

Stress and Psychoneuroimmunology Revisited: Using mind-body interventions to reduce stress

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Stress is a fundamental component of life. It is an unconscious response to a demand and when the demand is perceived as excessive, stress results along with diseases and conditions. Psychoneuroimmunology (PNI) has given importance to the relationship between stress and its physiological effects on the body. Scientists in this growing field have discovered that stress modulates the activities of the nervous, endocrine, and immune systems. Mind-body medicine is developing unconventional methods for coping with stress-related disorders. Nurses are empowered to implement mind-body interventions, such as meditation, imagery, therapeutic touch, and humor, to reduce stress and promote self-control and positive well-being for their patients.

To ensure meeting the needs of the entire individual, mind, body and spirit, holistic nurses promote the concept of the mind-body connection. Their practice is based on a holistic view of the patient as they help patients manage their illness; how to think about it, cope with it and respond to it. Holistic approaches in health care hold promise for positive outcomes when the mind-body model is embraced. The concept of mind-body connection may be first attributed to Florence Nightingale who wrote in her *Notes on Nursing* in 1862 about the healing power of sensory stimulation and personal connection. A new discipline evolved from this type of thinking and is referred to as psychoneuroimmunology (PNI).

The growing field of psychoneuroimmunology was established by scientists who were interested in gaining a better understanding of the interrelationship between the mind and body. Psychoneuroimmunologists have contributed greatly to medical science, showing that stress and the emotional state of an individual may play a significant role in making one vulnerable to diseases (Daruna, 2004). They discovered that stress modulates the activities of the body's systems, adversely affecting their functioning to maintain health. They have helped practitioners see the mind-body connection in sickness, whereby the mind and body communicate with each other by the interactions of the endocrine, nervous, and immune systems (Song & Leonard, 2000). They have presented a new view that disease may actually be a form of stress with physical, as well as psychological aspects. Furthermore, psychoneuroimmunologists postulate that stress may increase the probability of contracting diseases, such as cancers, coronary disease, and some autoimmune diseases. It is important for medical practitioners, nurses, and social workers to understand the effects of stress in the complex processes that underlie health.

Understanding Stress

The normal steady state of the human body's organ and tissue function is termed homeostasis. One significant factor that may cause an upset to homeostasis is stress. Stress is the absence of homeostasis (Wisneski & Anderson, 2005). Stress refers to any external or internal demands placed on the body. This can be a cognitive sensory stimulus

that comes from outside the body, such as the death of a spouse or a child. Cognitive stress is processed through the peripheral nervous system (cranial and spinal nerves) and central nervous system (brain and spinal cord). Stress can also be an internal sensory input, or a non-cognitive stress, such as a bacterial infection. Cognitive stress is received by the immune system, which relays this information to the neuroendocrine system (Blauer-Wu, 2002). Psychoneuroimmunology focuses primarily on the mind-body connection concerning cognitive stress.

When an individual can no longer adapt to a stressor, homeostasis is not maintained. The body cannot continue its normal functions. Stress causes chronic suppression of the immune system, increasing the risk for contracting certain diseases (Melmed, 2001).

Some findings that point out the relationship between stress and disease are noteworthy. There is an increased risk for heart disease for individuals experiencing either acute or chronic stress (Krantz, Sheps, Carney, & Natelson, 2000; O'Connor, C.M., Gurbel, P.A., & Serebruany, V.L., 2000). These researchers have shown that stress increases platelet activation, which is a cause of heart attacks. Other correlations are pointed out between stress and gastrointestinal disorders, chronic pain and diabetes (Jacobs, 2001). It has also been confirmed that stress is responsible for making one more vulnerable for catching the common cold (Cohen & Miller, 2001). Chronic stress has also been found to have devastating effects on the brain (McEwen, 2000). It decreases the size of the hippocampus, which impairs memory.

Certain life experiences may be very stressful. Loss of a child, loss of a spouse, and divorce can be devastating to an individual. However, any stressor will stimulate and elevate enzymes in the adrenal glands to produce the major stress hormones, which are epinephrine, norepinephrine, and adrenal corticoids. These hormones are responsible for activating biochemical changes in the nervous, endocrine, and immune systems, which affect all organ systems (Blauer-Wu, 2002).

Stress and the Immune System

Psychological stressors are known to trigger the immune system and the responses made to these stressors may result in different diseases. The exact mechanisms involved in triggering the immune system are not clear. However, it is believed to be a multilayered response (Blauer-Wu, 2002).

