



It has been suggested that coffee consumption is associated with anxiety. Here we review the scientific evidence on this topic and conclude that, in those predisposed to this effect, coffee may be associated with increased feelings of anxiety. However, sensitivity varies considerably between individuals and tolerance to this effect can be developed, so coffee consumption tends not to be moderated.

Background

Anxiety is a general term for nervousness, dread, apprehension, and worry, generally related to an unpleasantness. Mild anxiety is vague and unsettling, while severe anxiety can be extremely debilitating and can even be categorized as a disorder.¹

Anxiety is not the same as fear, which is a response to a real or perceived immediate threat; anxiety is the worry or unfounded expectation of a possible future threat.²

Potential mechanisms

It is thought that the adenosine receptor system, which mediates the psychoactive effects of caffeine, is involved in the regulation of anxiety, although the precise mechanism is unknown at present.

Caffeine has been reported to increase anxiety in some individuals and it is suggested that this effect may be linked to a polymorphism of the A2A (adenosine) receptor gene.^{9,10} However, tolerance to this anxiety raising effect of caffeine may occur, even in genetically susceptible individuals.⁹

Further research supporting an association with an A2A polymorphism showed that a dose of 150mg caffeine (equivalent to 2 cups of coffee) increased anxiety in subjects with this polymorphism. The authors reported that lower doses (50mg caffeine) did not produce anxiety in healthy volunteers but high doses (450mg caffeine) probably overcame the subtle genetic differences and may trigger an effect in most subjects.⁶

Additional research in females with the A2A polymorphism showed an impaired ability to selectively process very early information and to determine the irrelevant sensory information, following caffeine consumption, providing further evidence of a role for the adenosinergic system in anxiety.¹¹

Conclusion

Caffeine may be associated with an increase in anxiety at moderate levels of intake (150mg caffeine – approximately two cups of coffee) in individuals who are predisposed to this effect. Symptoms of anxiety are less likely to be seen at lower levels of caffeine intake.

Research suggests that there may be a genetic component to this sensitivity, explaining why only some individuals appear to experience an effect. Further research is required to confirm these effects.

A substantial tolerance develops to the potential tendency to increase anxiety, so individuals do not tend to moderate their intakes of caffeine and coffee.

Further information on Guidelines on Caffeine Intake can be found [here](#)

Summary of research on caffeine, coffee and anxiety

A number of studies have reviewed coffee consumption in relation to anxiety with varying conclusions. Summaries of the key studies are presented below:

Author	Conclusion
Shirlow & Mathers (1985)	Some individuals may experience anxiety after drinking coffee, particularly when at higher doses of caffeine [240mg caffeine]. ³
Quinlan et al. (1997)	Both caffeine and milk in beverages improved mood and reduced anxiety 30 and 60 minutes post-consumption, concluding that ingestion of hot caffeinated beverages stimulated physiological processes faster than earlier considered, primarily via the effects of hot water and caffeine. ⁴
Daly & Fredholm (1998)	Research suggested that reduction in caffeine intake is associated with headache, irritability, fatigue, depressed mood, anxiety, and difficulty concentrating. ⁵
Childs et al. (2008)	Caffeine seemed to have no effect on anxiety in some individuals whilst in others, particularly at moderate (150mg caffeine) levels of intake, caffeine may increase anxiety. ⁶
Nehlig et al. (2010)	Research in adults receiving 3mg/kg body weight of caffeine, (around 2 large cups of coffee) suggested that caffeine activates regions of the brain involved in the control of vigilance, anxiety, and cardiovascular regulation. ⁷
Pané-Farré et al. (2014)	Research in high and low anxiety sensitive individuals showed similar alertness and symptom reports following caffeine ingestion. Respiratory symptoms, such as increased breathing rates, were more marked when caffeine was expected and administered in the low anxiety sensitive group and when caffeine was unexpectedly administered in the high anxiety sensitive group. ⁸

References: 1. Stanley R. [2002] Anxiety and its Disorders—The Nature and Treatment of Anxiety and Panic Ed. Barlow D.H., **The Guilford Press**, New York; 2. American Psychiatric Association [2013]. Diagnostic and Statistical Manual of Mental Disorders [Fifth ed.]. Arlington, VA: **American Psychiatric Publishing**, p. 189. ISBN 978-0-89042-555-8.; 3. Shirlow M.J., Mathers C.D. [1985] A study of caffeine consumption and symptoms; indigestion, palpitations, tremor, headache and insomnia. *Int J Epidemiol*. 1985; 14:239-248.; 4. Quinlan P. et al. [1997] Effects of hot tea, coffee and water ingestion on physiological responses and mood: the role of caffeine, water and beverage type. *Psychopharmacology* 134(2):164-73.; 5. Daly J.W. Fredholm B.B. [1998] Caffeine—an atypical drug of dependence. *Drug Alcohol Depend*.51:199-206.; 6. Childs E. et al. [2008] Association between ADORA2A and DRD2 Polymorphisms and Caffeine-Induced Anxiety. *Neuropsychopharmacology*. 33(12): 2791-2800.; 7. Nehlig A. et al. [2010] SPECT assessment of brain activation induced by caffeine: no effect on areas involved in dependence. *Dialogues Clin Neurosci*, 12:255-63.; 8. Pané-Farré C.A. et al. [2014] Anxiety sensitivity and expectation of arousal differentially affect the respiratory response to caffeine. *Psychopharmacology* Dec 5. [Epub ahead of print] 9. Rogers P.J. et al. [2010] Association of the anxiogenic and alerting effects of caffeine with ADORA2A and ADORA1 polymorphisms and habitual level of caffeine consumption. *Neuropsychopharmacology*, 35(9): 1973-83. 10. Alsene K. et al. [2003] Association between A2a receptor gene polymorphisms and caffeine-induced anxiety. *Neuropsychopharmacology*, 28(9): 1694-702. 11. Gajewska A. et al. [2013] Effects of ADDORA2A gene variation and caffeine on prepulse inhibition: a multi-level risk model of anxiety. *Prog Neuropsychopharmacol Biol Psychiatry*. 40:115-21.