*Evaluation of Exercise Tolerance*

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**Modified Balke protocol**
- Graduated exercise test
- Constant speed
- Increased incline, 1° per minute
- Measure of physical exhaustion (Borg RPE) and/or exercise intolerance

*The BCTT*

- Establish exercise intolerance - acute, post-concussion syndrome (PCS)
- Differential diagnosis of post-concussion symptoms (PCS, cervicogenic, etc.)
- Identify physiologic changes associated with concussion, exacerbation of symptoms (exercise intolerance)
- Assist in treatment protocols, Return to Play

*Use of the BCTT*
**Contraindications**

- Cardiovascular illness
- Respiratory dysfunction
- Beta blockers
- Serious vestibular/balance problems
- Inability to walk safely (orthopedic)
- Severe dizziness or noticeably poor balance
- Patient is too symptomatic

**Preparation**

- Exercise clothing / shoes
- Chair, water, towel
- Treadmill w/ 15 (adaptable for 12°)
- Heart rate monitor
- Borg RPE scale & 10 point Likert scale
- Record sheet

**Borg’s Rating of Perceived Exertion (RPE) Scale**

<table>
<thead>
<tr>
<th>Perceived Exertion Rating</th>
<th>Description of Exertion</th>
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</thead>
<tbody>
<tr>
<td>6</td>
<td>No exertion. Sitting &amp; resting</td>
</tr>
<tr>
<td>7</td>
<td>Extremely light</td>
</tr>
<tr>
<td>8</td>
<td>Very light</td>
</tr>
<tr>
<td>9</td>
<td>Light</td>
</tr>
<tr>
<td>10</td>
<td>Somewhat hard</td>
</tr>
<tr>
<td>12</td>
<td>Hard</td>
</tr>
<tr>
<td>15</td>
<td>Very hard</td>
</tr>
<tr>
<td>18</td>
<td>Extremely hard</td>
</tr>
<tr>
<td>20</td>
<td>Maximal exertion</td>
</tr>
</tbody>
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[Link to physical activity benefits and consequences](http://monroe.uwex.edu/2015/07/21/physical-activity-benefits-and-consequences/)
Starting speed: brisk walk (approx. 3.3 mph)
Increase incline 1° per minute
Record HR, RPE and symptoms until:
• Participant reaches max HR or RPE of 19 (exhaustion)
  OR
• Symptoms increase by ≥ 3 points (new symptom or increased symptom load) on the Likert scale (symptom exacerbation)

Rate Your Overall Condition

<table>
<thead>
<tr>
<th>Scale</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
<td>6</td>
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<tr>
<td>7</td>
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<td>9</td>
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</tbody>
</table>

- 1: Feel well, no symptoms
- 2: Feel some symptoms but quite comfortable
- 3: Symptom a little worse
- 4: Symptom much worse
- 5: Feeling quite symptomatic
- 6: Feel terrible, worst ever felt

ex. Headache, Dizziness, Light/Sound Sensitivity, Feeling “Not Right”, Difficulty Concentrating

*Protocol
• 2 minute cool down at 2.5mph, 0 incline
• Report symptoms & HR at full stop

*Protocol

• 2nd evaluator present
• Assess patient risk throughout (severe, sudden onset of symptoms, balance concerns)
• Engage in conversation
• Be aware of postural changes

Emphasize goal to report symptoms, not push through them

*Safety

• Evaluation of symptom load, exercise intolerance
• Differential diagnosis (cervicogenic, physiologic PCS, etc.)
• Determination of safe exercise threshold (HR)

*Outcomes
For general patients 80% of HRt, 20 minutes per day after a five minute warm up.

For athletes 90% of HRt, 20 minutes per day, and if well tolerated, move to 2x per day with a separation in between.

Never exercise if not feeling well, and stop exercising if symptoms become exacerbated.

*Establishing an exercise program*

After one week, increase exercise HR goal by 5%-10%.

No need to re-examine.

May re-examine after two weeks on BCTT.

Regular communication is key.

Sometimes team trainer helps or hinders.

*Follow up*