IMPACT OF EARLY LIFE DEPRIVATION ON COGNITION: IMPLICATIONS FOR THE EVOLUTIONARY ORIGINS OF THE HUMAN MIND

Glossary

Adversity: Challenging experiences that threaten function, development, or survival of an individual or system.

ACEs: Adverse childhood experiences, usually referring to the measure developed by Felitti and others (1998) for the ACE study.

Allostasis: The process of achieving stability, or homeostasis, through physiological or behavioral change.

Allostatic Load/Overload: The accumulated "wear and tear on the body," or the physiological consequences of chronic exposure to fluctuating or heightened neural or neuroendocrine response, due to chronic stress. The term was coined by McEwen and Stellar in 1993.

Approach/Avoidance Model: A theoretical framework for understanding the onset of maternal behavior in species that avoid infants prior to giving birth to their own. The model was developed based on data from rats and posits that care giving behavior occurs when the tendency to approach infants is greater than the tendency to avoid them. Thus, the model indicates that two distinct processes regulate the onset of maternal care. Mother-infant bonding at birth results not only from an increase in attraction to infant cues but also from a reduction of aversion to them.

Assets: Advantages or resources associated with positive (desirable) outcomes; predictors of positive outcome; also known as promotive factors.

Behavior: The way in which individuals act or conduct themselves, especially toward others.

Bucharest Early Intervention Project: A joint collaboration between researchers at Tulane University, University of Maryland, and Boston Children's Hospital. The study, which began in the fall of 2000, seeks to examine the effects of early institutionalization on brain and behavior development, and to examine the impact of high quality foster care as an intervention for children who have been placed in institutions.

Background: Nicolae Ceaușescu, general secretary of the Romanian communist party from 1965-89, instituted pro-natalist policies (banning abortion, outlawing contraception, and imposing a tax on families with fewer than five children) to increase the Romanian population in an effort to create more workers to bolster the economy. Correspondingly, the birth rate climbed but the poor were unable to afford larger families. It became acceptable to give infants and children to state-run child-rearing institutions, which spawned one of the largest per capita orphanage systems in history. By 1989, more than 170,000 Romanian children were living in institutions. Even ten years after the overthrow of Ceaușescu, the rate of child abandonment did not diminish.

CauCau of Chile: A young boy who had been neglected and abandoned by alcoholic parents in Chile. CauCau lived in a forest without human companionship starting around 1945 at age 7 or 9, until being "found" in 1947.

Central Aversion System: A neural circuit that regulates fearful, defensive and/or aggressive behavioral responses to aversive stimuli.

Chromatin: A complex of DNA and proteins (histone and adaptor proteins) forming chromosomes.

Chromatin Accessibility: The idea that the 3D conformation of chromatin and the presence or absence of regulatory proteins (and their chemical modifications) interacting with histone proteins or directly with DNA can impact whether or not, and to what level, gene expression occurs.

Cognition: The mental action or process of acquiring knowledge and understanding through thought, experience, and the senses.

Competence: Capability for effective function in the environment, potential or manifested**.**

Culture: Behavior and norms that are shared, learned, and socially transmitted. Human culture includes language, institutions, and the creation of shared meaning.

Developmental Amnesia: A selective disorder characterized by marked impairment in episodic memory despite relatively preserved semantic memory.

Developmental Cascade: Spreading effects over time across systems or domains of function that result from interactions in dynamic systems and cumulatively alter development.

Developmental Tasks: Psychosocial milestones or accomplishments expected of people of different ages in a given cultural and historical context; Common developmental tasks include bonding with caregivers, walking, talking, learning to read, getting along with other people, and caring for one's children.

DNA Sequence: The order of nucleotide bases (cytosine, guanine, adenine, thymine).

Dose or Risk Gradient: A graph showing a pattern of rising problems or undesirable outcomes as the level of trauma, exposure to disaster, or number of cumulative risk factors or ACEs increases.

Ecology: The interaction of organisms with their physical environment, along with other organisms.

