

STRESS

Physiological Responses

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What is “Stress”

- Set of **physiological changes** that occur in your body
- Brain perceives that there is some sort of threat or danger
- Your coping skills are being stretched
- In order to survive **“flight or fight”** response is triggered
- No matter what the source or response needed, the **same** reaction is triggered.



Stress Response

- Hypothalamus sets off the alarm
- Combination of nerve and hormonal signals
 - Prompts the adrenal glands - adrenaline and cortisol
 - Brain becomes bathed in chemicals that heighten our senses and focus our attention – difficult to think about anything else.
 - Glucose and fats flood the bloodstream.
 - Cardiovascular and respiratory systems rev up.

All the above gives us energy to deal with the stress.

Stress Response:

- There are three main characteristics of the Stress Response:
 - Your body gears up to produce **Extra Energy**,
 - It prepares for **Damage Control**, and
 - It is a **Fast Response**.



In order to provide Extra Energy:

- Corticoids are secreted by the adrenal glands (adrenaline, epinephrine, and norepinephrine)
- Energy stores broken down – blood glucose level increases
- The blood circulating to active areas increases
- Heart has to pump with increased force, causing a rise in blood pressure
- Dilatation of the airways (bronchi) occurs, thus allowing respiration to occur more efficiently

In order to provide Damage Control:

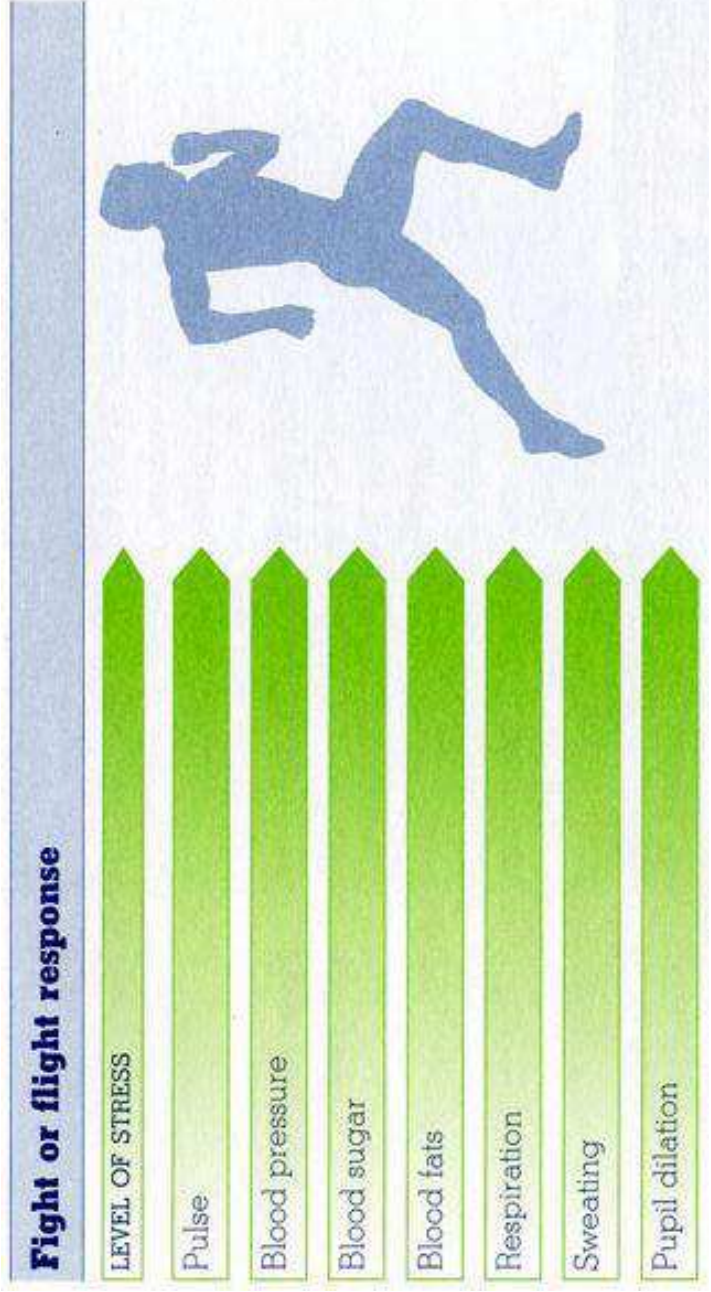
- Cortisol is released
- Natural pain killers (endorphins) are released
- Clotting agents are released
- Cells concerned with defence increase in number and become more active



