ORIGINS OF KNOWLEDGE

Nolan Bond, 5 months, sits with his father, Skip Bond of Westminster, during an exercise on Tuesday at the Cognitive Development Center at the University of Colorado.

Babies’, children’s brain power studied at CU

Researchers in center are exploring the foundations of knowledge

By Mary Butler
Denver Staff Writer

Peepo-box is more than just child’s play for University of Colorado researchers exploring the origins of knowledge. Almost every day, infants and young children are studied as they participate in carefully orchestrated games at CU’s Cognitive Development Center.

On Tuesday, Nolan Bond, a chubby, blond 5-month-old, sat on his father’s lap while a puppet show of sorts unfolded before him.

First, he was shown a red-and-green striped box. Next, a polka-dot cylinder was placed to the right of the box. Then a screen folded up so that the box was no longer visible. The screen was flipped up and down, showing Nolan that the box remained even though he couldn’t always see it.

The finale — and most important part of the experiment — came when the screen again hid the box, which was dropped beneath the stage, and the cylinder was moved through where the box once sat.

Did Nolan stare longer at the seemingly impossible act?

Not in this case. He squirmed and cried.

But CU researcher Yuko Munakata said in most instances the event will catch the otherwise bored infant’s attention. Tracking such reactions is at the heart of Munakata’s work studying what children ages 3 months to 3 years know and when they know it.

“There’s a lot of controversy over the origins of knowledge,” Munakata said. “What do 5-month-old infants understand about physics, for instance?”

The volunteer parents who participate in the studies tend to be just as skeptical as they are supportive of the work.

Maureen Brady, whose 7-month-old daughter Sophia was a research subject two months ago, said the work fascinated her.

“Do they understand whether something is physically possible? On one hand, I’m a little skeptical. A baby is just a little baby,” Brady said. “But they have little brains that are the basis for adult brains. I guess it’s perfectly possible. I think it’s really important to investigate these kinds of questions.”

There are academics who say their research proves infants understand such things as gravity or inertia. Others are just as emphatic that there’s no way babies can grasp such concepts.

Munakata’s work straddles both camps.

“I’m trying to consider both the successes and failures in testing children’s knowledge and what they mean about how knowledge develops,” she said.

Her research team, including 14 undergraduate students, conducts much of its work in the basement of CU’s Maatzinger Psychology building, hence the 2-year-old

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Cognitive Development Center.

CU opened the center as part of its efforts to recruit Munakata, who at 34 is considered a rising star in the field of cognitive development research, said Jerry Rudy, who hired her as associate professor. Rudy previously was the psychology department chair, but now is interim associate dean for sciences.

In the mid-'90s, Rudy said he began growing the psychology department in the areas of cognitive development and neuroscience.

Munakata's partner, Randy O'Reilly, was among the hires. O'Reilly is a computational neuroscientist and with Munakata co-authored "Computational Explorations in Cognitive Neuroscience," a textbook published in 2000.

"Understanding how the brain develops and how cognitive processes develop are fundamental to understanding human behavior," Rudy said. "It's just a really important area."

Munakata's work recently fetched a five-year, $1 million grant from the National Institute of Child Health and Human Development to support research at the center, which also includes two graduate students, three post-doctoral researchers and a lab coordinator.

While the field of cognitive development is "hot," CU psychology department chairman Ed Craighead said, it's still relatively small.

"We have a chance to make a real contribution," Craighead said.

Munakata said her research could someday shape how children are taught.

In one of her experiments, children are asked to sort a deck of cards first by color and then by shape. Time after time, the 3-year-olds being tested have trouble changing gears — often sticking with sorting by color even though they say they know they're supposed to organize the cards by shape.

"I think it's informative that they can answer the question, but when it comes down to it, they can't sort the cards correctly," Munakata said.

To solve the dilemma, researchers in Munakata's lab approached the task by helping the children form a new habit instead of telling them what to do.

They replaced the blue and red game cards — shaped like either a truck or a flower — with black cards bearing generic block shapes. The cards bearing shapes and colors were then gradually worked back into the games with more than a 90 percent success rate.

"It's better to gradually practice them toward another option," said Jen Brace, a researcher in the lab and one of Munakata's students.

The lesson, Munakata says, is that in the face of a strong pull, you can counter it with the pull to do something else.

University of Denver's Marshall Haith, who has studied cognitive development for 40 years, calls Munakata "a voice of reason" in the field. The two were colleagues before Munakata came to Boulder.

"The side of the field that raises my hackles is trying to appeal to the press and the lay public," he said.

"It's putting adult concepts to infant behavior. It's dramatic. If you're outside the field, you'd say, 'Oh, wow,' like when people say kids listening to Mozart do better on IQ tests. That's sensationalism."

He calls claims that infants can understand physical principles "outrageous" and a result of "dumbing down" the much more complex reality.

"They understand experience and whatever experience is put in front of them," Haith said.

"That doesn't mean they understand more general principles such as gravity or the understanding of permanence. ... Infants understand some pieces of the phenomenon of object permanence but not all aspects of it."

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