

THE ULTIMATE GUIDE TO
IRON
FOR ATHLETES

 **ACTIVEIRON**[®]



WHY IRON IS IMPORTANT FOR ATHLETES.

Iron is an essential mineral that is required for a wide range of processes in the body including the production of red blood cells, oxygen transport, DNA synthesis, immune function, and energy production.

A major function of iron is in the production of the molecule, haemoglobin. This is the protein in red blood cells that carries oxygen from the lungs to the body's tissues and this is where most of the body's iron is stored. As a functional component of oxygen transport and energy production, iron is critically important for sport and exercise performance.¹

Identification and correction of low iron can have a significant impact on performance and well-being in endurance and team sports.

Maintaining a positive iron balance is particularly important for female athletes to avoid the effects of low iron and to maintain or improve performance.²

About 1 mg of iron is lost each day through shedding of cells from skin and mucosal surfaces such as the lining of the gastrointestinal tract. In premenopausal women, menstruation increases the average daily iron loss to about 2 mg per day and as a result, women need more iron than men – up to twice as much.³

The iron requirements for athletes can vary depending on factors such as sex, age, training intensity, and overall health status. Training stimulates an increase in the number of red blood cells and small blood vessels, increasing the body's demand for iron and this is highest for endurance athletes training at high intensity.



IRON AND ATHLETIC PERFORMANCE.

As outlined above, in addition to its other functions, iron plays a vital role in transporting oxygen to the muscles and other tissues in the body and is therefore critical for athletic performance. Oxygen is transported from the lungs to the rest of the body bound to the heme group of hemoglobin in red blood cells. In muscle cells, iron binds oxygen to myoglobin, which regulates its release.

“Athletes have an increased need for iron.”

Athletes have an increased need for iron due to the stress that high-intensity exercise places on the body's tissues, particularly on the muscles. Yet iron deficiency is one of the most common deficiencies in sport.² The prevalence of iron deficiency anaemia is likely to be higher in athletic populations, especially in younger female athletes, than in healthy sedentary individuals.¹

Those who do a lot of training and engage in endurance sports, such as long-distance running, cycling, and triathlon, may also experience iron losses through sweating and a phenomenon called foot strike haemolysis which is the breakdown of red blood cells in the feet due to impacts from repeatedly striking the ground.

Three groups appear to be at greatest risk for developing altered body iron: female athletes, distance runners, and vegetarian athletes. These groups are advised to pay particular attention to maintaining an adequate consumption of iron in their diets.

The benefit of iron supplementation for performance is not consistent but has been demonstrated in athletes with low iron following supplementation. One study indicates an evidence based, clinically applicable threshold of 20 µg/L for iron supplementation in endurance athletes.⁴

IMPACT OF LOW IRON IN ATHLETES.

Iron deficiency can cause fatigue, weakness, and a decrease in endurance capacity, and together with potentially an impaired immune function, can negatively impact an athlete's ability to train and perform at their best.

Low iron decreases work capacity through combined effects on oxygen delivery and muscle metabolism.⁵ Total haemoglobin mass, which is a primary determinant of VO₂ max, is fundamentally reliant upon adequate iron stores. A reduction in iron stores may therefore impact upon the capacity for both oxygen transport and utilisation, lead to fatigue, or cause under-performance.²

Monitoring ferritin concentration (iron stores) has become common practice in endurance athletes at all levels, and not just athletes with a history of low iron. It is widely understood

that low ferritin (even with normal hemoglobin levels), is responsible for fatigue and poor performance.⁴

Additionally, since iron is essential for brain development and cognitive performance, low iron could affect motivation, concentration and decision-making, also impacting upon exercise performance.² Iron also contributes to the normal function of the immune system, so the body's capacity to mount an adequate immune response can be hampered by low iron levels.

One study in female soldiers found that basic training negatively affected their iron levels but this impact was reduced through iron supplementation.⁶ In addition, the research indicated iron could prove beneficial for mood and physical and cognitive performance during training.⁶

“I live a busy life and like most people I am juggling lots, so having something that supports me on a daily basis is so important to function to the level I want to. **Active Iron** has had a profound effect on me during my menstrual cycle as it helps support my iron and energy levels throughout the month. I need to maintain high levels of intense training and it's critical I don't have a monthly dip in performance due to my iron and energy levels.”