Fast Response

- And finally, all of the things described previously happen **simultaneously** and make you extremely alert and ready for action.
- The stress response needs to happen quickly.
- We don't think about it - it's like a reflex reaction!



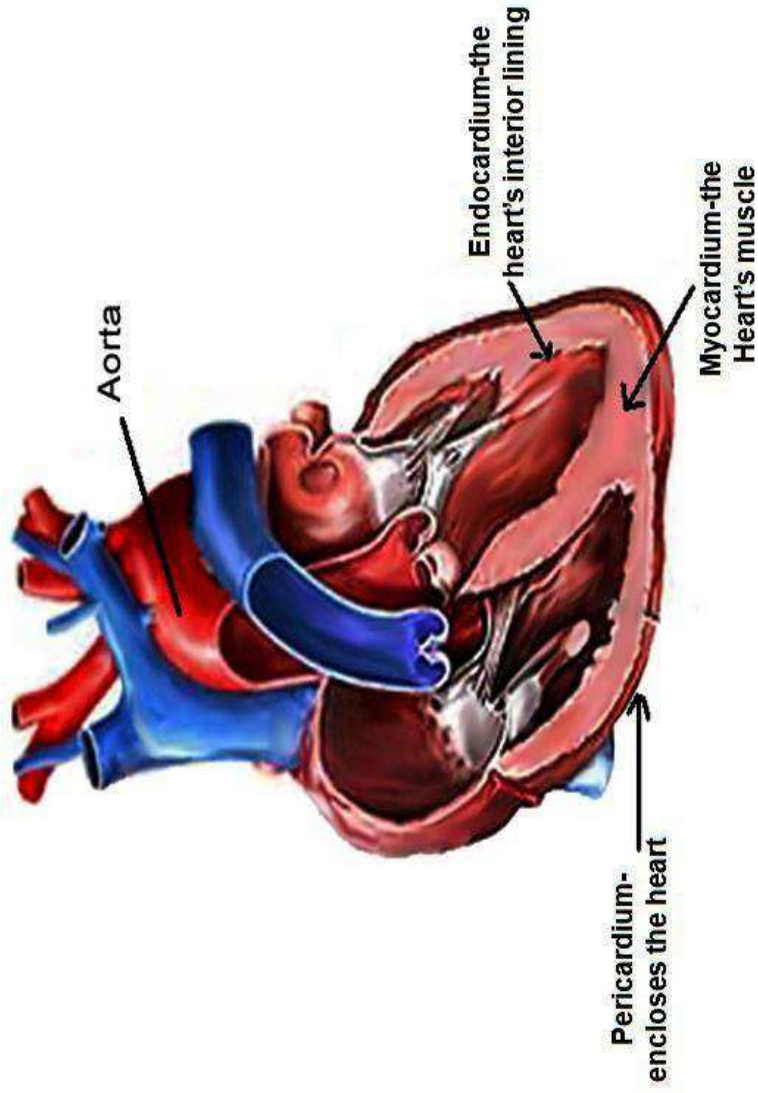
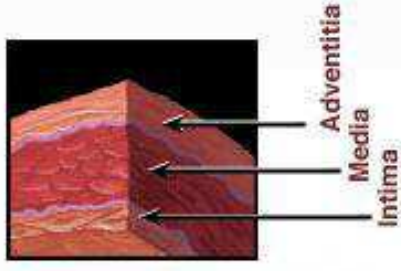


