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Coffee constricts blood vessels

Caffeine is the world's most popular psychostimulant. In the United States, more than 90 percent of adults regularly consume caffeine and the average 'user' takes in about 300 milligrams per day, the equivalent of 3 cups of coffee. Beverages infused with caffeine are by far the most common way the chemical is administered. As a mild stimulant, caffeine is prized for its effects on cognition, attention and alertness. Drinking coffee, tea or soda is an essential and acceptable part of the day for many adults while other psychostimulants—like amphetamines and cocaine—remain highly controlled. One difference between illicit stimulants and coffee is the effect they have on the brain. While more controlled psychostimulants facilitate a rush of blood to the whole brain, caffeine actually restricts blood flow overall. A new study published in Nature's Scientific Reports looks at this counterintuitive fact and explains caffeine's beneficial effect by way of 'resting brain entropy', or BEN. Despite decreasing blood flow to the brain, caffeine leaves individual regions more stimulated. The stimulating effects are uneven, however, creating a chaotic balance of energy when the stimulant is in full force. The greater unevenness in stimulation throughout the brain, the higher the entropy. Caffeine consumption decreases cerebral blood flow Caffeine induced whole brain cerebral blood flow (CBF) decrease. Paired-t test showed that compared with control condition (no caffeine), caffeine induced whole brain CBF decrease. (a) is the thresholded t map presented in 2D, blue means lower after caffeine ingestion, p < 0.001. (b) is the same result presentation in 3D. (Scientific Reports ISSN 2045-2322) According to researchers, "caffeine caused BEN increase in a big portion of the cerebral cortex with the highest increase in lateral prefrontal cortex, the DMN, visual cortex, and motor network." "Caffeine-induced BEN increase varied across the brain with relatively larger BEN increase in prefrontal cortex, lateral striatum, visual cortex, and motor area. This distribution may be a result of caffeine effects on cognition: caffeine has the strongest impact on attention, vigilance, and action/motion function which are mainly subserved by the aforementioned brain regions." Caffeine consumption increases resting brain entropy Caffeine induced BEN increase in a large portion of the cerebral cortex. Paired-t test showed that compared with control condition (no caffeine), Caffeine induced BEN increase in a large portion of the cerebral cortex with the highest increase in lateral prefrontal cortex, the DMN, visual cortex, and motor network. (a) is the thresholded t map presented in 2D, blue means lower after caffeine ingestion, red means higher after caffeine ingestion, p < 0.001. AlphaSim corrected (cluster size threshold is 270). (b) is the same result presentation in 3D. (Scientific Reports ISSN 2045-2322) Because stimulation to brain regions is not vascular—overall blood flow to the brain decreases after caffeine is consumed—researchers conclude that caffeine's stimulating effects are a result of greater neuronal activity. And despite what advocates for moderation have claimed for decades, there appear to be no negative side effects to caffeine consumption above average amounts. -- You rely on your morning coffee to help you feel more alert and awake. Caffeine – the active ingredient in your coffee -- has a number of effects on your body when it first works 1. The effects may be unpleasant when the caffeine breaks down in your system 12. One example of how caffeine affects your body is your blood vessels. Understanding the changes in your blood vessels can help determine how much caffeine you can safely consume 1. Adenosine is a neurotransmitter in your brain that helps to dilate your blood vessels and slow nerve cell activity, which can make you feel sleepier. One of the ways caffeine works is by attaching to the receptors for adenosine in your brain 1. This means instead of widening your blood vessels as your body normally would, your blood vessels constrict. Epinephrine and Norepinephrine The presence of caffeine on your adenosine receptors sets off additional chain reactions in your body that can affect your blood vessels 1. Because adenosine is not present to slow down nerve cell activity, your nerve cells start to move faster. This triggers the release of norepinephrine, one of two hormones responsible for your body's "fight-or-flight" response. The additional hormone, epinephrine, also is activated. The goal of the fight-or-flight response is to reduce blood flow to less necessary organs, including those of your digestive system, and increase blood flow to your brain and heart. This makes you feel more alert and awake. The