

Half Marathon

21.1 km. Short enough to race hard, long enough for the calves to file a complaint at 16 km.

Small numbers point to the sources on page 2.

1 Where cramps bite

- Cramp risk climbs with intensity relative to training, not distance alone. Racing faster than usual is the top predictor².
- Typical site in runners is the calf, then quads and hamstrings¹.
- The last 5 km, when pace is high and muscles are fatigued, is the danger zone.
- Hydration and blood sodium do not separate crampers from non-crampers in race studies^{2,4}.

2 Cut your risk

- Train at goal pace in the final third of long runs so the calves know the job.
- Strength work protects: regular lifters cramped half as often in marathon data⁴.
- Do not start faster than your goal pace. Surging early is the classic half-marathon cramp set-up².
- Race in the shoes you trained in. New racing flats load the calf differently.
- History of cramping is the strongest personal predictor: plan around it².

3 When it hits

- Ease the pace before it locks. A twinge is your warning, not the cramp.
- Stretch the cramping muscle to full length and hold. Still the first-line response in every review¹.
- **Early, not late.** Take your GOAT Shot at the twinge. In the lab a small measured shot cut cramp duration to about 85 s against 134 s for water, through a mouth-to-nerve reflex rather than digestion³.
- Do not chug plain water to fix a cramp. Neither dehydration nor blood sodium separated crampers from non-crampers in field studies².
- Once it releases, rebuild pace over 3 to 5 minutes. Straight back to race pace re-triggers it.
- The evidence behind this tactic is lab-based and mixed: Miller (2010) found a clear effect, later trials found a small or non-significant one⁹. What it is not: an electrolyte top-up. Test it in training, not on race day.

4 Fuel

- No full carb load needed under 90 min of racing. A high-carb day before (7 to 10 g/kg) is enough for most⁵.
- Pre-race meal 1 to 4 g/kg carbohydrate, 1 to 4 h before⁵.
- For a 1 to 2 h race, 30 g/h carbohydrate improves performance; up to 60 g/h if you are out over 2 h^{5,6}.
- One gel at 40 min and one at 80 min covers most runners.
- Caffeine 3 mg/kg an hour before is well supported if you have practised it⁷.

5 Fluid and salt

- Pre-load 5 to 7 ml/kg about 4 h before the start⁷.
- Under 2 h, drinking to thirst is enough for most. Grab water at aid stations, do not stop⁷.
- Sodium only matters if it is hot or you are a heavy, salty sweater⁷.
- Finish within 2% of start weight; do not gain weight drinking⁷.

6 Race day

- Taper 7 to 10 days, volume down 41 to 60%, keep the sharp sessions short⁸.
- Kit: race-tested shoes and socks, gel in the pocket, GOAT Shot in the belt from 12 km.
- Morning: up 2.5 to 3 h out, eat, sip, arrive 60 min early, 10 to 15 min warm-up with strides.
- Race even, then lift over the last 5 km if the legs allow.

Sources and the fine print

Every numbered claim on page 1 traces to one of these. Peer-reviewed studies and consensus statements only, no influencer opinion.

1. Maughan RJ, Shirreffs SM. Muscle cramping during exercise: causes, solutions and questions remaining. Sports Med 2019;49(S2):115-124.

2. Schwellnus MP et al. Increased running speed and previous cramps rather than dehydration or serum sodium changes predict EAMC: 210 Ironman triathletes. Br J Sports Med 2011;45:650-656.

3. Miller KC et al. Reflex inhibition of electrically induced muscle cramps in hypohydrated humans. Med Sci Sports Exerc 2010;42(5):953-961.

4. Martinez-Navarro I et al. Muscle cramping in the marathon: dehydration and electrolyte depletion vs muscle damage. J Strength Cond Res 2020 (Valencia Marathon, n=84).

5. Burke LM et al. Carbohydrates for training and competition (IOC consensus). J Sports Sci 2011;29(S1):S17-27.

6. Jeukendrup A. A step towards personalized sports nutrition: carbohydrate intake during exercise. Sports Med 2014;44(S1):25-33.

7. Thomas DT, Erdman KA, Burke LM. Nutrition and athletic performance: ACSM / Academy of Nutrition and Dietetics / Dietitians of Canada position. Med Sci Sports Exerc 2016;48:543-568; Sawka MN et al. ACSM exercise and fluid replacement, 2007.

8. Wang Z et al. Effects of tapering on performance in endurance athletes: systematic review and meta-analysis. PLOS ONE 2023;18(3):e0282838.

9. Behringer M et al. Effects of TRPV1 and TRPA1 activators on the cramp threshold frequency: randomised placebo-controlled trial. Eur J Appl Physiol 2017;117:1641-1647; Lavender AP et al. Mouth rinsing vs ingesting pickle juice. Appl Sci 2021;11:12096.

GOAT Shot, plainly

A 10 mL single-serve shot of Australian organic apple cider vinegar with the mother, saltbush brine and native botanicals, in a small thin sachet that opens easily. A food, not a medicine.

The research above (Miller 2010; Behringer 2017; Lavender 2021) is what the twinge tactic on page 1 is built on. Read it and make your own call.

Test any race-day tactic in training first. That includes this one.

Pickled GOAT is a food under the Food Standards Australia New Zealand code. It is not a therapeutic good and is not intended to diagnose, treat, cure or prevent any condition. This guide is general information for healthy adults, not medical advice. If cramps are frequent, severe or happen at rest, see a sports doctor. Informed Sport and HASTA certification are stated goals and are not currently held.

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