CHDD
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INSIDE

Supporting Children's Development by Strengthening Families Who Are Homeless

The extreme stress suffered by many homeless families can have serious consequences for young children, including developmental delays. CHDD researcher Jean Kelly and her colleagues have developed and are evaluating programs to help homeless parents find better ways to deal with stress and to nurture their children.

Imagine that you are a young, single mother living in a shelter for homeless women, exhausted from the stress of working nights at a low-paying job, and during the day trying to meet the demands of caring for two children under the age of three.

Jean Kelly, Ph.D., observed this kind of stress when she volunteered at a homeless shelter. Building on her expertise in strengthening relationships between mothers and young children, she began work on programs and techniques to help homeless families. Kelly, research professor of family and child nursing, is the chair of the Early Intervention Task Force at the Center on Human Development and Disability (CHDD) and a CHDD research affiliate.

Most homeless parents are single women with minimal family support and limited economic opportunities. They must expend tremendous emotional resources in trying to meet basic needs, such as food and shelter, and often run short on energy to best nurture their children, says Kelly, who is also director of the Promoting First Relationships Program in the School of Nursing and NCAST-AVENUW, a dissemination and training program to promote nurturing environments for young children.

"It's very stressful to be poor in this society," says Kelly. "When you're extremely stressed it's hard to be emotionally available and children need parents to be emotionally available to thrive. When their needs aren't met, children usually do one of two things: they either act out, or they get sad and withdrawn." Neither type of behavior is likely to encourage loving attention from a parent. As a result, parent and child can get caught in a loop of negative feedback.

A deficit in emotional support, combined with the disruption and stress of being homeless, can have serious consequences for homeless children. Many suffer from developmental delays or behavioral and learning problems. As these children grow to adulthood, their problems may, in turn, hamper their own ability to be effective parents.

Kelly is working to break this cycle by helping homeless parents to better nurture their children. Kelly's team works to strengthen and support young families by training the staff members in homeless shelters who work with families. The team is also evaluating the training curriculum "Promoting First Relationships" used for this and other projects. The curriculum was developed by Kelly and her colleagues at the University of Washington. Its effectiveness has been validated by research in a variety of settings with typically developing children and children who have developmental disabilities. In the current project, "A Relationship-Focused Approach to Family Stabilization," funded by the Bill and Melinda Gates Foundation, the team is working with 55 families at the Phoenix Housing Network, which provides shelter and transitional housing in Tacoma, Washington.

Many homeless parents feel like failures and are worried that they are unable to effectively meet their young children's needs. Therefore, a key focus of the "Promoting First Relationships" curriculum is to build on parents' strengths rather than point out

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CHDD is an interdisciplinary center dedicated to the prevention and amelioration of developmental disabilities through research, training, clinical service, and community outreach. CHDD includes the University Center of Excellence in Developmental Disabilities and the Mental Retardation and Developmental Disabilities Research Center.

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weaknesses. “We try to build feelings of confidence in parents, rather than increase blame, guilt, avoidance, or denial,” says Kelly. “We teach problem solving and help parents find better ways to deal with stress.” Ultimately, the team hopes to encourage a cycle of positive interactions between parent and child.

Parents in the program meet regularly with staff members, who may provide general information on parenting skills. However, the staff members’ primary job is to reinforce specific positive behaviors between parent and child. Typically the parent spends a portion of each session playing with her child. The staff member provides detailed, positive feedback during the session and again while the staff member and parent watch a videotape of the session.

> “We try to build feelings of confidence in parents…Within a few months, we can see big improvements for children.”
>
> - Jean Kelly

Julie Nagel, L.I.C.S.W., early childhood consultant with the project, provides several examples of positive feedback: “I just noticed the delightful way in which you gave him a choice between the red or the blue cup. Giving him choices helps him feel a sense of control and independence.” or “You gave him such a nice message in telling him how special he is when he brought you the book. It’s such a wonderful way to show him he is worthy and loved.”

“Within a few months, we can see big improvements for children,” says Kelly. “I believe that if a parent is sensitive and emotionally available they can overcome many of the effects of poverty on their children’s development.” Kelly is careful to note that even the best parental nurturing may not alleviate all the impacts of extreme family stress, such as domestic violence or drug abuse.

