

Is Usain Bolt the greatest athlete of all time? That's not what the numbers say

Written by Kate R Saunders, PhD Student, University of Melbourne

Usain Bolt has finally hung up his running shoes, retiring from athletics amid plaudits hailing him as the [greatest athlete](#) and [greatest champion](#) of all time.

While it wasn't quite the fairy tale ending in [Bolt's final race](#) – he came third and claimed only bronze in the 100m final at the IAAF World Athletics Championships in London – his overall career results are certainly fit for the record books.

The final sprint race for Usain Bolt saw him bring in the bronze.

He is the fastest runner in history over 100m and 200m, as well as winning the “[triple triple](#)” at the Olympics: gold in the 100m, 200m and 4x100m relay at three consecutive games, in Beijing, London and Rio. (The Beijing 2008 4x100m relay gold [was later revoked](#) after his team mate Nesta Carter was disqualified for failing a drug test.)

Bolt also held the world championship title over these distances between 2009 and 2015, with the exception of [one false start in the 100m](#) in 2011.

But is the Jamaican athlete the greatest of all time, as is [often claimed](#) ?

Read more: [The secret to Usain Bolt's speed may lie in synchronicity](#)

How to compare athletes

This is an interesting question given how the athletics world has changed over time.

Athletes today have access to cutting-edge training methods, nutrition plans and [scientific and technological advancements](#)

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in equipment such as

[track composition](#)

and

[footwear](#)

. There have also been improvements in measuring an

[athlete's performance during a race](#)

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The performance of past 100m winners could be influenced by a number of things such as race conditions and scientific advantages that were available at the time.

For Bolt to truly deserve the title of “greatest of all time”, we need to compare his results to those of previous athletes over the 100m. We also need to compare his track performances to the fastest times over the other track distances. We can do this [using statistics](#) .

If we look at the fastest 100m race times for each year, we see there has been a large decrease in fastest times for both men and women.

This pattern of decreasing times is observed for race times across all distances. A key reason in the decrease in race times is due to advances in modern training and scientific knowledge. In our statistical model, we include a changing trend in time so we can compare athlete performances in different years.

We also need to include adjustments in our statistical model for environmental and political factors that influence the population from which athletes are. During World War I and World War II, for example, the pool of athletes was depleted by men away fighting for their country.

The statistical model that we used, that includes both the trend in time and adjustment for population influences, is called a [Weibull distribution](#) .

This distribution is perfect for calculating the probability of rare events occurring in a given year, such as the fastest race times, and is ideal for estimating the probability of breaking world

records.

Crunch the numbers

We use this distribution to model the fastest race times each year over the distances 100m, 200m, 400m, 800m, 1500m, 5000m and 10,000m. Using the statistical properties of the distribution, we can then rescale to compare different athletes' performances over different distances. This means we can answer the question: is Usain Bolt the greatest athlete of all time?

The top 10 rankings from the statistical model are given below. These rankings account for the advantage of racing in different years and account for performances over different distances.

Bolt is the world's fastest man of all time over 100m and 200m but the title of world's greatest athlete goes to [Lee Evans](#) of the United States, who broke the world record in the [mens 400m at the Olympics in 1968](#) in Mexico City.

Lee Evans wins the race and a new world record.

For women, the greatest athlete of all time is [Florence Griffith-Joyner](#) of the United States for her performance in the [100m in the US Olympic Trials in 1988](#). Her records for both 100m and 200m remain unbroken today.

Griffith-Joyner's 100m world record time of 10.49s was suspected to be wind-assisted. But she also ran the second- and third-fastest official times in history for the women's 100m, at 10.61s and 10.62s, so the title is well deserved.

Florence Griffith-Joyner, also known as 'Flo Jo'

The study of extremes

All this number crunching might seem like just a bit of fun, but statistical modelling of minima and maxima is actually really important and commonly used in fields of engineering, finance and earth sciences.

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For example, we use distributions like this one to model the wettest day of the year and estimate the amount of rainfall we expect on average once every 100 years – the 1-in-100-year prediction.

Read more: [Explainer: was the Sydney storm 'once-in-a-century'?](#)

This allows us to build infrastructure to cope with extreme rainfall events, like drainage and levee banks, and protect against rainfall events that we may not have even seen yet.

But the statistical modelling also gives us a useful method of checking to see if claims of athletic greatness or champion uphold to scrutiny of the numbers.

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