Overview of the Stress Response

The Physiological mechanism of the sympathetic/fight-flight response
Allostasis and allostatic load
How chronic stimulation and sympathetic dominance can lead to chronic illness and disease

CONTACT INFORMATION

Jessica Byron, MD, ERYT, C-IAYT
Healing Path Yoga, LLC
www.healingpathyoga.net
STRESS and ANXIETY

Stress
- nonspecific response to real and perceived environmental threats (called stressors).
- A particular environmental change (a demand or an event) may be perceived by one person as stressful and by another as benign.

Anxiety
- The generalized feeling of fear and apprehension associated with a stressor.
- Typically accompanied by activation of the sympathetic nervous system
- If our autonomic nervous system is not working well it is often related to the experience of trauma.

“Trauma is residue in our nervous system—it is more than our system can digest.”
Kimberly Johnson

Autonomic Nervous System (ANS)

Historically the ANS has been broken down into two branches
- the sympathetic nervous system (SNS) – “fight/flight”
- the parasympathetic nervous system (PsNS) – “rest/digest/relax”

There is a third component, the enteric nervous system (ENS) which consists of neurons in the wall of the gut (aka “second brain”).
Stress Response ACTIONS

The **ANS** provides a programmed response that will aid in survival. Physiologically, the stress response is characterized by:

- Activation of the sympathetic nervous system
- Secretion of chemicals into the bloodstream
- Behavioral response that will protect the organism from harm

Sympathetic Nervous System

**Excitatory** prepares the body for action in response to stress

- *“Fight or Flight Response”* - works in combination with the endocrine and lymphatic systems to release adrenaline/epinephrine and other chemicals and hormones
- Briefly: Increases heart rate, increases pupil size, increases blood pressure, increases sweating
- The pre-ganglionic neurons of the SNS arise in the thoracic lumbar spinal cord
HOW THE STRESS RESPONSE WORKS

- Brain senses danger
- The amygdala sends alarm signal to the hypothalamus.
- Hypothalamus activates the SNS
- SNS signals release of epinephrine from the adrenal glands.
- Epinephrine from the adrenal glands is released into the blood.

*All of the above happens in split second*

HPA AXIS *In the Stress Response*

After epinephrine subsides, the second phase of your stress response kicks in:

**HYPOTHALAMUS-PITUITARY-ADRENAL**

The HPA triggers your adrenal glands to secrete cortisol and keeps your sympathetic nervous system in high gear. This continues as long as you are faced with a threatening situation.
FIGHT or FLIGHT

- In the 1920s, Walter Cannon recognized that the autonomic nervous system was activated in response to stress and suggested that stress mobilizes the body's responses in readiness for either attacking (fight) or fleeing (flight) an enemy or threatening situation.

- These responses may have promoted survival when they evolved in human history but they are not productive given the longer periods of stress exposure common in modern life.

- Trauma can have serious long-term effects on health and other life outcomes. Common responses to trauma are the physiologic and psychologic responses we experience in the Stress Response.
SNS: List of effects of engagement

- Fight or Flight, release of adrenaline/epinephrine
- Increases heart rate
- Increases blood pressure
- Increases respiratory rate and dilates bronchi
- Increases pupil dilation
- Increases sweating
- Increases muscle tension
- Decreases peristalsis and digestive secretions
- Inhibits bladder contractions
- Affects Immune response

REACTIONS OF THE BODY TO STRESS

In response to a threat or demand, stress chemicals are released into the bloodstream which puts the body on alert. This is done by a series of specific reactions in the body:

- Increased sympathetic nervous system activity
- Increased stress chemicals
- Increased heart rate
- Increased blood pressure
- Increased metabolic rate for increased energy, including the release of glucose from the liver.
REACTIONS OF THE BODY TO STRESS

- Increased functioning of the endocrine portion of the pancreas related to the production and control of glucose
- Bronchiole dilation for more oxygenation
- Contraction of muscles, especially the large muscles of the body used for fight-or-flight like the thighs, back and shoulders
- Shunting of blood from the internal organs to the large muscles, resulting in reduction of digestive activity
- Shunting of blood away from the sex organs
- Vasoconstriction
- Increased alertness, dilated pupils

Allostasis

- Allostasis is the body’s way of keeping all the systems in balance, particularly as we move from one situation to another. It is the body’s mechanism for adapting and adjusting to meet perceived and anticipated changes and demands for resources.