Rachael Burford,
Harlequins Captain & Head of Women's Rugby



PERIODS AND SPORT.

Monthly periods are the most common cause of iron loss worldwide and research shows that women of childbearing age need twice as much iron as men.³ Amongst women who experience heavier periods, adequate daily iron intake is particularly important and may be difficult to achieve with diet alone. Female athletes generally meet macronutrient and micronutrient requirements with the exception of iron.¹

Female athletes are at an increased risk of compromised iron status due to heightened iron losses through menstruation, as well as exercise-induced losses associated with endurance activity (haemolysis, sweating and exercise-induced inflammation).¹

During menstruation, women's bodies increase the rate of absorption of iron from the diet. The normal absorption rate of 1 mg is stepped up to 1.5 to 3 mg per day in response to blood loss. It may be difficult to meet this increased need for iron through diet alone, particularly for women with a low red meat intake or a plant-based diet.

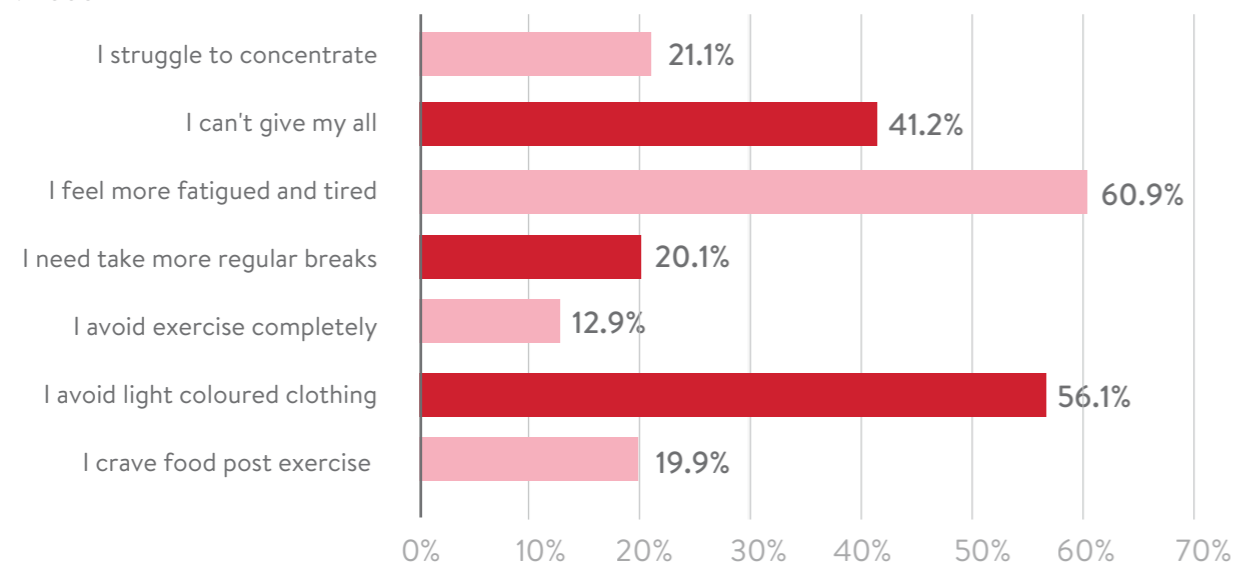
A survey amongst marathon runners found that heavy periods were prevalent amongst 37% of elite athletes, negatively impacting their training and performance and potentially depleting iron levels.⁸

According to a recent survey carried out by **Active Iron**, over 60% of women feel more tired and fatigued, and over 40% feel they cannot give their all when exercising on their period.⁹

Which of the following statements do you agree with?

When exercising on my period...

N=1000



Active Iron survey conducted by 3Gem. N = 1,000. 2022.

IRON METABOLISM AND TESTING.

The processes by which iron is absorbed from the diet, transported throughout the body, stored, and used is called iron metabolism. It is regulated by a complex system that ensures that the body has enough iron to meet its needs without causing toxicity - both iron deficiency and iron overload can lead to serious health consequences.

Iron is primarily obtained from the diet and the best sources of dietary iron are red meat, poultry, and fish. The absorption of dietary iron occurs mainly in the small intestine, where it is taken up by a specialised transport protein called the divalent metal transporter (DMT1). Once absorbed, iron is transported in the bloodstream by a protein called transferrin.

