

Physiological Assessment: Summary Report

Assessment Details

Personal Details:

Name: Tom Allen
Event: Ride Across America
Date of Birth: 10th May 1992
Height: 179.1 cm
Weight: 68.7 cm
Sex: Male

Assessment Details:

Assessment Venue: Manchester Institute of Health Performance
Assessment Date: 6th March 2019
Assessment Time: 10 am
Assessments: 1. Incremental Maximal VO₂ Assessment;
Lactate Threshold Test and respiratory assessment.
Assessor(s): Malcolm MacAllister – Performance lab Technician
Ross Mizen - Performance Lab Technician

Assessment Protocol

A VO_2 max test is used to assess an individual's capabilities and is defined as the highest rate at which oxygen is delivered and utilised during severe exercise and an important parameter for performance. Other important parameters include the lactate threshold (**LT**), lactate turn point (**LTP**) and economy of movement which can alter performance or compensate for a lower VO_2 max.

The protocol carried out was an incremental cycling test performed using a SRM Ergometer, breath by breath analysis using the Vyntus CPX and the Lactate Scout for blood lactate concentration analysis (**[La]**).

The test involved a 5 minute self-selected cycling warm up followed by a protocol consisting of 3 minute stages starting at 90W with an increment of 30W at the end of each stage until above lactate turn point (**LTP**). A finger prick blood sample was taken during the final 30 seconds of each stage to determine blood lactate concentration **[La]**.

A blood sample was taken at the end of the protocol and 5 minutes post termination of the test as well as continuous breath by breath analysis throughout the protocol.

Assessment measurements and Test profile

Stage	Watts	RPE	Lactate (mmol/L)	Heart Rate (bpm)	VO2 (l/min)	VO2 (ml/min/kg)
Rest	-	-	1.7		-	-
1	120	6	1.8	148	2.01	29.2
2	150	7	2.0	156	2.40	34.9
3	180	10	2.4	162	2.68	38.9
4	210	11	3.1	172	3.01	43.8
5	240	13	4.8		3.34	48.7
6	270	17	8		3.65	53.1
7	300	19	18.8	188	3.86	56.2

At rest and under steady-state exercise conditions (e.g. an easy cycle), the balance between blood lactate production and removal are generally equal, meaning that lactate concentration (**[La]**) does not change by much. As intensity of exercise increases, the rate of lactate production exceeds the rate of removal, resulting in an increased **[La]**. The Lactate Threshold (LT) refers to the intensity of exercise at which **[La]** increases above baseline levels and also useful to determine 'easy and steady' cycling. Once you've reached your LT, if the exercise intensity increases, **[La]** will also increase and if exercise intensity is increased further, a second abrupt increase in **[La]** will occur, known as the Lactate Turning Point (LTP). This marker generally occurs between 2-4 mmol/l **[La]**. These can be used to distinguish between the transition of 'steady' and 'threshold' training.

The lactate Threshold (**LT**) corresponds to a steady increase in **[La]** above baseline, typically above 2 mmol/L.

From your results your LT occurs at **180 watts** where your blood [La] was **2.4 mmol/L**.

As the intensity (watts) continues to build the production of lactate further increases, with an abrupt increase in [La] signifying the Lactate Turnpoint (**LTP**). This marker generally occurs between 2-4 mmol/l [La].

In your case, the LTP occurs at **210 watts** with and blood lactate [La] of **3.1 mmol/L**.

Maximal Oxygen Uptake Response to Exercise

VO₂ max: Maximal oxygen uptake was calculated as **56.2 ml.kg⁻¹.min⁻¹** during the last 30 seconds where your heart rate reported was 188 bpm.

What is VO₂ max:

This is expressed as the highest rate at which oxygen is taken up and utilised during exercise. VO₂ max is a good indicator of oxygen delivery and utilisation. However, other factors such as lactate threshold, lactate turning point and cycling economy can partially compensate for a poor VO₂ max. VO₂ max is expressed as a rate, either in absolute terms (L/min), or relative to body weight (ml/kg/min).

How did I do in comparison to normative values?:

Using the normative ACSM's guidelines for exercise testing and prescription values to categorise your physical fitness places you into the **Superior** score classification for a male aged between **20-29 years old**. This is a great representation of your maximal capacity.