Epigenetics: A term first coined by the developmental biologist, Conrad Waddington, in 1942 to explain how a singular genotype might produce variations in phenotype across development. He argued that some level of regulation must exists "above" or "over" genes to determine when and where they are expressed. Today the term refers to stable

alterations in gene expression without changes to the underlying DNA sequence.

Fragmented Maternal Care: A measure of abnormal mothering in rodents. Fragmentation score reflects disruptions in the temporal pattern of care typically displayed by rodents. High fragmentation scores indicate shorter nursing bouts and generally erratic behavior.

Fos: A protein that is rapidly synthesized in neurons when they become active and therefore is used as a marker of neuron activity and is involved in regulating gene expression.

Gene expression: The process by which the information contained within a gene (nucleotide sequence) is used to direct protein synthesis and dictate cell function. Nearly all of the cells in the body contain identical genes, but only a subset of this information is used or expressed at any time. The genes expressed in a cell determine what that cell can do.

Hippocampus: A part of the limbic system that plays important roles in the consolidation of information from short-term memory to long-term memory, and in spatial memory that enables navigation. A major component of the brain of humans and other vertebrates. Humans and other mammals have two hippocampi, one in each side of the brain. It is named after its resemblance to the shape of a sea horse.

Histone Deacetylase Inhibitor (HDACi): A drug that inhibits histone deacetylases or molecules involved in modifying histone proteins. Histone deacetylases typically function to reduce chromatin accessibility and gene expression. Therefore, administration of this drug allows for higher levels of gene expression.

***Homo*:** The genus that comprises the species *Homo sapiens*, as well as several extinct species classified as ancestral to, or closely related to, humans.

Intracellular Signaling Cascade: The series of sequential events that transmit signals received at the surface of a neuron to internal regulatory molecules, which are then modified by the signal. These pathways allow external signals from the environment to regulate gene expression.

John Ssebunya of Uganda: In 1989, at age 4-5, he witnessed his father murder his mother and subsequently fled into the Ugandan jungle. He was accepted as a peripheral member of a group of vervet monkeys who cared for and nourished him for a period of two years. He was found and captured in 1991.

Late Bloomers: Individuals from high-risk backgrounds who begin to manifest resilience later in adolescence or adulthood following a period of maladjustment or problems.

Limited Bedding and Nesting: A paradigm used in the laboratory to model scarcity of resources. Mothers (rats/mice) are not given enough nesting materials to build a nest for their infants and neglect/maltreatment occurs as a result.

Maternal Separation: An experimental paradigm in which the experimenter separates a mother rat or mouse from her offspring for some period of time (minutes to hours) to study the effects of maternal deprivation on offspring development.

Medial Preoptic Area (MPOA): A region of the brain located in the anterior part of the hypothalamus that critically regulates care giving behavior.

Neglect: The failure to provide for the development of the child in all spheres: health, education, emotional development, nutrition, shelter, and safe living conditions (including protecting the child from harm). It is the most common form of child maltreatment. In rodents, neglect it is similarly defined as inconsistent care, failure to group displaced infants in the nest, infant avoidance and failure to protect infants from harm or potential harm.

Neurostransmitter: A type of chemical messenger that transmits signals across a chemical synapse, such as a neuromuscular junction, from one neuron (nerve cell) to another "target" neuron, muscle cell, or gland cell.

Neuromodulators: A subset of neurotransmitters that regulate diverse populations of other neurons.

Non-Hormonal Basis of Maternal Care: The finding that care giving behavior can occur in female rats and mice that have not reproduced themselves through repeated exposure to infants.

Parental Behavior: Any behavior of a member of a species toward an immature conspecific that increases the likelihood that the immature organism will survive to maturity.

Poised Gene: The idea that some genes are more easily expressed because of their chromatin state.

Promotive Factor: Predictor of positive outcome under most conditions, whether risk is low or high.

Protective Factor: Moderator of risk or adversity associated with better outcomes particularly when risk or adversity is high.

pS6: A ribosomal subunit that is activated by intracellular cascades and therefore used as a marker for neuron activity. This subunit is physically attached to RNA molecules that are being translated into protein and therefore can also provide information about which genes are expressed in active neurons.

