Introduction to Caffeine

Caffeine occurs naturally in more than 60 plants including the coffee plant, kola nuts, guarana berries, and the leaves of the tea bush. Caffeine first appeared in history around 3,000 BC, when the Chinese emperor Shennong discovered tea by accident after leaves from a particular plant fell into hot water and he found the resulting brew was quite invigorating (Evans, 1992). In the United States, an estimated 80% of adults consume caffeine on a daily basis with the average adult ingesting 200-250mg of caffeine daily. (FDA, 2007)

Fitness-related Benefits

When it comes to fitness and athletic performance, caffeine has many benefits. Certainly, every athlete would find value in an increased ability to focus and remain alert during competition. But those are just some of the benefits caffeine holds for anyone looking to improve their physical performance either in the gym or on a competitive field of play.

Caffeine is one of the most widely studied ergogenic aids, a substance or mechanism that “increases the capacity for bodily or mental labor by eliminating fatigue symptoms” (Merriam-Webster, 2014). More than 75 studies have been conducted on the use of caffeine for short-term, high intensity workouts as well as longer, endurance oriented exercise. The general consensus of these studies is that caffeine helps improve performance (average performance increase of 12%), and decreases the perceived amount of effort (by an average of 6%) (Clark, 2014). Some specific examples of caffeine’s positive effects include improved jump performance among basketball players (Abian-Vicen, 2014), reduced reaction time in martial artists (Santos, 2014), and improved recovery time following exercise (Pesta, 2013). Caffeine also showed the ability to reduce the amount of pain a study participant felt when paired with a common analgesic compared to those who took a pain-killer without caffeine (Derry, 2012).

In scientific research studies, the amount of caffeine that enhances performance ranges from 1.5 to 4 mg per pound of body weight (3-9 mg/kg.) (Clark, 2014). Studies show that for maximum benefit the dose should be taken about an hour before exercise. For most people, half of the caffeine will be removed from the body within 5 hours, depending on the dosage and the body composition of the individual and most identifiable benefits will subside. Caffeine is generally washed out of the body 8-10 hours after consumption.

Other Health Benefits

The positive effects of caffeine on attentiveness and athletic performance are well documented. Recent research has also shown other overall health benefits associated with caffeine consumption. For example, one study observed 648 people aged 65 or older for the space of three years and found that “caffeine intake was associated with a lower risk of cognitive decline” as the subjects aged (Santos C., 2010). Another study concluded that, “caffeine improves concentration, reduces fatigue, and enhances alertness.” (Paluska, 2003)

During exercise there is an increase in a kind of free radical called a reactive oxygen species (ROS). A high concentration of ROS in the body during and following a workout causes exercise-induced oxidative stress, which is when the body can’t get rid of ROS faster than they are produced causing damage to proteins, DNA, and interfering with cellular signaling. A study recently published in the journal, *Life Sciences*, found that caffeine moderated the body’s negative responses associated with exercise-induced oxidative stress (Barcelos, 2014) which could prove to be another benefit of consuming caffeine for fitness purposes.
**Potential Side Effects**

Doses of caffeine between 50 and 200 mg are where benefits like alertness, wakefulness, faster and clearer flow of thought, increased focus, and better general body coordination start developing. For some people, these levels may have an adverse effect and induce restlessness, a reduction of fine motor control, headaches, and dizziness. At much higher doses, 2 grams (2000mg) or the equivalent to drinking 12 cups of coffee, more serious side effects like insomnia, agitation, tremors, and rapid breathing begin to appear (CMU, 2014).

**Potential Risks**

While caffeine does have some benefits, each person should consider for themselves whether or not it is right for them. For certain people there may be side-effects associated with caffeine consumption that have an adverse effect on overall health. One study showed that “chronic coffee and caffeine consumption modestly raises systolic blood pressure”. So individuals at risk for high blood pressure or heart disease should consult their doctor prior to consuming caffeine (Higdon, 2008). Women who are pregnant should be especially mindful of the amount of caffeine they are taking. Calcium absorption may also be effected by high intakes of caffeine. A study in Sweden of 31,527 older women found that those who consumed four or more cups of coffee per day were at a moderately increased risk of osteoporotic fracture, but the association was only significant in women with a low (<700mg/day) calcium intake (Hallstrom, 2006). In all cases, extremely high doses of caffeine can be fatal; however, a lethal dose is around 14g (14,000mg) of caffeine or the equivalent of drinking 80-100 cups of coffee in a short period of time.

**Conclusion**

For most people, consuming moderate amounts of caffeine is safe and offers physical performance benefits. Taking a caffeine-containing pre-workout supplement an hour before exercise can give you the energy you need during your workout and help you recover more quickly.
References


