

Effects of Stress on the Body

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Selye's Concept of Stress

- Development of the stress concept
 - Through many experiments, Selye exposed animals to noxious agents and found that they all responded with the same syndrome of changes, or "stress triad"
- Definitions
 - Stress: a state or condition of the body produced by "diverse nocuous agents" and manifested by a syndrome of changes
 - Stressors: agents that produce stress
 - General adaptation syndrome: group of changes that manifest the presence of stress

Stress Defined

- What we experience when we face challenges in our lives
- Can be negative or positive
 - Distress (e.g., exams, divorce, deadlines)
 - Eustress (e.g., marriage, graduation, job promotion)
- Stressors
 - External (physical) or internal (fear) challenges
- Responses to stress occur:
 - Cognitively in form of worry
 - Somatically in form of biological responses

Causes of Stress

- Biological
 - Substance abuse (alcohol, drugs)
 - Nutritional excess (caffeine, sugar)
- Psychological
 - Perfectionist attitudes
 - Obsessiveness/compulsiveness
 - Need for control
- Interpersonal
 - Lack of social skills, shyness, insecurity, loneliness
 - Environmental strain (noise, temperature)



Stress in Students

- Stress: The human reaction to events in our environment
- Han Selye defines stress as wear and tear on the body

Stress!!!

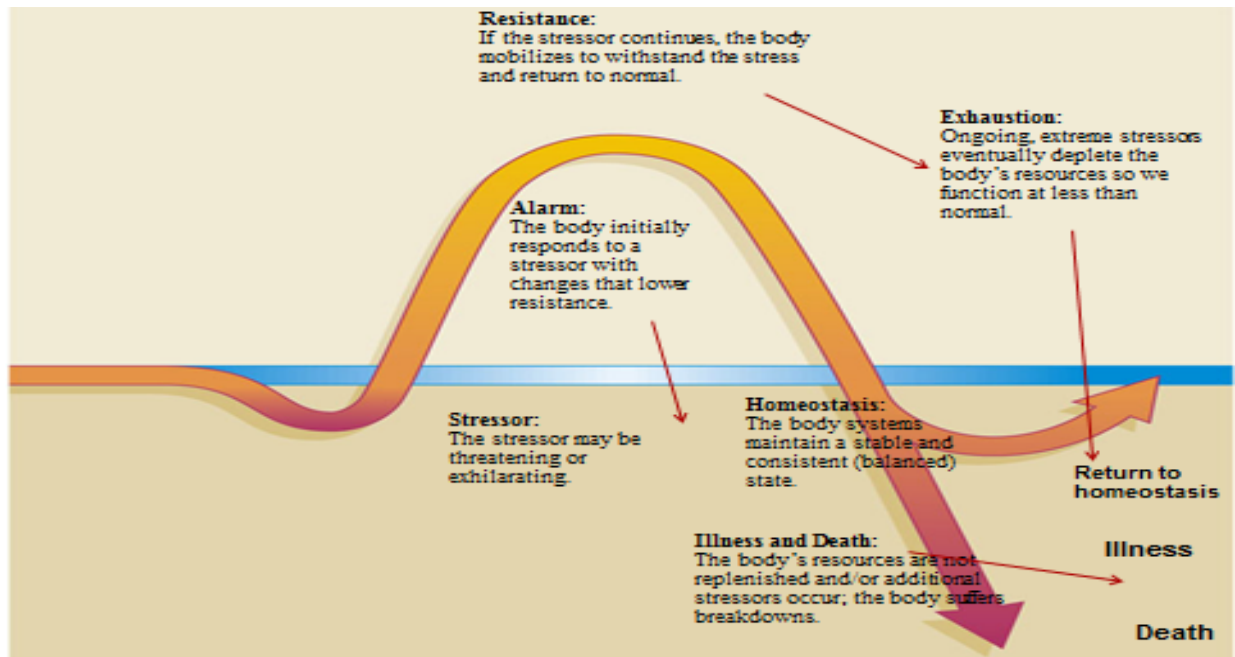
- Eustress: Good Stress
 - Getting into college
 - Getting engaged
 - Winning the lottery
- Distress: Stress from bad sources
 - Difficult work environment
 - Overwhelming sights and sounds
 - Threat of personal injury

Four Types of Stress

- General Stress:
 - Everyone has this kind of stress
 - It resolves itself within a day or two
 - No intervention is necessarily required
- Cumulative Stress:
 - Stress builds up in your body
 - It becomes more difficult to alleviate your symptoms
 - You may have more serious physical symptoms
 - You may have more serious mental anguish
- Acute Traumatic Stress:
 - Critical Incident Stress
 - Produces considerable psychological distress
 - A normal reaction to abnormal events
- Post Traumatic Stress:
 - Severe stress produced by severe psychological trauma
 - Created by unresolved Critical Incident Stress
 - Produces lasting changes