presence of caffeine on your adenosine receptors sets off additional chain reactions in your body that can affect your blood vessels 1. This triggers the release of norepinephrine, one of two hormones responsible for your body's "fight-or-flight" response. Norepinephrine and epinephrine mean that caffeine can selectively dilate your blood vessels based on what your body would need most in an emergency situation. Withdrawal One of the problems with consuming caffeine in coffee is the sensation of withdrawal 1. When your body fully uses caffeine, the effects caffeine had will reverse. For example, the blood vessels to your brain and lungs will constrict back to their normal size and those to your stomach will dilate. This can cause you to feel fatigued, have a headache or experience stomach upset. Caffeine affects people differently. Some people can consume a moderate amount – about two 12-ounce cups of coffee – without experiencing adverse side effects, according to MedlinePlus. However, you may be especially susceptible to caffeine's effects and experience strong effects when consuming less caffeine than a moderate amount. One of the problems with consuming caffeine in coffee is the sensation of withdrawal 1. However, you may be especially susceptible to caffeine's effects and experience strong effects when consuming less caffeine than a moderate amount. The caffeine in a cup of coffee might help your small blood vessels work better, according to research presented at the American Heart Association's Scientific Sessions 2013. A study of 27 healthy adults showed - for the first time - that drinking a cup of caffeinated coffee significantly improved blood flow in a finger, which is a measure of how well the inner lining of the body's smaller blood vessels work. Specifically, participants who drank a cup of caffeinated coffee had a 30 percent increase in blood flow over a 75-minute period compared to those who drank decaffeinated coffee. "This gives us a clue about how coffee may help improve cardiovascular health," said Masato Tsutsui, M.D., Ph.D., lead researcher and a cardiologist and professor in the pharmacology department at the University of the Ryukyus in Okinawa, Japan. The study adds to a growing body of research about coffee, the most widely consumed beverage worldwide. Previous studies showed that drinking coffee is linked to lower risks of dying from heart disease and stroke, and that high doses of caffeine may improve the function of larger arteries. Study participants were people who did not regularly drink coffee, ranging in age from 22 to 30. On one day, each participant drank one five-ounce cup of either regular or decaffeinated coffee. Then researchers measured finger blood flow with laser Doppler flowmetry, a non-invasive technique for gauging blood circulation on a microscopic level. Two days later, the experiment was repeated with the other type of coffee. Neither the researchers nor the participants knew when they were drinking caffeinated coffee. The researchers noted blood pressure, heart rate, and vascular resistance levels. They also took blood samples to analyze levels of caffeine and to rule out the role of hormones on blood vessel function. Compared to decaf, caffeinated coffee slightly raised participants' blood pressure and improved vessel inner lining function. Heart rate levels were the same between the two groups. It's still unclear how caffeine actually works to improve small blood vessel function, although Tsutsui suggests that caffeine may help open blood vessels and reduce inflammation. "If we know how the positive effects of coffee work, it could lead to a new treatment strategy for cardiovascular disease in the future," said Tsutsui. Co-authors are Katsuhiko Noguchi, Ph.D.; Toshihiro Matsuzaki, M.D., Ph.D.; Mayuko Sakanashi, Ph.D.; Naobumi Hamadate, Ph.D.; Taro Uchida; B.Sc.; Mika Kina-Tanada, D.D.S.; Haruaki Kubota, M.D.; Junko Nakasone, Ph.D.; Matao Sakanashi, M.D., Ph.D.; Fumihiko Kamezaki, M.D., Ph.D.; Akihide Tanimoto, M.D., Ph.D.; Nobuyuki Yanagihara, Ph.D.; Yusuke Ohya, M.D., Ph.D.; Hiroaki Masuzaki, M.D., Ph.D.; and Shogo Ishuchi, M.D., Ph.D. Author disclosures are on the abstract. The study was funded in part by the All Japan Coffee Association. For more news from AHA Scientific Sessions 2013 follow us on Twitter @HeartNews #AHA13. Statements and conclusions of study authors that are presented at American Heart Association scientific meetings are solely those of the study authors and do not necessarily reflect association policy or position. 