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Review of physiological variables during Ironman triathlon race, taken from:

Laursen et al. (2005) **Relationship between laboratory measured variables and heart rate during ultra-endurance triathlon**. Journal of Sports Sciences. 23 (10) 111 - 1120.

The 'anaerobic threshold' is a measurement taken in the sports laboratory, often used as a predictor of performance for 10k running, cycle time trials or Olympic distance triathlon. By locating the anaerobic threshold, coaches can use corresponding heart rate as a gauge for intensity in training and competition.

Although the anaerobic threshold is a useful measurement for such events, it is less important for longer triathlon races such as the Ironman distance. The research completed by Laursen in October 2005, was carried out to provide Ironman triathlon competitors with some accurate advice relating to exercise and heart rate intensities. Laursen recognised that athletes could not use the anaerobic threshold as a gauge for such events and set out to identify a clear pacing strategy for long distance triathletes.

How was the test conducted ?

- All athletes prior to completing their Ironman race were asked to complete a cycle ergometer test to exhaustion and a run treadmill test to exhaustion. During these tests, the aerobic and anaerobic thresholds were noted, in addition to maximal heart rate readings. The percentage of maximum heart rate at which the threshold points occurred were then calculated.
- Following the laboratory tests, all of the subjects competed in Ironman events and their heart rate readings for the swim, cycle and run sections were recorded.
- The average heart rate readings for the cycle and run sections were calculated and compared against the laboratory measurements.

What were the findings ?

There was a clear correlation between aerobic threshold (measured in laboratory) and average heart rate, during both cycle and running sections. In simple terms, athletes tended to naturally select the aerobic threshold as their Ironman pace.

In addition to this, Laursen found that those athletes who performed above the aerobic threshold during the cycle section, then slowed during the marathon. His data showed that athletes who cycled at an intensity higher than their aerobic threshold, could expect to run the marathon below their aerobic threshold by a similar amount.

The research by Laursen has highlighted not only that pacing is an important part of Ironman race strategy, but also that the heart rate corresponding to aerobic threshold could perhaps be used as an ideal indicator of race intensity.

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