Behavior

Monkeys play by the numbers

Abel sits in front of his computer and eyes the bright cursor at the center of the blank screen. Five numerals pop onto the screen, randomly arrayed around the cursor. Abel grasps a joystick and directs the cursor to the numeral 8; eight fruit-flavored treats shoot into a dispenser at his side. Happily munching away, he sends the cursor to the numeral 6, then 5, then 4 and finally 1. Each time, he receives a corresponding number of treats.

Abel may not qualify as an ace mathematician, but he and a buddy named Baker — both rhesus monkeys — display a facility for ordering numerals beyond that demonstrated with any other nonhuman animals, assert David A. Washburn and Duane M. Rumbaugh, psychologists at Georgia State University in Atlanta. The monkeys' surprising ability to go from larger to smaller numerals does not necessarily mean that they count as humans do, the researchers note in the just-released May PSYCHOLOGICAL SCIENCE. Abel and Baker may have learned either to associate specific quantities with numerals from 0 to 9 or to assign relative values to the symbols by concluding that 9 stands for more treats than all other numerals, 8 stands for more treats than all other numerals except 9, and so on.

The monkeys first learned to distinguish between two numerals presented on the screen. After several hundred trials, Abel and Baker generally chose the larger numeral. In subsequent tests, they usually chose the numeral of greater value from novel combinations and from arrays of up to five numerals. Overall scores ranged from about 70 to 100 percent correct, with more errors on trials with more numerals on the screen and greater differences between numerals.

In previous experiments with chimpanzees, dolphins, birds and other animals, researchers have had difficulty demonstrating knowledge of an ordered series of numbers, although one chimp displayed an apparent ability to count and add up to 4 (SN: 5/23/87, p.334; 8/27/88, p.140).

Insanity test revisions miss the mark

In the wake of the 1982 insanity acquittal for attempted presidential assassin John Hinckley, many states narrowed their legal definitions of insanity in hopes of undermining the attractiveness and success of this controversial defense (SN: 10/6/84, p.218). But extensive data from one of those states demonstrate that the changes had no significant impact on the use of the insanity defense.

Psychologist Margaret A. McGreevy of Policy Research Associates in Delmar, N.Y., and her co-workers gathered criminal and mental health information on all 1,300 defendants who entered insanity pleas in seven California counties from July 1979 through June 1985. A total of 662 received acquittals. California's 1982 revisions, which shifted the burden of proving insanity to the defense and tightened the standard of proof, did not affect the rate of insanity pleas or acquittals, the criminal and mental characteristics of those using the defense or the length of hospital stays for those deemed insane, the researchers report in the June AMERICAN JOURNAL OF PSYCHIATRY.

However, insanity pleas in California steadily declined from late 1980 (before Hinckley's verdict) at least through 1985 for a reason unrelated to the insanity test, McGreevy's team asserts. In 1979, the state adopted determinate sentencing, in which those found insane receive hospital commitments equal to the maximum prison terms for their offense, but with no time off for good behavior. Thus, successful insanity pleas often resulted in hospital stays that lasted considerably longer than prison terms for the same crimes. A clear deterrent, such as determinate sentencing, to the use of the insanity plea packs far more punch than tinkering with the wording of the insanity test, the researchers conclude.

Biomedicine

Beware the cigarette belly

All other things being equal, smokers usually weigh less than nonsmokers. But not all smokers are slim. And a new study now indicates that when smokers start putting on fat, they are slightly more likely than nonsmokers to deposit it around the belly. Because people who tend to plump out around the waist rather than the hips are more likely to develop heart disease, this finding may offer one partial explanation for smokers' higher risk of this disease, the study's authors speculate.

The researchers correlated smoking habits, diet, alcohol consumption, exercise and body build in 765 Boston-area men, aged 43 to 85, who have participated in a "normative aging study" undertaken by the Department of Veterans Affairs in 1961. Smokers in the study weighed less than nonsmokers and had a smaller body-mass index (the weight-to-height-squared ratio used in determining obesity). However, smokers also had a higher abdomen-to-hip ratio than former- or never-smokers — a trend independent of age, alcohol use, exercise and body mass.

"The mechanism by which smoking increases [abdominal] accumulation of body fat is unknown," Scott T. Weiss of Brigham and Women's Hospital in Boston and his co-workers write in the May AMERICAN JOURNAL OF CLINICAL NUTRITION. The researchers found smokers more likely to dine on foods high in saturated fat, but their statistical analyses indicate that while this dietary fat correlated with body-mass index, it did not affect the abdomen-to-hip ratio.

Body fat: The hormone factor

How can one person pig out and still stay slim, while another diets conscientiously, only to remain chubby? Exercise often plays a major role. But evolving research suggests that the number and size of fat cells, or adipocytes, a person carries may also influence the propensity for obesity. A new animal study offers a hormonal explanation for the wide adipocyte variations from one individual to the next. And, if confirmed in humans, the finding suggests the possibility of identifying some obesity-prone people at an early age, and perhaps treating them to thwart their adipocyte heritage.

Rats are born slim because the adipocytes that will eventually store their excess calories have not yet matured into a state that will accept lipids (fats). In recent cell-culture studies, biochemist Ginette Serrero identified the hormone that blocks this transformation of adipocyte precursors into fat cells. Now, she and Dianne Mills have confirmed that this hormone, called epidermal growth factor (EGF), also blocks adipocyte maturation — and weight gain — in rats.

Working at the W. Alton Jones Cell Science Center in Lake Placid, N.Y., the researchers selected 80 rats, each 24 hours old, for use in 10-day tests. All animals received a daily injection of saline or saline laced with enough EGF to deliver 0.1 to 1 microgram of the hormone per kilogram of body weight.

Compared with the saline-only rats, the EGF-treated animals showed a dose-dependent reduction in abdominal fat-storage "pads," Serrero and Mills report in the May 1 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. Fat pads of rats receiving the most EGF weighed only half as much as those of untreated animals, contained only 25 percent as many mature adipocytes and accumulated only 20 percent as much lipid.

People who develop "early-onset obesity," which usually shows up by adolescence, suffer from excess adipose tissue, containing both more and larger fat cells than usual, explains Serrero. Her work with genetically obese mice has shown that they produce insufficient EGF. If humans predisposed to excess weight gain suffer from too little EGF, she says, then EGF assays might identify this condition. Moreover, she notes, "EGF or something like that might someday be used like a therapy" to head off obesity in these individuals.