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## What Do You Mean, 'It's Just Like a Real Dog?'; As Robot Pets and Dolls Multiply, Children React in New Ways to Things That Are 'Almost Alive'

By KATIE HAFNER


IN the 1930's, when the Swiss developmental psychologist Jean Piaget quizzed children to find out if they could tell the difference between living creatures and inanimate objects, he concluded that they defined life by figuring out which objects could move by themselves, without an outside push or pull.

In the last 20 years or so, that particular theory of Piaget's has been almost completely overturned by research showing that young children are not fooled by things like garage doors that move by remote control. That is, children can tell the difference between animals and machines even if the machines appear to move by themselves.

Now children are encountering a new category of objects, things that seem to possess intentions, preferences and others characteristics previously reserved for living beings.

What do children think about what it means to be alive? And at what ages can children distinguish mechanical objects from real animals or people? Research into these questions is still in its earliest stages. There was a flurry of interest in children's reactions when Tamagotchis, virtual pets from Japan, first appeared a few years ago and then started dying on their young owners. But the topic is attracting more attention now as seemingly intelligent toys and other robots appear on the market in increasing variety and numbers.

Tiger Toys, maker of the chatty, needy Furby, will soon introduce Shelby, a talking clam that does many of the things Furby does. Tiger also has a new robot dog, Poo-Chi, on toy store shelves. Panasonic is testing a robotic cat for isolated old people. And Hasbro, with help from artificial intelligence experts, has developed an animatronic doll that not only says "ba-ba" and makes babylike facial expressions but can also mimic human expressions in other ways.

 "The proliferation of virtual pets is raising new questions about what kinds of relationships seem appropriate to have with nonbiological objects," said Prof. Sherry Turkle, a psychoanalyst who studies the sociology of science at the Massachusetts Institute of Technology. "This is about a new kind of relationship that we don't know enough about. We need to continue to study this very carefully."

Professor Turkle, who studies the relationships between computers and people, is among the first researchers to stake a claim in this fertile new area. For the past two years, she and her research assistant, Jennifer Audley, have studied virtual pets, like Tamagotchis and electronic dolls like Furbies. They are trying to understand how interacting with these pet impersonators - what Professor Turkle calls "relational artifacts" - affects the way people think about their human identity.

In a research project still in its early stages, Professor Turkle and Ms. Audley have visited after-school centers in the Boston area to watch the ways children 5 to 10 years old play with Furbies. They have also sent Furbies home with children and asked the children and their parents to keep diaries of the interactions.

Again and Again, Ms. Audley said, the researchers have asked the children: "Is it alive? Is it like a real pet? Does it know you?"

"Strikingly," Ms. Audley said, "often the answer they settled on was, 'It's not alive in a human or animal kind of way, but in a Furby kind of way.'"

Watching children assign personality and emotion to toys is nothing new for children, but this category of "sort of alive" breaks new ground. It is showing up more and more as a first generation of children plays with interactive toys that need attention and nurturing.

"When a doll of 10 years ago said, 'I love you,' " Professor Turkle said, "the children knew that there was a little tape recorder inside. The language did not come from a relationship of nurturance, of there being a sense that a consciousness internal to the doll was processing the quality of the relationship between child and doll."

An emerging class of dolls and toys is designed to give exactly that sense.

Hasbro's \$100 animatronic infant, called My Real Baby, will be in toy stores in November. The doll, which Hasbro developed with the iRobot Corporation of Somerville, Mass., is a complex matrix of sensors and chips. The result is an object that mimics some of a real child's moods and needs. To be put to sleep, it must be laid down or rocked. If it is tickled, it giggles.



It seems to go beyond another product from Hasbro coming out in August: eSpecially My Barney, which connects to a computer so a child or parent can download activities like songs and games for the toy to play.

The doll, which does not have a serial cable, develops over time. When it is first taken out of the box, it simply stares and coos. After the doll is played with for a while, it starts asking for things, like its bottle. Over time, the baby starts to form more complete sentences.

While designing the doll, toy makers at Hasbro hired Dr. Gar Roper, a child psychologist in Fairfield, Conn., to observe little girls as they played with it. He noticed that the unpredictability of the doll's responses confused the children but also fascinated them.

Dr. Roper said the girls seemed to consider the doll more alive than other dolls. "They seemed to be aware that this was a middle ground of some kind," he said. "They desperately wanted to hold it, but they were very uncertain of how to hold it. They held it very gently, with uncertain tenderness."

