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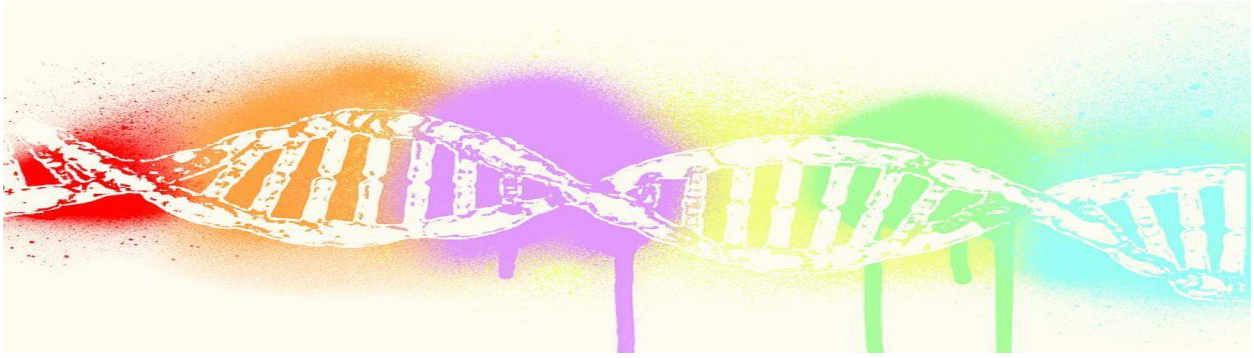
Quality Improvement Project (QIP)

A Guide to Mindfulness Meditation: Enhance Neuroplasticity and Alter Gene Expression for Vibrant Health



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Introduction

In today's changing times, stress and anxiety seem to be running rampant and causing severe health conditions. We know that lifestyle changes are necessary: proper nutrition, getting enough sleep, meditation, and exercise. These are the essential ingredients to create a healthy and vibrant life. The demands of modern life lead many of us directly toward a path of chronic stress and increased prevalence of stress-related conditions; stress is a significant contributing factor to human disease. [1]

Scientific research highlights the magnitude of changes that occur while incorporating mindful meditation techniques and hopefully will encourage people to add this into their lives. Meditation is most commonly practiced to reduce stress and anxiety. [2] However, it can help with imbalances that ultimately lead to disease. It is essential to understand that the thoughts in the human brain can create neural structures that display health or illness. Therefore, it is critical to monitor the endless negative chatter that fills up our minds throughout the day. Long term meditators increased the amount of grey matter in the insula and sensory cortex, the auditory cortex, and sensory regions of the brain. It has also been discovered the frontal cortex had increased gray matter, which is associated with executive decision making and working memory.[3]

The prefrontal cortex is a part of the brain that shrinks as you age which causes memory problems and difficulty trying to figure things out. Lazar and her colleagues found that 50-year-old meditators had the same gray matter in this region of the brain as those who were just 25 years of age. [3] Several reports suggest that consistent meditation may slow the gradual degeneration of neural tissue associated with aging. In two separate studies Lazar and colleagues and Pagnoni and his team, both reported that a subset of brain regions in experienced meditators failed to show the typical decline in gray matter volume that one would expect with age. The non-meditating control group did show this decline. [3] [4]

Meditative practices added into daily life, can enhance neurotransmitters, stimulate neuroplasticity, and change the gene expression that alters the outcome of health. [5] This guide

provides, research and evidence of health improvements, and simple tools to educate patients about why the lifestyle choice of meditation is so important and how to quickly start with just a few minutes per day.

What is Neuroplasticity, and why is it Important?