General Adaptation Syndrome

- Stage I - Alarm Reaction
 - The “fight or flight” response which causes you to be ready for physical activity
 - However, it decreases the effectiveness of the immune system which makes you more susceptible to illness
- Stage II – Stage of adaptation
 - If stress continues, the body adapts to the stressors it is being exposed to
 - If the stressor is starvation, the person experiences a reduced desire for physical activity to conserve energy, and the absorption of nutrients from any food intake is maximized
- Stage III – Stage of Exhaustion
 - Stress persists for a long time
 - The body’s resistance may be reduced or collapse quickly
 - People who experience long-term stress may have heart attacks, severe infections, or chronic pain or illness



Effects of Stress on the Body

- Hypothalamic-Pituitary-Adrenal (HPA) axis
 - Complex set of interactions between the 3 glands
 - Major part of the neuro-endocrine system that
 - Controls reactions to stress
 - Regulates many body processes: digestion, immune system, moods and emotions, sexuality, energy storage and expenditure
 - Involved in the neurobiology of functional illnesses and mood disorders
- Adrenalin (epinephrine) is released by the adrenal glands
 - Heart rate increases
 - Blood vessels are constricted
 - Fight or flight response
- Cortisol is released by the adrenal glands
 - Increases blood sugar
 - Suppresses the immune system
 - Decreases bone formation

Effects of Chronic Stress

- Higher levels of cortisol cause weight gain
- Immune system is dampened or suppressed causing the body to be more susceptible to infections (*the older you are, the more stress effects the immune system*)
- Interferes with the body's ability to heal
- May play a role in the progression of breast cancer

Stress Affects Vary by Person

- More likely to SUFFER FROM chronic stress
 - Type A personality
 - External Locus of Control
 - Conflict resolution strategy of avoidance
 - Pessimism
- Less likely to SUFFER FROM chronic stress
 - Type B, C, or D personality
 - Internal Locus of Control
 - Conflict resolution strategy of addressing the issue
 - Optimism

Short Term Physical Stress Symptoms

- Dry mouth
- Cool skin
- Cold hands and feet
- Increased sweating
- Rapid breathing
- Faster heart rate
- Tense muscles
- Feelings of nausea
- Butterflies in your stomach
- Diarrhea
- A desire to urinate



Long Term Physical Stress Symptoms

- Insomnia
- Change in Appetite
- Sexual disorders
- Aches and pains
- Frequent colds
- Feelings of intense and long-term tiredness
- Prone to illness

Behavioral Stress Symptoms

- Yawning
- Talking too fast
- Talking too loud
- Fiddling
- Twitching
- Nail biting

- Grinding teeth
- Drumming fingers
- Pacing
- Over reacting

Behavioral Stress Symptoms - continued

- Emotional
- Defensive
- Irritable
- Irrational
- Defensive
- Hostile
- Critical
- Aggressive

Behavioral Stress Symptoms

- These symptoms will have a negative affect on your performance
- By reducing your effectiveness
- Making you accident prone
- Causing you to be forgetful
- Causing you to be very negative
- You may neglect your appearance
- You may make poor judgments
- Causing you to make more mistakes
- Increasing your absenteeism

Performance Stress Symptoms

- You may not make good decisions
- Your fine motor skills are affected
- You may no longer enjoy your work
- Your attention span may be affected
- You may have more negative thoughts
- Your self confidence will suffer
- You may have difficulty concentrating
- All of your positive energy is consumed

Physiological Study of Stress

- Role endocrine system
 - Hypothalamus
 - Adrenal gland
- Endocrine Responses to stress
 - Epinephine (widely referred to as "adrenaline")
 - Coritsol (also produced by adrenal gland)
 - Catecholamine (urinary epinehine and norepinehine)
- Personality



- Type A behavior
- Vital Exhaustion (feeling of excessive fatigue, increased irritability, and feelings of demoralization)

Warning! Warning! System Overload!

- SAM (Sympathetic adrenal medullary system) and HPA (hypothalamic-pituitary-adrenal activation) become overworked.
- If neither is turned off after a stressor(s) is or are removed it will cause the other systems of the body to become overloaded!
- Fit person's SAM & HPA respond rapidly to the stressor and "turns off" rapidly but not in a unfit person.

