

Sleep is the substrate.

A practitioner's guide to sleep architecture, HRV, and the levers that turn recovery from a feeling into a measurable system.

01 · FOUNDATION

You can't out-train bad sleep.

Every adaptation your body makes — to training, to stress, to a new diet — happens during recovery, not during the stimulus itself. And the most important recovery variable is also the most consistently unmeasured.

You track your training volume. You track your macros. You track your heart rate during intervals. But the eight hours that govern whether all of that work actually sticks? They remain a black box.

This protocol is the framework we use to close that loop. It is not a sleeping-pill regimen. It is not a meditation app. It is a measurement-first approach to recovery: quantify the variable, then engineer the environment to improve it.

THE RECOVERY EQUATION

Adaptation = Training Load × Sleep Quality ÷ Allostatic Load. Sleep is the multiplier. When it trends down, every other variable is being divided.

7–9h

Recommended adult sleep window — without context, the number is meaningless

~30%

Of adults report insufficient sleep — the recovery economy is booming, but the foundation is unmeasured

2–3×

Higher injury rates in athletes with poor sleep — the data is unambiguous

02 · ARCHITECTURE

Not all sleep is equal.

A full night is composed of four distinct stages, each playing a different role. Optimizing for total time, without understanding stage distribution, is like optimizing a car for fuel level without checking the engine.

AWAKE	LIGHT	DEEP	REM
■ Awake Brief arousals — normal up to ~5 per night. Elevated counts signal environment issues.	■ Light (N1+N2) ~50% of total. Memory consolidation, transition state. Most responsive to environment.	■ Deep (N3) ~20%. Physical recovery, growth hormone release, immune function. Hardest to achieve.	■ REM ~25%. Cognitive recovery, emotional processing, motor learning. Suppressed by alcohol.

What governs stage distribution?

Three environmental inputs, mostly: **light** (blue-spectrum light suppresses melatonin and REM onset), **temperature** (core body temp must drop 1–2°F to initiate deep sleep), and **air quality** (CO₂ above ~1000 ppm fragments deep sleep and reduces sleep efficiency). Most bedrooms fail on at least one of these without the sleeper knowing.

PRACTICAL SIGNAL

If you're waking tired despite "8 hours" — the issue is almost never duration. It's stage distribution. The fix starts with measurement, not supplements.

03 • THE HRV CONNECTION

Heart rate variability is the readout.

HRV — the beat-to-beat variation in your heart rate — is the single most informative non-invasive marker of autonomic nervous system state. It tells you, on any given morning, whether your body is in a state of recovery or a state of stress.

Higher HRV at rest = parasympathetic dominance = recovery is happening. Lower HRV = sympathetic dominance = your body is still in fight-or-flight, training load is exceeding recovery capacity, and you are one bad night away from illness or injury.

What HRV actually measures

The variation between consecutive heartbeats reflects the dynamic interplay between your sympathetic ("go") and parasympathetic ("rest") nervous systems. It's not a single number — it's a trend, and the trend is what matters.

A single morning reading is data. Two weeks of readings is information. Two months is a map of how your body responds to training, stress, alcohol, late meals, and everything else.

What moves the needle

- Sleep duration and deep-sleep proportion
- Alcohol (suppresses HRV for 2–4 days)
- Late training sessions (6h+ before sleep)
- Caffeine timing (cut off 8–10h before bed)
- Room temperature (18–20°C optimal)
- CO₂ concentration (keep below 1000 ppm)

TRACKING PRINCIPLE

Measure at the same time, in the same position, every morning — before reaching for your phone. Consistency is what makes the data interpretable. Five minutes of stillness, immediately upon waking, is the gold standard.

04 · ENVIRONMENT

Four levers you control.

Once you've decided to measure, the next question is what to change. Sleep is sensitive to environment in ways most people underestimate. The four levers below account for the majority of "mysterious" sleep quality differences between nights.

① Light spectrum

Blue-spectrum light (400–490nm) suppresses melatonin production and delays sleep onset by up to 90 minutes. Standard LEDs and screens emit heavily in this range. The fix: red and amber lighting only in the 2 hours before bed, and zero blue light in the sleep environment. This is non-negotiable for shift workers and serious optimizers.

② Temperature

Core body temperature needs to drop 1–2°F to initiate and maintain deep sleep. A room temperature of 18–20°C (65–68°F) supports this drop. Warmer rooms = more wake events, less deep sleep. Cooler is almost always better, provided feet and hands stay warm.

③ CO₂ concentration

This is the under-appreciated variable. A closed bedroom with two occupants can reach 1500–2500 ppm CO₂ within 2 hours — well above the 1000 ppm threshold where cognitive function and sleep efficiency measurably decline. Ventilation or active air management is the single highest-leverage environmental upgrade most people can make.

④ Sound

It's not just loudness — it's variability. A consistent 35 dB is less disruptive than intermittent sounds at 25 dB. The brain treats unpredictability as a threat signal. Aim for either true silence or a constant, low-frequency masking sound (brown noise, not white or pink).

THE COMPOUNDING EFFECT

Each lever individually might shift deep sleep by 5–10%. Optimize all four together and the effect compounds — most users report 30–50% more time in deep and REM stages within the first week.

05 · ACTION

The 7-day protocol.

One week. Seven changes. Sequenced for compounding effect. By day seven you'll have a baseline reading of your own sleep architecture and a personalized set of levers to pull.

01 Establish the baseline

Sleep your normal schedule. Note total time in bed, subjective quality (1–10), and morning energy. Don't change anything yet — you need a reference point.

02 Fix the light

After sunset, switch all lighting to red/amber only. No screens within 90 min of bed (or use aggressive blue-blocking). Bedroom should be pitch black — black-out shades, no standby LEDs.

03 Fix the temperature

Set bedroom to 18–20°C. Use a breathable mattress topper. Warm feet and hands (socks work) but cool core. Notice: deeper sleep comes faster on the first cool night.

04 Fix the air

Crack a window or run an air exchange. Get a CO₂ monitor (\$50–100) — most bedrooms will surprise you. Target under 1000 ppm at all times during sleep.

05 Caffeine and alcohol cutoff

No caffeine after 2pm. No alcohol within 4 hours of bed (ideally not at all — REM suppression is severe). Replace evening ritual with herbal tea or sparkling water.

06 Time the training

No high-intensity sessions within 6 hours of bed. Move hard training to morning or early afternoon. Replace evening workouts with mobility, sauna, or a walk.

07 Measure, compare, iterate

Compare your day-7 reading to the day-1 baseline. The changes should be measurable, not just felt. From here, the protocol is no longer one-size-fits-all — it's a personal experiment.

MEASURE WHAT MATTERS

The protocol works. Now close the loop.

Environmental optimization is the highest-leverage recovery intervention most people can make. But it's the first half. The second half is measurement — knowing which nights your protocol actually worked, and which it didn't.

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