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# HRV-Based Recovery Guide

Train smarter by reading your nervous system

## What Is HRV?

Heart rate variability (HRV) is the variation in time between consecutive heartbeats, measured in milliseconds. It is controlled by the autonomic nervous system: higher HRV reflects greater parasympathetic (rest-and-digest) tone and readiness for stress; lower HRV reflects sympathetic dominance and accumulated load.

HRV is the most sensitive daily readiness metric available without a lab. A 2016 study in the International Journal of Sports Physiology and Performance found that HRV-guided training produced superior VO2 max gains compared to pre-planned periodization over eight weeks, with athletes training harder on high-HRV days and reducing intensity on low-HRV days.

## How to Measure Correctly

Measurement window: First 5 minutes after waking, before standing or checking your phone.
Body position: Lying flat. Standing elevates HR and compresses HRV scores.
Consistency: Same time, same position, every day. Trend matters more than single values.
Duration: Minimum 2.5 minutes. Most apps use a 60-second short-form; full 5-minute RMSSD is more reliable.
Device: Chest ECG strap (Polar H10) is most accurate. Finger pulse oximeters and wrist PPG sensors introduce noise that inflates variability estimates by 10–20%.

## Interpreting Your Score

HRV scores are individual. A population normal means nothing — your personal 7-day rolling average is the only benchmark that matters. Track your coefficient of variation (CV) around that rolling average.

+10% above rolling avg → Green zone. Training load, intensity, or volume can be increased.
Within ±10% of avg → Amber zone. Maintain planned training as scheduled.
–10% below rolling avg → Red zone. Reduce volume by 30–50%. Prioritize sleep, nutrition, recovery.
–20% or more → Full recovery day. No structured training. Walk, stretch, sleep.

Note: a single low reading after a poor night's sleep is noise. Three consecutive low readings indicate genuine systemic load — illness, overreaching, or accumulated life stress — and require meaningful rest.

## What Suppresses HRV

Alcohol (even 1–2 drinks suppresses HRV for 24–48 hours via ANS disruption — documented in multiple wearable-data studies including the 2022 Finnish cohort study, n=745, published in Alcoholism: CEAR).
Sleep deprivation below 6 hours. High training volume without progressive taper. Acute illness.
Psychological stress (chronic work pressure, conflict, anxiety) — the ANS does not distinguish sources of stress.
High sodium intake and dehydration reduce cardiac stroke volume and HRV within hours.

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## What Raises HRV (Evidence-Ranked)

1. Consistent aerobic base training (Zone 2 cardio). The most robust long-term HRV driver. Cardiac remodeling from endurance training increases parasympathetic tone at rest (La Rovere et al., 1998, The Lancet). Effect builds over 8–16 weeks of consistent aerobic volume.

2. Sleep quality and duration. The single most acute HRV determinant. Even one night of delayed sleep onset (>30 min) or early awakening reduces morning HRV meaningfully. Prioritizing sleep timing consistency across 7 days shows measurable HRV improvement within 2 weeks.

3. Controlled slow breathing (0.1 Hz / 6 breaths per minute). Resonance frequency breathing drives maximum HRV amplitude acutely and, with practice, raises resting HRV baselines. 5-minute sessions, twice daily. Documented in Lehrer & Gevirtz (2014), Applied Psychophysiology and Biofeedback.

4. Cold water immersion (CWI). Post-exercise CWI accelerates parasympathetic reactivation within 1–2 hours (Buchheit et al., 2009, European Journal of Applied Physiology). Effect is most pronounced after high-intensity or high-volume sessions.

5. Magnesium glycinate and omega-3 supplementation. Both have modest but replicated effects on HRV in randomized trials. Omega-3 increases vagal tone via cardiac ion channel modulation. Neither is a substitute for sleep and training load management.

## Weekly HRV Protocol

Daily (5 min on waking): Measure HRV. Log the value. Check against your 7-day rolling average.
Daily (5 min before sleep): 6-breaths-per-minute resonance breathing. Nasal only. Inhale 5s, exhale 5s.
After training: Note session RPE. Cross-reference next morning's HRV for individual load-response calibration.
Weekly: Review trend. If average has declined over 7 days, reduce total training volume by 20% the following week.
Monthly: Review which lifestyle variables preceded your 3 highest and 3 lowest HRV readings. Act on the pattern.

## Key Studies Referenced

Kiviniemi et al. (2010). Intl Journal of Sports Physiology and Performance — HRV-guided training vs. fixed plans.
Flatt & Esco (2016). Intl Journal of Sports Physiology and Performance — HRV for endurance performance.
La Rovere et al. (1998). The Lancet — Baroreflex sensitivity and HRV predictors of mortality post-MI.
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