Athletes, particularly female athletes, participating in endurance sport are at increased risk of low iron levels due to the combined effects of menstruation and exercise induced losses.

Haemoglobin and ferritin are traditionally used to identify iron deficiency. The average adult has about 1-3 g of iron in their body mainly in ferritin. Ferritin can release iron into the bloodstream when required and is the main store of iron.

By assessing the levels of ferritin and transferrin in the body, it is possible to identify whether a person might be iron deficient. A serum ferritin level below 15 mg/l in adults indicates low iron stores. The criteria for anaemia in females is haemoglobin levels of less than 12 g/ dL.

Monitoring serum ferritin concentration has become common practice in endurance athletes at all levels, and not just athletes with a history of low iron. There is widespread belief that low ferritin, even in the context of normal hemoglobin levels, is the culprit for fatigue and poor performance.⁴

HOW MUCH IRON DO ATHLETES NEED?

Adequate iron intake is essential for achieving optimal athletic performance, yet iron deficiency is one of the most common deficiencies in sport.²

The recommended daily intake of iron for adult men is 8 mg per day, while women require 14 mg per day. Athletes, however, may require more iron. The amount of iron needed depends on a person's gender, age and lifestyle. Generally, women need more iron than men due to the combined effects of menstruation and exercise induced losses.

High performing endurance athletes are characterised by a high aerobic capacity.² VO₂ max is fundamentally reliant upon adequate iron stores.²

Some evidence suggests that iron requirements for female endurance athletes, particularly long distance runners, are increased by approximately 70 %.⁷ If this suggestion was to be followed, the current UK recommended daily intake of 14 mg would be increased by 10 mg.

A systematic review found that iron supplementation does not always improve performance in athletes with ferritin levels greater than 20 µg/L, but that supplementation may play a role in improving performance in athletes with low iron.⁴ 78.9% of Elite athletes have supplemented with iron.⁸

It is recommended that adults do not consume more than 45 mg of iron daily unless directed to do so by a health care professional.

For children, taking too much iron can be toxic. As with all medicines and supplements it is best to keep iron supplements in a cabinet where children can't see or reach them.

“For years I really struggled with my iron levels. I tried so many iron supplements but couldn't stomach any of them. **Active Iron** has been a complete game changer for me. Its Kind & Strong formula doesn't irritate my stomach and keeps my iron levels topped up, so I have all the energy I need to get through my hectic training schedule.”



Aifric Keogh,
Irish Rower
and Olympic
Medal Winner

DIETARY SOURCES OF IRON FOR ATHLETES.

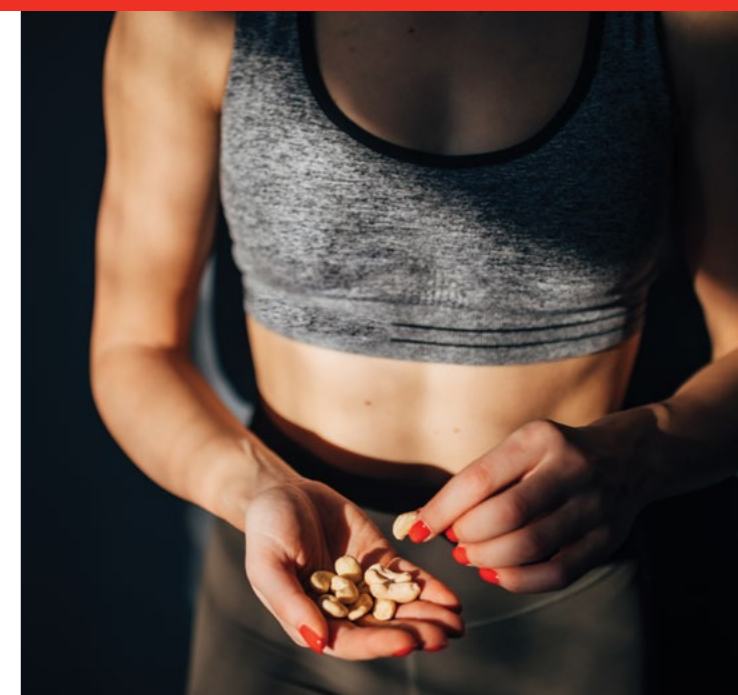
A well-balanced diet is the best way to get the required amount of iron. Athletes can increase their iron intake by consuming iron-rich foods, such as lean red meat, poultry, fish, beans, lentils, tofu, and fortified cereals. Pairing iron-rich foods with vitamin C-rich foods, such as citrus fruits, tomatoes, and peppers, can also enhance iron absorption.

