Youth Is Served

FROM NEWBORNS TO TEENAGERS, CHILDREN ARE THE FOCUS OF BREAKTHROUGH PROJECTS AT UT ARLINGTON. Researchers in a range of fields are generating creative solutions to longtime concerns. Concerns like sudden infant death syndrome, which professors have developed a way to combat via refashioned baby monitors. Concerns like teenage substance abuse, which a team of social workers hopes to discourage by developing educational video games. Concerns like communicating with autistic children, which an engineer believes he can do with lifelike robots. Children are the future, and these researchers are doing their part to make it bright.
**SENSING DANGER IN BABY CRIBS**

Like many new fathers, Hung Cao stared in amazement behind the maternity unit's observation window when his son was born six years ago. But one question haunted him: “How do I know he’s OK?”

That’s when the engineer in Cao took over. The newly minted engineering doctoral graduate had been working on something quite un-baby-like. He was part of a UT Arlington team tasked with building a wireless sensor that detected gas escaping from long-adiabed infants. If gas leaks, the infant might not function.

He approached his Ph.D. adviser, electrical engineering Professor J-C. Chiao, with the idea that the sensor might be adapted to determine if a baby was exhaling carbon dioxide. The two researchers have now received a patent for a device that attaches to baby cribs and detects carbon dioxide being exhaled. The wireless system could help prevent sudden infant death syndrome.

The sensors could be attached to a baby’s crib or car seat. They are less cumbersome than current technology that requires a breathing apparatus being placed around the infant’s nose.

“Our sensors let you know if the baby is breathing normally without the wires and breathing tubes,” Chiao says.

Beardsley says the team is working to reduce the cost of the device to spread its transition to the marketplace. “That’s the key to commercialization. People are willing to pay lots for the device but not several thousand dollars.”

She believes the system will be more accurate than what exists now.

“There are audio, video, and motion detection devices to monitor infants, but it is still difficult to determine whether a baby is breathing,” she says. “Those current systems aren’t being endorsed by the American Academy of Pediatrics anymore. The CO₂ system would be better. It represents a significant risk reduction in the health care industry.”

**PROGRAMMED TO TREAT AUTISM**

Zero has empathetic eyes in a beautiful hazel hue and can walk and gesture with two hands. His lifetime skin is called Frubber and allows his face to smile, frown, and look inquisitive. But he doesn’t make judgments.

Zero is a 2-foot-tall robot, and researchers believe he may be able to recognize autism in infants and toddlers before traditional diagnoses that rely on speech and social interactions.

UT Arabian scientists have teamed with colleagues at the University of North Texas Health Science Center, the Dallas Autism Treatment Center, Texas Instruments, and Hanson Robotics in Plano to rework Zero and other life-like robots to diagnose and treat children suffering from autism spectrum disorders. The robot would not only interact with the children but would measure their movement and indicate what therapies work best.

“It’s more than just seeing how autistic children react when interacting with the robot,” says electrical engineering Associate Professor Dan Pope, principal investigator of the project, which is funded in part by a grant from the Texas Medical Research Collaborative. “Eventually, we want to customize the robot to better fit individual needs of children with autism.”

Carolyn Garver, director of the Dallas Autism Treatment Center, says the earlier the disorder is identified, the sooner it can be treated.

“Children with autism are intrigued by the robot. Roboticists are nonjudgmental. Sometimes autistic children just shut down with human interaction,” says Garver, who notes that one in every 88 children will have an autism spectrum disorder.

She believes the best possible outcome of the research would be to identify biomarkers through a child’s movement to aid in diagnoses.

Scientists hope a life-like robot named Zero can help diagnose and treat children with autism. Dan Pope, who directs the Next Generation Synergistic group at the UT Arlington Research Institute, is developing robots that are smaller, less expensive, and more intelligent than current models.
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Zeno has empathetic eyes in a beautiful hazelnut hue and can walk and gesture with two hands. His lifelike skin is called Fubber and allows his face to smile, frown, and look inquisitive. But he doesn't make judgments.

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"There really are no biological methods of determining autism. Right now we just observe. If we can document that a certain eye gaze or motor movement means some level of autism, this could help in developing ways to treat it early on."

Nicoleta Bagarini, an associate professor at the UNT Health Science Center and a physical therapist/neuroscientist, is most interested in motor control issues. "How these children keep their balance, reach for an object, and move about a room may be extremely important in diagnosing autism," she says. "If we can detect these motor biomarkers and determine the timing of these differences during the developmental process, that would be of great benefit for diagnosis and treatment."

Autism is typically diagnosed based on deficiencies in social interaction and speech problems. But with infants or toddlers, an emphasis on motion could aid early detection. "In the first two years of life, language is a small part of a person," Dr. Bagarini says. "Children move first, then speech comes. We can't wait until they use speech. We need to determine sooner who has autism."

Dr. Popa, who directs the Next Generation Systems group at the UT Arlington Research Institute, focuses on developing robots that are smaller, less expensive, and more intelligent, agile, and networked than those on the market today. Hamon Robotics sought his help to make the robots more human and take them from the lab to the home. Hamon provided the initial robot, and Popa's team embedded a more performance-controlled system into it. "That way you can adapt the robot behavior to do anything you want," he says. Popa, who has worked with Hamon since 2005, says responsive cameras similar to the technology in game systems like Microsoft's Xbox Kinect could be placed in Zeno's eyes. Such vision tools would record a child's movements and mimic behavior. Hardware based on Texas Instruments chips and cameras could be used to fashion a control and perception system to record movement. "We believe the research will lead to a better life for the child with autism," he says.

