RUN WORKSHOP

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At the end of this workshop you will…

…have a simple operating system for running easier, better, faster, further, injury-free… and above all: ENJOY IT! ☺

Engine	Strength	Efficiency	Adaptation	Nutrition
energy systems, HR, aerobic/anaerobic, lactate & zones	strength, mobility	Warmup, Technique	Supercompensation, sleep, stress, rest & adaptation	fuelling, hydration, before/during/after

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Engine

How to become a better runner: how your engine works

To run faster / for longer, your body needs to produce energy efficiently.
Good news: this can be trained!

- **Muscles need energy = ATP**
  ATP is the usable energy that makes your muscles contract. Because we store very little, your body must continuously remake it while you run.

- **Aerobic = using oxygen**
  Your main energy system for sustained running. It uses fat and carbohydrate and dominates easy running

- **Anaerobic = fast energy without relying on oxygen**
  Contributes more as intensity rises, when energy is needed faster than the aerobic system can supply it. It relies mainly on carbohydrate.

- **Heart rate = your dashboard**
  As effort and oxygen demand increase, HR usually rises. It helps indicate intensity, but is affected by heat, fatigue, stress, caffeine, hydration, etc. (and measures also lag behing so not suitable for sprint)

- **Lactate = not the enemy**
  Lactate is produced and reused by the body as fuel. As intensity rises, production increases. At high intensities it eventually accumulates faster than your body can use and clear it.

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Engine

How to improve your engine: Train your different energy systems!

Zone	Physiology	Talk test	RPE	Useful for
Z1 Recovery	well below LT1	easy chatting	1–2	recovery
Z2 Easy	below / around LT1	full sentences	2–4	aerobic base
Z3 Steady	between LT1 and LT2	shorter sentences	4–6	steady tempo
Z4 Threshold	around LT2	few words	6–8	threshold intervals
Z5 VO_2	above LT2	1–2 words	8–10	VO_2 intervals

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Engine

The hard of today will be the easy of tomorrow ☺

Z1 Recovery → supports recovery and easy training volume
Z2 Easy / Aerobic → builds the aerobic engine, mitochondria and endurance
Z3 Steady / Tempo → improves your ability to run faster aerobically
Z4 Threshold → lets you sustain a faster pace before lactate rises rapidly
Z5 VO_2max / intervals → raises your aerobic ceiling
Sprints / hills → develop speed, power and anaerobic capacity

The takeaway

- Easy running builds the engine.
- Threshold raises your sustainable speed.
- VO_2max intervals raise the ceiling
- Sprints add speed and power.
- Recovery allows the engine to adapt.

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Engine

DEEP DIVE - Zone Training: Effort/Feel and Goals/Outcomes

Zone	Effort / feel	Main fuel	Energy & lactate	What it trains
Z1 – Recovery	RPE 1–2 • ~50–60% HRmax • very easy, relaxed breathing	Mostly fat, some carbohydrate	Almost entirely aerobic • very low lactate	Recovery, circulation, easy volume
Z2 – Easy / Aerobic	RPE 2–3 • ~60–70% HRmax • easy, full conversation	Fat + carbohydrate	Predominantly aerobic • lactate stays low	Aerobic base, endurance, mitochondria, fat use
Z3 – Steady / Tempo	RPE 4–6 • ~70–80% HRmax • moderate, short sentences	Increasingly carbohydrate / glycogen	Still mainly aerobic • lactate starts to rise	Running faster aerobically, muscular endurance
Z4 – Threshold	RPE 7–8 • ~80–90% HRmax • hard but controlled, only a few words	Mostly carbohydrate / glycogen	High aerobic + increasing anaerobic contribution • lactate accumulates faster	Raise threshold: sustain a faster pace for longer
Z5 – VO_2max	RPE 9–10 • ~90–100% HRmax • very hard, heavy breathing	Mainly carbohydrate / glycogen	Aerobic system near maximum + substantial anaerobic contribution • lactate rises quickly	Maximum aerobic power / VO_2max
Sprint / Anaerobic	RPE 10 • maximal / near-maximal • seconds	Phosphocreatine + carbohydrate	ATP-PCr + anaerobic glycolysis dominate	Speed, acceleration, power

