Preschoolers get grip on hidden emotions

Preschool-age children feel at home with emotions, from the volcanic anger that fuels temper tantrums to the spontaneous glee evoked by a game of hide-and-seek. Many researchers have assumed, though, that preschoolers do not understand that emotions exist inside individuals' minds and are not always expressed truthfully.

Now, a study indicates that, when tested under certain conditions, many 3- to 5-year-olds exhibit just such a sophisticated understanding of the inner world of emotions. "Preschoolers' conceptions of people go beyond how others look externally and what they appear to be on the surface to include what people think and how they feel inside," says Mita Banerjee, a psychologist at Pitzer College in Claremont, Calif.

Young children rapidly grasp the presence of unseen emotions and other mental states, such as beliefs and intentions (SN: 7/17/93, p. 40), as they navigate through the realms of home, school, and peer groups, Banerjee holds. Such knowledge proves essential for social decision making, she asserts.

Earlier studies followed a direct avenue to explore preschoolers' emotional insights. A researcher might ask children, for example, whether they could experience specific feelings in another person's presence without that individual's realizing it.

Banerjee instead took an indirect approach to gauging emotional knowledge in 54 girls and 49 boys age 3, 4, or 5. Participants came mainly from white, middle-class families. Each child heard six brief stories in which a young person had reason to hide an emotion, such as joy or sadness. In one story, a girl spending the night at her cousin's house feels sad upon discovering that she left her favorite teddy bear at home, but the girl doesn't want her cousin to see how sad she is and call her a baby.

Children were then shown a set of facial drawings and asked to choose the picture that portrayed how the main character really felt and the picture for how that character would try to look.

Banerjee then used stuffed dolls to describe to the children situations in which the doll had experienced an emotion and needed advice on whether or not to express that emotion. For instance, one doll wanted to know if it was all right to scrunch up its face and spit out grandma's "yucky" casserole if grandma was at the table; another doll sought consultation on whether to shout "happy birthday" and give a big hug to "my dad" at his birthday party.

Children offered advice on each quandary and described the reasons behind their decisions.

Nearly all of the 5-year-olds displayed a thorough understanding of the difference between real and apparent emotions, as did about half of the younger children, Banerjee reports in the summer SOCIAL COGNITION. Because some 3- and 4-year-olds exhibited the same degree of knowledge on these tasks as 5-year-olds, emotional insights appear to develop at markedly different rates from one preschooler to another.

Children had an easier time understanding that a person might want to hide a negative emotion, such as sadness, versus a positive one.

Large proportions of children in each age group also identified situations in which hiding or expressing an emotion is appropriate, although 3-year-olds offered sparse explanations for their choices. At that age, a solid understanding of the rationale behind rules for emotional displays has yet to emerge, Banerjee suggests.

At all ages, girls performed better on emotional understanding tasks than boys. Female superiority in dealing with emotions has attracted much interest (SN: 6/14/97, p. 365), although "it's startling to see such [sex] differences at the preschool level," Banerjee says.

"These findings fit with an emerging picture of much greater cognitive competence in infants and young children than has often been assumed," says psychologist Alan M. Leslie of Rutgers University in New Brunswick, N.J.

Future work needs to examine how children as young as 2 years pick up specific emotional signals from others in their quest to learn about the social world, Leslie contends. —*B. Bower*

Odd companions create unusual environment

Despite their generally incompatible natures, oil and water have found common ground. On a surface with an unusual structure, each substance spreads out evenly, report Akira Fujishima of the University of Tokyo and his colleagues in the July 31 NATURE.

This finding reveals "a fundamentally new physical and chemical phenomenon," according to Adam Heller of the University of Texas at Austin, who considers the results "nothing short of revolutionary." Some materials, when perfectly clean, can bind to either oil or water but become committed to whichever one they adhere to first. On the surface described in the recent study, however, water and oil can displace each other, Fujishima says, a commercially valuable characteristic. Although the surface itself is not new, the possibility that it could behave in this unusual way was "simply not examined previously."

The scientists coated a piece of glass with titanium dioxide—a multipurpose material commonly used as a pigment in paint. After irradiating the surface with ultraviolet light, the researchers placed drops of water or oil on it. All of the drops flattened out completely, indicating that both fluids adhere to the coating, the team reports.

Using friction force microscopy to examine the surface on an atomic scale, the researchers discovered a mosaic of tiny regions 30 to 80 nanometers across, each with a strong affinity for either oil or water. The researchers suggest that each area binds the substance for which it has an affinity, so together the regions imbue the surface with this unique property.

The exceptional spreading behavior adds to what scientists previously knew about the self-cleaning properties of this coating (SN: 9/2/95, p. 157). Specifically, it explains how the surfaces get rid of particular types of dirt. Because water adheres strongly to the surface and forms so thin a film, it creeps under oily spots to displace them, Fujishima says. Similarly, a sheet of oil slips under a drop of water. The researchers have not yet explored how the surface would cope with equal amounts of water and oil.

Because the liquids spread extraordinarily evenly, the coating can be used to circumvent everyday problems associated with fluid globs. For example, normal glass and mirrors cloud up because water collects in droplets, which scatter light. On the titanium dioxide surface, beads of water flatten out so uniformly that they become transparent. The classic method of cutting through fog is to use water repellents; a surface that strongly attracts water represents a novel approach to the problem, says Heller.

The researchers' industrial collaborator, TOTO of Chigasaki, is already producing new antifogging products with this coating, Fujishima says. —*E. Strauss*

Fujishima

Removing steam: A titanium dioxide film coats the right side of the mirror.