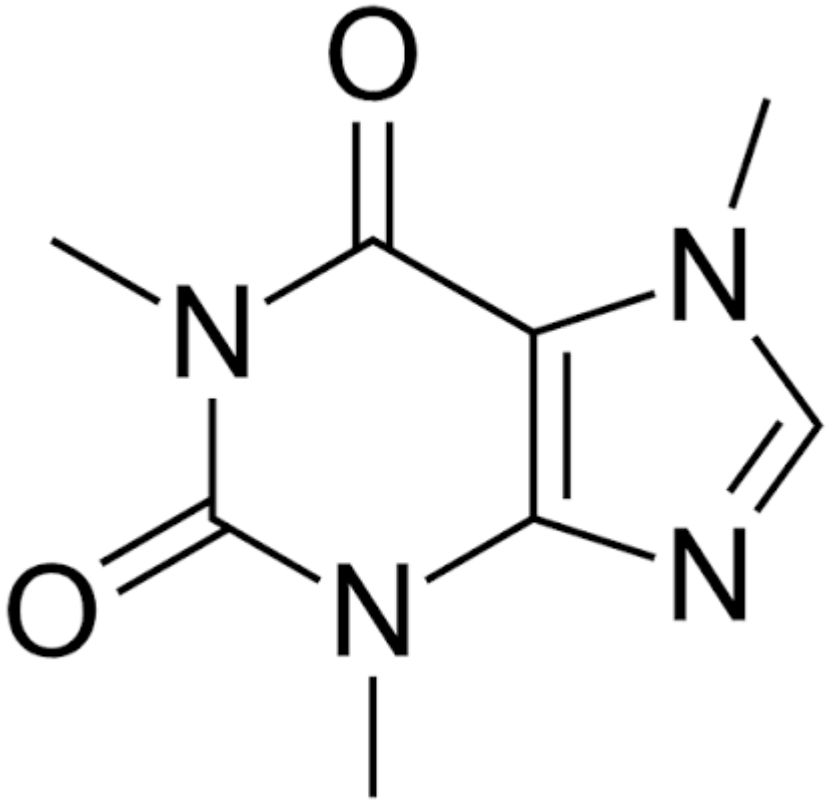


Coffee & Physical Performance

Caffeine & physical performance

Caffeine may help to improve physical performance during both endurance and high-intensity exercise.

- This effect is seen at around 3mg/kg body weight.
- It is observed across a range of sports including endurance events, team and racquet sports and sustained high-intensity activity such as swimming and rowing.
- This is true for both trained and untrained sports people.



Astorino T.A. et al. (2012). Laurence G. et al. (2012). Burke L.M. (2008). Goldstein E.R. et al. (2010).

Exercise & caffeine



Aerobic endurance exercise seems to show most consistent benefits linked to caffeine consumption.

Small to moderate effects* also include:

- Muscular endurance
- Movement velocity
- Muscular strength
- Sprinting
- Jumping
- Throwing

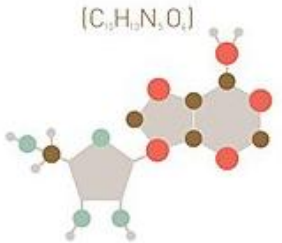
***Effects are variable. Individual differences in the effect of caffeine on exercise performance are associated with:**

- Different habitual intakes
- Genetic variations associated with caffeine metabolism
- Individual sensitivity
- Possible effects on sleep
- Type of exercise

Guest N.S. et al. (2021).

Potential mechanism

- Caffeine blocks adenosine receptors in the brain, helping to reduce tiredness and increase adrenaline production.
- Caffeine can modulate fatigue and reduce perceived exertion and pain while increasing feelings of vigour.
- The increased production of adrenalin may help to stimulate energy production and improve blood flow to the muscles and heart.



Adenosine

High intensity exercise

- Athletes see improvements in performance during short-term, high-intensity exercises after a moderate dose of caffeine.
- A 2009 review on anaerobic mechanisms of action showed that it is **not yet clear** how caffeine improves short-term high-intensity exercise performance.

Astorino T.A. and Roberson D.W. (2010). Grgic J. (2018). Ferreira R.E.S. et al. (2021). Hodgson A.B. et al. (2013). Davis J.K. et al. (2009).

Hydration is important in sports performance

- Fluid balance is particularly important for athletes as dehydration can reduce performance.
- Black coffee contains over 95% water and contributes to fluid balance.
- Caffeine in coffee can have a mild, short-term diuretic effect, but this effect does not counter-balance the fluid intake from coffee drinking.
- Drinking caffeinated coffee in moderation can help maintain adequate fluid balance.



Silva A.M. et al. (2013). Killer S.C. et al. (2014).

EFSA conclusions in relation to physical exercise

The European Food Safety Authority (EFSA) concluded in 2011 that caffeine consumption is associated with:

Increase in endurance performance

Increase in endurance capacity

Reduction in the perceived rate of effort or exertion during exercise

Safety considerations:
The EFSA 'Scientific Opinion on the Safety of Caffeine' concluded in 2015 **that single doses of caffeine up to 200mg (about 3mg/kg bw)** from all sources do not raise safety concerns for the general adult population, even if consumed less than two hours prior to intense physical exercise under normal environmental conditions.

EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA) (2011). European Food Safety Authority Panel on Dietetic Products, Nutrition and Allergies (NDA) (2015).

Important notes

- Many sports performance studies have used caffeine supplements rather than coffee. While these provide a useful basis to explain the effects of coffee, it is possible that these findings may differ slightly than if the studies had been conducted using coffee.

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