

WORKSHOP: STRESS

INFORMATION SHEET

Literature study compiled by Dr Micki Pistorius

DPhil Psychology

Aim and theme of this training

Outcome: To understand the physiological effect of the stress hormone cortisol on your brain and body and to learn how to manage it and counter the attack.

Stress can cause your brain to dysfunction and your body to collapse. Stressors may differ in origin. They can be physical - an exhausting rugby game; environmental - an earthquake; or psychological - fear of being fired or rejected, but the effect of stress is a physiological change in your brain and bodily organs. It cannot differentiate between the different sources of stress.

It is interesting to know that our body experiences exactly the same physiological response whether we encounter a burglar in our house, or whether we suddenly embrace a loved one, we did not expect to see. It is the amygdala in the limbic system that attaches the emotion of fear or joy to it. The body responds exactly the same to any stressor - whether good or bad, emotional or physical. Bodily feedback increases the emotional encounter, but the body does not inform you which emotion is at play.

Our brain receives all information through our senses. When something is new, uncontrollable and unpredictable it registers stress. If it is new, whether dangerous or not, the stress response sharpens our attention, and prepares our bodies to be ready to face, adjust or flee from the novelty. Stress can be invigorating, as long as the pack of wild dogs - the hormone: cortisol - is not unleashed.

Cortisol attacks and devours internal body organs to obtain glucose / fuel. Eventually the long-term bodily functions are under siege. Spastic colon and ulcers, heart attacks and strokes are the three deadly long-term possible consequences of chronic stress. The wild dogs can literally devour you and kill you.

Recent research conducted by Stanford University School of Medicine found that stress triggers a hormone called Adamt₁, which generates fat cells in the body, causing body fat. The study found that workplace stress leads to poor diet and comfort eating, concurring with findings from University College London that people exposed to workplace stress are 20% more likely to become overweight.

Module 1: HOW THE BRAIN PROCESSES ACUTE STRESS

Outcome: The thalamus is the part of the limbic system in the brain that processes all incoming information via the senses. It has a fast and slow route to process information. Using a warrior in battle as an example, we examine what happens inside his body when he encounters an enemy.

The thalamus-to-amygdala is a fast, inaccurate short cut involved when the body responds to a stressor. Within milliseconds, the electrical transmission takes the following route: Lightning fast electrical impulses speed down the spinal cord affecting the cardio-vascular, immune and gastro-intestine systems: The heart rate accelerates, and the blood pressure increases, the arterioles in the skin constrict, the digestion and metabolism system is locked down, and blood supply to the genitals is also restricted. The blood is needed by the heart, lungs, arms, legs and brain.

Adrenalin is released and it breaks into the liver, turning the glycogen into glucose – the fuel. Adrenalin also congeals the blood. The higher brain functions – neo-cortex – also runs on glucose, but since the physical exertion of the fight requires all the glucose, the neo-cortex will temporarily shut down due to lack of glucose. Are you going to try and have a reasonable conversation with Leonidas in full battle mode?

When we have time to think about a stressor: The thalamus-to-cortex is a slow chemical route, but the more accurate path. The cortex is the rational thinking brain. This path is aided by chemical transmissions. The process takes time and can waste seconds that can cost us our lives.

Module 2: INTUITION OR GUT FEELINGS

The gut has an enteric nervous system, which can function independently from the brain. It produces the same neurotransmitters as the brain, and it communicates to the brain via the vagus nerve.

Gut feelings is the language of the body, telling your brain something is amiss. This happens when the body signals the presence of a stressor to the brain and the brain interprets these as gut feelings. Gut feelings are actual real bodily reactions and the brain responds to them on a pre-conscious level. Gut feelings are literally physiological changes in your stomach. People get into serious trouble when they ignore their “gut feelings.”

The cells in your body registers and remembers the changes in your gut, and your body will alert you when a similar situation occurs, which can influence your decision. These cell memories are stored in the automatic nervous system – we no longer think about them consciously.