Contrary to previous thinking, neurotransmitters that were once thought to be only in the brain are located in the immune system as well. Therefore, any immune function can occur in the brain. When the central nervous system (CNS) receives cognitive stimuli, it conveys that information by hormonal pathways to receptors on immune cells. This causes immunological changes. For example, certain receptors that are the primary inhibitory neurotransmitters and benzodiazepine receptors that are anti-anxiety molecules have been found to exist in the immune cells in addition to the brain. These receptors can actually modulate the actions of the immune system (Song & Leonard, 2000). This is the

physical basis for the mind's influence on the development of disease, which is a primary example of the mind-body connection.

The immune system helps to maintain homeostasis within the body. Stress induced alterations in the immune system occur primarily in the spleen, lymph nodes, and lymphoid tissues. However, there are numerous components of the immune system that may be modified by stress hormones. It has been shown that individuals who are under stress are at an increased risk for developing autoimmune diseases. The most common autoimmune diseases related to stress are psoriasis, rheumatoid arthritis, and multiple sclerosis (Jacobs, 2001).

It must be pointed out that stress alone does not necessarily determine how well or poorly the immune system will function. The important factor is the individual's ability to cope with stress (Blauer-Wu, 2002). How an individual perceives a stressful event may be more important than the existence of the stress itself. Individuals with high stress levels and excellent coping skills may have minimal effects on the functioning of their immune systems. A low level of stress in individuals who have poor coping skills may have significant alterations in their immune functioning, increasing their susceptibility to disease. The actual amount of stress is not important for determining its effect on the immune system. An individual's coping skills are the important factor for determining the immune system's response to stress.

One other important finding is that behavioral characteristics in individuals may influence their immune response to stress. It is suggested that personality characteristics may have a role in how the immune system responds to stress. Passive individuals may have lower cortisol levels, and consequently, have fewer alterations in their immune systems in response to stressors. Both the mind and body respond to stressors, and the physiological pathways of the neuroendocrine and immune systems communicate between them.

Neuroendocrine-Immune Interactions

Communication between the mind and the body is carried out by peptides called neurotransmitters. Three neurotransmitters, norepinephrine, serotonin, and dopamine, are essential for neurocommunication. In addition to these neurotransmitters, the hypothalamus, a key structure in the nervous system, plays a significant role in psychoneuroimmunology. The hypothalamus is affected strongly by the emotional and cognitive states. It is surrounded by and interconnected with the limbic system, a part of the nervous system that controls the emotional state of an individual. It is also adjacent to the cerebral cortex, which provides cognitive and interpretive processes (Bloom & Lazerson, 2000).

Incoming stimuli is first recognized by the central nervous system (CNS) as a stressor. The brain becomes sensitized to these stressors and is more vigilant to incoming stimuli. The brain is stimulated by signals from inside the body (organs) or outside the body from cranial nerves (smell, hearing, sight, taste) and peripheral nerves (touch). Stimuli produced by stressful thoughts and emotions are processed in the brain,

specifically by the hypothalamus. These thoughts and emotions from the cerebral cortex and limbic structures lead to numerous other processes within the brain, as well as to the rest of the body. The entire body is now on the alert to these or other stressors. Reactions to these stressors are stored in the memory. As stressors are activated or reactivated, the previously conditioned responses are retrieved from the memory, primarily by the hippocampus, which is responsible for storing long-term memory. The hippocampus stores memories that are associated with trauma or stress. When a stressful thought reoccurs, the sympathetic nervous system secretes norepinephrine. This neurotransmitter strengthens the stressful memory and activates the stress response. In essence, each time there is a stressor similar to a previously stored one, the subsequent stressor reinforces the traumatic result from the first stressor. (Bloom & Lazerson, 2000). This may explain why mind-body modalities, such as meditation or guided imagery that affect thoughts and emotions, can also lead to changes in the physiologic functioning.

It must be understood that the neurotransmission of the stress response is highly complex. Scientists are only beginning to unravel the neural mechanisms involved in processing stressors and the impact of these stressors on neuroimmune mechanisms. Psychoneuroimmunology helps to provide insight about the complex relationship between the immune system and stress, as well as the effects on this relationship on the health of individuals.

The physiological pathways that connect the mind and body demonstrate the strong relationship between them and emphasize the mind's effect on the body. The mind and body continually send messages to each other and it is these messages that produce biological and physiological changes that help determine the health status of an individual. Responses made to these messages may result in either illness or wellness. The mind-body connection entails physiological pathways that involve the nervous system, the endocrine system, and the immune system (Freeman & Lawlis, 2001). The mind and body are able to communicate with each other by the interactions of these three systems. These three systems are involved in two physiological pathways.

