

# Your brain on -- and off -- caffeine

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Ever miss your daily cup of coffee and subsequently get a pounding headache? According to reports from consumers of coffee and other caffeinated products, caffeine withdrawal is often characterized by a headache, fatigue, feeling less alert, less energetic and experiencing difficulty concentrating.

Researchers from the University of Vermont College of Medicine and Johns Hopkins School of Medicine sought to investigate the biological mechanisms of [caffeine](#) withdrawal in a paper published recently in the online edition of the scientific journal *Psychopharmacology*. They looked at brain [electrical activity](#) and blood flow during caffeine withdrawal to examine what was taking place physiologically during acute caffeine abstinence, including the likely mechanism underlying the common "caffeine withdrawal headache."

The group examined caffeine's effects in a double-blind study, which involved the administration of caffeine and placebo capsules. Each participant's response to the caffeine or placebo was measured using three different measures — brain electrical activity via electroencephalogram (EEG); blood flow velocity in the brain via ultrasound; and participants' self-reports of subjective effects via questionnaires.

The team demonstrated that stopping daily [caffeine consumption](#) produces changes in cerebral blood flow velocity and quantitative EEG that are likely related to the classic caffeine withdrawal symptoms of headache, drowsiness and decreased alertness. More specifically, acute caffeine abstinence increased brain blood flow, an effect that may account for commonly reported withdrawal headaches. Acute caffeine abstinence also produced changes in EEG (increased theta rhythm) that has previously been linked to the common withdrawal symptom of fatigue. Consistent with this, volunteers reported increases in measures of "tired," "fatigue," "sluggish" and "weary." Overall, these findings provide the most rigorous demonstration to date of physiological effects of caffeine withdrawal.

The researchers also discovered a provocative and somewhat unexpected finding — that there were no net benefits associated with chronic caffeine administration.

"In addition to looking at caffeine withdrawal, this rigorous design also permitted comparison of chronic caffeine maintenance with chronic placebo maintenance, which provides unique information about the extent to which there are net beneficial effects of daily caffeine administration," said Stacey Sigmon, Ph.D., research associate professor of psychiatry at the University of Vermont and first author on the study. "In contrast to what most of us coffee lovers would think, our study showed no difference between when the participant was maintained on

chronic placebo and when the participant was stabilized on chronic caffeine administration. What this means is that consuming caffeine regularly does not appear to produce any net beneficial effects, based on the measures we examined."

Source: University of Vermont

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