AT—Some Practical Applications

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Until four to five years ago, the intensity of workouts for many endurance sports was defined in relation to the percentage of VO2 max and the heart rate (HR) at this point. Because VO2 max in itself represents peak capacity of an athlete, it does not have much practical application. It is much more interesting to know how much of this capacity the athlete is able to use purely aerobically, and at which point (anaerobic threshold—AT) he starts to accumulate too much lactate. It has been proven that in the case of two runners with the same VO2 max, one can have AT at 75% of this VO2 max and the other at 80%. In this situation, runner B should be faster since he is more efficient. He will go into the anaerobic process much later than runner A.

Surprisingly enough, it has also been proven that runners (marathon, 10,000m) who train at a lot at an intensity below AT have much higher AT (% of VO2 max) than milers whose work intensity is mostly above AT. In my work with Dr. Fritz Hagerman last year, we found that two three-minute pieces, rowed at full pressure, at a rate from 18-22, accumulated up to 10 mmol lactate in the athlete’s blood. That was much higher than what we expected (around 3 mmol). Probably, it also happens that in one boat there are athletes with completely different physiological characteristics. So, the workout which is good for one is almost definitely not good for another.

For all these reasons, determination of AT for every individual athlete and individually prescribed intensities of the workout in relation to AT can be very crucial to further improvement of the athlete’s physiological characteristics.

There are a couple of methods to determine AT. One is HR at AT and percentage of VO2 max. But they all require expensive gas analyzers and technical personnel not available to the average rowing club.

In 1982, Professor Conconi from Italy developed a very simple non-invasive test to determine AT in many sports. Since then, this method has been used with great success by Italian runners (gold medalist, New York Marathon), cyclists, cross country skiers (gold medal, 1985) and rowers.

We started using Conconi’s test in 1986 and were able to make very important corrections in training programs, even in late spring.

### Principles of the Test

During continuous and progressive efforts (rowing, running, cycling), the correlation between the increase in speed and HR. At one point (deflection) there is rapid increase in the slope of the previously linear relationship of V-V'HR. This point represents the anaerobic threshold point. It will be defined by speed and HR as well.

### Equipment Needed

1. Ergometer with digital readout (New Concept II) — use mode “Time/500m” and put the chain on one of the outer gears.
2. Heart Rate Monitor (CCM).

### Procedure

- **Warm up for 5-10 minutes at HR around 130/minute.**
- **Start from 5 minutes at 20; HR = 130-140/minute.**
- **Toward the end of 5 minutes, take precise reading of the “Time/500m” and the HR.**
- **Without stopping, increase speed every minute by 3 seconds and rate by 2 strokes. Read the HR at the end of each minute directly before the increase.**
- **For higher accuracy of HR readings, use memory mode.**

### Example—Rower 1

<table>
<thead>
<tr>
<th>Time/500</th>
<th>5'</th>
<th>6'</th>
<th>7'</th>
<th>8'</th>
<th>9'</th>
<th>10'</th>
<th>11'</th>
<th>12'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate</td>
<td>20</td>
<td>22</td>
<td>24</td>
<td>26</td>
<td>28</td>
<td>30</td>
<td>32</td>
<td>34</td>
</tr>
<tr>
<td>HR</td>
<td>138</td>
<td>148</td>
<td>158</td>
<td>166</td>
<td>168</td>
<td>173</td>
<td>173</td>
<td>18+</td>
</tr>
</tbody>
</table>

### Rower 2

<table>
<thead>
<tr>
<th>Time/500</th>
<th>5'</th>
<th>6'</th>
<th>7'</th>
<th>8'</th>
<th>9'</th>
<th>10'</th>
<th>11'</th>
<th>12'</th>
</tr>
</thead>
<tbody>
<tr>
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<td>22</td>
<td>24</td>
<td>26</td>
<td>28</td>
<td>30</td>
<td>32</td>
<td>34</td>
</tr>
<tr>
<td>HR</td>
<td>12+</td>
<td>128</td>
<td>133</td>
<td>136</td>
<td>148</td>
<td>153</td>
<td>157</td>
<td>162</td>
</tr>
</tbody>
</table>

Now we draw diagram of relationship of “Time/500m” to the “HR.”

At one point there is a rapid decrease in the slope of the previously linear relationship V-HR. This point is the anaerobic threshold.