Neuroplasticity research describes how neurons in the brain multiply and increase the number of connections throughout life. [6] Dr. David Perlmutter defines this as merely the ability of the brain to change and reorganize itself and its function. [7] New patterns or connections in the brain develop as thoughts, emotions, and experiences together change behaviors and create new neural connections in the brain. [8] Negative thoughts, beliefs, and programming from childhood upbringing or society, in general, have a strong hold on our feelings and in turn, have a tremendous effect on our immune system, diseases, stress levels, and our health. Positive beliefs, thoughts, and experiences pave new pathways in our brain structures that allow the body to thrive in health. [8]

We all have the power and ability to intentionally change our brain chemistry resulting in more efficient, balanced, and healthy bodies. There are numerous ways to diminish these old pathways and to nourish, build, and regrow new ones. Learning, trying new things, taking different routes to work, meditation, doing anything in a way that is different and new will cause the brain to make new connections and pathways. As we age and get settled into set ways of life, it is easy to fall into a rut of doing the same things over and over. It is common for us to eat the same foods, go to the same restaurants, do the same exercises, go to the same stores, and, unfortunately, repeat monotony day after day. We will remain unchanged, and by this way of living our brains age as we get stuck in these repetitive cycles.

Research shows the growth of neurons in the brains of adults exposed to a wide variety of experiences ranging from playing piano and violin, juggling, and even taxi drivers who memorize the maze-like patterns of city streets. [6] Though the underlying mechanisms in each of these various cases are different, brain plasticity research suggests that challenging learning

experiences can lead to the growth of brain tissue that is comparable to how physical exercise leads to the developing of muscle tissue. [6]

Our neurons need to remember these connections to keep them bound together. When the brain makes these new changes, our thoughts produce neurotransmitters such as serotonin, dopamine, and acetylcholine. [5] Eric Kandel, M.D. in his research demonstrated that unless learning experiences are repeated over and over again, that any new synaptic connections made will revert to the original state in just a few weeks, but as new memories form and the process repeats numerous times that the number of synaptic connections will double. [9] This unique wiring then cements the new memories into place, and now we have created a lasting change. Making alterations in our lives even if they are small can bring about significant opportunities for our minds and bodies to stay young and to remain healthy.

Gene Expression and Epigenetics

By now, it is safe to say most of us have heard that lifestyle choices such as meditation, exercise, and proper nutrition all play a role in the quality of our lives, but most people do not realize that these can also change your genetics. The old train of thought led us to believe that our genes controlled our destiny. If strokes, heart disease, and cancer were prevalent in your family, your fate was already set in stone. Today we know that the genes you were born with, your genetic blueprint, does not control the outcome "genes are not destiny!" [8]
How exactly can meditation transcend your genetics? Environmental factors, nutrition, stress levels, and lifestyle choices, all play an extensive role in determining illness or health. We all have options and can change how our genes express themselves even if we simply start with our thoughts. We all can tap into this incredible power. An easy way is to start meditating. There are various styles of mindfulness practices that you can do anywhere, and

all you need is you. Start with just a couple of minutes a day. Meditation is renowned for its ability to alter gene expression and one of the simplest ways to modify nature's blueprint, reduce inflammation, and increase immunity.

Dr. Dean Ornish and his colleagues at the University of California, San Francisco conducted a study of men with prostate cancer in an attempt to modify gene expression from lifestyle changes alone. The participants engaged in daily mindfulness practices for stress reduction, including meditation, yoga, breathing exercises, and imagery techniques along with healthy eating habits. The results revealed a decrease in the expression of multiple cancer-associated genes. [10] Several cancer-causing genes completely turned off.

We have tremendous power to generate health or disease by choosing to engage in these simple practices. Another study showed a reduction in the expression of the histone deacetylase genes, alterations in "global modification" of histones, and pro-inflammatory genes showed a decrease in gene expression. [11] We know that inflammation is a significant cause of pain and leads to disease if not kept under control. By taking control of our own lives and choosing to incorporate routines such as meditation, we can lower inflammation in our bodies and start to change our genetic expression.

Neurotransmitters - Why Are They Important?