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Engine How to train each system - examples

Quality	Example session	What it should feel like
Aerobic base	30–60 min easy / run-walk	You finish feeling you could do more
Threshold	3×6 min or 2×10 min controlled	Hard but not desperate
VO_2max	4–5×3 min hard / 2 min easy	Rep 1 and final rep still similar
Speed / neuromuscular	4–6×15–20 sec strides	fast, relaxed, full recovery
Durability	consistent weeks, not hero workouts	small repeatable stress + recovery

TIP: stick to your plan! Most recreational runners go too hard on easy days and too uncontrolled on hard days.

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Strength

Strength training is not optional ;)

Strength training helps you run more efficiently, tolerate more load, and reduce injury risk

The science

- Muscles produce force
  Stronger muscles need less effort for each stride.

- Tendons store and return energy
  Stiffer, stronger tendons act like springs, improving running economy.

- Better control = better movement
  Strength improves stability at the hips, knees and ankles.

- Stronger tissues tolerate more training
  Muscles, tendons and bones adapt to load, making the body more resilient.

Strength makes runners more efficient, more powerful and more durable.

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Strength

AGE and TRAINING. Highly trainable!

- **Muscle mass** declines by ca 3–8% per decade, with the decline accelerating later in life.
- **Strength** declines faster than muscle mass
- **Neuromuscular function** also deteriorates, so you can lose strength even without losing much visible muscle
- **Explosive strength** — the ability to produce force quickly — tends to fall faster than maximal strength. For runners, this affects push-off, hill running, acceleration and balance.
- **Tendons** become less responsive. **Collagen** turnover and **tendon** stiffness can decline. Tendons may become less efficient at storing and returning elastic energy
- **Bone density** gradually declines
- **Balance and coordination** decline too. Reduced proprioception and neuromuscular control can increase injury and fall risk

You can slow all this down significantly as your body **adapts strongly to strength training, progressive resistance, appropriate loading, single side work, stability and plyometrics**!

The takeaway

Yes, ageing reduces muscle, strength, power and tissue resilience — BUT these are highly trainable!
Strength training can help preserve:
Muscle → Force → Power → Tendon stiffness → Bone density → Joint control
Running maintains fitness. Strength training helps maintain the body that allows you to keep running.

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TEST → IDENTIFY WEAK LINK → TRAIN IT

TRY IT OUT!

The Bunkie test: testing various chains important for running

A. Anterior Power Line — front chain
trunk/core endurance, hip/pelvic control, ability to resist lumbar extension, leg – trunk connection

B. Posterior Power Line — posterior chain
Reverse plank / bridge with one leg unloaded
hamstrings, gluteals, spinal extensors , posterior-chain endurance

C. Lateral Stabilising Line - Side-plank variation
lateral trunk , gluteus medius/hip abductors, pelvic control, frontal-plane stability
(a series of single-leg landings, and the hip/trunk have to control the pelvis in the frontal plane. Gluteus medius function is therefore highly relevant to running mechanics.)

D. Medial Stabilising Line
adductors , medial hip chain , trunk , pelvis

E. **Posterior Stabilising Line**
gluteals , hamstrings , back extensors , lumbopelvic control.

A.

B.

C.

D.

E.

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STRENGTH – some more tests

TRY IT OUT!