Nevertheless, she is heartened by the gains she has seen. For example, one mother had been incarcerated shortly after her child was born. When they were reunited after several months, the baby was difficult to engage and the mother felt anxious and discouraged about her ability to parent. “She felt guilty, ashamed, and full of doubt. She was afraid that she would not be able to be the parent that she wanted to be,” says Kelly. But this mother made steady progress. After eight visits, while watching a videotape of a session with her baby, she said, “I don’t know how I became such a good parent.” When Kelly checked in with the mother two and a half years later, she was no longer homeless and her child was progressing well.

Kelly’s colleagues on the Family Stabilization project in Tacoma include JoAnne Solchany, R.N., Ph.D., assistant professor of family and child nursing, and Susan Spieker, Ph.D., and Kathryn Barnard, Ph.D., F.A.A.N., both professors of family and child nursing and CHDD research affiliates. Spieker also directs the CHDD Behavioral Science Core and Barnard is director of the Center on Infant Mental Health and Development. Members of the intervention staff include Nagel, Kim Buehlman, M.A., L.M.H.C., and Jennifer Rees, M.S.W.

For information on the “Promoting First Relationships” curriculum or a schedule of workshops in its use, call Jennifer Duval, program coordinator of “Promoting First Relationships” and the Tacoma project at 206-616-3823, or visit the program web site at (http://www.son.washington.edu/centers/pfr). ◆


Jean Kelly

Deciphering Viral Defenses

Pregnant women once dreaded the pink rash and inflamed eyes of rubella. If they became sick, their babies could be born with damaged hearts, brains, or hearing. But in the U.S., a vaccine stopped rubella epidemics. Public health agencies hope to eventually repeat this success story with cytomegalovirus (CMV), a herpes virus that is currently the primary cause of prenatal viral infection in the U.S.

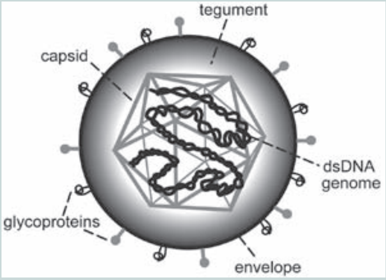
Vaccine development will build on work of researchers such as Adam Geballe, M.D., professor of medicine and research affiliate at the Center on Human Development and Disability (CHDD). Geballe studies the ways that CMV and other viruses evade the human immune system.

CMV infection is widespread; the Centers for Disease Control and Prevention estimate that as many as 85 percent of adults have encountered the virus. It causes minimal illnesses in otherwise healthy people infected after birth; most people don't even know they've been infected.

However, the virus can be devastating to children infected before birth. Each year, about 5,000 to 10,000 children suffer serious complications from prenatal CMV infection, including hearing loss, vision impairment, liver and kidney damage, and developmental disabilities. Symptoms may be apparent at birth or develop later in life.

Prenatal CMV infection almost always occurs in the children of women who contract the virus for the first time during pregnancy. "Sometimes it's a mother's second child who's affected," said Geballe. "One scenario is that a woman who has never been infected has a child. She sends the child to day care. CMV is passed around in day care so the first child brings the virus home when the mother is pregnant with her second child."

CMV can also cause severe illness in adults with compromised immune systems, such as persons undergoing cancer treatment. Geballe sees many such patients in his practice as a consulting physician with the Seattle Cancer Care Alliance. The total costs of treating CMV infection may be as much as $4 billion annually, according to the Institute of Medicine (IOM) of the National Academy of Sciences, which has called for the development of a CMV vaccine.



Cytomegalovirus (CMV) can cause severe disabilities in children infected before birth. CHDD researcher Adam Geballe is isolating genes that allow this herpes virus to evade the immune system, information that may contribute to the development of a CMV vaccine.

Development of a successful CMV vaccine may require detailed knowledge of the defenses used by human cells to combat CMV infection, as well as counter-defensive measures used by the virus to block host cell defenses. Geballe's CMV research focuses on defense pathways that involve gene translation. Gene translation is the process of transforming genetic information into proteins. It occurs when information in DNA is copied into messenger RNA (mRNA), which is then transported to the regions of the cell that make proteins.

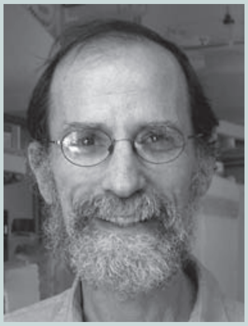
> "What we learn is likely to have implications far beyond CMV."
> - Adam Geballe

Gene translation is key to viral infection because viruses lack the ability to make proteins on their own. To reproduce, they hijack the host cell's protein-making machinery and use it to make viral proteins. As a result, cells have evolved defenses to detect and halt viral gene translation. In turn, viruses such as CMV have evolved counter strategies to continue gene translation despite the attempts of a host cell to stop it.