The first is the sympathetic-adrenal-medullary (SAM) that activates the autonomic nervous system (ANS) whereby neurotransmitters and neuropeptides communicate directly with immune cells. Neurotransmitters attach to immune cells and affect their ability to multiple or kill invaders. Because neurotransmitters are released from the brain during times of stress, it is likely that the emotions resulting from stressors may increase susceptibility to disease (Freeman & Lawlis, 2001).

Neuropeptides, secreted by the brain and immune system, have a crucial role in mind / body interactions since immune cells carry receptors for all the neuropeptides. The limbic system of the brain that regulates emotions is particularly rich in receptor sites for neuropeptides. It is reasoned that neuropeptides are a strong factor relating to the effects of the mind on immunity (Freeman & Lawlis, 2001).

The second pathway is the hypothalamic-pituitary-adrenal (HPA) that signals the endocrine system to release hormones. These hormones, particularly thyroid and adrenal,

have a direct effect on the immune system. They can increase or decrease cellular processes. It is important to point out that cancer cells synthesize hormones identical to the endocrine glands, but in an excessive and uncontrollable amount (Freeman & Lawlis, 2001).

Neurotransmitters, neuropeptides, and hormones have been shown to have certain effects on immunity. For example, certain hormones, such as cortisol and epinephrine, are released in higher amounts when an individual is under great stress. These hormones are known to depress T-cell activity, and thus, depress one's immune system (Freeman & Lawlis, 2001).

The mind may be referred to as both a healer and slayer because what one thinks, believes or feels can have a definite effect on one's health. This can result in either a positive or negative outcome. Pelletier (2002) points out that negative feelings, such as fear, despair, and depression, have a significant effect on the brain and can produce powerful changes in the body's chemistry. This turns attention to the concept of mind-body healing, whereby the mind can have significant influence on one's healing. There are various interventions for mind-body healing. Certain psychological mind-body therapies are effective for reducing stress. Nurses can use these interventions in their daily practice to help patients alleviate their stress, as well as enable them to recover successfully from stress-related problems. These therapies are to be used only in conjunction with conventional medicine to maximize the benefit of these interventions and to ensure that physical and emotional risks are nonexistent to the patient.

Mind-body Therapies to Reduce Stress

Stress is a fundamental part of living that can have both positive and negative effects on an individual's health. Stress can be positive, acting as a catalyst for producing helpful changes. However, stress is negative when there is a disproportion between what an individual wants or feels capable of doing and the constraints of the environment. This places an excessive amount of pressure and demand on the individual. If this pressure is unrelieved, unmanaged, or chronically experienced, this stress may have deleterious effects on the individual's health and well-being. Stress is the unconscious response to a demand. Stress becomes a problem when the demand exceeds an individual's ability to respond or cope effectively.

Mind-body medicine has been shown to reduce stress and enhance well-being (Ernst, 2001). These mind-body techniques help change the way individuals think about the problem, which gives them more control over their responses made to the stress. This enables individuals to manage and even reduce their stress because they are able to assert control over their reactions and behaviors to the stress. In addition, when individuals realize their ability to control their behaviors and, more importantly, their attitudes, they have more control over their stress overall. It is not the stress itself that causes physical and mental harm, but it is the reaction to the stress that determines how the individual experiences it. It becomes essential for individuals to learn how to control their thoughts, attitudes, and behaviors when encountering stressful situations.

It is important for nurses and other helping professionals to have knowledge and an appreciation for mind-body therapies that have been found to help reduce stress, and consequently, treat stress-related disorders. The use of mind-body therapies may help health care providers promote health and quality of life for individuals under their care. Some of the mind-body interventions that nurses can use in conjunction with conventional daily nursing practice to help reduce their patients' stress are meditation, imagery, therapeutic touch, and humor.

Using the Mind-body Connection

Clinicians may utilize this knowledge about the impact of stress on the immune system to help their patients in a more holistic way. They should include questions in their history taking about existing stressors and their coping mechanisms. Furthermore, understanding the physiological pathways of the mind-body connection is important; especially the integrated functions of the neurological, endocrine, and immune systems, in order for practitioners to apply mind-body techniques for helping individuals manage or reduce their stress.

