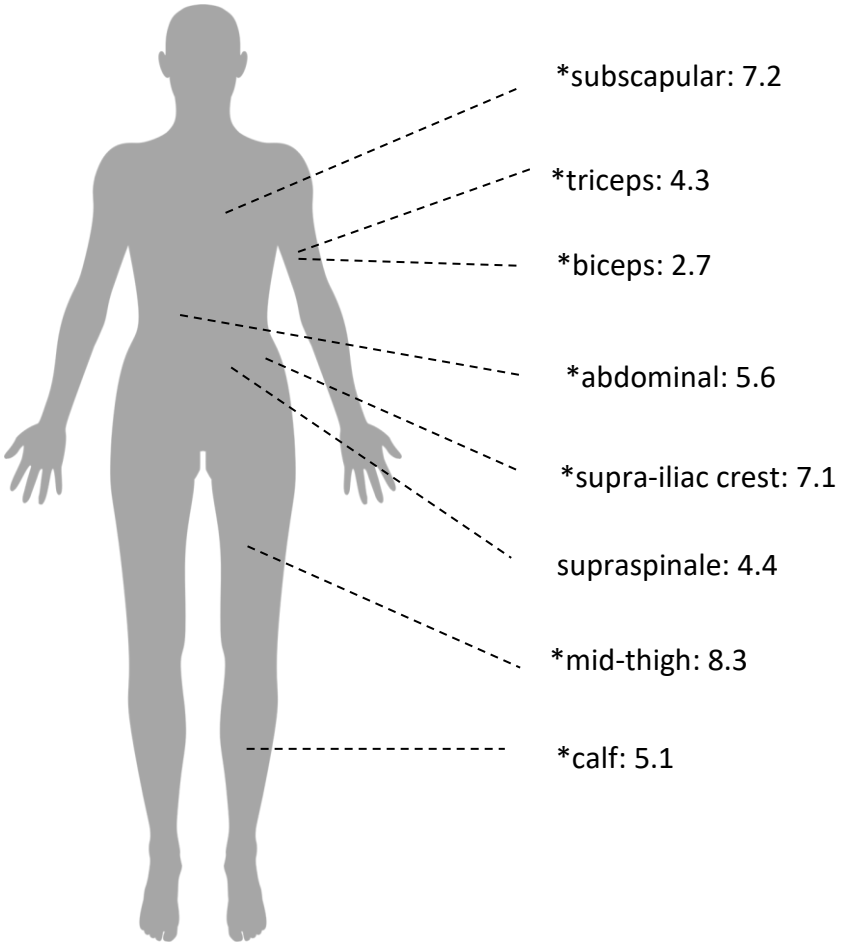
Testing Report

Lorenzo Delano

11 September 2024

Athlete Profile: Lorenzo Delano

Age	36
Height	1.76 m
Body Mass	72.5 kg
Body Mass Index (BMI)	23.27 kg/m^2
*Sum of 7 Skinfolds	40.3 mm
Predicted Body Fat %	12.93 % (DW)



Peak Power Output

The peak power output test was performed immediately after a 10-minute 100 Watt warm up. The test began at a workload of 100 Watts and the resistance was increased at a rate of 20 Watts per minute until the cyclist was unable to maintain a cadence of at least 70 RPM.

RELATIVE VO_2 MAX (ML/MIN/KG)	53.13	ABSOLUTE VO_2 MAX (L/MIN)	3.85
PEAK POWER OUTPUT (WATTS)	295	PEAK POWER-TO-WEIGHT (W/KG)	4.07
THRESHOLD POWER OUTPUT (WATTS)	220	THRESHOLD POWER-TO-WEIGHT (W/KG)	3.03
THRESHOLD POWER RANGE (WATTS)	220 – 240	THRESHOLD HEART RATE RANGE (BPM)	150 – 160
PEAK RQ	1.17	MAXIMAL HEART RATE (BPM)	172
GROSS EFFICIENCY (%)	18.2	COMPOUND SCORE (W^2/KG)	1200
1MIN POST-PPO LACTATE (MMOL)	6.7		

Training Zones

TRAINING ZONE	POWER OUTPUT (WATTS)	HEART RATE (BPM)
ZONE 1	< 120	< 115
ZONE 2	120 – 160	115 – 135
ZONE 3	161 – 219	136 – 149
ZONE 4	220 – 240	150 – 160
ZONE 5	> 240	> 160

LAA & Fat Max

The Lactate Accumulation Assessment (LAA) power output and heart rate provide feedback about your ability to sustain that power output for prolonged periods (40-70min). This is largely based on the ability of your working muscle to process fats and carbohydrates within the mitochondria and convert these to energy (ATP). A high oxidative capacity will allow you to continue at high intensities for longer durations. Above this maximal steady state the production of lactate by your working muscles is greater than your ability to redistribute this lactate and metabolise it, either to adjacent muscle fibers, or in other tissues in the body (these include muscles working at lower intensity such as your arms). Both the shape of the lactate curve and the final decompensation point are important.

