

The Resilient Brain: From Trauma to Thriving

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ABSTRACT

Resilience - thriving in the face of adversity - was once thought to be a trait of a few invulnerable individuals. However, recent research shows that resilience is a universal, life-long capacity of our adaptive human brains. Further, genes are not destiny since neuroplasticity builds new neural pathways to cope with challenges and heal trauma.

Keywords: Resilient brain, resilience

Weller than Well

Karl Menninger proposed that most symptoms of maladjustment are attempts to cope with stress. He observed that the history of psychiatry was progressing through three stages: First came the study of mental illness; next the focus shifted to mental health; and, ultimately, we will learn how to make people "Weller than well".^[1] True to his prediction, these themes are informed by the science of the resilient brain.

Consilience of Knowledge

Harvard sociobiologist E. O. Wilson^[2] observes that every field of study is being overwhelmed by complexity. For example, Googling the terms resilience or trauma will produce millions of hits. Further, various disciplines are fraught with hyper-specialization where research literature becomes inaccessible, incomprehensible, or irrelevant. The antidote is the principle of *consilience*, a term coined by British philosopher of science William Whewell^[3] in the 19th century. Powerful

simple truths are best identified by bringing together knowledge from different disciplines. Specifically, we will find answers to pressing problems by drawing from these four domains:

- **Values.** Dignity and respect must undergird all successful interventions. For example, over a century ago, Rabindranath Tagore^[4] called for replacing punitive methods with love in his school at Santiniketan.
- **Experience.** Most everyday problems are solved by practice expertise. Thus, Maria Montessori spent over half a century studying the education of children from the slums, including a decade working in India where she was in communication with both Tagore and Gandhi. Her comprehensive model of education tapped the "absorbent mind" of children.^[5,6]
- **Natural Sciences.** Most who work in education and social work have limited knowledge of how the

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emerging research on neuroscience might impact their professions. We highlight recent findings of neuroplasticity and epigenetics in this discussion.

- **Social Sciences.** Psychology, sociology, anthropology, and related disciplines all contribute to our understanding of human nature. Notably, the ecology of social relationships is the primary driver of human development, particularly the family, peer group, school, and community. Universal Developmental Needs

A consilience of research shows that brain-based psychological needs shape the course of development. Abraham Maslow^[7] was the first to clearly articulate this in his pyramid of developmental needs. At the most basic level are survival safety needs. These are followed by higher order biosocial growth needs for belongingness, esteem, self-actualization—and in Maslow's final revision, the highest level of self-transcendence—commitment to a person or cause beyond oneself.^[8] A generation later, Stanley Coopersmith's^[9] classic study established that humans measure their self-worth against four standards: significance, competence, power, and purpose.

In his research of child rearing among Native Americans, Lakota psychologist Martin Brokenleg and

colleagues identified four core cultural values that supported universal growth needs: belonging, mastery, independence, and generosity.^[10,11] It soon became apparent that these values were shared by many indigenous cultures worldwide. Canadian anthropologist Inge Bolin^[12] described the same values embedded in “cultures of respect” among natives of Highland Peru. A review of fifteen studies of resilience by Bonnie Benard^[13] identified four corresponding biosocial needs as foundations of positive youth development. More recently, noted resilience scientist from the University of Minnesota Ann Masten^[14] identified four brain programs that underlie resilience. This consilience of research is summarized in the table below.

There is abundant evidence of the primacy of these four biosocial needs which in psychology terms are referred to as *attachment, achievement, autonomy, and altruism*.^[16] In addition, CF Learning research identified two more key developmental needs, namely safety and adventure. These are not products of our social brain but are rooted in primitive approach/avoidance brain stem programs of all living creatures.^[17] Specifically, organisms seek out experiences that promise pleasure and well-being while avoiding experiences that portend pain and threat.

