

Psychoneuroimmunology

Psychoneuroimmunology is a field of study that looks at the interactions between the central nervous system (CNS) and the immune system. The transmitters from the CNS are hormones and neurotransmitters whereas the communication from the immune system to the CNS is made through **cytokines**.

A high amount of stress (both physical and psychological) in the body leads to a release of cytokines. The types of cytokines that are being stimulated by stress are the **pro-inflammatory** ones. The body under stress conditions may also release hormones (adrenaline) that can bind to specific receptors that signal the production of pro-inflammatory cytokines (interleukin-1, interleukin-6).^[1]

Chronic stress has been associated with the suppression of the immune function. In contrast, physical exercises have been shown to enhance immune responses.^[2]

A study regarding the immune-brain loop^[3] showed that a type of non-specific immune response called “sickness” response can trigger a series of psychological and behavioural changes (fever, reduced food and water intake, reduced exploration and increased anxiety). These manifestations are “orchestrated” in attempt to produce energy to fight infection and to preserve energy.

The researchers tried an experiment in which they inactivated the cytokines in the brain in small mammals (by cutting the vagal nerve) and the animals showed no sign of sickness after the infection. If they administered cytokines to the brain, the animals showed signs of infection even if the infection didn't even occur.

In the same way, stress is part of the same circuit as the one previously mentioned, but it starts in the brain, not in the immune system, by overlapping with the infection neural circuits (which critically involve interleukin-1). What the stress implicated was shown to be similar to the “sickness response”: decreased food and water intake, decrease in exploration and physiological changes (fever, increased white blood cell and activated macrophages-which produce cytokines). So, a person can be physically ill after stress or even overreact the physical response of the infection by generating such visible manifestations.

In a primary form, stress enhances immunity (which is a normal evolutionary response-the body is being prepared in case of injuries in dangerous/stressful situation) by producing cytokines, however in infections that also produce high amounts of cytokines (such as SARS-CoV-2) the response can be damaging due to a very high amount of cytokines in the body which may then create the “cytokine storm”.

Also, depression has been shown to have similar manifestations such as stress and sickness responses.

In the case of SARS-CoV-2, the pro-inflammatory cytokines produced by stress can interact with the pro-inflammatory cytokines generated by the appearance of the virus and the body and thus create an even bigger damage- can more easily promote the development of the **cytokine storm** that is ultimately the harmful part of the “infection” with the new virus.

Activities that decrease the stress levels and increase the feel-good state

In opposition to the effects of stress, well-being can have beneficial outcomes on the body and on the immunity.

Until not long ago the human body resistance towards infection was thought to be improved only by promotion of hygiene and the use of antiseptic ingredients, however, in a recent article ^[4], researchers suggest that there is another aspect that should be taken into consideration: the psychological balance. Psychological well-being can be structured with the help of: Autonomy, Environmental Mastery, Personal Growth, Positive Relationships towards other, The purpose in life, Self-acceptance, religiosity and spirituality.

My measuring different parameters in the plasma, saliva and blood, the researchers were able to scientifically prove the benefits of well-being. The multiplication of T-cells, the increase of natural killer cell cytotoxicity, differences in the cortisol levels, studies on phagocytes (the acceleration of wound healing thanks to them) are just a few of the modifications that have been registered and that have generated an increase in the immunity of people.

Such immunity increases can be stimulated by:

1. Mindfulness-meditation:

Mindfulness is a mental training framework for cultivating the awareness in daily life.

An article on “Mindfulness meditation and the immune system” ^[5] suggests that beside the self-awareness of disease symptomatology, there are biological mechanisms that are being influenced by meditation such as: circulating and stimulated inflammatory proteins (cytokines), influence on gene expression and transcription, increase in the immune cell numbers, influence on immune cell aging and antibody response.

The immune system dynamics influenced by meditation have been implicated in major physical and mental problems such as: asthma, rheumatoid arthritis, metabolic disorders, neurodegenerative disorders, in certain types of cancer, PTSDs and depression.

The article taken into consideration states that there is a correlation between the immune system and mindfulness meditation. The findings were that 4 parameters were modified with the help of meditation: reduction in inflammation by reducing the cellular transcription factor NF-kB, increase in the cell mediated immunity by the increase in T cell count and increase in Telomerase activity that prolonged the age of the cells.

2. Deep Breathing

Also called belly breathing, diaphragmatic breathing and abdominal breathing, deep breathing is a technique of breathing that is done by contracting the diaphragm. It was shown that heavy breathing has important influences in the immune system.

A study from 2005 ^[6] presented the implications of Sudarshan Kriya and Pranayam breathing (forms of rhythmic breathing) in immune improvements and stress reduction. ⁽⁷⁾

Positive effects of deep breathing are:

- Boosting immune cells
- Increase in natural killer cells
- Lowering cortisol levels (the stress hormone)
- Lowering blood pressure
- Improve in arterial flow

3. **Emotional Freedom Technique (EFT)**

EFT is an alternative treatment for physical pain and emotional distress and it is also referred to as tapping or psychological acupressure.^[8] It combines both cognitive and somatic elements.

A 2019 study^[9] sought to elucidate the action mechanism at the central nervous system level through measuring the heart rate variability, the blood pressure, the endocrine system-cortisol level and the immune system.

After assessing patients before and after EFT sessions, decreases were registered:

- in anxiety levels
- in depression
- in PTSD
- in pain
- in cravings
- And a significant increase in happiness.

These psychological emotions were backed by visible physiological indicators such as lower cortisol levels, lower resting heart rate and lower blood pressure. (in the case of anxiety, depression, PTSD) and in a increase of salivary immunoglobulin A-SigA (the case for happiness) that is also important in the increase of immunity.

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