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Coffee may perk up the blood vessels due to the effects of caffeine, a study suggests.Researchers found that drinking a cup of caffeinated coffee significantly improved blood flow in the fingers of 27 healthy adults.Measuring blood flow in the finger provides an indication of how well the body's smaller blood vessels are functioning.Comparing normal-strength coffee with decaf, the caffeinated version increased blood flow by 30% over a 75-minute period.Professor Masato Tsutsui, a heart expert from the University of the Ryukyus in Okinawa, Japan, said: "This gives us a clue about how coffee may help improve cardiovascular health."He presented the findings at the American Heart Association's Scientific Sessions meeting in Dallas, Texas.The study participants were all people aged from 22 to 30 who did not regularly drink coffee.A laser technique was used to study blood circulation in the finger on a microscopic level non-invasively.Volunteers were randomly assigned to drink caffeinated or decaffeinated coffee without knowing what they had been given. Two days later, each group had its coffee allocation swapped and the study was repeated.Caffeinated coffee caused a slight increase in blood pressure and improved the functioning of cells lining blood vessel walls, the researchers found.The study was part-funded by the All Japan Coffee Association.PA Each week, MyHealthNewsDaily asks the experts to answer questions about your health.This week, we asked neurologists and headache specialists: Does caffeine cause headaches, or cure them?Laura M. Juliano, director of Behavioral Pharmacology and Health Promotion at American University, Washington, DC:"There have been some case reports of people experiencing headache after drinking caffeine, but in general caffeine does not directly cause headaches."Regular caffeine consumption leads to physical dependence on caffeine, which manifests as withdrawal symptoms when a caffeine user abruptly stops using caffeine. A diffuse throbbing headache is a hallmark feature of caffeine withdrawal. The reason for this is that one of the pharmacological effects of caffeine is a constriction of blood vessels in the brain."When someone regularly drinks caffeine, the body adjusts in essence fighting this effect. Then when caffeine isn't consumed the result is that blood vessels dilate too much, which causes a headache. It takes a little while for the body to readjust to not having caffeine and that is why caffeine withdrawal headaches can persist for a week or more. A person doesn't have to be a very heavy caffeine user to experience a caffeine withdrawal headache. It varies from person to person but even as little as a small cup of coffee (100 mg of caffeine) each day could lead to withdrawal if someone stops caffeine abruptly."Caffeine can cure headaches that are caused by caffeine withdrawal. In fact, most people experiencing a caffeine withdrawal headache will feel better within 30 to 60 minutes of consuming caffeine. Caffeine is also added to some over-the-counter and prescription headache medications because there is some evidence that it enhances the effectiveness of analgesics (medications for pain)."If someone is headache-prone, they should avoid using caffeine regularly."**Dr. Kathleen Digre, fellow of the American Academy of Neurology and director of Headache and Neuro-ophthalmology Division at the University of Utah in Salt Lake:"The thing about caffeine and headache is that's it's complex, because it's both. Caffeine can be useful for the onset of headaches when taken with pain medications."There are certain headaches, called hypnic headaches, that can be prevented with caffeine. Hypnic headaches are a rare headache seen in elderly individuals that starts after they fall asleep. Drinking a bit of coffee before you go to sleep can prevent hypnic headaches. Caffeine is also used in post-lumbar puncture headaches [which can occur after a person undergoes a spinal tap]."For other types of headaches, sometimes caffeine is a cure when it's put in combination with many pain medicines such as acetaminophen, aspirin, ibuprofen, indomethacin and ergotamine. Caffeine increases the strength of the medication and how quickly it works."But caffeine is a two-edged sword. The other side of the coin is if you take a lot of caffeine and then stop it, you can have a withdrawal headache. A lot of people drink coffee during the week, and then don't have it on the weekends, and they get a headache."It can give people severe chronic rebound or medication-overuse headaches."While many people believe caffeine cures headaches because it is a vasoconstrictor, caffeine has minimal vasoconstrictive properties; it's ability to help headaches is related to its complex properties in the pain pathways. It is not just due to a vasoconstriction that's an oversimplification."