MED PROFESSOR TAPS INFANT MINDS FOR EARLY CLUES
BY CHRIS BERDIK

Electrodes measure small voltage changes caused by brain activity as a fifteen-month-old control subject in Helen Tager-Flusberg's study is exposed to word sounds and images.

Where Autism Begins

THE INFANTS IN Helen Tager-Flusberg's lab stare at alternating pictures of mommy and a stranger on a computer monitor. Later, a string of word sounds — ta, ta, ta — is emitted from nearby speakers. The babies wear what look like white plastic hairnets, which are actually a set of electrodes that record small voltage changes called event-related potentials, or ERPs, that indicate brain activity.

It's a strange scene, but the babies and their hairnets are part of a research project funded by the National Institutes of Health and the Autism Speaks Foundation. The goal is to identify children at high risk for autism well before the onset of the behavioral symptoms — trouble with language, lack of eye contact, social isolation, and repetitive motions — that have traditionally led to its diagnosis.

In recent years, the clinical definition of autism has broadened to include a range of neurological impairments known as autism spectrum disorders, and they affect one out of every 150 children born in the United States, according to the Centers for Disease Control and Prevention. And while the causes of autism remain a mystery, Tager-Flusberg, a School of Medicine professor of anatomy and neurobiology and director of the NIH Autism Research Center of Excellence at BU, says that early behavioral interventions focused on language and social skills can significantly lessen the disorder's effects.

Tager-Flusberg and Charles Nelson, a professor of pediatrics at Harvard University and research director of the Developmental Medicine Center at Children's Hospital Boston, are using ERP studies to look for telltale differences in infant brain development. Because every new picture or word sound creates an ERP wave "signature," the researchers can analyze the ERP patterns produced by at-risk infants, those with siblings diagnosed with autism, and compare them to control infants, whose siblings have not been diagnosed with autism.

The babies are first tested at three months, and then again every three to six months until they are two. While findings are still preliminary, some clear differences in brain development are already apparent. All of the younger infants, whether at-risk or controls, "find mom's face to be so much more interesting than a stranger's face," says Tager-Flusberg, leading to a significant difference in the ERP wave signature gathered when her picture appears. But by nine months, babies with typical brain development have a greater interest in, and sensitivity to, strangers' faces than do at-risk infants.

Likewise, the brains of all six-month-old infants are primed to learn any language, and thus process an English "ta" as a different sound from the subtly distinct Hindi "ta." But after several months, the typically developing brain is a more efficient processor of speech, concentrating language tasks in a particular part of the brain's left hemisphere.

According to preliminary ERP results, the language processing of at-risk infants involves more areas of the brain, evidence consistent with brain scans of older children diagnosed with autism. "It appears that they need both hemispheres of the brain to process language, so it's a lot more effortful," says Tager-Flusberg.

If the ERP research can identify autism risk signs in infants, the next step will be developing intensive "parent-based interventions appropriate for such a young age group," she says. ∎