Movement	What it shows	Why it matters	Training exercise
(Single-leg) squat	Hip/knee/ankle control	Prevents collapse and wasted movement	Split squat, step-ups/step downs downs
(Single-leg) calf raises	Calf strength	Key for push-off and tendon resilience	Standing calf raises
(Single leg) Bent-knee calf raises	Soleus strength	Supports every stride, especially endurance running	Seated/bent-knee calf raises
(Single-leg) bridge	Glute/hamstring strength	Helps hip extension and pelvis control	Hip thrusts, hamstring bridges
Jumps	Elastic strength/control	Improves running stiffness and injury resilience	Pogos, skipping, bounds, squat jumps, single-leg hops
Deadlift pattern	Hip power/posterior chain	Builds explosive hip extension for stride power	Deadlifts, Romanian deadlifts

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Strength — The little Strength Library

Soleus & Calf raise	**Planks**	**(Split) squat**
Bent & straight knee	Front, side, reverse, destabilised	(single-) leg strength
(Single-leg) RDL	**Step-up/down**	**Jumps**
posterior chain	control + force	elasticity

2×/week. Beginners 2×8–12. More trained 3–4×4–8 with meaningful resistance.

TIP: Remembers also the small muscles! For example the soleus takes most of the impact of each stride and is often forgotten .

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Strength

The extended Strength Library

Exercise	Main target	Why for runners
Squat	quads + glutes	force production through hip/knee
Split squat	quads + glutes	runner-specific unilateral strength
Reverse lunge	glutes + quads	single-leg control
Step-up	glutes + quads	single-leg force production
Deadlift	glutes + hamstrings	powerful hip extension/posterior chain
Romanian deadlift	hamstrings + glutes	eccentric hamstring + hip strength
Single-leg RDL	hamstrings/glutes	unilateral posterior chain + balance
Single-leg RDL → knee drive	hip extensors + hip flexors + balance	links propulsion into running posture
Glute bridge	glute max	basic hip extension
Single-leg glute bridge	glutes/hamstrings	unilateral pelvic stability
Hip thrust	glute max	high hip-extension force
Standing calf raise	gastrocnemius + soleus	ankle propulsion
Bent-knee calf raise	soleus emphasis	running-specific plantar-flexor strength
Tibialis raise	anterior lower leg	dorsiflexion/foot control
Copenhagen plank	adductors	medial hip strength
Side plank + leg lift	abductors/glute med	pelvis stability
Monster/side band walks	hip abductors	lateral hip control
Front plank	anterior core	resist trunk extension
Side plank	lateral core and abductor/glute medius	resist lateral collapse
Dead bug	trunk	limb movement with stable pelvis
Bird dog	trunk/posterior chain	contralateral control
Pallof press	anti-rotation	control rotational forces
Push-up	upper body/core	general strength
Row	upper back	scapular/postural strength
Farmer carry	trunk/grip/shoulders	whole-body stability

Don't neglect the calf — especially the soleus! The **soleus is one of the most important propulsion muscles in running** and contributes substantially to mechanical work as speed increases.

Non-negotiable ;)

Straight-knee calf raise

More gastrocnemius contribution.

Bent-knee calf raise

Reduces the mechanical contribution of the gastrocnemius and allows greater emphasis on the soleus.

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Efficiency

A GOOD WARMUP GOES A LONG WAY!

TRY IT OUT!

RAISE TEMPERATURE	MOBILISE	ACTIVATE	COORDINATE	RUN
Raise temperature (3–5 min) •brisk walk •easy jog •progressively increase speed.	**8–10 each** •ankle rocks •leg swings forward/back •leg swings side-to-side •hip circles •walking lunges •lunge + trunk rotation.	**8–10 each** • bodyweight squats •single-leg glute bridges •calf raises •bent-knee calf raises •Lunges front, back, side – with knee raises	**15–20 m each** •high knees •heel flicks •A-skips •Jumps/pogos	**Prime the nervous system** Before a fast session/race: 3×15–20 sec strides 60 → 70 → 80–90% walk/jog back

Good to know: dynamic stretching before running, static after!

TIP: Easy run: 5–10 min very easy may be enough. Intervals/race: use the full sequence.

