Hypoxic Training
In-House Testing
Background

- Rented portable hypoxic tent for 6 weeks.
- Intervention designed to see if hypoxic conditions would elicit greater physiological improvements.
- Recent research with athletes shows improved training adaptations in hypoxia:


Baseline Testing & Intervention

Baseline Testing

• Club Incremental Test
• Venous blood sampling

Intervention

• Lactate Threshold training.
• OBLA (4mmol lactate) 95 – 105% HR used.
• 3 x 8 minutes (30’ session)
• Aim 3 x per week for 4 weeks.
• Aim for 12 exposures to hypoxic conditions.
• Heart rate and SpO₂ monitored at end of 8 min blocks.
Baseline Testing & Intervention

Intervention

- Group 1 (Moderate Hypoxic & Heat)
- 2600m
- $O_2$ 15.3%
- AE - Woodway
- BM - Cycle
Baseline Testing & Intervention

Intervention

• Group 2 (Mild Hypoxic & Heat)

• Set to sea level, however, chamber did not maintain sea level $O_2$

• 200 - 1100m
• $O_2$ 20.2 – 18.2%

• DS - Woodway
• JB - Cycle
Climate and Physiological Responses
- Differences

• Group 1   Moderate Hypoxia

  - Temp. Range        21.7 – 33.2 °C
  - Humidity Range    16 – 88 %
  - SpO$_2$ Range     81 – 98%

• Group 2   Mild Hypoxia

  - Temp. Range        22.3 – 33.1 °C
  - Humidity Range    39 – 83%
  - SpO$_2$ Range     96 – 99%
Practical Issues

- Sea level setting not maintained.
- Due to other commitments it was not possible for all players to complete all sessions (e.g. U21 matches, college, FA qualifications)
- JB not a player! Training different.

**No. Of Sessions Completed**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AE</td>
<td>9</td>
</tr>
<tr>
<td>BM</td>
<td>8</td>
</tr>
<tr>
<td>DS</td>
<td>5</td>
</tr>
<tr>
<td>JB</td>
<td>15</td>
</tr>
</tbody>
</table>
Results

• Subjective Responses

• All participants said they felt good using the chamber and felt fitter.

• BM (Hypoxia & Cycle) in particular reported he felt a significant improvement.

• Potential placebo effect for DS?
## Results

**4mmol Speed (km/h)**

<table>
<thead>
<tr>
<th>Player</th>
<th>Baseline</th>
<th>Re-Test</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>AE</td>
<td>15.1</td>
<td>16.5</td>
<td>9.27%</td>
</tr>
<tr>
<td>BM</td>
<td>12.7</td>
<td>14.8</td>
<td>16.54%</td>
</tr>
<tr>
<td>JB</td>
<td>13.9</td>
<td>15.1</td>
<td>8.63%</td>
</tr>
<tr>
<td>DS</td>
<td>15.8</td>
<td>17</td>
<td>7.59%</td>
</tr>
<tr>
<td>Average</td>
<td>14.1</td>
<td>15.9</td>
<td>10.51%</td>
</tr>
</tbody>
</table>

Mod. Hypoxic: 12.90%
Mild Hypoxic: 8.11%
Results
Discussion

• BM showed greatest improvement of 16.54% (Hypoxia & Cycle)

• Overall moderate hypoxia showed larger improvements. (Statistical significance?)

• Due to sea level setting issue all participants had slight hypoxic stimulus. Reason for all improvements? Lower % change at sea level?

• Larger study group needed and different areas require investigation.
Discussion

• Provides a foundation for potential usage of hypoxia for different training goals.

• Possible intervention for:
  
  • Mid to long-term rehabilitation (evidence for physiological effects after 4+ weeks of training, 8+ sessions)
  
  • Pre-season (based on first inc. test of season)
  
  • Load compromised players requiring extra conditioning.
  
  • Other protocols / training goals (e.g. RSA?, strength?, lower aerobic?)
Discussion

• Further research required:

  • Responders v reduced responders?
  
  • Ideal no. of exposures
  
  • Time of exposure
  
  • Relationship with injury recovery – reduced $O_2$ healing effect?
  
  • Level of hypoxia (sea level group required)
  
  • Ideal $SpO_2$ Range
  
  • Temp. and Humidity Range
  
  • Hematological changes? – potential mechanism for improvement
Hypoxic Training
In-House Testing