Maximal Aerobic Speed (MAS)

Basic Theory.

- The maximal aerobic speed (MAS) test is designed to assess the minimum speed that elicits VO2max. This is commonly referred to as vVO2max, or the velocity associated with VO2max.
- Amount of time spent at or above the 100% Maximal Aerobic Speed (MAS) threshold appears to be the critical factor for improving aerobic power.
- Performing a number of short intervals at ≥100% MAS was a more effective method of building aerobic power than LSD training. This approach was also more effective than attempting to train only one interval continuously at 100% MAS.

Testing / Assessing MAS

Various methods of assessing MAS

- 1600m time trial.
- Distance covered in a 5-min or 6-min running test.
- University de Montreal Track Test (UMTT)*.
- 30s-15s Intermittent Fitness Test (30-15IFT).
- 20s-10s Intermittent Fitness Test (20-10IFT).
- Multi-Stage Fitness Test (MSFT)*.
- Yo-Yo Intermittent Recovery Test (YYIRT)*.

Note: *Correction factor needed to convert actual test score to MAS score.

MAS may also be measured using a stationary bike, or rowing ergometer, depending on the training modality selected for a particular training block.
More in depth analysis.


Applying theory into practice – BlackSticks Case Study

Why test MAS?
• YOYO II test 1 team average – 23.4 (Jan 2013)
• 5-10 min rotations on hockey pitch dependent on position.
• Amount of time spent at or above the 100% Maximal Aerobic Speed (MAS) threshold appears to be the critical factor for improving aerobic power.
• Testing fitness vs gaining information in order to enhance training prescription!
• GPS tracking in training – what we do vs how hard is it for YOU!

BlackSticks Mens Hockey Team
• MAS test = 1600m Time Trial or 16 x 100 yard (hockey turf) shuttle run time trial. Dependant on time of season and training block.
• Typical error = 4-7 seconds (my squad).
• Distance Covered / time (sec) = MAS (m/sec)

Results of MAS testing

<table>
<thead>
<tr>
<th>Date</th>
<th>MAS Test</th>
<th>Fastest</th>
<th>Slowest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 2013</td>
<td>5:09</td>
<td>4:40</td>
<td>5:25</td>
</tr>
<tr>
<td>March 2013</td>
<td>5:12</td>
<td>4:36</td>
<td>5:19</td>
</tr>
<tr>
<td>June 2013</td>
<td>5:28</td>
<td>4:41</td>
<td>5:31</td>
</tr>
<tr>
<td>Dec 2013</td>
<td>5:59</td>
<td>4:34</td>
<td>5:20</td>
</tr>
<tr>
<td>Feb 2014</td>
<td>5:10</td>
<td>4:39</td>
<td>5:40</td>
</tr>
</tbody>
</table>

Note
Sept 2014* = New Squad + 2 month post pinnacle event
Dec 2013 = after 1 month off season of 3 x jog per week.
**Training Load**

**Jan 2013 – Feb 2014**
- 3 x hockey per week
- 2 x conditioning
- 2-3 x gym per week

**Key MAS Sessions**
- 4min on, 4min off x 4
- 4min on, 2min off x 4
- 5min hard, 2min jog x 2
- 30 sec on (shuttle), 30sec off x 30 with 2min rest every 10 mins
- 2min on 3min off x 15

**Feb 2014 – July 2014**
- 4-5 x hockey per week
- 2-3 x gym per week
- Conditioning in hockey training only along side SSG and technical/tactical work.

**Key Indicators**
- Distance above 100% MAS in training
- Distance 70-100% MAS in training
- Relative distance or m/min.
- Distance per min above 100% MAS in training

**In training top up / conditioning**
- 5-10 x 2 length sprint leaving on 1min
- 10 x 15 sec shuttle, 15 sec rest
- Tabata intervals x 4-5 reps.

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**Aerobic Training Zones and BlackSticks Use**

**Aerobic Training Zone**
- Z1: Recovery
- Z2: Threshold
- Z3: Aerobic #2
- Z4: Anaerobic Threshold
- Z5: Maximal
- Z6: Supra-maximal

**GPS Game Data**
- 4000m or 55.5% TO, 65% game time.
- 2200m or 30.5% TO, 30% game time
- 1000m or 14% TO, 5% game time

**Sessions and squad application**

**Session**
- Week 1
  - 4min on, 4min off
  - 80% MAS x 4
  - 90% MAS x 6
- Week 2
  - 4min on, 4min off
  - 80% MAS x 4
  - 90% MAS x 6
- Week 3
  - 4min on, 4min off
  - 100% MAS x 3
  - 100% MAS x 4
  - 100% MAS x 4
- Week 4
  - 4min on, 4min off
  - 100% MAS x 15
  - 100% MAS x 15
  - 100% MAS x 15
Sessions and Squad Application

<table>
<thead>
<tr>
<th>Session</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>30sec on, 30sec off shuttle (3COD)*</td>
<td>125% MAS x 10</td>
<td>125% MAS x 15</td>
<td>130% MAS x 10</td>
<td>130% MAS x 10</td>
</tr>
<tr>
<td>15sec on, 15sec off shuttle (1 COD)*</td>
<td>135% MAS x 10</td>
<td>140% MAS x 10</td>
<td>140% MAS x 10</td>
<td>140% MAS x 10</td>
</tr>
<tr>
<td>2 length sprint (200 yard shuttle)*</td>
<td>125% MAS x 10</td>
<td>130% MAS x 10</td>
<td>135% MAS x 10</td>
<td>130% MAS x 10</td>
</tr>
<tr>
<td>Tabata*</td>
<td>As far as possible in 8 x 20 sec on, 10 sec off. Record total distance.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* = done on hockey turf training

Anecdotal Findings

- Be aware of athletes Anaerobic Speed Reserve
  - In short intervals, athletes with high maximal sprinting speed (MSS) and relatively lower MAS may not be challenged to the same level as other athletes.
  - As MAS gets closer to MSS you may need to shift athletes focus to enhancing MSS before any MAS gains can be made.
  - Know your athletes - do they need to make MAS or MSS gains.

- Be organised, especially for on turf / pitch training sessions!
- Use Excel to make spreadsheets for distances and %MAS or become good friends with John Lythe
- Time vs distance based prescription?
  - 4min at 95% MAS or 1200m at 95% MAS
  - What would the differences be in your athletes and do they end up getting the same training response?

Many thanks to Dr. Stephen Hill-Haas for his hard work in setting up some great MAS training guidelines.