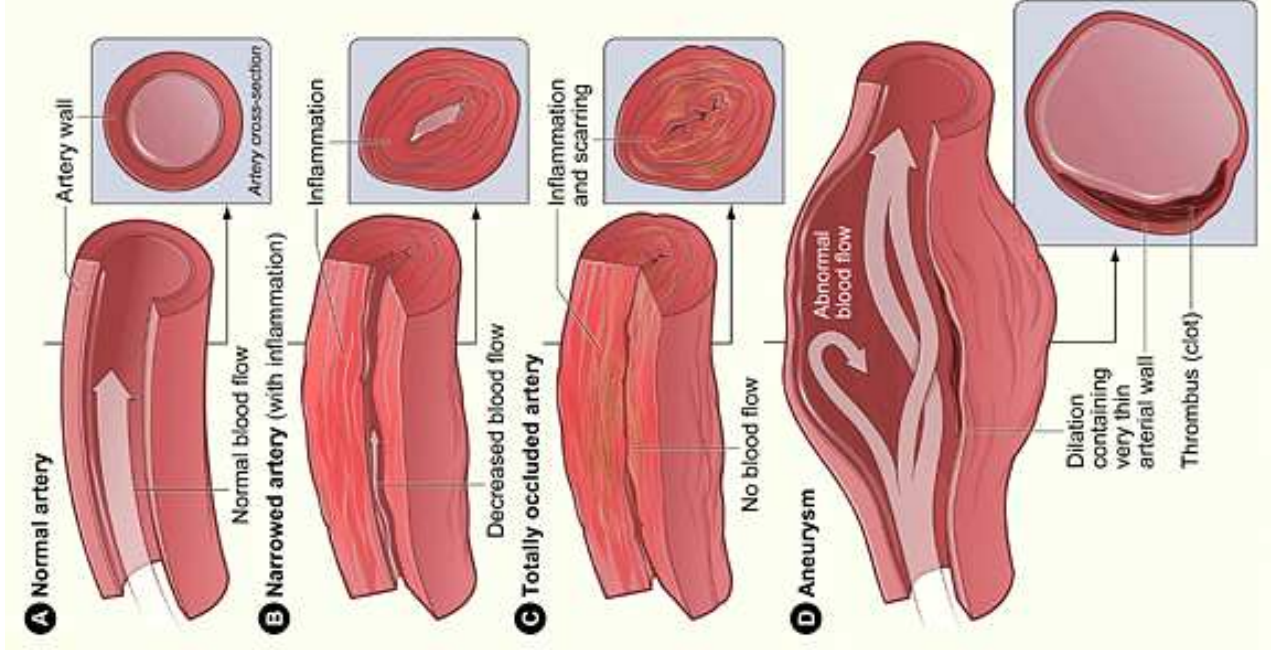
Chronic Stress

- Elevated cardiovascular disease risk factors
 - Hypertension
 - Increase in media thickness (walls of blood vessels)
 - Increase in myocardium “thickness”
 - Waist/hip ratio
 - Increased % body fat
 - Increase in total cholesterol, HDL/LDL ratio
 - Glucose intolerance
- Clustering of risk factors which keep on spiralling into increasingly worse physical and psychological health

