

Study shows competitive swimmer bodies consistent in morphology across race event lengths

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A trio of researchers with Hunter College of the City University of New York has found that despite swimming in vastly different events, competitive swimmers tend to have the same body mass index (BMI). In their paper published in *Proceedings of the Royal Society B*, Christian

Gagnon, Michael Steiper and Herman Pontzer describe their study of elite swimmer morphology and how it compared to elite runner morphology.

Most people have likely recognized the differences in the way elite runners are built—those who run short distances very fast tend to have a lot of muscle. Those who run for very long distances, on the other hand, tend to be very thin. These differences make sense logically—carrying extra muscle or fat in long-distance running would require more energy expenditure. In this new effort, the researchers wondered if the same might be true for swimmers.

To learn more about elite [swimmer](#) morphology, the researchers accessed a publicly available database that holds information for Olympic athletes. For their study, they focused on swimmers competing in the 2012 Summer Olympics in London—and only those who swam freestyle (aka the Australian crawl). For each athlete, they looked at height, weight and in which events they swam. The first two metrics allowed them to calculate a BMI for each athlete, which they used as a means for comparing morphology between swimmers.

The researchers discovered that elite swimmers all tended to have a similar morphology regardless of the events in which they swam. Those who swam short 50-meter races had approximately the same BMI as those who swam much longer 10,000-meter marathons. They did note that male and female swimmers had slightly different BMI averages—23 for men and 21 for women, and that height did not appear to play a factor in different length events.

The researchers suggest that the differences in [morphology](#) between swimmers and runners is likely due to gravity. Runners have to carry weight with them as they run; swimmers, on the other hand, do not—their weight is borne by the water.

More information: Christian M. Gagnon et al. Elite swimmers do not exhibit a body mass index trade-off across a wide range of event distances, *Proceedings of the Royal Society B: Biological Sciences* (2018). DOI: [10.1098/rspb.2018.0684](https://doi.org/10.1098/rspb.2018.0684)

Abstract

There is a trade-off reflected in the contrasting phenotypes of elite long-distance runners, who are typically leaner, and elite sprinters, who are usually more heavily muscled. It is unclear, however, whether and how swimmers' bodies vary across event distances from the 50 m swim, which is about a 20–30 s event, to the 10 000 m marathon swim, which is about a 2 h event. We examined data from the 2012 Olympics to test whether swimmers' phenotypes differed across event distances. We show that across all swimming event distances, from the 50 m sprint to the 10 000 m marathon, swimmers converge on a single optimal body mass index (BMI) in men's and women's events, in marked contrast with the strong inverse relationship between BMI and event distance found in runners. The absence of a speed–endurance trade-off in the body proportions of swimmers indicates a fundamental difference in design pressures and performance capability in terrestrial versus aquatic environments.

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