Neurotransmitters play a significant part in modulating and regulating behavior and anxiety. [2] Numerous studies show that practicing meditation triggers neurotransmitters that modulate psychological disorders such as anxiety, depression, stress, pain, insomnia, and increases the quality of life. Neurotransmitters are chemical messengers that send information from one neuron to another. They are used by the nervous system to transmits messages between neurons or from neurons to muscles. [12] When we think thoughts neurotransmitters of one neuron crosses the synaptic cleft to meet another, at this point, a neuron fires an electric bolt of information. [12] When we think a thought over and over, the neuron keeps firing down the same path reinforcing the bond between the two cells so they can more easily convey a signal the next time they fire. This process demonstrates physical evidence in the brain that something was learned and remembered. [5]

As the groups of neurons fire in unison to supports the new thought, this is when an additional protein is created inside the nerve cell and ends up in the DNA. The protein then turns on

multiple genes.[13] So if we repeat a thought enough times, this process reinforces the brain cells to make stronger connections that in the end, affects the physical body structure. So when you think a new thought, you change your body genetically, chemically, and neurologically [5]. By being aware of your thinking and redirecting to a more constructive pattern, you can alter the expression of your genes. Guided meditations help to rewire your brain, eliminate old negative thought patterns, and nourish and grow new positive avenues.

Meditation Affects Neurotransmitters

- **Serotonin** elevates mood, happiness, and general wellbeing, it also helps with the sleep cycle, digestive system regulation, appetite, memory, and protects various parts of the nervous system. [12] Deficiencies in serotonin are associated with depression. [2] In a study of Transcendental Meditation practitioners, the meditators exhibited higher levels of serotonin when compared to the control group, and showed significantly higher levels after the meditation.[14]

- **GABA** helps calm the central nervous system and improves focus. When GABA levels are low symptoms of anxiety, nervousness, racing thoughts, and insomnia surface. Research proves that lower levels of GABA or GABA receptors are connected with higher levels of anxiety. [2] Psychiatrists at the Boston University School of medicine discovered a 27% increase in GABA levels after just one hour of meditation. [15]

- **Endorphins** are released during exercise, excitement, and sex, producing well-being, euphoria, and reducing pain. They are known as the feel-good neurotransmitter, often associated with the "runners high" due to increased levels after exercising. Meditations studies show increased levels of endorphins after meditation at higher levels than after running. [16]

- **Dopamine** produces feelings of pleasure. It plays a role in the motivational component of reward-motivated behavior and reinforcement.[12] The first time you try something, a reward of dopamine follows, and as cravings are satisfied, dopamine is released. It helps to regulate movement, attention, learning, working memory, cognition, and emotion. Low levels are associated with depression and Parkinson's disease. A study published in Cognitive Brain Research shows a 65% increase in dopamine levels during a meditation-induced change of consciousness. [17] The imaging was captured on an MRI.

- **Norepinephrine** is a primary neurotransmitter in the sympathetic nervous system associated with anxiety, high blood pressure, sweating, and the fight-or-flight response where it increases heart rate and blood flow to the muscles. It affects various organs in the body that control blood pressure, kidney, lung, liver, and many other functions. [12] Norepinephrine acts as a neurotransmitter and a hormone and affects attention and responding actions in the brain. Norepinephrine levels were compared between two groups of heart failure patients, one group practiced meditation, and the other attended weekly meetings. The group practicing meditation showed lower levels of norepinephrine in the blood serum sample as compared to the control group. [2]

- **Acetylcholine** is associated with thought, learning, memory, muscle control, and depression. Increased acetylcholine has been found in the frontal lobe during meditation has been shown to increase attention and in the parietal lobes where it tends to enhance orienting ability. [18] Increases in the signaling of this neurotransmitter appear to contribute to stress-related illnesses such as major depressive disorders. [19]

How to Meditate

There are numerous styles of meditation to choose from, but it is essential to pick one technique and simply start meditating. It can be as easy as focusing on counting your breath for two minutes for the first day and then expanding upon that each day. Your body will mend

and heal itself, and your life will change. There is a reason why people who meditate continue to do it as a daily practice; the results are profound. The best way is to find what is comfortable for you. Meditative positions can be anything from the well-known lotus position sitting on the floor with your legs crossed, sitting in a chair, lying on the floor, or finding a spot in nature on a rock or under a tree. There is no right or wrong way to meditate. What matters most is that you find what resonates with you and begin.