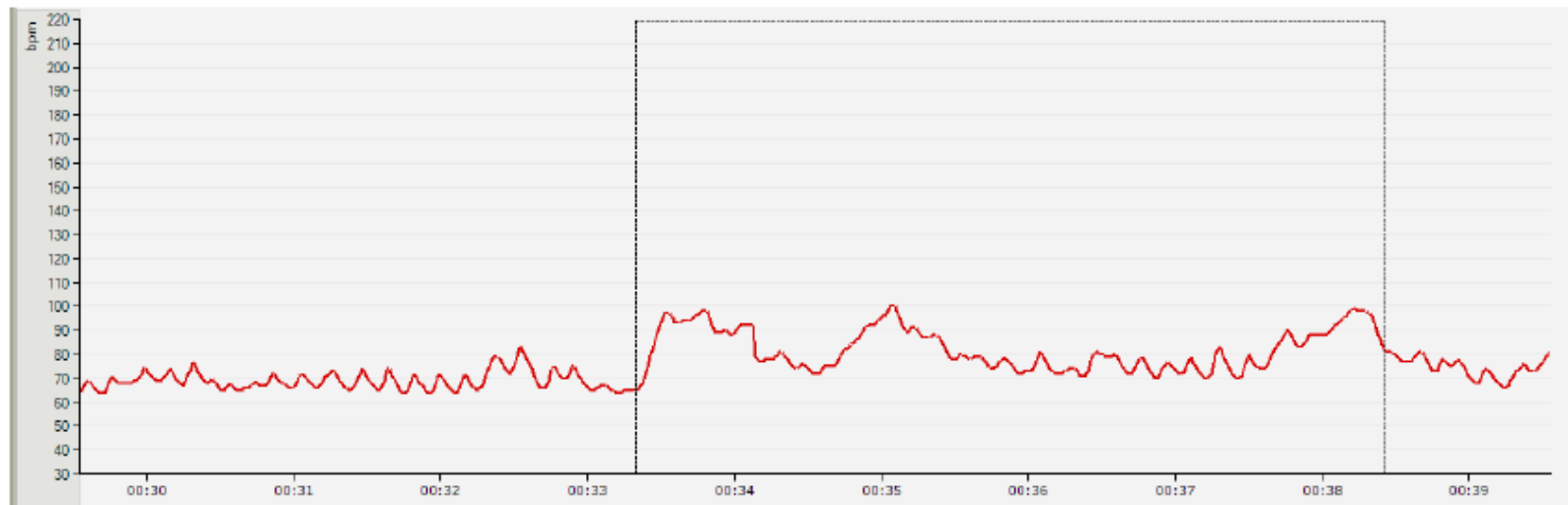
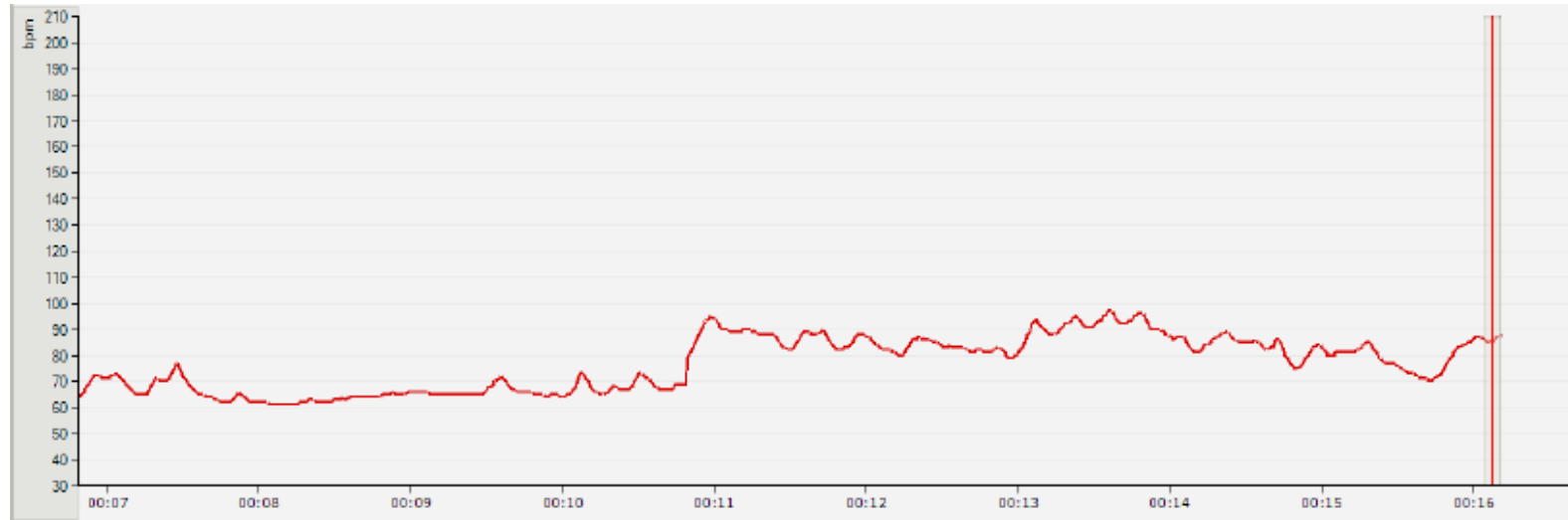


