Stress and the immune system

What is stress?

> “Stress is defined as a process in which environmental demands strain an organism’s adaptive capacity resulting in both psychological demands as well as biological changes that could place it at risk for illness”. (Cohen Kessler, & Gordon, 1995)

There are many different theories about stress and about how and why stress affects the body and how people respond to that stress. Many theories talk about the resilience and the temperament of the individual and how that contributes to the capacity of a person to deal with stress. As with all of our body’s responses it is an initiated because of a stimulus and that stimulus can be an event or a series of events that initiate a series of reactions in our body. For now we are going to describe 2020 is a rather large stimular event

For the purposes of this blog we are addressing a theory called General Adaptation Syndrome [GAS] developed by Seyle (1974). Remembering that the environment within 2020 is our stress stimulus even. At least 2020 is not personal with nearly all people experiencing profound and prolonged periods of stress that would try any coping strategy. We are still experiencing stress from the changes and challenges in our environment and there are consequences on our long term physical and mental health.

What is General Adaptation Syndrome [GAS]?

The theory is that there are three stages or responses to stress and a person can stop at any three of the stages but the further you progress through the stages the more damaging it is to health and immunity. At first we will explore what the stages are and the broader concepts of GAS. Then we will explore the immune system and how prolonged or chronic stress impacts on immunity. At the end of this blog we will provide some personal practice ideas to use movement to help calm the stress response in our body.

The stages are:

> // **Alarm** Many people are familiar with this concept. It is the fight or flight stage in which our Autonomic nervous system triggers the sympathetic system. To put it in 2020-speak for many people it is the response or stage you experienced when you heard that you had to close your business, stop working and somehow survive. In Australia, that was 23 March, 2020. In other countries and places it was slightly different.

The physiological response to this is the production of glucocorticoids from the HPA (hypothalamus, pituitary and adrenal)axis to stimulate the production of adrenaline. The result being reduced digestion, increased fluid retention, greater heart rate, poorer hearing more focused eyesight with a loss of a sense of the periphery. In other words the heightened stress response. In nature this is a response that is aimed to help us deal with an immediate danger which should be over relatively quickly. However, the pandemic has been dragging on a bit which has meant that many people are in alarm response for too long which? interferes with homeostasis. This stage of stress response is described as having a behavioural response such as “flight or flight” in men and in the case of women the response technique is known as “friend and bend”. I love the term “friend and bend” but essentially it describes how for some people, mostly women, the strategy for stress is to identify the “enemy” befriend it and try to live or adjust to it all. I have often thought that the explanation of “friend and bend” also explains how come women are three times likely to have autoimmune conditions than men. More about autoimmune conditions when we discuss the adaptive immune system.

// **Resistance** This is when the body is seeking to bring us back to balance using the parasympathetic system of the Autonomic Nervous System. This is when the body is pumping out cortisol to try and mop up the adrenaline (known as norepinephrine in the USA). However, if the stress stimulus continues for too long and the person keeps swinging in and out of the alarm stage we will start to see our body deplete its resources.

// **exhaustion** Is the final stage that occurs when the body has tried to create resistance but could not achieve this. It is at this stage when the body is completely deprived of all resources and starts to get ill.

It is when we are in the exhausted state, and I am going to be honest for most of us that was in June 2020, that our health and immune system suffers? For many people, they were able to maintain an attempt at resilience until the second lockdown in Victoria which tipped them over into the exhaustion stage. During exhaustion there is a weakening of the immune system, making us more susceptible to a variety of health problems including colds and other diseases (Cohen & Herbert, 1996; Faulkner & Smith, 2009; Miller, Chen, & Cole, 2009; Uchino, Smith, Holt-Lunstad, Campo, & Reblin, 2007).

In this video from the introduction to neuroanatomy course we talk a little bit about the differences between the various parts of the nervous system and how that relates to stress.
https://vimeo.com/382750490/1a36fa6e27

What is the immune system and how does it relate to stress?

> *An immunologist and a cardiologist are kidnapped. The kidnappers threaten to shoot one of them, but promise to spare whoever has made the greater contribution to humanity. The cardiologist says, "Well, I've identified drugs that have saved the lives of millions of people." Impressed, the kidnappers turn to the immunologist. "What have you done?" they ask. The immunologist says, "The thing is, the immune system is very complicated …" And the cardiologist says, "Just shoot me now."*

Let's try and make this simple, because yes, the immune system is incredibly complex. For now we need to understand that the immune system has two components, what we know as the:

// innate immune system

// adaptive immune system

Innate immunity

We have systems in our body designed to just protect us by creating **barriers** to infection such as our skin and mucous. We all know that when we get a cut we need to cover it so that the infection/ pathogen does not get into our body. The mucous of our lungs catches germs and stops them passing into our bloodstream.

