

III. THE DATA

It is undisputed that the average male is bigger, faster, and stronger than the average female. These differences in athletic ability are not just the effect of human variation between top athletes and non-athletes. Nor are they the result of socialization, unequal opportunity, or lack of funding.⁵⁴ Rather, the male-female athletic differential is almost entirely the result of biology.⁵⁵

A. Physiological Differences Between Males and Females

Men have:



larger hearts



larger lungs



more bone mass



more muscle mass



stronger muscles



less fat

Biological differences between females and males begin *in utero*,⁵⁶ becoming vastly more pronounced during puberty. Below are just some of the many differences that contribute to the male athletic advantage:

Hearts, Lungs, Hemoglobin, and Aerobic Capacity

- Males have larger hearts than females,⁵⁷ which helps to pump blood to the muscles more efficiently.⁵⁸
- Males have larger lungs than females,⁵⁹ which helps to oxygenate the blood.⁶⁰
- Males have about a 12% higher concentration of hemoglobin than females,⁶¹ which helps to transport oxygen in the blood.⁶²
- As a result, males typically have better aerobic capacity than females.⁶³

Bones/Skeletal Structure:

- Grown males are, on average, 4.5 inches taller⁶⁴ and have longer, larger, and denser skeletal structures⁶⁵ than grown females.
- Grown males tend to have greater bone mass, even after taking body size into account.⁶⁶
- In some parts of the body, males have different bone geometry than females.⁶⁷
- As a result, male and female bodies have different biomechanics, with the female body “set up to produce less force in running, jumping and throwing.”⁶⁸

Muscle Mass, Muscle Strength, and Fat Distribution

- Grown males have approximately 36% greater muscle mass than grown females (with about 40% more muscle mass in the upper body, and 33% more muscle mass in the lower body).⁶⁹

- Grown males have more fast-twitch muscle than females, which allows them to generate greater force, speed, and anaerobically-produced energy than females.⁷⁰
- Grown males have less fat (and a different distribution of body fat) than grown females.⁷¹
- Even in males and females with similar body mass, male muscles are stronger than female muscles (both absolutely and relative to lean body mass).⁷²

B. The Male Athletic Advantage

How do physiological differences impact performance? Scientists believe that when it comes to sport-specific actions, such as tackling or throwing, the physiological differences between males and females combine in ways that are “**likely synergistic**” and that “widely surpass the sum of individual magnitudes of advantage in isolated fitness variables.”⁷³

Male puberty confers a significant, and lasting, athletic advantage.

It is widely believed that significant athletic gaps do not emerge until around age 12.⁷⁴ Nevertheless, boys may carry some athletic advantage over girls even in **childhood**. For example, a 2012 study of physical fitness differences between pre-pubescent boys and girls found that boys performed better in tests of aerobic fitness, strength, speed, and agility, while girls performed better in tests of balance and flexibility.⁷⁵ Some studies also indicate significant sex differences in throwing ability from an early age.⁷⁶ And other studies indicate that boys have an advantage over girls in running, jumping, and aerobic capacity even before the age of ten.⁷⁷

Irrespective of the debate surrounding any childhood athletic gap, the science is consistent and irrefutable that the 20-fold boost in testosterone that occurs during **male puberty**⁷⁸ creates a significant, and lasting, athletic advantage for men. Because most American boys begin puberty between ages 9 and 14,⁷⁹ **the male-female athletic differential is significant by age 15.**⁸⁰

This advantage is particularly prominent with respect to activities where speed, size, power, strength, or cardiorespiratory/anthropometric characteristics are determinative of performance.⁸¹ Males may also have an advantage in sports where aggressive behavior and risk taking influence performance, as these behaviors are more common in individuals exposed to higher levels of testosterone.⁸²



“We know who’s going to win the race before it even begins...It just seems like all our hard work is going down the drain.”

ALANNA SMITH
Danbury, CT



Males **jump** approximately **25% higher** than females



Males **throw** about **25% further** than females



Males **run** approximately **11% faster** than females



Males **accelerate** around **20% faster** than females



Males **punch 30–162% harder** than females



Males are around **30% stronger** than females of equivalent stature and mass

female strength differential is so great that even untrained males are stronger than athletically trained females.⁹⁰

