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IssueBrief

The Science of Early Brain Development

Dr. Pat Levitt, one of the speakers at the 32nd Wisconsin Family Impact Seminar on *The Science of Early Brain Development*, is with the University of Southern California and the Children's Hospital of Los Angeles. In his lab, Dr. Levitt identified a gene that increases the risk for autism spectrum disorder. He has published his research in 190 scientific articles and 65 scholarly books, monographs, and reviews. This issue brief summarizes his seminar presentation.

ADDITIONAL INFO

Dr. Levitt's Family Impact Seminar presentation is available on the web at wisfamilyimpact.org/fis32/. His chapter in the briefing report edited by Rothermel Bascom Professor of Human Ecology Karen Bogenschneider and Olivia Little is also available at this web address.

The Wisconsin Family Impact Seminars are an initiative of the UW-Madison Chancellor's Office and School of Human Ecology, along with contributions from Phyllis M. Northway.

Toxic Stress and Its Impact on Early Learning and Health

Building a Formula for Human Capital Development

Children's early experiences shape the architecture of the brain. Based on decades of research, when the brain is built on a strong foundation, it can improve school success, economic productivity, and responsible citizenship. When the foundation is weak, it increases the odds of later difficulties. Just like building a home, the brain is built in a predictable sequence—laying the foundation, framing the rooms, and wiring the electrical system. During the first few years of life, the wiring grows at an amazing rate. Every second, 700 new neural connections (synapses among brain cells) are formed.

The brain is most plastic early in life. Even during the first year of life, a baby's brain becomes specialized to the sounds it hears and begins losing the ability to respond to other languages. When the circuitry of the brain is not formed properly from the beginning, it takes more physiological energy to rewire it later. So influencing a baby's brain early in life is less expensive than the subsequent costs of remedial education, clinical treatment, public assistance, incarceration, and so forth.

Brain growth is highly interconnected. Children's thinking, emotions, and social skills do not operate in silos, but depend on each other to function properly. Together they are the "bricks and mortar" that form the foundation for human development.

Toxic stress can damage the architecture of the developing brain. Toxic stress refers to events that produce strong, frequent, or prolonged activation of the body's stress response system. Even among children as young as infants, toxic stress results in systems that turn on too quickly or shut down too slowly. In fact, toxic stress can "tune" a child's senses and thinking in ways that make it difficult to correctly interpret the

world around them, function at a high level, and avoid problems later in life. Over time, the wear and tear of the body's response to toxic stress and the chemicals it releases can have consequences that last a lifetime—academic problems, social maladjustment, mental illness, and chronic physical disease.

Responsive and sensitive caregiving can serve as a powerful buffer against toxic stress. Healthy development can be threatened, not only by bad things that happen to children, but also by the absence of good things. Children's ability to cope with stress depends, in part, upon stable and caring relationships with parents and the adults who care for them. Babies babble, coo, and reach out to people who respond with their own words and gestures, much like the "serve and return" in a game of tennis.

Neglect is more common and can be more damaging to a young child's development than physical abuse. Young children who are neglected may not have physical harm, but they may still have disruptions in the circuitry of their brain. Neglect interferes with the development of the prefrontal cortex that supports a wide range of executive functions such as planning, controlling impulses, solving problems, and staying focused. Also, serious deprivation is related to abnormal activities in parts of the brain that deal with emotion and stress regulation, as well as attention and self-control.

Children who have been neglected have the capacity to recover. Evidence-based programs and policies that target both children and their parents/caregivers produce biological changes in children's response to stress that can have lifelong benefits. Most child welfare agencies have limited capacity to address child neglect. To prevent neglect, targeting family circumstances such as addiction to substances, financial hardship, medical challenges, parental depression, and social isolation can have a positive impact on child outcomes even though