006-2009 (n=229 players)

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**Test Protocol – Strength Power and Competencies Testing**

**Rationale -**
AFL players perform a variety of dynamic high-intensity actions and movements such as sprinting, jumping, and tackling that are influenced by underlying strength and power qualities. A detailed assessment of strength and power levels allows the design of programs to address specific limitations. The degree of complexity of strength and power testing is largely dependent on access to specialised equipment.
Test Procedure -

Maximal Strength Testing - it is common for AFL programs to assess maximal strength with the use of compound (i.e. multijoint) lifts such as the bench press, leg press, chin-ups, and squats. Testing is generally conducted to determine the maximal load that can be lifted for a specified number of repetitions (usually 1-6). The specific exercises and precise repetition range should be determined on availability of equipment and experience of the group. Regardless of the repetitions and exercises selected, it is critical that athletes be completely familiar with the techniques required for each movement. Testing should be performed with athletes in a fatigue-free state and conditions standardized for each test occasion.

Specific guidelines for the conduct of upper- and lower-body maximal strength tests are contained in the Strength and Power Assessment Protocols chapter. These guidelines are applicable for the assessment of AFL players. In general, AFL clubs perform a lower-body test (e.g. leg press or squat) and an upper-body pushing (e.g. bench press) and pulling (e.g. chin ups or bench pull) movement.

Power Testing - there is an important role for the direct measurement of power in AFL players McGuigan et al. 2009; Sheppard et al. 2008; Young et al. in press) using a force plate or position transducer. This type of equipment provides data on numerous force-time variables. Similar to maximal strength testing, power performance should be assessed in a fatigue-free state. A high degree of test familiarisation and calibration of equipment is critical for this type of assessment.

Specific guidelines for the conduct of a range of power tests, protocols and equipment considerations are provided in the Strength and Power Assessment Protocols chapter. These guidelines are applicable for the assessment of AFL players. AFL clubs that use this form of testing are often interested in determining the ability of the athlete to generate power in various load conditions (e.g. body weight and body weight + extra load), in addition to assessing the ability to use the stretch-shorten cycle (for example countermovement jump [CMJ] v Squat jump [SJ]). Although numerous qualities can be calculated (e.g. force, velocity, height), power (as measured in watts or watts per kilogram) may be one of the most useful.

At the elite level, power should be assessed with these tests:
- Countermovement jump at body weight
- Squat jump at body weight
- Countermovement jump with added load (suggested 40kg)
- Squat jump with added load (suggested 40kg).

During body weight conditions, the athlete should hold a fibreglass pole or broom stick across the shoulders to allow attachment of the position transducer. In the loaded condition, an Olympic bar with 10 kg weight plates on each side (total weight 40 kg) is used.
Athletes should commence with a dynamic warm-up and perform at least three maximal body weight countermovement jumps prior to test trials. Three trials in each condition should be performed and the highest value from each condition used for analysis. The instruction to the athlete should be to jump as explosively as possible.

The squat jump is designed to assess explosive qualities without the contribution of the stretch shortening cycle. In both loaded and unloaded conditions, the athlete should squat to approximately 90º (alternatively a self-selected knee angle may be utilised) and hold this position for 3 s before jumping.

The countermovement jump requires a self-selected rate of knee flexion followed by explosive knee extension.

Additional variables can be calculated from the various jump conditions:
- Eccentric Utilisation Ratio (EUR) – body weight CMJ to body weight SJ. Values less than 1.0 may suggest an inability to effectively utilise the SSC.
- Load Tolerance – ratio of loaded to unloaded power in both SJ and CMJ.

**Data Analysis**
Detailed strength and power profiling, including data obtained with specialised equipment, is used (particularly in the elite setting) to provide information on the underlying qualities that influence sprinting, jumping and change of direction performance. It is common practice to conduct strength and power profiling in AFL players at the start and end of preparation phases and also during competitive seasons. The results against reference values (see below) can be used to identify particular performance limitations and help with design of a specific training program. Athletes must be thoroughly familiarised with test procedures to ensure acceptable levels of test-retest reliability. Values obtained may differ between phases of the year attributable to the different emphasis of training during preparation and competition periods. Results should be interpreted in light of the emphasis of the preceding training block and the possibility of fatigue influencing performance during the season.

**Normative Data**
The table below presents normative data for maximal strength tests and power tests for Australian Football players.
Maximal strength and power test data for Australian Football players  
(mean ± SD; range)

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<th>3RM (direct)</th>
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<tr>
<td><strong>Bench Press (kg)</strong></td>
<td>~ 112-140 ± 15 (&lt;1.0 kg per kg body mass)</td>
<td>~ 100 ± 15 (&lt;1.1-1.4 kg per kg body mass)</td>
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<tr>
<td><strong>Chin Up</strong></td>
<td>~ 32 ± 15 (&lt;0.3-0.4 kg per kg body mass)</td>
<td>~ 15-30 ± 8 (&lt;0.3-0.4 kg per kg body mass)</td>
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<td>(load added to body mass)</td>
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<tr>
<td><strong>Squat</strong></td>
<td>~ 100-160 ± 20 (&lt;1.2-1.7 kg per kg body mass)</td>
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<tr>
<td><strong>Squat Jump</strong></td>
<td>69-74 ± 8</td>
<td>52-58 ± 6</td>
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<td>(W/kg body mass)</td>
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<td><strong>Countermovement Jump</strong></td>
<td>69-76 ± 7</td>
<td>59-60 ± 5</td>
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<td>(W/kg body mass)</td>
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Typical error: Bench press = 2.5 kg; Chin Ups = 1.25 kg; Squat = 5.0 kg; SJ = <3.5%; CMJ =<3.5%

Data source: Senior elite AFL players; multiple AFL club data during preparation and competition phases 2006-2010 (n=250 players)
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References