But Prof. Alison Gopnik, a developmental psychologist at the University of California at Berkeley and co-author of "The Scientist in the Crib: Minds, Brains and How Children Learn" (William Morrow, 1999), cautioned against drawing hasty conclusions from such behavior.

While it may be true that the children pretended that the doll was alive, Professor Gopnik said, "children behave as if practically everything is alive when they're engaged in pretend play. That in itself doesn't mean they're confused about what's alive and what isn't."

Prof. Susan Gelman, a psychologist at the University of Michigan at Ann Arbor, agreed that even very young children could make a distinction between animals like dogs and inanimate objects like chairs.

"But do they maintain such a distinction even when confronted with creatures that defy our usual expectations," she said, "that present what seems to be a fuzzy boundary between animals and objects?"

Professor Gelman agreed with Professor Turkle that the new digital dolls coming on the market bent the familiar boundaries between the animate and the inanimate. "By looking at lively, responsive robotic creatures," she said, "researchers can test the boundaries of some of our most fundamental concepts in very new and provocative ways.

"If it turns out that robots pose difficulties that self-moving machines do not, then this would be very interesting indeed, suggesting that maybe the social, interactive features are particularly central and salient to children."

Then there is the question of electronic death. The Tamagotchi, the palm-size screen character from Japan that was very popular a few years ago, demanded continual care and feeding, and it responded to the quality of care. But no matter how attentive its owner, Tamagotchis either died or sprouted wings after a couple of weeks or so, often prompting gloom and guilt.

Furbys evoked similar emotions. Some children panicked when the toys broke, a sign to their small owners that the pseudopets had died untimely deaths.

Ms. Audley tells of midnight calls from frantic parents whose children were beside themselves because their Furby had suddenly gone on the blink. "I would rush over to the house with a new Furby, and every single time, the child showed no interest in the new one," Ms. Audley recalled.

"They gave lots of indications that they felt betrayed, taken in and fooled. It had revealed its nature as a machine and they felt embarrassed and angry. They were totally unwilling to invest that kind of emotional relationship in an object again."

Children are not the only ones grappling with the new world of lifelike objects.

"We are finding ourselves in a different world from the old artificial-intelligence debates in which researchers argued about whether machines could be really intelligent," Professor Turkle said. "The new objects sidestep arguments about what is inherent in the machines and play instead on what they evoke in us."

In that vein, Panasonic is currently testing a furry robotic cat called Tama and a robotic teddy bear called Kuma, which are intended to provide companionship to elderly people; each is expected to cost about \$500. Tama and Kuma react to touch and sound and can be programmed to say a number of things, like reminders to take medication.

Paul Liao, chief technology officer in Panasonic's United States office, emphasized that unlike Sony's \$2,500 Aibo robotic dog -- which wanders around the room and chases balls and even lifts its leg to scratch -- the Panasonic creatures were not intended as entertainment.

And what about creatures that seem to be alive but immortal? Professor Turkle said one woman told her that Aibo was better than a real dog because it would not die suddenly and plunge its owner into grief.

The comment startled Professor Turkle, she said, putting her in mind of a 1969 story by Ray Bradbury, "I Sing the Body Electric!" In the story, a robotic grandmother wins the trust of a young girl who has recently lost her mother only after the girl learns that the grandmother cannot die.

"In many ways throughout the story we learn that the grandmother is actually better than a human caretaker," Professor Turkle said, "more

able to attend to each family member's needs, less needy, with perfect memory and inscrutable skills, and most importantly, not mortal."

Mortality has traditionally defined the human condition, Professor Turkle said. "A shared sense of mortality has been the basis for feeling a commonality with other human beings," she said, "a sense of going through the same life cycle, a sense of the preciousness of time and life, of its fragility.

"The possibilities of engaging emotionally with creatures that will not die, whose loss we will never need to face, presents potentially dramatic changes in our psychology."

And what of other lessons learned in the cycle of life, lessons that are less traumatic than death but still difficult?

Hasbro, for its part, sidesteps those lessons. The company has gone out of its way to make sure that its new doll, however lifelike, will not disappoint young customers. Put the doll down and it may fuss for a while. Continue to ignore it and instead of working itself up into real screams, it quiets down and drifts off into a blissful sleep.

"At the end of the day," said Helen Greiner, president of iRobot, "it's a toy, and we've developed play patterns that don't upset kids. If you don't change its diaper, after a while it gets over it."