Geballe's research, in part, focuses on defense mechanisms involving double-stranded RNA (dsRNA). Double-stranded RNA, as its name implies, has two strands of genetic information, a configuration similar to DNA, which is also doubled-stranded. (In contrast, mRNA is single-stranded.) Many viruses produce dsRNA during infection. The presence of dsRNA in a cell can be "a sort of alarm signal," said Geballe. As a result, many host cell defenses are triggered by dsRNA, including defenses against CMV.

Geballe's team has detected two genes critical to CMV's counter defenses against host cells. "These might be good genes to eliminate in designing a vaccine against CMV," said Geballe. Experiments that removed similar genes from other viruses dramatically reduced their ability to cause disease in animals. A better understanding of defenses against CMV may also help scientists understand why some children are especially vulnerable to this devastating infection. "One percent of babies born in the U.S. are infected with CMV, but only about 25 percent of these children suffer from developmental disabilities or other serious complications," said Geballe.

Geballe's studies of gene translation in CMV may also contribute to the prevention and treatment of other viral diseases, and even of other types of disease. For example, his research could illuminate aspects of cancer, which is caused, in part, by the cell's failure to regulate gene translation, leading to uncontrolled growth. "Viruses are great tools for studying basic biological properties such as gene translation, so what we learn is likely to have implications far beyond CMV," said Geballe. ◆



Adam Geballe

Youth with FASD and the Law: Helping Them Stay Straight

Susan Astley leads a training session on techniques to recognize youth with fetal alcohol spectrum disorders (FASD). The training was sponsored by Skagit County FASD Juvenile Court Initiative. More than 200 staff members involved with juvenile justice programs have been trained so far.

Many adolescents with brain damage from prenatal alcohol exposure find themselves in juvenile court, often without quite understanding how they got there. To identify these young people and help them receive treatment to reduce their odds of re-offending, researchers at the Center on Human Development and Disability (CHDD) are working with a juvenile court system in rural Washington State.

> "While at risk of delinquency, youth with FASD are also at risk of becoming victims. So our goal is not only to prevent these youth from committing crimes but also to prevent them from being harmed."
>
> \- Bob Hicks

Prenatal exposure to alcohol can cause a range of developmental disabilities, collectively known as fetal alcohol spectrum disorders (FASD). As many as one percent of children in the U.S. are born with FASD. Perhaps half of these children may be incarcerated sometime during their lives, according to a study led by Ann Streissguth, Ph.D., emeritus professor of psychiatry and behavioral sciences and CHDD research affiliate.

"We became aware of FASD as a risk factor for youth here and decided to see what we could do about it," said Bob Hicks, project director of the Skagit County FASD Juvenile Court Initiative, a project of the national Fetal Alcohol Spectrum Disorders Center for Excellence. Training staff members to recognize youth with FASD is a key part of the Skagit County initiative. Therefore the Skagit County team recruited Susan J. Astley, Ph.D., director of the Washington State Fetal Alcohol Syndrome Diagnostic and Prevention Network (FAS DPN), professor of epidemiology, and CHDD research affiliate. Through spring 2006, Astley and her team trained almost 200 staff members involved with the initiative, including probation officers with the Skagit County Juvenile Court and officers from the courts of four tribal nations: the Sauk-Suiattle Indian Tribe, the Swinomish Indian Tribal Community, the Samish Indian Nation, and the Upper Skagit Tribe.

Diagnosis of FASD can be complex because prenatal alcohol exposure can cause a range of disabilities, depending on the timing and severity of exposure. Persons with the most easily diagnosed disorder, fetal alcohol syndrome (FAS), have distinctive facial features, including a thin upper lip, smooth philtrum (the groove between the nose and upper lip), and small eyes. Not all individuals damaged by prenatal alcohol exposure have FAS. Many have brain damage that is as severe as persons with FAS, yet lack the distinctive facial features of FAS.

