Stress

About 573,000,000 results
Stress, biology, psychology
About 11,300,000 results
Stress biology psychology physiology
About 6,860,000 results
Scholar About 91,000 results
Scholar 2012- About 6,800 results
Scholar 2000-2001 About 3,500 results
Scholar 1990-1991 About 1,160 results

What is stress?

• Stress is simply a fact of nature -- forces from the inside or outside world affecting the individual. The individual responds to stress in ways that affect the individual as well as their environment. Because of the overabundance of stress in our modern lives, we usually think of stress as a negative experience, but from a biological point of view, stress can be a neutral, negative, or positive experience.

  * http://www.medicinenet.com/stress/article.htm#What_is_stress
Stress typically describes a negative concept that can have an impact on one's mental and physical well-being, but it is unclear what exactly defines stress and whether or not stress is a cause, an effect, or the process connecting the two. With organisms as complex as humans, stress can take on entirely concrete or abstract meanings with highly subjective qualities, satisfying definitions of both cause and effect in ways that can be both tangible and intangible.


Excess stress can manifest itself in a variety of emotional, behavioral, and even physical symptoms, and the symptoms of stress vary enormously among different individuals. Common somatic (physical) symptoms often reported by those experiencing excess stress include sleep disturbances, muscle tension, muscle aches, headache, gastrointestinal disturbances, and fatigue. Emotional and behavioral symptoms that can accompany excess stress include nervousness, anxiety, changes in eating habits including overeating, loss of enthusiasm or energy, and mood changes, like irritability and depression. Of course, none of these signs or symptoms means for certain that there is an elevated stress level since all of these symptoms can be caused by other medical and/or psychological conditions.

http://www.medicinenet.com/stress/page3.htm#What_are_the_signs_and_symptoms_of_poorlyManaged_stress
Stress
Cannon coined the terms fight or flight response. Referring to the responses of the sympathetic nervous system to an external threatening stimulus.

Selye described the General Adaptation Syndrome Of the HPA axis.

Stress is any stimulus external or internal which elicits a physiological threat response whether appropriate or not.

Allostasis is the ability to adapt to change.

Allostatic load is defined as the physiological consequences of chronic exposure to fluctuating or heightened neural or neuroendocrine response that results from repeated or chronic stress. [McEwen]

Four conditions that lead to allostatic load

• Repeated frequency of stress responses to multiple novel stressors;

• Failure to habituate to repeated stressors of the same kind;

• Failure to turn off each stress response in a timely manner due to delayed shut down; and

• Inadequate response that leads to compensatory hyperactivity of other mediators.
Holmes and Rahe Stress Scale.

Psychological Distress as a Risk Factor for Cardiovascular Events
Pathophysiological and Behavioral Mechanisms

Table 1: Descriptive Characteristics of Participants at Baseline by Psychological Distress

<table>
<thead>
<tr>
<th>Variable</th>
<th>No Childhood Abuse</th>
<th>Childhood Abuse</th>
<th>Pearson's r</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, yrs</td>
<td>45.4</td>
<td>43.2</td>
<td>-0.01</td>
<td>0.081</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>28.3</td>
<td>28.1</td>
<td>0.006</td>
<td>0.991</td>
</tr>
<tr>
<td>Hypertension, %</td>
<td>35.3</td>
<td>36.2</td>
<td>-0.05</td>
<td>0.818</td>
</tr>
<tr>
<td>Diabetes, %</td>
<td>32.8</td>
<td>33.1</td>
<td>0.004</td>
<td>0.986</td>
</tr>
<tr>
<td>CVD, %</td>
<td>27.2</td>
<td>41.1</td>
<td>-0.01</td>
<td>0.001</td>
</tr>
<tr>
<td>Alcohol, g/week</td>
<td>15.4</td>
<td>15.0</td>
<td>0.05</td>
<td>0.618</td>
</tr>
<tr>
<td>Physical activity, minutes/week</td>
<td>30.1</td>
<td>30.4</td>
<td>0.001</td>
<td>0.999</td>
</tr>
<tr>
<td>Sleep, hours/night</td>
<td>7.1</td>
<td>7.1</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Farnsworth-Meshkani, %</td>
<td>22.6</td>
<td>22.6</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Life Satisfaction, %</td>
<td>6.9</td>
<td>6.9</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Happiness, %</td>
<td>7.9</td>
<td>7.9</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Positive affect</td>
<td>1.9</td>
<td>1.9</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Negative affect</td>
<td>2.0</td>
<td>2.0</td>
<td>0.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Psychological distress factor</td>
<td>2.0</td>
<td>2.0</td>
<td>0.000</td>
<td>1.000</td>
</tr>
</tbody>
</table>
Ventriculographic Assessment of Cardiac Function and MRI Assessment of Myocardial Viability at Admission in a Patient with Stress Cardiomyopathy


