

Molecular hydrogen and exercise heart rate

A clear summary of a 2019 randomised, double-blind, placebo-controlled crossover pilot study

The short answer: Hydrogen supplementation was linked to a slightly lower heart rate during exercise. During the first nine minutes of a graded treadmill test, average heart rate was about 5 beats per minute lower than with placebo. The effect was statistically significant but small, and peak exercise capacity did not improve.

How was the study organised?

19 completed 15 men and 4 women, aged 18-45; healthy adults rather than patients or elite athletes	Crossover design Each person completed baseline, hydrogen and placebo treadmill tests; order of hydrogen/placebo was randomised
Hydrogen protocol Two capsules (one tablet equivalent) the night before and again at least 30 minutes before testing	What was measured Heart rate, breathing rate, oxygen consumption and respiratory exchange ratio during a treadmill test to exhaustion

The capsules contained a commercial magnesium-based hydrogen-producing tablet. The authors estimated that one full tablet could provide approximately 5 mg of molecular hydrogen. Hydrogen and placebo capsules looked identical, and tests were separated by at least four days.

What did the study find?

Outcome	Reported result	Plain-English meaning
Heart rate: minutes 1-9	Average HR was 121 +/- 26 bpm with hydrogen, 126 +/- 26 with placebo and 124 +/- 27 at baseline. Hydrogen was 5.1 bpm lower than placebo ($P<0.001$).	The clearest finding was a small reduction in heart rate during the earlier, mainly submaximal part of the test.
Heart rate: full test	Average HR was approximately 4 bpm lower with hydrogen than placebo ($P<0.001$). A smaller difference continued after 9.5 minutes ($P=0.001$ vs placebo).	The pattern was not limited to one isolated reading, although the size of the difference remained modest.
Breathing rate	Average respiratory rate was lower with hydrogen across the full test ($P=0.021$) and during minutes 1-9 ($P=0.018$), but not after 9.5 minutes.	Breathing rate also showed a small submaximal difference, but not consistently at higher intensity.
Peak exercise measures	No significant differences were found in maximum or minimum heart rate, oxygen consumption, breathing rate or respiratory exchange ratio.	Hydrogen did not raise peak aerobic capacity or maximal exercise measurements.
Effect size	For the analysed variables, reported Cohen's d values were below 0.14.	The statistical effects were small; their real-world usefulness is uncertain.

A small exercise response - not a cardiac treatment

Why the finding is interesting

The crossover design is useful because every participant acted as their own comparison. Randomisation, identical capsules and double blinding also reduced some common sources of bias.

A lower heart rate while maintaining similar oxygen consumption could be worth investigating. The authors proposed possible changes in stroke volume or oxygen use, but these were speculations: neither was directly measured.

What it does not show

This study did not examine resting heart rate, high blood pressure, arrhythmias or heart disease. It also did not demonstrate improved race time, time to exhaustion, perceived exertion or recovery. Therefore, it should not be described as proving that hydrogen 'improves heart health' or athletic performance.

Important limitations

- Pilot study with only 19 completed participants and just four women.
- Participants had varied fitness levels; the same test minute represented different relative intensities for different people.
- Exercise, diet, calories and exact capsule timing were not controlled or recorded.
- The analysis included many repeated measurements and several time windows.
- Effect sizes were very small and practical importance was unknown.
- No direct measures explained why heart rate differed.
- One participant's data were lost.
- The commercial hydrogen and placebo tablets were donated by their manufacturer.

Best interpretation

Acute hydrogen supplementation produced a reproducible but small reduction in average exercising heart rate, most clearly during the first nine minutes of the test. This is an encouraging physiological signal that needs confirmation in larger studies using fixed relative exercise intensities and meaningful performance outcomes.

Quick glossary

Submaximal exercise	Exercise below a person's maximum effort; in this study, especially the earlier part of the treadmill test
VO2	The amount of oxygen the body uses during exercise
Crossover study	Each participant receives both treatments on separate occasions and serves as their own comparison
Effect size	An estimate of how large a difference is; statistical significance alone does not mean a difference is important

Original study LeBaron TW, Larson AJ, Ohta S, et al. Acute Supplementation with Molecular Hydrogen Benefits Submaximal Exercise Indices. Randomized, Double-Blinded, Placebo-Controlled Crossover Pilot Study. *Journal of Lifestyle Medicine*. 2019;9(1):36-43. [Read the full original study](#) | DOI: [10.15280/jlm.2019.9.1.36](https://doi.org/10.15280/jlm.2019.9.1.36)

Educational summary only. Molecular hydrogen is still being researched and should not be presented as a treatment, cure or substitute for medical care. This summary explains one study's findings and does not constitute medical advice.