FASD can impair the brain's executive functions, such as the ability to plan, delay gratification, and control impulses. Persons with FASD may also have great difficulty understanding abstract concepts such as time and the difference between legal and illegal acts. "Often, an outcome of FASD is that people aren't able to link actions and consequences," said Hicks, adding that this characteristic can put them in conflict with the courts, which are "a consequence-driven system."

Persons with FASD may also be trusting and vulnerable to peer pressure. "They're often a kind of social chameleon and they'll try to get along no matter what," said Hicks. "If they're with a group looking out for their best interests, that's good. But they might fall in with a group that's predatory and that can be tragic." For example, persons with FASD may be easily persuaded to steal a car or break into a building. If arrested, they may be so eager to please court officers that they waive their rights to legal counsel, sign forms they don't understand, or confess to crimes that they haven't committed.

The goal of Hicks' program is to direct young offenders with FASD to services and treatment. For example, intense, structured supervision can help persons with FASD stay out of legal trouble. Successful programs

Susan Astley

have included supervised living situations, life skills education, and drug and alcohol treatment. “We would like there to be more services, but many are already available,” said Hicks. “For example, we can work with the schools to give these youth more hands-on vocational training, as opposed to academic work, which is too abstract for many youth with FASD.” The team also draws on the expertise of Heather Carmichael Olson, Ph.D., an expert on intervention and treatment for persons with FASD. Carmichael Olson is a senior lecturer in psychiatry and behavioral sciences and a CHDD research affiliate.

The first step toward treatment is identifying youth with FASD. Therefore, the training provided by Astley and her colleagues at the FAS DPN “has been crucial,” said Hicks. Under the Skagit County initiative, probation officers and other persons in the system who suspect a youth may suffer from FASD refer the youth to Hicks and his colleagues for evaluation. If the members of Hicks’ team think FASD is a possibility, they refer the youth to the FAS DNP clinic for a definitive diagnosis. If a youth is diagnosed with FASD, the Skagit County team is available to support the family in the process of obtaining services.

Hicks and his colleagues are also working to increase awareness of FASD among schools and community groups, as well as be juvenile justice systems. “We’d like to develop community services that effectively intervene and reduce exposures to risks faced by youth the FASD. While at risk of delinquency, youth with FASD are also at risk of becoming victims. So our goal is not only to prevent these youth from committing crimes but also to prevent them from being harmed.”

More information on the FAS DPN is available online at http://www.fasdpn.org; information on the Fetal Alcohol Spectrum Disorders Center for Excellence is available at http://www.fasdcenter.com/; and the Parent Child Assistance Program at http://depts.washington.edu/fadu/FADU.projects.html#B23P. ♦

FAS Prevention Successful in Washington State

Efforts to prevent fetal alcohol syndrome (FAS) have been successful in Washington State, according to a recent analysis by Astley. Prevention programs began in the 1970s when researchers at the University of Washington, including Streissguth, discovered that prenatal alcohol exposure causes permanent brain damage. Prevention efforts increased substantially in the 1990s with support from the Centers for Disease Control and Prevention and a mandate from the Washington State Legislature. Programs range from public education, such as notices in restaurants (example below), to direct intervention with women at high risk of drinking alcohol while pregnant.

Intervention programs include the Parent-Child Assistance Program led by Therese Grant, Ph.D., director of the University of Washington Fetal Alcohol and Drug Unit, research assistant professor of psychiatry and behavioral sciences, and CHDD research affiliate.

To determine if these programs have been effective, Astley compared women’s reports of their drinking with the incidence of FAS in foster children. The information on drinking by women before and during pregnancy came from a 1993-1998 series of annual surveys (Pregnancy Risk Assessment Monitory System) collected by the Washington State Department of Health. The FAS data were collected by the FAS Screening Program, conducted jointly by the Washington State FAS DPN and the Foster Care Passport Program, which maintains health records for children in foster care. The program has screened foster children for FAS since 1999. Astley found that the percentage of children born with FAS decreased from 1993 to 1998, the same time period when women reported significant reductions in alcohol use during pregnancy.