The vagus nerve located at the top of the brain stem, reaches down the spine into the stomach and is the switch which controls and releases the sympathetic and parasympathetic nervous system. Interestingly, the origin of the vagus nerve is located next to the part of the brain that controls the facial muscles. When our facial muscles contract into a smile, the vagus nerve carries a message through the body to relax and activate the parasympathetic nervous system. So just by smiling, you can already physiologically relieve depression and promote positive thoughts.

Module 3: HOW THE BRAIN AND BODY REACTS TO CHRONIC STRESS

Outcome: Chronic stress is characterised by excessive release of cortisol. The hypothalamus signals to the adrenals to release cortisol when the adrenalin runs out. Cortisol diverts energy away from the digestive system and it prohibits the enzymes from digesting the food. It will attack muscles and turn them into amino acids, it will turn fat cells into free fatty acids, it inhibits insulin to draw glucose from the blood and causes bad cholesterol to block the arteries and it inhibits the production of growth hormones, testosterone and oestrogen.

The effect of cortisol on the brain is even more devastating. Cortisol affects the amygdala. The amygdala will attach an exaggerated emotion to the memory. Our brain is racing at a high gamma hertz. Cortisol literally changes the shape of the amygdala and the hippocampus due to the increased cortisol receptors in these regions. Elevated levels of cortisol destroy neurons in the hippocampus, causing memory loss. Fear is turned into free flowing anxiety.

Due to the body burning all the fuel, the neo-cortex is off-line. All the rational, mature, sophisticated brain functions are under siege of cortisol.

Module 4: STRESS MANAGEMENT

Outcomes: We examine simple, yet effective stress management techniques and the rationale behind them.

4.1 Breathe:

When we experience acute stress – a sympathetic nervous system activation, one of the first and fastest ways to reduce stress is deep breathing. Inhaling oxygen slowly and deep into the abdomen switches the system from sympathetic to parasympathetic.

4.2 Please your senses:

Another immediate emergency method to reduce acute stress is to please your senses. Remember when the thalamus interprets a negative sensory stimuli, the amygdala attaches a negative emotion, activating the sympathetic nervous system.

When we experience a pleasant sensory system, we smile, breathe deeply, relax and extend the pleasant experience, thus activating the parasympathetic nervous system.

4.3 Enhance memory:

The sound waves of Mozart's music resonates with your optimal brain waves. When we switch from sympathetic to parasympathetic, our neo-cortex is flooded with the oxygen and fuel it needs and opens up like a lotus flower.

4.4 *Cool it!*

When we experience stress, our heart rates, blood pressure, etc increases to a rapid rate. It only seems logical that an ice cold pack to the neck will produce the opposite effect and slow us down. A lesson we learn from the penguins.

4.5 *Shift the attention: Plan a positive event*

The solution to mental fatigue is a shift of attention. A new challenge can raise the dopamine levels. To plan an event will reactivate the parts of the brain that experienced a shut-down. The prefrontal cortex is involved in planning. This is the rational part of your brain and it needs to get active and take back the power that the over-emotional amygdala has usurped.

Module 5: MANAGING CHRONIC STRESS

5.1 *Breaks – build endurance:*

Resilience comes from being exposed to stressors and having the resources to deal with it. An effective stress coping mechanism is to introduce short breaks to recover. A person who applies effective stress management knows when and how to apply the vagus nerve and to switch from the sympathetic to the parasympathetic nervous system, within seconds.

5.2 *Anabolic and catabolic balance:*

A person who is equipped to deal with stress, maintains a balance between the catabolic cortisol and the anabolic adrenalin.

An effective stress management tool is to regularly check this balance, known as the growth index by a saliva or blood test. When cortisol attacks the immune system, our cytokine levels increase. Cytokine are inflammatory proteins. A hyper arousal level of cytokine can cause tissue damage, shock and death.

5.3 *Control emotions and cultivate a positive attitude:*

A positive mental attitude releases dopamine, a motivation towards reward. A mature person will activate the orbito frontal cortex and focus on the long term rewards. The neo-cortex is in control, not the amygdala. Learn to slow track the amygdala and reason a perceived stressor.

Positive self-talk has a direct effect upon the water in your body, that transports the blood, that ferries the neurotransmitters to your brain. A healthy body and immune system is much more equipped to manage stress.

