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NEWS

RSNA Press Release

Coffee Jump-starts Short-term Memory

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At A Glance

- Caffeine exerts a positive effect on short-term memory and reaction times.
- fMRI showed that 100 milligrams of caffeine (about two cups of coffee) increased activity in regions of the brain associated with working memory and attention.
- The increased activation patterns in the brain had a direct effect on performance in a memory task.

CHICAGO - For the first time, researchers have demonstrated that caffeine modulates short-term working memory. The study was presented today at the annual meeting of the Radiological Society of North America (RSNA).

"We were able to show that caffeine modulates a higher brain function through its effects on distinct areas of the brain," said the paper's lead author, Florian Koppelstätter, M.D., Ph.D., radiology fellow at Medical University Innsbruck in Austria.

Dr. Koppelstätter and colleagues used functional magnetic resonance imaging (fMRI) to determine the effects of caffeine consumption on brain activation in a network of modules subserving short-term memory of 15 healthy adult volunteers during a working memory task. Working memory represents the kind of brain activity required to remember things for a short period of time, according to Dr. Koppelstätter, "like looking up a telephone number in the phone book and storing the number until you've dialed it."

The volunteers were shown a sequence of simple images (the letters A, B, C or D) and then asked if an image was the same as the one shown two images earlier. The volunteers were instructed to respond as quickly as possible using the right index finger for "yes" and the left index finger for "no." The task was performed after a 12-hour period of no caffeine and a four-hour period of no nicotine exposure. Administration of 100 milligrams (mg) of caffeine (approximately the amount in two cups of coffee) as well as placebo was randomized across volunteers so that each of them underwent a caffeine and placebo scan. In the "caffeine condition," the volunteers demonstrated a tendency towards improved short-term memory skills and reaction times during the task. The fMRI showed increased activity in brain regions located in the frontal lobe, where a part of the working memory network is located, and the anterior cingulum, the part of the brain that controls attention. In the "placebo condition," the volunteers showed no change in activation patterns from the earlier test.

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"What is exciting is that by means of fMRI we are able to see that caffeine exerts increases in neuronal activity in distinct parts of the brain going along with changes in behavior," Dr. Koppelstätter said.

While these results are promising, Dr. Koppelstätter does not recommend rushing out to the break room for another cup of coffee just yet. "We can demonstrate that caffeine exerts influence on the function of the normal brain, but we still need to learn more about caffeine's effect on mental resources."

Caffeine is currently the most widely used stimulant in the world, and is mainly found in coffee, tea, soft drinks and chocolate. Daily caffeine consumption per person averages 76 mg (equivalent to 1 ½ cups of coffee) worldwide and 238 mg (more than 4 ½ cups of coffee) in the United States.

Dr. Koppelstätter's co-authors are Thorsten D. Poeppel, M.D., PhD., Christian M. Siedentopf, Ilka Haala, Anja Ischebeck, Ph.D., Felix M. Mottaghy, M.D., Ph.D., Paul Rhomberg, M.D., Ph.D., Michael Verius, Ph.D., Stefan M. Golaszewski, M.D., Ph.D., Christian Kolbitsch, M.D., Ph.D., Stephan R. Felber, M.D., Ph.D., and Bernd J. Krause, M.D., Ph.D.

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