Behavior

Learning strength: You be the judge

Volunteers in psychology experiments usually cannot judge whether they have actually learned new information presented by the researchers. In one study, for instance, volunteers perused a series of noun pairs and, immediately after seeing each item, rated their confidence that they could remember the word duo. A memory test a few minutes later revealed that those with the most confidence scored no better than those expressing great doubt about learning the same items.

But a new study suggests that people can indeed monitor their learning progress if they follow a simple rule: After studying a piece of information, wait at least a minute or two before gauging whether it persists as a secure memory. This rule has many practical implications, say psychologists Thomas O. Nelson and John Dunlosky of the University of Washington in Seattle. For example, high school students preparing for a French vocabulary test could evaluate their learning progress and allocate study time most efficiently by allowing for a delay between word study ("*chateau* means *castle*") and the mental monitoring of word knowledge ("How well do I know the English translation of *chateau*?").

Nelson and Dunlosky instructed 30 college students to study 60 pairs of unrelated nouns. Each pair appeared on a computer screen for eight seconds. For half the items, participants examined the pair and immediately rated their confidence (from 0 to 100 percent) in their ability to recall the second word when prompted with the first word on a test to be administered 10 minutes later. For the other items, they rated their confidence levels about five minutes after studying each noun pair.

When tested, volunteers recalled nearly half the items correctly, regardless of whether they had judged their recall ability on an immediate or delayed basis. As in earlier studies, immediate confidence ratings proved highly inaccurate. However, delayed ratings predicted performance almost flawlessly, the team reports in the July PSYCHOLOGICAL SCIENCE.

Accurate assessments of learning depend on the scanning of material stored in long-term memory, Nelson and Dunlosky contend. But immediate learning judgments may trigger a scan of both short-term and long-term memory, they propose. Other studies suggest that new information is stored for no more than 30 seconds before either gaining long-term status or fading from memory. Thus, an immediate judgment may often mistake early recall for a lasting memory.

New look at caffeine cravings

Caffeine, ubiquitous in coffee, tea and colas, ranks as the most widely used psychoactive drug in the world. However, researchers disagree on whether people can get hooked on it.

A preliminary study now suggests that some coffee drinkers exhibit three signs of caffeine addiction: They seek out the drink for caffeine's stimulating and pleasing effects; they experience withdrawal symptoms such as drowsiness, fatigue and headaches; and they report adverse effects of caffeine consumption such as stomachaches, earaches, trembling and profuse sweating. These same coffee fans lack other key signs of drug dependence, including unsuccessful efforts to control their caffeine use, and tolerance to caffeine's behavioral effects.

Psychiatrist John R. Hughes and his co-workers at the University of Vermont in Burlington studied 22 healthy adults who normally drank three to seven cups of caffeinated coffee each day. Given a choice, 10 of the volunteers consumed significantly more of an unlabeled caffeinated coffee than an unlabeled decaffeinated coffee over a two-day test period. Most caffeine seekers also reported adverse caffeine effects and withdrawal symptoms. Even so, labeling heavy caffeine use as "drug dependence" remains controversial, the researchers conclude in the July ARCHIVES OF GENERAL PSYCHIATRY.

Biomedicine

Carol Ezzell reports from Bar Harbor, Maine, at the Short Course in Medical and Experimental Mammalian Genetics

Secondary gene in severe hemophilia?

One out of every 10,000 males worldwide is born with hemophilia A, an inherited deficiency of the blood-clotting protein called Factor VIII. The disorder, which leaves its victims vulnerable to life-threatening bleeding episodes, is usually treated with Factor VIII isolated from donated blood plasma. But it has long posed a paradox: Some boys with hemophilia A are endangered by any bump or scrape, while others have such mild forms that the disorder goes undetected until they lose their first tooth.

Stylianos E. Antonarakis, a geneticist at Johns Hopkins University School of Medicine in Baltimore, says the explanation may lie in a still-undiscovered secondary gene that controls the operation of the Factor VIII gene. He and his colleagues at Vanderbilt University in Nashville and The Orthopedic Hospital in Los Angeles analyzed mutations in the Factor VIII genes of 30 patients with severe hemophilia A and 17 patients with milder forms of the disorder. They detected mutations in the Factor VIII genes of all but one of the patients with mild hemophilia, but could locate such defects in only 53 percent of those with severe hemophilia.

"Something else besides a defect in the Factor VIII gene is causing severe hemophilia A," Antonarakis concludes. The researchers, whose findings are scheduled to appear in the Aug. 15 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES, are now searching for an adjacent gene that could turn the Factor VIII gene on and off. Antonarakis proposes that this regulatory gene may be defective in patients with severe hemophilia A, preventing them from producing any Factor VIII. Even though the Factor VIII gene itself is defective in patients with milder forms of the disorder, he says, they can still produce some partially active Factor VIII.

"The take-home message is: When you find the gene responsible for a disorder, you aren't always finished," Antonarakis says.

Gene therapy possible for Sly's syndrome

Geneticists at Jackson Laboratory in Bar Harbor report using gene therapy to cure a rare, inherited metabolic disorder — known in humans as Sly's syndrome — in newborn and adult mice. The team, led by Edward H. Birkenmeier, has so far spliced normal copies of the gene for the enzyme beta-glucuronidase into the bone marrow of hundreds of mice, reversing all signs of the disease.

The mice were born with mucopolysaccharidosis Type VII, a disfiguring and eventually fatal disease caused by mutations in the genes that code for beta-glucuronidase. The mutations prevent production of the enzyme, which is needed to rid cells of complex sugars called mucopolysaccharides. Without beta-glucuronidase, toxic levels of the sugars accumulate in compartments called lysosomes, which are responsible for breaking down cellular wastes. The buildup causes stunted growth, as well as deformities of the skeletal and nervous systems.

People with Sly's syndrome usually have cardiac murmurs and mental retardation, and most die before 2 years of age. "Currently, there's no definitive treatment for the disorder," says its discoverer, William S. Sly of St. Louis University School of Medicine. Sly says he and Birkenmeier have been able to produce moderate quantities of beta-glucuronidase through genetic engineering, but have not yet convinced a drug or biotechnology company to develop the engineered enzyme, which has a limited market.

As long as the enzyme treatment remains unavailable, Sly says, "this disorder would be a candidate for human gene therapy." In the recent mouse experiment, the inserted gene produced only 2 to 5 percent of the normal enzyme level, but this was sufficient to cure the disease, Birkenmeier says.