5.4 Thermo-regulation:

The brain needs oxygen – fresh air. Research has proved that a tolerance for cold temperatures induces emotional stability. Sunlight – vitamin D – reduces depression and stress. Sunlight enters the body through the eyes, which direct the light to the brain's pineal gland. The pineal gland uses the light to produce the hormone melatonin, which triggers the production of serotonin.

5.5 Stick to the familiar:

Fatigue sets in when the energy and effort we put in, exceeds the return. Under chronic stress stick to familiar patterns and social support of family and friends. When we feel safe in our surroundings and circumstances, the amygdala will not attach a fear emotion, but rather a positive emotion, which help us to relax.

5.6 Stay in the moment:

We are designed to respond with the sympathetic system only when we are truly threatened, and then to return to the parasympathetic system when the stressor dissipates. By projecting ourselves in future negative situations, we are creating artificial stressful circumstances, but our bodies are responding to the anticipated future stressors, right now.

5.7 Meditate and apply relaxation techniques:

MGH Psychiatric Neuroimaging Research Programme at Harvard Medical School found that even already after 8 weeks of meditation, it causes changes in brain structure. There is an increase in the density of grey matter of the hippocampus – memory centre- and in the amygdala. There are also changes in medial cortex associated with self-awareness, compassion and introspection. Participants in the study reported improvement in mood, stress and memory.

5.8 Exercise:

Exercise produces brain-derived neurotrophic factor BDNF which is a "fertilizer" to grow new neurons – neurogenesis. Cytokines- the inflammatory proteins – are associated with belly fat. This inflammation can affect the brain, as they attack the BDNF. Thus, as belly fat increases, your brain power decreases.

Exercise impacts on several neurotransmitters such as dopamine and serotonin, vital self-generated anti-depressants; endorphins – the dolphins of the mind, which make us happy and relieves pain and GABA – an inhibitory neurotransmitter.

Exercise provides more oxygen to the brain and increases the heart rate, which pumps blood. When the brain lacks oxygen, seizures occur and neurons die. Cerebral auto regulation is the brain's mechanism to regulate blood flow.

Researchers at Tsukuba University and Ryutsu Keizai University in Japan found that aerobic exercise increased testosterone in men. Testosterone fights cortisol.

Lack of exercise can lead to higher insulin resistance, muscular degeneration, cardio-vascular and respiratory problems, diabetes, strokes and various cancers.

5.9 Socialize:

Research has found that the health related cost of loneliness is higher than that of smoking. Another study found that loneliness is a marker of psychological stress and depression. People with a bigger social network are more resilient to stress.

When we socialize, the temporal-parietal junction is strengthened and our cognitive empathy increases- as it does with meditation. When we are lonely, our nucleus accumbens – thrill centre – shuts down. Socializing promotes neuroplasticity.

Ever heard of the expression: Two people fall in love, because there is chemistry between them? Learn which brain hemisphere is activated when we fall in love and which neurotransmitters flood the thrill centre, causing the rational brain to shut down.

5.10 Sleep

Sleep deprivation can lead to: insulin resistance, type 2 diabetes, high blood pressure and weight gain due to ghrelin and leptin malfunctioning. It compromises brain functions such as attention span, new learning and memory.

Computers, cell phones and tablets emit light into your eyes and your brain thinks it is day time, which prevents the pineal gland from secreting melatonin. It disturbs your circadian rhythm – your body clock. Stress also affects your circadian rhythm. Alternatively, when you read a book in bed, the light shines from behind you on the book and not in your eyes. Book reading will promote sleep, playing with your cell phone or tablet promotes insomnia.

Learn which foods help you sleep and why you should avoid high protein meals at night. Refined carbohydrates such as white bread and sugar, prevent sleep due to glucose production.

Learn why coffee and alcohol reduces sleep and why sleep medication is ineffective in the long run. Certain medications have side effects that impact negatively on sleep.

Recommended additional related courses:

- Brain Basics
- Psychodietetics / brain nutrition – eat your brain and life healthy
- Adolescent brain

For a full comprehensive curriculum vitae of Dr Micki Pistorius and more information on these seminars, please refer to www.mickipistorius.co.za