Revving Your Engine

How to turn exercise into a fountain of youth.

I am a doctor, but I am not your doctor. This is education, not medical advice. There is no single best way to live, and your results will vary. Before starting anything strenuous, particularly if you have been sedentary or have a known condition, talk to the physician who knows you.

206 bones, 350 joints, 600 muscles, 78 organs, 11 organ systems. It is a serious piece of engineering and it was built to do things. A car kept in the garage stays pristine, and that is not what cars are for.

What exercise actually is

- The word carries a lot of baggage, most of it from abandoned resolutions, unused memberships, and equipment being used as furniture. It sounds like a chore, a punishment, or a separate thing bolted onto real life.
- Try this instead. **Exercise is a test drive.** It is not separate from your life, it is a check that the systems you were built with still work. Can you balance, so you do not fall? Can you move through a full range? Can you get from here to there, and how far? Can you move objects around in space?
- Like practising scales, it is rehearsal for the real thing. And it tells you today whether anything has quietly started sliding since last year.
- The claim underneath all of it: **exercise may be the single most potent medical intervention ever known.** If you keep one line, keep that one.
- And it is worth being specific about what it does at the cellular level, because the anti-aging language usually attached to this subject is marketing and this is not. Training measurably affects most of the recognized biological hallmarks of aging: it preserves mitochondrial function, reduces chronic inflammation, improves the disposal of damaged cellular material, and slows the loss of tissue that regenerates. That is not a claim about living forever. It is a claim about the shape of your last decade.

Where the energy comes from

Four systems, handing off in sequence, which is why different training does different things.

- **Immediate, about 10 seconds.** Stored ATP plus creatine inside the muscle fiber. Enough for a sprint start or a single heavy lift.
- **Short-term, 1 to 5 minutes.** Glucose burned without oxygen, which is fast and produces lactate, so it fatigues quickly. A 400-metre run lives here.
- **Intermediate, 2 minutes to an hour.** Oxidizing carbohydrate with oxygen. Efficient and sustainable, but the stores are limited. A 5K or moderate cycling.
- **Long-term, past about an hour.** Oxidizing fat. Slower to yield energy, and effectively unlimited. Marathons, long hikes, and the reason a well trained body can keep going after the sugar runs out.

Train the system you want to improve, and the body responds by building the machinery: more mitochondria, more capillaries, more capacity. That adaptation is the entire product.

What goes wrong

- How we travel, work, obtain food and play has all been re-engineered to remove effort. Comfort is the risk, not the reward, and the environment now supplies it by default.
- Here is the number that should change the conversation. Among 122,000 adults given a treadmill test and followed for a median of over eight years, **low cardiorespiratory fitness carried a hazard ratio for death of 3.9 against high fitness.** (Mandsager and colleagues, *JAMA*, 2018.)
- Put that beside the conditions we take seriously. Smoking, 1.4. Diabetes, 1.4. Coronary artery disease, 1.3. End-stage renal disease, 2.8. Low fitness compared with merely above-average fitness is also 2.8.
- **Which means low fitness carries roughly the mortality risk of kidney failure.** The difference is that it is common, invisible, unlabelled, and treatable without surgery or medication. No lab result tells you. You have to look at your own habits.

Opposition is the mechanism, not the obstacle. Look at where load holds things up. An arch stands because opposing forces push against each other. A suspension bridge transfers tension up the cables into the towers, and without that tension it collapses under its own weight. A kite stays up because of the string; let go and it falls.

- Your body works the same way. Bone thins and demineralizes without load, and I see it on x-rays. Muscle atrophies within days of disuse. Skin builds callus exactly where it is worked.
- So the paradox is real: the more comfortable and effortless life becomes, the softer, weaker and more injury-prone you get. Exercise is work, which is why people avoid it, which is precisely the point being missed.
- Discomfort is a signpost rather than a stop sign. And if you are over fifty, stop assuming you have graduated from a hard workout. There is no age limit on intensity, only a sensible on-ramp.

Muscle is an organ, not an ornament

- It is one of the most neglected organ systems in the body, and it declines steadily with age unless you actively defend it. The clinical name for that decline is sarcopenia, and it is a major reason people lose independence.
- It is also a major site of glucose disposal. Losing muscle removes one of the places your surplus energy was going, which quietly worsens everything in the nutrition session.
- And past about fifty the body becomes more resistant to building it, which means both the training stimulus and the protein intake have to go up rather than down at exactly the age most people assume they should be taking it easier.
- The benefits stack: more muscle, higher resting metabolism, easier weight control, denser bone, and better protection against the fall that would otherwise end things.

The four pillars

Guiding principle: the minimum effective dose. This is optimized for a long healthy life, not for performance, records or race times.