The purpose of the fat max assessment is to determine the intensity where an athlete has the highest rate of fat oxidation. Your maximal fat oxidation will have a daily variation due to diet and training status.

The test began at 100 watts and increased 35 watts every 7 minutes until a respiratory exchange ratio (RER) of 0.95, a sharp increase in your lactate concentration or an RPE of 16. In this test, three of these conditions were met halfway through the 240-watt stage.

LAA & Fat Max

WORKLOAD (WATTS)	HEART RATE (BPM)	VO_2 (ML/MIN/KG)	PERCENTAGE VO_2MAX	FAT OXIDATION (G/MIN)	CARBOHYDRATE OXIDATION (G/MIN)	LACTATE (MMOL)
100	108	24.6	46	0.42	1.24	1.3
135	122	30.7	58	0.45	1.76	1.3
170	134	36.4	68	0.44	2.33	1.8
205	149	42.8	81	0.17	3.69	3.9
240	157	47.7	90	0.00	4.97	6.3

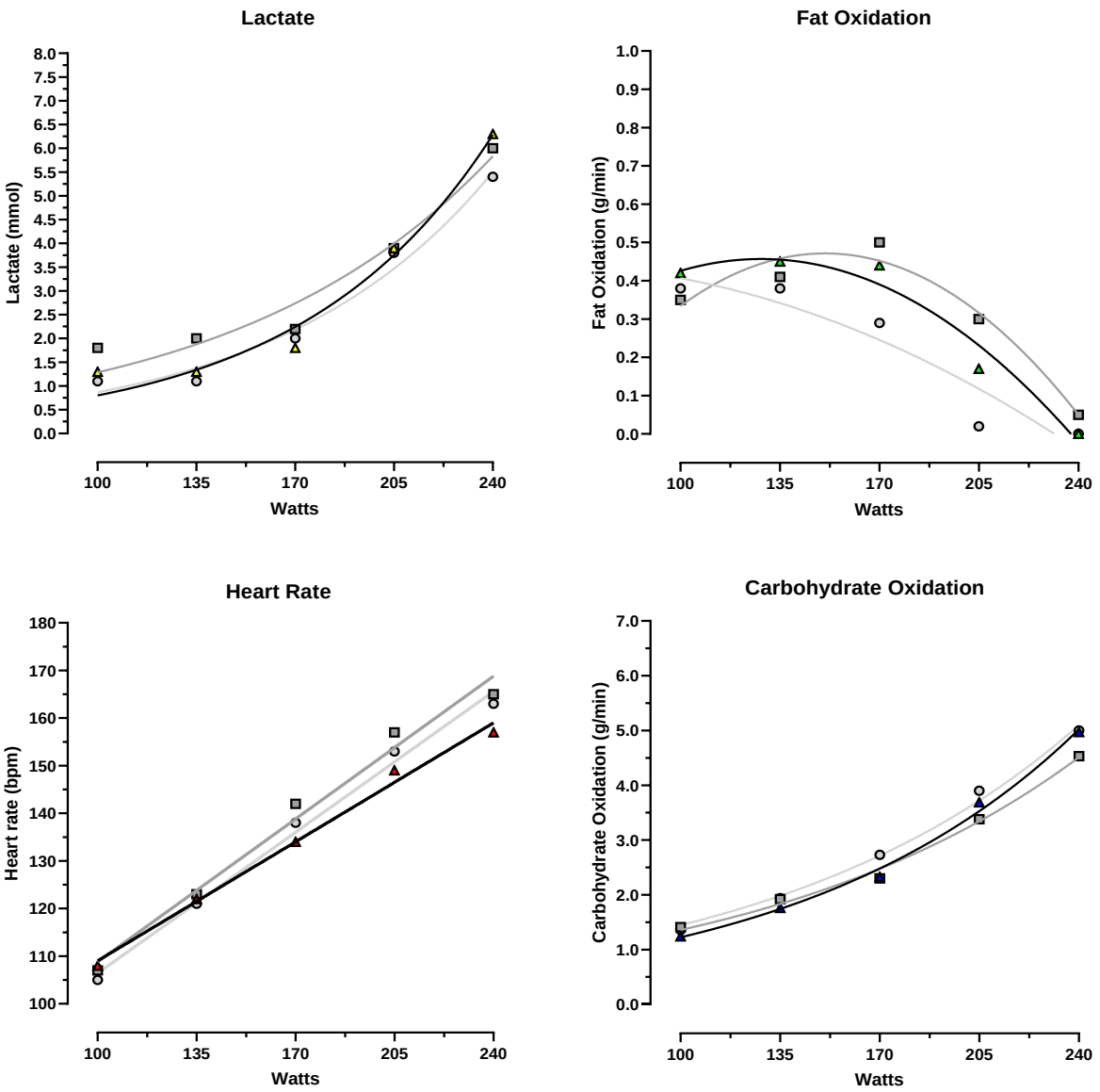


Figure 1. Data points in grey represent 2022 (circles with light grey line) and 2023 (squares with grey line). Data points in colour (triangles with black line) represent 2024.

Analysis

Well done on a great day of testing Lorenzo! It was great to have you in our laboratory again!

Starting with your anthropometry, your body fat percentage is good and is just within the range which we typically see in elite male athletes (8-12%). It is important to not lower your body fat percentage excessively as it may affect performance, recovery, and immune function.

LAA & FAT MAX

Carbohydrates and fat are the main sources of energy during exercise. The amount of energy that we extract from each of these sources is dependent on numerous variables, with exercise intensity having the biggest influence on where we derive our energy. In general, fat oxidation (usage) tends to increase from low to moderate exercise intensity and then decrease as the intensity increases further. There can be large differences in maximal fat oxidation rates between athletes, even in athletes of similar abilities.

The mean maximal fat oxidation (MFO) rates in male athletes are 0.60 ± 0.18 $g.min^{-1}$.

Your recorded maximal fat oxidation rate was 0.45 $g.min^{-1}$, which occurred at a workload of 130 - 140 W, and 122 bpm. Your fat oxidation values are within the normal range. Your fatmax is occurring at a moderate intensity, although you are utilising a high percentage of this value at lower intensities and even at 170 W, which is good!