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Efficiency

The GoZebra running technique check: top to bottom

Head	look ahead, neutral neck	**Hips**	controlled, not frozen
Shoulders	space between ears and shoulders	**Foot**	down/back under you
Collarbone	open, pull gently forward	**Ground Contact**	quick, stiff but elastic ;)
Trunk	stable but not rigid	**Recovery**	heel up → knee forward naturally

Best cues: Floor is Lava ;)
‚Tap Tap‘
Cadence!

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Efficiency

The GoZebra running technique check: top to bottom

Measure	Meaning	Hobby runners	Trained / competitive	Elite / sub-elite	Key points
Cadence	steps/min	~150–170	~165–180	~175–190+	Pace-dependent; no universal 180. Small changes (e.g. +5–10%) can help if overstriding.
Ground contact time	ms on ground	~260–320 ms	~220–270 ms	~180–230 ms	Usually falls as speed rises. Lower is not automatically better without enough force and stiffness.
Stride length	distance per stride	~0.9–1.3 m	~1.1–1.5 m	~1.3–1.8 m+	Strongly affected by pace and height. Do not simply 'reach longer' — avoid overstriding.
Vertical oscillation	up/down movement	~9.0–12.0 cm	~7.0–9.5 cm	~5.5–8.0 cm	Lower is often more economical, but not always better. Taller runners may show slightly higher values.
Vertical ratio	VO ÷ stride length	~8.5–10.5%	~7.0–8.8%	~5.5–7.5%	Useful mainly to compare you vs you. Lower often suggests better economy, but context matters.
GCT balance	left/right contact symmetry	~48.5–51.5%	~49–51%	~49.5–50.5%	Aim near 50/50. Persistent asymmetry, especially >52/48, may matter with pain, fatigue or hills.

Notes: Ranges are broad practical coaching guides, not diagnostic cut-offs. Cadence and GCT are aligned with Garmin running-dynamics percentiles; vertical metrics vary by sensor placement (chest vs waist), pace, terrain and runner height. Stride length is the most pace-dependent metric.

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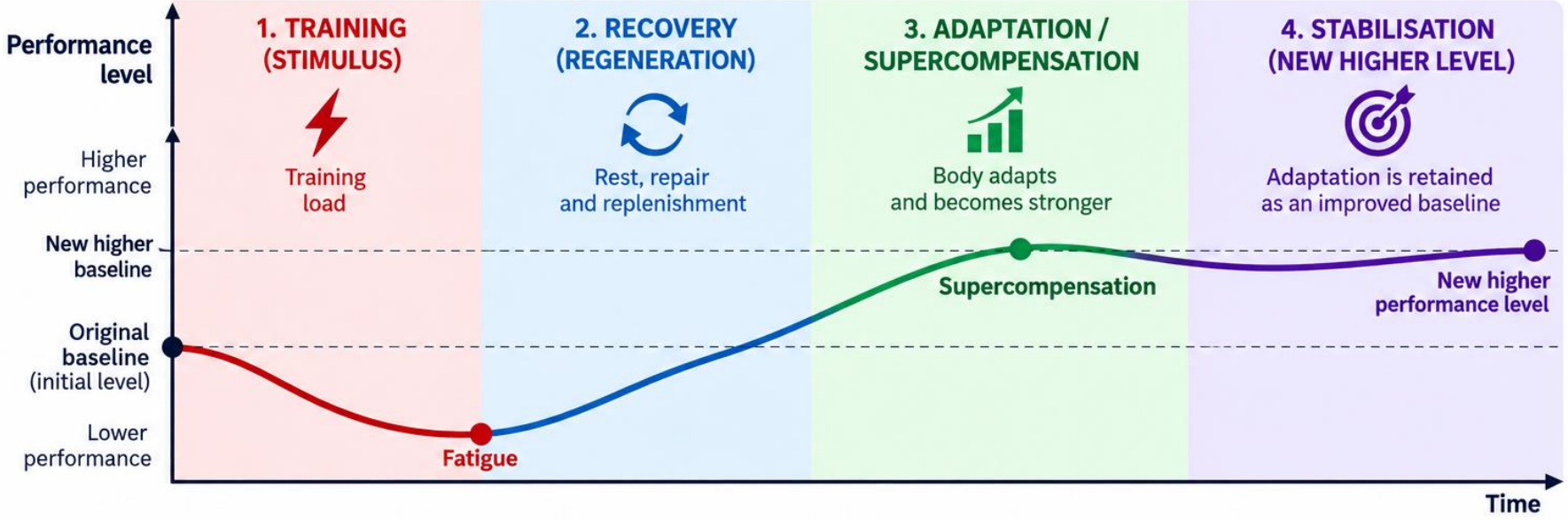
Adaptation

