BACKGROUND

• Education:
  – Bachelor Degree Sport and Exercise Science (Napier University)
  – Master of Exercise Science (Edith Cowan University, Western Australia)

• Work Experience
  – Edinburgh Rugby (Student Assistant S&C Coach 2004 – 2005)
  – Queensland Reds Super 14 Rugby Union (S&C intern 2005 - 2006)
  – Brisbane Lions Australian Rules Football (Sport Science Intern 2005)
  – East Tigers Rugby League (Head of Strength & Conditioning 2005 - 2006)
  – Professional development in various sports teams and institutes of sport (Australia, Japan, England)
  – Scottish Institute of Sport (S&C Coach 2006)
  – Scottish Rugby Union (S&C Coach 2006)
  – Celtic Football Club (Sport Scientist 2006 – present)
Physical Qualities in Football

• To be fast (sprints)

• To be powerful (jumping, shooting)

• To be strong (hold off players, 1v1, balance)

• To be able to recover quickly between high intensity actions

• To maintain a high intensity throughout 90 – 120 minutes
So where do we fit in?

CELTIC LAB

• Objectives
  – To optimise the performance during the games
  – To enable youth players to reach the level to play 1st team
CELTIC LAB

• Methods

– To make players stronger physically

– To help players to understand their strengths & weaknesses and the strengths & weaknesses of team-mates

– To prevent injuries

– To help players to return quicker and stronger following injury

– To gather all scientific resources to enable players and staff to make the right decisions
CELTIC LAB

• Support Services
  – Testing
  – Training
  – Monitoring
  – Recovery
  – Match Analysis
  – Injury prevention/later stages rehabilitation
  – Nutritional advice and recommendations
  – Football specific scientific research
TESTING

• Assessing the athletic capabilities of elite footballers is essential
  – To identify strengths and weaknesses
  – To design a training program
  – To assess the effectiveness of that training program
TESTING

- **Aerobic Qualities**
  - University of Montreal Track Test (UMTT) (Leger and Bouchet, 1980)
    » Determines individuals’ Maximal Aerobic Speed (MAS)
    » Estimates VO2max

- **Anaerobic Qualities**
  - Speed (10m, 20m and 40m)
  - Power (Squat Jump, Countermovement Jump, Free Jump)

- **Maximum Strength**
  - 3 repetition maximum (3RM) (Lower body and Upper Body)

- Also Anthropometric tests, flexibility tests
# TEST RESULTS

## Tests Results

### Player Profile
- **Position:** MID CENTRE
- **Right/Left handed:** RIGHT

### Anthropicometric Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
<th>Level</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (cm)</td>
<td>173</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>65.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>21.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>8.8</td>
<td>A</td>
<td>&lt; 10%</td>
</tr>
</tbody>
</table>

**Comment:** Excellent value

### Flexibility Test

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
<th>Level</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexibility (cm)</td>
<td>30.5</td>
<td>B</td>
<td>&gt; 30</td>
</tr>
</tbody>
</table>

**Comment:** Good result

### Aerobic Qualities (field)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
<th>Level</th>
<th>Norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximal Aerobic Speed (km/h)</td>
<td>15</td>
<td>D</td>
<td>&gt; 17</td>
</tr>
<tr>
<td>Time to exhaustion (min,sec)</td>
<td>14.11</td>
<td>D</td>
<td>&gt; 16</td>
</tr>
<tr>
<td>VO2max estimated (ml/kg/min)</td>
<td>52.5</td>
<td>D</td>
<td>&gt; 59.5</td>
</tr>
</tbody>
</table>

**Comment:** Poor values

### Anerobic Qualities

#### Jump Test (Optojump)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
<th>Level</th>
<th>Norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height Squat Jump (cm)</td>
<td>38.9</td>
<td>B</td>
<td>&gt; 35</td>
</tr>
<tr>
<td>Height Counter Movement Jump (cm)</td>
<td>44.1</td>
<td>A</td>
<td>&gt; 45</td>
</tr>
<tr>
<td>Height Free Jump (cm)</td>
<td>50.6</td>
<td>A</td>
<td>&gt; 50</td>
</tr>
<tr>
<td>Ratio CMJ/SJ</td>
<td>1.13</td>
<td></td>
<td>&gt; 1.25</td>
</tr>
</tbody>
</table>