The ‘Lactate Accumulation Assessment’ test is performed to determine the intensity at which your body is producing more lactate than it can metabolise. During low intensity exercise, blood lactate levels stay near resting levels because the rate of clearance of lactate matches its rate of production.

Lactate is a source of fuel and is continually utilised either through oxidation within local muscle fibres or by shuttling it to distant muscle fibres and organs to be metabolised there.

Lactate levels rise as exercise intensity increases. Eventually, there comes a break point, at which the production of blood lactate exceeds the ability to oxidise it.

Your best rate of lactate oxidation occurred at a workload of 185 W (2.55 W/kg) and a HR of 145 bpm; this can typically be described as your final state of ‘metabolic stability’. At 170 W we observed 1.8 mmol, and at 205 W we observed 3.9 mmol at the end of the stage. There was a 2.1 mmol increase across this stage, and therefore your last point of stability is most likely occurring between 170 and 205 W. This intensity is where the rate of lactate production by your legs is matched by your body’s maximal ability to metabolise that lactate (lactate production ≈ lactate metabolism).

Training at and just above your lactate threshold intensity will result in a rate of production of lactate greater than baseline levels. Maintaining this intensity for long durations will ultimately shift of your lactate curve to the right, indicating a greater ability to metabolise lactate as a fuel. This is achieved by increasing mitochondrial biogenesis and enzyme activity as well as increasing lactate transport proteins, lactate dehydrogenase activity and other key enzymes and proteins.

Going forward, your focus should be to progressively shift your lactate threshold curve to the right, indicating that accumulation is occurring at a higher power output.

PPO

The RQ value is the ratio of fat and carbohydrates which your body is using. A value of 0.7 means you are only burning fat, and a value greater than or equal to 1.0 means you are only burning carbohydrates. We would normally expect cyclists to reach a value over 1.1 in a maximal effort. Your RQ value reached a maximum of 1.17, which indicates that you produced a maximal metabolic effort.

Your absolute VO2max is 3.85 L/min. Your relative VO2max is 53.13 ml/min/kg.

Your absolute peak power is 295 W. Your relative peak power output is 4.07 W/kg.

Your relative threshold power output is 220 W (or 3.03 W/kg).

Tim Klein

Hons (Med) Exercise Science
tim@sciencetosport.com