Meditation triggers the relaxation response and helps the body relax and calms the mind. It is a mind-body intervention recommended specifically for reducing stress and enhancing the individual's well-being (Wisneski & Anderson, 2005). There are different methods used for meditating, some includes concentrating on a single thought or word for a set period of time. This helps release distractions from the mind, and consequently, release stress. Thoughts or feelings that may arise and cause stress during meditation are recognized, allowing the individual to have an understanding and acceptance of these thoughts with greater insight. Other forms of meditation include meditation upon positive thoughts about healing the body or healing the relationships between other people and situations. Individuals who meditate learn experience peacefulness and tranquility, as well as physical and mental health.

The relaxation response, pioneered by Herbert Benson, M.D. (1976), head of the Mind-body Medical Institute at New England Deaconess Hospital and Harvard Medical School, Division of Behavioral Medicine, attests to its scientific validation for stress reduction. Dr. Benson explains the relaxation response as a body response, which results in physiological changes when the individual who partakes in this therapy engages in a repetitive mental activity and consciously ignores negative distracting thoughts. Dr. Benson has shown scientific evidence for the physiological changes that occur during the relaxation response. There is a decrease in heart rate, and a rapid decrease in blood lactate that is associated with lower levels of anxiety. Blood pressure is also lowered in persons with hypertension. Alpha brain waves, associated with feelings of well-being and relaxation, increase in frequency and intensity. These physical changes are a sign of decreased activity of the sympathetic nervous system, indicating a sense of calmness and low anxiety. The relaxation response gives individuals control over their physiological actions, giving them generalized self-control and peacefulness.

In conjunction with the relaxation response, cognitive restructuring may also be used to reduce stress and its effects in various medical conditions (Ernst, 2001). This is a

mind-body technique that focuses specifically on cognition by teaching individuals to recognize and change stress-inducing thoughts to eliminate negative reactions to them and instead promote a sense of control and optimism. Relaxation response and cognitive restructuring have been especially useful for reducing stress and disorders associated with it; especially panic attacks, headaches, and depression.

Relaxation response and cognitive restructuring have been shown to effectively reduce stress and relieve symptoms associated with it, as well as provide other non-medical benefits. These mind-body interventions can help lessen medical costs since the patients can perform these techniques without medical intervention, thereby using less doctor and hospital visits. In addition, relaxation response and cognitive restructuring give patients a feeling of self-control and optimism, which boost immune functioning and contribute to overall better health (Jacobs, 2001).

Prayer is also used for meditation. Prayer and meditation both have a specific focus. The difference between prayer and meditation is that meditation focuses attention on a thought, and prayer focuses attention on a Higher Being or Higher Power. Like meditation, prayer has been shown to have positive effects on health. It produces positive emotions, which can have a positive impact on the immune system. Also, prayer has been shown to be an effective coping strategy. This helps reduce stress and its effect on one's health (Maier-Lorentz, 2004).

Nurses provide holistic care for their patients. This includes meeting their spiritual needs as well as their physical, mental, and emotional needs. Patients of all cultures use prayer in times of stress and illness (Fontaine, 2000). Patients of various cultural backgrounds use different types of prayer. Prayer can be done on an individual or group basis. Individuals can pray for themselves or others at a distance, known as intercessory prayer. Praying for others at a distance can be as effective as praying for someone in close proximity. Skeptics of prayer proclaim that proving the effectiveness of prayer may be beyond current scientific methods. However, whether prayer works as a placebo only or stress is reduced or a disease cured, prayer can still greatly benefit a patient (Maier-Lorentz, 2004).

Imagery is another mind-body intervention used to alleviate anxiety. It is standard therapy for promoting relaxation in both children and adults. Imagery uses the imagination to cause a change in the physical, emotional, or spiritual characteristics of an individual. Imagery is a hallmark of stress-management programs and is used to promote deep relaxation to help individuals live spiritually (Post-White & Fitzgerald, 2002).

Imagery is forming mental representations using any of the senses. Imagery may be active in which the individual cognitively evokes thoughts or ideas. For example, the individual envisions a goal such as being healthy and well. This is very therapeutic for helping individuals' manage their stress since they focus on positive thoughts as having good health. Imagery can also be process-oriented in which the individual imagines a desired effect, such as the immune system conquering a viral infection. Imagery can be very effective for reducing stress and helping individuals recover from stress-related

disorders. It reduces the stress response, which is mediated by psychoneuroimmune interactions. The stress response is triggered when a stress threatens the emotional well-being of individuals or the individual has no coping mechanisms for dealing with the stress. Imagery helps the individual reframe from having negative responses of fear and anxiety in stressful situations and use the senses to evoke positive thoughts of health and well-being. Eliminating negative responses and formulating positive images helps reduce the physiologic stress response of the body (Post-White & Fitzgerald, 2002). Imagery can be practiced as an independent activity and can be used as often as needed to combat stressful feelings. Nurses can also facilitate this healing process, and is then referred to as guided imagery.