Normal Layers of Artery





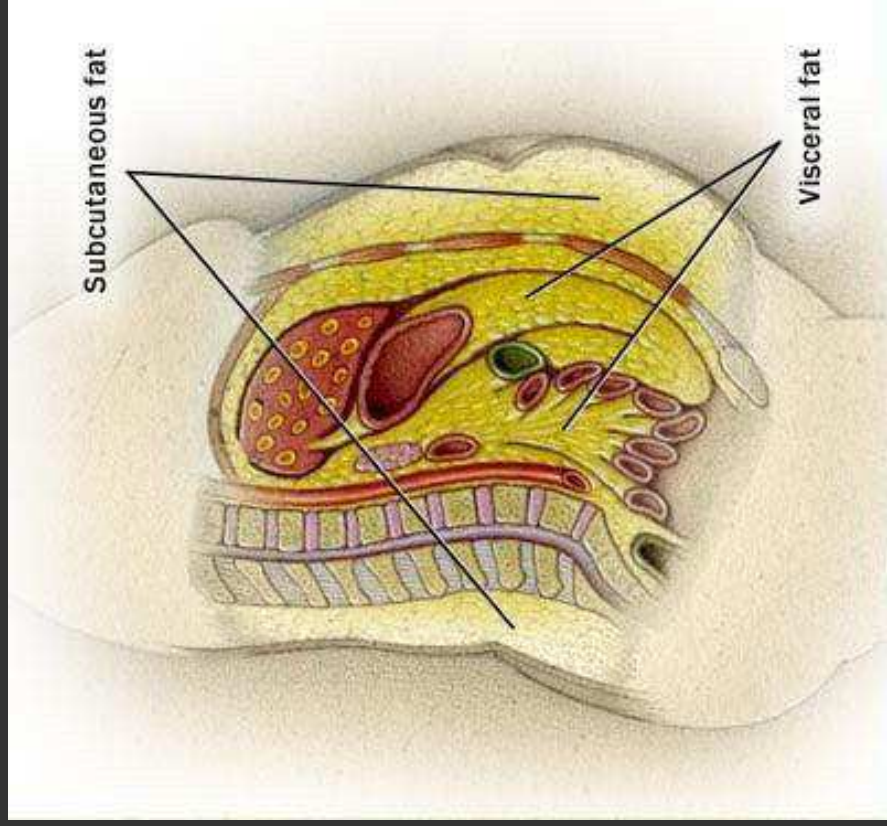
Stress Indicators



Abdominal Obesity

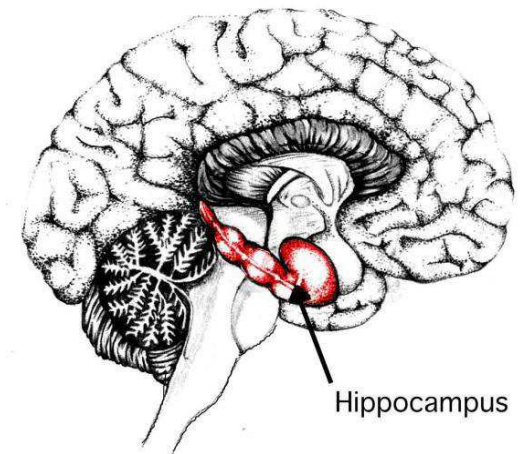
- Clustering of risk factors is associated with abdominal obesity.
- Stress together with abdominal obesity, hypertension and arteriosclerotic disease present a lethal combination.
- Waist-to-hip ratio is the best overall predictor of abdominal visceral obesity.