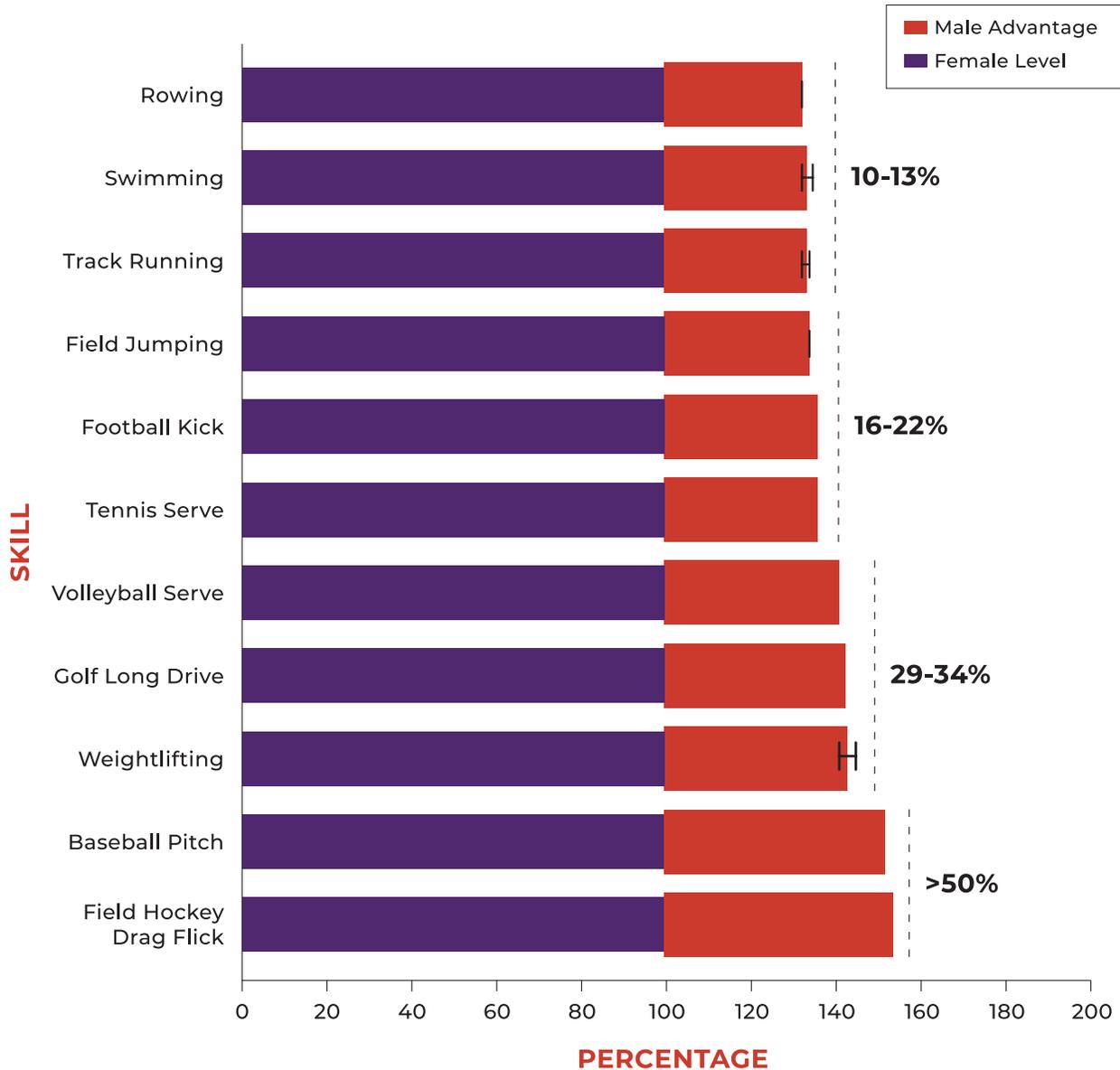
With regard to **specific skills**, studies indicate that post-pubescent males can jump (25%) higher than females,⁸³ throw (25%) further than females,⁸⁴ run (11%)⁸⁵ faster than females, and accelerate (20%)⁸⁶ faster than females.

Perhaps the largest performance gap is seen in the area of strength. Some studies show that males are able to lift 30% more than females of equivalent stature and mass.⁸⁷ Males can also punch significantly harder than females. Andrew Langford, a performance scientist, strength & conditioning coach, and an associate lecturer at Sheffield Hallam University in England, estimates that men can punch with 30% greater force than women.⁸⁸ But at least one study has found that “even with roughly uniform levels of fitness, the males’ average power during a punching motion was 162% greater than females, with the least-powerful man still stronger than the most powerful woman.”⁸⁹ **The male-**

In addition to these significant performance gaps, studies indicate that males are much less prone to **sports-related injuries** than females.⁹¹ Gaps in injury rates, as well as in numerous individual athletic functions, contribute to significant performance gaps across sporting events and across various levels of athletic competition.