Psychopathology: The study of mental disorders.

Pup: The term used to refer to an infant rodent (rat or mouse).

Pup Retrieval: An infant transport behavior in which the mother uses her mouth to gently carry a pup by the back of the neck. Mothers do this if pups crawl out of the nest or if she has to move her pups to a new nest location. In the laboratory, this behavior can be used as an index of maternal motivation because it is a proactive, voluntary response to an infant.

Resilience: Capacity (potential or manifested) of a system to adapt successfully to challenges that threaten system function, survival, or development; positive adaptation in the context of significant adversity exposure.

Risk: Higher probability of a negative (undesired) outcome.

Risk Factor: Indicator of risk for specified negative outcome in a population.

Selective Attachment: A specific bond formed between a mother and her offspring, which results in the mother exclusively caring for her own young and actively rejecting non-familiar young.

Social-Emotional Development: The experience, expression, and management of emotions and the ability to establish positive and rewarding relationships with others. It encompasses both intra- and interpersonal processes. The core features of emotional development include the ability to identify and understand one's own feelings, to accurately read and comprehend emotional states in others, to manage strong emotions and their expression in a constructive manner, to regulate one's own behavior, to develop empathy for others, and to establish and maintain relationships.

Stress: Effects of disturbances in an individual or system that disrupt adaptive functions; response of a dynamic system to challenges or demands.

Stressors: Events or experiences that typically result in stress on a system.

Subcortical Structure: A group of diverse neural formations deep within the brain which include the diencephalon, pituitary gland, limbic structures and the basal ganglia. They are involved in complex activities such as memory, emotion, pleasure and hormone production. They act as information hubs of the nervous system, as they relay and modulate information passing to different areas of the brain.

T-maze Test: A parental challenge test. The apparatus is a T-shaped Plexiglas structure that is used to measure whether female rats or mice are willing to protect their infants from potential harm. The maze is novel (new) and therefore fear-inducing to neophobic rodents. Rodents that fail to group pups in the nest within 15 minutes are considered neglectful.

Transcription: The first step in gene expression during which the nucleotide sequence of DNA is transcribed into an RNA molecule that can ultimately be translated into protein.

Transcription Factors: Proteins that bind to specific sequences of DNA called regulatory elements, or other proteins that do so, and directly or indirectly affect the initiation of transcription. The activities of transcription factors determine where and when genes are expressed.

Transcriptional Memory: The idea that following repeated stimulus-induced activation, genes become poised or primed to respond to that stimulus.

Translation: The process by which RNA sequences are translated to amino acid sequences during protein synthesis.

Turnaround Cases: Individuals who show a striking change in direction of the life course; In resilience science, a pathway indicating dramatic improvement in adjustment.

Uniparental: Species in which a single parent rears offspring. Over 95% of mammalian species are uniparental with the mother providing sole care.

Vulnerability: Individual or system susceptibility or sensitivity specific to harmful consequences from threats or disturbances; moderator of adversity or risk that results in higher than typical negative effects.

Wild Boy of Aveyron: A French feral child who was captured in 1800 at the estimated age of twelve. A young physician, Jean Marc Gaspard Itard, worked with the boy for five years and gave him his name, Victor. Itard was interested in determining what Victor could learn and devised procedures to teach words and recorded his progress. Based on his work with Victor, Itard broke new ground in the education of the developmentally delayed. Victor is estimated to have been born around 1788 and Itard reported he was a normal child at birth but later he was neglected by his alcoholic parents at an early age, and he left to the wild. Recent commentary by Uta Frith, a German developmental psychologist at the Institute of Cognitive Neuroscience, University College London, postulates that Victor displayed signs of autism.

Wolf-Girls of India: Amala (1918-21) and Kamala (1912-1929) were two feral girls from Bengal, India, who were alleged to have been raised by a wolf family. There is much controversy to the veracity of the girls' wolf story.

This glossary is the product of the Anthropogeny Graduate Specialization students, Anthropogeny faculty, CARTA staff, and the symposium speakers.