Stress and the Brain

- Chronic stress changes the brain regions and makes us more receptive to stress
- Changes in the brain due to stress are associated with, and contribute to a range of stress-related disorders such as CVD, depression and accelerated aging.
- High levels of stress hormones are neurotoxic and can kill brain cells
- Damage to the hippocampus



Exercise and Risk Factors

- High intensity intermittent exercise breaks down triglycerides (type of fat) within muscles to release fatty acids for energy production.
- Increase in HDL cholesterol
- Increase in circulating growth hormone
- Amount of muscle mass involved with exercise is also important

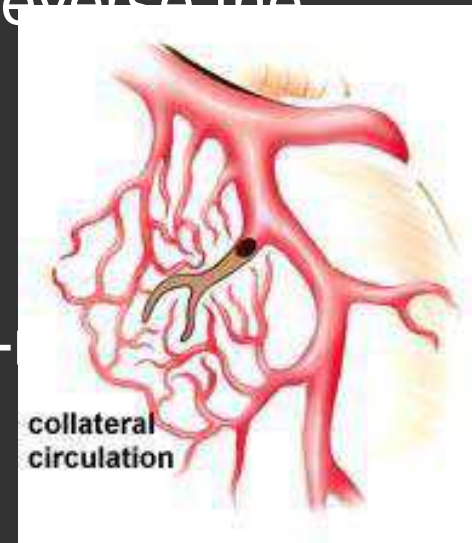


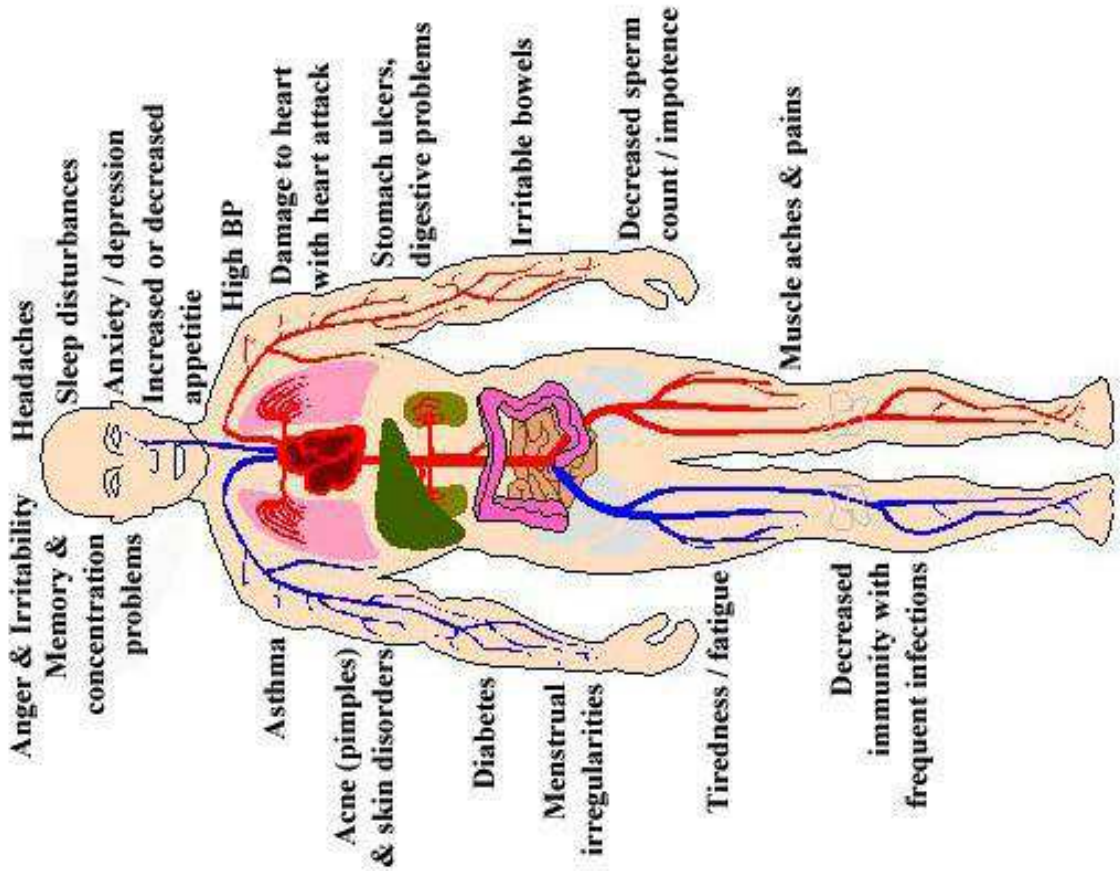
Exercise and the Brain

- Tremendous neuroprotective effect.
- Reverses the effects of chronic stress on the brain.
- Increases brain-derived neurotrophic factor which maintains brain health, supports brain growth and combats the negative effects of stress
- Triggers brain's self repair process – may help reverse the neurotoxic effects of chronic stress.

Development of collateral vessels

- Activated the stress-calming system.
- Regular exercise over time can create a “stress-brain.”





Resilience

- Stress is not always bad
- Need stress to grow and become fitter, smarter and stronger
- No avoiding stress, it is inevitable
- Focus on our ability to handle stressful situations and ensure we bounce back

This is Resilience

Resilience

- Based on how much and for how long we can withstand sustained stress
- Only a period of time before your body and mind tap out and say enough is enough
- Younger generation – greater work/life balance as a result of the demanding world we live in
- Older generations perspective is the younger generation just need to harden up

Resilience

Both are wrong!

- Combat the effects of the Sympathetic Nervous System - “fight or flight response” by triggering the Parasympathetic Nervous System - also known as the “rest and recovery response”
- Stress is necessary in order to make us not only stronger and fitter but also more focused, productive and resilient