**Comment:** Excellent values

### Speed Test (Photocells)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Values</th>
<th>Level</th>
<th>Norms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time on 10 m (s)</td>
<td>1.81</td>
<td>A</td>
<td>&lt; 1.85</td>
</tr>
<tr>
<td>Time on 20 m (s)</td>
<td>3.02</td>
<td>A</td>
<td>&lt; 3.05</td>
</tr>
<tr>
<td>Time on 30 m (s)</td>
<td>4.11</td>
<td>B</td>
<td>-</td>
</tr>
<tr>
<td>Time on 40 m (s)</td>
<td>5.21</td>
<td>B</td>
<td>&lt; 5.25</td>
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</tbody>
</table>

**Comment:** Excellent values
TRAINING – AEROBIC QUALITIES

• A high level of aerobic fitness is required to meet the physiological demands of football

• Aerobic Endurance
  • Continuous exercise at 80 – 90% MAS
    » e.g. 30 min @ 80% MAS, 20 min @ 85% MAS

• Aerobic Power
  • High intensity intermittent exercise (>90% MAS)
    » e.g. 30sec/30sec @ 100% MAS, 15sec/15sec @ 120% MAS
AEROBIC EXERCISE – 15/15 @ 120% MAS

<table>
<thead>
<tr>
<th>Distance</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>16 km/h</td>
<td>17 km/h</td>
<td>18 km/h</td>
</tr>
<tr>
<td>Distance</td>
<td>80m</td>
<td>85m</td>
<td>90m</td>
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</tbody>
</table>
ANAEROBIC QUALITIES

• In football, the performance depends on anaerobic qualities (i.e. Speed & Power)
  – Accelerating to win the ball before an opponent
  – To jump higher than an opponent
  – Striking the ball

• Therefore – the improvement of anaerobic qualities should be an important objective of training
TRAINING METHODS – SPEED & POWER

- Strength
- Plyometric
- Ballistic
EXPLOSIVE SESSION
MONITORING TRAINING

- To prevent overtraining, injury & illness

- Rate of Perceived Exertion (RPE)
  - quantifying exercise intensity
    - Aerobic
    - High intensity interval training
    - Small Sided Games
    - Plyometrics
    - Strength Sessions

- Using the Session RPE method allows calculation of the weekly training load (RPE x duration of session)
RATE OF PERCEIVED EXERTION (RPE)

SCALE 1: RPE
HOW WAS YOUR WORKOUT DURING THE SESSION?

<table>
<thead>
<tr>
<th>Rating</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>NOTHING AT ALL</td>
</tr>
<tr>
<td>1</td>
<td>VERY, VERY EASY</td>
</tr>
<tr>
<td>2</td>
<td>EASY</td>
</tr>
<tr>
<td>3</td>
<td>MODERATE</td>
</tr>
<tr>
<td>4</td>
<td>SOMewhat HARD</td>
</tr>
<tr>
<td>5</td>
<td>HARD</td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>VERY HARD</td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>MAXIMAL</td>
</tr>
</tbody>
</table>

BORG RATING OF PERCEIVED EXERTION SCALE MODIFIED BY FOSTER et al., 1996
### Scale 1: RPE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly Load</td>
<td>5130</td>
</tr>
<tr>
<td>Daily Mean Load</td>
<td>733</td>
</tr>
<tr>
<td>Daily SD of Load</td>
<td>701</td>
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<tr>
<td>Monotony</td>
<td>1.05</td>
</tr>
<tr>
<td>Strain</td>
<td>5367</td>
</tr>
</tbody>
</table>

**between 3000 to 6000**

**less than 10,000**

Training Load x Monotony
CONCLUSION

• Football performance is dependant on various factors:
  – PHYSICAL
  – MENTAL
  – TECHNICAL
  – TACTICAL

• Sport Science Support helps to ensure that players are prepared physically and also mentally
QUESTIONS?

Questions are guaranteed in life; Answers aren't.