- **1. Stability.** The least glamorous and the one that decides whether you are independent at eighty. Balance, mobility, control through range. A fall is the event that ends a great many independent lives.
- **2. Strength.** Three movements cover most of it: push, pull, and hip hinge or squat. **Progressive overload** is the whole method. Start with a weight you can lift 8 to 12 times with good form, leaving about two reps in reserve. Do 3 or 4 sets. When the prescribed sets and reps become easy, add 2.5 to 5 pounds. That is it. It is not complicated, and it is where most of the benefit is.
- **3. Aerobic, or Zone 2.** Roughly 70 percent of maximum heart rate, or the point where nose breathing becomes difficult and you can still hold a conversation. Three sessions a week of about 45 minutes. What it builds: more mitochondria and better ones, metabolic flexibility so you can burn fat for fuel, a lower resting heart rate, lower blood pressure, and better insulin sensitivity.
- **4. Anaerobic, or Zone 5.** 90 to 100 percent of maximum, in intervals, once a week. Four minutes hard, four minutes easy, repeated four times is a standard protocol. Each interval drives maximal cardiac output, the rest allows partial recovery, and over weeks you get a bigger stroke volume, more capillaries and more mitochondria, which is to say a higher VO2 max.

Starting

- **Set the time before the content.** When matters more than what, at least at first.
- **Make it easy and start small.** If you feel lost, a trainer for a few sessions is money well spent, and a partner helps more than most people expect.
- **Push play.** Recorded workouts remove every excuse at once and require no decision. Twenty-five minutes, at home, whatever the weather.
- **Expect the excuses and pre-answer them.** No time is a scheduling problem. No equipment is solved by your own body weight. Not knowing what to do is solved by following a video. Not wanting to be seen is solved by a bedroom floor. Each one has an answer, and each one will still show up tomorrow morning.
- **Give yourself an allowance.** Missing a session is not a failed program, it is a missed session, and the people who last are the ones who never let it become two.
- A note from a 71-year-old who wrote about this well: two years earlier he had arthritis setting in and new type 2 diabetes; he walked, lifted three days a week and ate cleanly, lost thirty pounds, and the arthritis pain and the diabetes both came under control. His trick for the days the voice says take today off: try five minutes, and quit if you still do not feel like it. He almost never quits.

What the benefits actually are

- Improved metabolism and insulin sensitivity, which is the through-line connecting this session to the last one.
- Lower risk across cardiovascular disease, several cancers, and dementia.
- Fewer injuries, because strength and stability are what stop a stumble becoming a fracture.

- More energy, better mood, and better sleep, all three of which are reported more consistently than almost any drug effect.
- If a pharmaceutical company could put that list on a label, it would be the most valuable product in the world. It is free, it is available today, and it requires about four hours a week.

TRY THIS

- Estimate your VO2 max this week. There are calculators and your watch may already know.
- Do the centenarian test on the resources page and find the item you would fail.
- Pick your two strength days and put them in the calendar as appointments.
- Do one Zone 2 session where you deliberately go slowly enough to talk.
- Try one set of four-minute intervals, once, and see what it tells you.

Easy choices, hard life. Hard choices, easy life. And the best exercise remains the one you will actually do.

Resources

The centenarian test

Not a fitness test. A list of things you will want to be able to do in your last decade, which means training for them now. Work backwards from whichever one you would fail today.

- Carry four bags of groceries up four flights
- Get down on the floor and play with grandchildren
- Get up off the floor using one point of contact
- Lift 30 pounds into an overhead bin
- Pull yourself out of a pool without the stairs
- Pick up a child running at you
- Run for twenty minutes
- Walk 50 feet over rocky ground
- Go on a hike

The weekly shape

- **Strength** twice a week: 3 to 5 sets, 10 to 12 reps per muscle group, push and pull and hinge.
- **Zone 2** three times a week, 45 minutes, conversational pace.
- **Zone 5** once a week, intervals, genuinely hard.
- **Stability** woven through, or a dedicated session if balance is already a concern.

Referenced in this session

- Mandsager and colleagues, *JAMA*, 2018. Cardiorespiratory fitness and long-term mortality in 122,000 adults.
- Peter Attia, for the centenarian decathlon framing.

Reading and where to train

- *Outlive*, Peter Attia. The four pillars, Zone 2 and Zone 5, at length.
- *Bigger, Leaner, Stronger* and *Thinner, Leaner, Stronger*, Michael Matthews. Practical programming, one for men and one for women.
- *Younger Next Year*, Chris Crowley. The motivational case, and the best-argued one for anyone past sixty.
- Free video: HASfit, Fitness Blender, and Bob and Brad for seniors. Paid: Apple Fitness+, Peloton, BODi. Apps for tracking strength: Jefit, Fitbod, Stronglifts 5x5.

Theme: health. From my course *The Human Body*. The companion sessions are on nutrition, sleep, and what breakdown looks like from the inside.