- Allostasis is an adaptive concept, a critical component in our understanding of how the body responds to the stress in our environment (Sterling and Eyer, 1988).

- Allostasis emphasizes adjustment in “the internal milieu to meet perceived and anticipated demand.”
Dr. Bruce McEwen describes the crossover from acute to chronic stress as a journey from allostasis to allostatic load.

If allostasis is the body's ability to maintain balance under stress, allostatic load refers to the factors that threaten to destabilize it.

The transition from acute to chronic stress is a journey from allostasis to allostatic load.
Types of Allostatic Load

- When multiple stressors lead to elevated stress hormones that continue over a long period of time (losing your job, can’t meet mortgage payments, can not support the family)
- When you can’t seem to adapt to a stressor even though it repeats itself again and again (if you are terrified of public speaking, and you have to give the same presentation 10 times—and if each time feels as stressful as the last)
- When your body turns on the stress hormones and doesn’t turn them off after the stressor has gone (you have a conflict at work that has been resolved, yet when you come home that night you are still agitated, replaying the conversation over and over again in your head)

Allostatic Load - The Tipping Point

- When the tipping point is reached is still the subject of research, but maladaptive responses appear to be related to PTSD, anxiety, depression, and have an impact on brain aging.
- Elevated allostatic load, aging and health consequences show correlations with decline in cognitive function, increases in blood pressure, insulin and lipid levels, alterations in immune function, heart rate, with virtually every target organ affected. Seeman, Singer, Roew, et al, Price of adaptation-allostatic load and its health consequences, Arch Intern Med.
- This is the situation where the nervous system defaults to agitation rather than rest.
Perception of Threat

“Instead of being able to use the gift of our pre-frontal lobe cortex to discern what is real threat from what is perceived threat, we have instead collected every painful experience of our lives and we’ve projected that onto the script of the present. This is causing us to perceive threat where there is no danger, and as a result we have developed a state of being that is indigenous to human beings: sympathetic dominance.”  J. Eric Gentry, PhD

Balancing the Two Branches of the ANS

- The SNS and the PNS work together to create homeostasis in the body; the more stressed out you are, the harder the body will have to work to regain balance.

- Eventually, if stress is not managed, the whole system gets stressed out and reaches a point where it can no longer regain balance.
GENERAL ADAPTATION SYNDROME

In the 1930's Hans Selye researched the effects of stress on the endocrine system and the demands placed on the whole body system. He identified three stages:

- the alarm stage
- the stage of resistance
- the stage of exhaustion

THE GENERAL ADAPTATION SYNDROME (GAS)

GAS is the body’s short-term and long-term reactions to stress and how the body tries to accommodate stress by adapting.
Variation in stress perception-stressors themselves less dangerous to health than people’s maladaptive responses to them

Errors in our adaptive responses to stress=>“diseases of adaption”, including cardiovascular disorders, inflammatory disorders and mental disorders

How Stress Changes Us

- The stresses on our physical bodies may result in the following adaptations:
- Chronic muscular tension holding patterns that are no longer under conscious motor control (difficulty releasing, muscle spasms)
- Less than optimal functioning of digestive, endocrine, reproductive systems (those considered lower priority in hierarchy of needs during F/F)
- Emotional and sensory processing dysregulation—may be short or longer term.
EFFECTS OF STRESS!!!!

- Increased blood pressure
- Muscle tension — shakiness, headache
- Joint and muscle pain
- Excessive sweating, palpitations
- Chest pain or heaviness
- Shortness of breath
- Gastrointestinal issues
- Fatigue
- Irritability
- Panic attacks
- Hormonal imbalances
- Immune system suppression
- Restlessness or feeling keyed up or “on the edge
- Irrational fears, invasive thoughts
- Difficulty concentrating
- Difficulty controlling worry
- Sleep disturbance
- The list goes on...

Stress

- Mismatch between perceived demands and the ability to cope.

- Coping: adaptive or maladaptive responses to deal with stressors

- **Sympathetic dominance**: nervous system is constantly activated (hyper-aroused) by chronic stress and does not come back to a resting state

- **Sympathetic dominance** puts individuals at risk for increased disease and illness.
End for TIYT MH