This trend can be extrapolated to the rest of the children born in Washington State during these years, according to Astley. “As goes foster care, so should go the whole population,” she said. In addition, declines in FAS should also indicate a decline in the number of children with other types of FASD. “It seems clear that all the effort and taxpayer dollars that have gone into trying to prevent FASD are working,” says Astley. “So we need to keep it up. We still have a long way to go.” ♦

Children with Autism See Faces Differently: Brain Scans May Diagnose Disorder in Toddlers

Avoiding eye contact is common among persons with autism spectrum disorders (ASD), a group of neurological disorders that disrupt connections in the brain crucial to social communication. “Individuals with autism tend to focus on the parts more than the whole of a face,” says Sara Jane Webb, Ph.D., research assistant professor of psychiatry and behavioral sciences and research affiliate at the Center on Human Development and Disability (CHDD). “If you’re focused on just one part of the face, it means you’re missing information from the rest,” said Webb. This tendency contributes to difficulties in interpreting facial expressions or paying attention during conversations.

Webb focuses on the way the brain processes information from faces because these functions are critical building blocks of social skills.

Above, a three-year-old models the sensor net participants wear during EEG studies. The sensors record the activity of the brain as it responds to images.

Above, during studies of facial processing, participants watch images of familiar and unfamiliar faces.

Webb is developing techniques to test the ways the brains of persons with ASD respond to images of faces. These tests may be used to assist in detecting young children at risk for developing ASD, as well as to track the effectiveness of treatments for ASD. Webb’s collaborators include Geraldine Dawson, Ph.D., director of the CHDD Autism Center, professor of psychology, and CHDD research affiliate; and Elizabeth Aylward, Ph.D., professor of radiology, and CHDD research affiliate.

Webb focuses on the way the brain processes information from faces because these functions are critical building blocks of social skills. For example, studies by Webb and Dawson have shown that children with ASD who have more typical patterns of brain responses to faces also tend to have more typical patterns of interactions with others. In addition, says Webb, “face processing is an area that we can measure well.”

Webb and her colleagues analyze brain activity with electroencephalography (EEG), which measures electrical signals from groups of neurons. “You never have just one neuron firing,” says Webb. “Your brain works as a unit. When a population of neurons become active, they fire together.” Some of this electrical activity travels to the surface of the brain where it can be detected by sensors on the scalp. “We can see millisecond changes in the activity of a group of neurons, a whole time course of activation,” says Webb.

Certain patterns of activation in relation to a specific event are called event-related potentials (ERPs) and represent the strength and speed of the brain’s activation. In other words, ERPs measure the swift actions of the brain as it responds to an image, sound, or thought. Therefore, study participants do not need to consciously or explicitly respond to an event for an ERP to be recorded. As a result, researchers can collect ERP data from persons who may not be able to participate in other types of tests.

“The strongest thing about EEG methodology is that it is applicable to everyone, regardless of their abilities,” said Webb. EEGs can be especially useful in studies involving people who have difficulty speaking or understanding language, either because of a developmental disability or their age. For example, Webb and her colleagues are pioneers in developing EEG techniques for use with very young children. “The University of Washington is one of the few universities in the world that has been able to use this methodology across the age spectrum,” says Webb. Currently, Webb is testing children aged 18 to 30 months.

“The strongest thing about EEG methodology is that it is applicable to everyone, regardless of their abilities.”

Sara Jane Webb

Research with young children has shown that patterns of facial recognition begin very early. In typically developing children, the brain responds differently to familiar faces than it does to unfamiliar faces. For example, in one of Webb’s studies the brains of newborns generated different ERPs when the infants were shown images of their mothers, than they did when the infants saw images of women who were not their mothers. The brains of typically developing children also make distinctions

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Faculty Members Appointed as New CHDD Research Affiliates

Olivia Bermingham-McDonogh, Ph.D., is a research assistant professor of otolaryngology—head and neck surgery. She studies the genetics of development of the cochlea of the inner ear with the goal of contributing to therapies for hearing loss. Specifically, she examines the role of fibroblast growth factors (FGFs) in the development of specific cell types, including Pillar cells, which support auditory hair cells. FGF mutations can cause profound deafness. She is also interested in determining what factors prevent hair cells in mammals from regenerating after damage, as they do in birds and lower vertebrates. Bermingham-McDonogh earned her Ph.D. in biochemistry at the University of California, Los Angeles.

Raymond T. Ferri, M.D., Ph.D., is an acting assistant professor of neurology. He studies leukodystrophies. These inherited, degenerative disorders cause the loss of myelin sheaths, which, in turn, can lead to a wide range of symptoms including muscle spasticity and weakness, and childhood dementia. Ferri's goal is to improve understanding of leukodystrophies and to identify potential targets for therapies by studying oligodendrocytes, the cells that form myelin. He currently focuses on genes, such as transcription factors, that regulate oligodendroctye activity during typical myelin development and maintenance. Ferri earned his medical degree and Ph.D. in biochemistry at The Medical College of Pennsylvania.

