Are Athletes Born or Built? Genetics and Athletic Success

How important are genetics in athletic success?
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*Citation*


Athletic records are broken year after year, and the limits of human performance continue to be debated. Just as soon as we think something can’t be done, someone comes along and shows us that it indeed can be done. There was a time when no one thought a human could run a four-minute mile. Roger Bannister did that in 1954 and soon, many others followed. Ultramarathons, Ironman Triathlons and 24-hour races are now commonplace.

Is there any limit?

Surely there must be some limit. So what factors limit performance? Most physiologists agree that the current limits have to do with our genetics – specifically genes that regulate our cardiovascular endurance and muscle fiber type, but some factors are much more variable. Things like nutrition, motivation, environment and advances in equipment (running shoes, swim suits, skis, bicycles) all allow for dramatic improvements in athletic performance.

**Genetics And Performance**

Genetics shape us in many ways including our potential to excel in sports. Training, diet, and other factors play a large role in developing our potential, but our genes may also limit performance. You may have the genetic potential for being a champion athlete, but if you live a lifestyle of overeating and no exercise you are unlikely to achieve that potential. On the other hand, someone with limited genetic
potential can find ways to compensate and become a solid performer.

Genetics have a large influence over strength, muscle size and muscle fiber composition (fast or slow twitch), anaerobic Threshold, lung capacity, flexibility, and, to some extent, endurance.

One major limitation for endurance athletes is cardiac capacity, or the heart’s ability to deliver enough oxygen (via the bloodstream) to the working skeletal muscles. This, too, is largely determined by genetics.

The other limitation for endurance athletes is the muscles' ability to effectively use the oxygen and create ATP (adenosine triphosphate), the fuel that allows muscular contraction and movement. (see: Creating Energy for Exercise.) The efficiency of this process is measured by something called VO2 max (maximum volume of oxygen).

**How Genetics Influence Response to Training**  
Your genes may also determine how your body responds to training, diet and other external factors.

Research on aerobic endurance shows that some people respond more to training than others. So even if you have a low genetic potential for endurance, you may respond well to training and develop your potential more completely than someone with genetic 'talent' who doesn't respond to training.

Training also increases cardiac efficiency, but the extent of this increase may depend upon genetics. Genetically gifted athletes will have a much greater response to training and will have a large increase in the number of mitochondria in cells. (The mitochondria are organelles in cells that produce the ATP, so the more mitochondria a person has, and the more efficient they are.)

**Other Factors That Affect Performance**  
Characteristics that genetics have less influence over include balance,
agility, reaction time and accuracy.

**Nutrition** also affects performance. This is clear when even the most highly-trained and gifted athlete bonks during an event. Bonking is usually related to running out of glycogen. Athletes can avoid this either by ‘teaching’ the body to burn fat when glycogen stores decrease, or replenishing the body with nutrition during an event. (See: Energy for Exercise.)

**Mental Skills Training**
Practicing mental skills training (including good judgment, learning the tactics and strategies of your sport, and using the right equipment) is another critical component of success that has nothing to do with genetics.

While it is more likely that elite athletes are blessed with great genetics and a great training routine, even recreational athletes can make the most of their ability through optimal conditioning, good nutrition and a positive mental attitude.

Source