“Many athletes may struggle to meet their iron requirements through diet alone.”

Many athletes may struggle to meet their iron requirements through diet alone, however, and may require iron supplements to maintain adequate levels. This can be especially true for athletes who compete in sports with strict weight classes (such as boxers) or those who follow a vegetarian diet. Studies have suggested that while female athletes generally tend to meet their energy and general micronutrient needs, iron intake is frequently not met.¹

There are two types of iron: heme and non-heme iron. Non-heme iron which comes primarily from plant-based foods is less easily absorbed (bioavailable) by the body than that from animal-based sources. Interestingly, despite its lower bioavailability, on average non-heme iron contributes more to iron intake simply because the quantity of non-heme iron in the diet is usually much greater than that of heme iron.

Some ingredients in foods such as tannins in tea and coffee, calcium, polyphenols, and phytates in wholegrains can inhibit the absorption of iron.



BEST IRON SUPPLEMENTS FOR ATHLETES.

There are many iron supplements available, and while usually in the form of tablets or capsules, iron is also available in liquids but typically these contain low levels of iron. When selecting an iron supplement, the two main things to consider are absorption and potential side effects.

Unfortunately, most oral iron supplements are poorly absorbed in the gut. This often leads to side effects such as constipation, bloating, and nausea. It is estimated that 8/10 people who take iron supplements report side effects,¹⁰ with 50% stopping taking their supplements entirely.¹¹

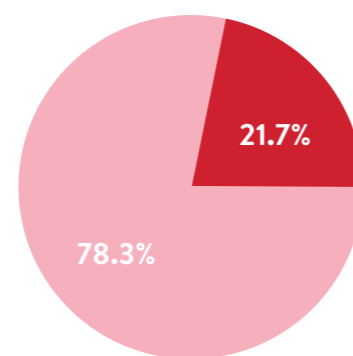
Active Iron is different. Its ground breaking protein formula protects the iron from breaking down in the stomach and targets the right place for absorption in the small intestine, the DMT-1. This helps reduce oxidation and protects the gut from inflammation. As a result, **Active Iron** is highly absorbed compared to other iron supplements¹², making it gentle on the stomach. Our clinical results have also shown that it increases iron levels by 94%¹³ and increases energy significantly.

This is why Active Iron is the iron supplement of choice amongst Olympians, Premier League Football Clubs and by the Nutritional Team at Loughborough University.

In a recent survey carried out with female gym-goers by **Active Iron**, almost 8/10 respondents felt a noticeable increase in energy levels after taking **Active Iron**.

Did you see a notable increase in your energy levels after your trial of **Active Iron**?

- Yes
- No



OUR VALUED PARTNERSHIPS.

Loughborough University

Active Iron is Proud to be Partnering with **Loughborough University**, home to the world's largest university-based sports technology research group.



**LOUGHBOROUGH
SPORT**

Informed Sport Certification

As part of our commitment to quality and safety, we have partnered with **Informed Sport** to ensure that our products are certified to be free from any banned substances.

Informed Sport is a global programme that certifies supplements and sports nutrition products to be free from substances banned in sport.

This certification provides reassurance to athletes and exercisers that they can trust **Active Iron** to support their training without any risk of failing a drug test.

So, when you choose **Active Iron**, you can be confident that you are getting a high-quality supplement that is free from any harmful substances and certified by **Informed Sport**.

Please check for the **Informed Sport** logo on our packaging as not every product in our range is tested.

Active Iron Advance contains 25mg of elemental iron and is the product we recommended for athletes; it is **Informed Sport** certified.



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CLINICALLY PROVEN

ACTIVE IRON[®]



INCREASES IRON LEVELS BY 94%



GENTLE ON THE STOMACH



FIGHTS TIREDNESS AND FATIGUE



— **CERTIFIED** —
INFORMED SPORT

SPORT