TRAINING MAKES YOU TIRED. RECOVERY MAKES YOU BETTER.

The Supercompensation Curve

Training → Fatigue → Recovery → Adaptation → Higher Performance

"With adequate recovery, the body adapts and performance capacity improves."



1. Training (Stimulus)

- Stress on the body
- Energy stores are used
- Muscles and nervous system are fatigued
- Performance decreases temporarily

Training makes you tired (weaker in the short term).

2. Recovery (Regeneration)

- Replenish energy stores (ATP, glycogen)
- Repair muscle tissue
- Restore fluids and electrolytes
- Nervous system recovers

Performance increases back towards baseline.

3. Adaptation (Supercompensation)

- The body not only recovers, but adapts to the load
- Becomes better prepared for future stimuli
- Performance temporarily rises above the original level

You are now stronger than before.

4. Stabilisation (New Higher Level)

- Adaptation is retained as an improved baseline
- Performance capacity shifts upward
- The next training stimulus builds from a higher level

With consistent training and recovery, performance improves over time.

The key: Repeat the cycle with the right timing.

"Adaptation means the body becomes better prepared, and performance capacity shifts upward."

Good to know: the body does not distinguish between different stressors on the body (exercise, work, private, etc). Plan your run journey holistically, it is not isolated from the rest of your life!

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Adaptation MOBILITY

Stretching after **training is good in many ways, to signal your body that training is over and it can relay again, smoothing your nervous system and calming down. An extra stretching session is always a good idea, especially if tightness…**

TRY IT OUT!

1. **Gastrocnemius.** Straight back knee, heel down.
2. **Soleus.** Same position but bend the back knee while keeping heel down.
3. **Hip flexor.** Half-kneeling lunge; posterior pelvic tilt before moving forward.
4. **Quadriceps.** Heel toward glute, knees together, pelvis neutral.
5. **Hamstrings.** Hip hinge with knee relatively straight rather than rounding the back.
6. **Glute.** Figure-four/pigeon-style stretch.
7. **Adductors.** Wide-knee/rock-back or lateral adductor stretch.
8. **Hip rotation.** 90/90 hip position.
9. **Ankle dorsiflexion:** knee-to-wall

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Nutrition

NUTRITION BEFORE, DURING, AFTER TRAINING

Before training

- **3–4 hours before**: last main meal.
- **1 hour before:** light, easily digestible, carbohydrate-rich, low-fat snack.
- **Less than 1 hour before:** glass of fruit juice, glucose tablets, or dried fruit.

During training

- **more than 45–60 minutes exercise:** additional carbohydrates least **30 g of carbohydrates per hour**, e.g.(homemade) sports or electrolyte drinks, fruit purée pouches, bars, gels, gummy sweets

After training

- **Protein:** to support muscle recovery and muscle building.
- **Carbohydrates:** to replenish the glycogen stores used during exercise.

TIP: TRY OUT WHAT WORKS FOR YOU!

