

of 21.34 s. The ratio of their times is 0.899.

Checking the results for 30 running categories for races from the 60 m indoor and 100 m outdoor through the half marathon and full marathon, we find the ratio of times ranges from 0.820 for the 30 km track event to 0.923 for the 60 m indoor. For nine indoor distances, from 60 m to 3 km, the mean women/men speed ratio is 0.90 ± 0.01 , and for the 21 outdoor distances, from 100 m to marathon, the ratio is 0.89 ± 0.02 .

The ratio is essentially constant. So let's check a different type of sport, kayaking, with distances of 200 m, 500 m, 1000 m, and 5000 m and the number of paddlers being one, two, or four. For those 12 categories, the mean ratio is 0.88 ± 0.01 .

Now let's look at another sport, swimming, where both arms and legs are involved. For a total of 30 categories of events in freestyle, breaststroke, backstroke, and butterfly, with distances of 50 m to 1500 m in 50 m pools and 25 m pools, the mean ratio is 0.90 ± 0.02 .

Track cycling has only three categories of events that have the same distances for men and women. For the 200 m flying start, the ratio is 0.90. For the 500 m flying start, the ratio is 0.85. In endurance cycling, what is measured is the distance cycled in one hour. The record for men is 54.5 km, and for women 47.98 km, which gives a ratio of 0.88. For all three cycling categories, the mean ratio is 0.88 ± 0.02 .

In rowing, the crew size can be one, two, four, or nine (eight rowers and the coxswain). Two competition categories are based on the weight of the crew. The two types of rowing are sweep, with one oar per rower, and sculling, with two. The competitions are all for a fixed distance of 2 km. For 10 categories of rowing, the mean ratio is 0.90 with a standard deviation of only 0.01.

Speed skating on ice is powered by both arms and legs. It's reputed to be the fastest human-powered sport. The standard track for competitions is a 400 m oval. The events that are common to men and women are 500 m, twice 500 m, 1000 m, 1500 m, 3 km, 5 km, and 10 km. For those 7 categories, the mean ratio is 0.92 ± 0.01 .

Summarizing all the sports, we have 90 categories with a narrow distribution of ratios: a mean ratio of 89% with a standard deviation of only 2%.

It seems we have a universal constant, an invariant: that the best women com-

petitors can reach a speed of about 89% of that of the best men competitors. Those ratios have held for at least 50 years.

If the constant is universal, its explanation must be simple and basic to the physiology of the two genders.¹ But what could it be?

A hint at a possible answer is the hemoglobin concentration: In the general population, for men it is 13.6–17.5 grams per deciliter. For women, it's 12.0–15.5. The ratios vary from 0.88 at the low end to 0.89 at the high end.²

I welcome comments from readers.

References

1. R. Van Damme et al., *Evol. Ecol. Res.* **10**, 229 (2008).
2. S. J. McPhee, M. A. Papadakis, eds., *Current Medical Diagnosis and Treatment*, 48th ed., McGraw Hill/Lange (2009), p. 1530.

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Correction

October 2017, page 52—In the figure, the geological map on the office wall is of the Korea Peninsula, not Finland. PT

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