A Consilience of Research on Universal Biosocial Needs

Biosocial Growth Needs	Attachment	Achievement	Autonomy	Altruism
Hierarchy of Needs Maslow, 1943 ^[7]	Belongingness	Esteem	Self - Actualization	Self -Transcendence
Childhood Self-Esteem Coopersmith, 1967 ^[9]	Significance	Competence	Power	Virtue
Circle of Courage Values Brokenleg, 1990 ^[10]	Spirit of Belonging	Spirit of Mastery	Spirit of Independence	Spirit of Generosity
Resilience Research Benard, 2004 ^[13]	Social Competence	Problem Solving	Autonomy	Purpose
Leadership and Service CF Learning, 2008 ^[15]	Belonging	Achievement	Power	Purpose
Brain-Based Systems Masten, 2014 ^[14]	Attachment System	Mastery Motivation	Self -Efficacy	Spirituality/Purpose

The Model of Leadership and Service



As seen in the accompanying figure, this paradigm is called *The Model of Leadership and Service*. As the title suggests, these six developmental needs apply both to helpers and leaders of programs as well as to children, family, or clients being served. Adults whose own needs are unmet are ill equipped to meet these needs in young people. These six developmental needs provide the focus for positive development prevention and treatment intervention.^[18] These are summarized below:

1. **Safety** _ensure physical, emotional, and cultural safety by replacing threat with trust.
2. **Belonging** _strengthen social bonds to create positive family, peer, and community climates.
3. **Achievement** _strengthen intrinsic motivation to engage learners and grow intelligence.
4. **Power** _strengthen self-regulation, responsibility, and positive leadership.
5. **Purpose** _strengthen empathy and find meaning through service to others.
6. **Adventure** _Provide challenges and healthy risks that spark the spirit of joy.

One has only to reverse these positive needs or strengths to see how essential they are. No one thrives in a world of danger, rejection, failure, powerlessness, purposelessness, and boredom.

New Frontiers in Resilience

The term resilience is a relative newcomer to psychology since it was borrowed from the field of physics describing an object that can spring back after being stressed. Masten^[14] notes that research on resilience has progressed through four stages. Initially studies collected long lists of risks and protective factors. Next, attention turned to how resilience developed. Third was

a search for how to build resilience. Most recently, the focus has shifted to neuroscience and epigenetics.

These stages led to a redefinition of resilience. First seen as personality traits of invulnerable children, it is now clear that no persons are invulnerable; trauma or extreme stress without support adversely affects all individuals. Current scholarship supports the view that resilience is a normal capacity of all healthy brains and healthy relational ecology. While there are certainly traits associated with resilience—extroversion, intelligence, likeability—these strengths empower children to solicit relational support. Reviewing five decades of research, Suniya Luthar^[19] concluded that resilience is ultimately grounded in relationships.

All modern neuroscience builds upon the discovery of the neuron by Spanish physician Ramon Y Cajal.^[20] He used magnification and staining of brain tissue to counter the mistaken notion that nerves were continuous like blood vessels. Ramon Y Cajal won the 1906 Nobel Prize for his discovery of the neuron and neuroplasticity - how nerves are developed and pruned through experience. A half century later, Canadian researcher Donald Hebb^[21] surmised that cells that fire together wire together. In the year 2000, Erik Kandel won the Nobel Prize for showing how this was done. Specifically, experiences in the environment redesign brain pathways through a process of turning genes on or off to produce protein needed for growth.^[22] This is the basis of the new science of epigenetics.

Epigenetics

Epi means on top of and epigenetics has overturned the dogma that genes are destiny. Epigenetics shows how experience shapes genes by turning them on or off. Children have highly resilient brains and 84 per cent of their genes are involved in developing the brain.^[23]

Scientists mapping the human genome expected to find 100,000 genes because of the large numbers of proteins in humans. They also believed that the human genome would reveal specific genes tied to mental illness. They were disappointed in both respects. It turns out humans have only 20,000 plus genes, about the same as earthworms. Further, they found no magic genetic bullet to account for mental illness. Instead, scientists rendered the nature/nurture debate obsolete since neither can operate without the other.^[24]

Humans have 23 pairs of chromosomes which contain genes contributed by each biological parent. During fetal development, specific sets of genes turn on proteins causing embryonic stem cells to specialize in one of some 200 types, e.g., skin, neuron, muscle, etc. But all genes are found in the nucleus of virtually every cell of the body. The great puzzle was that genes only took up 5 per cent of the space of the chromosome. Crick, one of the scientists who discovered the double helix chromosome, called the rest of the supposedly unused space as junk DNA.

