Understanding What Science Is (and Isn't)

Companion to the Week 1 episode. Science is not a body of facts — it's a process for reducing error. Here's how to put that to work.

1. The one idea

Science is not a collection of answers — it is a disciplined method for catching and correcting our own mistakes. Progress isn't "we proved it true"; it's "we've ruled out more of the ways we could have been fooled." Everything else in this course is a tool for doing that better.

2. The error-reduction loop

This is the engine under all of science. You don't run it once — you run it again and again, and knowledge is what survives.

1. Claim / idea
"Recovery boots improve next-day sprints."

→

2. Ask how it could be wrong
Placebo? No control? Fluke? Would they improve anyway?

→

3. Design a fair test
Control condition, blinding, adequate sample, pre-planned analysis.

4. Observe + its uncertainty
An estimate AND a plausible range — not a yes/no.

→

5. Did it survive?
Yes → hold more firmly, replicate. No → revise or discard.

→

6. Replicate
Different lab, athletes, kit. Flukes vanish; real effects return.

↻ *…then repeat. One turn of the loop is a study; knowledge is many turns, cross-checked.*

3. The belief-to-evidence ladder

Not all "evidence" is equal. Grade any claim by how much it has actually *earned* your trust — and act accordingly. (Strongest at the top.)

Replicated across labs + meta-analysis — many turns of the loop, flukes filtered out. *Act on it*

One well-controlled study — RCT/crossover, blinded, adequate sample, preregistered. *Hold with interest*

One small / uncontrolled study — tiny N, no control, or unregistered. *Watch, don't overhaul*

Expert opinion · mechanism · plausibility — a reason it *might* work. A hypothesis, not a finding. *Test it*

Anecdote · personal experience · testimonial — great for ideas, unreliable as proof. *Idea generator only*

Calibration rule: your confidence in a claim should *match its rung*. Acting on rung 4–5 beliefs as though they were rung 1–2 evidence is a *documented* risk in our field: reviews report an over-representation of statistically significant results, small samples, and few replications (Mesquida, Murphy, Lakens & Warne, 2022; Halperin et al., 2018; Caldwell et al., 2020).

4. Evidence vs belief — quick reference

	Belief	Evidence
Comes from	Experience, tradition, a mechanism, a charismatic source	A claim that *survived* a fair test that could have shown it false
Could it be wrong?	Yes — and it was never checked	Yes — but the checking has been done
Good for	Generating hypotheses, knowing your athletes	Deciding what to actually do
Trap	Confirmation, desirability & regression biases feel like proof	Over-trusting a single study

5. Worked example — a real claim, calibrated

Claim: *"Beetroot juice boosts endurance performance."* A genuinely well-studied case. The point is not to accept it or dismiss it, but to state what the published evidence actually supports.

Question	What the published evidence says	Source
Is there a real physiological effect?	Yes — dietary nitrate can reduce the O_2 cost of submaximal exercise and improve performance "in some circumstances."	Jones (2014), *Sports Medicine*

Does it work for everyone?	No — the benefit is moderated by **training status**: often measurable in recreational exercisers, but attenuated and sometimes absent in elite endurance athletes.	Umbrella review of 20 meta-analyses (2025), *Sports Medicine*
How certain is the effect size?	Heterogeneous — varies with dose, exercise type and population; not a single fixed number.	Multiple systematic reviews
Calibrated verdict	**Not "it works" and not "it's a myth."** Nitrate has a *real but conditional* effect that tends to shrink as training status rises. Confidence: moderate for recreational athletes, low/uncertain for elites. Trial it individually; never promise a fixed % gain.	

This is what calibrated, unbiased reporting looks like — state the real effect, its conditions, and its uncertainty, rather than a headline verdict in either direction.

6. Do this — this week

Your calibration exercise

1. Write down *one claim you currently act on* with your athletes (a supplement, a recovery method, a training rule).
2. Place it on the **belief-to-evidence ladder** above — honestly. Which rung?
3. Run the five calibration questions on it: sample size? control? real effect size? which population? replicated?
4. Write one sentence of *calibrated confidence*: "I hold this [firmly / lightly / as a hypothesis] because ___."
5. All week, swap "a study showed" for "**one study suggested**" — and notice how it changes your thinking.

References

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