Clinical Characteristics of 19 Patients with Stress Cardiomyopathy on Admission

5/21/2013

[Image of zebras and tigers]

[Diagram showing Fight, Appease, FREEZE, Flight]

[Diagram showing Parasympathetic and Sympathetic nervous systems]

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Adrenal Medulla (epinephrine) is composed of modified post-ganglionic neurons and is directly connected to the Sympathetic Nervous system via the sympathetic ganglia.
Selye and Stress

1) Hypertrophy of the Adrenal
2) Stomach ulceration
3) Atrophy of the Thymus

General Adaptation Syndrome
The Physiological mechanism which raises the resistance to damage

1.) Alarm
2.) Resistance
3.) Exhaustion
Action potentials arriving at the terminals in the neurohypophysis activate voltage-gated Ca2+ channels in this region to cause Ca2+-dependent exocytosis of AVP and OT.

- Cells that secrete OXY and ADH also secrete CRF and Dynorphins A and B (endorphins)
  - Pathways have been traced from the paraventricular nucleus towards the dorsal and ventral hippocampus., the nuclei of the amygdala, substantia nigra and substantia grisea, nucleus tractus solitarius, nucleus ambiguus and to the substantia gelatinosa of the spinal cord.
  - Immobilization stress increases Dynorphins in the hippocampus which block glutamate release and new learning

<table>
<thead>
<tr>
<th>Layer</th>
<th>Name</th>
<th>Primary product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most superficial cortical layer</td>
<td>Zona glomerulosa</td>
<td>mineralocorticoids (e.g., aldosterone)</td>
</tr>
<tr>
<td>Middle cortical layer</td>
<td>Zona fasciculata</td>
<td>Glucocorticoids (Cortisol)</td>
</tr>
<tr>
<td>Deepest cortical layer</td>
<td>zona reticularis</td>
<td>weak androgens and DHEA</td>
</tr>
</tbody>
</table>
Aldosterone neurons in the NTS

Schematic diagram of Vagus and NTS

Medulla and Nucleus tractus solitarius (NTS)
Nucleus Tractus Solitarius (NTS)

- It is key to cardiovascular and enteric regulation
- Vagal afferents converge in the (NTS)
- It projects neurons to the PVN and SO of the hypothalamus
- And Amygdala
- It has aldosterone receptors especially sensitive to NaCl depletion
- It has angiotensin II receptors whose cells project to key affective regions of the brain

Cholesterol

![Cholesterol diagram]

![Tiger image]
Purpose of the Acute Stress Response

Salvation of the organism from a threatening situation
1.) Ready for action
2.) Protect sensitive areas, neck, viscera
3.) Contain or prevent hemorrhage
4.) Contain or prevent infection
5.) Maintain the organism in a readiness state

The Acute Stress Response
1.) Turn off the parasympathetic nervous system
2.) Turn on the sympathetic nervous system
3.) Turn on the HPA axis e.g. adrenal cortical function
Box 2 | Central and peripheral functions of the stress response

- Functions of the central nervous system
  - Facilitation of arousal, alertness, vigilance, cognition, attention and aggression
  - Inhibition of digestive functions (e.g. reproduction, feeding, growth)
  - Activation of counter regulatory feedback loops

- Peripheral functions
  - Increase of salivation
  - Nutrition of brain, heart and skeletal muscles
  - Increase of cardiovascular tone and respiration
  - Increase of metabolism (catabolism, inhibition of reproduction and growth)
  - Increase of detoxification of metabolic products and foreign substances
  - Activation of counter regulatory feedback loops (includes immune suppression)

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The Physiology of Fight or Flight
What we know is happening...

- Clear or bright vision
- Dry mouth
- Muscle tension
- Tightness in chest
- Sweating
- Nausea/diarrhea
- Need to urinate
- Chest and jaw tight
- Heart pounding
- Butterflies in the stomach
- Trembling/weakness

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1.) Pupil of the eye dilates
2.) Tighten jaw
3.) Brace neck
4.) Hunch shoulders
5.) Tighten abdomen
6.) Shorten muscles
7.) Breathe more rapidly
8.) Mobilize the immune system
9.) Increase coagulation factors
10.) Retain fluid
11.) Raise blood pressure
12.) Mobilize glucose
13.) Turn off reproductive functioning
14.) Turn off G.I. functions
Influence of moderate and profound hyperventilation on cerebral blood flow, oxygenation and metabolism
Tobias Clausena,*, Alexander Scharfa, Matthias Menzela, Jens Soukupa, Carsten Holzb, Andreas Regerb, Frank Hanischc, Endre Brathd, Norbert Nemethd, Iren Mikod, Peter Vajkoczye, Joachim Radea, Dirk Henzea

Effects of 1 minute of voluntary hyperventilation on brain oxygen levels (vasoconstriction due to lack of CO2)
Influence of moderate and profound hyperventilation on cerebral blood flow, oxygenation and metabolism


Four conditions that lead to allostatic load

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Caregiver Study

The inflammatory reflex.

