

FITNESS PROFILING / RUNNING

Fast over 10K. Stronger over the half.

Short intervals felt comfortable. Half marathons started confidently, then pace unravelled after 14 km. Long runs rarely exceeded 75 minutes and fuelling was inconsistent.

THE ATHLETE

34 years | 68 kg | 55 km/week | Six training days | 12-week block

10K BEST

35:00

3:30 per kilometre

HALF MARATHON

1:23:30

3:57 per kilometre

GOAL

<1:19

Hold the pace late

THE GOAL

Run under 1:19 for the half marathon without losing 10K speed.

The missing piece was durability.

A strong aerobic engine was already there. The useful work was keeping the cost of running, leg strength and fuelling under control as fatigue accumulated.

4:55

12-WEEK OUTCOME

Faster half marathon | 1:23:30 to 1:18:35

01 / UNDERSTAND THE CHALLENGE

The engine was strong. The cost rose late.

Gas exchange and blood lactate set the intensity boundaries. A separate sustained run exposed the change that a fresh test would miss.

SPIROFIT VO2MAX

64

mL/kg/min

LACTATE LT2

3:40/km

Upper threshold estimate

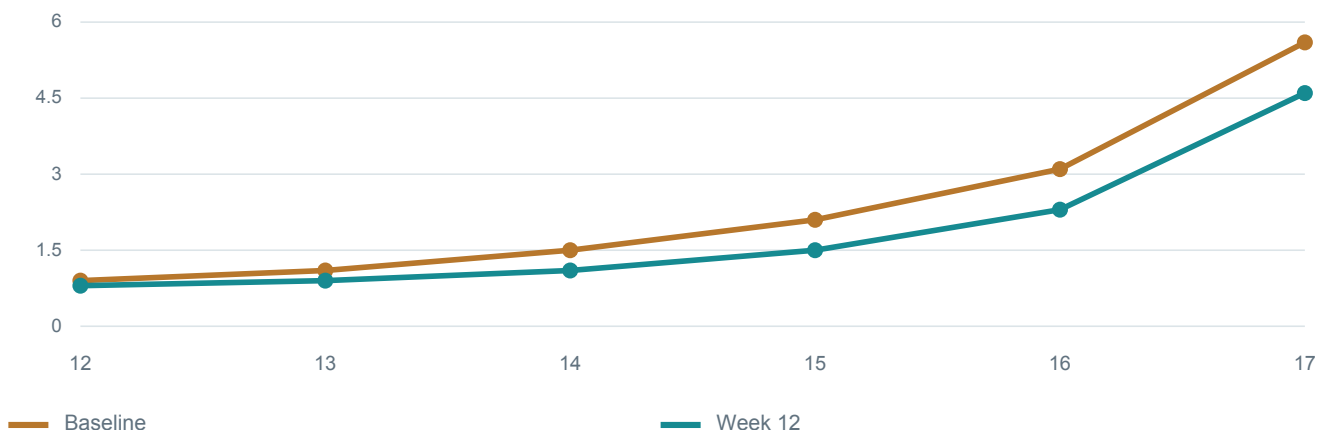
INSCYD VLAMAX

0.54

mmol/L/s | modelled

Less lactate at the same running speed

Blood lactate (mmol/L) | x-axis: treadmill speed, km/h



FRESH VERSUS TIRED

At 4:15/km, oxygen cost rose from 205 to 225 mL/kg/km after 60 minutes: a 9.8% rise for the same speed. [1,7]

FUEL USE, NOT A DIET LABEL

INSCYD estimated 210 g/h carbohydrate use at 4:00/km. That is total fuel demand, not an instruction to eat 210 g/h. [2]

THE DECISION

Build longer controlled running, preserve speed with a small dose, and practise fuelling. A higher VO2max alone would not resolve the whole problem.

02 / CONNECT THE MEASUREMENTS

The late-run change was measurable.

Ochy and VALD added movement and force data. Train.Red supplied local muscle-oxygen context; no single score was used to diagnose the cause.

Ochy: ground-contact time

ms | fixed 4:15/km | baseline

Fresh



220

After 60 min



244

VALD: countermovement jump

cm | baseline | same warm-up

Fresh



31

After 60 min



26.4

ASSESSMENT	BASELINE	WHAT IT ADDED
DynaMo ankle plantarflexion	490 / 540 N	Left / right; 9.3% difference. Strength work for both sides.
Train.Red local recovery	52 seconds	Time to 90% recovery after a fixed effort; tracked within athlete.
Sweat rate + sodium	1.10 L/h 850 mg/L	Approx. 935 mg sodium/h lost in the test conditions.

TRAINING IMPLICATION

Support the final third: progressive calf and single-leg strength, longer easy runs and a rehearsed drink-and-fuel plan. Video changes are observations, not proof of injury risk.

