Psychoneuroimmunology

Objectives:

1. What is psychoneuroimmunology (PNI)?
2. Historical timeline of PNI framework
3. Sickness behaviors
4. Physiological mechanisms of PNI
5. PNI and the relaxation response
6. Relationship between Healing Touch and PNI
For centuries, we used the term psychosomatic with the implication being...
What is psychoneuroimmunology (PNI)?

PNI refers to the cross-talk, interactions, and interconnections that occur between your nervous system and the immune system.
What does that mean?

When humans acquire an infection, they become “sick.”

Common symptoms include fever, loss of appetite, somnolence, an inability to concentrate, fatigue, lethargy, and pain.
Psychoneuroimmunology

So what?

All of these symptoms are physiological responses that require activation of both the immune and nervous systems.

So, it makes sense that the immune and nervous systems are linked in ways that dramatically affect our health and well-being.
Psychoneuroimmunology

So, why is this a surprise?

Regulation of major organs of the body has long been studied in the discipline of systemic physiology.
Systems Biology

Major scientific journals have a long history of this systems biology approach.

- The Journal of the American Physiological Society was founded in 1898.
- The Journal of Immunology was founded in 1915.
- The Journal of Neuroscience was founded in 1981.
New paradigm of integrative physiology

It has become clear that all physiological systems work together to maintain homeostasis and to promote proper functioning of the body during both health and disease.
Integrative Physiology

- Depression
- Manic depression
- Schizophrenia
- Diabetes
- Alzheimer's disease
- Cardiovascular disease
Influenza viruses generally gain access to the body via mucus membranes, such as those in the eyes and nose.

Symptoms include fever, chills, headaches, somnolence, and reduced appetite.
Sickness Behaviors

When you get sick, you feel sick.

These symptoms of sickness are generally considered to promote recovery and healing.

While the immune system is doing its job, various parts of the brain are responsible for regulating body temperature, appetite, sleep, pain, and motivational aspects of fatigue.
This is your brain...
And these are your immune cells.
Flu Outbreak in the Hippocampus?

When you have the flu, the virus can be found in the lungs but not the brain.

However, there is an inflammatory immune response in the brain.

Cytokines are chemical messengers in the body that drive the work of the immune system.

Inflammatory cytokines activate the immune system and cause sickness behaviors.
But if the flu virus doesn't get into the brain, then how does the brain know you're sick?
Getting into the brain

Somehow, information is getting to the brain to let it know that you're sick when you have an infection.

As you can imagine, with a systems approach to physiology, this is hard to operationalize.

What we've come understand over the past century is that there are several ways in which the brain and the immune system communicate with each other.
Blood-brain barrier

Because of this barrier, physiologists thought there was only one way into the brain.
Choroid plexi
As we learned more about membrane transport, or how molecules cross cell membranes, we learned more about the blood-brain barrier.

In fact, some cytokines and other chemical messengers called chemokines can cross the blood-brain barrier.
Vagus nerve

And then there is the vagus nerve, which connects the brain via the brainstem to multiple organs of the body.

Traditionally, it was thought that information only came down from the brain to the body. But we've since learned that it's a two-way street.
Cytokines in the brain

As we learned even more about the immune system, we threw out the old idea that the immune system was not present in the brain.

Our first clue was the presence of cytokines in the brain.
Microglia
Lymphatic vessels in the brain

The latest discovery from 2015 is the finding that there are lymphatic vessels in the brain.

This finding rewrote textbooks that for over a century stated that there were no lymphatic vessels in the brain.
CNS lymphatic vessels
So, what does this have to do with Healing Touch?
Hypothalamic-pituitary-adrenal axis

The hypothalamic-pituitary-adrenal (HPA) axis plays a role in the stress response in the body and is supported by PNI.
Classical stress pathway

When we perceive stress, the hypothalamus signals the pituitary, which signals the adrenals to release cortisol.

This, too, was thought of as a one-way street.
Vagus nerve and stress

In fact, the vagus nerve can be activated by the immune system to signal the brain to initiate a stress response.

So, the vagus nerve can turn up the HPA axis AND turn it down.
Top-down & bottom-up

There are top-down mechanisms that lead to stress in the body (anxiety, tension).

And there are bottom-up mechanisms from stress experienced in the body that can activate the brain.
Healing Touch, relaxation, and the immune response

Healing Touch promotes relaxation and is shown to decrease heart rate and respiratory rate and increase blood oxygenation.

Healing Touch also increases markers of immune function.

These effects are supported by the PNI framework.
A recent study investigated the cellular effects of the relaxation response on the expression of genes.

They compared novice meditators, newly trained meditators, and experts. They used an omics approach.
Omics and the relaxation response

30 minutes of relaxation following meditation, regardless of the level of experience, had an effect on the transcriptome.

Genes related to inflammation were turned down and those that are anti-inflammatory were turned up.

The only difference in response was the level of experience. Those who had been meditating longer had a greater response.
In a nutshell...

There are multiple physiological and biochemical pathways of communication between the brain and the body.

These pathways not only play a role in our usual immune response, but also provide the connections to mediate the physiological effects of mind-body therapies such as Healing Touch.
Thank You