Natural Killer Cells

- Myeloid & cytolytic cells are our killer cells.
- These cells are our defense mechanism of the immune system.
- Relationship between stress and one's ability to fight off diseases.

Stress Response

- Is initiated when some real or perceived threat or challenge is encountered
- Involves the secretion of two kinds of hormones from the adrenal glands:
 - Catecholamines (epinephrine and norepinephrine): elevated levels are secreted in situations that presents a challenge to an individual
 - Cortisol: Generally occurs when an individual is faced with a threat or unpleasant challenge

Epinephrine

- Epinephrine plays a central role in the short-term stress
- It is secreted by the adrenal medulla.
- When released into the bloodstream, epinephrine binds to multiple receptors and has numerous effects throughout the body.
 - increases heart rate and stroke volume
 - dilates the pupils
 - constricts arterioles in the skin
 - dilating arterioles in leg muscles
 - elevates the blood sugar level by increasing hydrolysis of glycogen to glucose in the liver, and at the same time begins the breakdown of lipids in adipocytes
- Epinephrine has a *suppressive* effect on the immune system.

Cortisol

- Higher and more prolonged levels of cortisol in the bloodstream (like those associated with chronic stress) have been shown to have negative effects:
 - Impaired cognitive performance
 - Suppressed thyroid function
 - Blood sugar imbalances such as hyperglycemia
 - Decreased bone density

- Decrease in muscle tissue
 - Higher blood pressure
- Lowered immunity and inflammatory responses in the body, as well as other health consequences

Homeostasis and Allostasis

- Homeostasis (single point turning):
 - The ability of an organism to change and stabilize its internal environment despite constant changes to external environment.
- Allostasis (adaptation process):
 - A wide range of functioning of the coping/adaptation systems, depending on a variety of factors (time of day, internal needs, external demands)

Allostatic Load

- The cost of coping/adaptation
- Wear and tear on the brain and body
- Ongoing stress means that the stress response never “turns off,” which ultimately leads to illness and disease
 - Example: Chronic elevations of heart rate and blood pressure can lead to decreased immune function, memory loss, and increased risk of anxiety and depression

The Big Picture: Stress and the Whole Body

- Stress affects the entire body
- Nervous system detects and integrates stressors that trigger stress responses
- Stress affects immune system
- Neuroimmunology studies mind-immunity link

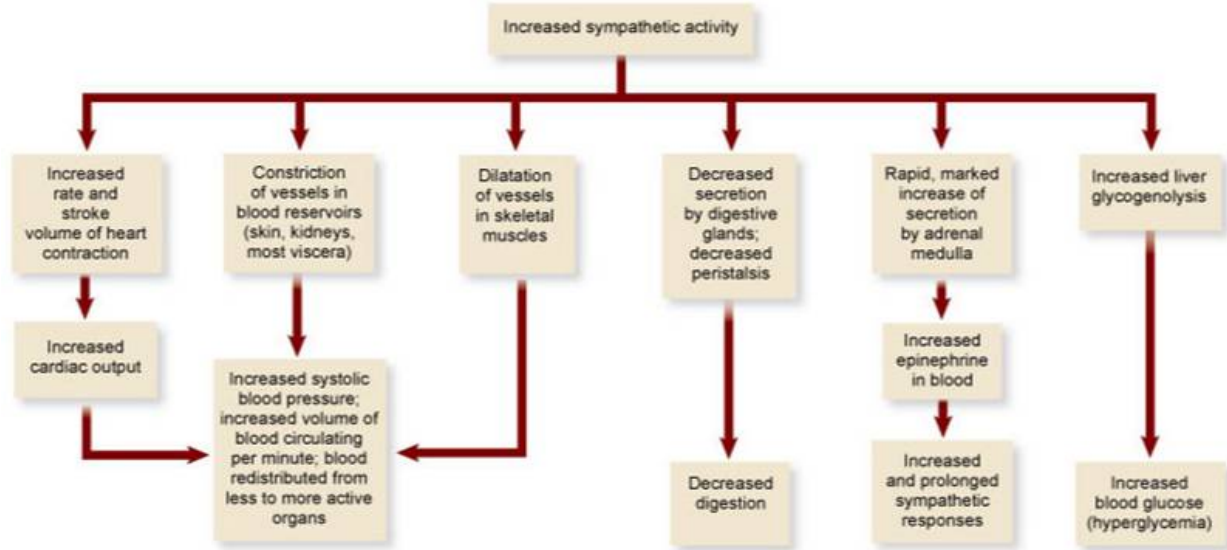


Fig. 22-4. Alarm reaction responses resulting from increased sympathetic activity. Note that these are the responses commonly referred to as the "fight-or-flight" reaction.

