

Geraldine Dawson, Autism Sleuth

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Twenty years ago, the average person was probably as acquainted with autism as they were with the Internet, but both have since seen a rapid, profile-raising proliferation. In fact, the exploding prevalence of autism — a greater than tenfold increase in the last 40 years, with current estimates of one in 88 children in the United States affected — amounts to an emerging public health crisis. Naturally, this increased prevalence has come with soaring costs, currently estimated at around \$137 billion annually.

As with other global health challenges like Alzheimer's disease, early detection and intervention are vital. Perhaps no one is more keenly aware of this than 2012 James McKeen Cattell Fellow Geraldine Dawson, the chief science officer for [Autism Speaks](#) and founding director of the University of Washington's Autism Center. Informed by more than 30 years of autism research, Dawson discussed the current state and future direction of autism detection and treatment in her award address at the 24th APS Annual Convention.

She began by giving an overview of autism, explaining that symptoms vary widely from child to child but tend to fall within three major areas: social interaction, communication impairment, and repetitive behaviors. Autism is also associated with a range of other conditions, from sleep and mood disorders to attention problems and seizures.

“Autism isn't just a brain disorder,” Dawson clarified. “It affects the whole body.”

Although current diagnosis can point to one of many subtypes of autism, the upcoming fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* will bring them all together under the singular diagnosis of autism spectrum disorders. The reasoning, according to Dawson, is that there is actually little scientific evidence for the divisions created by diagnostic subtyping.

“If you're a person with Asperger's syndrome, you may care very much that you retain that diagnosis, and people can continue to do that,” she said. “But the fact is, it doesn't prescribe a specific treatment, it doesn't map onto a specific etiology, and in fact expert clinicians cannot reliably make these distinctions.”

Although the average age of diagnosis in the US is currently around five years, Dawson has found that autism can be detected in children as young as 12 months. This is done through traditional diagnostic tools like questionnaires, as well as emerging behavioral, electrophysiological, and brain-imaging detection techniques. Amazingly, electrophysiological measures can detect anomalies in brain signaling even before a child begins showing symptoms: An atypical pattern of brain activation in response to faces can be seen in 10-month-olds who eventually go on to develop autism. Neuroimaging based on MRI has also revealed that brain structures develop atypically in autistic children and this pattern can be seen even before all of the symptoms emerge; interestingly, the white matter fiber tracts in their brains

actually grow faster than normal at first, before this growth plateaus and eventually reverses as the brain begins to slow in its development.

“This is a very dynamic process,” Dawson said, “and you have to study brain development over time to see the abnormalities in the growth trajectory.”

She explained that one of the most urgent lines of research is in identifying biomarkers that can be used to detect increased risk for autism at a very early age, with the aim of initiating interventions as soon as possible.

“In an ideal situation now, we diagnose kids by 18 to 24 months, they get on a waiting list, and they don’t start intervention until maybe three years of age,” said Dawson. “What we want to do is to begin intervention far earlier in this developmental course, with the hope that we might be able to alter the course of brain development.”

Indeed, animal model studies have shown that early intervention can significantly reduce or even eliminate the negative effects of early brain injury (such as a stroke) or genetic risk.

Current early intervention strategies for autism come in many forms, including several based on applied behavior analysis methodology. Although many studies have demonstrated the positive effects of this approach on IQ, language, and adaptive behavior, Dawson wanted to take advantage of the plethora of new findings in developmental psychology related to the way infants learn. “There’s a whole science of learning now, so how can we incorporate those concepts into the interventions that we’re using?” she wondered.

For instance, the passive activities found in many traditional treatment environments, like responding to prompts, may be counterproductive.

“We know that typical children are active explorers,” said Dawson. “They’re constantly forming and testing hypotheses in the environment.”

In addition to active engagement, Dawson noted that social interaction with people is also a highly important factor.

“There is something about information being delivered in an affectively rich social context that is important for brain development,” she said.

With this information in mind, Dawson and her long-time collaborator APS Fellow Sally Rogers, of the University of California, Davis, designed the Early Start Denver Model (ESDM) for autism intervention in children as young as 12 months. The multi-year curriculum covers all aspects of development, from motor and language skills to imitation and social skills.

“We’re really building a whole child, so to speak,” said Dawson.

There is a special emphasis on cultivating an emotional bond between the child and the therapist, so interpersonal exchanges and joint activities are conducted within a positive affect-based context. (Rogers

refers to this as “finding the smile.”)

Although the intervention is led by a therapist, Dawson stressed the importance of parental involvement, a core feature of ESDM.

“Parents are taught these strategies from the get-go,” she said, “so they’re using them at home — in the context of every interaction, they’re using strategies so that each interaction can be an opportunity for learning.”

The results of the first randomized controlled trial (RCT) of ESDM, which compared it with a group of other interventions available in the Seattle area (the community intervention, or “treatment as usual” group), were quite positive. Although the number of hours invested in each intervention group was nearly the same, one year of ESDM intervention had a significant positive effect on IQ and receptive language. Similar effects were seen in adaptive behavior: Whereas those in the ESDM group mostly kept up with their nonautistic peers or fell slightly behind, the community intervention group fell further and further behind as the trial progressed.

Brain imaging studies confirmed the physiology behind these cognitive and behavioral gains: The ESDM group showed faster responses to faces than objects (in autism — and the community intervention group — the opposite was true), and spectral analysis of EEG signals revealed that cortical activation was much greater in response to faces than objects in the ESDM group, as it is in typical children.

After the two-year RCT was complete, Dawson and her colleague, Annette Estes at the University of Washington, continued to follow up with the children; she found that, from ages four to six, kids who had received ESDM required about half the number of hours of intervention as their community treatment counterparts did. At age six, they showed reductions in many of the core and associated symptoms of autism.

Despite these positive results, Dawson said that some insurance companies and health-care policymakers want to see more data before they agree to pay for these kinds of interventions. While Dawson now tackles these issues from a policy side through her role at Autism Speaks, Rogers has been leading another larger RCT to gather more insight into the efficacy of ESDM. This second clinical trial has been completed since Dawson’s address, and the initial results will be presented later this year.

Whether these findings will be persuasive enough for all insurance companies remains to be seen, but Dawson is optimistic about the potential of early interventions like ESDM.

“When we provide these interventions,” she said, “we can alter the pattern of early brain development and offer children the best possible outcomes, and I think that’s pretty exciting.”