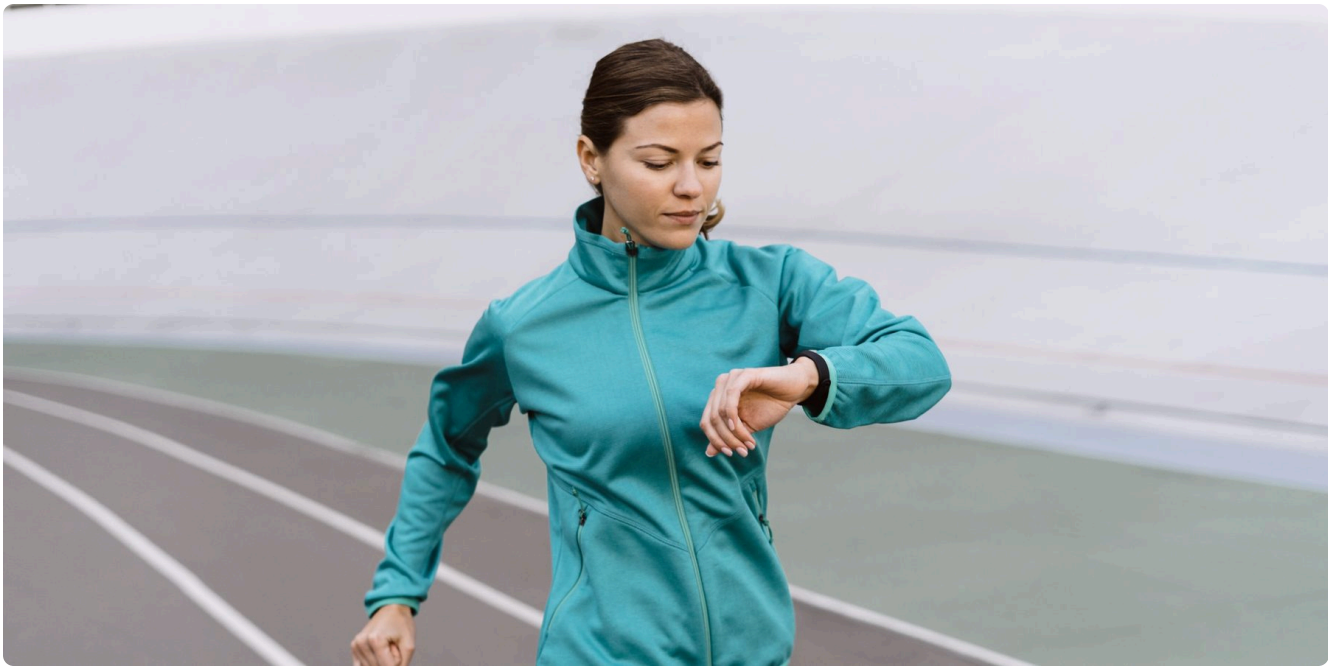
Designing intervals

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Advanced: for experienced endurance athletes.

High-intensity intervals raise aerobic fitness slightly more than steady training.

Why it matters: Intervals are the most adjustable part of endurance training. The work length, effort, rest and number of repeats change what you get from a session.

The big picture: Longer intervals of 2 minutes or more, more total hard time per session, and programs of 4 to 12 weeks produced the biggest gains. Short, sharp intervals still help when time is tight.

What to do with this

- **For aerobic fitness (maximal oxygen uptake):** intervals of 2 to 5 minutes at a hard, near-maximal sustainable effort, with equal or slightly shorter easy recovery, adding up to 15 minutes or more of hard work.
- **When time is short:** short intervals of 30 seconds or less still improve fitness.
- **Do one or two interval sessions a week,** not more, with easy days between (see "Training intensity distribution").
- **Build gradually:** add a repeat or a minute before adding speed.
- **Stop the session** if your pace or power drops sharply; the quality is the point.

Go deeper

The terms:

- **Interval:** a hard bout of exercise followed by recovery, repeated several times.
- **Work-to-rest ratio:** how long the hard part lasts compared with the recovery.
- **Maximal oxygen uptake (VO2max):** the most oxygen your body can use, a key marker of aerobic fitness.
- **Long intervals:** hard bouts of 2 minutes or more.
- **Short intervals:** hard bouts of 30 seconds or less.
- **Sprint intervals:** all-out efforts, usually 30 seconds or less, with long recovery.

What people believe: Harder is always better, and intervals should leave you on the floor.

Intervals vs steady training:

- A 2015 meta-analysis of 28 trials with 723 adults found that both interval training and steady endurance training raised maximal oxygen uptake substantially, by about 5.5 and 4.9 mL/kg/min compared with no exercise [1].
- Intervals added a small extra gain of about 1.2 mL/kg/min over steady training [1].

Which intervals?

- A 2019 meta-analysis of 53 randomized trials found short intervals (30 seconds or less) improved maximal oxygen uptake compared with no training [2].
- Long intervals (2 minutes or more) produced larger gains, and only long intervals beat steady moderate training [2].
- Sessions with 15 minutes or more of hard work beat steady training; sessions with 5 minutes or less still helped compared with no training [2].
- Programs of 4 to 12 weeks produced larger effects than shorter ones [2].

Between the lines: The best interval session for aerobic fitness accumulates plenty of time at a hard, controlled effort. Brutal all-out sessions aren't necessary.

Reality check: Most trials were in untrained or recreationally active adults. In highly trained athletes, gains from adding more intervals are smaller and less certain (see "Training intensity distribution").

How sure are we: Strong that intervals improve maximal oxygen uptake. Moderate that long intervals with more total hard time work best. Moderate that intervals add a small extra benefit over steady training.

Sample sessions

Session	Structure	Use
Classic long intervals	4 to 6 × 4 min hard, 3 min easy	Building maximal oxygen uptake
Medium intervals	6 to 8 × 2 min hard, 2 min easy	Building maximal oxygen uptake, slightly less taxing
Short intervals	2 sets of 10 × 30 s hard, 30 s easy	Time-efficient; race sharpening
Threshold intervals	3 × 10 min at threshold, 2 min easy	Sustained speed for half marathon and longer
Sprint intervals	6 × 20 s all-out, 2 to 3 min easy	Speed and power; use sparingly

Warm up for 10 to 15 minutes and cool down for 10 minutes. These sessions are common coaching practice, built around the research above.

Sources

1. Milanović Z, Sporiš G, Weston M. Effectiveness of high-intensity interval training (HIT) and continuous endurance training for VO2max improvements: a systematic review and meta-analysis of controlled trials. *Sports Medicine*. 2015;45(10):1469–1481. doi:10.1007/s40279-015-0365-0
2. Wen D, Utesch T, Wu J, et al. Effects of different protocols of high intensity interval training for VO2max improvements in adults: a meta-analysis of randomised controlled trials. *Journal of Science and Medicine in Sport*. 2019;22(8):941–947. doi:10.1016/j.jsams.2019.01.013