A key component when it comes to meditation is to tap into an emotion and feel it. Cells regenerate and become healthy or sick, depending on the feelings and thoughts that we feed them. Our brain controls the behavior of the body's cells. [8] So it is critical to fill the mind with positive nourishment. For the body to heal a cell, one must believe and see the cell healing by adding emotion to the process. Candace Pert's work emphasized that thoughts and emotions affect our health, and our bodies and minds function together like pieces of an interconnected system. [20] Focused meditation tapping into consciousness can bring health to a diseased body, and inappropriate unconscious control of emotions can quickly destroy a healthy body and make it sick. [8]

Various Styles of Meditation

- **Guided meditations** are a perfect option for people who have difficulty emptying the constant chatter that bombards us as we try to quiet the mind. All that is necessary is to focus on what the speaker is guiding you to do. This type of meditation makes it easier to focus more directly and not get lost in the endless loop of noise going on in your head.

- **Breath awareness meditations** focus on each breath as you breathe in and out. The focus can be on the air and life force filling up the lungs, or counting as you inhale and exhale. Another possibility is to breath deeply inhaling through your nose to the count of four and exhaling out the mouth to the count of six taking deep breaths.

- **Visualization meditation** the focus is on something that you want to change or improve in your life, such as an illness or to manifest any you desire. See new healthy cells in your body regenerating and all of the organs functioning properly. Visualize the energy field around your body, and see it expanding in diameter and becoming brighter.

- **Focused or present** meditation involves choosing to intently focus on a physical object, image, word, or phrase in order to let go of any thoughts. Often people gaze at a candle flame, an hourglass, or any object of choice. Meditations such as Transcendental meditation use a repeated phrase. Om is an ancient traditional sound repeated over and over which also produces a vibratory frequency used in healing.

- **Movement meditation** includes qi gong, tai chi, yoga, walking labyrinths, or general walking. As with all mindfulness practices, the idea is to focus on the breath, clear your mind, and be present in the moment with each movement. The left and right turns throughout a labyrinth are thought to balance both hemispheres of the brain, resulting in balance, and physical and emotional well-being. Many hospitals use labyrinths as a support tool for treating diseases such as cancer. [21] Churches and parks also have labyrinths that are open for all to enjoy.

- **Loving-kindness meditation** is thought to create more empathy and compassion in our world by sending loving thoughts to others that will spread across the planet. Focus on your heart sending love, compassion, and peace out into the world. Mentally set a kind intention and see it in your mind's eye expanding out to all living beings and the earth or repeat a word or mantra.

Conclusion

Every person on this planet has the opportunity in life to make decisions that are best for them. Many people, at one point or another, come to a crossroad where they become confused and get stuck in situations where they do not know what to do. As health care practitioners and physicians, it is our responsibility to help and guide those in need. Meditation is one of the most natural things to add to a patient's protocol where they will reap tremendous benefits and see vast improvements in their lives if they stay with it. Mindfulness practices can pull people out of depression, elevate their moods, and alleviate stress levels which strengthen the immune system, alters their gene expression, improves neurotransmitters, and trigger neurogenesis. It is free, can be done anywhere, for any length of time and every breathing human can do it.

Patients are seeking answers, especially those in chronic situations where nothing seems to work. Getting to the root of an illness is often like peeling the layers of an onion and deep within there is something hidden that needs to be released.

"And the day came when the risk to remain tight in a bud was more painful than the risk it took to blossom."

-Anais Nin

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