

FACT SHEET: CAFFEINE AND PERFORMANCE

INTERNATIONAL FOOD INFORMATION COUNCIL FOUNDATION

Caffeine is one of the most comprehensively studied ingredients in the food supply and has been safely consumed in foods and beverages for centuries. Evidence of caffeine's beneficial effects on performance, both mental and athletic, is especially strong. Also linked with athletic performance, research showing beverages containing caffeine can contribute to daily water intake has largely been overlooked. This and other research on performance benefits from caffeine is described below.

Caffeine & Mental Performance

Caffeine is known to improve mental performance. Several recent prospective cohort studies have demonstrated that caffeine increases key aspects of cognitive function related to alertness. In one study, participants used the words “vigor”, “efficiency”, “energy”, and “clear-headedness” to describe their moods after consuming caffeine.¹ Research has also shown that caffeine consumption has the ability to improve memory and reasoning in sleep-deprived individuals.² Alertness and performance also improved.³ The consumption of caffeine may benefit consumers through improvements in their performance at school and work.

Additionally, a study done by the French National Institute for Health and Medical Research demonstrated that consumption of at least three cups of coffee per day (or approximately 300 mg caffeine*) is associated with a slower rate of decline in cognitive abilities in women.⁴ This suggests that caffeine intake could help keep mental and memory skills sharper for a longer period of time in older individuals. These beneficial effects also appear to increase with age.

Caffeine & Physical Performance

There is evidence that caffeine can improve physical performance. In a study on recreational athletes, the consumption of 6mg/kg body weight of caffeine – roughly 490 mg caffeine for a 180 lb. male, or about five cups of coffee – significantly increased muscle endurance during brief, intense exercise. Prior to a maximum effort run, caffeine consumption of 5 mg/kg body weight – roughly 295 mg caffeine for a 130 lb. female, or about three cups of coffee – resulted in significantly greater anaerobic metabolism and improved athletic performance among recreational runners.⁵

In addition, a study conducted on cyclists found that consuming 6 mg caffeine per kg body weight (about 355 mg for a 130 lb person, or three to four cups of coffee) improved

performance times during a cycling trial, regardless of whether caffeine was ingested one hour before exercise or in a series of doses throughout the trial.⁶

Researchers made another interesting observation in this study – they found that caffeinated soft drinks could act as a replacement for sports drinks during the last part of an event with no loss of performance. They also found that soft drink consumption produced “enhanced performance” when consumed at the end of tasks. The benefits observed were determined to be largely due to the ingestion of a small amount of caffeine - just 1.5 mg/kg body weight (roughly 90 mg caffeine for a 130 lb person, or about one cup of coffee).⁷ Other research has also suggested that all types of caffeinated beverages, including soft drinks and sports drinks, are of equal value to cyclists in terms of improved performance during a prolonged task.

Consumption of caffeine has also been shown to improve endurance during physical exercise when consumed before the task.⁸ One explanation for this is that caffeine may lower the threshold for exercise-induced β -endorphin and cortisol release. These hormones produce the so-called “runner's high,” which may contribute to the reported caffeine exercise benefits. However, further research must be done to investigate this theory.

Caffeine & Hydration

Staying hydrated, while important for humans at all levels of activity, is especially important for athletes during vigorous exercise. Historically, athletes have been advised against consuming caffeine because of caffeine's mild diuretic effect. However, a point often missed is that any fluid, including water, will also have a mild diuretic effect. In a review of hydration and caffeinated beverages, Lawrence Armstrong, PhD concluded that “it is unlikely that athletes and recreational enthusiasts will incur

detrimental fluid-electrolyte imbalances if they consume caffeinated beverages in moderation and eat a well-balanced diet.”⁹ Contrary to popular belief, research has shown that caffeinated beverages can and do contribute to hydration.

Summary

Caffeine has been shown to have beneficial effects on mental and physical performance. Increased cognitive function, improved memory and reasoning, and increased alertness are just a few of the benefits seen from caffeine intake in terms of mental performance. Increased muscle endurance, greater anaerobic metabolism, and improved performance times are some of the effects of caffeine intake in terms of physical performance. Along with this, and contrary to common misconception, studies show that caffeinated beverages can contribute to an individual's hydration status, which is important to physical performance. Therefore, advising against the consumption of caffeinated beverages because of dehydration concerns is not supported by the scientific evidence. Caffeine can provide many performance benefits to healthy individuals.

*For more information on the caffeine content of various foods and beverages, please refer to the IFIC Review: Caffeine and Health: Clarifying the Controversies (Page 2; Table 1). Individual sensitivities to caffeine may vary, and certain sub-populations such as children and pregnant women, as well as those with a history of heart attack and/or high blood pressure, may experience increased sensitivity to caffeine. These groups should monitor their caffeine intake and talk to a physician about their consumption levels.

Footnotes

^{1,3} Lieberman, H.R. The effects of ginseng, ephedrine, and caffeine on cognitive performance, mood and energy. *Nutr Rev.* 2001; Apr;59(4):91-102.

² Bonnet, M.H., Balkin, T.J., Dinges, D.F., Roehrs, T., Rogers, N.L., Wesensten, N.J. The use of stimulants to modify performance during sleep loss: A review by the Sleep Deprivation and Stimulant Task Force of the American Academy of Sleep Medicine. *Sleep.* 2005; Sep 1;28(9):1163-1187.

⁴ Ritchie, K., Carrière, I., de Mendonca, A., Portet, F., Dartigues, J.F., Rouaud, O., Barberger-Gateau, P., and Ancelin M.L. The Neuroprotective Effects of Caffeine. *Neurology.* 2007;69:536-545.

⁵ Doherty, M. The effects of caffeine on the maximal accumulated oxygen deficit and short-term running performance. *Int J Sport Nutr.* 1998; 8:95-104.

^{6,7} Cox, G.R., Desbrow, B., Montgomery, P.G., Anderson, M.E., Bruce, C.R., Macrides, T.A., Martin, D.T., Moquin, A., Roberts, A., Hawley, J.A., Burke, L.M. Effect of different protocols of caffeine intake on metabolism and endurance performance. *J Appl Physiol.* 2002; 93:990-999.

⁸ Laurent, D., Schneider, K.E., Prusaczyk, W.K., Franklin, C., Vogel, S.M., Krssak, M., Petersen, K.F., Goforth, H.W., Shulman, G.I. Effects of caffeine on muscle glycogen utilization and the neuroendocrine axis during exercise. *J Clin Endocrinol Metab.* 2000;Jun;85(6):2170-5.

⁹ Armstrong, L.E. Caffeine, body fluid-electrolyte balance, and exercise performance. *Int J Sport Nutr Exerc Metab.* 2002; Jun;12(2):189-206.

For more Information about Caffeine:

IFIC Review: Caffeine and Health: Clarifying the Controversies

<http://www.ific.org/publications/reviews/caffeineir.cfm>

Everything You Need to Know About Caffeine

<http://www.ific.org/publications/brochures/caffeinebroch.cfm>

Fact Sheet: Caffeine and Women's Health

<http://www.ific.org/publications/factsheets/caffwomen.cfm>



International Food Information Council Foundation

1100 Connecticut Avenue, NW
Suite 430

Washington, DC 20036
<http://www.ific.org>