The usefulness of imagery for mind-body medicine is dependent upon the individual's hypnotic ability and involvement in the proposed activities of imagination. However, nurses can effectively use imagery for facilitating relaxation and anxiety reduction. Imagery, as well as other mind-body techniques, are virtually physically and emotionally risk free when used in conjunction with conventional medicine. Outcomes of using imagery for relaxation include increased oxygen saturation levels, lower blood pressure, lower heart rate, warmer extremities, reduced muscle tension, greater alpha waves on EEG, and expression of sensing less or no anxiety overall (Post-White & Fitzgerald, 2002).

Therapeutic touch (TT) is a process of energy modulation in which nurses use their hands with the intention to help or heal their patients (Krieger, 2002). The most important factor in therapeutic touch is intention. The intention to help or heal refers to the nurse being compassionate and focusing attention on the patient exclusively. Also, therapeutic touch refers to healing and not curing. Curing is removing all signs and symptoms of a disease. Therapeutic touch refers to nurses facilitating a relationship or a connection between the patient's mind, body, and spirit to promote a state of harmony or peace. This concept supports the concept of mind-body healing. This is important for helping patients heal from any problems.

Therapeutic touch is based on the philosophy of holism and general systems theory (Krieger, 2002). This has application to nursing. Nursing explains that all persons are composed of complex fields of various forms of energy. These fields of energy are in constant interaction and exchange with other energy fields. Thus, energy fields change each other because of their interactions with each other. Therapeutic touch channels energy through the practitioner's hands to the patient, resulting in the restoration of balance so the patient has the capacity to heal. Healing energy should flow from the practitioner to the patient who is receiving therapeutic touching. The practitioner using therapeutic touch essentially is the conduit for transferring this energy. Since nurses base their clinical practice on this concept, the use of therapeutic touch as a mind-body therapy is congruent with nursing philosophy. Therapeutic touch can be a nursing intervention to include in patients' care plans.

Humor is regarded by nurses as an interaction or communication that leads to laughing, smiling, or a feeling of amusement (Smith, 2002). Nurses typically use humor

to lighten up tense situations. It can be used effectively in highly stressful situations to help patients overcome their anxieties. Humor provides a safe atmosphere that enables patients to express their thoughts, feelings, and emotions about their circumstances.

Humor is also described as a defense mechanism for dealing with stress (Smith, 2002). Some patients find humor as very helpful for dealing with their very difficult and stressful problems during times of illness. Using humor has been shown to be very effective for helping patients deal with fear and anxiety, Nurses also find humor to be very beneficial for increasing their patients' pain threshold, which helps them relax and reduce their stress (Smith, 2002).

Humor can be used solely as a mind-body intervention for relieving stress. There is no contraindication for using it alone. It can also be used in conjunction with traditional medical modalities, complementing pharmacological interventions for treating stress. Goals for using humor in nursing practice are specific. One reason for including humor in the nursing care plan is to enhance the well-being of the patient. Its value may be that it uplifts the patient's spirits in general. Humor also helps build a therapeutic relationship between the nurse and patient. Patients may feel at ease when the nurse introduces humor in the clinical setting, which can help these patients feel comfortable with the nurse and the interventions implemented in the care. Most importantly, humor may bring hope and joy to the situation, which helps relieve stress and speed recovery (Smith, 2002).

Conclusion

Mind-body interventions are effective for reducing stress and improving other symptoms associated with diseases. There are other benefits for using mind-body therapies as well. They are cost-effective since nurses and other health care providers can perform them. Additionally, using many of these therapies, such as meditation, imagery, therapeutic touch, and humor, do not incur cost to the practitioner or to the patient. Patients who use mind-body modalities may have less doctor visits and hospitalizations, which help reduce medical costs dramatically. Many of the mind-body interventions have no side effects and improve patients' self-control, which increases their sense of well-being.

The use of mind-body intervention is used for helping to relieve many symptoms associated with chronic diseases. However, mind-body medicine is most important for its role in helping to reduce stress. The underlying etiology of many major medical problems, such as coronary disease, accidents, suicides, and depression, is stress and its effects on the body. Many of these conditions are preventable in part or in total. This clearly points out the significance of integrating mind-body techniques with conventional medical practice (Pelletier, 2002). The growing number of individuals and health care professionals using mind-body medicine attests to its positive impact on the health and well-being of individuals. It is conceivable that mind-body medicine may soon be recognized as conventional medical therapy.

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