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Nutrition

‘NORMAL’ VS SPORTS NUTRITION

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Nutrition

CARBS ARE YOUR FRIENDS!

Carbohydrates are the body's most important source of energy.

In sports nutrition, especially during intensive training sessions, a targeted intake that meets the body's energy needs is essential. Carbohydrates should be part of every meal.

Before training or competition
1–4 g carbohydrates per kg body weight
2–4 hours before exercise

During exercise - depending on intensity: **30–90 g carbohydrates per hour**
For **1–2 hours of exercise:** around **30 g per hour**

After exercise
1–1.2 g carbohydrates per kg body weight
within the **first 1–2 hours after exercise**

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Nutrition

CARBS ARE YOUR FRIENDS!

Examples for 30 g Carbs (before workout)

Datteln (3-4 Stk.)
30 g Carbs

Müsliriegel (2 Stk.)
32 g Carbs

Quetschie (2 Stk.)
30 g Carbs

Honig-Reiswaffeln
(1 Pkg.) = 31 g

Eierwaffeln (2 Stk.)
18 g Carbs

Banane (1 mittlere)
30 g Carbs

Rosinenbrötchen (1 Stk.)
33 g Carbs

O-Saft (300 ml)
26 g Carbs

Examples for 30 g Carbs (during workout)

Datteln (3-4 Stk.)
30 g Carbs

Isostar (40 g)
35 g Carbs

Quetschie (2 Stk.)
30 g Carbs

Goldbären (40 g)
31 g CAbrs

Traubenzucker (45 g)
39 g Carbs

Fruchtsaft (300 ml)
26 g Carbs
→ verdünnt mit
Wasser + Prise Salz

Examples for Carbs (after workout)
Recommended 1–1.2 g per kg of body weight, e.g.

Food	Typical portion	Approx. carbs
Cooked rice	200 g	~55–60 g
Cooked pasta	200 g	~55–60 g
Potatoes	300 g	~50 g
Sweet potato	300 g	~55–60 g
Couscous, cooked	200 g	~45–50 g
Quinoa, cooked	200 g	~40–45 g

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Nutrition

PROTEIN IS A KEY BUILDING BLOCK OF CELLS; ENZYMES, HORMONES etc

Recommended **1–1.5 g per kg of body weight,** e.g.
- 20–30 g protein per main meal
- 10–20 g protein per snack

Naturjoghurt (500 g)
20,5 g EW

Skyr (200 g)
19 g EW

Magertopfen (125 g)
15 g EW

Cottage Cheese (200 g)
20 g EW

Schnittkäse (50 g)
13 g EW

Vollmilch (300 ml)
10 g EW

1 Ei (Größe L)
8 g EW

Huhn/Schwein (100 g)
23 g EW

Faschiertes gemischt (150 g)

magerer Schinken (50 g)
9 g EW

magerer, weißer Fisch (125 g)

22,5 g EW

Edamame (150 g)
18 g EW
Garnelen (150 g)
22,5 g EW

Tofu/Tempeh (150 g)
19,5 g EW

Thunfisch-Dose (100 g)
24 g EW

Lachs (125 g)
25 g EW

Kichererbsen (250 g)
16 g EW

Lachs (125 g)
25 g EW

Käferbohnen (200 g)
10 g EW

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Participant questions

- Warm-up: easy run = start slowly; race/intervals = full dynamic warm-up.
- Beginner: start with run/walk, 2–3×/week; progress frequency before intensity.
- Technique: no universal style; land closer under COM, run tall, relaxed and rhythmic.
- Intervals: hard but repeatable; not all-out from rep 1.
- Knee issues: check load, strength, overstride, cadence, previous injury and recovery.
- Age 56: age matters, but a lot can be counter acted with the right training! first audit training dose, intensity distribution, strength, stress and sleep.

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THANK YOU!

Any questions, run analysis, run training,
swimming, cycling, running, hyrox, fitness:

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