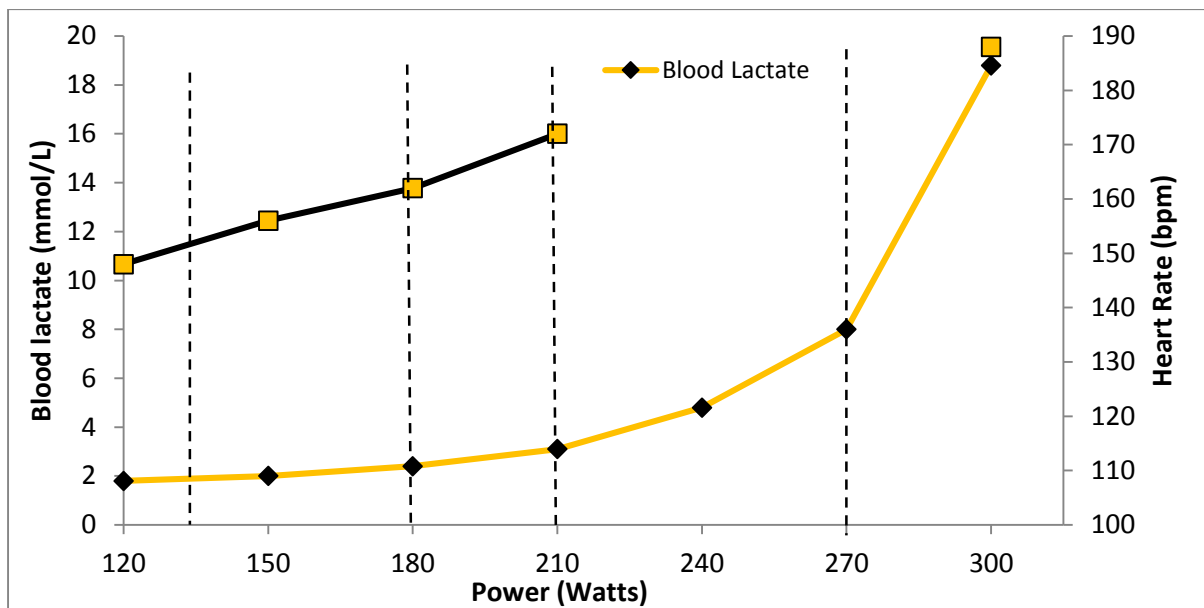
Recovery profile

Recovery is an important component of performance with the below tables and figures providing details of your recovery profile for the 5 minutes post the maximal testing. Recovery was monitored whilst cycling at self-selected pace. Post 5 min lactate was documented as 9 mmol/l. Monitoring recovery is a useful tool for evaluating increases and decreases in health and fitness.

Recovery (30 second Average)				
Time (min)	VO ₂ (ml/min)	VCO ₂ (ml/min)	VO ₂ (ml/kg/min)	Lactate (mmol/L)
1	1.97	2.77	28.6	18.8
2	2.02	2.08	29.3	
3	1.80	1.72	26.2	
4	1.77	1.63	25.8	
5	1.98	1.67	28.8	9

Heart Rate Training Zones

Mike, your heart rate training zones are constructed around Lactate Thresholds and Turn points as well as maximal efforts, they are categorised into the points as follows. These are different from previous assessments due to the changes in your physiological adaptations to rehab. It is advised that this particular physiological assessment is carried out in a few months to re-evaluate your training zones and also progression.



	HR (bpm)		Watts	
	Low	High	Low	High
Recovery		152		
Easy	152	162	135	180
Steady	162	172	180	210
Tempo	172	182	210	270
Intervals	182	188	270	

Recovery

Low intensity cycling at a speed somewhat lower than Lactate threshold and is slower than easy rides (see below). This is used primarily to aid recovery by promoting blood flow to muscles, without stressing the system.

Easy:

Is low intensity and is again slower than your workload at Lactate threshold. It is used in long duration rides, warm-ups/cool-downs and during active recovery between higher intensity intervals.

Steady:

Is a moderate intensity which is at a constant pace that is above your watts at Lactate threshold(LT), but is below your watts at Lactate Turning Point(LTP). It involves medium to long duration rides (20 – 60 minutes) with workloads closest to the workloads at LT being longer than those nearer LTP.

Tempo/Longer Duration Intervals:

Tempo based work generally occurs at the lower end of this zone. They are moderate-high intensity rides which occur for sustained periods. Tempo rides can be completed in a number of ways.

1. Constant pace rides at a load (watts) that is just above your workload at LTP,
2. Longer duration ride where the watts are just below your LTP
3. A ride, which gradually increases the intensity until reaching your watts at LTP.

All of these have the purpose of increasing the sustainable power for a set duration, or increasing the duration at a set power. At the upper end of this zone, intervals can be performed. There will be large variations in the duration of the reps and the number of reps and sets.

High aerobic intensity intervals:

This is a high intensity workout where the power would be unsustainable for long durations. The duration of the reps will depend upon the pace of the interval and the intended outcome of the session. At the lower end of this zone, longer intervals are required to allow a sufficient time to reach VO_{2max} (will often take 2-3 minutes to reach VO_{2max}). At higher intensities, shorter duration intervals will be used; however, if the purpose is to challenge the aerobic system, then short recoveries are required to maintain VO_2 at high levels.

Considerations

For your training leading up to the event, continuing to improve your steady state cycling which is typically signified at your lactate threshold. This is currently done by working for prolonged period at and above this intensity which is currently 180 watts.

Many thanks for choosing the Manchester Institute of Health and Performance.

If you have any queries about the information contained within this report please do not hesitate to contact:

Performance@mihp.co.uk