RE-EXAMINING PARENTS AS TEACHERS

For centuries, educators have debated why Johnny can't read. Sometimes it comes down to a lack of support at home. If parents underwent specialized training to better prepare their preschoolers, would it make a difference in the children's long-term academic performance? That's what curriculum and instruction Assistant Professor Amber Brown aims to find out. She's taking a second look at a long-running program designed to help at-risk children increase their chances of successful early-school readiness. "Home Instruction for Parents of Preschool Youngsters (HIPPY) is a three-year, early education intervention program geared toward low-income, primarily minority parents of 3-, 4-, and 5-year-olds. Through role play, parents are trained to be their child's first teacher using a carefully developed curriculum of books and materials designed to strengthen cognitive skills, early literacy, and social, emotional, and physical development. HIPPY, which began in Israel as a pilot program, is provided in both English and Spanish. Dr. Brown is conducting follow-up research to evaluate how effective the program is long term, once children leave the elementary level and advance to high school. Her study, which begins this fall, focuses on Dallas Independent School District high school seniors who participated in HIPPY as preschoolers, along with their parents or guardians. For students whose parents consent and participate, DISD personnel will provide the students' GPA and standardized test scores. Mean scores for parent involvement, educational motivation, and educational aspirations also will be reported.

Brown conducted a similar study in 2010 on children in third, fifth, seventh, and ninth grades. Results suggested that HIPPY intervention can increase school achievement and build a strong base for academic success.

"Children who participated in HIPPY had significantly higher rates of school attendance, were retained less often, and had fewer repeat discipline referrals," she says. "They also scored higher on the reading and math Texas Assessment of Knowledge and Skills tests than matching students without HIPPY experience."

COORDINATED EFFORT

It's not every day you hear a college professor termed a "huge blessing," but that's how Fort Worth mother Christine Lund describes Priscila Cacola. This spring Lund brought her 7-year-old daughter, Evelyn, to Dr. Cacola's Developmental Motor Cognition Lab at UT Arlington. The kinesiology assistant professor and her team of undergraduates and graduate students are testing children ages 7-15 for developmental coordination disorder, a condition that limits motor development and is sometimes referred to as dyspraxia. Researchers believe it affects at least 6 percent of school-age children.

Children with the condition have difficulty with activities like games and sports, and it can even affect handwriting and other fine motor skills. They are more likely to become sedentary and suffer health consequences because they don't participate in movement activities. Becoming victims of bullying and experiencing social isolation are common. Cacola believes developmental coordination disorder may be linked to a difficulty in the way the brain plans movement. She hopes working with children like Evelyn—a bright girl who worries that her trouble with handwriting will cause her problems in school—will test that theory and lead to more effective interventions.

Getting the word out is the first step. "Awareness is a huge challenge with movement difficulties," Cacola says. "Our testing has been going well, and parents who come to campus for the assessments are happy that they did. But sometimes it's difficult to get parents because more people don't go around telling others that their kids seem clumsy. When they hear about our study is when they link the facts with their situation."

Later this year Cacola plans to start an intervention program for kids with developmental coordination disorder as part of UT Arlington's Center for Healthy Living and Longevity, which is housed in the Kinesiology Department of the College of Education and Health Professions. It will give participating children an opportunity to try research-based solutions in an environment with others who have similar difficulties.

For Christine and Evelyn Lund, knowing that there are researchers like Priscila Cacola opens new options. "I want to empower Evelyn so she can feel confident in her abilities," Christine says. "Now that I have the information, it's up to me to decide how to move forward."
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Q&A:

PLAYING TO LEARN

Perhaps no group plays video games more than teenagers. Led by Beverly Black, the Jillian Michelle Smith Professor in Family Violence Research in the School of Social Work, a research team is capitalizing on the comfort many teens have with technology.

Tell us about the video game you and your team developed to help teenagers make wise decisions about substance abuse and relationship violence.

"Choices and Consequences" stemmed from a Department of Commerce-funded project to develop an Internet substance abuse prevention community for teens. Our research found that teens preferred game delivery of prevention materials over other forms, and this is our first major research project to capitalize on that preference. The Amon G. Carter Foundation and the Innovative Community Academic Partnership provided funding for us to get started. In the game, students compete to develop a fun, risk-free weekend for a 13-year-old. There are many actions to choose from for each activity they select.

The game is being piloted at a local school. What have you learned from students so far?

They generally say that they believe "Choices and Consequences" could help prevent substance abuse and relationship violence and that they learned many lessons by playing the game. One girl said, "I learned to never drink something that I didn't pour myself." Another stated that she learned different ways to effectively respond in situations involving substance abuse and relationship violence.

What do you hope to accomplish with this game?

There's a significant need for the creation of innovative prevention programs for teens that address substance abuse and relationship violence. We hope to develop an appealing and challenging social game for youth that will run on smartphones, tablets, or computers. We hope it will prevent substance abuse and dating violence behaviors through changes in knowledge, attitudes, norms, and self-efficacy.

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