Thomas Moeller, Ph.D., is a research associate professor of neurology. He studies microglial cells, the primary immune cells of the nervous system, and the signaling molecules that trigger microglial activity and inflammation in the brain. He is currently focusing on compounds that can leak in the brain during seizures and strokes. Strokes occur more frequently than brain tumors in children and inflammation associated with strokes can cause severe brain damage. Better knowledge of the signaling pathways involved in brain inflammation may lead to better interventions to minimize the impact of strokes and other brain injuries. Moeller earned his Ph.D. in neuroscience at the Free-University in Berlin.

Fred Bookstein, Ph.D., is a professor of statistics and of psychiatry and behavioral sciences, and scientific director of the Fetal Alcohol and Drug Unit. He uses his expertise in morphometrics (the measurement of biological shape and shape change) to study brain damage in persons diagnosed with fetal alcohol spectrum disorders (FASD). Currently, his research focuses on correlations between brain shape and behavioral deficits and psychiatric problems in persons diagnosed with FASD. He is exploring new ways to detect this brain damage at birth, so alcohol-affected children can be diagnosed and begin receiving appropriate interventions at the earliest possible age. He earned his Ph.D. in statistics and zoology at the University of Michigan.

Bryan H. King, M.D., is a professor of psychiatry and behavioral sciences. He studies psychopathology in persons with developmental disabilities and potential treatments for persons with these conditions. His primary focus is repetitive self-injurious behavior (SIB). He has explored animal models of self-biting with the aim of better understanding the causes of SIB in persons with autism spectrum disorders (ASD) and other developmental disabilities. King is currently involved in studies of the safety and effectiveness of medications to treat behavioral disturbances in persons with ASD. He is also exploring better ways to collect data in clinical trials involving this population. King earned his medical degree at the Medical College of Wisconsin, Milwaukee, Wisconsin.

Sean Murphy, Ph.D., is a professor of neurological surgery. He studies mechanisms that can protect the brain from damage caused by strokes. Strokes can occur at any age, and are especially devastating in infants. He currently focuses on the potential of two drugs, progesterone and granulocyte stimulating factor (G-CSF), that suppress specific aspects of harmful, post-stroke brain inflammation in animals, resulting in smaller areas of tissue death and preservation of cognitive and motor skills. Murphy also studies the effects of these drugs on the development of new neural cells after stroke. Murphy earned his Ph.D. in cell biology at the Open University, United Kingdom.

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between familiar and unfamiliar objects, such as toys.

In contrast, children with ASD show a different pattern of brain activation. EEG studies by Webb and others have found that the brains of children with ASD are better at distinguishing between familiar and unfamiliar objects than they are between familiar and unfamiliar faces. In addition, children with ASD tend to process information about faces more slowly than typically developing children. These and other differences indicate that certain types of brain circuitry in persons with ASD "either formed incorrectly or didn't form at all," said Webb.

A primary goal of Webb's research is to determine how much of the atypical brain structure of children with ASD is set at birth and how much develops over time. If the atypical structure develops over time, it is possible that early interventions may help the brains of children with ASD grow in a more typical fashion.

Motivation to interact with others may be crucial to developing more typical brain circuitry. "Typically developing children are highly motivated to watch other people and look in their eyes. Children with ASD are much less motivated," said Webb. Because typically developing children are motivated to engage with others, they get extensive practice in social interaction, practice that may be crucial to development of specialized brain circuitry for social tasks such as face processing. Children with ASD may get less pleasure from social interactions because of the way the reward structures of their brain are organized.

> "We're going to keep measuring the same responses in the same children each year. If the interventions are successful in improving social motivation and social skills in children [with ASD], then we should see changes in the face-processing circuitry as well."
>
> Sara Jane Webb

CHDD researchers are testing interventions designed to make social interactions more rewarding for children with ASD and so motivate them to engage more frequently with others. Webb's EEG tests may eventually provide a quantifiable way to determine if these interventions are helping children with ASD develop more typical patterns of brain organization. "We're going to keep measuring the same responses in the same children each year," said Webb. "If the interventions are successful in improving social motivation and social skills in these children, then we should see changes in the face-processing circuitry as well." ◆

Sara Jane Webb

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