



Recent research in neuroscience and physiology has profoundly altered our understanding of the mechanisms behind a child's responses to stress, and has also reinforced what physicians have intuitively understood for generations: that children's physical and mental health is inextricably intertwined.

Perhaps nowhere is this phenomenon better illustrated than in the rapidly growing understanding of self-regulation. The core concept of self-regulation refers to the manner in which the brain maintains physiological stability through complex feedback mechanisms. It is this ability to self-regulate that allows a child to respond to stressors in the child's environment.

As in any homeostatic system, the brain regulates the amount of energy expended in order to deal with stressors and then recover so as to promote restoration and growth. When explaining self-regulation to parents and caregivers, we use the classic example of a furnace as a simple homeostatic system. A furnace is regulated by a thermostat—a simple bimetallic strip that is rolled into a coil and then expands or contracts depending on the ambient temperature. In the case of the brain the "thermostat" is an array of systems and sensors running throughout the body – everything from baroreceptors in the blood vessels to neural systems in the subcortex that constantly monitor for potential challenges or threats. These systems and sensors behave essentially in the same way as a thermostat, with both positive and negative efferent signals being sent from the brain to different organs in the body in response to the afferent signals received from the various organs back to the brain.

At the heart of this self-regulating process is the autonomic nervous system (ANS). Just as it did millions of years ago, at the first sign of predator or prey—or anything that seems threatening or exciting—the ANS dispatches neurohormones that prime the body for action: fight, flight, or hunt and capture. These stress responses consume an enormous amount of energy, so the ANS has another mechanism to rapidly restore balance once the danger has passed or the hunt (or math test) is done.

These dual opposing mechanisms that maintain equilibrium are: 1) the sympathetic nervous system (SNS), which releases adrenaline for acceleration and quick action, and 2) the parasympathetic nervous system (PNS), which releases cortisol to slow things down to a rest point for recovery. Together these two systems continuously regulate every

Self-Regulation Information Bulletin #3: A Science Backgrounder

biological detail of a child's existence like breathing, eating, sleeping, studying, and getting along with peers. But if this energy recovery mechanism is overused, and the signs that it needs to rest and restore energy are ignored, then the system can become strained and over time the first early signs of downstream physical and/or mental health problems appear.

The brain's response to high energy-demand is to shut down those parts that are not immediately necessary--- rather like living in a very large house in which you close off the vents in rooms that aren't being used in order to reduce heating costs. The brain operates on a similar principle; but unfortunately, the 'vents' it turns off may be some of the most important ones a child needs in terms of monitoring and modulating his emotions, behaviour, and attention. The brain directs its energy to attend to the body's core needs – e.g., heart, respiration, thermoregulation, large muscle groups – and away from such things as extremities, metabolism, the prefrontal neural systems needed for modulating impulses and strong emotions, and even the systems in the middle ear that detect the human voice.

How do we know when a child is expending too much energy? As listed on the accompanying information sheet for parents, a parent or other caregiver may notice that their child

- has a lot of trouble falling asleep or staying asleep
- is very crabby in the morning
- gets upset easily—even over little things-- and has trouble calming down when this happens
- Has a volatile mood
- Has trouble paying attention, even to familiar voices
- gets angry too often, or seems to be overly sad, fearful, or anxious

A traditional behaviourist approach to such problems would focus on trying to suppress or extinguish the behaviours or the “inappropriate” response to them. But these behaviours are often signs that a child's stress load is too high. Recognizing the sources of the stress load allows a much more effective upstream approach to easing the child's stress level and therefore bringing the child back to a calm and focussed state. This approach underpins the self-regulation approach, a concept rooted in basic preventative health.

Recognizing stressors is therefore critical in supporting stressed children. Some common stressors for children are:

- The child's biology: e.g., his sensory, or sensory/motor system
- Poor sleep regime
- Poor diet (high in processed foods)
- Lack of physical activity
- Stressors in the environment: e.g., too much noise, light, crowding
- The demands being made on the child (e.g., by family, school, etc)
- Too much screen time.

There are three critical steps to addressing these issues:

- Identify and reduce the major stressors on the child
- Help both the child and the parent develop self-awareness of when he/they are becoming over-stressed
- Help the family identify proactive and reactive strategies for mitigating and dealing more effectively with stress.

Primary care physicians and community nurses can play a critical role by helping families recognize and mitigate stressors through the principles of self-regulation. In this way health professionals and parents can work together to identify issues early and promote a healthy developmental trajectory in children.

Stuart Shanker, Brendan Hanley, and Mike McKay
Canadian Self-Regulation Initiative (www.self-regulation.ca)



The MEHRIT Centre