SmO2 is a local oxygen supply-demand signal. Use the same device, placement and protocol; a lower value is not automatically worse. Video and force tests support the performance story, not a diagnosis. [3-6]

03 / APPLY THE RIGHT STIMULUS

More staying power. The same speed.

The block changed the balance of training: less repeated high-intensity work, more sustained running and two short strength exposures.

01 Extend the easy run

Once weekly: 75 to 100 minutes at conversational effort, initially about 4:40-5:10/km. Add 5-10 minutes only when recovery is good.

Stimulus: tolerate longer work with less late-run physiological drift.

Check: oxygen-cost drift below 5% in the matched lab run.

02 Build controlled pace

One session weekly: 3 x 10 minutes at 3:55-4:00/km, 2-minute easy jog. Progress to 2 x 20 minutes; practise 3:45/km only after a stable review.

Stimulus: accumulate sustainable race-relevant work without turning every run into a race.

Check: even repetitions and no late-session pace collapse.

03 Strengthen the running support

Twice weekly, 25 minutes: split squat and hip hinge 3 x 5-6; straight- and bent-knee calf raises 3 x 6-8. Keep 2 repetitions in reserve.

Stimulus: raise force capacity and help movement hold up when tired.

Check: smaller fresh-to-fatigued jump loss; stronger calf tests.

04 Keep speed; rehearse fuelling

Six relaxed 15-second strides after an easy run. Practise 60 g carbohydrate/h on long runs; 0.5-0.7 L/h fluid, initially 800 mg sodium/L.

Stimulus: retain speed while improving fuelling tolerance and hydration execution.

Check: no gut upset; avoid drinking beyond losses or gaining body mass.

Example week: Mon rest; Tue controlled pace; Wed easy + strength; Thu easy; Fri easy + strength; Sat short easy + strides; Sun long run. Build roughly 55 to 65 km/week only if tolerated.

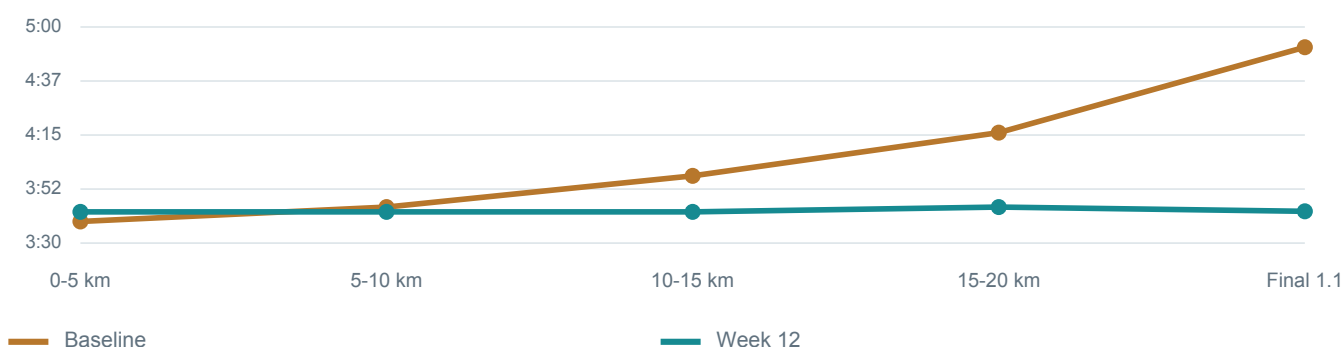
04 / CHECK WHAT CHANGED

A faster half, with less late-race fade.

Week-12 results: the half-marathon goal was achieved in this scenario, while short-distance speed stayed almost unchanged.

Half-marathon pace by segment

Seconds per km | lower is faster | all segments sum to the stated finish



OUTCOME	BASELINE	WEEK 12	WHAT CHANGED
Half marathon	1:23:30	1:18:35	4:55 faster
10K	35:00	34:55	Speed maintained
Late-run oxygen-cost rise	9.8%	3.9%	Less physiological drift
Late-run ground contact	244 ms	229 ms	Fresh values: 220 / 219 ms
CMJ decline after 60 min	14.8%	6.3%	Better force retention
VO2max	64	65 mL/kg/min	Small change; secondary finding

WHAT THE PROFILING MADE POSSIBLE

The value was the change in training focus: longer-lasting pace, supported by force capacity and fuelling. The combined programme and pacing strategy contributed; the tests did not create the improvement.

APPENDIX A / ASSESSMENT RECORD

The numbers behind the story.

Baseline and week-12 values are simulated. Direct observations, calculated results and model estimates are separated so the numbers can be interpreted properly.