For example, British biologist Emma Hilton and Swedish researcher Tommy Lundberg reviewed performance gaps in a variety of specific athletic activities and found disparities of more than 50% in activities, such as a baseball pitch or a field hockey drag flick, where upper body effort plays a significant role.⁹²

Male Advantage for Particular Sport-related Skills

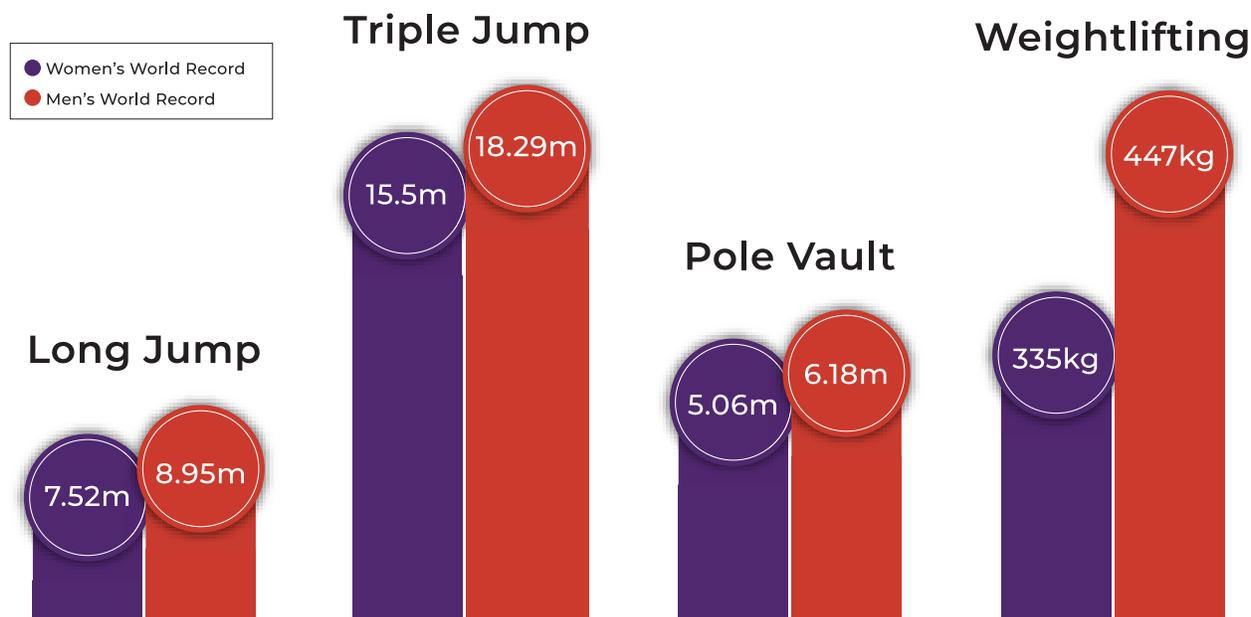
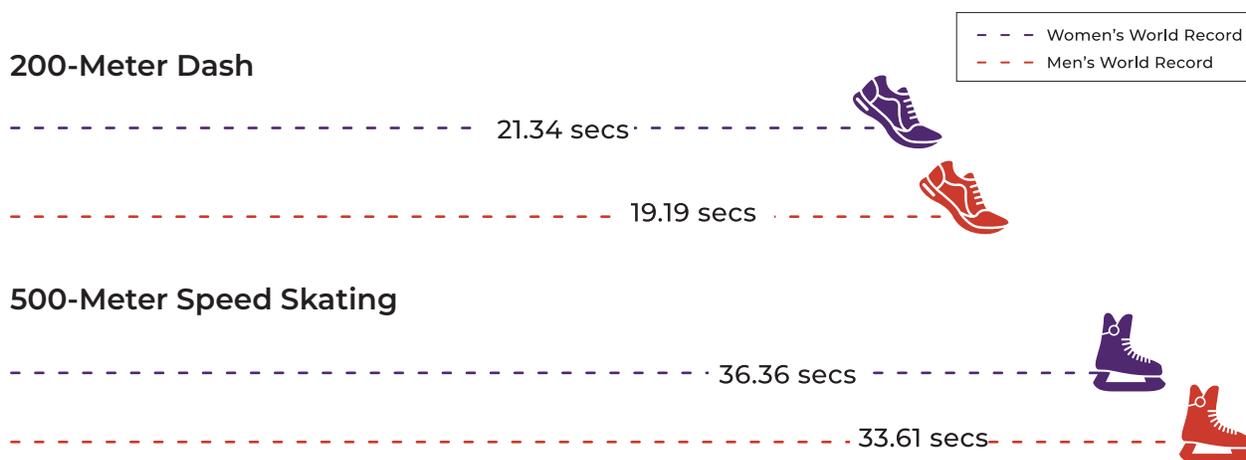


Source: Emma N. Hilton and Tommy R. Lundberg, *Transgender Women in the Female Category of Sport: Perspectives on Testosterone Suppression and Performance Advantage*, 51 *SPORTS MEDICINE* 199, 202-203 (2021), <https://link.springer.com/article/10.1007/s40279-020-01389-3> (data demonstrating the male performance advantage over females in selected sporting disciplines with the female level set to 100%).

C. Differences in Men's and Women's Athletic Performance

In terms of overall performance, males have a significant—and, indeed, insurmountable—athletic advantage over females.⁹³ Not surprisingly, then, we see significant disparities in men's and women's **world records** across events. In running, to take just one example, the gap between men's and women's world-record times is 9-10% at every distance up to the marathon.⁹⁴ The chart below makes the point clearly:

Men's and Women's World Records



Source: worldathletics.org