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Here are ways in which some key body systems react.

1 NERVOUS SYSTEM

When stressed — physically or psychologically — the body suddenly shifts its energy resources to fighting off the perceived threat. In what is known as the “fight or flight” response, the sympathetic nervous system signals the adrenal glands to release adrenaline and cortisol. These hormones make the heart beat faster, raise blood pressure, change the digestive process and boost glucose levels in the bloodstream. Once the crisis passes, body systems usually return to normal.

2 MUSCULOSKELETAL SYSTEM

Under stress, muscles tense up. The contraction of muscles for extended periods can trigger tension headaches, migraines and various musculoskeletal conditions.

3 RESPIRATORY SYSTEM

Stress can make you breathe harder and cause rapid breathing — or hyperventilation — which can bring on panic attacks in some people.

4 CARDIOVASCULAR SYSTEM

Acute stress — stress that is momentary, such as being stuck in traffic — causes an increase in heart rate and stronger contractions of the heart muscle. Blood vessels that direct blood to the large muscles and to the heart dilate, increasing the amount of blood pumped to these parts of the body. Repeated episodes of acute stress can cause inflammation in the coronary arteries, thought to lead to heart attack.

5 ENDOCRINE SYSTEM

Adrenal glands
When the body is stressed, the brain sends signals from the hypothalamus, causing the adrenal cortex to produce cortisol and the adrenal medulla to produce epinephrine — sometimes called the “stress hormones.”

Liver

When cortisol and epinephrine are released, the liver produces more glucose, a blood sugar that would give you the energy for “fight or flight” in an emergency.

6 GASTROINTESTINAL SYSTEM

Esophagus

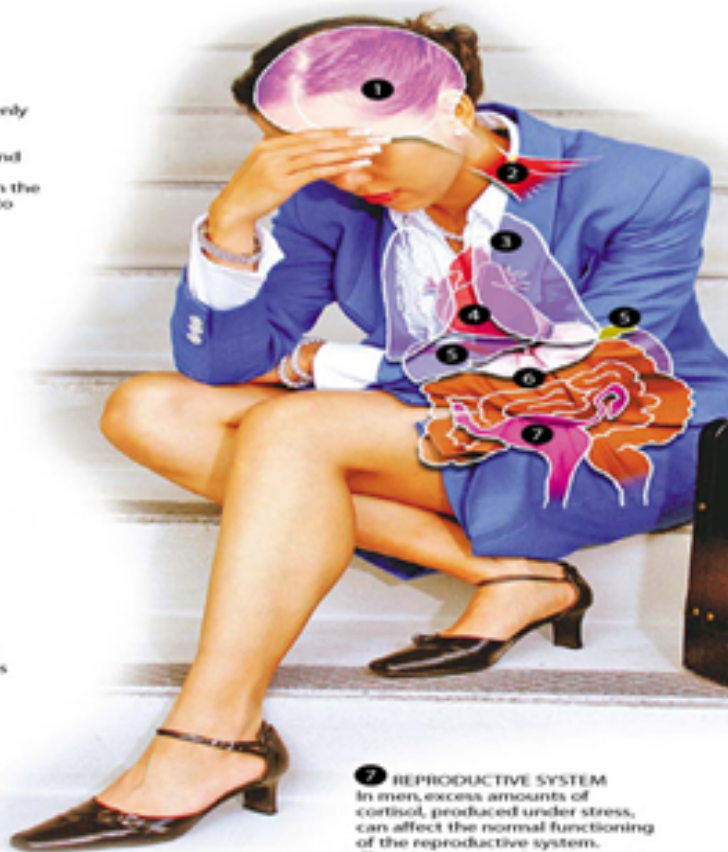
Stress may prompt you to eat much more or much less than you usually do. If you eat more or different foods or increase your use of tobacco or alcohol, you may experience heartburn, or acid reflux.

Stomach

Your stomach can react with “butterflies” or even nausea or pain. You may vomit if the stress is severe enough.

Bowels

Stress can affect digestion and which nutrients your intestines absorb. It can also affect how quickly food moves through your body. You may find that you have either diarrhea or constipation.



7 REPRODUCTIVE SYSTEM

In men, excess amounts of cortisol, produced under stress, can affect the normal functioning of the reproductive system. Chronic stress can impair testosterone and sperm production and cause impotence.

In women, stress can cause absent or irregular menstrual cycles or more-painful periods. It can also reduce sexual desire.