In fact, “junk DNA” seems to be in charge. Chromosomes contain some 4 million gene switches—a massive control panel that turn genes on or off.^[25] Plant biologists have long recognized that some epigenetic process was redesigning organisms based on nutrients in the soil, moisture, sunlight, etc. Only recently have we begun to fathom the awesome power of epigenetics in molding human nature.

Michael Meaney and colleagues from McGill University in Canada are the most cited researchers in the exciting new field of behavioral epigenetics.^[26] In his original study, Meaney^[27] compared the effect of two kinds of parenting by Norway rat mothers. One set of mothers was highly nurturing, using licking to soothe offspring. The other type of mother was neglectful, often ignoring her pups when they were distressed. The effect was profound. Those with nurturing mothers became curious and resilient. Those neglected became anxious, fearful, and hypervigilant. Simply fostering infant rats to the other type of mother produced the predictable positive or negative outcomes. This process occurs in humans and other mammals as well. Nurturing caregiving activates neurons in the brain's hippocampus that tone down the stress response. But neglectful caregiving leaves the infant at the mercy of an untethered stress reaction system.

In humans, as in other animals, normal stress is adaptive, prepping the individual to meet some stressful challenge, and can even have a “steeling” effect giving resilience to better manage such challenges in the future.^[28] But severe and chronic stress is the stuff of trauma, preparing the individual to meet a hostile environment. Thus, children only thrive when their needs for nurturance are met.

Epigenetics not only affects the stress system, but also learning, immune response, and physical growth.^[29] In addition, the physical environment, toxic chemicals, nutrition, and a host of environmental variables can cause aberrant epigenetic reactions. For example, many of the growing number of children on the autism spectrum have a genetic tendency for this brain variation which is activated by chemicals in the environment. Michael Meaney contends with good evidence that many “side effects” of prescription drugs are in fact epigenetics gone awry. Modern technology has produced 83,000 chemicals that are not natural in the history of human evolution and thus can have wildly unpredictable effects on growth, development, and health.^[30] The solution for these problems is to rear children in the kind of safe, nurturing, and health-promoting environments in which humans are designed to live.

Meeting Growth Needs

Decades before the science of epigenetics, Maslow recognized that when developmental needs are met, the person thrives. In fact, he documented how indigenous First Nations peoples in a Canadian Blackfoot tribe achieved high levels of mental health and positive functioning, far exceeding that in Western culture.^[31] Ironically, after colonial contact and enforced assimilation through residential boarding schools, the healthy culture of Blackfoot people was severely damaged. In plain terms, Maslow^[32] observed that most symptoms of disorder and illness represent unmet developmental needs. So, meeting needs is the core of well-being, and when deprived of these needs, humans show illness and fail to thrive. Cure, he surmised, should focus on meeting needs.

Every profession working in the education, growth, treatment, or development of children, youth, and families faces the challenge of drowning in data which can distract from what are the core essentials for positive outcomes. Einstein suggested that everything should be as simple as possible but not simpler. In that spirit, we suggest that the four biosocial needs (belonging, achievement, power, and purpose) and two more primitive brain-stem needs (safety and adventure) are fundamental. While many scholars elaborate these into subcategories, one should be as parsimonious as

possible.

Our colleagues at CF Learning are involved in research, publication, and training which meets the evidence-based standard of consilience. Specifically, professionals require need-based, strength-building interventions for families, schools, peer groups, and communities. New models of assessment flow from this simple profound science. Practical strategies are available for building connections with relationship-wary persons. Schools need fresh alternatives to colonial models of education which unleash the power of the curious brain. Youth justice systems are being reframed from coercive to positive youth development models. Those working directly with traumatized children need interventions beyond the therapy hour so that everyday relationships in the other 23 hours foster healing and growth. In the words of Karl Menninger, our new challenge is to make persons *weller* than well.

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