MEASURE / SOURCE	BASELINE	WEEK 12	UNIT / INTERPRETATION
SpiroFit: VO2max	64	65	mL/kg/min; gas exchange
SpiroFit: VT1 / VT2	4:28 / 3:38	4:18 / 3:35	min/km; ventilatory estimates
Blood lactate: LT1 / LT2	4:25 / 3:40	4:15 / 3:36	min/km; curve-based estimates
INSCYD: VLamax	0.54	0.46	mmol/L/s; model estimate
INSCYD: FatMax / peak fat	5:00 / 0.50	4:50 / 0.63	min/km and g/min; modelled
INSCYD: carbs at 4:00/km	210	195	g/h; modelled total use
SpiroFit: oxygen cost, fresh / late	205 / 225	206 / 214	mL/kg/km at 4:15/km
Ochy: contact, fresh / late	220 / 244	219 / 229	ms at 4:15/km
ForceDecks: CMJ, fresh / late	31.0 / 26.4	32.0 / 30.0	cm; impulse-momentum method
DynaMo: ankle force, L / R	490 / 540	560 / 575	N; fixed seated position
Train.Red: recovery t90	52	39	s; derived from SmO2 trace
Sweat rate / sodium	1.10 / 850	Plan retained	L/h and mg/L; condition-specific

LT1/LT2: lower/upper blood-lactate threshold estimates. VT1/VT2: ventilatory thresholds. These are related markers, not identical measurements. VLamax and fuel-use values shown here are modelled, not direct instrument readings.

APPENDIX B / REPEAT THE RIGHT TEST

A result is only useful if it is comparable.

The protocol links the finding to the goal. These case-study protocols span several visits, including follow-up; they are not all delivered inside one three-hour appointment.

AEROBIC AND METABOLIC

Four-minute treadmill stages, 1% incline, with capillary lactate sampled at stage end. Gas exchange reviewed for VO2max and VT1/VT2. INSCYD uses a separate valid lactate profile and model; listed outputs are simulated model estimates for this case.

DURABILITY AND MOVEMENT

Separate session: 60 minutes at 4:15/km; compare gas and Ochy samples at minutes 8-10 and 58-60. CMJ immediately before and after, matched timing. Retest at the same absolute speed and with the same nutrition, shoes, room conditions and warm-up.

MUSCLE OXYGEN AND HYDRATION

Train.Red on the same marked right vastus lateralis site. Recovery t90: time from end of a 3-minute run at 16 km/h to 90% return towards the pre-effort SmO2 value, during fixed easy recovery. Sweat: 60 minutes at 20 C / 50% RH; mass-balance sweat rate and wearable sodium estimate.

HOW TO READ THE EVIDENCE

Across visits: same time of day, food and caffeine routine, equipment and warm-up; avoid hard training for 48 hours. Repeat key tests after familiarisation. Small changes may sit within measurement variation. The results describe this athlete; they do not establish injury-risk cut-offs or rankings.

Sweat rate = (pre-exercise mass - post-exercise mass + drinks - urine) / duration, approximating 1 kg as 1 L. Sodium loss estimate = sweat rate x sweat sodium. Regional wearable readings are estimates; confirm unexpected values. Intake is adapted to comfort and conditions, not automatic 100% replacement.

Training response in this worked example: follow-up changes are internally consistent examples, not causal proof or guaranteed outcomes. Thresholds and training doses require individual review.

APPENDIX C / SUPPORTING READING

The methods, in context.

Sources support the assessment approach and general training principles. They do not validate the invented athlete values or the example improvement shown in this document.

1. SpiroFit: measured gas exchange and ventilatory thresholds

<https://spirofit.de/frequently-asked-questions/>

2. INSCYD: interpretation and estimation of VLamax

<https://inscyd.com/wp-content/uploads/2021/11/INSCYD-Whitepaper-VLamax.pdf>

3. VALD: strength and running assessment rationale

<https://valdhealth.com/news/optimizing-endurance-running-performance-and-rehabilitation-a-q-and-a-with>

4. Ochy: video-derived running metrics

<https://www.ochy.io/science>

5. Train.Red: running assessment and muscle oxygen context

<https://train.red/blogs/news/running-assessment>

6. Sweat measurement: fluid loss and body-mass method

<https://www.precisionhydration.com/performance-advice/hydration/how-to-measure-your-sweat-rate/>

7. Durability: test design and control of fatigue protocols

<https://pubmed.ncbi.nlm.nih.gov/40150840/>

8. Strength training and running economy: systematic review

<https://pubmed.ncbi.nlm.nih.gov/38165636/>

9. ACSM / Academy / Dietitians of Canada: sports nutrition

<https://pubmed.ncbi.nlm.nih.gov/26920240/>