Resilience

- Become the villain if we are in a prolonged state of stress – this is known as chronic stress
- To increase our resilience we must first stress the body
 - the body will slightly degenerate/fatigue
 - good recovery will start to compensate and increase our threshold to future stress
 - our body then suspects we may face the same stress in the future and actually gives us a bit of an added buffer

Supercompensation

Resilience

- Constantly stress our bodies we will only get weaker and sicker and will perform worse.
- This condition is called overtraining or burnout and will decrease the body's immune function
 - susceptible to illness
 - increased muscle tension (leading to injury)
 - increase in cortisol (thereby slowing fat metabolism and brain function)

Resilience

- Resilience isn't about how much stress we can take – ability to switch on and off.
- In scientific terms – ability to switch from our sympathetic nervous system to our parasympathetic nervous system.
- Our ability to switch from fight and flight to rest and regenerate has been impeded.
- The world has become so fast we need to learn to slow down.

Resilience

- So, resilience isn't about how much stress we can take but **how well we recover from stress** – the same way your muscles grow from weight training – muscles do not grow while you're exercising, they actually grow while you're resting



Exercise Guidelines – Time Constraints

High intensity intermittent sessions:

- Haddad et al. (2009). Nocturnal Heart Rate Variability Following Supramaximal Intermittent Exercise. *International Journal of Sports Physiology and Performance*.
- Broadbent, Rousseau & Tielemans. (2012). Higher Intensity interval training improves aerobic capacity and metabolic profile in men with cardiac disease. *Scandinavian Journal of Medicine and Science in Sports*.
- Warm-up \pm 2min
- 15 - 60sec @ 95% MHR followed by 15 - 60sec active recovery
- Repeat for 4 times

Improved cardiorespiratory function!

Exercise Guidelines - Time Constraints

Resistance training:

Whole body

Chest

Bench press, push-ups

Back

Seated row, “superman”

Abdominals

Curl-ups

Legs

Squats