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Distress and Incident CHD: Prospective Epidemiologic Studies

Relative Risk

Anxiety Depression

Good times Bad times
Stress-Buffering Effects of Oxytocin & Social Support: Preliminary Findings

Change in Negative Affect Score by Oxytocin Group

Change in Negative Affect by Social Support Group

From NIH R21: Biology of Resilience: Oxytocin, Social Relationships, and Health

Oxytocin Release Stimulated By

- Parturition
- Sex
- Massage
- Fatty food, glucose
- Exercise
- Singing
- MDMA
- Mother’s voice
- Empathy

Heart-Mind Connections

Anterior Hypothalamus
Preoptic Area
Acanthomelan Unit
Subcortical Hypothalamus
Anterior Pituitary
Hypothalamus
Cortisol
Oxytocin
Melanin
ACTH
Dopamine
Norepinephrine
Adrenocorticotropin
Somatostatin
GABA
Neuropeptide Y
Tryptophan
Serotonin
Oxytocin
Catecholamine
Endorphin
Dopamine
Norepinephrine
Actions of Oxytocin on the Heart

- Mild negative ionotrope
- Causes mild bradycardia
- Binds with oxytocin receptors to release more oxytocin
- Binds with oxytocin receptors to release ANP (Atrial natriuretic peptide)
- May act through Vagal neurons

ANP Release Stimulated by
- Atrial distention
- Angiotensin, Steroids
- Thyroid hormone
- Myocardial ischemia
- Oxytocin
- TNF alpha, IL-2, IL-6
- Insulin
- Growth Hormone
- Ginseng
**Actions of Oxytocin**

- Parturition, milk letdown, maternal-child bonding
- Induced maternal behavior
- Stimulate central and cardiac oxytocin release
- Enhanced socially dependent learning and empathy esp. in men
- Increases trust and generosity
- Improved social behavior in autistic and ASD children
- Anti-inflammatory, blunts the response to endotoxin
- Analgesic and anxiolytic

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**Actions of Oxytocin**

- Increased envy
- Gloating and schadenfreude
- Increased xenophobia.

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**Actions of ANP**

- Diuresis, Naturesis,
- Decreases the need for Dialysis in ARF
- Vasodilation
- Prevents vascular endothelium disruption
- Inhibits CRF, ACTH, aldosterone and renin release
- Inhibits CCK-4 induced anxiety attacks
- Cardioprotective, anti-fibrotic, prevents hypertrophy
- Increases the release of free fatty acids
- Modulates the immune response
- Antitumorigenic effects in cancer
Other Players in the Game
- Urocortins have CRF-like actions related to sympathetic mediation of stress
- Neuropeptide Y
- Dynorphins A&B
- CCK’s-???
- Others

Summary
1.) The stress response is a life preserving response which deactivates the parasympathetic and activates the sympathetic nervous systems and activates the HPA axis
2.) Recurrent stressors whether real or imagined or failure to deactivate the stress response results in increased allostatic load and long term results in chronic diseases
3.) The stress response can be disengaged by activities which promote oxytocin release

Conclusions
The demands of modern society are constantly engaging the stress response. In order to better function in modern society with less chronic disease, we are going to have to learn to downregulate the stress response and engage in prosocial behaviors. Part of that down regulation can be achieved by Bio and neurofeedback.
Summary

1. Fear-based attitudes including anger, anxiety and depression activate the stress response and have been implicated in cardiovascular disease, and other diseases.

2. Oxytocin is released from the posterior pituitary by bonding and other prosocial behaviors and enhances prosocial behavior.

3. Oxytocin stimulates release of ANP from the heart.

4. Oxytocin turns off the secretion of CRF in the hypothalamus turning off the stress response.

5. ANP down-regulates the renin-angiotensin-aldosterone system.

6. ANP has positive cardiovascular and systemic regenerative properties.

7. ANP institutes a positive feed-forward loop within the brain which may involve the cardiac endocrine system.
Conclusions

Oxytocin which can be released by empathy and prosocial behaviors diminishes the stress response by stimulating release of cardiac ANP. Cardiac ANP selectively turns off CRF and other components of the HPA axis.

The development of empathy and prosocial behavior may be key to the prevention and treatment of cardiovascular disease.