Behavior

Speed rivets brain's attention

Amphetamine drugs, also known as speed, are sought as an illicit means of improving alertness and sharpening thinking. These effects may reflect speed's activation of selected brain areas essential for carrying out specific types of mental tasks, a new study finds.

Amphetamines bolster the brain's ability to allocate attention during problem solving, asserts study director Daniel R. Weinberger, a psychiatrist at the National Institutes of Health Neuroscience Center in Washington, D.C. As a result, these substances jump-start whatever brain region is most critical to a particular mental operation, Weinberger argues.

"Amphetamines respected the normal [cerebral] landscape by enhancing activity where it was appropriate and decreasing it where it was not," he holds. "This is probably what attention is all about."

Weinberger and his colleagues used positron emission tomography (PET) to measure changes in brain blood flow in eight healthy men and women between the ages of 22 and 32 as they performed two tasks. One task assessed the subject's ability to match blocks according to shifting criteria, such as simple shape or color, a test that uses short-term memory. The other task called for more complex judgments about which of several shapes was missing from a larger abstract figure.

Volunteers took each test twice, once after ingesting an amphetamine pill and once after swallowing a placebo.

In speedfree participants, the simpler task yielded increased blood flow—a sign that cells are working harder—in tissue at the front of the brain, an area linked to memory of immediate past experiences. The tougher task produced greater activity in and around the hippocampus, a region implicated in the coordination of more distant memories.

On amphetamines, the simpler task induced especially strong frontal lobe activity and a slowing of blood flow in the hippocampus, the scientists report in the Aug. 1 JOURNAL OF NEUROSCIENCE. The complex task sparked an unusually marked hippocampal response and a drop in frontal lobe activity.

Both groups scored high on the simple task. Those on speed, however, outperformed the controls on the complex test.

These results help explain the calming effect of Ritalin, an amphetamine, on many children diagnosed with attention-deficit hyperactivity disorder (ADHD), notes neuroscientist Roy A. Wise of Concordia University in Montreal. Ritalin's attention-grabbing ability may yield better performance on a variety of classroom tasks, thus lowering frustration and agitation, Wise theorizes.

Some ADHD kids ride bipolar express

About one child in four diagnosed with ADHD also has or will soon develop bipolar disorder, sometimes called manic depression, according to a report in the August JOURNAL OF THE AMERICAN ACADEMY OF CHILD AND ADOLESCENT PSYCHIATRY. These youngsters exhibit a volatile mix of symptoms, including distractibility, anxiety, depression, irritability, and violent outbursts. The combination often leads to hospitalization.

Children diagnosed with bipolar disorder tend to bounce quickly between severe irritability and depression, or even to experience both at the same time, assert psychiatrist Joseph Biederman of Massachusetts General Hospital in Boston and his coworkers. In adults, bipolar disorder usually involves slower shifts between euphoria and depression.

For their 4-year study, Biederman's group recruited 140 boys with ADHD and 120 boys free of psychiatric disorders. Participants entered the project between ages 6 and 17.

Around 11 percent of the ADHD boys were diagnosed with bipolar disorder early in the study, and another 12 percent developed the condition later. It afflicted none of the controls at the study's start and about 2 percent of them by its conclusion.

Earth Science

Reining in estimates of sea level rise

An error in satellite measurements of global sea level has inflated recent estimates of how quickly the oceans are swelling, according to NASA scientists. Their revised calculations of 1 to 3 millimeters per year bring the satellite measurements more in line with data compiled over the last half century by coastal stations set up to gauge tides around the world.

A U.S. and French satellite called TOPEX/Poseidon tracks the height of the seas with altimeters that emit radar pulses which bounce off the ocean surface and return to the satellite. Launched in 1992, TOPEX/Poseidon was designed to track ocean currents, but the altimeters proved more accurate than planned, and scientists found they could use the satellite data to monitor global sea levels.

One of the scientists involved in the satellite mission, R. Steven Nerem of the University of Texas at Austin, reported in the Dec. 15, 1995 JOURNAL OF GEOPHYSICAL RESEARCH that the satellite data show sea levels rising at a rate of 5.8 millimeters per year over the satellite's first 2.5 years. That rate greatly exceeded values suggested by the global network of tide gauges, which showed sea levels rising at an average rate of less than 2 mm per year over a 50-year period.

Early this year, the satellite numbers crept even higher, into the range of 8 mm per year. After Nerem and others questioned the accuracy of the data, engineers discovered an error in the software that corrects the clock keeping time on the satellite. NASA engineers have since corrected the problem.

"It was very small, almost unnoticeable in all other uses of the TOPEX data," says Nerem. The error showed up in the sea level calculations because these track smaller changes and require more accuracy.

Even before the error surfaced, Nerem and his colleagues cautioned that the TOPEX/Poseidon measurements represent only snapshots of sea level changes. With this short period of observations, it is impossible to tell whether the current rise is part of a long-term climate trend or just a minor fluctuation. Scientists expect sea level to be rising, in part because global warming over the last century has melted mountain glaciers and expanded seawater volume. But researchers say they need at least a decade of satellite measurements to determine how sea level is actually responding to climate change.

Pouring salt on stingy clouds

At the end of the last century, an editorial in the Hartford Courant quipped, "Everybody talks about the weather, but nobody does anything about it." That statement remained true until the 1940s, when rain seekers started seeding clouds in hopes of generating precipitation. After half a century, meteorologists still regard this widespread practice with skepticism because no experiment has proved it effective. Now, scientists at the National Center for Atmospheric Research in Boulder, Colo., have launched a major project to determine whether seeding clouds can actually work.

In a 4-year experiment conducted in Mexico, NCAR investigators and their Mexican colleagues are using pyrotechnic flares on aircraft to seed clouds with salt. The moisture-loving salt, a mix of sodium chloride and potassium chloride, prompts water vapor to condense into droplets that, as they grow bigger, fall to the ground. This technique has shown promise in trials over South Africa, where scientists report a 30 to 60 percent increase in precipitation from seeded versus unseeded clouds.

The problem with most previous experiments has been their inability to distinguish natural precipitation from that generated by cloud seeding. In the Mexico study, researchers plan to track the effects of seeding by using radar and lasers to measure droplet size within the clouds before and after applications of salt.