Another part of our innate immune system is our body's **inflammatory response mechanism** that goes into stopping infections etc. Part of the inflammatory process creates a fever hence the use of temperature checks as a means of detecting inflection. During this phase the body produces glucocorticoids. Remember, as part of our immune system response glucocorticoids are pro-inflammatory, but when used in pharmaceutical interventions they are used as anti-inflammatory. A whole discussion can be had on this but not in this blog.

The inflammatory response can be a big problem for our bodies. When you read about COVID-19 for example much of the illness occurs from our body producing mucous in our lungs to fight off the infection. The excess mucus then means people can't breath and need to be ventilated. It is a bit like a protest. It may be a necessary way of highlighting a problem for the "body politic" but sometimes it can create a whole new level of problems.

The other part of our innate immune system are our **white blood cells.** The presence of white blood cells such as leukocytes etc are how the body fights off infection as part of our innate system. It is why we have blood tests as the simple white blood count will identify if there is an infection response happening in our body. We also have natural killer cells which? check on

cells that have mutations that can cause cancer etc, their role is to take the mutant cells. (Wells, 2006)

Stress and the innate immune system

Our earlier assertion was that stress affects our immune system as supported by a number of research papers, several of which are listed in the further reading list at the end of this blog for those wanting to learn more. We will now explore a bit of the detail about how this plays out. The production of glucocorticoids is part of the HPA axis discussed above as part of the ANS in full. When that system is initiated there is a whole raft of hormonal and chemical responses that are initiated including a reduction in our digestive system. Now a little bit of reduction in our digestive system, increase in fluid retention and heart rate and shallowness of breath can obviously help us in the short term but maintaining this for a long period of time interferes with our bodies ability to maintain homeostasis. In the long term this can result in us lacking appropriate nutrition and maintaining excessive fluids.

Excessive glucocorticoids also damages our DNA, making us less likely to be able to repair wounds and respond to the genetic mutations that cause disease (Epel et al., 2006). As a result, wounds heal more slowly when we are under stress. (Kiecolt-Glaser, McGuire, Robles, & Glaser, 2002)

Glucocorticoids also reduce the amount of natural killer cells within our body therefore affecting their gatekeeper role of capturing and removing cell mutations from our system through a process called phagocytosis, before those cells mature into a malignancy such as cancer.

Adaptive immunity

When there are failures of our innate immune system our body starts to rely on the adaptive immune system as the second line of defence. Our adaptive immune system is more detail-orientated, specifically identifying the target pathogen and checking it against the memory collected of previous exposure to that disease.

The adaptive immune system has components known as

- // T cells
- // B cells
- // antibodies

T and B cells are both from the bone marrow, but the T cells mature in the Thalamus. The T cells help activate the adaptive immune system in something called T helper cells. B cells create antibodies

Stress can play a role in interfering with the T helper cells which can lead to problems with autoimmune conditions.

An aside about polyvagal theory?

Dr Porges wrote about polyvagal theory and stress and trauma. Dealing with polyvagal theory is a much bigger topic and whilst touched on in the approach to stress management, it is a concept that requires much more detailed discussion and focus. I will be organising a lovely presenter in the future Leisa Parker who has undertaken her three years training in polyvagal theory as well as pilates movement. Leisa will talk about and present some interesting ideas and perspectives about movement and polyvagal theory. Keep your eyes open for more information about this upcoming workshop at www.bodyorganics.com.au/education.

What can I do to minimize the effects of stress on my immune system?

When our sympathetic nervous system is activated our breath, heart rate, vision and core muscles are all affected. Accordingly, to help calm these responses down, a class or session that involves:

// deep diaphragmatic breath and release of the diaphragm
// vision and encouraging the movement of the eyes to incorporate the periphery
// hearing and sound in a way that does not startle or agitate
// movement that is closed chain in order to allow the engagement of all the senses in order to help the person engage with their environment and appreciate that the environment is a safe place not a threat.

Link to webinar recording: https://www.bodyorganics.com.au/chronic-stress-and-its-consequences-for-the-immune-system/

Where can I learn more about this?

Body Organics Education provides:
// Professionally filmed and edited online courses with quality content, manuals and videos www.bodyorganics.com.au/education You can obtain continuing education points from (APMA, PAA and PMA)
// zoom education courses to support your learning from our online courses
// in person courses, when they are possible

If you want to find out more about Body Organics Education email us education@bodyorganics.com.au and we can help you find the write online course for your interests, experience and needs

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