Behavior

Bruce Bower reports from New York City at the annual meeting of the American Psychological Association

Young kids fail symbol-minded tasks

Lawyers and clinicians often use anatomically complete dolls in attempts to help young children recall incidents of alleged physical or sexual abuse. But this practice probably fails to help preschool-age youngsters and may even increase their memory errors, asserts Judy S. DeLoache of the University of Illinois at Urbana-Champaign.

"Our data indicate that very young children have particular difficulty detecting and mentally representing symbolic relations," DeLoache contends. "We also find that dolls do not help young children report an event they have experienced."

The Illinois psychologist has already reported that children age 2 1/2 to 3 fail to appreciate that a small-scale model of a room can symbolize a larger room (SN: 12/19&25/87, p.389).

At that age, however, children can reason about the corresponding rooms if they think about them in an unusual, nonsymbolic way, DeLoache and her colleagues find. A researcher hid a toy behind a piece of furniture in a tentlike portable room as 2 1/2-year-olds watched. Youngsters left the room while a small machine flashed green lights.

When they returned after less than 1 minute, the room had been replaced by the model. The experimenter convinced each child that the flashing machine had shrunk the room. Children then retrieved the hidden toy from its corresponding position in the model on a large majority of trials.

In contrast, many errors occurred when 2 1/2-year-olds were told only to look for the hidden toy in "the same place" in the model, a task that required them to think symbolically.

Further studies directed by DeLoache indicate that 2 1/2- to 3 1/2-year-olds can mentally connect entities of the same kind, such as two dolls, but not different entities, such as a doll and a person. After watching an investigator place a sticker on a doll, for instance, children in that age range could place a sticker in the same place on another doll with great accuracy. But their performance plummeted when they saw a sticker placed on a child and were asked to put a sticker in the same place on a doll.

In a final study, 3- to 5-year-olds showed no next-day memory boost regarding upsetting incidents with their preschool classmates if an interviewer encouraged them to use two dolls to portray the events, as opposed to simply describing the events. In fact, those using dolls made slightly more errors when recalling upsetting encounters.

Hurting to feel better

People who cut, burn, or otherwise mutilate themselves with no intention of committing suicide apparently experience genuine relief from emotional anguish, contends John Briere of the University of Southern California School of Medicine in Los Angeles.

In a national survey of 370 psychiatric patients, Briere finds that one in five cites some form of self-mutilation in the prior 6 months. Nearly all self-mutilators also reported past sexual or physical abuse.

Briere and Eliana Gil, a clinician in Rockville, Md., then interviewed 99 people who acknowledged regular self-mutilation. The frequency and severity of this behavior rose sharply in those who noted prior physical abuse that required medical attention or sexual abuse that involved penetration, according to Briere. Participants said that they physically hurt themselves for several reasons: to see if they were still alive or real; to stem the pressure of their anger, fear, guilt, or other negative emotions; to block painful memories; or as a cry for help or attention.

Whereas masochists find pleasure in pain, self-mutilators seek relief from distressing emotional states, Briere argues. "Their behavior serves a purpose, and they probably won't stop it because a clinician tells them it's a bad idea."

Mathematics

Pi continued

It's possible to use the distribution of bright stars across the night sky to deduce a numerical value of pi (π) that comes within 0.5 percent of its exact value (SN: 5/20/95, p.319). But determining pi—the ratio of the circumference of a circle to its diameter—to billions of decimal places requires mathematical ingenuity and tremendous computer power.

Earlier this month, Yasumasa Kanada and his coworkers at the University of Tokyo announced that they had calculated pi to 3.22 billion decimal places, beating the old record of 2.26 billion digits (SN: 8/24/91, p.127). The researchers checked their result by using two different formulas to compute pi, requiring more than 36 hours to complete each calculation on a supercomputer.

Meanwhile, mathematicians David V. and Gregory V. Chudnovsky of Columbia University, who held the old record, have been quietly extending their own calculation. In response to the Japanese announcement, the Chudnovskys noted that they had upgraded their own custom-built computer and had already reached more than 4 billion decimal digits of pi last year.

Such calculations of pi involve much more than setting a record. The Chudnovskys, for example, have developed novel mathematical formulas for computing pi efficiently and methods for checking the results to ensure that the digits are correct. Computing pi to a large number of decimal places also serves as an excellent test of how well a computer functions. The Chudnovskys have been able to use their pi-tested computer to complete a variety of mathematical calculations linked to the study of certain types of differential equations.

Vibrations: From nodes to knowledge

Sprinkle sand across the surface of a flat, rectangular plate, then set the plate vibrating at one of its natural frequencies. The sand quickly gathers into a distinctive pattern, bouncing away from areas that are in motion and settling wherever the plate remains stationary. These clearly delineated, stationary regions are called nodes or nodal lines. The resulting patterns depend on the geometric shape of the vibrating object—and on such characteristics as its stiffness and density distribution.

Applied mathematician Joyce R. McLaughlin and her coworkers at Rensselaer Polytechnic Institute in Troy, N.Y., have been studying what information about a vibrating object can be gleaned from the positions of nodes and nodal lines. She described the work earlier this month at the Burlington (Vt.) Mathfest, a joint meeting of the American Mathematical Society and the Mathematical Association of America.

Experiments reveal that attaching a small mass to a vibrating rod lowers its natural frequency and shifts the positions of nodes toward the location of the added mass. For a given nodal pattern, McLaughlin and her coworkers have shown that it is mathematically possible to extract useful information about variations in density and stiffness along the length of a rod, or beam, from precise measurements of the node positions in a subset of the nodes displayed by the vibrating object.

The situation for a plate or membrane is somewhat more complicated. Experiments and computer simulations involving rectangular membranes show that nodal line patterns can change in unexpected ways in response to variations in mass, stiffness, or applied force. For example, the number of intersections and domains defined by the nodal lines can decrease. This gives the researchers less information with which to work. Nonetheless, for some of these cases, they can still deduce mathematical relationships representing how the applied force or some other material property varies across the surface of a vibrating membrane.