**Dr. Joseph Kass, assistant professor of Neurology at Baylor College of Medicine and Chief of Neurology Service at Ben Taub General Hospital in Houston:"The jury is mixed on that. We know that a number of over-the-counter and prescription medications have caffeine for the purpose of making them more effective. Caffeine speeds up the absorption of the medication and it reduces the dose you may need to get pain relief."On the flip side, studies have shown that caffeine from tea and coffee can cause rebound headaches."Recent studies looking at people who had chronic daily headache, and people who had occasional migraine headaches that turn into daily headaches, found an association with caffeine. One of these correlations among people who had chronic headaches and analgesic overuse. But daily use of caffeine was another association. Even people with chronic post-traumatic headaches (headaches that follow a head injury) there was also an association with caffeine."The issue with caffeine is similar with any pain medicine: if you take it on a continual basis, especially together in medicine, you are at risk for developing rebound headaches. However, in 2009, there was a study from Norway that showed people who drink caffeine have less chance of developing headaches."Caffeine can also provide relief for a patient with a migraine. In moderation it has a lot of benefits, like anything else if you're using it excessively, [caffeine] can cause problems. We know that any pain medication that is used too frequently can contribute to headaches. If you're having migraines that are lasting more than a few days, or that are happening more than once a week, you should see a headache specialist."**Dr. Todd D. Rozen, director of the Geisinger Headache Center in Wilkes-Barre and Danville Penn"Caffeine can both cause and cure headaches."Caffeine actually can be helpful for headaches if it is used at the time of a headache for example, in combination [medicines] like Excedrin or even just as a strong cup of coffee. In this setting, caffeine works in several ways."First, as it constricts cranial blood vessels, it can alleviate pain ... especially in migraine headaches where there is vessel dilation. In addition, when caffeine is taken at the time of another medication, for example when used with an anti-inflammatory, it will enhance the absorption of that other medication."It may also have effects on neurotransmitters involved in head pain but there is not much data on this."Caffeine can also cause headaches when it used daily for long periods of time ... Caffeine is causing the person to have daily headache when it is used on a daily basis."Or caffeine can lead to a headache when it has been stopped after long periods of daily use, thus causing a substance withdrawal headache. A caffeine substance withdrawal very common cause of weekend headaches (if you miss that cup of morning java), or fasting headaches like with The Jewish or Islamic fasting holidays."What I tell patients is that caffeine can be very helpful for headaches if used intermittently. And if you have no medication around for your headache, take a strong cup of coffee, and that typically will help the pain. Daily caffeine intake, however, either in the form of combination analgesics or coffee, soda, energy drinks (especially high amounts every day) can lead to a daily headache and a severe withdrawal headache once it has been stopped."**Dr. Randolph W. Evans, clinical professor of Neurology at Baylor College of Medicine in Houston:"Caffeine alone or combined with other drugs can relieve tension-type and migraine headaches in some people, by blocking adenosine receptors and blood vessels which result in the release of excitatory [brain chemicals called] neurotransmitters, and constriction of blood vessels in the brain."People are generally aware that caffeine is found in coffee, tea, soft drinks and chocolate, but may not know that caffeine is also contained in a variety of over the counter medications such as Excedrin and Anacin, and prescription drugs as butalbital combinations (such as Fiorinal and Esigic) contain caffeine."As an example, an eight ounce cup of brewed coffee contains 135 mg caffeine, eight ounces of Lipton tea has 35-40 mg, 12 ounces of Coca-Cola has 45 mg, and Excedrin (and Excedrin migraine, which have the same ingredients) contains 65 mg."About 50 percent of people who consume more than 200 mg of caffeine daily may develop caffeine withdrawal headaches when they suddenly stop caffeine, which can also be associated with nausea, depression and flu-like symptoms. Some people are quite sensitive, and can have withdrawal even after regular consumption of 100 mg daily."So enjoy the stimulating and pain relieving properties of caffeine in moderation. However, too much caffeine can not only make you wired but can also cause or worsen pre-existing headaches. In addition, women should consume caffeine with caution during pregnancy, in consultation with their obstetrician, as consumption of 200 mg daily or more may increase the risk of miscarriage."

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